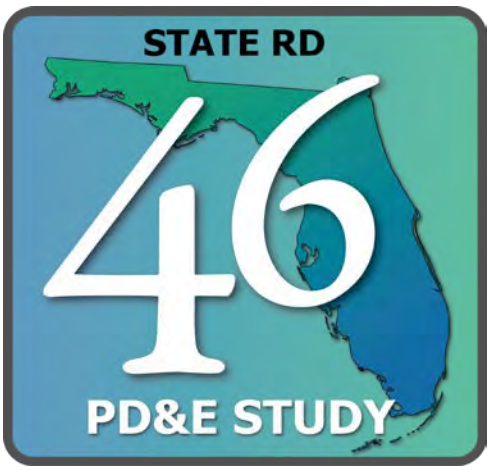
POND SITING REPORT



SR 46 PD&E Study

from SR 415 to CR 426

Seminole County, Florida

FPN 240216-4-28-01

April 2014

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

URS

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with URS Corporation, a corporation, authorized to operate as an engineering business, Certificate of Authorization No. 000002, by the State of Florida, Department of Business and Professional Regulation, Board of Professional Engineers, and that I have reviewed or approved the evaluation, findings, opinions, conclusions, or technical advice hereby reported for:

Project: SR 46 PD&E Study from SR 415 to CR 426

FPN: 240216-4-28-01

Location: Seminole County, Florida

Client: Seminole County and FDOT – District Five

This Pond Siting Report includes a summary of data collection efforts and conceptual drainage analyses prepared for conceptual analyses for the SR 46 PD&E Study from SR 415 to CR 426. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of civil engineering as applied through design standards and criteria set forth by the federal, state, and local regulatory agencies as well as professional judgment and experience.

Name: Danh Lee, P.E.

Signature: 

P.E. Number: 68228

Date: 04/02/2014

Address: URS Corporation

315 E. Robinson Street

Suite 245

Orlando, FL 32801

PAGE

EXHIBITS **PAGE**

TABLES

APPENDICES

EXECUTIVE SUMMARY

Seminole County and the Florida Department of Transportation (FDOT) District 5 have initiated a Project Development and Environment Study (PD&E) to widen State Road 46 (SR 46) from a two lane rural roadway to a four lane divided facility from East of SR 415 to CR 426 in Seminole County, Florida. The purpose of the proposed improvements is to improve the mobility in the SR 46 corridor to accommodate future projected traffic demand in the Design Year (2035) safely and efficiently. The study will develop and evaluate concepts that address traffic operations. The study will also evaluate the anticipated impacts and costs for each concept.

The purpose of this pond siting report is to discuss the stormwater management plan for the project. This report identifies pond locations, discusses right-of-way requirements, and possible mitigation costs associated with each pond location.

Existing Drainage Conditions

SR 46 is located within the jurisdiction of the SJRWMD. According to the USGS quadrangle maps, the approximate ground surface elevation within the project limits range from as low as approximately +5 feet to high as approximately +75 feet. The elevations are based on 1929 National Geodetic Vertical Datum (NGVD). The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an Outstanding Florida Waters (OFW). However, the Florida Department of Environmental Protection (FDEP) has adopted Total Maximum Daily Loads (TMDL) for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney.

The original construction of SR 46 crosses several floodplain areas longitudinally. The floodplain locations were determined using the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Seminole County, Florida and incorporated areas. The following Community-Panel Numbers were used in reference:

- 12117C0090F
- 12117C0095F
- 12177C0185F
- 12117C0205F

FEMA FIRM identified three floodplain zones present within the limits of this project. These zones are defined as follows:

- Zone AE – Base flood elevation determined (Elev. 9.0 ft, NAVD)
- Zone AE – Base flood elevation determined (Elev. 29.0 ft , NAVD)
- Zone A – No base flood elevation determined

Effective dates of these panels are September 28, 2007 (**See Appendix A**).

Existing land use along the project corridor west of the bridge and north of SR 46, the Bergmann Tract land is zoned vacant (other). West of the bridge and south of SR 46, the land is zoned agricultural, residential, and conservation. Existing land use along the project corridor east of the bridge is primarily residential single family. The parcels owned by the City of Sanford (Site 10) east of the bridge and south of SR 46 are zoned agricultural. Commercial land uses are clustered around the intersections of SR 46 with SR 415 and CR 426. Existing land use is shown on **Exhibit 2-4**. The future land use for the project area is shown on **Exhibit 2-5**. This project is consistent with the future land use identified in the Seminole County Comprehensive Plan.

In general, stormwater discharged from SR 46 is not treated within the project limits. The existing typical section of SR 46 is crowned and the travel lanes and outside shoulders slope to the outside into existing roadside ditches. The roadside ditches then convey the stormwater runoff to several existing cross drains. The cross drains then conveys the runoff into various wetland areas found within the project limits, which ultimately discharge to the St. Johns River. A summary of existing cross drains are shown in **Table 1-1**.

Table 1-1 – Summary of Existing Cross Drains

SUMMARY OF EXISTING CROSS DRAINS						
Structure No.	**Station**	**Type**	**Size**	**Flow Line Left**	**Flow Line Right**	**Comments**
CD-1	**9+24**	**RCP**	**24"**	**12.56**	**10.72**	**Removed**
CD-2	**188+62**	**RCP w/ PVC Liner**	**24"**	**13.70**	**13.00**	
CD-3	**201+61**	**RCP w/ PVC Liner**	**24"**	**14.00**	**13.80**	
CD-4	**226+60**	**CBC**	**(2) 8'x3'**	**13.00**	**13.20**	
CD-5	**276+60**	**RCP w/ PVC Liner**	**(2) 24"**	**20.20**	**20.40**	
CD-6	**296+64**	**RCP w/ PVC Liner**	**24"**	**20.50**	**20.00**	
CD-7	**310+52**	**RCP w/ PVC Liner**	**24"**	**20.00**	**20.10**	
CD-8	**326+73**	**RCP w/ PVC Liner**	**24"**	**25.10**	**31.60**	
CD-9	**384+60**	**RCP w/ PVC Liner**	**18"**	**58.50**	**58.40**	

The only area currently treated is within the limits of the bridge replacement project, over Lake Jesup, which was constructed in 2009. The new bridge and approaches are being treated by existing stormwater treatment wet detention pond(s) 1 and 2. The ponds are located west and east of the bridge, respectively. Stormwater runoff from the high point of the bridge to the west end of the project is collected and conveyed to existing Pond 1 by a series of shoulder gutter inlets and ditch bottom inlets. Stormwater runoff from the high point of the bridge to the east end of the project is collected and conveyed to existing Pond 2 by a series of bridge scuppers, shoulder gutter inlets, and ditch bottom inlets. The bridge scuppers are connected to fiber reinforced concrete pipes that hang beneath the south side of the bridge.

Proposed Drainage Conditions

This study anticipates the stormwater runoff for the proposed SR 46 widening will be collected via a series of curb and gutter inlets. The existing profile grade in several areas along the project limits is nearly flat. During the design phase, special gutter profiles may be required if widening from the existing pavement results in less than the minimum required 0.3% gutter grades. Stormwater runoff from the proposed bridge, high point to eastern limits, will be collected via a series of bridge scuppers and piped into the stormwater treatment pond. Offsite drainage areas, which are unable to be collected in the onsite system due to hydraulic constraints, will be bypassed and conveyed via pipes that discharge to the existing outfall locations. During the design phase, a thorough evaluation of the potential to comingle offsite and onsite runoff into a single collection system should be performed in an effort to minimize conveyance system costs.

As stated before, the sub-basin limits were typically defined as the area between two cross drains. During the design phase, there may be opportunities to reduce the number of ponds required by combining sub-basins. However, this depends on the pond depth being able to accommodate the SR 46 stormsewer system routed underneath the existing cross drains.

SR 46 is located within the jurisdiction of the SJRWMD. The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an OFW. However, the Florida Department of Environmental Protection (FDEP) has adopted Total Maximum Daily Loads (TMDL) for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney. See **Section 3.9** for more details regarding TMDL analysis. Also, 100-year floodplains are found within the project limits with the majority being located around the bridge over Lake Jesup. See **Section 3.5** for more details regarding 100-year floodplain analysis.

To determine feasible pond locations, the following procedures were used:

- Establish sub-basins and determine existing outfall locations. The majority of the sub-basins have been divided between existing cross drains.
- Soil conditions and geotechnical subsurface ground water elevations were evaluated to determine the type of stormwater treatment facility (i.e. wet or dry pond). The estimated seasonal high water table (ESWHT) elevations were established based on the preliminary roadway soil survey performed by Ardaman & Associates, permitted conditions for existing Pond(s) 1 & 2 (Bridge Replacement project; SJRWMD Permit No. 40-117-95925-5), and permitted conditions for existing Pond 101 (Sterling Meadows Subdivision; SJRWMD permit No. 4-117-5166-2). The bottom elevations for all dry ponds were set at a minimum of 18" above the ESHWT elevation.
- Existing ground elevations were determined by using Seminole County GIS Lidar Data, 1 foot contours.
- Based on SJRWMD, water quality (treatment) and water quantity (attenuation) criteria were determined. Please refer to **Appendix E** for design criteria.

- All ponds were sized with the capacity to retain the required treatment volume plus the Post-Pre attenuation volume (25 year / 24 hour) with 1 foot of freeboard to the inside berm elevation. Please refer to calculations in **Appendix F**.
- Hydraulic Grade Line (HGL) elevations were compared to roadway elevations in each basin to develop the allowable pond stages. The estimated stormsewer tailwater elevation was assumed to be the pond stage at the 3 year / 24 hour Post-Pre attenuation volume (closed system) plus the required treatment volume.
- The FDOT Critical Storm of 100 year / 72 hour, for open basins, was used to determine the required Post-Pre attenuation volume in basins where there has been record of flooding. This applies to Basin C & D.
- 100-year floodplain impacts will be compensated by Floodplain Compensation Pond(s) 1 & 2 and roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation at each pond and ditch location.
- Post development TMDLs will be equal to or less than Pre development TMDLs for all basins discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney.

All wet ponds were sized with a 15.0 ft maintenance berm (1:15 or flatter). Side slopes of 1:4 to two feet below the seasonal high water table, and then a 1:2 slope to the proposed pond bottom. All dry ponds were sized with a 15.0 ft maintenance berm (1:15 or flatter) and side slopes of 1:4 to the proposed pond bottom.

Summary

Alternative pond sites have been identified along the project limits. The analysis estimates right-of-way needs using volumetric analysis, which accounts for water quality treatment and water quantity for runoff attenuation. The right-of-way cost estimates found in this report is a budget tool that can be used by Seminole County and FDOT District 5 to estimate total acquisition costs associated with each pond alternative and to budget the appropriate funds for acquisition. Right-of-way cost estimates are not real estate appraisals and do not reflect market values.

Pond sizing calculations as well as graphics showing the roadway alignment and associated pond site alternatives are included in **Appendix F** and **Appendix G**, respectively, of this Pond Siting Report. Please note that the recommendations were based on pond sizes and locations determined from preliminary calculations, reasonable engineering judgment, and assumptions. Pond sizes and locations may change during the final design as more detailed information on ESHWT elevations, wetland normal pool elevations, final roadway profile design, and confirmed TMDL requirements, etc. become available. **Table 1-2** shows the Pond Alternatives Evaluation Matrix and the following states the reason(s) why the preferred pond sites were selected for each sub-basin.

Basin A

Pond A3 is the preferred alternative because it requires less mitigation effort. Alternative Pond(s) A1 and A2 are located within a multi-owned conservation easement, while Pond A3 is located within a single conservation easement owned by the SJRWMD. Also, Pond A3 does not require a proposed drainage easement for the pond outfall location, which results in less right-of-way acquisition and wetland impacts.

Basin 1

Modification of existing Pond 1 was the only pond alternative evaluated for this basin, which requires the least amount of additional pond right-of-way. Existing Pond 1 will be expanded to provide additional stormwater treatment and attenuation for the proposed roadway improvements.

Basin 2

Modification of existing Pond 2 was the only pond alternative evaluated for this basin, which requires the least amount of additional pond right-of-way. Existing Pond 2 will be expanded to provide additional stormwater treatment and attenuation for the proposed roadway improvements.

Basin B

Pond B1 is the preferred alternative because the area is located within the remnant parcel that will be purchased for the proposed roadway improvements. This pond can also utilize the existing ditch located on the south side of West Osceola Road for its outfall location before ultimately discharging into the St. Johns River.

Basin C

Pond C1 is the preferred alternative because this site does not require any relocation of existing residents as compared to alternative Pond C2. Also, this site will have less wetland impacts as compared to alternative Pond C3.

Basin D

Pond D1 is the preferred alternative because this site does not require a separate system for the pond outfall. Also, this site would allow for the proposed improvements to resolve the drainage issue on the downstream side of CD-5 by re-grading the existing ditch to provide positive drainage into the adjacent wetland. The re-graded ditch could also potentially provide compensation for the reduction in floodplain impacts created by the construction of the proposed pond.

Basin E

Pond E2 is the preferred alternative because this site has a higher potential of resulting in no impacts to the 100-year floodplain as compared to alternative Pond E3. In addition, during the design phase the proposed 25 ft drainage easement could potentially be eliminated by conveying the pond outfall in a separate system that would discharge to the downstream side of CD-6 which would result in no wetland impacts.

Basin F

Pond F2 is the preferred alternative because the proposed 25 ft drainage easement required for the pond outfall will have less wetland impacts than the required easement associated with Pond F3. Also, this proposed pond site and easement will only impact one parcel compared to two parcels required for Pond F3.

Basin G

Pond G2 is the preferred alternative because there is less variation in the existing ground elevations at this proposed pond site than alternative Pond G3, which should made construction of the pond less difficult. Also, there is an existing spring in the vicinity of the Pond G3 site where the exact location has not been determined.

Basin H

Pond H1 is the preferred alternative because there will be no impacts to wetlands as compared to alternative Pond H3 and no business damages as compared to alternative Pond H2.

Table 1-2 - Pond Alternatives Evaluation Matrix

Pond Site Alternative	Pond Size Required including easements & access (acres)	Total Parcel Required (acres)	FEMA Flood Zone	Wetland Impacts (acres)	Arch. / Historical Impact Potential	Environmental Impact Risk	Threatened or Endangered Species Impacts	Hazardous Materials & Contamination Potential	Social Impact	Major Utility Conflict Potenial (Y/N)	Existing Land Use	Future Land Use	Total Pond Costs	Rankings
Pond A1	8.84	8.84	AE	8.84	Low	High	Medium	None	Low	N	Wet Prairies	Preservation/ Managed Lands	$1,586,017.29	2
Pond A2	8.84	8.84	AE	8.84	Low	High	Medium	None	Low	N	Mixed Scrub - Shrub Wetland	Preservation/ Managed Lands	$1,743,571.63	3
Pond A3	8.42	8.42	AE	8.42	Low	High	Medium	None	Low	N	Wet Prairies	Preservation/ Managed Lands	$1,664,589.66	1
Pond B1	6.00	6.00	X	1.37	Low	Medium	Medium	None	Low	N	Wetland Forested Mixed	Rural/5	$858,560.89	1
Pond B2	5.96	5.96	X	0.00	Low	Low	Low	None	Low	N	Improved Pastures	Public/Quasi-Public	$697,272.20	2
Pond B3	6.12	6.12	A	0.50	Low	High	High	None	Low	N	Pine Flatwoods	Rural/5	$1,146,396.40	3
Pond C1	4.08	4.08	X	0.29	Low	Medium	Low	None	Low	N	Woodland Pastures	Rural/5	$2,734,136.29	1
Pond C2	4.16	4.16	X	0.00	Low	Low	Low	None	Low	N	Woodland Pastures	Rural/5	$822,139.57	2
Pond C3	4.16	4.16	A	4.16	Low	High	Medium	None	Low	N	Freshwater Marshes	Public/Quasi-Public	$847,860.66	3
Pond D1	2.00	2.00	A	0.00	Medium	Low	Low	None	Low	N	Residential, Rural	Rural/5	$440,880.39	1
Pond D2	1.99	1.99	X	0.00	Medium	Low	Low	None	Low	N	Improved Pastures	Rural/5	$316,184.05	2
Pond D3	1.99	1.99	A	0.00	Medium	Low	Low	None	Low	N	Freshwater Marshes	Rural/5	$429,489.97	3
Pond E2	2.07	2.07	AE	0.10	Medium	Medium	Low	Low	Low	N	Rural Land in Transition	Rural/5	$309,210.32	1
Pond E3	1.97	1.97	A	0.02	Medium	Medium	Medium	None	Low	N	Wetland Forested Mixed	Rural/5	$274,889.26	2
Pond F2	1.54	1.54	X	0.03	High	Low	Low	Low	Low	N	Rural Land in Transition	Rural/5	$233,810.84	1

Table 1-2 - Pond Alternatives Evaluation Matrix

Pond Site Alternative	Pond Size Required including easements & access (acres)	Total Parcel Required (acres)	FEMA Flood Zone	Wetland Impacts (acres)	Arch. / Historical Impact Potential	Environmental Impact Risk	Threatened or Endangered Species Impacts	Hazardous Materials & Contamination Potential	Social Impact	Major Utility Conflict Potenial (Y/N)	Existing Land Use	Future Land Use	Total Pond Costs	Rankings
Pond F3	1.74	1.74	X	0.13	High	Medium	Medium	None	Low	N	Upland Mixed Coniferous/ Hardwood	Rural/5	$256,317.16	2
Pond G2	3.16	3.16	X	0.00	Low	Low	Low	None	Low	N	Sand and Gravel Pits	Rural/5	$295,729.09	1
Pond G3	3.49	3.49	X	0.00	High	Low-Medium	Low-Medium	None	Low	N	Upland Mixed Coniferous/ Hardwood	Rural/5	$358,586.31	2
Pond H1	2.89	2.89	X	0.00	High	Low	Low	None	Low	N	Pine Flatwoods	Rural/5	$402,317.56	1
Pond H2	2.96	2.96	X	0.00	Medium	Low	Low	Low	Low	N	Pine Flatwoods	Rural/5	$1,512,437.96	2
Pond H3	2.98	2.98	X	0.02	High	Low	Low	None	Low	N	Pine Flatwoods	Rural/5	$1,933,872.93	3
MOD Pond 1	1.02	1.02	AE	1.00	Low	Medium	Medium	None	Low	N	Cabbage Palm Hammock	Preservation/ Managed Lands	$282,194.86	1
MOD Pond 2	1.72	1.72	AE	0.00	High	Low	Low	None	Low	N	Upland Mixed Coniferous/ Hardwood	Rural/5	$391,552.79	1
FP Comp 1	8.15	8.15	AE	0.00	High	Medium	Medium	None	Low	N	Upland Mixed Coniferous/ Hardwood	Planned Development	$1,373,710.43	1
FP Comp 2	26.96	26.96	AE	3.81	High	Medium-High	High	None	Low	N	Upland Mixed Coniferous/ Hardwood	Rural/5	$3,462,443.69	1

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 includes cost of installed drainage structures, drainage pipes and outfalls, clearing and grubbing, earthwork excavation and grading, berm construction, fencing, access accommodations, and sodding. The associated parcel acquisition costs for each alternative evaluated includes the estimated cost of land and any impacted improvements, administrative costs, and legal fees.

1.0 PROJECT OVERVIEW

Seminole County and the Florida Department of Transportation (FDOT) District 5 have initiated a Project Development and Environment Study (PD&E) to widen State Road 46 (SR 46) from a two lane rural roadway to a four lane divided facility from East of SR 415 to CR 426 in Seminole County, Florida. The purpose of the proposed improvements is to improve the mobility in the SR 46 corridor to accommodate future projected traffic demand in the Design Year (2035) safely and efficiently. Exhibit 1-1 shows the project location and study limits.

1.1 Purpose of Pond Siting Report

This Pond Siting Report (PSR) provides an analysis of potential pond sites along SR 46 for Seminole County and the FDOT. The analysis estimates right-of-way requirements using a volumetric analysis, which accounts for water quality (treatment) and water quantity (attenuation) requirements.

A variety of factors are used to determine right-of-way requirements for each potential pond site. The following factors were used:

- Required treatment volume and attenuation volume
- Soil types and water table
- Wetland limits
- Floodplain limits
- Threatened and endangered species
- Cultural and historical sites
- Property lines
- Location of site with respect to outfall location

Resources used for this report include the following:

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Seminole County and incorporated areas. The following Community-Panel Numbers, with an effective date of September 28, 2007, were used: 12117C0090F, 12117C0095F, 12117C0185F, and 12117C0205F (Refer to **Appendix A**).
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service Soil Survey of Seminole County (1990).
- U.S. Geological Survey (USGS) Quadrangle Maps T19S-R31E, T20S-R31E, and T20S-R32E (Refer to **Appendix B**).
- FDOT Construction Plans of SR 46, Financial Project ID No(s): 240163-1-52-01, 240216-2-52-01, 407355-1-52-01, 417178-1-52-01, and 7704-105.

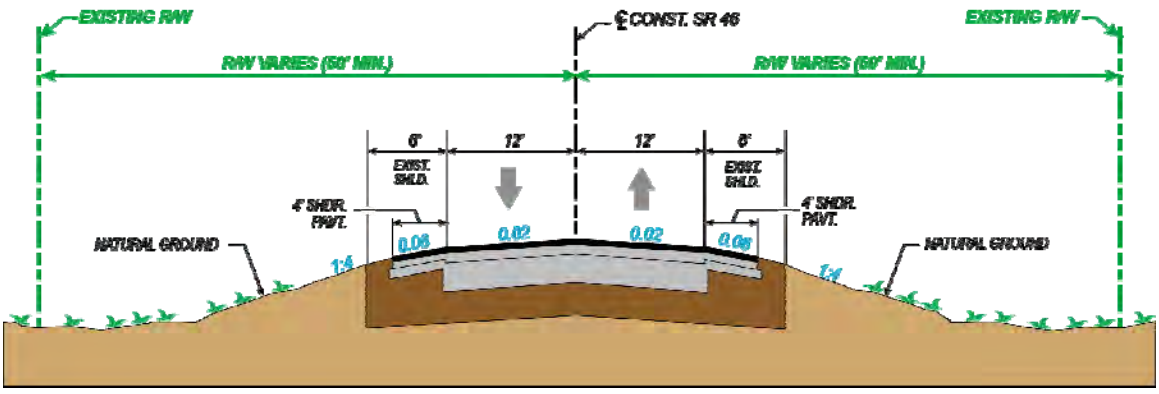
- Centex Homes Construction Plans of Sterling Meadows, SJRWMD Permit No. 4-117-51666-2.
- FDOT Straight Line Diagram of Road Inventory (Refer to **Appendix C**).
- Seminole County GIS Database for floodplains.
- Seminole County GIS Lidar Data, 1 foot contours.
- Correspondence (Refer to **Appendix D**).
- Field investigation.

Exhibit 1-1 - Project Location Map

2.0 EXISTING CONDITIONS

SR 46 is classified as a Rural Principal Arterial within the project limits. The portion of SR 46 included in this Pond Siting Report has limits from East of SR 415 to CR 426 in Seminole County, a distance of approximately 7.4 miles. Within the project limits, the existing typical roadway section of SR 46 (See **Exhibit 2-1**) consists of a rural section with two 12-foot lanes and 6-foot (4-foot paved) outside shoulders.

Exhibit 2-1 – Existing Typical Section



2.1 Soils

Geotechnical information reviewed for this report included the 1990 Soil Survey for Seminole County, Florida, as prepared by the U.S. Department of Agriculture Natural Resources Conservation Service. **Table 2-1** lists the existing soil types present in the project area and corresponds to the figures presented in **Exhibit 2-2** and **Exhibit 2-3**.

Table 2-1 – Existing Soil Types

Symbol	Soil Type
3	Arents, 0 to 5% slopes
9	Basinger and Delray fine sands
10	Basinger, Samsula and Hontoon soils, depressional
11	Basinger and Smyrna fine sands, depressional
12	Canova and Terra Ceia mucks
13	EauGallie and Immokalee fine sands
15	Felda and manatee mucky fine sands, depressional
16	Immokalee sand
17	Brighton, Samsula and Sanibel mucks
18	Malabar fine sand
19	Manatee, Floridana and Holopaw soils, frequently flooded
20	Myakka and EauGallie fine sands
21	Nittaw mucky fine sand, depressional
22	Nittaw muck, occasionally flooded
23	Nittaw, Okeelanta and Basinger soils, frequently flooded
25	Pineda fine sand
26	Udorthents, excavated
27	Pomello fine sand, 0 to 5% slopes
29	St. Johns and EauGallie fine sands
33	Terra Ceia muck, frequently flooded
35	Wabasso fine sand
99	Water

Exhibit 2-2 – USDA NRCS Soil Map (1 of 2)

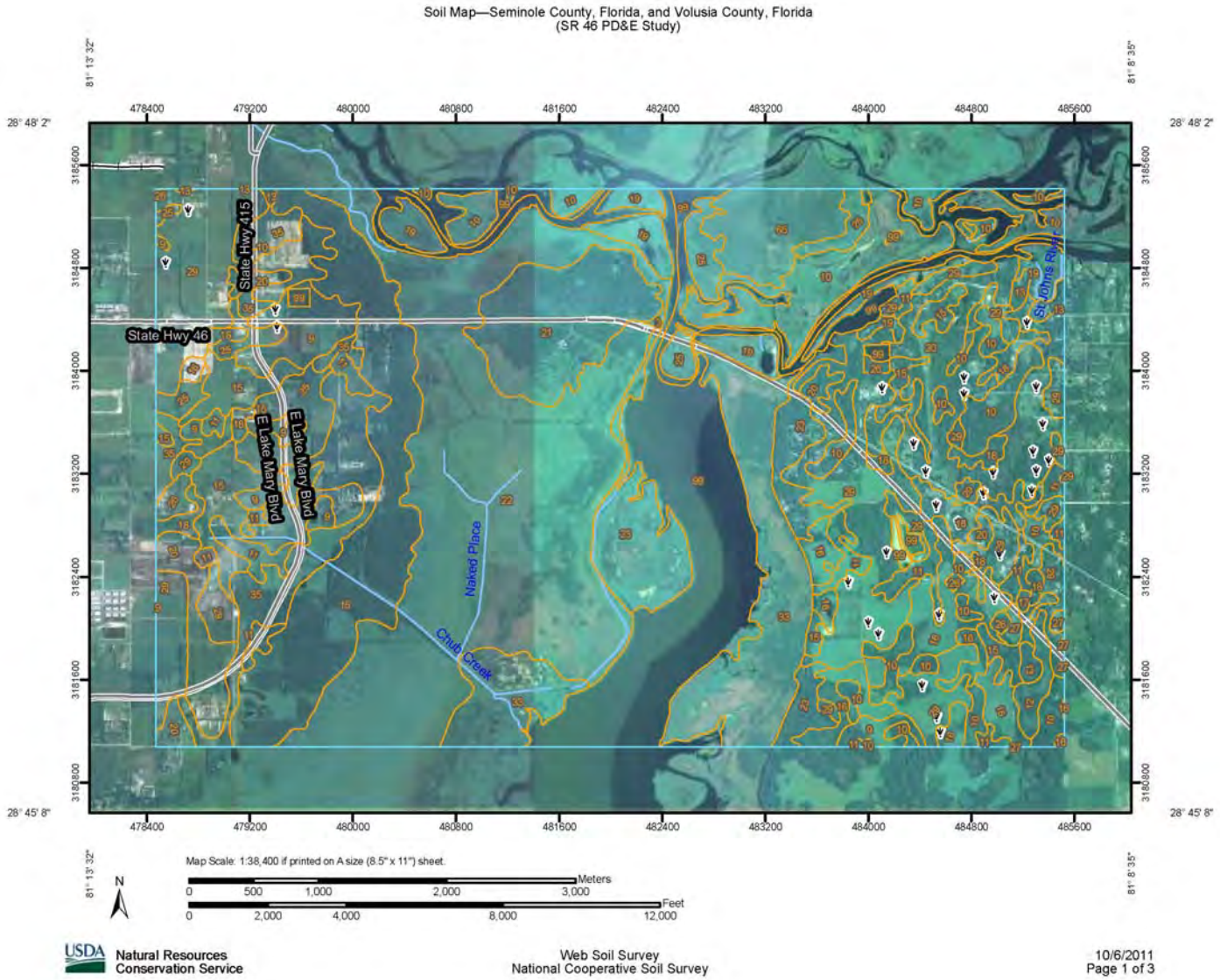
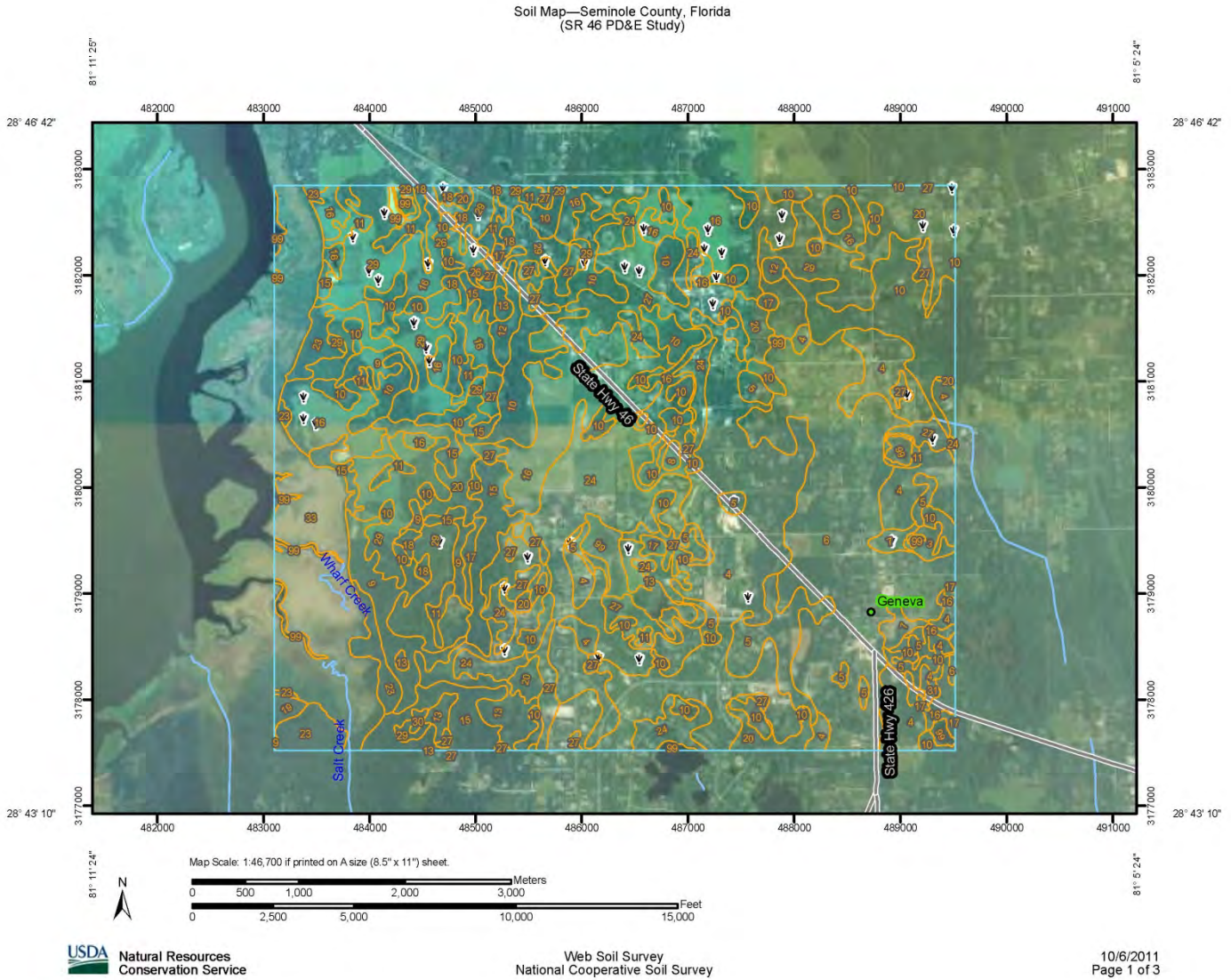


Exhibit 2-3 – USDA NRCS Soil Map (2 of 2)



2.2 Land Use

Existing land use along the project corridor west of the bridge and north of SR 46, the Bergmann Tract land is zoned vacant (other). West of the bridge and south of SR 46, the land is zoned agricultural, residential, and conservation. Existing land use along the project corridor east of the bridge is primarily residential single family. The parcels owned by the City of Sanford (Site 10) east of the bridge and south of SR 46 are zoned agricultural. Commercial land uses are clustered around the intersections of SR 46 with SR 415 and CR 426. Existing land use is shown on **Exhibit 2-4**. The future land use for the project area is shown on **Exhibit 2-5**. This project is consistent with the future land use identified in the Seminole County Comprehensive Plan.

2.3 Cross Drains

There are a total of 9 cross drains within the limits of this project ranging from 18" RCP to double 8' X 3' CBC (See **Table 2-2**). All these existing cross drains have been numbered and are shown on the Pond Alternatives Location Plans (Refer to **Appendix G**). There is also one existing bridge over Lake Jesup that was recently constructed in 2009. As part of the proposed roadway improvements, a parallel bridge will be constructed on the north side of the existing bridge.

According to the FDOT Maintenance Department, all of the cross drains are in good physical condition; however, there are two locations where there has been record of flooding problems on the downstream side of the cross drains. The first location being in the vicinity of CD-4, north of SR 46 and east of Mullet Lake Park Road. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located through downstream private properties and the ultimate outfall of the conveyance system leading into the St. Johns River. The second location being in the vicinity of CD-5, north of SR 46 and east of Mockingbird Lane. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located within the downstream private property into which the cross drain discharges before entering the wetland located within this property. The FDOT Maintenance Department does not believe that the existing cross drains are undersized in these locations, but the problems exist due to the lack of positive drainage grading within downstream private properties and that the problems cannot be fixed without some type of drainage easement. (**Appendix D** shows records of telephone conversations). The fact that the flooding occurs on the downstream side of the existing cross drains would indicate that the size of the existing cross drains are most likely not the cause of the flooding.

Field investigation was also conducted for all the existing cross drains within the project limits. Field inspection revealed a discrepancy with the FDOT Straight Line Diagram of Road Inventory for CD-4. The inventory shows this cross drain as a double 8' X 2' CBC, but field measurements indicate this cross drain is actually a double 8' X 3' CBC. Several of the cross drains contain PVC liners due to minor leaking at the joints according to the FDOT Maintenance Department. The FDOT Maintenance Department

also stated that replacement of the existing cross drains should be examined to meet the design service life projected within this PD&E Study.

The existing cross drains were analyzed using FHWA's HY-8 program and the discharges were calculated using FDOT's velocity method. Detailed calculations for all existing cross drain can be found in the **SR 46 PD&E Location Hydraulics Report**.

Table 2-2 – Summary of Existing Cross Drains

SUMMARY OF EXISTING CROSS DRAINS						
Structure No.	**Station**	**Type**	**Size**	**Flow Line Left**	**Flow Line Right**	**Comments**
CD-1	**9+24**	**RCP**	**24"**	**12.56**	**10.72**	**Removed**
CD-2	**188+62**	**RCP w/ PVC Liner**	**24"**	**13.70**	**13.00**	
CD-3	**201+61**	**RCP w/ PVC Liner**	**24"**	**14.00**	**13.80**	
CD-4	**226+60**	**CBC**	**(2) 8'x3'**	**13.00**	**13.20**	
CD-5	**276+60**	**RCP w/ PVC Liner**	**(2) 24"**	**20.20**	**20.40**	
CD-6	**296+64**	**RCP w/ PVC Liner**	**24"**	**20.50**	**20.00**	
CD-7	**310+52**	**RCP w/ PVC Liner**	**24"**	**20.00**	**20.10**	
CD-8	**326+73**	**RCP w/ PVC Liner**	**24"**	**25.10**	**31.60**	
CD-9	**384+60**	**RCP w/ PVC Liner**	**18"**	**58.50**	**58.40**	

Exhibit 2-4 Existing Land Use Map

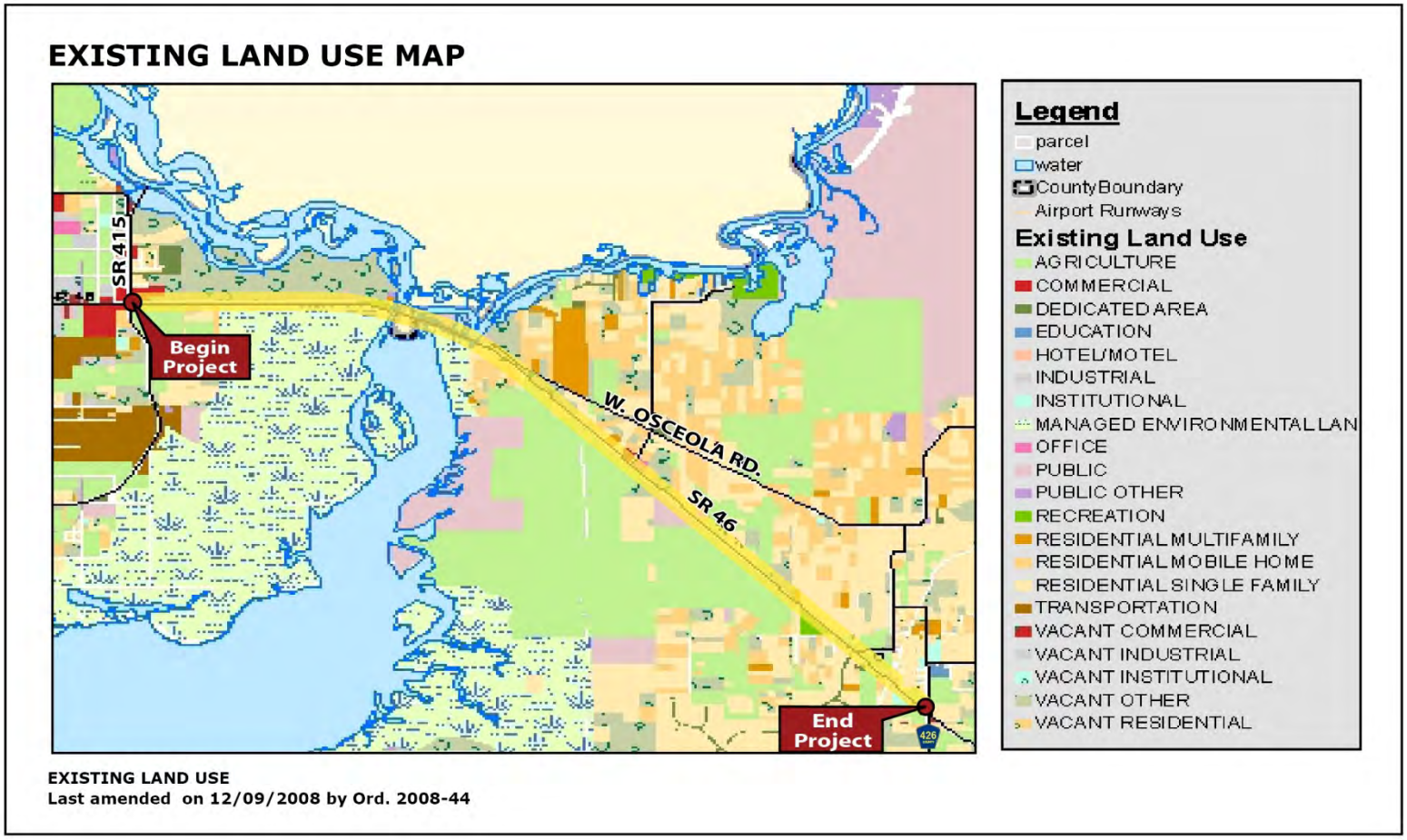
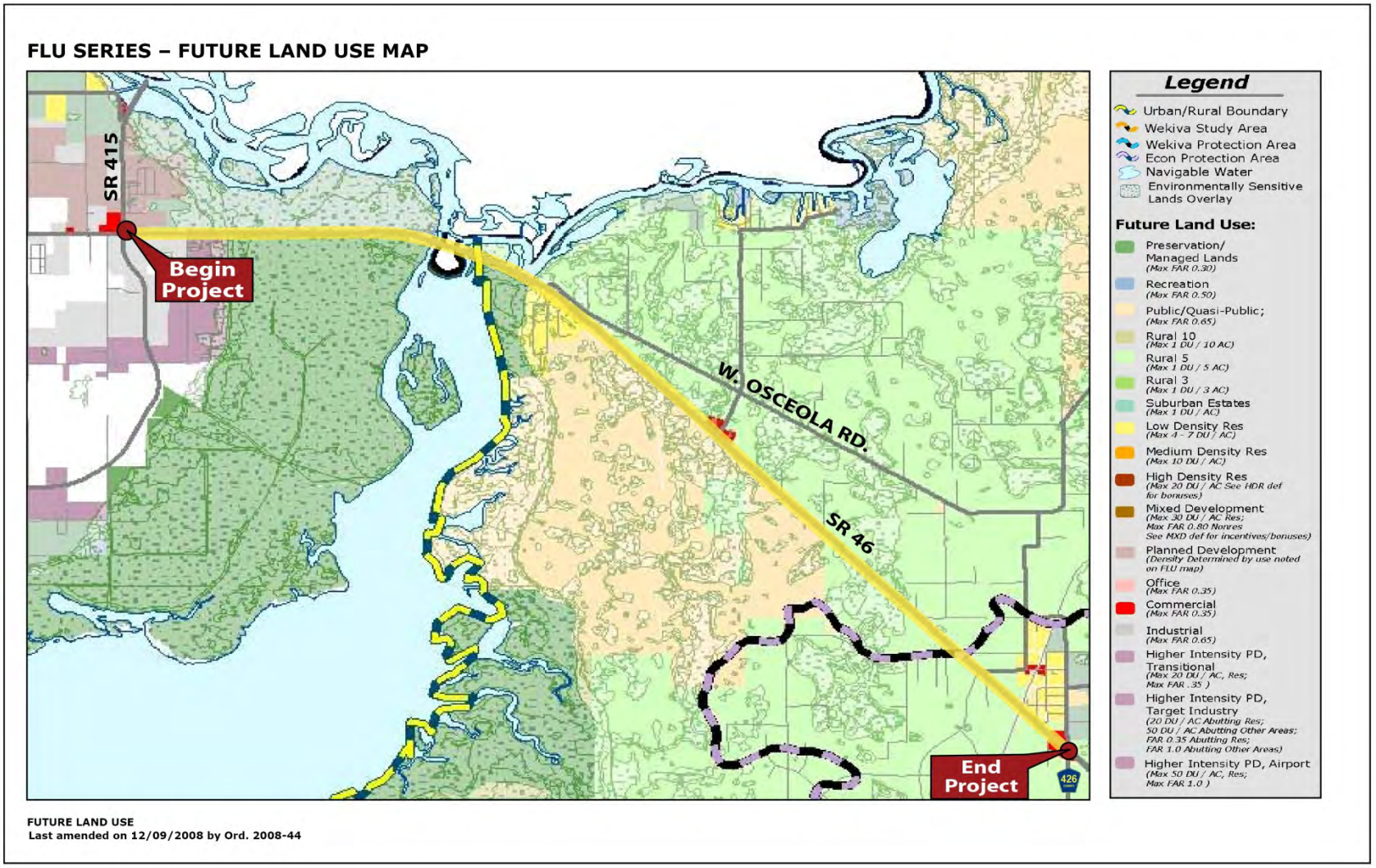


Exhibit 2-5 Future Land Use Map



2.4 Bridge Structures

There is one bridge within the project limits. The bridge over Lake Jesup / St. Johns River was constructed in 2009, is in good condition. The bridge spans three historic channels of the St. Johns River. Channel A (approximate Station 105+00) is the existing channel into Lake Jesup from the St. Johns River. Channel B, at approximately Station 114+00, is defined as the historic route of the St. Johns River that was filled in as part of the construction of the causeway that was removed as part of the bridge construction. Channel C, an eastern channel from the St. Johns River to Lake Jesup filled in by past river dredging projects, is located at approximately Station 135+00.

2.5 Floodplains/Floodways

The original construction of SR 46 crosses several floodplain areas longitudinally. The floodplain locations were determined using the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Seminole County, Florida and incorporated areas. The following Community-Panel Numbers were used in reference:

- 12117C0090F
- 12117C0095F
- 12177C0185F
- 12117C0205F

FEMA FIRM identified three floodplain zones present within the limits of this project. These zones are defined as follows:

- Zone AE – Base flood elevation determined (Elev. 9.0 ft, NAVD)
- Zone AE – Base flood elevation determined (Elev. 29.0 ft , NAVD)
- Zone A – No base flood elevation determined

Effective dates of these panels are September 28, 2007 (Refer to **Appendix A**).

2.6 Environmental Characteristics

2.6.1 Cultural Resources

A Cultural Resource Assessment Survey (CRAS) was conducted by Janus Research. Please refer to the **SR 46 PD&E Study CRAS** for more detailed information.

2.6.2 Wetlands

A Wetland Evaluation Report (WER) was performed by EMD. Please refer to the **SR 46 PD&E Study WER** for more detailed information.

2.6.3 Threatened and Endangered Species

An Endangered Species Biological Assessment (ESBA) report was performed by EMD. Please refer to the **SR 46 PD&E Study ESBA** report for more detailed information.

2.7 Physical Environment – Contamination

Forty-one properties within the project area were assessed for potential contamination and assigned risk ratings. Of these 41 properties, 12 were assigned potential contamination risk ratings of low, medium or high. These 12 properties are listed in **Table 2-3**.

Table 2-3 – Potential Contamination Sites

ID	Name	Address	Risk Rating
1	RaceTrac	4115 SR 46 E	Low
2	Joyce Well Drilling (former location)	4125 E HWY 46	Low
3	The Pantry, Inc. (gas station)	4140 E SR 46 (@ SR 415)	High
4	Residence/Complete Well & Pump Service	4565 SR 46 E	Low
5	Former Trombley's Auto Body	2740 SR 46 W	High
6	Lake Jesup Groves Maintenance Area	2017 SR 46 W	Medium
7	Former Landscape Supply/Nursery	Not Listed	Low
8	Former Mining/Borrow Pit	Not Listed	Low
9	Focal Point Landscape Supplies – Nursery Area	145 SR 46 W	Low
10	Geneva Food Store/MJM Food Store	140 SR 46 W	Medium
11	Kangaroo Express/Handy Way 2655	173 1st St.	Low
12	Chuck's Automotive Repair	145 E. SR 46	Low

2.8 Existing Drainage Conditions

SR 46 is located within the jurisdiction of the SJRWMD. According to the USGS quadrangle maps, the approximate ground surface elevation within the project limits range from as low as approximately +5 feet to high as approximately +75 feet. The elevations are based on 1929 National Geodetic Vertical Datum (NGVD). The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an Outstanding Florida Waters (OFW). However, the Florida Department of Environmental Protection (FDEP) has adopted Total Maximum Daily Loads (TMDL) for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney. Also, 100-year floodplains are found within the project limits with the majority being located around the bridge over Lake Jesup.

In general, stormwater discharged from SR 46 is not treated within the project limits. The existing typical section of SR 46 is crowned and the travel lanes and outside shoulders slope to the outside into existing roadside ditches. The roadside ditches then convey the stormwater runoff to several existing cross drains. The cross drains then

conveys the runoff into various wetland areas found within the project limits, which ultimately discharge to the St. Johns River.

The only area currently treated is within the limits of the bridge replacement project, over Lake Jesup, which was constructed in 2009. The new bridge and approaches are being treated by existing stormwater treatment wet detention pond(s) 1 and 2. The ponds are located west and east of the bridge, respectively. Stormwater runoff from the high point of the bridge to the west end of the project is collected and conveyed to existing Pond 1 by a series of shoulder gutter inlets and ditch bottom inlets. Stormwater runoff from the high point of the bridge to the east end of the project is collected and conveyed to existing Pond 2 by a series of bridge scuppers, shoulder gutter inlets, and ditch bottom inlets. The bridge scuppers are connected to fiber reinforced concrete pipes that hang beneath the south side of the bridge.

3.0 PROPOSED CONDITIONS

3.1 Soils

A preliminary geotechnical investigation was performed to conceptually evaluate roadway and stormwater management constraints. Specifically, the purpose of this preliminary geotechnical investigation was to evaluate subsurface conditions at the alternative stormwater pond and swale sites for the proposed SR 46 widening. No borings were performed for the roadway. This information was used to develop preliminary recommendations regarding the geotechnical engineering aspects of the roadway, pond, and swale alternatives.

The geotechnical investigation includes one boring per preferred pond site and alternative swale locations. Geotechnical parameters were established to determine the existing ground water elevations, estimated seasonal high water table (ESHWT) elevations, and permeability rates per boring location. For detailed geotechnical data, refer to the **Preliminary Geotechnical Investigation Report**.

The soil classifications for this project will not change as a result of the proposed improvements.

3.2 Land Use

The Land Use for this project will not change as a result of the proposed improvements.

3.3 Cross Drains

As previously stated, there are a total of 9 cross drains within the limits of this project ranging from 18" RCP to double 8' X 3' CBC. The proposed SR 46 widening will impact all the cross drains.

West of the St. Johns River Bridge, there is only one cross drain (CD-1) which will be eliminated once the proposed improvements are complete at the intersection of SR 415 and SR 46 under the FDOT FPID 240216-2-52-01 project.

East of the St. Johns River Bridge, the existing cross drains (CD-2 thru CD-8) were analyzed based on the worst case scenario only, which is the Rural Best Fit Option. The Rural Best Fit Option will require a greater extension length of the cross drains as compared to the Suburban Best Fit Option. The rural typical section will require the proposed length of the cross drains to be approximately 170 feet in length and will also result in a lower outside edge of pavement elevation due to the widening of SR 46. As a result, several of the cross drains will need to be upsized to maintain an allowable headwater elevation. The remaining cross drains will be replaced in kind to meet the design service life projected within this PD&E Study.

Between Hart Road to CR 426, there is only one cross drain (CD-9) that was analyzed based on the urban typical section. The urban typical section will require the proposed length of the cross drains to be approximately 104 feet in length and will also result in a lower outside edge of pavement elevation due to the widening of SR 46. As a result, this cross drain will need to be upsized to maintain an allowable headwater elevation.

All proposed cross drains will be sized to ensure an allowable headwater elevation. The allowable headwater elevation was determined from an evaluation of land use upstream of the culvert and the proposed roadway elevation. The following factors were also considered in determining the allowable headwater elevation:

- Non-damaging or permissible upstream flooding elevations (e.g. existing buildings or Flood Insurance Regulations).
- State Regulatory Constraints (e.g. Water Management District).
- No encroachment into the proposed elevation of the outside edge of travel lane.

The cross drains were analyzed using FHWA's HY-8 program and the discharges were calculated using FDOT's velocity method. Detailed calculations for all proposed cross drain can be found in the **SR 46 PD&E Location Hydraulics Report**.

3.4 Bridge Structures

The existing bridge was constructed 88 feet to the south of the bridge and causeway it replaced. The proposed bridge will be constructed to the north of the existing bridge, within the limits of the since-demolished bridge and causeway. Depending on the selected typical section, the proposed bridge will either be offset 30 or 40 feet to the north of the existing bridge. There will be no walls on the project, as sloped embankment will be used at both end bents.

As the proposed bridge will run along-side the existing bridge, span the same distance, have similar geometric constraints and provide the same number of travel lanes, both aesthetics and economics dictate that the proposed bridge be constructed with the same structural system as that used by the recently completed existing bridge. The only difference from the existing structure will be the use of Florida-I girders in lieu of AASHTO Type IV girders. The 2012 FDOT Structures Design Guidelines state in section 4.3.1 that all new bridges and bridge widenings with I-shaped beams shall utilize Florida-I Beams. These beams are more cost effective than AASHTO girders, providing for longer spans with wider beam spacings. Horizontal and vertical alignments will match those of the existing bridge.

The proposed bridge will provide two 12-foot wide travel lanes, with 10-foot outside and six-foot inside shoulders and 32-inch F-Shape Traffic Railings for a total width of 43 feet, one inch. The typical section will consist of 4- Florida-I 54 girders, spaced at 11'-11", and an eight and one half inch thick slab. Spans will largely match those of the existing bridge, with all pile bents perpendicular to the centerline except for those at

Channel B. In order for the intermediate bents on either side of Channel B to align with those of the existing bridge, span lengths will need to be adjusted within the vicinity of the channel. The substructure will exclusively utilize pile bents.

To accommodate a multi-use path, the bridge's cross section width could be increased. In this case, the cross-section would consist of two 12-foot travel lanes, with 10-foot outside and six-foot inside shoulders and 32-inch F-Shape Traffic Railings, and the trail with a 32-inch Vertical Shape Railing and a Post "C" Bridge Aluminum Pedestrian/Bicycle Bullet Railing – a total width of 54'-1½". For this alternative, the typical section will consist of five-Florida-I 54 girders, spaced at 11'-9", and an eight and one half inch thick slab. As is the case without the multi-use trail, spans will match those of the existing bridge, with all pile bents perpendicular to the centerline except for those at Channel B, and the substructure will exclusively utilize pile bents.

The existing bridge's intermediate pier placement at Channels A, B, and C were largely dictated by the need to accommodate a possible future navigable waterway. At the time, the United States Army Corps of Engineers (USACE) was investigating the possible closure of a portion of the existing navigable waterway, which runs along the north side of the bridge, and redirecting it through two of the channels to improve water flow into Lake Jesup. Since that time the USACE finalized the Lake Jesup Ecosystem Restoration Report, selecting the No Action alternative. Having concluded that Government Cut has not attributed to the ecological decline of Lake Jesup, there are no current plans to run the navigable waterway through any of the channels. However, during final design, coordination with the USACE should take place in order to confirm that this is still the case.

Deck drainage for the proposed bridge will match that of the existing bridge. From the high point to the west water will flow to inlets located at the end of the bridge. From the high point to the east inlets along the deck will route water to an underdeck drainage pipe.

3.5 Floodplain/Floodways

SR 46 within the limits of this project was constructed on fill and according to available information it appears that the highway is above the 100-year floodplain. An evaluation of 100-year floodplain conditions for this project has been performed to determine the impacts from the embankment required for the proposed widening and proposed ponds. By superimposing the FEMA FIRM maps onto the preferred roadway build alternative, the 100- year floodplain encroachment locations have been determined.

The 100-year floodplain impacts and compensation analysis will be based on the preferred roadway alternative and preferred stormwater treatment ponds. The analysis identified five floodplain boundary encroachments within the project limits. The following provides details regarding floodplain impact locations, conditions, and the method used for floodplain calculations are discussed below.

Floodplain No. 1

According to the FEMA FIRM maps, the limits of Floodplain No. 1 begin at STA 30+32 and ends at STA 142+84. This floodplain is classified as Zone AE, where the base floodplain elevation has been determined to be 9.0 ft NAVD. The roadway embankment required for the proposed widening of SR 46, construction of the new bridge, and proposed ponds will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESHWT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

In order to quantify volumetric floodplain impacts due to the proposed widening of SR 46, preliminary roadway cross sections have been developed using the proposed Suburban Typical Section (widen south and best fit) and Lidar data for Seminole County was used to determine existing ground conditions. In addition, estimated seasonal high water table (ESHWT) elevations from the Bridge Replacement project were used to establish ground water conditions, from STA 77+00 to STA 148+00. The Bridge Replacement project datum is NGVD, therefore a conversion factor of 1 foot has been used to convert from NGVD to NAVD, with NAVD elevations being lower. From STA 22+00 to STA 30+00, a conservative approach will be used to define volumetric floodplain impacts as any fill above the existing ground elevation to the 100-year floodplain elevation. From STA 31+00 to STA 76+00, the ESHWT elevation will be based on the highest existing ground elevation on the north side of SR 46. This approach is conservative and consistent with typical ESHWT elevations that occur within wetlands as well as the preliminary pond boring taken for proposed Pond A.

Based on the preliminary roadway cross sections, floodplain impact (fill) area(s) were quantified per cross section and the average end method was used to determine the volumetric floodplain impacts due to the proposed widening of SR 46.

Floodplain impacts due to the construction of the new bridge were considered minimal and were not calculated as part of this floodplain analysis.

Floodplain impacts due to the construction of the ponds were determined by calculating the average fill height between the 100-year floodplain elevation and the ESHWT elevation per location. Then the pond area required to tie down the proposed pond berm elevation to the ESHWT elevation was measured in CADD. However, in some cases only a portion of the pond is within the floodplain boundary. In such cases, only those areas were measured to determine the floodplain impacts. In order to determine the volumetric floodplain impact created by the pond berms, the impact area(s) were multiplied by the average fill height.

Floodplain compensation for Floodplain No. 1 will be achieved by the construction of Floodplain Compensation Pond(s) 1 and 2. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation at each pond location.

Floodplain Compensation Pond 1 is located north of SR 46, adjacent to the Sterling Meadows subdivision. Once wetland delineation was performed by EMD, the original pond area was revised to avoid impacts to the wetland. However, the preliminary pond boring performed by Ardaman & Associates, Inc. was taken within the limits of this wetland and showed the ESHWT elevation at the ground surface. Additional borings are recommended to be performed within the revised pond location during the design phase of this project. For the purposes of this study, the geotechnical boring information from the Sterling Meadows subdivision Pond 101 (SJRWMD Permit No. 4-117-51666-2), was used to establish the ESHWT elevation for Floodplain Compensation Pond 1. The borings indicate that the average ESHWT elevation is 1.5 ft below the existing ground surface elevation. According to Lidar data, the ESHWT elevation would be approximately 7.5 ft NAVD. The Sterling Meadows subdivision Pond 101 is located just west of proposed Floodplain Compensation Pond 1. The northeast corner of this pond creates minor floodplain impacts and has been calculated by the method described above.

Floodplain Compensation Pond 2 is located east of Lake Jesup and north of SR 46, adjacent to modified Pond 2. The preliminary pond boring performed by Ardaman & Associates, Inc. indicates that the ESHWT elevation is 1 ft below the existing ground surface elevation. According to Lidar data, the ESHWT elevation from Ardaman & Associates, Inc. would be approximately 11.5 ft NAVD which appears to be relatively high considering the 100-year floodplain elevation is 9.0 ft NAVD and the permitted ESWHT elevation used for adjacent Pond 2, constructed during the bridge replacement project, is 8.0 ft NGVD which converts to 7.0 ft NAVD. Therefore an estimate of 8.0 ft NAVD will be used as the ESHWT elevation within the proposed pond area for the floodplain compensation calculations. The northwest corner of this pond creates minor floodplain impacts and has been calculated by the method described above.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 1. For detailed calculations of the values shown, please refer to the **SR 46 PD&E Location Hydraulics Report**.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	29.17	NA
Floodplain Comp Pond 1	0.04	11.09
Pond A3	2.14	NA
Modified Pond 1	0.82	NA
Floodplain Comp Pond 2	0.08	24.27
Floodplain No. 1 Project Total:	**32.25**	**35.36**

Floodplain No. 2

According to the FEMA FIRM maps, the limits of Floodplain No. 2 begin at STA 199+59 and ends at STA 211+48 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the north side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 16.5 ft NAVD. Due to the proximity and similar soil type, the ESWHT elevation from the preliminary pond boring for proposed Pond B will be used to establish the ESHWT elevation for Floodplain No. 2 calculations. According to Lidar Data, the existing ground elevation at the boring is 15.0 ft NAVD, which puts the ESHWT elevation at 14.5 ft NAVD. The roadway embankment required for the proposed widening of SR 46 will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESHWT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

Floodplain compensation for Floodplain No. 2 will be achieved by the construction of roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 2. For detailed calculations of the values shown, please refer to the **SR 46 PD&E Location Hydraulics Report**.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	0.69	0.69
Floodplain No. 2 Project Total:	**0.69**	**0.69**

Floodplain No. 3

According to the FEMA FIRM maps, the limits of Floodplain No. 3 begin at STA 198+77 and ends at STA 204+99 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the south side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 16.5 ft NAVD. Due to the proximity and similar soil type, the ESWHT elevation from the preliminary pond boring for proposed Pond B will be used to establish the ESHWT elevation for Floodplain No. 3 calculations. According to Lidar Data, the

existing ground elevation at the boring is 15.0 ft NAVD, which puts the ESHWT elevation at 14.5 ft NAVD. The roadway embankment required for the proposed widening of SR 46 will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESHWT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

Floodplain compensation for Floodplain No. 3 will be achieved by the construction of roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 2. For detailed calculations of the values shown, please refer to the **SR 46 PD&E Location Hydraulics Report**.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	0.19	0.22
Floodplain No. 3 Project Total:	**0.19**	**0.22**

Floodplain No. 4

According to the FEMA FIRM maps, the limits of Floodplain No. 4 begin at STA 295+18 and ends at STA 313+10. This floodplain is located on the south side of SR 46 and is classified as Zone AE, where the base floodplain elevation has been determined to be 29.0 ft NAVD.

The existing roadway profile within this area ranges from 25.0 ft to 28.5 ft NAVD. By digitizing the FEMA floodplain area and overlaying it upon the proposed roadway alignment, it appears as though the widening would encroach upon this floodplain. However, while developing preliminary roadway cross sections with use of one-foot Lidar contours for this area, there appears to be an existing land berm which contains the 100-year floodplain from encroaching into SR 46. The fact that there has been no record of flooding issues in this area would further reinforce this assumption.

During the design phase of this project, it would be prudent to gather addition survey to define the limits of the existing land berm to ensure that the 100-year floodplain would not encroach into the proposed widening of SR 46. In addition, if any proposed improvement impact the existing land berm, replacement of the berm at an elevation higher than 29.0 ft NAVD will be required.

Floodplain No. 5

According to the FEMA FIRM maps, the limits of Floodplain No. 5 begin at STA 295+35 and ends at STA 296+32 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the north side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 22.5 ft NAVD.

The limits of Floodplain No. 5 only encroach into the proposed 10-foot shared-use-path on the north side of the roadway. Since this encroachment area is so minor, during the design phase of this project the horizontal and vertical placement of the proposed 10-foot shared-use-path should be adjusted to avoid any impacts to Floodplain No. 5.

3.6 Environmental Characteristics

3.6.1 Cultural Resources

The project team conducted a Cultural Resources Assessment Survey (CRAS) for all pond alternatives. No potential impacts to archaeological or historic resources are anticipated. Please refer to the **SR 46 PD&E Study CRAS** for more detailed information.

3.6.2 Wetlands

All of the wetland systems found within the project corridor are currently impacted by their close proximity to the heavily travelled roadway, by drainage projects, and by the adjacent commercial or residential developments. Other surface waters will also be impacted by the proposed roadway improvements, both upland-cut and wetland-cut ditches.

The total number of wetland impacts for the Preferred Alternative is 27.31 acres. The Preferred Alternative will directly impact approximately 27.05 acres of forested wetlands and 0.26 acres of wet prairie / marsh. Additionally, approximately 1.33 acres of wetland-cut ditches will be impacted. Please refer to the **SR 46 PD&E Study Wetland Evaluation Report (WER)** for more detailed information.

3.6.3 Threatened and Endangered Species

The field survey conducted by EMD revealed occurrences of wading birds, eagles, osprey and other raptors, small passerine birds, and amphibians in the project corridor. Evidence of deer, wild hogs, raccoons, and opossums were also determined to be found along the

project corridor. Please refer to the **SR 46 PD&E Study Endangered Species Biological Assessment (ESBA)** report for more detailed information

3.7 Typical Sections

For the purposes of analyzing build alternatives, the project was split into four segments as follows:

- Segment 1 – SR 415 to the west end of the Lake Jesup/St. Johns River Bridge
- Segment 2 – The Lake Jesup/St. Johns River Bridge
- Segment 3 – The east end of the Lake Jesup/St. Johns River Bridge to Hart Rd
- Segment 4 – Hart Road to CR 426

Two typical sections, rural and suburban, were analyzed for the widening of SR 46 between SR 415 and Hart Road and an urban typical section is proposed for the widening of SR 46 from Hart Road to CR 426. For the rural and suburban typical sections, a widen north and a widen south option was explored.

The rural typical section includes two 12-foot lanes in each direction with eight-foot (two-foot paved) inside shoulders and 10-foot (five foot paved) outside shoulders, which serve as undesignated bicycle lanes. A 40-foot median separates the travel lanes. Conveyance swales are provided on each side of the roadway within the 36-foot clear zone. The design speed of the rural typical section is 60 mph and it requires a minimum of 188 feet of right-of-way (See **Exhibit 3-1** and **Exhibit 3-2**).

The suburban typical section includes two 12-foot lanes in each direction with four-foot inside shoulders and 6.5-foot outside shoulders, which serve as undesignated bicycle lanes. A 30-foot median separates the travel lanes and type E curb and gutter is proposed on both the inside and outside edges of pavement. Within the 30-foot clear zone are a 10-foot asphalt shared-use-path on the north side of the roadway and a five-foot concrete sidewalk on the south side. The design speed of the suburban typical section is 55 mph and it requires a minimum of 148 feet of right-of-way (See **Exhibit 3-3** and **Exhibit 3-4**).

The urban typical section includes one 12-foot lane and one 11-foot lane in each direction with four-foot outside shoulders, which serve as designated bicycle lanes. A 22-foot median separates the travel lanes with type E curb and gutter proposed on the inside edge of pavement and type F curb and gutter proposed on the outside edge of pavement. Within the 12-foot border width is an eight-foot sidewalk on the north side of the roadway and a six-foot concrete sidewalk on the south side. The design speed of the suburban typical section is 45 mph and it requires a minimum of 100 feet of right-of-way (See **Exhibit 3-5**).

In addition to the three proposed alternative typical sections, there will also be construction of a new bridge, parallel to the existing bridge over Lake Jesup. Two bridge typical sections were developed, one with a shared use path and one without. Both bridge typical sections retain the existing bridge as the future eastbound lanes. The

proposed westbound lanes, to be built upon the alignment of the old bridge and causeway that was removed during the construction of the existing bridge, provides two 12-foot lanes, a six-foot inside shoulder and a 10-foot outside shoulder. The typical section without the shared-use path is intended for use with the rural roadway typical section, and maintains the 40-foot median (See **Exhibit 3-6**). The typical section with the shared-use path is intended for use with the suburban typical section, and maintains a 30-foot median (See **Exhibit 3-7**). The shared use path is barrier-separated from the travel lanes and is 10 feet wide.

The proposed typical sections are shown in **Exhibit 3-1** thru **Exhibit 3-7**.

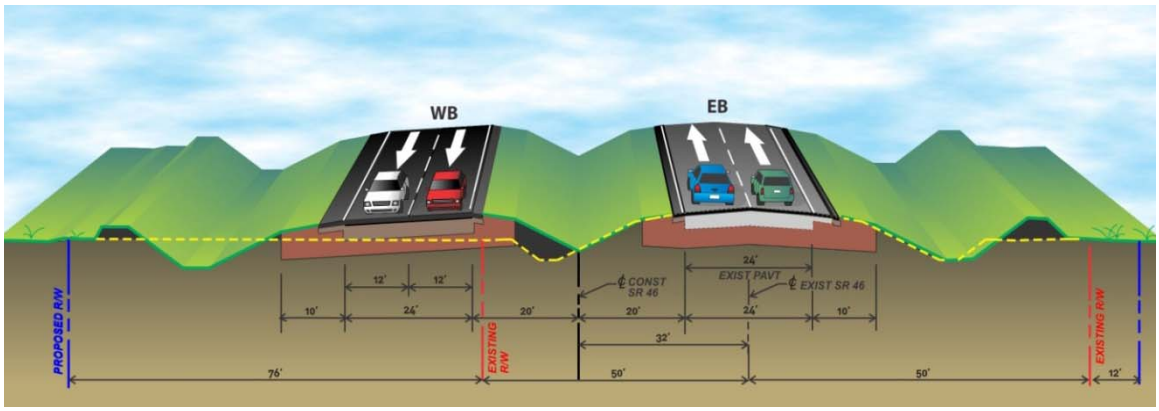


Exhibit 3-1 - Rural Typical Section-Widen to the North

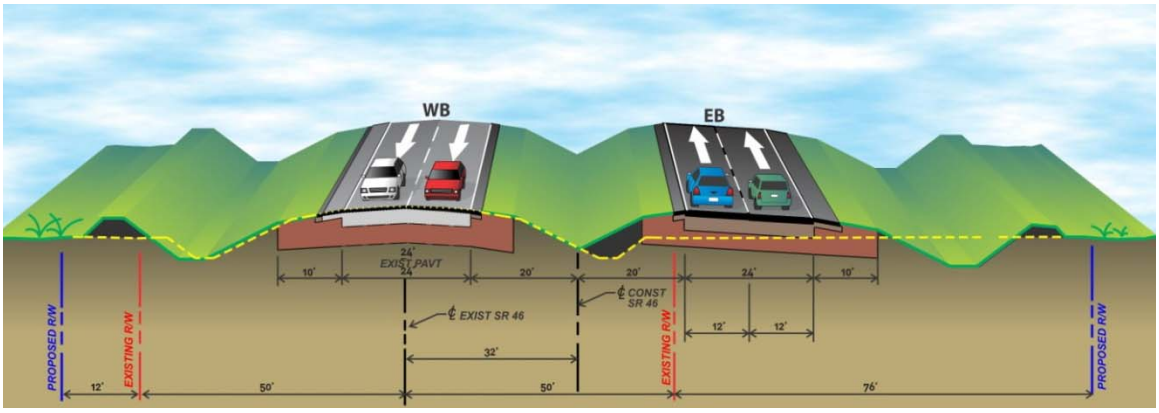


Exhibit 3-2 - Rural Typical Section-Widen to the South

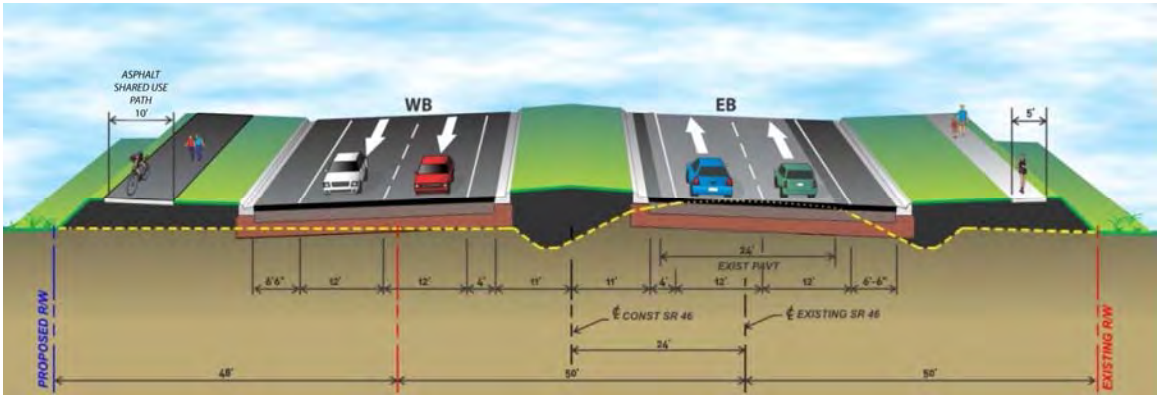


Exhibit 3-3 - Suburban Typical Section-Widen to the North

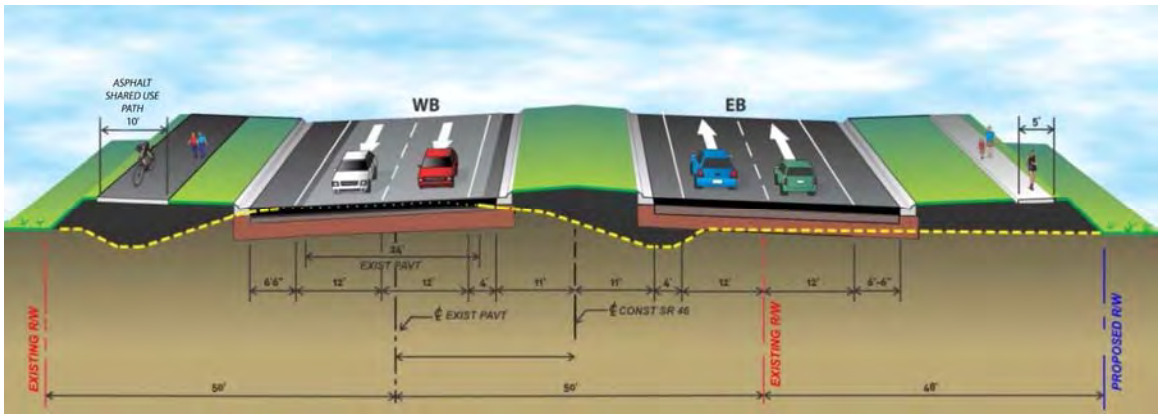


Exhibit 3-4 - Suburban Typical Section-Widen to the South

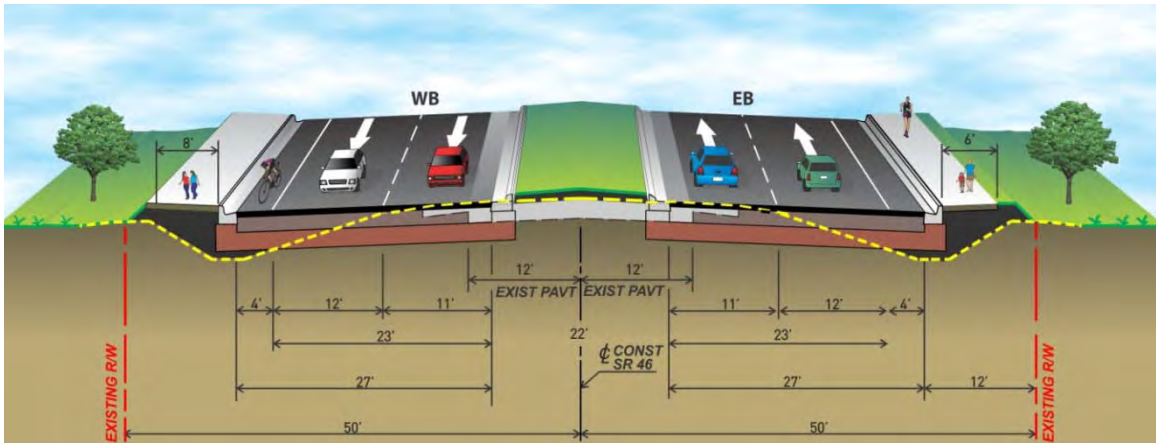


Exhibit 3-5 - Urban Typical Section-Centered Widening

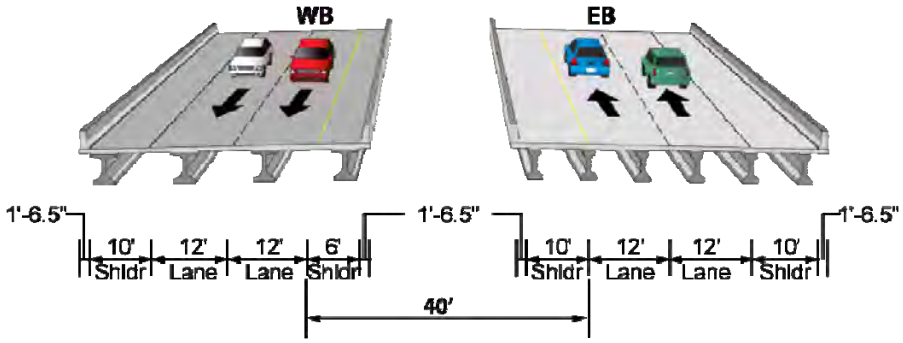


Exhibit 3-6 - Bridge Typical Section without Shared Use Path

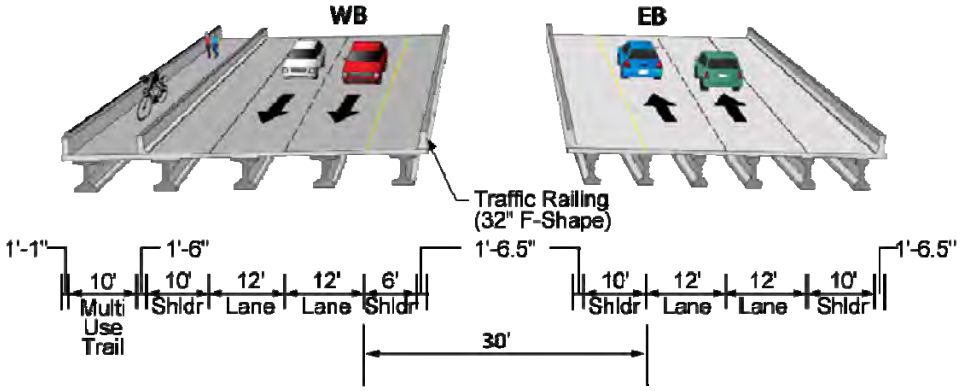


Exhibit 3-7 - Bridge Typical Section with Shared Use Path

Once the typical sections were identified, typical section alternatives were selected by segment.

Segment 1

In order to minimize impacts to existing conservation easements both north and south of SR 46 within this segment, only the suburban typical sections will be considered for Segment 1. Alternative 1 uses the Suburban – Widen North typical section and Alternative 2 uses the Suburban – Widen South typical section.

Segment 2

Segment 2 is the bridge typical section and is dependent on the typical section selected for Segment 3 as indicated above. The Bridge with Shared Use Path typical section is compatible with the suburban typical section and the Bridge without Shared Use Path is compatible with the rural typical section.

Segment 3

Both the rural and suburban typical sections are appropriate for use within Segment 3. Both typical sections will be evaluated and vary between north and south widening in order to minimize impacts to both the natural, physical and social environments. These combinations of north and south widening are known as the Rural Best Fit and Suburban Best Fit alternatives.

Segment 4

Only the urban typical section is being analyzed for Segment 4 in order to minimize right-of-way acquisition to the commercial land uses in the downtown Geneva area.

Full Build Alternatives can be developed from the alternatives listed for each segment. The bridge with the shared use path is compatible with the Suburban Best Fit Alternative, and the bridge without the shared use path is compatible with the Rural Best Fit Alternative. The Segment 1 typical section alternatives are interchangeable and the Segment 4 typical section alternative works with either the Suburban or Rural Best Fit alternatives. **Table 3-1** lists the potential Build Alternatives and associated pond right-of-way acreage for the widening of SR 46.

Table 3-1 – Build Alternatives

Build Alternative	Segment 1	Segment 2	Segment 3	Segment 4	Required Pond R/W (ac)
1	Suburban North	Bridge with Path	Suburban Best Fit	Urban	65.7
2	Suburban South	Bridge with Path	Suburban Best Fit	Urban	65.7
3	Suburban North	Bridge without Path	Rural Best Fit	Urban	59.0
4	Suburban South	Bridge without Path	Rural Best Fit	Urban	59.0

In order to minimize impacts to both natural, physical and social environments as well as public consideration obtained from a public meeting held on August 29, 2012, the build alternative 2 was selected as the preferred SR 46 widening improvements. As a result, the proposed drainage design for stormwater treatment, attenuation, and conveyance will be developed to accommodate this preferred build alternative.

3.8 Proposed Drainage

SR 46 is located within the jurisdiction of the SJRWMD. The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an OFW. However, the FDEP has adopted TMDLs for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, and the St. Johns River above Lake Jesup. Also, 100-year floodplains are found within the project limits with the majority being located around the bridge over Lake Jesup.

To determine feasible pond locations, the following procedures were used:

- Establish sub-basins and determine existing outfall locations. The majority of the sub-basins have been divided between existing cross drains.
- Soil conditions and geotechnical subsurface ground water elevations were evaluated to determine the type of stormwater treatment facility (i.e. wet or dry pond). The estimated seasonal high water table (ESWHT) elevations were established based on the preliminary roadway soil survey performed by Ardaman & Associates, permitted conditions for existing Pond(s) 1 & 2 (Bridge Replacement project; SJRWMD Permit No. 40-117-95925-5), and permitted conditions for existing Pond 101 (Sterling Meadows Subdivision; SJRWMD permit No. 4-117-5166-2). The bottom elevations for all dry ponds were set at a minimum of 18" above the ESHWT elevation.
- Existing ground elevations were determined by using Seminole County GIS Lidar Data, 1 foot contours.
- Based on SJRWMD, water quality (treatment) and water quantity (attenuation) criteria were determined. Please refer to **Appendix E** for design criteria.
- All ponds were sized with the capacity to retain the required treatment volume plus the Post-Pre attenuation volume (25 year / 24 hour) with 1 foot of freeboard to the inside berm elevation. Please refer to calculations in **Appendix F**.
- Hydraulic Grade Line (HGL) elevations were compared to roadway elevations in each basin to develop the allowable pond stages. The estimated stormsewer tailwater elevation was assumed to be the pond stage at the 3 year / 24 hour Post-Pre attenuation volume (closed system) plus the required treatment volume.
- The FDOT Critical Storm of 100 year / 72 hour, for open basins, was used to determine the required Post-Pre attenuation volume in basins where there has been record of flooding. This applies to Basin C & D.
- 100-year floodplain impacts will be compensated by Floodplain Compensation Pond(s) 1 & 2 and roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation at each pond location.

- Post development TMDLs will be equal to or less than Pre development TMDLs for all basins discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney.

All wet ponds were sized with a 15.0 ft maintenance berm (1:15 or flatter). Side slopes of 1:4 to two feet below the seasonal high water table, and then a 1:2 slope to the proposed pond bottom. All dry ponds were sized with a 15.0 ft maintenance berm (1:15 or flatter) and side slopes of 1:4 to the proposed pond bottom.

Appendix F has detailed calculations for all pond alternatives analyzed.

This study anticipates the stormwater runoff for the proposed SR 46 widening will be collected via a series of curb and gutter inlets. The existing profile grade in several areas along the project limits is nearly flat. During the design phase, special gutter profiles may be required if widening from the existing pavement results in less than the minimum required 0.3% gutter grades. Stormwater runoff from the proposed bridge, high point to eastern limits, will be collected via a series of bridge scuppers and piped into the stormwater treatment pond. Offsite drainage areas, which are unable to be collected in the onsite system due to hydraulic constraints, will be bypassed and conveyed via pipes that discharge to the existing outfall locations. During the design phase, a thorough evaluation of the potential to comingle offsite and onsite runoff into a single collection system should be performed in an effort to minimize conveyance system costs.

As stated before, the sub-basin limits were typically defined as the area between two cross drains. During the design phase, there may be opportunities to reduce the number of ponds required by combining sub-basins. However, this depends on the pond depth being able to accommodate the SR 46 stormsewer system routed underneath the existing cross drains.

3.8.1 Basin A

The limits for Basin A begin at STA 12+00 and continue eastward to STA 75+40. STA 12+00 is the end of project limits for the proposed improvements for the intersection of SR 415 and SR 46 under the FDOT FPID 240216-2-52-01 project and STA 75+40 is the begin project limits for the bridge replacement project under the FDOT FPID 240163-1-52-01. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Surburban South typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

An important drainage system within this basin includes an existing drainage ditch located on the south side of SR 46. This ditch will be filled in due to the proposed SR 46 widening. Under the proposed conditions, the existing stormwater runoff collected within this ditch will need to be piped to the existing outfall location at STA 43+00.

Basin A is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Monroe and Lake Jesup near the St. Johns River. Alternatives A1, A2 and A3 have been identified as potential pond sites.

Pond A1 is a wet pond located on the north side of SR 46 at STA 45+00. This parcel is within the Bergmann Tract, a private mitigation bank under various conservation easements. There may be many small easements that have been purchased for a variety of developments, which could make this pond location more difficult to mitigate (See **Appendix D** for Correspondence). Pond A1 is completely within the 100-year floodplain boundary and wetland system located on the north side of SR 46. The pond would outfall to the north within a proposed 25 ft drainage easement used to provide positive drainage to the ultimate outfall at the St. Johns River.

Pond A2 is a wet pond located on the north side of SR 46 at STA 50+00. This parcel is within the Bergmann Tract, a private mitigation bank under various conservation easements. There may be many small easements that have been purchased for a variety of developments, which could make this pond location more difficult to mitigate (See **Appendix D** for Correspondence). Pond A2 is completely within the 100-year floodplain boundary and wetland system located on the north side of SR 46. The pond would outfall to the north within a proposed 25 ft drainage easement used to provide positive drainage to the ultimate outfall at the St. Johns River.

Pond A3 is a wet pond located on the south side of SR 46 at STA 50+00. This parcel is within a single conservation easement over the Futch property granted to the FDEP. The Futch property was utilized as mitigation for the construction of the Eastern Beltway permitted through FDEP (See **Appendix D** for Correspondence). Pond A3 is completely within the 100-year floodplain boundary and wetland system located on the south side of SR 46. The pond would outfall to the southwest into the existing drainage ditch that flows into Lake Jesup before ultimately discharging into the St. Johns River.

Preferred Alternative

Pond A3 is the preferred alternative because it requires less mitigation effort. Also, Pond A3 does not require a proposed drainage easement for the pond outfall location, which results in less right-of-way acquisition and wetland impacts. According to the Seminole County Soil Survey, Pond A3 consists of Nittaw (HSG D) soil. The geotechnical boring taken for Pond A1 shows the ESHWT elevation at the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 4.0 ft NAVD. However, due to similar soil conditions and close proximity to existing Pond 1, constructed as part of the bridge replacement project, the permitted conditions have been used to establish the control elevation within Pond A3 in an effort to provide positive discharge from the pond. Because the Bridge Replacement project datum is NGVD, a conversion factor of 1 foot has been used to convert from NGVD to NAVD, with NAVD elevations being lower. With the data complied it was determined that Pond A3 will be a

wet pond with the normal water level / control elevation set at an elevation of 6.4 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 4.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 8.42 acres of area.

3.8.2 Basin 1

The limits for Basin 1 begin at STA 75+40 and continue eastward to the high point of the existing and proposed bridge over Lake Jesup, STA 107+83. These limits are consistent with the permitted conditions for existing Pond 1 constructed during the bridge replacement project (SJRWMD Permit No. 40-117-95925-5). This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Surburban South and Bridge with Path typical sections, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin 1 is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Monroe.

Modification of existing Pond 1 was the only pond alternative evaluated for this basin, which requires the least amount of additional pond right-of-way. Existing Pond 1 will be expanded to provide additional stormwater treatment and attenuation for the proposed roadway improvements. In order to determine the required pond area, modified Pond 1 has been preliminarily designed using the pond control elevation and boundary conditions under the permitted conditions. In addition, to establish the modified Pre development discharge rate from Basin 1, runoff from the additional area(s) for construction of the new bridge and pond expansion were calculated and added to the permitted Pre development discharge rate. Also, the existing pond outfall structure will need to be modified and the inside pond berm elevation will need to be raised to maintain 1 foot of freeboard from the design high water elevation within the pond, based on current FDOT criteria. Basin CN worksheets and ICPR modeling for Basin 1 can be found in **Appendix F**.

The expanded pond area for Modified Pond 1 is completely within the 100-year floodplain boundary and wetland system located on the north side of SR 46. The outfall location of this pond is to adjacent wetlands before ultimately discharging into the St. Johns River.

3.8.3 Basin 2

The limits for Basin 2 begin at the high point of the existing and proposed bridge over Lake Jesup, STA 107+83 and continue eastward to STA 158+15. These limits are consistent with the permitted conditions for existing Pond 2 constructed during the bridge replacement project (SJRWMD Permit No. 40-117-95925-5). This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Bridge with

Path and Surburban best-fit typical sections, via bridge scuppers and curb and gutter inlets which convey the runoff to the proposed pond.

An important drainage system within this basin includes an existing drainage ditch located on the south side of SR 46. This ditch will be filled in due to the proposed SR 46 widening. Under the proposed conditions, the existing stormwater runoff collected within this ditch will need to be conveyed to the existing outfall location at the end of bridge over Lake Jesup.

Basin 2 is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup.

Modification of existing Pond 2 was the only pond alternative evaluated for this basin, which requires the least amount of additional pond right-of-way. Existing Pond 2 will be expanded to provide additional stormwater treatment and attenuation for the proposed roadway improvements. In order to determine the required pond area, modified Pond 2 has been preliminarily designed using the pond control elevation and boundary conditions under the permitted conditions. The existing pond outfall structure will need to be modified and the inside pond berm elevation will need to be raised to maintain 1 foot of freeboard from the design high water elevation within the pond, based on current FDOT criteria. Basin CN worksheets and ICPR modeling for Basin 2 can be found in **Appendix F**.

The expanded area for Modified Pond 2 is above the 100-year floodplain elevation so there will be no floodplain impacts. Also, there are no wetland impacts as a result of the expanded pond area. The outfall location of this pond is to adjacent wetlands before ultimately discharging into the St. Johns River.

3.8.4 Basin B

The limits for Basin B begin at STA 158+15 and continue eastward to STA 226+60. This basin will collect stormwater runoff from the proposed SR 46 widening and new side street connections to West Osceola Road, based on the preferred Surburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin B is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives B1, B2 and B3 have been identified as potential pond sites.

Pond B1 is a wet pond located on the north side of SR 46 at STA 168+00. This remnant parcel falls between the proposed SR 46 widening and West Osceola Road. The entire parcel will most likely be purchased for the proposed roadway improvements mentioned above. Pond B1 is not within the 100-year floodplain boundary, but will impact three

isolated wetlands. The pond would outfall to the north within an existing ditch along the south side of West Osceola Road that ultimately discharges to the St. Johns River.

Pond B2 is a wet pond located on the south side of SR 46 at STA 170+00. This parcel is within the City of Sanford Water Reclamation spray fields. Pond B2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond outfall would need to be conveyed in a separate system that would discharge to the south side of the existing bridge over Lake Jesup.

Pond B3 is a wet pond located on the north side of SR 46 at STA 180+00. This pond site is located on both the remnant parcel, mentioned within the Pond B1 narrative, and the adjacent residential parcel. However, the proposed pond site will not impact any existing structures within the residential parcel. The northeast corner of Pond B3 falls within the 100-year floodplain boundary and the pond will also impact one isolated wetland. After the threatened and endangered species survey was performed, an existing eagle's nest was located within the area of Pond B3. The pond would outfall to the north within an existing ditch along the south side of West Osceola Road that ultimately discharges to the St. Johns River.

Preferred Alternative

Pond B1 is the preferred alternative because the area is located within the remnant parcel that will be purchased for the proposed roadway improvements. This pond can also utilize the existing ditch located on the south side of West Osceola Road for its outfall location before ultimately discharging into the St. Johns River. According to the Seminole County Soil Survey, Pond B1 consists of St. Johns (HSG B/D) soil. The geotechnical boring taken for Pond B1 shows the ESHWT elevation at 0.5 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 15.0 ft NAVD, which puts the ESHWT elevation at 14.5 ft NAVD. With the data complied it was determined that Pond B1 will be a wet pond with the normal water level / control elevation set at an elevation of 14.0 ft NAVD. This elevation is lower than the ESHWT elevation; however, according to the boring it is still above the encountered groundwater elevation and there will still be positive discharge from the pond due to the fact that Lidar Data indicates that the existing outfall ditch elevation is approximately 13.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 14.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 6.00 acres of area.

3.8.5 Basin C

The limits for Basin C begin at STA 226+60 and continue eastward to STA 276+60. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Surburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin C is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives C1, C2 and C3 have been identified as potential pond sites.

Pond C1 is a wet pond located on the north side of SR 46 at STA 237+00, within a vacant parcel. Pond C1 is not within the 100-year floodplain boundary, but will impact one isolated wetlands. The pond would outfall to the west via a conveyance pipe that could be directly connected to the downstream side of cross drain, CD-4. CD-4 discharges into an open ditch that runs along Mullet Lake Park Road before ultimately discharging into the St. Johns River.

Pond C2 is a wet pond located on the north side of SR 46 at STA 232+00, within a residential parcel. Pond C2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond outfall would be the same as the pond outfall for Pond C1 described above.

Pond C3 is a wet pond located on the south side of SR 46 at STA 229+00. This pond site is located within the Sanford Aero Modelers Flying Field. Pond C3 is not within the 100-year floodplain boundary but is located entirely within a wetlands system located on the south side of SR 46. The pond would outfall to the west to the upstream side of CD-4.

Preferred Alternative

Pond C1 is the preferred alternative because this site does not require any relocation of existing residents as compared to alternative Pond C2. Also, this site will have less wetland impacts as compared to alternative Pond C3. According to the Seminole County Soil Survey, Pond C1 consists of St. Johns (HSG B/D) soil. The geotechnical boring taken for Pond C1 shows the ESHWT elevation at 0.5 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 17.0 ft NAVD, which puts the ESHWT elevation at 16.5 ft NAVD. With the data complied it was determined that Pond C1 will be a wet pond with the normal water level / control elevation set at an elevation of 13.0 ft NAVD. This elevation is lower than the ESHWT elevation; however, according to the boring it is still above the encountered groundwater elevation and there will still be positive discharge from the pond due to the fact that Lidar Data indicates that the elevation at downstream side of CD-4 is approximately 12.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 16.0 ft NAVD. There has been record of flooding issues within Basin C so the required Post – Pre attenuation volume has been based on the FDOT critical duration, 100 year / 72 hour storm event. Preliminary pond sizing calculations indicates that this pond requires approximately 4.08 acres of area.

3.8.6 Basin D

The limits for Basin D begin at STA 276+60 and continue eastward to STA 296+64. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Surburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin D is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives D1, D2 and D3 have been identified as potential pond sites.

Pond D1 is a wet pond located on the north side of SR 46 at STA 279+00, within a residential parcel. However, the proposed pond site will not impact any existing structures within the residential parcel. The northeast corner of Pond D1 falls within the 100-year floodplain boundary but there is no wetland impacts associated with this pond site. The pond would outfall to the downstream side of cross drain, CD-5. CD-5 eventually discharges into a wetland system located within this parcel. There has been record of flooding issues on the downstream side of CD-5 (See **Appendix D** for Correspondence).

Pond D2 is a wet pond located on the south side of SR 46 at STA 284+00, within a vacant parcel. Pond D2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond outfall would need to be conveyed in a separate system that could be connected to the upstream side of CD-5.

Pond D3 is a wet pond located on the north side of SR 46 at STA 290+00, within a residential parcel. However, the proposed pond site will not impact any existing structures within the residential parcel. The north side of Pond D3 falls within the 100-year floodplain boundary but there is no wetland impacts associated with this pond site. The pond outfall would need to be conveyed in a separate system that would discharge to the downstream side of CD-5.

Preferred Alternative

Pond D1 is the preferred alternative because this site does not require a separate system for the pond outfall. Also, this site would allow for the proposed improvements to resolve the drainage issue on the downstream side of CD-5 by re-grading the existing ditch to provide positive drainage into the adjacent wetland. The re-graded ditch could also potentially provide compensation for the reduction in floodplain impacts created by the construction of the proposed pond. According to the Seminole County Soil Survey, Pond D1 consists of Pomello (HSG C) soil. The geotechnical boring taken for Pond D1 shows the ESHWT elevation at 1.5 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 23.2 ft NAVD, which puts the ESHWT elevation at 21.7 ft NAVD. With the data complied it was determined

that Pond D1 will be a wet pond with the normal water level / control elevation set at an elevation of 21.0 ft NAVD. This elevation is slightly lower than the ESHWT elevation; however, according to the boring it is still above the encountered groundwater elevation and there will still be positive discharge from the pond due to the fact that Lidar Data indicates that the elevation at downstream side of CD-5 is approximately 20.2 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 21.0 ft NAVD. There has been record of flooding issues within Basin D so the required Post – Pre attenuation volume has been based on the FDOT critical duration, 100 year / 72 hour storm event. Preliminary pond sizing calculations indicates that this pond requires approximately 2.00 acres of area.

3.8.7 Basin E

The limits for Basin E begin at STA 296+64 and continue eastward to STA 310+54. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Surburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin E is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives E2 and E3 have been identified as potential pond sites. At the beginning of this study, roadside swales were a potential stormwater treatment option due to the more favorable soil conditions and lower ESHWT elevations. Since the Surburban best-fit typical section has been selected for the roadway improvements, roadside swales will no longer be evaluated in this study. However, if a rural typical section is re-evaluated during the design phase, roadside swales still have the potential to provide the required treatment and attenuation for stormwater runoff from the proposed roadway improvements.

Pond E2 is a dry pond located on the south side of SR 46 at STA 301+00, within a vacant parcel. This vacant parcel was once used as a borrow pit for the roadway improvements of SR 417. According to the FEMA FIRM maps, Pond E2 is within the 100-year floodplain boundary. However, according to Lidar Data, there appears to be an existing land berm which would better define the actual boundary of the 100-year floodplain. The exact location of this land berm should be identified during the design phase. The pond would outfall to the west within a proposed 25 ft drainage easement used to provide positive drainage to the downstream side of cross drain, CD-6. This drainage easement will impact the wetland system located on the south side of SR 46.

Pond E3 is a dry pond located on the north side of SR 46 at STA 299+00, within a vacant parcel. The north side of Pond E3 falls within the 100-year floodplain boundary and also impacts a wetland system on the north side of SR 46. The pond would outfall to the upstream side of CD-6.

Preferred Alternative

Pond E2 is the preferred alternative because this site has a high potential of resulting in no impacts to the 100-year floodplain. In addition, during the design phase the proposed 25 ft drainage easement could potentially be eliminated by conveying the pond outfall in a separate system that would discharge to the downstream side of CD-6 which would result in no wetland impacts. According to the Seminole County Soil Survey, Pond E2 consists of Astatula (HSG A) soil. The geotechnical boring taken for Pond E2 shows the ESHWT elevation at 7.5 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 27.1 ft NAVD, which puts the ESHWT elevation at 19.6 ft NAVD. With the data complied it was determined that Pond E2 will be a dry pond with the pond bottom set at an elevation of 22.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 23.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 1.91 acres of area. By using the proposed pond geometry and geotechnical soil parameters, a preliminary recovery analysis was performed to verify that the entire treatment volume could be recovered within 72 hours.

3.8.8 Basin F

The limits for Basin F begin at STA 310+54 and continue eastward to STA 326+73. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Suburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin F is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives F2 and F3 have been identified as potential pond sites. At the beginning of this study, roadside swales were a potential stormwater treatment option due to the more favorable soil conditions and lower ESHWT elevations. Since the Suburban best-fit typical section has been selected for the roadway improvements, roadside swales will no longer be evaluated in this study. However, if a rural typical section is re-evaluated during the design phase, roadside swales still have the potential to provide the required treatment and attenuation for stormwater runoff from the proposed roadway improvements.

Pond F2 is a dry pond located on the south side of SR 46 at STA 316+50, within a vacant parcel. This vacant parcel was once used as a borrow pit for the roadway improvements of SR 417. Pond F2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the west within a proposed 25 ft drainage easement used to provide positive drainage to the upstream side of cross drain, CD-7. This drainage easement will impact one isolated wetland located on the south side of SR 46.

Pond F3 is a dry pond located on the north side of SR 46 at STA 315+00, within a vacant parcel. Pond F3 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the west within a proposed 25 ft drainage easement used to provide positive drainage to the downstream side of cross drain, CD-7. This proposed easement will also impact the vacant parcel to the west of the proposed pond site. This drainage easement will impact the wetland system located on the north side of SR 46.

Preferred Alternative

Pond F2 is the preferred alternative because the proposed 25 ft drainage easement required for the pond outfall will have less wetland impacts than the required easement associated with Pond F3. Also, this proposed pond site and easement will only impact one parcel compared to two parcels required for Pond F3. According to the Seminole County Soil Survey, Pond F2 consists of Astatula (HSG A) soil. The geotechnical boring taken for Pond F2 shows the ESHWT elevation at 9.0 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 25.0 ft NAVD, which puts the ESHWT elevation at 16.0 ft NAVD. With the data complied it was determined that Pond F2 will be a dry pond with the pond bottom set at an elevation of 19.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 26.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 1.28 acres of area. By using the proposed pond geometry and geotechnical soil parameters, a preliminary recovery analysis was performed to verify that the entire treatment volume could be recovered within 72 hours.

3.8.9 Basin G

The limits for Basin G begin at STA 326+73 and continue eastward to STA 368+00. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Suburban best-fit typical section, via curb and gutter inlets which convey the runoff to the proposed pond.

Basin G is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Jesup. Alternatives G2 and G3 have been identified as potential pond sites. At the beginning of this study, roadside swales were a potential stormwater treatment option due to the more favorable soil conditions and lower ESHWT elevations. Since the Suburban best-fit typical section has been selected for the roadway improvements, roadside swales will no longer be evaluated in this study. However, if a rural typical section is re-evaluated during the design phase, roadside swales still have the potential to provide the required treatment and attenuation for stormwater runoff from the proposed roadway improvements.

Pond G2 is a dry pond located on the south side of SR 46 at STA 329+00, within a vacant parcel. Pond G2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the west to the upstream side of CD-8.

Pond G3 is a dry pond located on the north side of SR 46 at STA 324+50, within a vacant parcel. Pond G3 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the east to the downstream side of CD-8.

Preferred Alternative

Pond G2 is the preferred alternative because there is less variation in the existing ground elevations at this proposed pond site than alternative Pond G3, which should made construction of the pond less difficult. Also, there is an existing spring in the vicinity of the Pond G3 site where the exact location has not been determined. According to the Seminole County Soil Survey, Pond G2 consists of Astatula (HSG A) soil. The geotechnical boring taken for Pond G2 shows the ESHWT elevation at 8.5 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 48.9 ft NAVD, which puts the ESHWT elevation at 40.4 ft NAVD. With the data complied it was determined that Pond G2 will be a dry pond with the pond bottom set at an elevation of 43.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 43.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 3.16 acres of area. By using the proposed pond geometry and geotechnical soil parameters, a preliminary recovery analysis was performed to verify that the entire treatment volume could be recovered within 72 hours.

3.8.10 Basin H

The limits for Basin H begin at STA 368+00 and continue eastward to the end of the study limits. This basin will collect stormwater runoff from the proposed SR 46 widening, based on the preferred Urban typical section, via curb and gutter inlets which convey the runoff to the proposed pond. The stormwater runoff from the proposed roadway improvements along CR 426 will also be collected and conveyed to the proposed pond via ditch bottom inlets.

Basin H is an open basin that ultimately discharges to the St. Johns River. The basin is not considered to be an OFW; however, the FDEP has adopted TMDL for both nitrogen and phosphorous for any basin that discharges to the St. Johns River above Lake Harney. Alternatives H1, H2, and H3 have been identified as potential pond sites.

Pond H1 is a dry pond located on the north side of SR 46 at STA 399+00, within a residential parcel. However, the proposed pond site will not impact any existing structures within the residential parcel. Pond H1 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the south side of SR 46 into an existing roadside ditch before ultimately discharge into the St. Johns River.

Pond H2 is a dry pond located on the southeast corner at the intersection of SR 46 and CR 426 at STA 394+00. The site is located on 3 parcels, 2 parcels being vacant and the other parcel is Chuck's Automotive Repair. Pond H2 is not within the 100-year floodplain boundary and will not impact any wetlands. The pond would outfall to the south side of SR 46 into an existing roadside ditch before ultimately discharge into the St. Johns River.

Pond H3 is a dry pond located on the northeast corner at the intersection of SR 46 and CR 426 at STA 392+00 within a vacant parcel. Pond H3 is not within the 100-year floodplain boundary but will impact one isolated wetland on the north side of SR 46. The pond would outfall to the south side of SR 46 into an existing roadside ditch before ultimately discharge into the St. Johns River.

Preferred Alternative

Pond H1 is the preferred alternative because there will be no impacts to wetlands as compared to alternative Pond H3 and no business damages as compared to alternative Pond H2. According to the Seminole County Soil Survey, Pond H1 consists of Astatula (HSG A) soil. The geotechnical boring taken for Pond H1 shows the ESHWT elevation at 9.0 ft below the ground surface. According to Lidar Data, the existing ground elevation at the boring is approximately 42.4 ft NAVD, which puts the ESHWT elevation at 33.4 ft NAVD. With the data complied it was determined that Pond G2 will be a dry pond with the pond bottom set at an elevation of 38.0 ft NAVD. According to Lidar Data obtained for this pond site, the existing ground elevation at the perimeter of the pond is at approximately 41.0 ft NAVD. Preliminary pond sizing calculations indicates that this pond requires approximately 2.89 acres of area. By using the proposed pond geometry and geotechnical soil parameters, a preliminary recovery analysis was performed to verify that the entire treatment volume could be recovered within 72 hours.

3.9 Total Maximum Daily Loads (TMDL)

SR 46 is located within the jurisdiction of the SJRWMD. The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an OFW. However, the FDEP has adopted TMDLs for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, the St. Johns River above Lake Jesup, and the St. Johns River above Lake Harney.

Pre-development and post-development annual mass loading for both nitrogen and phosphorus have been preliminary calculated for each sub-basin (See **Table 3-2**). TMDL reduction within the stormwater management facilities are only based on the type of proposed facilities (i.e. wet or dry ponds).

Table 3-2 – Pre-Development and Post-Development TMDL

SUB-BASIN	Pre - Annual Mass Loading - Nitrogen (kg/yr)	Pre - Annual Mass Loading - Phosphorus (kg/yr)	Post - Annual Mass Loading - Nitrogen (kg/yr)	Post - Annual Mass Loading - Phosphorus (kg/yr)	Stormwater Management Facility (SWMF)	Effluent Annual Mass Loading from SWMF - Nitrogen (kg/yr)	Effluent Annual Mass Loading from SWMF - Phosphorus (kg/yr)
A	23.125	1.106	89.516	12.008	Wet Pond	51.689	2.907
1	16.788	0.803	51.043	6.847	Wet Pond	29.857	1.900
2	29.455	1.409	64.012	8.587	Wet Pond	37.160	2.219
B	27.923	4.411	99.560	13.356	Wet Pond	58.792	3.965
C	12.248	0.586	71.413	9.580	Wet Pond	42.114	2.820
D	10.161	1.605	27.891	3.741	Wet Pond	16.637	1.173
E	3.585	0.566	16.278	2.184	Dry Pond	0.159	0.021
F	1.334	0.064	21.577	2.895	Dry Pond	0.153	0.021
G	5.523	0.872	51.456	6.903	Dry Pond	0.668	0.090
H	7.597	1.174	41.866	5.616	Dry Pond	0.443	0.059
TOTAL(s): (kg/yr)	**137.739**	**12.596**				**237.672**	**15.175**

Based on the table above, TMDL net reduction will present a challenge during the design and permitting phase of this project. The proposed stormwater management facilities per each sub-basin only will not achieve the required post-development TMDLs being equal to or less than the pre-development TMDLs. The largest contributing factor for the net increase in TMDLs is the percentage of directly connected impervious area (DCIA) from the pre-development versus post-development conditions. Based on the existing typical section, all impervious areas are considered Non-DCIA while the preferred alternative typical sections (Suburban South, Bridge with Path, Suburban Best Fit, and Urban) all impervious areas are considered DCIA.

During the design and permitting phase of this project, it is recommended to have a pre-application meeting with SJRWMD to discuss the following:

- Since all sub-basin ultimately discharge to the St. Johns River, can the pre - post TDMLs quantities be considered a comprehensive nutrient loading (as shown in the table above).
- For all sub-basins / ponds that discharge into a wetland and /or ditch before ultimately discharging to the St. Johns River, is there sufficient mixing to allow for the nutrient loading (TMDL) requirements to be eliminated.

In addition to the recommendations shown above, the following stormwater treatment options should be examined during the design phase of this project to provide the required nutrient removal:

- Stormwater Harvesting
- Floating Islands with Wet Detention
- Vegetated Natural Buffer
- Pervious Pavement
- Swales

4.0 CONCLUSIONS

Alternative pond sites have been identified along the project limits. The analysis estimates right-of-way needs using volumetric analysis, which accounts for water quality treatment and water quantity for runoff attenuation. The right-of-way cost estimates found in this report is a budget tool that can be used by Seminole County and FDOT District 5 to estimate total acquisition costs associated with each pond alternative and to budget the appropriate funds for acquisition. Right-of-way cost estimates are not real estate appraisals and do not reflect market values.

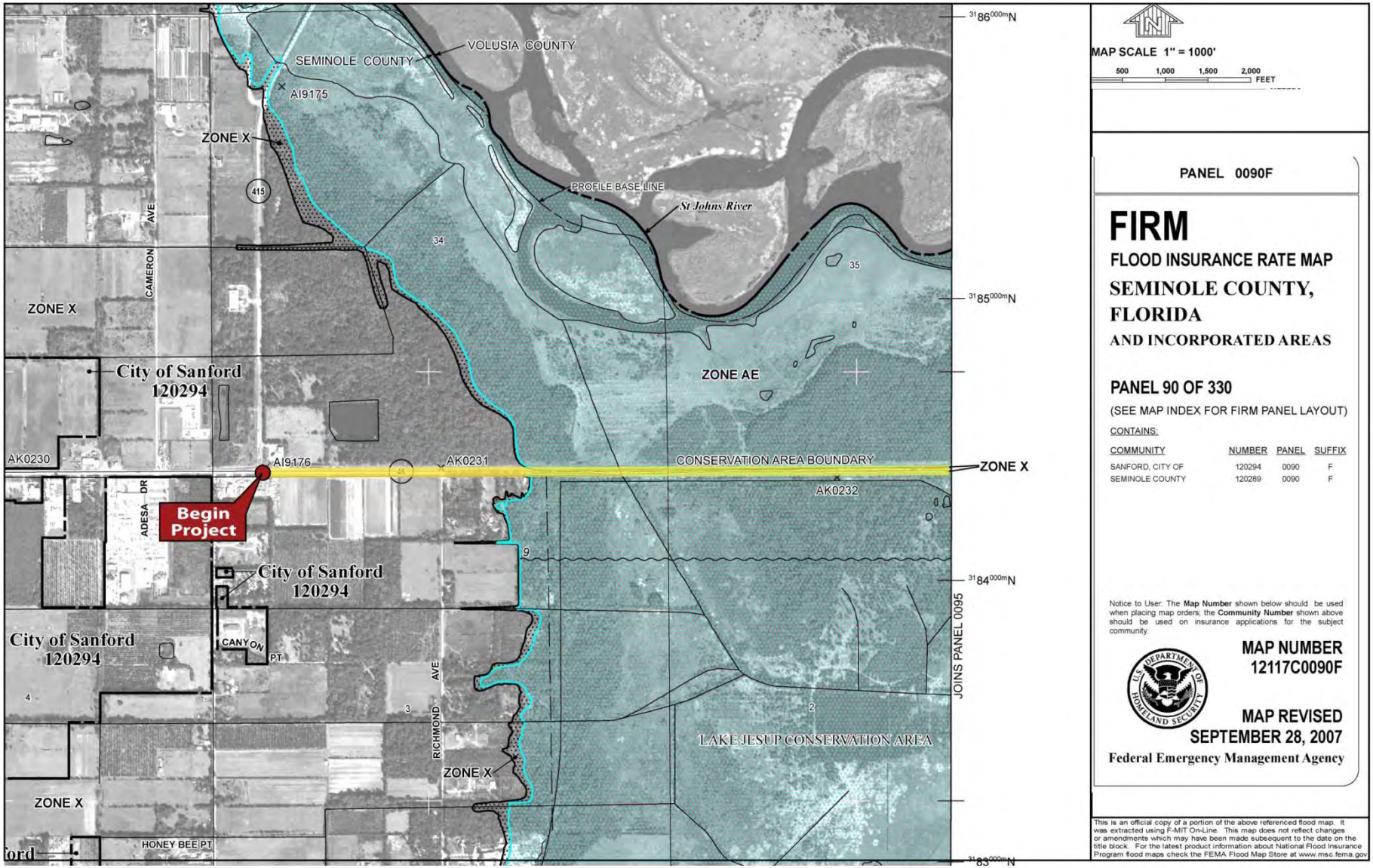
Pond sizing calculations as well as graphics showing the roadway alignment and associated pond site alternatives are included in **Appendix F** and **Appendix G**, respectively, of this Pond Siting Report. Please note that the recommendations were based on pond sizes and locations determined from preliminary calculations, reasonable engineering judgment, and assumptions. Pond sizes and locations may change during the final design as more detailed information on ESHWT elevations, wetland normal pool elevations, final roadway profile design, and confirmed TMDL requirements, etc. become available. Please see **Table 4-1** for a Summary of Pond Recommendations.

Table 4-1 – Summary of Pond Recommendations

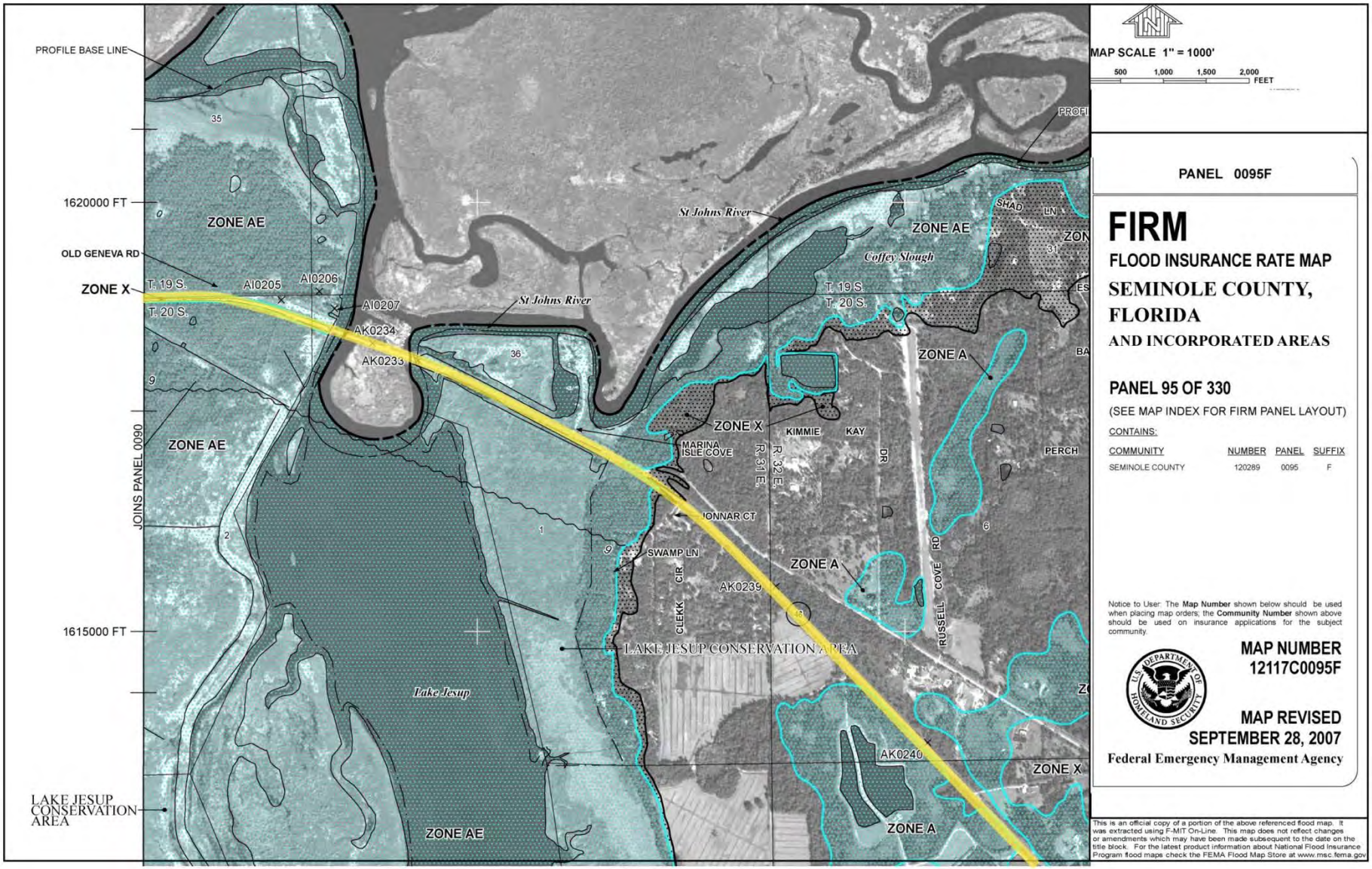
Basin	Preferred Pond Alternative
A	Pond A3
B	Pond B1
C	Pond C1
D	Pond D1
E	Pond E2
F	Pond F2
G	Pond G2
H	Pond H1
1	MOD Pond 1
2	MOD Pond 2
Floodplain No. 1	FP Comp 1 FP Comp 2

APPENDIX A

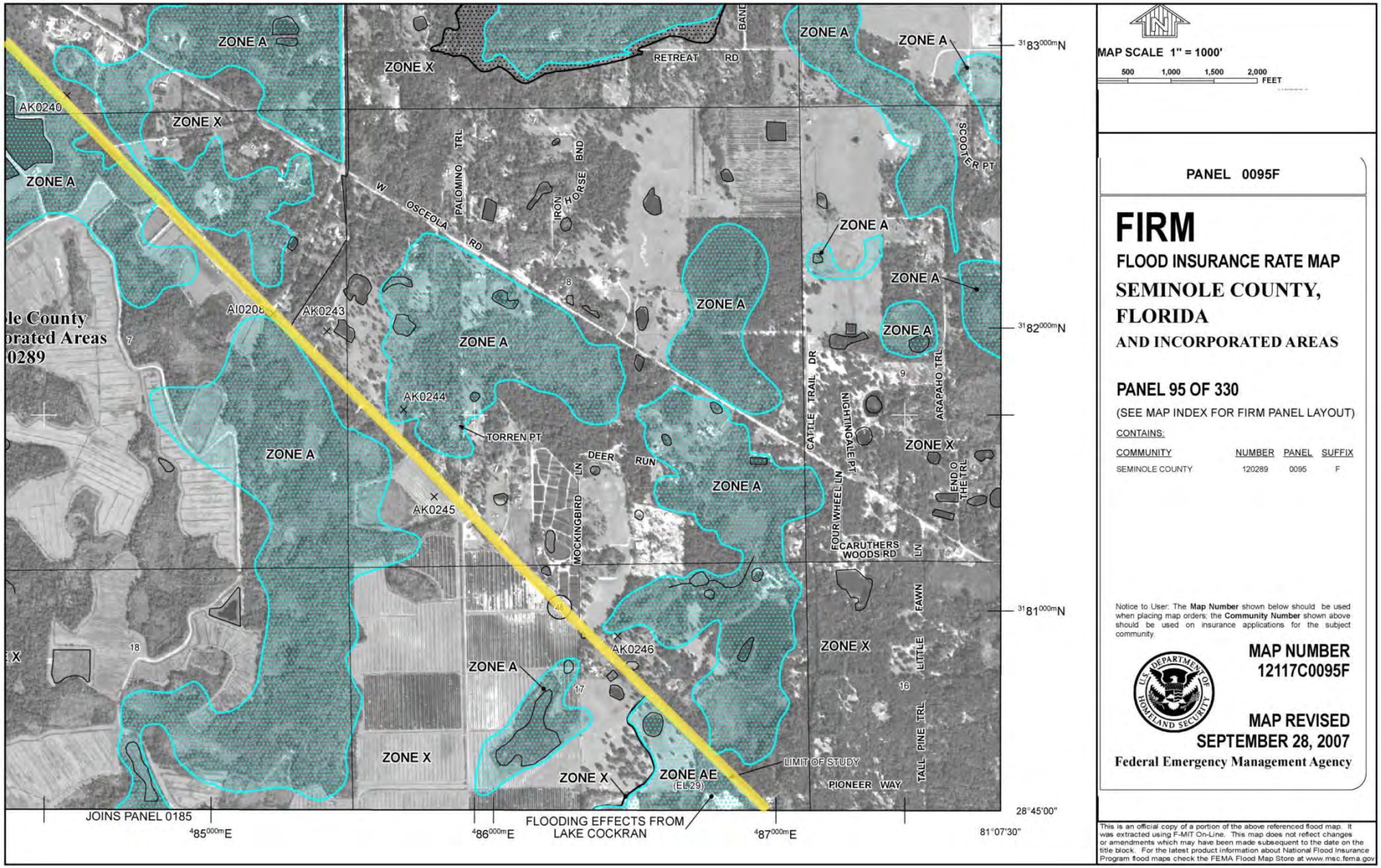
FEMA FIRM Maps



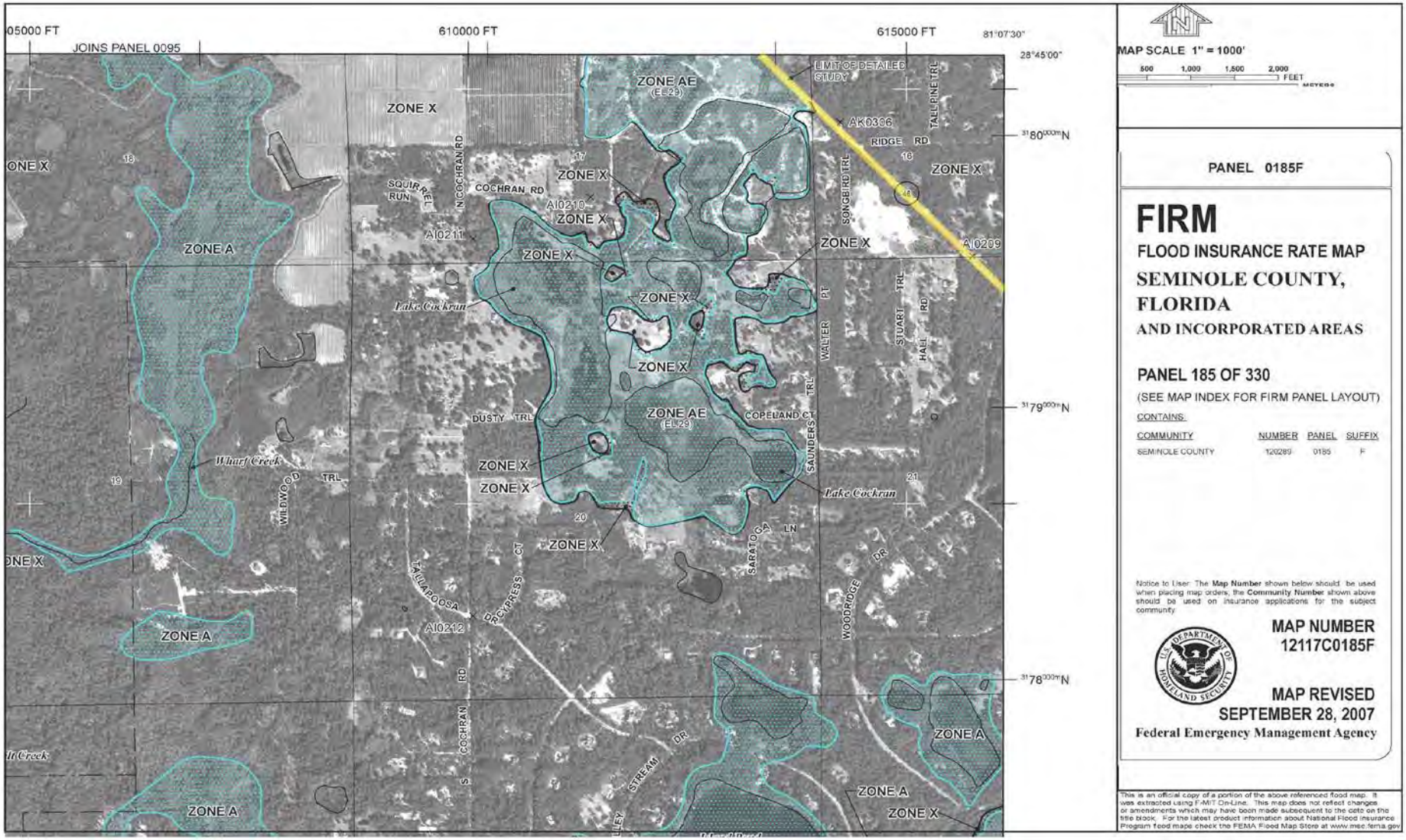
FEMA FIRM Maps (1 of 5)



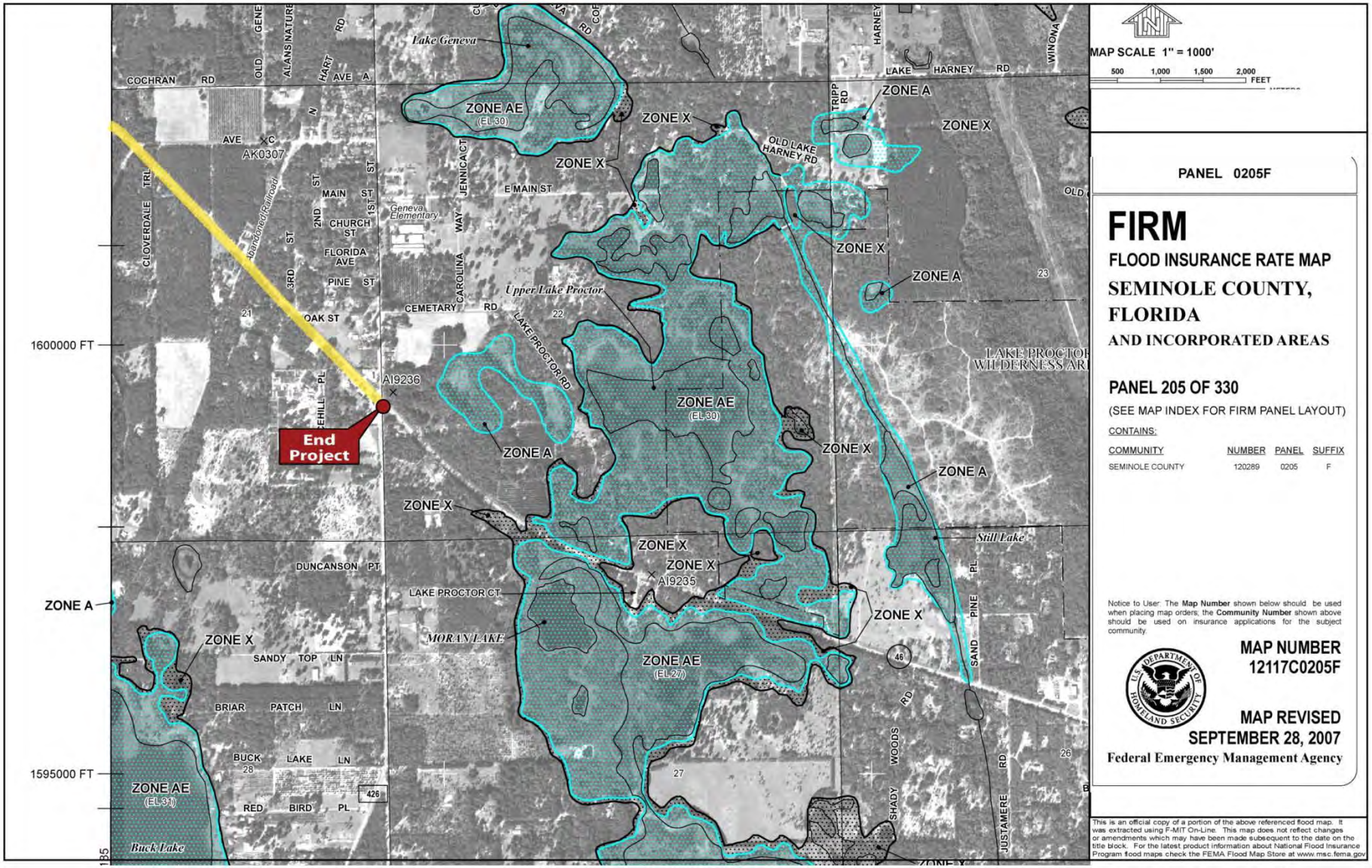
FEMA FIRM Maps (2 of 5)



FEMA FIRM Maps (3 of 5)



FEMA FIRM Maps (4 of 5)



FEMA FIRM Maps (5 of 5)

APPENDIX B

USGS Quadrangle Maps

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OSTEEN QUADRANGLE
FLORIDA
7.5 MINUTE SERIES (TOPOGRAPHIC)

BEGIN PROJECT

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, USCE, and Florida Geodetic Survey

Planimetry by photogrammetric methods from aerial photographs taken 1957 and 1958. Topography by planetable surveys 1965

Selected hydrographic data compiled from USC&GS Chart 688 (1964)
This information is not intended for navigational purposes

Polyconic projection
10,000-foot grid based on Florida coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 17, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983
move the projection lines 26 meters south and
19 meters west as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Red tint indicates areas in which only landmark buildings are shown

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Revisions shown in purple compiled from aerial photographs taken 1977 and other source data. This information not field checked. Map edited 1980

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUMS IS VARIABLE
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 0.5 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Heavy-duty
Medium-duty
Light-duty
Unimproved dirt
State Route

FLORIDA
QUADRANGLE LOCATION

OSTEEN, FLA.
N2845—W8107.5/7.5

1965
PHOTOREVISED 1980
DMA 4741 I SW—SERIES V847

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1981

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GENEVA QUADRANGLE
FLORIDA
7.5 MINUTE SERIES (TOPOGRAPHIC)

END PROJECT

LAKE HARNEY

Geneva

Lake Geneva

Lake Proctor

Stone Island

Gopher Slough

Rauleson Cove

YOLUSIA CO
SEMINOLE CO

Cow Island

ST JOHNS

Jordan Slough

SPOIL BANK

Buck Lake

Snow Hill

Gaging Station

Palmer-Taylor Mound

Buzzard Roost

Cabbage Slough

PUZZLE LAKE

RIVER

ECONLOCKHATCHEE

Flowing Well

Creek

Branch

Roberts

Fulch Ranch

Jackson

Turkey

Mills Lake

Lake Gore

Chuluota

Well

Chuluota Cem

Mills Branch

Sylvan Pt

Buck Point Mound

Heiffer Mound

Saddle Mound

Moccasin Mound

Noah Mound

LEVEE

BM

BR 20

BR 13

BR 47

MT. DORA 35 MI.
SANFORD 11 MI.

ORLANDO (CH) 17 MI.
OVIEDO 5.6 MI.

SOUTHMERE 3.3 MI.
TITUSVILLE 15 MI.

0.3 MI. TO FLORIDA 419

3 MI. TO FLORIDA 420

T. 20 S.
T. 21 S.

R 32 E.
R 33 E.

4741 I SW (OSTEEN)
4841 IV SW (MAYTOWN)
4741 II NW (OVIEDO)
4841 III NW (AURANTIA)
(OVIEDO SW) 4741 II SW
(TITUSVILLE SW) 4841 III SW
4741 I SE (OSCEOLA)
(BITHLO) 4741 II SE

81°07'30" 28°45' 81°00' 28°37'30"
42'30" 40'
2'30" 5'
490 000 FEET 470 000 FEET
1 600 000 FEET 1 570 000 FEET
3180000m N. 3167000m N.
488000m E. 499000m E.

Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and USCE

Culture and drainage in part compiled by U. S. Corps of Engineers and Geological Survey from aerial photographs taken 1951
Topography by plane-table surveys 1952-1953
Hydrography from USC&GS Chart 688 (1:40,000)

Polyconic projection. 1927 North American datum
10,000-foot grid based on Florida coordinate system, east zone

Dashed land lines indicate approximate locations

1000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue

Revisions shown in purple compiled from aerial photographs taken 1970. This information not field checked

MN GN
1° 18 MILS 0°02' 1 MIL
UTM GRID AND 1970 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Map photoinspected 1977
No major culture or drainage changes observed

20% TOTAL RECOVERED FIBER

SCALE 1:24000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL
SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Heavy-duty	4 LANE | 6 LANE	Light-duty	
Medium-duty	4 LANE | 6 LANE	Unimproved dirt	
U. S. Route		State Route	

FLORIDA
QUADRANGLE LOCATION

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1985

GENEVA, FLA.
N2837.5—W8100/7.5
PHOTOINSPECTED 1977
1953
PHOTOREVISED 1970
AMS 4741 II NE.—SERIES V847

ISBN 0-607-13852-1
9 780607 138528

APPENDIX C

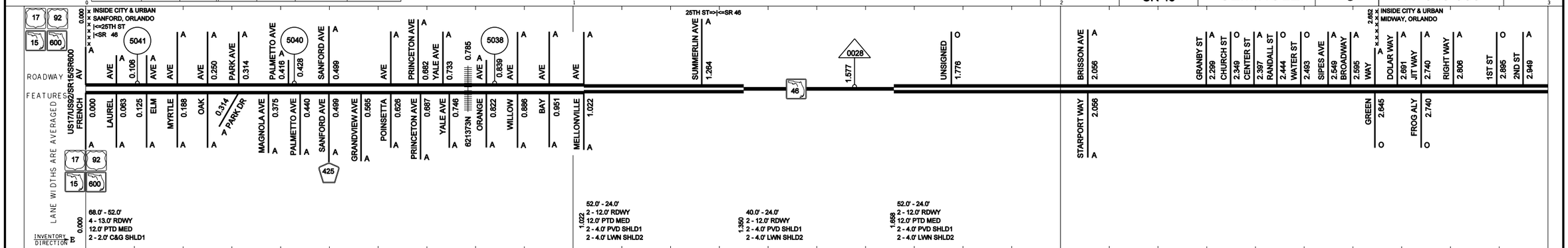
FDOT Straight Line Diagrams

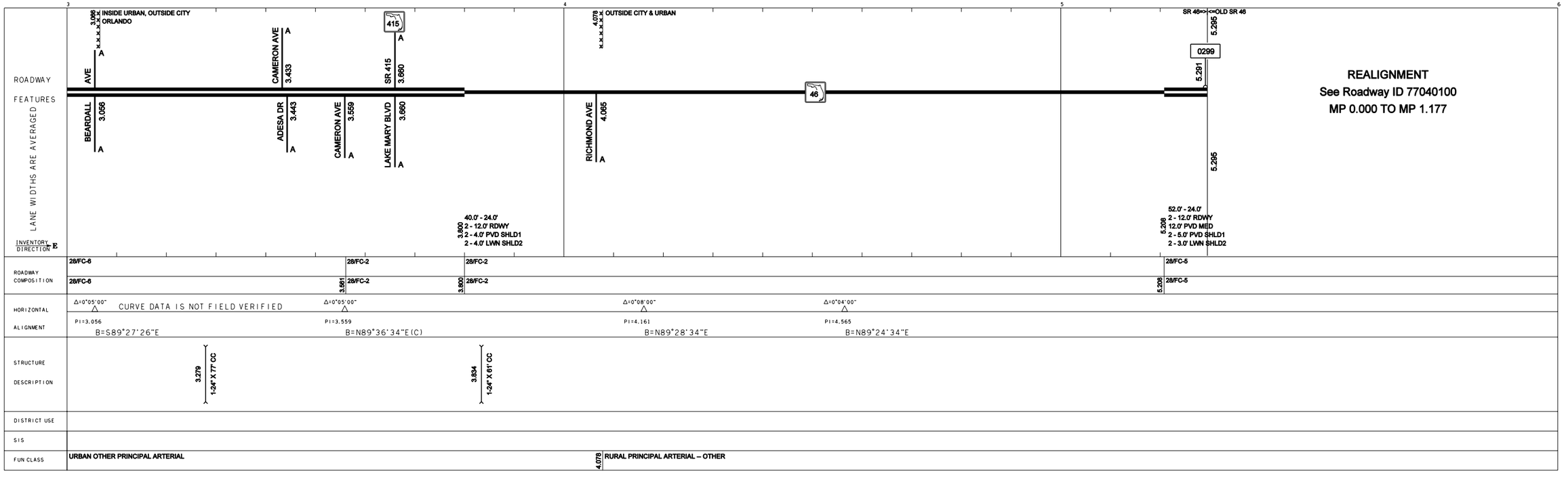
STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INTERIM REVISIONS	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	02/08/08	03/24/08	000.000	016.100	06/04/10 KA	06/21/10 URS
BY	KA	URS	000.000	016.000	07/07/09 KA	18/04/09 URS

INT. or US ROUTE NO	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 000	1 OF 3





REALIGNMENT
See Roadway ID 77040100
MP 0.000 TO MP 1.177

H:\DeLand\UserData\MT50RMW\DGN's\77040-2010.dgn
PRINTED: 6/21/2010 3:00:08 PM

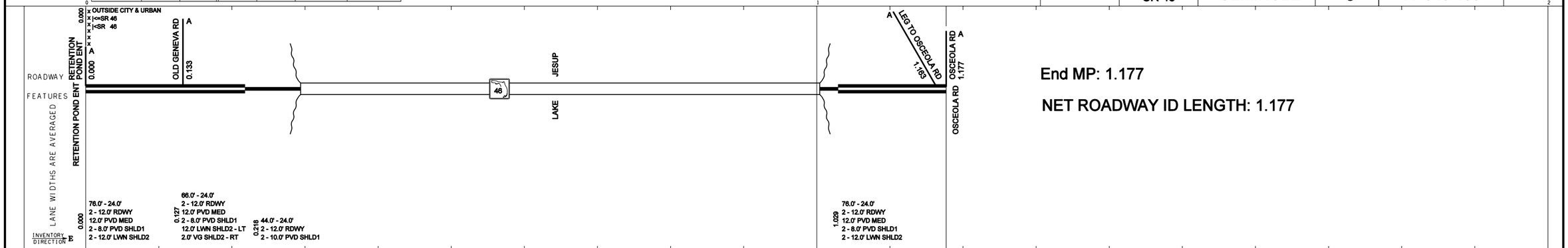
INTERIM REVISIONS	5 YR INV	SLD REV
DATE	06/04/10	06/21/10
BY	KA	URS

BMP	EMP	INV	SLD REV

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 100	1 OF 1



End MP: 1.177

NET ROADWAY ID LENGTH: 1.177

DISTRICT USE	
SIS	
FUN CLASS	RURAL PRINCIPAL ARTERIAL – OTHER

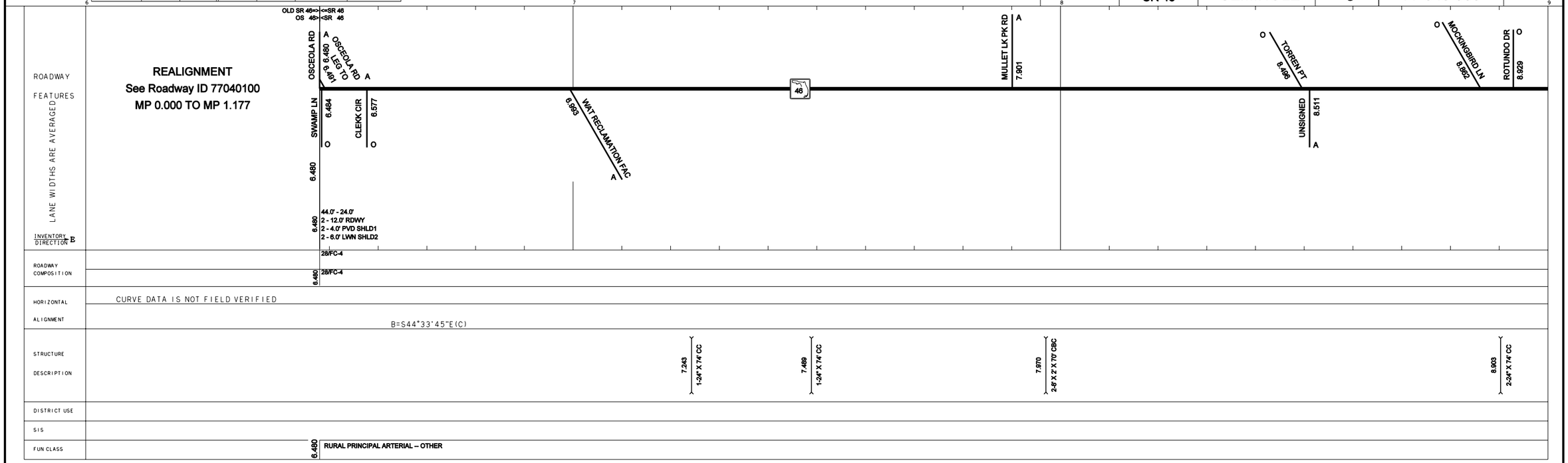
H:\DeLand\UserData\MT50RM\DGN's\77040100-2010.dgn
PRINTED: 6/21/2010 3:30:48 PM

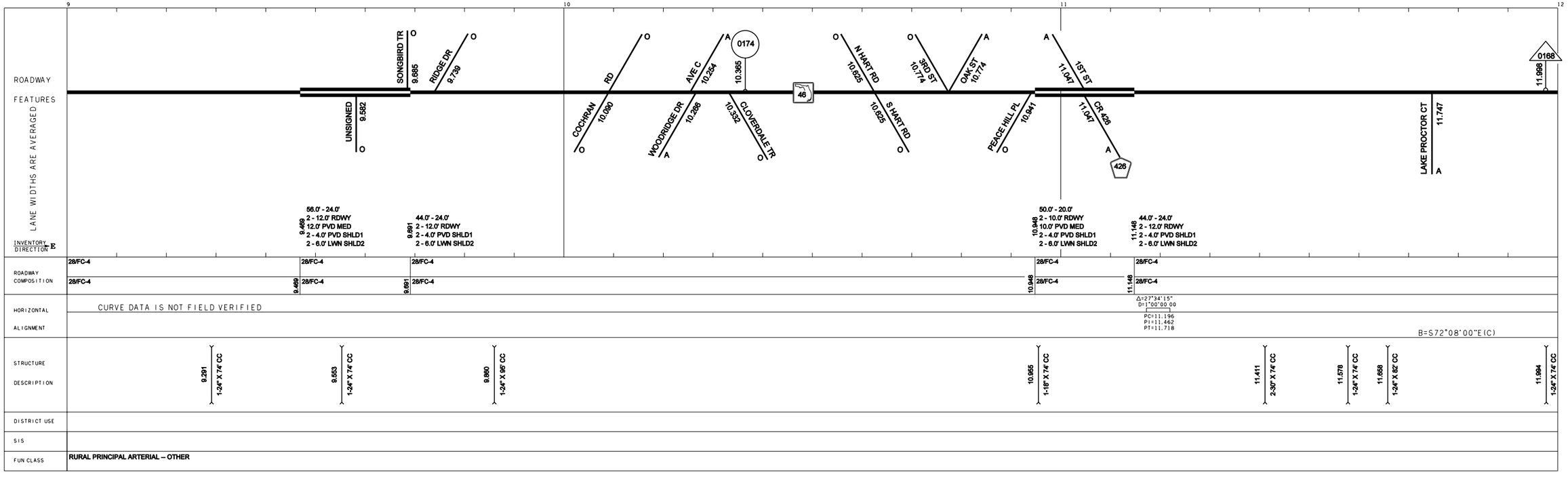
INTERIM REVISIONS	5 YR INV	SLD REV	BMP	EMP	INV		SLD REV	
DATE	02/08/08	03/24/08	000.000	016.100	06/04/10	KA	06/21/10	URS
BY	KA	URS	000.000	016.000	07/07/09	KA	18/04/09	URS

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 000	2 OF 3





H:\DeLand\UserData\MT50RM\OGN's\77040-2010.dgn
PRINTED: 6/21/2010 3:00:40 PM

APPENDIX D

Correspondence

URS Corporation

315 E. Robinson Street, Suite 245
Orlando, FL 32804
Phone: (407) 422 – 0353
Fax: (407) 423 – 2695

RECORD OF CONVERSATION

DATE: Feb. 7, 2012 JOB #: 12721027

RECORDED BY: DTL CLIENT: Seminole County & FDOT

TALKED WITH: Jim Wood OF: FDOT Maintenance

NATURE OF CALL: Incoming ☐ Outgoing ☒ Meeting ☐

ROUTE TO: _____ _____

_____ _____

MAIN SUBJECT OF CONVERSATION: Drainage issues and base clearance

---

Danh Lee spoke with Jim Wood of FDOT Maintenance about any possible drainage concerns within the project corridor. The first item of concern, Jim mentioned, deals with an existing cross drain (CD-5 at mile post 7.97) and the fact that there is not positive drainage at the outfall. However, the outfall drains into private property and thus has not been fixed. Jim believes that the problem exist due to the grading or lack thereof, within the private property.

The only other concern is in the area of Mullet Lake Park Road. The east side of the roadway, north of SR 46 sometimes floods. FDOT has received calls in the past regarding flooding in this area. However, since the flooding occurs outside of FDOT right of way, there is not much they can do to fix the problem. Jim believes that flooding happens due to the ultimate outfall and the conveyance system(s) leading into St. Johns River. Specifically, the water is backing up into private property due to not having positive drainage / adequate grading required within certain private properties. Also, the conveyance systems may be undersized to handle the required flow capacities which would allow for the runoff to be maintained within the appropriate limits.

The discussion continued about field observations that were made on 2/2/12. During the field visit, I noticed that two (2) endwalls for the existing cross drains

315 E. Robinson Street, Suite 245
Orlando, FL 32804
Phone: (407) 422 – 0353
Fax: (407) 423 – 2695

were buried. The endwall for CD-7, on the south side of the roadway was completely buried. The top of the endwall for CD-8, on the north side was only visible and the 24" RCP was completely underground. Jim stated that no problems existed in these areas and that the maintenance crew would be sent out soon to un-cover the endwalls during this current dry season.

The next item of discussion was base clearance. I asked Jim if there were any issues regarding base clearance and / or any problems with deterioration of the existing road surface. Jim stated that there were no issues that he could recall. He did state that the road surface within the project corridor was recently milled and re-surfaced so no problems are currently visible. However, he stated that before the milling and re-surfacing project, there were some areas that had "alligator" cracking.

SR 46 Environmental Issues
Meeting Notes
Meeting with St. Johns River Water Management District – Maitland Service Center
August 22, 2012

SR 46 PD&E Study
FPN 240216-4-28-01
Contract No. PS-5738-10

ATTENDEES:

Mark Flomerfelt, P.E. – Seminole County
Jan Everett – URS
Chris Rizzolo – URS
Mary McGehee – FDOT
Lee Kissick – SJRWMD
Kenneth Lewis – SJRWMD
Shannon Carter Wetzel – Seminole County
Danh Lee – URS
Liz Barker – EMD
Victoria Nations – SJRWMD
Marjorie Cook – SJRWMD

A meeting was held at the Maitland Service Center of the St. Johns River Water Management District on August 22, 2012 for the SR 46 Project Development and Environment (PD&E) study. The meeting was held to discuss the proposed roadway improvements, the conservation easements within the corridor and the proposed impacts to environmentally sensitive areas. A summary of the items discussed at the meeting includes the following:

Chris Rizzolo introduced the project, provided a brief history and background information.

- The limits of the PD&E study were discussed as well as the various typical sections associated with the project. The suburban typical section requires 148' of R/W and the rural typical section requires 188' of R/W. Only the suburban typical section is under consideration for the portion of the project west of the bridge.
- The Build Alternatives have been broken into smaller segments to allow for a more detailed and thorough evaluation. In addition, there will be north, central and south alignment alternatives.
- In addition, there is an adjacent FP&L transmission line north of the roadway between SR 415 and the bridge.
- The project is scheduled for design in fiscal year 2015 (July 2014 through June 2015).
- The summary of findings outlined within the U.S. Army Corps of Engineers Draft Ecosystem Restoration Report (April 2012) regarding the Government Cut (bypass canal) was discussed. In addition, information regarding Channels A, B and C was provided.

- The previous PD&E study was discussed as well as the commitments and recommendations made during the previous PD&E process.

Liz Barker provided a summary of the environmental information collected to date regarding the conservation easements along the corridor and the mitigation areas associated with the Lake Jesup Bridge Replacement project.

- West of Lake Jesup and north of SR 46 is the Bergmann Tract, a private mitigation bank under various conservation easements. The URS PD&E team does not have a record of all the acreage that has been placed within the various conservation easements or information on whether or not all easements have been recorded within Seminole County. There may be many very small easements that have been purchased for a variety of developments, which could make widening SR 46 to the north difficult.
- West of Lake Jesup and south of SR 46 is a single conservation easement over the Futch Property granted to the Florida Department of Environmental Protection (FDEP). The Futch property was utilized as mitigation for the construction of the Eastern Beltway (Seminole County Expressway Authority) permitted through FDEP.
- The mitigation for the previously permitted Lake Jesup Bridge Replacement was discussed, which consisted of the removal of the causeway and the restoration of the Tornado Tavern and Marina Isle Fish Camps. The mitigation was evaluated utilizing UMAM during the permitting of the bridge replacement. The documentation demonstrating the final scoring and function gain for each mitigation area is still in question. Lee Kissick stated that he is working with Lisa Grant to determine if the UMAM scoring, as outlined within Anthony Miller's email dated November 3, 2006, is the final version of the UMAM scoring.
- An existing Sovereign Submerged Lands easement from the Board of Trustees of the Internal Improvement Trust Fund (TIITF) exists within project corridor. Therefore, a modification for the project improvements should not be required.
- Although not quantified at this time, the project will result in direct and secondary wetland impacts throughout the corridor.
- Various mitigation options were preliminarily discussed which included additional restoration and enhancement opportunities as well as mitigation bank credits.

Victoria Nations outlined the permitting requirements for the project:

- The SJRWMD will only require a Conservation Easement Release submittal for impacts to recorded conservation easements. The URS PD&E team will need to determine if all conservation easements have been recorded.
- In addition, the District may have the master map that demonstrates all conservation easements associated with the Bergmann Mitigation Tract. The District will search their files.

- The SJRWMD will not require permit modifications of the various permits associated with the Bergmann Mitigation Tract in conjunction with the Conservation Easement Release submittals.
- The SJRWMD will not require a modification to the Lake Jesup Bridge Replacement permit due to the proposed impacts to the existing mitigation areas.
- The SJRWMD Individual Environmental Resource Permit will be applied for at the appropriate time.
- Restoration of Channel B as requested by the Friends of Lake Jesup may be one mitigation strategy, but it would have to show a benefit,

Danh Lee explained the preliminary stormwater design for the project, consisting of ponds and adjacent swales.

Marjorie Cook addressed the following items:

- The preliminary stormwater design for the project needs to address the loss of flood storage within the 10-year floodplain. Compensation shall be provided through excavation of a volume of uplands equivalent to the loss of storage within the regulatory floodplain.
- It was recommended that the URS PD&E team review the existing sovereign submerged lands easement to insure that the proposed project occurs within the SSL easement.

Note: The above reflects the writer's understanding of the contents of the meeting. If any misinterpretations or inaccuracies are included, please notify the author within seven (7) days of receiving the notes.

SR 46 Environmental Issues
Meeting Notes
Meeting with Florida Department of Environmental Protection – Central District Office
August 28, 2012

SR 46 PD&E Study
FPN 240216-4-28-01
Contract No. PS-5738-10

Chris Rizzolo – URS	Liz Barker – EMD
Mary McGehee – FDOT	Lisa Prather – FDEP

A meeting was held at the Central District office of the Florida Department of Environmental Protection on August 28, 2012 for the SR 46 Project Development and Environment (PD&E) study. The meeting was held to discuss the proposed roadway improvements, the conservation easements within the corridor and the proposed impacts to environmentally sensitive areas. A summary of the items discussed at the meeting includes the following:

Chris Rizzolo introduced the project, provided a brief history and background information.

The limits of the PD&E study were discussed as well as the various typical sections associated with the project. The suburban typical section requires 148' of R/W and the rural typical section requires 188' of R/W. Only the suburban typical section is under consideration for the portion of the project west of the bridge.

- The physical constraints within the limits of the project were discussed, which include the environmental constraints, available right-of-way and utilities.
- The summary of findings outlined within the U.S. Army Corps of Engineers Draft Ecosystem Restoration Report (April 2012) regarding the Government Cut (bypass canal) was discussed.

Liz Barker provided a summary of the environmental information collected to date regarding the conservation easements along the corridor.

- West of Lake Jesup and north of SR 46 is the Bergmann Tract, a private mitigation bank under various conservation easements.
- West of Lake Jesup and south of SR 46 is a single conservation easement over the Futch Property granted to the Florida Department of Environmental Protection (FDEP). The

Futch property was utilized as mitigation for the construction of the Eastern Beltway (Seminole County Expressway Authority) permitted through FDEP.

- Since it is highly likely that a Conservation Easement Release would be required by FDEP to allow for the proposed roadway improvements, various mitigation options were preliminarily discussed that included additional restoration and enhancement opportunities as well as mitigation bank credits.

Lisa Prather outlined the requirements for a Conservation Easement Release:

- Historically, a Conservation Easement Release was completed during the permitting of the Lake Jesup Bridge Replacement, which was accomplished utilizing mitigation bank credits from the Lake Monroe Mitigation Bank.
- The FDEP will only require a Conservation Easement Release letter submittal for impacts to the recorded conservation easement for the Futch Property.
- No permit modification would be required in associated with the Conservation Easement Release.
- FDEP would be amenable to the concept of using the restoration of Channel B for the partial release of lands within the Futch Property. The details of this mitigation plan would needed to be provided to FDEP as part of the Conservation Easement Release submittal. There was discussion regarding the timing of the mitigation and how many acres of the channel would be restored. Authorization for the proposed restoration project would be provided through the issuance of an Environmental Resource Permit.
- FDEP would not object to the elimination of the canal within the Futch Property, which occurs on the south side of SR 46, since it was planned to be filled as part of the original mitigation plan.

Note: The above reflects the writer's understanding of the contents of the meeting. If any misinterpretations or inaccuracies are included, please notify the author within seven (7) days of receiving the notes.

APPENDIX E

Design Criteria

SR 46 PD&E
FROM SR 415 TO CR 426
FPN 240216-4-28-01
SEMINOLE COUNTY AND FDOT DISTRICT 5

DRAINAGE DESIGN CRITERIA

The design of the stormwater management facilities for the project is governed by the rules set forth by the SJRWMD and FDOT. Water quality treatment and water quantity attenuation requirements will comply with the guidelines as defined in SJRWMD Chapter 40C-4 of the Florida Administration Code (F.A.C) Environmental Resource Permit (ERP) manual.

Wet detention and dry retention ponds will provide for water quality improvements as well as water quantity attenuation for the project runoff. Please refer to the summary below for the water quality, water quantity, FDOT critical duration, and retention pond facilities configuration criterion used for the project:

Water Quality

- Wet detention ponds – stormwater treatment will be provided for the greater of one inch (1") of stormwater runoff over the drainage area or two and a half inches (2.5") of runoff from the impervious area (excluding water bodies). An orifice should be set at or above the average between the Estimated Seasonal High Water Level (ESHWL) elevation and Estimated Seasonal Low Water Level (ESLWL) elevation and sized to drawdown one-half of the required treatment volume within 24 to 30 hours but no more than one half of this volume will be discharged within the first 24 hours.
- Dry retention ponds (off-line) – stormwater treatment will be provided for the greater of one half inch (0.5") of stormwater runoff over the drainage area or one and a quarter inches (1.25") of runoff from the impervious area (excluding water bodies). For online dry retention ponds the treatment will be provided for the greater of that which is specified for offline systems, plus an additional one half inch (0.5") of stormwater runoff over the drainage area. The pond bottom, for dry retention, shall be set no less than one foot (1') above the SHWL in order to provide recovery of the required treatment volume through the soil. The required treatment volume is required to be fully recovered within 72 hours of the storm event.
- Dry retention ponds (on-line) – stormwater treatment will be provided for the greater of that which is specified for off-line systems, plus an additional one half inch (0.5") of stormwater runoff over the drainage area. The pond bottom, for dry retention, shall be set no less than one foot (1') above the SHWL in order to provide recovery of the required treatment volume through the soil. The required treatment volume is required to be fully

recovered within 72 hours of the storm event.

Water Quantity

- For open basins, SJRWMD requires that the post-development peak discharges shall be at or below pre-development peak discharges for the 25-year/24- hour storm event.

Critical Duration

- For open basins, FDOT critical duration analysis for 1-hour through 3-day storm events shall be analyzed to ensure that the post developed peak runoff volume do not exceed the pre-developed peak runoff volume.

Wet Detention Pond Facilities Configuration

- The proposed pond will include a 20-foot maintenance berm (15' minimum and no steeper than 1:6), maximum 1:4 (Vertical:Horizontal) for pond side slopes (to a depth of 2-feet below the control elevation, then 1:2 to the pond bottom) and tie up/down slopes to existing ground and a minimum 1-foot freeboard from the inside maintenance berm to the Design High Water (DHW). Please refer to FDOT District 5 checklist for more detailed information about pond configurations.

Dry Retention Pond Facilities Configuration

- The proposed pond will include a 20-foot maintenance berm (15' minimum and no steeper than 1:6), maximum 1:4 (Vertical:Horizontal) for pond side slopes (to a depth of 1-foot above the SHWL) and tie up/down slopes to existing ground and a minimum 1-foot freeboard from the inside maintenance berm to the Design High Water (DHW). Please refer to FDOT District 5 checklist for more detailed information about pond configurations.

The stormwater runoff for the roadway will be collected by curb and gutter inlet systems and conveyed to the proposed wet detention and dry retention ponds. The SCS method has been used to determine the required pond size for each sub-basin. In addition, Basin 1 and Basin 2 also used ICPR to model the existing pond expansion in more detail and preliminary recovery analysis has been performed for all dry retention ponds. Also, it should be noted that for contingency purposes, the alternative pond sites for Basin A thru Basin H have been upsized by twenty percent (20%).

APPENDIX F

Pond Sizing Calculations

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	02/19/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/19/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A1 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.86	59.34
Open Space - Fair Conditions	Basinger (35%)	B/D	69	6.08	419.52
Open Space - Fair Conditions	Felda (10%)	D	84	1.74	146.16
Open Space - Fair Conditions	Nittaw (50%)	D	84	8.68	729.12
Impervious (Paved parking, roads, etc.)			98	4.69	459.62
Pond footprint	Nittaw	D	84	6.52	547.68
			TOTALS	**28.57**	**2361.44**

COMPOSITE CN	82.65

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.10	3.69	**8.78**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.10	5.46	**13.00**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.10	6.51	**15.50**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	02/19/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/09/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A1 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.42	28.98
Open Space - Fair Conditions	Basinger (35%)	B/D	69	2.95	203.55
Open Space - Fair Conditions	Felda (10%)	D	84	0.84	70.56
Open Space - Fair Conditions	Nittaw (50%)	D	84	4.22	354.48
Impervious (Paved parking, roads, etc.)			98	13.62	1334.76
Pond NWL			100	5.39	539.00
Pond pervious area	Nittaw	D	84	1.13	94.92
			TOTALS	**28.57**	**2626.25**

COMPOSITE CN	91.92

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	0.88	4.67	**11.11**
SJRWMD Open Basin	10 yr / 24 hr	7.50	0.88	6.54	**15.57**
SJRWMD Open Basin	25 yr / 24 hr	8.60	0.88	7.63	**18.16**

URS

MADE BY:	DTL	DATE: 02/19/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE: 04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: A1	BASIN:	Basin A

Water Quality

Total Basin Area =	28.57	ac
Paved Area =	13.62	ac
Pond Area at NWL =	5.39	ac

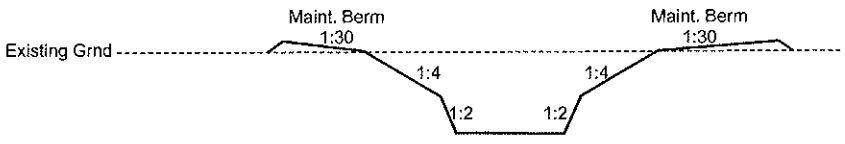
A.	1.0	" Over Total Basin Area =	2.38	Ac-Ft	
B.	2.5	" Over Paved Area =	2.84	Ac-Ft	
Required Treatment (PAV) =			**2.84**	Ac-Ft	
Required Attenuation (Post - Pre) =			**2.34**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =			**2.57**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =			**2.66**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =			**5.50**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =			**5.17**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
4.00	**Poud R/W** (1:2 max slope tie down)	7.02				
9.00	**Out Berm**	6.52				14.80
			6.15	0.50	3.08	
8.50	**Inside Berm**	5.78				11.73
			5.69	1.00	5.69	
7.50	Provided Treatment Vol. + Attentuation Vol.	5.59				6.04
			5.59	0.10	0.54	
7.40	Required Treatment Vol. + Attentuation Vol.	5.58				**5.50**
			5.57	0.06	0.33	
7.34	Estimated Stormsewer Tailwater	5.57				**5.17**
			5.53	0.42	2.32	
6.92	Required Treatment Vol. (PAV)	5.49				**2.84**
			5.44	0.52	2.84	
6.40	**Normal Water Level**	5.39				
4.40		5.02				
-2.40	**Bottom**	4.42				

Required Treatment Vol. + Attentuation Vol. =	5.50 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	6.04 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	7.40 Ft	Provided Treatment Vol. + Attentuation Stage =	7.50 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 5.17 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 7.34 Ft



Additional 20% of Pond R/W = 8.42 ac

URS

MADE BY:	DTL	DATE:	02/19/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE:	04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND:	A1	BASIN:	Basin A

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	13.62	0.95	12.94
Roadway Pervious Area	8.43	0.20	1.69
Pond Pervious Area	1.13	0.20	0.23
Pond Area at NWL	5.39	1.00	5.39
Total	**28.57**		20.24

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.78 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.18 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	Out. Berm	6.52				
8.50	In. Berm	5.78				
7.40		5.58				
6.92	(PAV)	5.49				
6.40	(NWL)	5.39				42.51
			5.21	2.00	10.41	
4.40		5.02				32.10
			4.72	6.80	32.10	
-2.40	Bottom	4.42				

Permanent Pool Volume Provided = **42.51 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **124.4 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **7.89 ft**

URS

MADE BY:	DTL	DATE: 02/19/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DCP	DATE: 04/29/14	
PROJECT:	SR 46 PD&E	POND: A1	BASIN: Basin A

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 7.34 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 22.05 ac

3) Lowest gutter elevation in Basin for HGL check

Station	39+00
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	8.79

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.45 ft

5) Pipe length from Pond to lowest gutter point = 400 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.66	
int. =	6.50	in/hr
A =	22.05	ac
Q =	94.59	cfs

Manning's n =	0.012	
Sum K =	2.39	
V =	4.82	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.31 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.0 ft
60 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	2/10/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A2 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.86	59.34
Open Space - Fair Conditions	Basinger (35%)	B/D	69	6.08	419.52
Open Space - Fair Conditions	Felda (10%)	D	84	1.74	146.16
Open Space - Fair Conditions	Nittaw (50%)	D	84	8.68	729.12
Impervious (Paved parking, roads, etc.)			98	4.69	459.62
Pond footprint	Nittaw	D	84	6.52	547.68
			TOTALS	**28.57**	**2361.44**

COMPOSITE CN	82.65

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.10	3.69	**8.78**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.10	5.46	**13.00**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.10	6.51	**15.50**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/10/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A2 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.42	28.98
Open Space - Fair Conditions	Basinger (35%)	B/D	69	2.95	203.55
Open Space - Fair Conditions	Felda (10%)	D	84	0.84	70.56
Open Space - Fair Conditions	Nittaw (50%)	D	84	4.22	354.48
Impervious (Paved parking, roads, etc.)			98	13.62	1334.76
Pond NWL			100	5.39	539.00
Pond pervious area	Nittaw	D	84	1.13	94.92
			TOTALS	**28.57**	**2626.25**

COMPOSITE CN	91.92

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	0.88	4.67	**11.11**
SJRWMD Open Basin	10 yr / 24 hr	7.50	0.88	6.54	**15.57**
SJRWMD Open Basin	25 yr / 24 hr	8.60	0.88	7.63	**18.16**

URS

MADE BY:	DTL	DATE: 02/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DCP	DATE: 04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: A2	BASIN:	Basin A

Water Quality

Total Basin Area =	28.57	ac
Paved Area =	13.62	ac
Pond Area at NWL =	5.39	ac

A.	1.0	" Over Total Basin Area =	2.38	Ac-Ft
B.	2.5	" Over Paved Area =	2.84	Ac-Ft
Required Treatment (PAV) =			**2.84**	Ac-Ft

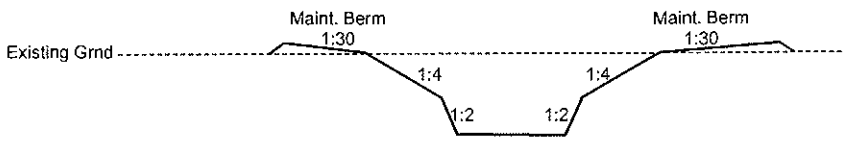
Required Attenuation (Post - Pre) =	**2.34**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**2.57**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**2.66**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =	**5.50**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**5.17**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
4.00	**Pond R/W** (1:2 max slope tie down)	7.02				
9.00	**Out Berm**	6.52				14.80
			6.15	0.50	3.08	
8.50	**Inside Berm**	5.78				11.73
			5.69	1.00	5.69	
7.50	Provided Treatment Vol. + Attentuation Vol.	5.59				6.04
			5.59	0.10	0.54	
7.40	Required Treatment Vol. + Attentuation Vol.	5.58				**5.50**
			5.57	0.06	0.33	
7.34	Estimated Stormsewer Tailwater	5.57				**5.17**
			5.53	0.42	2.32	
6.92	Required Treatment Vol. (PAV)	5.49				**2.84**
			5.44	0.52	2.84	
6.40	**Normal Water Level**	5.39				
4.40		5.02				
-2.40	**Bottom**	4.42				

Required Treatment Vol. + Attentuation Vol. =	5.50 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	6.04 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	7.40 Ft	Provided Treatment Vol. + Attentuation Stage =	7.50 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. =	5.17 Ac-Ft
Estimated Stormsewer Tailwater Elevation =	7.34 Ft



Additional 20% of Pond R/W = 8.42 ac

URS

MADE BY:	DTL	DATE:	02/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE:	04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND:	A2	BASIN:	Basin A

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	13.62	0.95	12.94
Roadway Pervious Area	8.43	0.20	1.69
Pond Pervious Area	1.13	0.20	0.23
Pond Area at NWL	5.39	1.00	5.39
Total	**28.57**		20.24

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.78 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.18 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	Out. Berm	6.52				
8.50	In. Berm	5.78				
7.40		5.58				
6.92	(PAV)	5.49				
6.40	(NWL)	5.39				42.51
			5.21	2.00	10.41	
4.40		5.02				32.10
			4.72	6.80	32.10	
-2.40	Bottom	4.42				

Permanent Pool Volume Provided = **42.51 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **124.4 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **7.89 ft**

URS

MADE BY:	DTL	DATE: 02/20/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DLP	DATE: 4/30/14	
PROJECT:	SR 46 PD&E	POND: A2	BASIN: Basin A

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 7.34 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 22.05 ac

3) Lowest gutter elevation in Basin for HGL check

Station	39+00
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	8.79

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.45 ft

5) Pipe length from Pond to lowest gutter point = 900 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.66	
int. =	6.50	in/hr
A =	22.05	ac
Q =	94.59	cfs
Manning's n =	0.012	
Sum K =	2.42	
V =	3.98	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.20 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.5 ft
66 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	11/7/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DET	11/14/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A3 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.86	59.34
Open Space - Fair Conditions	Basinger (35%)	B/D	69	6.08	419.52
Open Space - Fair Conditions	Felda (10%)	D	84	1.74	146.16
Open Space - Fair Conditions	Nittaw (50%)	D	84	8.68	729.12
Impervious (Paved parking, roads, etc.)			98	4.69	459.62
Pond footprint	Nittaw	D	84	6.52	547.68
			TOTALS	**28.57**	**2361.44**

COMPOSITE CN	82.65

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.10	3.69	**8.78**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.10	5.46	**13.00**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.10	6.51	**15.50**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin A	MADE BY:	DTL	11/7/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DET	04/14/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin A / Pond A3 - Suburban Typical					
Open Space - Fair Conditions	Pineda (5%)	B/D	69	0.42	28.98
Open Space - Fair Conditions	Basinger (35%)	B/D	69	2.95	203.55
Open Space - Fair Conditions	Felda (10%)	D	84	0.84	70.56
Open Space - Fair Conditions	Nittaw (50%)	D	84	4.22	354.48
Impervious (Paved parking, roads, etc.)			98	13.62	1334.76
Pond NWL			100	5.39	539.00
Pond pervious area	Nittaw	D	84	1.13	94.92
			TOTALS	**28.57**	**2626.25**

COMPOSITE CN	91.92

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	0.88	4.67	**11.11**
SJRWMD Open Basin	10 yr / 24 hr	7.50	0.88	6.54	**15.57**
SJRWMD Open Basin	25 yr / 24 hr	8.60	0.88	7.63	**18.16**

URS

MADE BY:	DTL	DATE: 11/7/13	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE: 5/12/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: A3	BASIN:	Basin A

Water Quality

Total Basin Area =	28.57	ac
Paved Area =	13.62	ac
Pond Area at NWL =	5.39	ac

A.	1.0	" Over Total Basin Area =	2.38	Ac-Ft
B.	2.5	" Over Paved Area =	2.84	Ac-Ft
Required Treatment (PAV) =			**2.84**	Ac-Ft

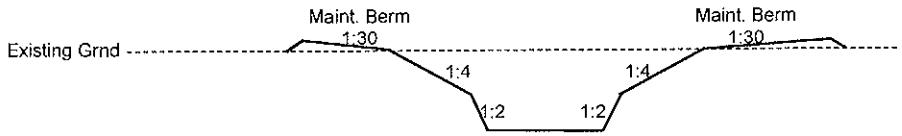
Required Attenuation (Post - Pre) =	**2.34**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**2.57**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**2.66**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =	**5.50**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**5.17**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
4.00	**Pond R/W** (1:2 max slope tie down)	7.02				
9.00	**Out Berm**	6.52				14.80
			6.15	0.50	3.08	
8.50	**Inside Berm**	5.78				11.73
			5.69	1.00	5.69	
7.50	Provided Treatment Vol. + Attentuation Vol.	5.59				6.04
			5.59	0.10	0.54	
7.40	Required Treatment Vol. + Attentuation Vol.	5.58				**5.50**
			5.57	0.06	0.33	
7.34	Estimated Stormsewer Tailwater	5.57				**5.17**
			5.53	0.42	2.32	
6.92	Required Treatment Vol. (PAV)	5.49				**2.84**
			5.44	0.52	2.84	
6.40	**Normal Water Level**	5.39				
4.40		5.02				
-2.40	**Bottom**	4.42				

Required Treatment Vol. + Attentuation Vol. =	5.50	Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	6.04	Ac-Ft
Required Treatment Vol. + Attentuation Stage =	7.40	Ft	Provided Treatment Vol. + Attentuation Stage =	7.50	Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. =	5.17	Ac-Ft
Estimated Stormsewer Tailwater Elevation =	7.34	Ft



Additional 20% of Pond R/W = 8.42 ac

URS

MADE BY:	DTL	DATE:	11/7/13	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE:	04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND:	A3	BASIN:	Basin A

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	13.62	0.95	12.94
Roadway Pervious Area	8.43	0.20	1.69
Pond Pervious Area	1.13	0.20	0.23
Pond Area at NWL	5.39	1.00	5.39
Total	**28.57**		20.24

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.78 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.18 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	Out. Berm	6.52				
8.50	In. Berm	5.78				
7.40		5.58				
6.92	(PAV)	5.49				
6.40	(NWL)	5.39				42.51
			5.21	2.00	10.41	
4.40		5.02				32.10
			4.72	6.80	32.10	
-2.40	Bottom	4.42				

Permanent Pool Volume Provided = **42.51 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **124.4 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **7.89 ft**

URS

MADE BY:	DTL	DATE: 11/7/13	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DLT	DATE: 04/20/14	
PROJECT:	SR 46 PD&E	POND: A3	BASIN: Basin A

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 7.34 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 22.05 ac

3) Lowest gutter elevation in Basin for HGL check

Station	39+00
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	8.79

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.45 ft

5) Pipe length from Pond to lowest gutter point = 1000 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.66	
int. =	6.50	in/hr
A =	22.05	ac
Q =	94.59	cfs
Manning's n =	0.012	
Sum K =	2.43	
V =	3.98	fps

7) Estimation of Pipe Size

$HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g$

HL = Allowable Head Loss (ft) 1.27 trial
<actual HL - OK
n = Manning's n
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.5 ft
66 in

Basin A

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Undeveloped / Rangeland / Forest: TN=1.150 TP=0.55				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

Total pre-development catchment area:	28.57	AC
Total post-development catchment or BMP analysis area:	28.57	AC
Pre-development Non DCIA CN:	82.65	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	86.39	
Post-development DCIA percentage:	47.70	%
Estimated Area of BMP (used for rainfall excess not loadings)	6.52	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**	23.125	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.106	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	89.516	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	12.008	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin A

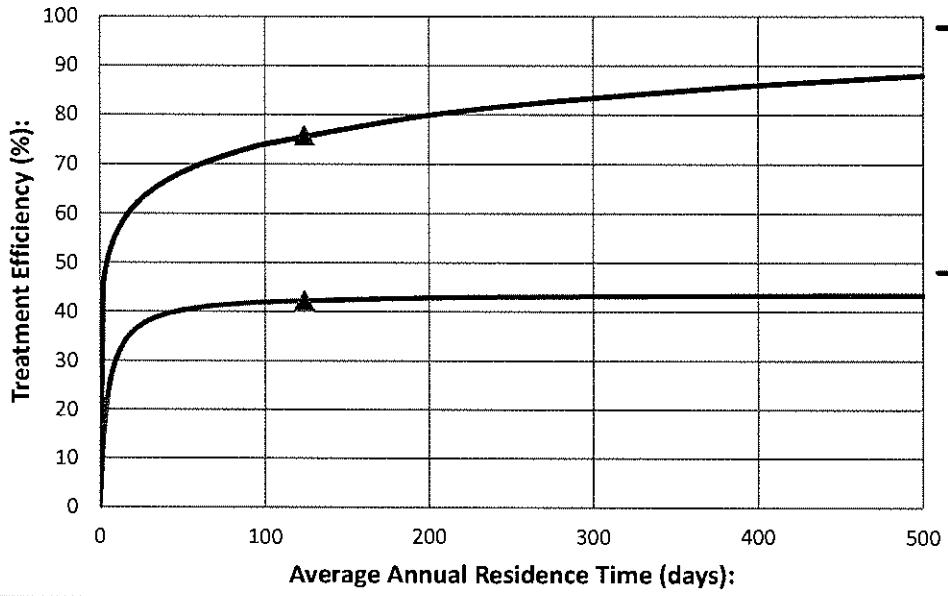
WET DETENTION:

WET DETENTION POND SERVING:

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	28.570	0.000	0.000	0.000	ac
Total post-development catchment area:	22.050	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	124.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	74.167				%
Total **Phosphorus** removal required:	90.790				%
Total **Nitrogen** removal efficiency provided:	42.257				%
Total **Phosphorous** removal efficiency provided:	75.794				%
Is the wet detention sufficient:	NO				

Wet Detention Pond Characteristics:

Permanent Pool Depth:	12.53	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	15.036	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

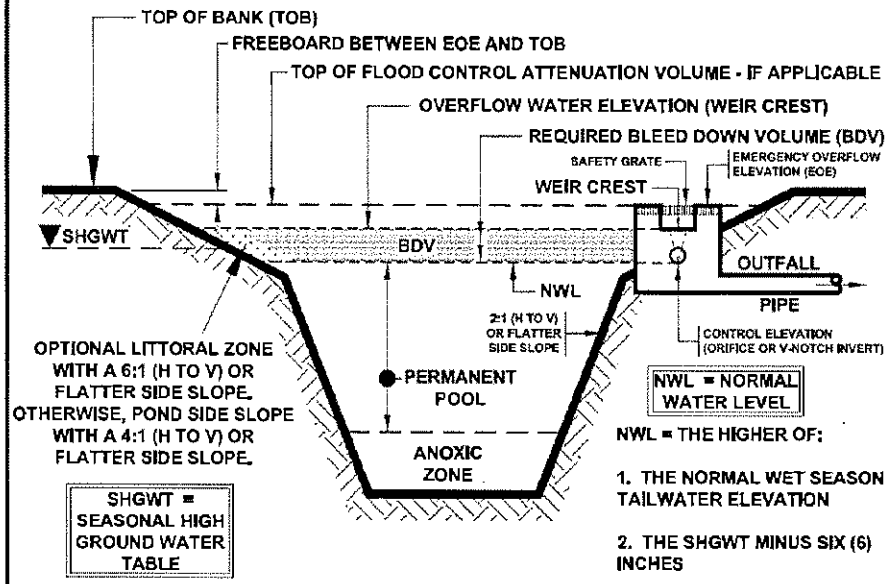
Basin A

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	55.262				%
Remaining treatment efficiency needed (**Phosphorus**):	61.951				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:				DATE
BASIN DESIGNATION:	Basin 1	MADE BY:	DTL	11/11/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DET	12/09/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

Note: Area(s) shown below accounts for additional runoff that was not included in permitted calculations for Basin 1.

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin 1 - Suburban Typical					
Additional pond footprint					
Open Space - Fair Conditions	Nittaw	D	84	1.02	85.68
New bridge section					
Open Space - Fair Conditions	Pineda	B/D	69	0.14	9.66
Open Space - Fair Conditions	Arents	D	84	0.17	14.28
Water Surface			100	0.39	39.00
			TOTALS	**1.72**	**148.62**

COMPOSITE CN	86.41

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.57	4.07	**0.58**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.57	5.89	**0.84**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.57	6.96	**1.00**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:				DATE
BASIN DESIGNATION:	Basin 1 - Suburban Typical	MADE BY:	DTL	11/11/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	12/19/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin 1 - Suburban Typical					
Open Space - Fair Conditions	Nittaw (90%)	D	84	3.88	325.92
Open Space - Fair Conditions	Arents (10%)	D	84	0.43	36.12
Impervious (Paved parking, roads, etc.)		N/A	98	7.47	732.06
Pond NWL area		N/A	100	1.96	196.00
Pond pervious area	Nittaw	D	84	1.08	90.72
			TOTALS	**14.82**	**1380.82**

COMPOSITE CN	93.17

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	0.73	4.81	**5.94**
SJRWMD Open Basin	10 yr / 24 hr	7.50	0.73	6.69	**8.26**
SJRWMD Open Basin	25 yr / 24 hr	8.60	0.73	7.78	**9.61**

URS

MADE BY:	DTL	DATE: 11/11/13	JOB NO.	
CHECKED BY:		DATE:	SHEET NO.	
CALCULATIONS FOR:	Basin 1	POND: MOD Pond 1	BASIN:	Basin 1 - Suburban Typical

Water Quality

Total Basin Area =	14.82	ac
Paved Area =	7.47	ac
Pond Area at NWL =	1.96	ac

A.	1.0	" Over Total Basin Area =	1.24	Ac-Ft	
B.	2.5	" Over Paved Area =	1.56	Ac-Ft	
Required Treatment (PAV) =			**1.56**	Ac-Ft	SJRWMD Open Basin

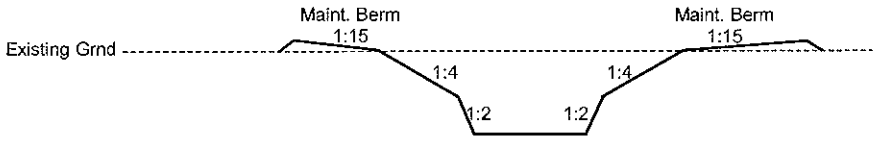
Stage Storage Calculations

ELEV. (ft) (NGVD)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
11.00	**Out Berm**	2.68				8.31
			2.46	1.00	2.46	
10.00	**Inside Berm**	2.24				5.85
			2.19	1.00	2.19	
9.00		2.13				3.67
			2.09	0.82	1.71	
8.18	**PAV**	2.04				1.96
			2.01	0.68	1.37	
7.60		1.98				0.59
			1.97	0.20	0.39	
7.50		1.97				0.20
			1.97	0.10	0.20	
7.40	**NWL**	1.96				
5.40		1.75				
-1.00	**Bottom**	1.44				

Bleed Down Volume

1/2 the req'd PAV	=	0.5 * 1.56	=	0.78	Ac-Ft

Volume remaining in pond after recovery of 1/2 PAV = 1.18 Ac-Ft



URS

MADE BY:	DTL	DATE:	11/11/13	JOB NO.	
CHECKED BY:	DCF	DATE:	12/19/13	SHEET NO.	
CALCULATIONS FOR:	SR 46 PD&E			BASIN:	Basin 1 - Suburban Typical

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	7.47	0.95	7.10
Roadway Pervious Area	4.31	0.20	0.86
Pond Pervious Area	1.08	0.20	0.22
Pond Area at NWL	1.96	1.00	1.96
Total	**14.82**		10.13

Composite C = **0.68**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **2.40 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provid = 1.5 x Min Perm Pool Vol. = **3.59 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
11.00	Out. Berm	2.68				
10.00	In. Berm	2.24				
9.00		2.13				
8.18	(PAV)	2.04				
7.40	(NWL)	1.96				13.92
			1.86	2.00	3.71	
5.40		1.75				10.21
			1.60	6.40	10.21	
-1.00	Bottom	1.44				

Permanent Pool Volume Provided = **13.92 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **81.3 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone. (See 40C-42.026)

Mean Depth = Permanent Pool Volume / Area at NWL = **7.10 ft**

SR 46 PD&E
MODIFIED BASIN 1 PRE-DEVELOPMENT CONDITIONS
FOR ADDITIONAL AREAS NOT PERMITTED
BASIN SUMMARY REPORT

* Permitted condition values obtained from Bridge Replacement Project SJRWMD Permit No. 40-117-95925-5

```
            Basin Name: Basin 1
            Group Name: BASE
            Simulation: 10YR24HR
             Node Name: BNDRY
            Basin Type: SCS Unit Hydrograph

      Unit Hydrograph: Uh323
        Peaking Fator: 323.0
  Spec Time Inc (min): 8.24
  Comp Time Inc (min): 5.00
        Rainfall File: Flmod
 Rainfall Amount (in): 7.500
 Storm Duration (hrs): 24.00
               Status: Onsite
   Time of Conc (min): 61.80
     Time Shift (hrs): 0.00
            Area (ac): 8.570
Vol of Unit Hyd (in): 1.001
         Curve Number: 85.000
             DCIA (%): 0.000

       Time Max (hrs): 12.58
      Flow Max (cfs): 15.829
  Runoff Volume (in): 5.728
Runoff Volume (ft3): 178199.032
```

⇒ 15.83 + 40.07 (permitted conditions) = 55.90 cfs total pre-discharge

---

```
            Basin Name: Basin 1
            Group Name: BASE
            Simulation: 25YR24HR
             Node Name: BNDRY
            Basin Type: SCS Unit Hydrograph

      Unit Hydrograph: Uh323
        Peaking Fator: 323.0
  Spec Time Inc (min): 8.24
  Comp Time Inc (min): 5.00
        Rainfall File: Flmod
 Rainfall Amount (in): 8.600
 Storm Duration (hrs): 24.00
               Status: Onsite
   Time of Conc (min): 61.80
     Time Shift (hrs): 0.00
            Area (ac): 8.570
Vol of Unit Hyd (in): 1.001
         Curve Number: 85.000
             DCIA (%): 0.000

       Time Max (hrs): 12.58
      Flow Max (cfs): 18.672
  Runoff Volume (in): 6.789
Runoff Volume (ft3): 211203.878
```

⇒ 18.67 + 46.11 (permitted conditions) = 64.78 cfs total pre discharge

---

```
            Basin Name: Basin 1
            Group Name: BASE
            Simulation: 3YR24HR
             Node Name: BNDRY
            Basin Type: SCS Unit Hydrograph

      Unit Hydrograph: Uh323
        Peaking Fator: 323.0
  Spec Time Inc (min): 8.24
  Comp Time Inc (min): 5.00
        Rainfall File: Flmod
 Rainfall Amount (in): 5.600
 Storm Duration (hrs): 24.00
               Status: Onsite
   Time of Conc (min): 61.80
     Time Shift (hrs): 0.00
            Area (ac): 8.570
Vol of Unit Hyd (in): 1.001
         Curve Number: 85.000
             DCIA (%): 0.000

       Time Max (hrs): 12.58
      Flow Max (cfs): 10.917
  Runoff Volume (in): 3.924
Runoff Volume (ft3): 122072.790
```

⇒ 10.92 cfs + 26.72 (permitted condition) = 37.64 cfs total discharge

---

PRE/POST DISCHARGE SUMMARY

WILBUR SMITH
PROJECT TITLE: SR 46
PROJECT NUMBER: 24016315201

DATE: October 6, 2009
CALC. BY:
CHECKED BY: PQS

BASIN 1 - SR 46

Simulation	Name	Existing Conditions Max. Inflow (cfs)	Proposed Conditions Max Inflow (cfs)	Δ Discharge = (Pre - Post)**
25 YR - 24 HR	OUTFALL	46.11	48.09	-1.98
10 YR - 24 HR	OUTFALL	40.07	41.10	-1.03
3 YR - 24 HR	OUTFALL	26.72	23.50	3.22

SJRWMD Permit No 40-117-95925-5

BASIN 2 - SR 46

Simulation	Name	Existing Conditions Max. Inflow (cfs)	Proposed Conditions Max Inflow (cfs)	Δ Discharge = (Pre - Post)*
25 YR - 24 HR	OUTFALL	91.17	91.38	-0.21
10 YR - 24 HR	OUTFALL	82.19	78.64	3.55
3 YR - 24 HR	OUTFALL	59.00	46.94	12.06

* ***Increase of 0.21 cfs for the 25yr/24hr storm will not result in adverse impacts as it is less than 0.5% of the total discharge.***

** Increase of 1.98 cfs for the 25yr/24hr storm will not result in adverse impacts as it is less than 0.2% of the lowest annual mean discharge rate for the St. Johns River (years 2005 thru 2008) at the nearest gage location (see attached map and documentation).

==========
==== Basins ====
==========

Name: Basin 1 | Node: Pond 1 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	17.00
Area(ac):	14.82	Time Shift(hrs):	0.00
Curve Number:	93.17	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

==========
==== Nodes ====
==========

Name: BNDRY | Base Flow(cfs): 0.000 | Init Stage(ft): 5.000
Group: BASE | Warn Stage(ft): 10.000
Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01
SJRWMD Permit No. 40-117-95925-5

Time(hrs)	Stage(ft)
0.00	5.000
24.00	5.500
48.00	6.000
72.00	6.400

Name: POND 1 | Base Flow(cfs): 0.000 | Init Stage(ft): 7.400
Group: BASE | Warn Stage(ft): 10.000
Type: Stage/Area

Initial Stage = NWL Elevation
Warning Stage = Inside Berm Elevation

Stage(ft)	Area(ac)
7.400	1.9600
10.000	2.2400
11.000	2.6800

==========
==== Weirs ====
==========

Name: OCS-1 ORIFICE | From Node: POND 1
Group: BASE | To Node: BNDRY
Flow: Both | Count: 1
Type: Vertical: Mavis | Geometry: Circular

Span(in):	4.00
Rise(in):	4.00
Invert(ft):	6.900
Control Elevation(ft):	7.400
	TABLE
Bottom Clip(in):	0.000
Top Clip(in):	0.000
Weir Discharge Coef:	3.200
Orifice Discharge Coef:	0.600

Name: OCS-1 Weir | From Node: POND 1
Group: BASE | To Node: BNDRY
Flow: Both | Count: 1
Type: Vertical: Mavis | Geometry: Trapezoidal

Bottom Width(ft):	18.60
Left Side Slope(h/v):	10.00
Right Side Slope(h/v):	10.00
Invert(ft):	8.180
Control Elevation(ft):	8.180
Struct Opening Dim(ft):	9999.00
	TABLE

```
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
          Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600



================================================================================
==== Hydrology Simulations =====================================================
================================================================================

         Name: 10YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\10YR24HR.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 7.50

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

--------------------------------------------------------------------------------
         Name: 25YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\25YR24HR.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 8.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

--------------------------------------------------------------------------------
         Name: 3YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\3YR24HR.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 5.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

================================================================================
==== Routing Simulations =======================================================
================================================================================

         Name: 10YR24HR            Hydrology Sim: 10YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\10YR24HR.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
          Start Time(hrs): 0.000                  End Time(hrs): 30.00
      Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
         Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.000

Group           Run
--------------- -----
BASE            Yes


--------------------------------------------------------------------------------
         Name: 25YR24HR            Hydrology Sim: 25YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\25YR24HR.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
```

```
        Start Time(hrs): 0.000                    End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000                Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.000

Group           Run
--------------- -----
BASE            Yes

--------------------------------------------------------------------------------------------------------------
         Name: 3YR24HR              Hydrology Sim: 3YR24HR
     Filename: I:\PROJECTS\12722145 SR46 PDE\DRAINAGE\BASIN 1\ICPR\3YR24HR.I32

      Execute: Yes          Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000                Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.000

Group           Run
--------------- -----
BASE            Yes
```

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1
NODE MIN / MAX REPORT

Pre Discharge Permitted Condition + addition non-permitted area (cfs)

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs	
BNDRY	BASE	10YR24HR	30.00	5.63	10.00	0.0003	0.00	12.31	45.54	0.00	0.00	
POND 1	BASE	10YR24HR	12.31	8.88	10.00	0.0050	92331.98	12.08	59.05	12.31	45.54	< 55.90
BNDRY	BASE	25YR24HR	30.00	5.63	10.00	0.0003	0.00	12.31	52.73	0.00	0.00	
POND 1	BASE	25YR24HR	12.31	8.94	10.00	0.0050	92601.66	12.08	68.19	12.31	52.73	< 64.78
BNDRY	BASE	3YR24HR	30.01	5.63	10.00	0.0003	0.00	12.34	31.70	0.00	0.00	
POND 1	BASE	3YR24HR	12.34	8.75	10.00	0.0049	91703.73	12.08	43.15	12.34	31.70	< 37.64

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1 RECOVERY ANALYSIS
INPUT ALL DATA REPORT

```
================================================================================
==== Basins ====================================================================
================================================================================

        Name: Basin 1                 Node: Pond 1                Status: Onsite
       Group: BASE                    Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh323                  Peaking Factor: 323.0
         Rainfall File:                  Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 14.82                 Time Shift(hrs): 0.00
         Curve Number: 93.17             Max Allowable Q(cfs): 999999.00
              DCIA(%): 0.00


================================================================================
==== Nodes =====================================================================
================================================================================

      Name: BNDRY              Base Flow(cfs): 0.000          Init Stage(ft): 5.000
     Group: BASE                                             Warn Stage(ft): 10.000
      Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01
SJRWMD Permit No. 40-117-95925-5

      Time(hrs)       Stage(ft)
--------------- ---------------
          0.00           5.000
         24.00           5.500
         48.00           6.000
         72.00           6.400

--------------------------------------------------------------------------------
      Name: POND 1             Base Flow(cfs): 0.000          Init Stage(ft): 8.180
     Group: BASE                                             Warn Stage(ft): 10.000
      Type: Stage/Area

Initial Stage = Weir Elevation
Warning Stage = Inside Berm Elevation

      Stage(ft)        Area(ac)
--------------- ---------------
          7.400          1.9600
         10.000          2.2400
         11.000          2.6800

================================================================================
==== Weirs =====================================================================
================================================================================

        Name: OCS-1 ORIFICE       From Node: POND 1
       Group: BASE                  To Node: BNDRY
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 4.00
                  Rise(in): 4.00
                Invert(ft): 6.900
      Control Elevation(ft): 7.400
                                        TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


================================================================================
==== Routing Simulations =======================================================
================================================================================

        Name: RECOVERY            Hydrology Sim:
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 1\ICPR\RECOVERY.I32

     Execute: Yes         Restart: No           Patch: No
 Alternative: No

      Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
   Time Step Optimizer: 10.000
```

Start Time(hrs): 0.000 End Time(hrs): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	5.000

Group	Run
BASE	Yes

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1 RECOVERY ANALYSIS
NODE TIME SERIES REPORT

imulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
RECOVERY	POND 1	BASE	27.35	7.82	10.00	87351.37	0.00	0.27	0.00	0.73
RECOVERY	POND 1	BASE	27.43	7.82	10.00	87346.98	0.00	0.27	0.00	0.73
RECOVERY	POND 1	BASE	27.52	7.82	10.00	87342.60	0.00	0.27	0.00	0.73
RECOVERY	POND 1	BASE	27.60	7.82	10.00	87338.22	0.00	0.27	0.00	0.73
RECOVERY	POND 1	BASE	27.68	7.82	10.00	87333.85	0.00	0.27	0.00	0.73
RECOVERY	POND 1	BASE	27.77	7.82	10.00	87329.48	0.00	0.27	0.00	0.74
RECOVERY	POND 1	BASE	27.85	7.82	10.00	87325.12	0.00	0.27	0.00	0.74
RECOVERY	POND 1	BASE	27.93	7.81	10.00	87320.76	0.00	0.27	0.00	0.74
RECOVERY	POND 1	BASE	28.02	7.81	10.00	87316.41	0.00	0.27	0.00	0.74
RECOVERY	POND 1	BASE	28.10	7.81	10.00	87312.06	0.00	0.27	0.00	0.74
RECOVERY	POND 1	BASE	28.18	7.81	10.00	87307.71	0.00	0.27	0.00	0.75
RECOVERY	POND 1	BASE	28.27	7.81	10.00	87303.37	0.00	0.27	0.00	0.75
RECOVERY	POND 1	BASE	28.35	7.81	10.00	87299.04	0.00	0.27	0.00	0.75
RECOVERY	POND 1	BASE	28.43	7.81	10.00	87294.71	0.00	0.27	0.00	0.75
RECOVERY	POND 1	BASE	28.52	7.81	10.00	87290.38	0.00	0.27	0.00	0.75
RECOVERY	POND 1	BASE	28.60	7.81	10.00	87286.06	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	28.68	7.81	10.00	87281.75	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	28.77	7.80	10.00	87277.43	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	28.85	7.80	10.00	87273.13	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	28.93	7.80	10.00	87268.82	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	29.02	7.80	10.00	87264.53	0.00	0.27	0.00	0.76
RECOVERY	POND 1	BASE	29.10	7.80	10.00	87260.23	0.00	0.27	0.00	0.77
RECOVERY	POND 1	BASE	29.18	7.80	10.00	87255.95	0.00	0.27	0.00	0.77
RECOVERY	POND 1	BASE	29.27	7.80	10.00	87251.66	0.00	0.27	0.00	0.77
RECOVERY	POND 1	BASE	29.35	7.80	10.00	87247.38	0.00	0.27	0.00	0.77
RECOVERY	POND 1	BASE	29.43	7.80	10.00	87243.11	0.00	0.26	0.00	0.77
RECOVERY	POND 1	BASE	29.52	7.80	10.00	87238.84	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	29.60	7.80	10.00	87234.57	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	29.68	7.79	10.00	87230.31	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	29.77	7.79	10.00	87226.06	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	29.85	7.79	10.00	87221.81	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	29.93	7.79	10.00	87217.56	0.00	0.26	0.00	0.78
RECOVERY	POND 1	BASE	30.01	7.79	10.00	87214.17	0.00	0.26	0.00	0.79

Recovers ½ PAU within 29.52 hours

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1
INPUT ALL DATA REPORT
TAILWATER CALCULATIONS

==========
==== Basins ==========
==========

Name: Basin 1 Node: Pond 1 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000 Time of Conc(min): 17.00
Area(ac): 14.82 Time Shift(hrs): 0.00
Curve Number: 93.17 Max Allowable Q(cfs): 999999.00
DCIA(%): 0.00

==========
==== Nodes ==========
==========

Name: BNDRY Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 10.000
Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01
SJRWMD Permit No. 40-117-95925-5

Time(hrs)	Stage(ft)
0.00	5.000
24.00	5.500
48.00	6.000
72.00	6.400

Name: POND 1 Base Flow(cfs): 0.000 Init Stage(ft): 8.180 * Weir Elev.
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Initial Stage = Weir Elevation
Warning Stage = Inside Berm Elevation

Stage(ft)	Area(ac)
7.400	1.9600
10.000	2.2400
11.000	2.6800

==========
==== Weirs ==========
==========

Name: OCS-1 ORIFICE From Node: POND 1
Group: BASE Assumed To Node: BNDRY
Flow: None * closed Count: 1
Type: Vertical: Mavis Geometry: Circular

Span(in): 4.00
Rise(in): 4.00
Invert(ft): 6.900
Control Elevation(ft): 7.400
TABLE
Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

Name: OCS-1 Weir From Node: POND 1
Group: BASE To Node: BNDRY
Flow: Both Count: 1
Type: Vertical: Mavis Geometry: Trapezoidal

Bottom Width(ft): 18.60
Left Side Slope(h/v): 10.00
Right Side Slope(h/v): 10.00
Invert(ft): 8.180
Control Elevation(ft): 8.180

```
      Struct Opening Dim(ft): 9999.00
                                                TABLE
            Bottom Clip(ft): 0.000
               Top Clip(ft): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600



================================================================================
==== Hydrology Simulations =====================================================
================================================================================

         Name: 10YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 1\ICPR\10YR24HR.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 7.50

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

--------------------------------------------------------------------------------

         Name: 3YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 1\ICPR\3YR24HR.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Flmod
    Rainfall Amount(in): 5.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

================================================================================
==== Routing Simulations =======================================================
================================================================================

         Name: 10YR24HR            Hydrology Sim: 10YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 1\ICPR\10YR24HR.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
   Time Step Optimizer: 10.000
      Start Time(hrs): 0.000                     End Time(hrs): 30.00
    Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.000

Group           Run
--------------- -----
BASE            Yes


--------------------------------------------------------------------------------

         Name: 3YR24HR             Hydrology Sim: 3YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 1\ICPR\3YR24HR.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
   Time Step Optimizer: 10.000
      Start Time(hrs): 0.000                     End Time(hrs): 30.00
    Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.000
```

Group	Run
BASE	Yes

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1
NODE TIME SERIES REPORT
3 YEAR / 24 HOUR TAILWATER CALCULATION

ulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
3YR24HR	POND 1	BASE	11.02	8.32	10.00	89684.72	4.35	3.24	0.90	0.62
3YR24HR	POND 1	BASE	11.10	8.32	10.00	89702.01	4.45	3.37	0.93	0.64
3YR24HR	POND 1	BASE	11.18	8.33	10.00	89719.02	4.58	3.51	0.96	0.67
3YR24HR	POND 1	BASE	11.27	8.33	10.00	89735.90	4.72	3.64	1.00	0.69
3YR24HR	POND 1	BASE	11.35	8.33	10.00	89754.72	5.19	3.80	1.03	0.72
3YR24HR	POND 1	BASE	11.43	8.34	10.00	89782.58	6.21	4.03	1.07	0.74
3YR24HR	POND 1	BASE	11.52	8.35	10.00	89822.99	7.35	4.38	1.12	0.77
3YR24HR	POND 1	BASE	11.60	8.36	10.00	89883.73	9.97	4.92	1.18	0.80
3YR24HR	POND 1	BASE	11.68	8.38	10.00	89985.00	14.89	5.88	1.25	0.84
3YR24HR	POND 1	BASE	11.76	8.42	10.00	90146.56	20.03	7.54	1.37	0.88
3YR24HR	POND 1	BASE	11.84	8.46	10.00	90356.15	25.33	9.94	1.52	0.94
3YR24HR	POND 1	BASE	11.92	8.52	10.00	90626.37	32.75	13.44	1.72	1.02
3YR24HR	POND 1	BASE	12.00	8.59	10.00	90943.35	39.73	18.10	1.96	1.13
3YR24HR	POND 1	BASE	12.09	8.66	10.00	91285.04	43.14	23.79	2.26	1.28
3YR24HR	POND 1	BASE	12.17	8.71	10.00	91528.19	40.46	28.26	2.55	1.46
3YR24HR	POND 1	BASE	12.26	8.74	10.00	91662.42	35.97	30.88	2.82	1.67
3YR24HR	POND 1	BASE	12.34	8.75	10.00	91703.14	32.27	31.69	3.04	1.87
3YR24HR	POND 1	BASE	12.43	8.74	10.00	91676.20	27.49	31.15	3.27	2.11
3YR24HR	POND 1	BASE	12.50	8.73	10.00	91607.64	23.81	29.79	3.42	2.29
3YR24HR	POND 1	BASE	12.59	8.71	10.00	91500.72	20.39	27.73	3.58	2.50
3YR24HR	POND 1	BASE	12.67	8.68	10.00	91376.89	17.27	25.43	3.71	2.68
3YR24HR	POND 1	BASE	12.76	8.65	10.00	91243.82	14.62	23.06	3.82	2.85
3YR24HR	POND 1	BASE	12.84	8.62	10.00	91109.93	12.47	20.78	3.92	3.01
3YR24HR	POND 1	BASE	12.93	8.59	10.00	90979.47	10.66	18.67	4.00	3.15
3YR24HR	POND 1	BASE	13.00	8.57	10.00	90870.25	9.37	16.97	4.06	3.26
3YR24HR	POND 1	BASE	13.09	8.55	10.00	90752.91	8.14	15.23	4.13	3.37
3YR24HR	POND 1	BASE	13.17	8.52	10.00	90643.29	7.06	13.67	4.18	3.47
3YR24HR	POND 1	BASE	13.26	8.50	10.00	90541.49	6.21	12.29	4.23	3.57
3YR24HR	POND 1	BASE	13.34	8.48	10.00	90454.37	5.67	11.16	4.26	3.64
3YR24HR	POND 1	BASE	13.42	8.47	10.00	90376.49	5.33	10.19	4.30	3.71
3YR24HR	POND 1	BASE	13.51	8.45	10.00	90297.03	5.04	9.24	4.34	3.79
3YR24HR	POND 1	BASE	13.59	8.44	10.00	90237.43	4.82	8.55	4.37	3.85
3YR24HR	POND 1	BASE	13.67	8.42	10.00	90181.54	4.53	7.92	4.41	3.90
3YR24HR	POND 1	BASE	13.76	8.41	10.00	90130.36	4.26	7.37	4.44	3.96
3YR24HR	POND 1	BASE	13.84	8.40	10.00	90083.77	4.07	6.87	4.46	4.01

$T_{w_{3yr}} = 8.66$ ft NGVD @ peak inflow

⇒ minor increase from permitted condition (8.58 ft NGVD)

3-YR (WITH MINOR LOSSES)

9/18/2009

STORM SEWER HYDRAULICS

System: **Basin-1**

PROJECT			
Number:	Lake Jessup	Organization:	Wilbur Smith Associates, Inc.
Description:	Lake Jessup SR-46	Designed by:	PQS
County:	Seminole	Checked by:	

		CONDITIONS				
Outfall Tailwater Elevation:	8.58 *	Storm Event		Runoff Coefficients		
Exit Loss at Outfall:	0.18	Zone	Freq	Area 1	Area 2	Area 3
Storm Sewer Control Elevatio	8.76	7	3	0.95	0.25	0.00

FROM Station / Type	Brls	TO Offset / Len	Drainage Areas Inc.	Sub-Total	Sub-Total CA	Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Qb)	Sum(Qb) CIA TOTAL	Inlet Elevations Inlet Clear.	HGL Jnc Loss	Pipe Elevations HGL Crown Line	Flow Line	Fall (ft)	Pipe Height Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity (cfs)	Mann'g 'N'
S-2		**S-1**	0.44	3.51	3.33					0.00	0.00	8.50	8.93	8.82	8.76	0.061	36	0.1095	Full	3.38		
18+40		-63.25	0.85	4.63	1.16	16.46	0.00	5.32	4.49		23.91			4.00	3.70						53.22	0.0120
DBI-B	1	55.30	0.00	0.00	0.00						**23.91**	-0.43	0.11	1.00	0.70	0.300	36	0.5425		7.53		
S-3		**S-2**	0.64	2.91	2.76					0.00	0.00	8.50	9.08	8.99	8.93	0.066	36	0.0666	Full	2.64		
18+40		35.00	0.65	2.72	0.68	15.84	0.63	5.41	3.44		18.64			6.00	4.00						102.70	0.0120
DBI-B	1	99.00	0.00	0.00	0.00						**18.64**	-0.58	0.09	3.00	1.00	2.000	36	2.0202		14.53		
S-4		**S-2**	0.16	0.16	0.15					0.00	0.00	12.80	12.83	11.68	8.93	2.750	18	4.5836	Partial sub	12.19		
19+00		-43.60	1.06	1.06	0.26	10.00	0.08	6.50	0.42		2.71			12.90	6.50						37.17	0.0120
MES4:1	1	60.00	0.00	0.00	0.00						**2.71**	-0.03	1.15	11.40	5.00	6.400	18	10.6667		21.03		
S-5		**S-3**	0.33	2.27	2.16					0.00	0.00	8.63	9.38	9.31	9.08	0.234	30	0.1129	Full	3.04		
20+50.00		33.35	0.29	2.07	0.52	14.70	1.13	5.58	2.67		14.93			6.50	6.20						16.92	0.0120
DBI-B	1	207.00	0.00	0.00	0.00						**14.93**	-0.75	0.07	4.00	3.70	0.300	30	0.1449		3.45		
S-6		**S-5**	0.25	1.94	1.84					0.00	0.00	8.78	9.72	9.66	9.38	0.274	30	0.0921	Full	2.75		
23+50.00		32.10	0.19	1.78	0.44	12.89	1.81	5.89	2.29		13.48			6.80	6.50						14.10	0.0120
DBI-B	1	298.00	0.00	0.00	0.00						**13.48**	-0.94	0.06	4.30	4.00	0.300	30	0.1007		2.87		
S-7		**S-6**	0.19	1.69	1.61					0.00	0.00	11.70	10.34	10.22	9.72	0.506	24	0.2456	Full	3.87		
25+54.55		22.10	0.02	1.59	0.40	12.01	0.89	6.06	2.00		12.14			10.20	6.80						31.49	0.0120
GUT-S	1	206.00	0.00	0.00	0.00						**12.14**	1.36	0.12	8.20	4.80	3.400	24	1.6505		10.02		
S-8		**S-9**	0.20	0.20	0.19					0.00	0.00	11.00	10.87	10.83	10.72	0.119	18	0.1006	Full	2.04		
27+00		-90.25	1.46	1.46	0.37	10.00	0.96	6.50	0.56		3.61			10.20	9.90						5.74	0.0120
DBI-B	1	118.00	0.00	0.00	0.00						**3.61**	0.13	0.03	8.70	8.40	0.300	18	0.2542		3.25		
S-9		**S-7**	0.35	1.50	1.42					0.00	0.00	13.56	10.72	10.61	10.34	0.268	19	0.1848	Full	3.42		
27+00		22.10	0.05	1.57	0.39	11.30	0.71	6.21	1.82		11.28			9.98	9.78						9.75	0.0120
GUT-S	1	145.00	0.00	0.00	0.00						**11.28**	2.84	0.11	8.40	8.20	0.200	30	0.1379		2.95		
S-10		**S-9**	0.21	0.95	0.90					0.00	0.00	20.83	19.11	18.49	11.29	7.200	18	2.3684	Partial sub	8.91		
30+00		22.10	0.04	0.06	0.01	10.73	0.57	6.33	0.92		5.81			19.40	12.20						17.51	0.0120
GUT-S	1	304.00	0.00	0.00	0.00						**5.81**	1.72	0.62	17.90	10.70	7.200	18	2.3684		9.91		
S-11		**S-10**	0.07	0.74	0.70					0.00	0.00	28.31	26.51	25.90	19.40	6.501	18	2.3813	Partial sub	8.84		
32+69.26		22.10	0.02	0.02	0.00	10.22	0.51	6.45	0.71		4.57			26.90	19.40						18.86	0.0120
GUT-S	1	273.00	0.00	0.00	0.00						**4.57**	1.80	0.61	25.40	17.90	7.500	18	2.7473		10.67		
S-12		**S-11**	0.67	0.67	0.64					0.00	0.00	30.85	28.91	28.40	26.90	1.495	18	1.4239	Partial sub	8.14		
33+70.00		22.10	0.00	0.00	0.00	10.00	0.22	6.50	0.64		4.14			29.40	26.90						17.56	0.0120
GUT-S	1	105.00	0.00	0.00	0.00						**4.14**	1.94	0.51	27.90	25.40	2.500	18	2.3810		9.94		

Units: ENGLISH

SR 46 PD&E
MODIFIED BASIN 1 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 1
NODE TIME SERIES REPORT
10 YEAR / 24 HOUR TAILWATER CALCULATION

imulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
10YR24HR	POND 1	BASE	11.02	8.36	10.00	89872.29	6.17	4.81	1.39	1.03
10YR24HR	POND 1	BASE	11.10	8.36	10.00	89893.17	6.31	5.01	1.44	1.06
10YR24HR	POND 1	BASE	11.18	8.37	10.00	89913.53	6.48	5.19	1.48	1.10
10YR24HR	POND 1	BASE	11.27	8.37	10.00	89933.61	6.67	5.38	1.53	1.13
10YR24HR	POND 1	BASE	11.35	8.38	10.00	89956.28	7.31	5.60	1.57	1.17
10YR24HR	POND 1	BASE	11.43	8.38	10.00	89991.35	8.72	5.94	1.63	1.21
10YR24HR	POND 1	BASE	11.52	8.39	10.00	90043.37	10.31	6.46	1.69	1.25
10YR24HR	POND 1	BASE	11.60	8.41	10.00	90122.65	13.94	7.28	1.78	1.30
10YR24HR	POND 1	BASE	11.67	8.44	10.00	90253.48	20.60	8.73	1.89	1.35
10YR24HR	POND 1	BASE	11.75	8.48	10.00	90458.79	27.50	11.22	2.04	1.42
10YR24HR	POND 1	BASE	11.84	8.55	10.00	90750.69	35.27	15.19	2.26	1.51
10YR24HR	POND 1	BASE	11.92	8.62	10.00	91087.35	45.06	20.41	2.53	1.63
10YR24HR	POND 1	BASE	12.00	8.70	10.00	91491.25	54.59	27.56	2.87	1.79
10YR24HR	POND 1	BASE	12.08	8.79	10.00	91888.30	59.05	35.52	3.26	2.01
10YR24HR	POND 1	BASE	12.17	8.85	10.00	92175.81	55.43	41.88	3.65	2.27
10YR24HR	POND 1	BASE	12.25	8.88	10.00	92308.25	49.42	44.98	4.01	2.57
10YR24HR	POND 1	BASE	12.34	8.88	10.00	92328.94	44.03	45.47	4.34	2.89
10YR24HR	POND 1	BASE	12.42	8.87	10.00	92269.30	37.93	44.05	4.62	3.20
10YR24HR	POND 1	BASE	12.51	8.84	10.00	92135.77	31.81	40.96	4.89	3.52
10YR24HR	POND 1	BASE	12.59	8.81	10.00	92000.95	27.74	37.95	5.07	3.76
10YR24HR	POND 1	BASE	12.67	8.78	10.00	91833.45	23.49	34.37	5.25	4.02
10YR24HR	POND 1	BASE	12.76	8.74	10.00	91659.37	19.87	30.81	5.41	4.25
10YR24HR	POND 1	BASE	12.84	8.70	10.00	91488.22	16.94	27.50	5.54	4.45
10YR24HR	POND 1	BASE	12.93	8.67	10.00	91324.27	14.46	24.48	5.65	4.64
10YR24HR	POND 1	BASE	13.00	8.64	10.00	91188.73	12.70	22.11	5.73	4.78
10YR24HR	POND 1	BASE	13.09	8.61	10.00	91044.66	11.03	19.71	5.81	4.93
10YR24HR	POND 1	BASE	13.17	8.58	10.00	90911.24	9.56	17.60	5.89	5.06
10YR24HR	POND 1	BASE	13.26	8.55	10.00	90788.25	8.41	15.74	5.95	5.18
10YR24HR	POND 1	BASE	13.34	8.53	10.00	90677.34	7.64	14.15	6.01	5.28
10YR24HR	POND 1	BASE	13.42	8.51	10.00	90591.55	7.21	12.96	6.05	5.37
10YR24HR	POND 1	BASE	13.50	8.49	10.00	90505.77	6.85	11.82	6.10	5.45

$T_{w_{10yr}} = 8.88$ ft NGVD
@ peak inflow

⇒ minor increase from permitted conditions 8.70 ft NGVD

10-YR (WITH MINOR LOSSES)

9/18/2009

STORM SEWER HYDRAULICS

System: **Basin-1**

PROJECT		
Number:	Lake Jessup	Organization: Wilbur Smith Associates, Inc.
Description:	Lake Jessup SR-46	Designed by: PQS
County:	Seminole	Checked by:

		CONDITIONS				
		Storm Event		Runoff Coefficients		
Outfall Tailwater Elevation:	8.70 *	Zone	Freq	Area 1	Area 2	Area 3
Exit Loss at Outfall:	0.25					
Storm Sewer Control Elevatio	8.95	7	10	0.95	0.25	0.00

FROM Station / Type	Brls	TO Offset / Len	Drainage Areas Inc.	Sub-Total	Sub-Total CA	Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Qb)	Sum(Qb) CIA TOTAL	Inlet Elevations Inlet Clear.	Inlet HGL Jnc Loss	Pipe Elevations HGL Crown Line / Flow Line		Fall (ft)	Pipe Height / Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual / Physical (fps)	Capacity (cfs)	Mann'g 'N'
S-2		**S-1**	0.44	3.51	3.33					0.00	0.00	8.50	9.18	9.03	8.95	0.085	36	0.1531	Full	4.00		
18+40		-63.25	0.85	4.63	1.16	15.70	0.00	6.29	4.49		28.28			4.00	3.70						53.22	0.0120
DBI-B	1	55.30	0.00	0.00	0.00						**28.28**	-0.68	0.15	1.00	0.70	0.300	36	0.5425		7.53		
S-3		**S-2**	0.64	2.91	2.76					0.00	0.00	8.50	9.39	9.27	9.18	0.092	36	0.0925	Full	3.11		
18+40		35.00	0.65	2.72	0.68	15.17	0.53	6.38	3.44		21.97			6.00	4.00						102.70	0.0120
DBI-B	1	99.00	0.00	0.00	0.00						**21.97**	-0.89	0.12	3.00	1.00	2.000	36	2.0202		14.53		
S-4		**S-2**	0.16	0.16	0.15					0.00	0.00	12.80	12.95	11.69	9.18	2.510	18	4.1837	Partial	12.70		
19+00		-43.60	1.06	1.06	0.26	10.00	0.08	7.41	0.42		3.09			12.90	6.50				sub		37.17	0.0120
MES4:1	1	60.00	0.00	0.00	0.00						**3.09**	-0.15	1.25	11.40	5.00	6.400	18	10.6667		21.03		
S-5		**S-3**	0.33	2.27	2.16					0.00	0.00	8.63	9.81	9.72	9.39	0.321	30	0.1550	Full	3.56		
20+50.00		33.35	0.29	2.07	0.52	14.20	0.97	6.54	2.67		17.49			6.50	6.20						16.92	0.0120
DBI-B	1	207.00	0.00	0.00	0.00						**17.49**	-1.18	0.10	4.00	3.70	0.300	30	0.1449		3.45		
S-6		**S-5**	0.25	1.94	1.84					0.00	0.00	8.78	10.26	10.18	9.81	0.368	30	0.1236	Full	3.18		
23+50.00		32.10	0.19	1.78	0.44	12.64	1.56	6.83	2.29		15.62			6.80	6.50						14.10	0.0120
DBI-B	1	298.00	0.00	0.00	0.00						**15.62**	-1.48	0.08	4.30	4.00	0.300	30	0.1007		2.87		
S-7		**S-6**	0.19	1.69	1.61					0.00	0.00	11.70	11.09	10.93	10.26	0.671	24	0.3259	Full	4.45		
25+54.55		22.10	0.02	1.59	0.40	11.87	0.77	6.98	2.00		13.99			10.20	6.80						31.49	0.0120
GUT-S	1	206.00	0.00	0.00	0.00						**13.99**	0.61	0.15	8.20	4.80	3.400	24	1.6505		10.02		
S-8		**S-9**	0.20	0.20	0.19					0.00	0.00	11.00	11.78	11.74	11.58	0.154	18	0.1306	Full	2.33		
27+00		-90.26	1.46	1.46	0.37	10.00	0.85	7.41	0.56		4.11			10.20	9.90						5.74	0.0120
DBI-B	1	118.00	0.00	0.00	0.00						**4.11**	-0.78	0.04	8.70	8.40	0.300	18	0.2542		3.25		
S-9		**S-7**	0.35	1.50	1.42					0.00	0.00	13.56	11.58	11.44	11.09	0.352	19	0.2428	Full	3.92		
27+00		22.10	0.05	1.57	0.39	11.25	0.62	7.12	1.82		12.93			9.98	9.78						9.75	0.0120
GUT-S	1	145.00	0.00	0.00	0.00						**12.93**	1.98	0.14	8.40	8.20	0.200	30	0.1379		2.95		
S-10		**S-9**	0.21	0.95	0.90					0.00	0.00	20.83	19.21	18.54	12.20	6.339	18	2.0851	Partial	9.26		
30+00		22.10	0.04	0.06	0.01	10.71	0.55	7.24	0.92		6.64			19.40	12.20				sub		17.51	0.0120
GUT-S	1	304.00	0.00	0.00	0.00						**6.64**	1.62	0.67	17.90	10.70	7.200	18	2.3684		9.91		
S-11		**S-10**	0.07	0.74	0.70					0.00	0.00	28.31	26.59	25.94	19.40	6.539	18	2.3953	Partial	9.12		
32+69.26		22.10	0.02	0.02	0.00	10.21	0.50	7.36	0.71		5.21			26.90	19.40				sub		18.86	0.0120
GUT-S	1	273.00	0.00	0.00	0.00						**5.21**	1.72	0.65	25.40	17.90	7.500	18	2.7473		10.67		
S-12		**S-11**	0.67	0.67	0.64					0.00	0.00	30.85	28.98	28.43	26.90	1.530	18	1.4574	Partial	8.44		
33+70.00		22.10	0.00	0.00	0.00	10.00	0.21	7.41	0.64		4.72			29.40	26.90				sub		17.56	0.0120
GUT-S	1	105.00	0.00	0.00	0.00						**4.72**	1.87	0.55	27.90	25.40	2.500	18	2.3810		9.94		

Units: ENGLISH

Basin 1

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Undeveloped / Rangeland / Forest: TN=1.150 TP=0.55				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	13.84 AC	
Total post-development catchment or BMP analysis area:	14.82 AC	
Pre-development Non DCIA CN:	87.76	
Pre-development DCIA percentage:	0.00 %	
Post-development Non DCIA CN:	88.27	
Post-development DCIA percentage:	50.40 %	
Estimated Area of BMP (used for rainfall excess not loadings)	3.04 AC	

Pre-development Annual Mass Loading - **Nitrogen:**	16.788 kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.803 kg/year
Post-development Annual Mass Loading - **Nitrogen:**	51.043 kg/year
Post-development Annual Mass Loading - **Phosphorus:**	6.847 kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

Basin 1

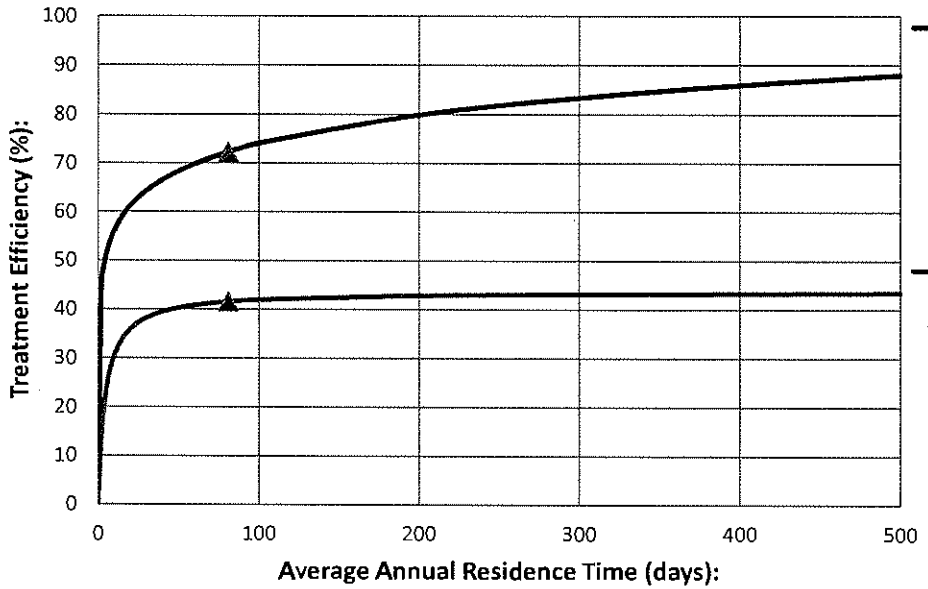
WET DETENTION:

WET DETENTION POND SERVING:

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	13.840	0.000	0.000	0.000	ac
Total post-development catchment area:	11.780	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	81.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	67.111				%
Total **Phosphorus** removal required:	88.274				%
Total **Nitrogen** removal efficiency provided:	41.506				%
Total **Phosphorous** removal efficiency provided:	72.245				%
Is the wet detention sufficient:	NO				

Wet Detention Pond Characteristics:

Permanent Pool Depth:	11.22	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	5.601	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

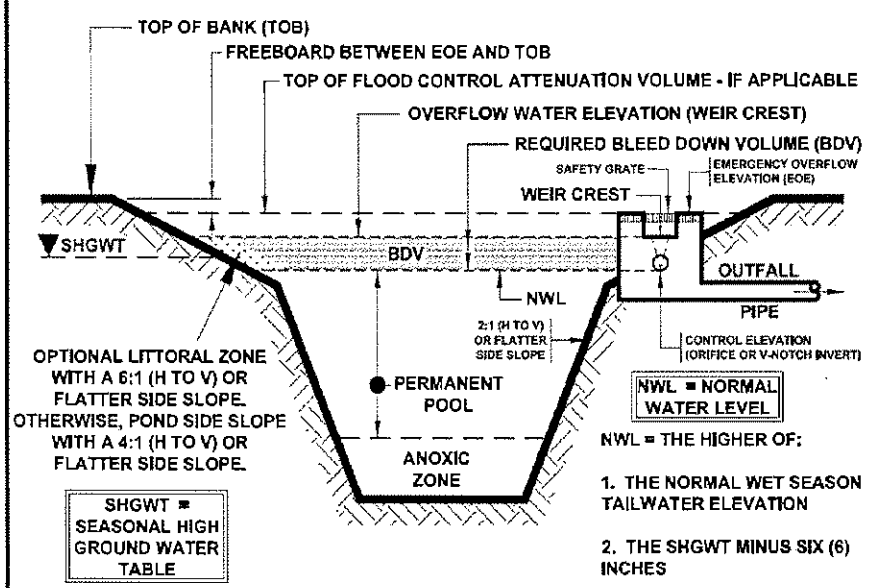
Basin 1

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	43.773				%
Remaining treatment efficiency needed (**Phosphorus**):	57.753				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:				DATE
BASIN DESIGNATION:	Basin 2 - Suburban Best Fit	MADE BY:	DTL	11/12/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	12/19/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin 2 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	B/D	69	0.43	29.67
Open Space - Fair Conditions	Myakka (10%)	B/D	69	0.43	29.67
Open Space - Fair Conditions	Nittaw (20%)	D	84	0.86	72.24
Open Space - Fair Conditions	St. Johns (60%)	B/D	69	2.60	179.40
Impervious (Paved parking, roads, etc.)			98	11.23	1100.54
Pond NWL area			100	4.08	408.00
Pond pervious area	St. Johns	B/D	69	1.83	126.27
			TOTALS	**21.46**	**1945.79**

COMPOSITE CN	90.67

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.03	4.53	**8.10**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.03	6.39	**11.43**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.03	7.48	**13.37**

URS

MADE BY:	DTL	DATE: 11/12/13	JOB NO.	
CHECKED BY:	DEP	DATE: 12/19/13	SHEET NO.	
CALCULATIONS FOR:	Basin 2	POND: MOD Pond 2	BASIN:	Basin 2 - Suburban Best Fit

Water Quality

Total Basin Area =	21.46	ac
Paved Area =	11.23	ac
Pond Area at NWL =	4.08	ac

A.	1.0	" Over Total Basin Area =	1.79	Ac-Ft	
B.	2.5	" Over Paved Area =	2.34	Ac-Ft	
Required Treatment (PAV) =			**2.34**	Ac-Ft	SJRWMD Open Basin

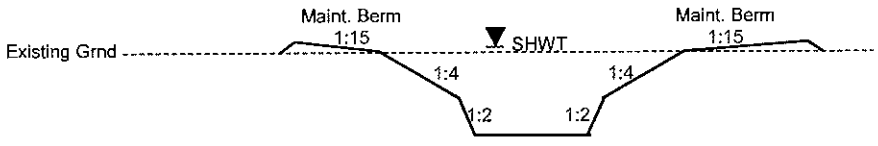
Stage Storage Calculations

ELEV. (ft) (NGVD)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
11.00	**Out Berm**	5.43				21.89
			5.07	1.00	5.07	
10.00	**Inside Berm**	4.70				16.82
			4.61	1.00	4.61	
9.00		4.51				12.22
			4.42	1.00	4.42	
8.00		4.32				7.80
			4.23	1.00	4.23	
7.27	**PAV**	4.19				3.57
			4.13	0.57	2.34	
7.00		4.14				1.23
			4.11	0.30	1.23	
6.70	**NWL**	4.08				
4.70		3.72				
-1.00	**Bottom**	3.22				

Bleed Down Volume

1/2 the req'd PAV	=	0.5 * 2.34	=	1.17	Ac-Ft

Volume remaining in pond after recovery of 1/2 PAV = 2.40 Ac-Ft



URS

MADE BY:	DTL	DATE:	11/12/13	JOB NO.	
CHECKED BY:	DEP	DATE:	12/19/13	SHEET NO.	
CALCULATIONS FOR:	SR 46 PD&E			BASIN:	Basin 2 - Suburban Best Fit

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	11.23	0.95	10.67
Roadway Pervious Area	4.32	0.20	0.86
Pond Pervious Area	1.83	0.20	0.37
Pond Area at NWL	4.08	1.00	4.08
Total	**21.46**		15.98

Composite C = **0.74**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **3.78 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provid = 1.5 x Min Perm Pool Vol. = **5.67 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
11.00	Out. Berm	5.43				
10.00	In. Berm	4.70				
9.00		4.51				
7.27	(PAV)	4.19				
6.70	(NWL)	4.08				27.58
			3.90	2.00	7.80	
4.70		3.72				19.78
			3.47	5.70	19.78	
-1.00	Bottom	3.22				

Permanent Pool Volume Provided = **27.58 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **102.2 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone. (See 40C-42.026)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.76 ft**

==========
==== Basins ====
==========

Name: Basin 2 | Node: Pond 2 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	15.00
Area(ac):	21.46	Time Shift(hrs):	0.00
Curve Number:	90.67	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

Name: Offsite 205 | Node: 205 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	61.80
Area(ac):	8.57	Time Shift(hrs):	0.00
Curve Number:	85.00	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

Name: Offsite 207 | Node: 207 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	62.40
Area(ac):	5.60	Time Shift(hrs):	0.00
Curve Number:	85.00	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

Name: Offsite 209 | Node: 209 | Status: Offsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	59.40
Area(ac):	5.88	Time Shift(hrs):	0.00
Curve Number:	85.00	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

Name: Offsite 211 | Node: 211 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	60.00
Area(ac):	11.58	Time Shift(hrs):	0.00
Curve Number:	85.00	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

Name: Offsite 213 | Node: 213 | Status: Onsite
Group: BASE | Type: SCS Unit Hydrograph CN

Unit Hydrograph:	Uh323	Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in):	0.000	Time of Conc(min):	42.00
Area(ac):	4.47	Time Shift(hrs):	0.00
Curve Number:	85.00	Max Allowable Q(cfs):	999999.00
DCIA(%):	0.00		

==========
==== Nodes ====
==========

Name: 205 Base Flow(cfs): 0.000 Init Stage(ft): 8.000
Group: BASE Warn Stage(ft): 11.000
Type: Stage/Area

Stage(ft)	Area(ac)
0.000	0.0004
8.000	0.0004

Name: 207 Base Flow(cfs): 0.000 Init Stage(ft): 8.000
Group: BASE Warn Stage(ft): 13.000
Type: Stage/Area

Stage(ft)	Area(ac)
8.000	0.0004
9.000	0.0590
10.000	0.0900
11.000	0.1180
12.000	0.1460
13.000	0.1740

Name: 209 Base Flow(cfs): 0.000 Init Stage(ft): 9.000
Group: BASE Warn Stage(ft): 13.000
Type: Stage/Area

Stage(ft)	Area(ac)
9.000	0.0020
10.000	0.0850
11.000	0.1210
12.000	0.1560
13.000	0.1920

Name: 211 Base Flow(cfs): 0.000 Init Stage(ft): 10.000
Group: BASE Warn Stage(ft): 14.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.000	0.0004
11.000	0.0930
12.000	0.1330
13.000	0.1730
14.000	0.2120

Name: 213 Base Flow(cfs): 0.000 Init Stage(ft): 11.000
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
11.000	0.0004
12.000	0.0560
13.000	0.0890
14.000	0.1160
15.000	0.1440

Name: BNDRY Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 10.000
Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01
SJRWMD Permit No. 40-117-95925-3

Time(hrs)	Stage(ft)

0.00	5.000
24.00	5.500
48.00	6.000
72.00	6.400

Name: POND 2 Base Flow(cfs): 0.000 Init Stage(ft): 6.700
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Initial Stage = NWL Elevation
Warning Stage = Inside Berm Elevation

Stage(ft)	Area(ac)
6.700	4.0800
10.000	4.7000
11.000	5.4300

Pipes

Name: SD-1 From Node: 207 Length(ft): 67.70
Group: BASE To Node: 205 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	8.100	7.830
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name: SD-2 From Node: 209 Length(ft): 67.50
Group: BASE To Node: 207 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	8.980	8.710
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name: SD-3 From Node: 211 Length(ft): 64.00
Group: BASE To Node: 209 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	10.010	9.750
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name:	SD-4	From Node:	213	Length(ft):	64.00
Group:	BASE	To Node:	211	Count:	2
				Friction Equation:	Average Conveyance
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Automatic
Geometry:	Circular	Circular		Flow:	Both
Span(in):	24.00	24.00		Entrance Loss Coef:	0.70
Rise(in):	24.00	24.00		Exit Loss Coef:	0.00
Invert(ft):	11.130	10.870		Bend Loss Coef:	0.00
Manning's N:	0.013000	0.013000		Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000		Inlet Ctrl Spec:	Use dn
Bot Clip(in):	0.000	0.000		Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Channels

Name:	South OS Ditch	From Node:	205	Length(ft):	557.00
Group:	BASE	To Node:	BNDRY	Count:	1
				Friction Equation:	Average Conveyance
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Automatic
Geometry:	Trapezoidal	Trapezoidal		Flow:	Both
Invert(ft):	7.830	5.600		Contraction Coef:	0.000
TClpInitZ(ft):	9999.000	9999.000		Expansion Coef:	0.000
Manning's N:	0.060000	0.060000		Entrance Loss Coef:	0.500
Top Clip(ft):	0.000	0.000		Exit Loss Coef:	1.000
Bot Clip(ft):	0.000	0.000		Outlet Ctrl Spec:	Use dc or tw
Main XSec:				Inlet Ctrl Spec:	Use dn
AuxElev1(ft):				Stabilizer Option:	None
Aux XSec1:					
AuxElev2(ft):					
Aux XSec2:					
Top Width(ft):					
Depth(ft):					
Bot Width(ft):	15.000	15.000			
LtSdSlp(h/v):	4.00	4.00			
RtSdSlp(h/v):	4.00	4.00			

Weirs

Name:	OCS-2 ORIFICE	From Node:	POND 2
Group:	BASE	To Node:	BNDRY
Flow:	Both	Count:	1
Type:	Vertical: Mavis	Geometry:	Circular
Span(in):	5.50		
Rise(in):	5.50		
Invert(ft):	6.200		
Control Elevation(ft):	6.700		
			TABLE
Bottom Clip(in):	0.000		
Top Clip(in):	0.000		
Weir Discharge Coef:	3.200		
Orifice Discharge Coef:	0.600		

Name:	OCS-2 Weir01	From Node:	POND 2
Group:	BASE	To Node:	BNDRY
Flow:	Both	Count:	1
Type:	Vertical: Mavis	Geometry:	Rectangular
Span(in):	60.00		
Rise(in):	32.76		

```
                Invert(ft): 7.270
      Control Elevation(ft): 7.270
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


-------------------------------------------------------------------------------------------------------
        Name: OCS-2 Weir02        From Node: POND 2
       Group: BASE                  To Node: BNDRY
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Rectangular

                Span(in): 732.00
                Rise(in): 999999999.00
              Invert(ft): 10.000
      Control Elevation(ft): 10.000
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


=======================================================================================
==== Hydrology Simulations ============================================================
=======================================================================================

        Name: 10YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\10YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 7.50

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

-------------------------------------------------------------------------------------------------------
        Name: 25YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\25YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 8.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

-------------------------------------------------------------------------------------------------------
        Name: 3YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\3YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 5.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

=======================================================================================
==== Routing Simulations ==============================================================
=======================================================================================

        Name: 10YR24HR            Hydrology Sim: 10YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\10YR24HR.I32

     Execute: Yes         Restart: No            Patch: No
 Alternative: No

       Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
  Time Step Optimizer: 10.000
     Start Time(hrs): 0.000                      End Time(hrs): 30.00
   Min Calc Time(sec): 0.5000                Max Calc Time(sec): 60.0000
      Boundary Stages:                          Boundary Flows:
```

Time(hrs)	Print Inc(min)
30.000	5.000

Group	Run
BASE	Yes

Name: 25YR24HR Hydrology Sim: 25YR24HR
Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\25YR24HR.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	5.000

Group	Run
BASE	Yes

Name: 3YR24HR Hydrology Sim: 3YR24HR
Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\3YR24HR.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	5.000

Group	Run
BASE	Yes

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
NODE MIN / MAX REPORT

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
BNDRY	BASE	10YR24HR	30.00	5.63	10.00	0.0003	4222.62	12.76	82.02	0.00	0.00
POND 2	BASE	10YR24HR	12.80	8.55	10.00	0.0037	192882.36	12.07	87.87	12.80	23.23
BNDRY	BASE	25YR24HR	29.99	5.62	10.00	0.0003	4222.61	12.87	86.65*	0.00	0.00
POND 2	BASE	25YR24HR	12.89	8.48	10.00	0.0047	192276.99	12.07	101.97	12.89	22.31
BNDRY	BASE	3YR24HR	30.00	5.62	10.00	0.0003	4222.04	12.75	61.51	0.00	0.00
POND 2	BASE	3YR24HR	12.87	8.22	10.00	0.0031	190185.63	12.07	63.36	12.87	14.88

*Less than pre-development / permitted conditions for Basin 2 ⇒ Qpre = 91.17 cfs
Bridge Replacement Project Permit No. 40-117-95925-5

PRE/POST DISCHARGE SUMMARY

WILBUR SMITH
PROJECT TITLE: SR 46
PROJECT NUMBER: 24016315201

DATE: October 6, 2009
CALC. BY:
CHECKED BY: PQS

BASIN 1 - SR 46

Simulation	Name	Existing Conditions Max. Inflow (cfs)	Proposed Conditions Max Inflow (cfs)	Δ Discharge = (Pre - Post)**
25 YR - 24 HR	OUTFALL	46.11	48.09	-1.98
10 YR - 24 HR	OUTFALL	40.07	41.10	-1.03
3 YR - 24 HR	OUTFALL	26.72	23.50	3.22

BASIN 2 - SR 46

Simulation	Name	Existing Conditions Max. Inflow (cfs)	Proposed Conditions Max Inflow (cfs)	Δ Discharge = (Pre - Post)*
25 YR - 24 HR	OUTFALL	91.17 *	91.38	-0.21
10 YR - 24 HR	OUTFALL	82.19	78.64	3.55
3 YR - 24 HR	OUTFALL	59.00	46.94	12.06

SJRWMD Permit No. 40-117-95925-5

** Increase of 0.21 cfs for the 25yr/24hr storm will not result in adverse impacts as it is less than 0.5% of the total discharge.*

** Increase of 1.98 cfs for the 25yr/24hr storm will not result in adverse impacts as it is less than 0.2% of the lowest annual mean discharge rate for the St. Johns River (years 2005 thru 2008) at the nearest gage location (see attached map and documentation).

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2 RECOVERY ANALYSIS
INPUT ALL DATA REPORT

==========
==== Basins ==========
==========

Name: Basin 2 Node: Pond 2 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000 Time of Conc(min): 10.00
Area(ac): 21.46 Time Shift(hrs): 0.00
Curve Number: 90.67 Max Allowable Q(cfs): 999999.00
DCIA(%): 0.00

==========
==== Nodes ==========
==========

Name: BNDRY Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 10.000
Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01
SJRWMD Permit No. 40-117-95925-3

Time(hrs)	Stage(ft)
0.00	5.000
24.00	5.500
48.00	6.000
72.00	6.400

Name: POND 2 Base Flow(cfs): 0.000 Init Stage(ft): 7.270
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Initial Stage = Weir Elevation
Warning Stage = Inside Berm Elevation

Stage(ft)	Area(ac)
6.700	4.0800
10.000	4.7000
11.000	5.4300

==========
==== Weirs ==========
==========

Name: OCS-2 ORIFICE From Node: POND 2
Group: BASE To Node: BNDRY
Flow: Both Count: 1
Type: Vertical: Mavis Geometry: Circular

Span(in): 5.50
Rise(in): 5.50
Invert(ft): 6.200
Control Elevation(ft): 6.700
TABLE
Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

==========
==== Routing Simulations ==========
==========

Name: RECOVERY Hydrology Sim:
Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\RECOVERY.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2 RECOVERY ANALYSIS
INPUT ALL DATA REPORT

Start Time(hrs): 0.000 End Time(hrs): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	5.000

Group	Run
BASE	Yes

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2 RECOVERY ANALYSIS
NODE TIME SERIES REPORT

imulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
RECOVERY	POND 2	BASE	26.52	7.00	10.00	180163.41	0.00	0.43	0.00	1.13
RECOVERY	POND 2	BASE	26.60	7.00	10.00	180157.50	0.00	0.43	0.00	1.13
RECOVERY	POND 2	BASE	26.68	7.00	10.00	180151.61	0.00	0.43	0.00	1.14
RECOVERY	POND 2	BASE	26.77	7.00	10.00	180145.72	0.00	0.43	0.00	1.14
RECOVERY	POND 2	BASE	26.85	7.00	10.00	180139.84	0.00	0.43	0.00	1.14
RECOVERY	POND 2	BASE	26.93	6.99	10.00	180133.96	0.00	0.43	0.00	1.15
RECOVERY	POND 2	BASE	27.02	6.99	10.00	180128.09	0.00	0.43	0.00	1.15
RECOVERY	POND 2	BASE	27.10	6.99	10.00	180122.23	0.00	0.43	0.00	1.15
RECOVERY	POND 2	BASE	27.18	6.99	10.00	180116.38	0.00	0.43	0.00	1.16
RECOVERY	POND 2	BASE	27.27	6.99	10.00	180110.53	0.00	0.43	0.00	1.16
RECOVERY	POND 2	BASE	27.35	6.99	10.00	180104.69	0.00	0.43	0.00	1.16
RECOVERY	POND 2	BASE	27.43	6.99	10.00	180098.86	0.00	0.43	0.00	1.16
RECOVERY	POND 2	BASE	27.52	6.99	10.00	180093.03	0.00	0.43	0.00	1.17
RECOVERY	POND 2	BASE	27.60	6.99	10.00	180087.21	0.00	0.43	0.00	1.17
RECOVERY	POND 2	BASE	27.68	6.99	10.00	180081.40	0.00	0.43	0.00	1.17
RECOVERY	POND 2	BASE	27.77	6.99	10.00	180075.60	0.00	0.43	0.00	1.18
RECOVERY	POND 2	BASE	27.85	6.99	10.00	180069.80	0.00	0.42	0.00	1.18
RECOVERY	POND 2	BASE	27.93	6.99	10.00	180064.01	0.00	0.42	0.00	1.18
RECOVERY	POND 2	BASE	28.02	6.99	10.00	180058.22	0.00	0.42	0.00	1.19
RECOVERY	POND 2	BASE	28.10	6.98	10.00	180052.44	0.00	0.42	0.00	1.19
RECOVERY	POND 2	BASE	28.18	6.98	10.00	180046.67	0.00	0.42	0.00	1.19
RECOVERY	POND 2	BASE	28.27	6.98	10.00	180040.91	0.00	0.42	0.00	1.19
RECOVERY	POND 2	BASE	28.35	6.98	10.00	180035.15	0.00	0.42	0.00	1.20
RECOVERY	POND 2	BASE	28.43	6.98	10.00	180029.40	0.00	0.42	0.00	1.20
RECOVERY	POND 2	BASE	28.52	6.98	10.00	180023.66	0.00	0.42	0.00	1.20
RECOVERY	POND 2	BASE	28.60	6.98	10.00	180017.93	0.00	0.42	0.00	1.21
RECOVERY	POND 2	BASE	28.68	6.98	10.00	180012.20	0.00	0.42	0.00	1.21
RECOVERY	POND 2	BASE	28.77	6.98	10.00	180006.48	0.00	0.42	0.00	1.21
RECOVERY	POND 2	BASE	28.85	6.98	10.00	180000.76	0.00	0.42	0.00	1.21
RECOVERY	POND 2	BASE	28.93	6.98	10.00	179995.05	0.00	0.42	0.00	1.22
RECOVERY	POND 2	BASE	29.02	6.98	10.00	179989.35	0.00	0.42	0.00	1.22
RECOVERY	POND 2	BASE	29.10	6.98	10.00	179983.66	0.00	0.42	0.00	1.22
RECOVERY	POND 2	BASE	29.18	6.98	10.00	179977.97	0.00	0.42	0.00	1.23
RECOVERY	POND 2	BASE	29.27	6.97	10.00	179972.29	0.00	0.42	0.00	1.23
RECOVERY	POND 2	BASE	29.35	6.97	10.00	179966.62	0.00	0.42	0.00	1.23
RECOVERY	POND 2	BASE	29.43	6.97	10.00	179960.96	0.00	0.41	0.00	1.23
RECOVERY	POND 2	BASE	29.52	6.97	10.00	179955.30	0.00	0.41	0.00	1.24
RECOVERY	POND 2	BASE	29.60	6.97	10.00	179949.64	0.00	0.41	0.00	1.24
RECOVERY	POND 2	BASE	29.68	6.97	10.00	179944.00	0.00	0.41	0.00	1.24
RECOVERY	POND 2	BASE	29.77	6.97	10.00	179938.36	0.00	0.41	0.00	1.25
RECOVERY	POND 2	BASE	29.85	6.97	10.00	179932.73	0.00	0.41	0.00	1.25
RECOVERY	POND 2	BASE	29.93	6.97	10.00	179927.11	0.00	0.41	0.00	1.25
RECOVERY	POND 2	BASE	30.01	6.97	10.00	179922.61	0.00	0.41	0.00	1.25

Recovers ½ PAV in 27.52 hours

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2
INPUT ALL DATA REPORT
10 YEAR / 24 HOUR TAILWATER CALCULATION

==========
==== Basins ====
==========

Name: Basin 2	Node: Pond 2		Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	15.00
Area(ac): 21.46		Time Shift(hrs):	0.00
Curve Number: 90.67		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

Name: Offsite 205	Node: 205		Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	61.80
Area(ac): 8.57		Time Shift(hrs):	0.00
Curve Number: 85.00		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

Name: Offsite 207	Node: 207		Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	62.40
Area(ac): 5.60		Time Shift(hrs):	0.00
Curve Number: 85.00		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

Name: Offsite 209	Node: 209		Status: Offsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	59.40
Area(ac): 5.88		Time Shift(hrs):	0.00
Curve Number: 85.00		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

Name: Offsite 211	Node: 211		Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	60.00
Area(ac): 11.58		Time Shift(hrs):	0.00
Curve Number: 85.00		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

Name: Offsite 213	Node: 213		Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN		
Unit Hydrograph: Uh323		Peaking Factor:	323.0
Rainfall File:		Storm Duration(hrs):	0.00
Rainfall Amount(in): 0.000		Time of Conc(min):	42.00
Area(ac): 4.47		Time Shift(hrs):	0.00
Curve Number: 85.00		Max Allowable Q(cfs):	999999.00
DCIA(%): 0.00			

==========

==== Nodes ==========

Name: 205 Base Flow(cfs): 0.000 Init Stage(ft): 8.000
Group: BASE Warn Stage(ft): 11.000
Type: Stage/Area

Stage(ft)	Area(ac)
0.000	0.0004
8.000	0.0004

Name: 207 Base Flow(cfs): 0.000 Init Stage(ft): 8.000
Group: BASE Warn Stage(ft): 13.000
Type: Stage/Area

Stage(ft)	Area(ac)
8.000	0.0004
9.000	0.0590
10.000	0.0900
11.000	0.1180
12.000	0.1460
13.000	0.1740

Name: 209 Base Flow(cfs): 0.000 Init Stage(ft): 9.000
Group: BASE Warn Stage(ft): 13.000
Type: Stage/Area

Stage(ft)	Area(ac)
9.000	0.0020
10.000	0.0850
11.000	0.1210
12.000	0.1560
13.000	0.1920

Name: 211 Base Flow(cfs): 0.000 Init Stage(ft): 10.000
Group: BASE Warn Stage(ft): 14.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.000	0.0004
11.000	0.0930
12.000	0.1330
13.000	0.1730
14.000	0.2120

Name: 213 Base Flow(cfs): 0.000 Init Stage(ft): 11.000
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
11.000	0.0004
12.000	0.0560
13.000	0.0890
14.000	0.1160
15.000	0.1440

Name: BNDRY Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 10.000
Type: Time/Stage

Boundary Conditions were referenced
from SR 46 over Lake Jesup project
FPID 240163-1-52-01

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2
INPUT ALL DATA REPORT
10 YEAR / 24 HOUR TAILWATER CALCULATION

SJRWMD Permit No. 40-117-95925-3

Time(hrs)	Stage(ft)
0.00	5.000
24.00	5.500
48.00	6.000
72.00	6.400

Name: POND 2 Base Flow(cfs): 0.000 Init Stage(ft): 7.270 Weir Elev.
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Initial Stage = Weir Elevation
Warning Stage = Inside Berm Elevation

Stage(ft)	Area(ac)
6.700	4.0800
10.000	4.7000
11.000	5.4300

==========
==== Pipes ==========
==========

Name: SD-1 From Node: 207 Length(ft): 67.70
Group: BASE To Node: 205 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	8.100	7.830
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name: SD-2 From Node: 209 Length(ft): 67.50
Group: BASE To Node: 207 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	8.980	8.710
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name: SD-3 From Node: 211 Length(ft): 64.00
Group: BASE To Node: 209 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	10.010	9.750
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000

Bot Clip(in):	0.000	0.000	Stabilizer Option: None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Name: SD-4 From Node: 213 Length(ft): 64.00
Group: BASE To Node: 211 Count: 2
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Entrance Loss Coef: 0.70
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	24.00	24.00
Rise(in):	24.00	24.00
Invert(ft):	11.130	10.870
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

==========
==== Channels ====
==========

Name: South OS Ditch From Node: 205 Length(ft): 557.00
Group: BASE To Node: BNDRY Count: 1
Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.000
Expansion Coef: 0.000
Entrance Loss Coef: 0.500
Exit Loss Coef: 1.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Trapezoidal	Trapezoidal
Invert(ft):	7.830	5.600
TClpInit2(ft):	9999.000	9999.000
Manning's N:	0.060000	0.060000
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:		
AuxElev1(ft):		
Aux XSec1:		
AuxElev2(ft):		
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):	15.000	15.000
LtSdSlp(h/v):	4.00	4.00
RtSdSlp(h/v):	4.00	4.00

==========
==== Weirs ====
==========

Name: OCS-2 ORIFICE From Node: POND 2
Group: BASE Assumed To Node: BNDRY
Flow: None closed Count: 1
Type: Vertical: Mavis Geometry: Circular

Span(in): 5.50
Rise(in): 5.50
Invert(ft): 6.200
Control Elevation(ft): 6.700
TABLE
Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

```
---------------------------------------------------------------------------------------------------
        Name: OCS-2 Weir01        From Node: POND 2
       Group: BASE                  To Node: BNDRY
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Rectangular

                  Span(in): 60.00
                  Rise(in): 32.76
                Invert(ft): 7.270
      Control Elevation(ft): 7.270
                                            TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600



---------------------------------------------------------------------------------------------------
        Name: OCS-2 Weir02        From Node: POND 2
       Group: BASE                  To Node: BNDRY
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Rectangular

                  Span(in): 732.00
                  Rise(in): 999999999.00
                Invert(ft): 10.000
      Control Elevation(ft): 10.000
                                            TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


===================================================================================================
==== Hydrology Simulations ========================================================================
===================================================================================================

        Name: 10YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\10YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 7.50

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

---------------------------------------------------------------------------------------------------
        Name: 25YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\25YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 8.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

---------------------------------------------------------------------------------------------------
        Name: 3YR24HR
    Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\3YR24HR.R32

     Override Defaults: Yes
   Storm Duration(hrs): 24.00
         Rainfall File: Flmod
   Rainfall Amount(in): 5.60

Time(hrs)       Print Inc(min)
--------------- ---------------
100.000         1.00

===================================================================================================
==== Routing Simulations ==========================================================================
===================================================================================================

        Name: 10YR24HR            Hydrology Sim: 10YR24HR
```

```
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\10YR24HR.I32

      Execute: Yes          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)        Print Inc(min)
---------------- ---------------
30.000           5.000

Group            Run
---------------- -----
BASE             Yes

-------------------------------------------------------------------------------------------------------
        Name: 25YR24HR             Hydrology Sim: 25YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\25YR24HR.I32

      Execute: No           Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)        Print Inc(min)
---------------- ---------------
30.000           5.000

Group            Run
---------------- -----
BASE             Yes

-------------------------------------------------------------------------------------------------------
        Name: 3YR24HR              Hydrology Sim: 3YR24HR
     Filename: I:\Projects\12722145 SR46 PDE\drainage\Basin 2\ICPR\3YR24HR.I32

      Execute: Yes          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)        Print Inc(min)
---------------- ---------------
30.000           5.000

Group            Run
---------------- -----
BASE             Yes
```

SR 46 PD&E
MODIFIED BASIN 2 POST-DEVELOPMENT CONDITIONS
MODIFIED POND 2
NODE TIME SERIES REPORT
10 YEAR / 24 HOUR TAILWATER CALCULATION

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
10YR24HR	POND 2	BASE	10.92	7.57	10.00	184834.20	8.25	2.61	1.67	0.41
10YR24HR	POND 2	BASE	11.01	7.58	10.00	184909.55	8.44	2.73	1.72	0.43
10YR24HR	POND 2	BASE	11.09	7.59	10.00	184987.67	8.65	2.86	1.78	0.45
10YR24HR	POND 2	BASE	11.18	7.60	10.00	185067.16	8.90	2.99	1.85	0.47
10YR24HR	POND 2	BASE	11.25	7.61	10.00	185137.95	9.12	3.11	1.90	0.49
10YR24HR	POND 2	BASE	11.34	7.62	10.00	185223.30	10.02	3.26	1.97	0.51
10YR24HR	POND 2	BASE	11.42	7.63	10.00	185328.65	12.28	3.44	2.05	0.53
10YR24HR	POND 2	BASE	11.51	7.65	10.00	185462.10	14.49	3.68	2.14	0.56
10YR24HR	POND 2	BASE	11.59	7.67	10.00	185636.83	20.08	4.00	2.26	0.58
10YR24HR	POND 2	BASE	11.67	7.70	10.00	185895.01	31.11	4.49	2.43	0.61
10YR24HR	POND 2	BASE	11.75	7.75	10.00	186311.91	41.99	5.31	2.68	0.64
10YR24HR	POND 2	BASE	11.83	7.81	10.00	186841.75	52.73	6.42	2.99	0.68
10YR24HR	POND 2	BASE	11.92	7.90	10.00	187545.31	68.57	8.00	3.41	0.73
10YR24HR	POND 2	BASE	12.00	8.01	10.00	188416.76	82.71	10.11	3.93	0.80
10YR24HR	POND 2	BASE	12.08	8.12	10.00	189385.87	87.43	12.65	4.52	0.87
10YR24HR	POND 2	BASE	12.17	8.24	10.00	190293.48	78.96	15.19	5.09	0.97
10YR24HR	POND 2	BASE	12.25	8.33	10.00	191035.14	69.37	17.37	5.60	1.08
10YR24HR	POND 2	BASE	12.33	8.40	10.00	191640.35	61.46	19.23	6.05	1.21
10YR24HR	POND 2	BASE	12.42	8.46	10.00	192109.83	51.79	20.71	6.44	1.35
10YR24HR	POND 2	BASE	12.50	8.50	10.00	192443.45	43.35	21.79	6.77	1.49
10YR24HR	POND 2	BASE	12.58	8.53	10.00	192672.75	36.88	22.53	7.05	1.65
10YR24HR	POND 2	BASE	12.67	8.54	10.00	192811.27	30.72	22.99	7.28	1.80
10YR24HR	POND 2	BASE	12.75	8.55	10.00	192874.42	25.51	23.20	7.48	1.96
10YR24HR	POND 2	BASE	12.84	8.55	10.00	192877.53	21.57	23.21	7.64	2.12
10YR24HR	POND 2	BASE	12.92	8.55	10.00	192836.44	18.34	23.08	7.78	2.28
10YR24HR	POND 2	BASE	13.01	8.54	10.00	192755.65	15.62	22.81	7.90	2.45
10YR24HR	POND 2	BASE	13.09	8.52	10.00	192655.09	13.69	22.48	8.00	2.60
10YR24HR	POND 2	BASE	13.17	8.51	10.00	192538.78	12.10	22.10	8.09	2.75
10YR24HR	POND 2	BASE	13.25	8.49	10.00	192409.77	11.02	21.68	8.16	2.90
10YR24HR	POND 2	BASE	13.33	8.48	10.00	192271.10	10.25	21.23	8.24	3.05
10YR24HR	POND 2	BASE	13.42	8.46	10.00	192130.76	9.75	20.78	8.30	3.19
10YR24HR	POND 2	BASE	13.50	8.44	10.00	191988.67	9.44	20.32	8.37	3.33
10YR24HR	POND 2	BASE	13.58	8.43	10.00	191850.68	9.09	19.89	8.44	3.47
10YR24HR	POND 2	BASE	13.67	8.41	10.00	191712.14	8.52	19.45	8.50	3.61
10YR24HR	POND 2	BASE	13.75	8.39	10.00	191571.56	8.03	19.01	8.55	3.74
10YR24HR	POND 2	BASE	13.83	8.37	10.00	191430.45	7.70	18.58	8.61	3.87

$T_{w_{10yr}} = 8.12$ ft NGVD
@ peak inflow

8.12 ft < 8.66 ft (permitted conditions)

STORM SEWER HYDRAULICS

System **Basin 2**

PROJECT			
Number	24016315201	Organization	Wilbur Smith Associates Inc
Description	SR 46 Lake Jessup	Designed by	AN
County	Seminole	Checked by	PS

		CONDITIONS				
Outfall Tailwater Elevation	8 66	Storm Event		Runoff Coefficients		
Exit Loss at Outfall	0 00	Zone	Freq	Area 1	Area 2	Area 3
Storm Sewer Control Elevatio	8 66	7	10	0 95	0 25	0 20

FROM Station / Type	TO Station / Offset / Brls / Len	Drainage Areas Inc	Sub Total	Sub Total CA	Tc (min)	Travel Time (min)	Inten (in/hr)	Total CA (ac)	Flow (cfs) (Qb)	Sum(Qb) CIA TOTAL	Inlet Elevations Inlet Clear	HGL Jnc Loss	Pipe Elevation HGL / Crown Line / Flow Line		Fall (ft)	Pipe Height / Width (in)	HGL (/) FL (/)	Flow Type	Velocity Actual / Physical (fps)	Capacity (cfs)	Mann g N
4460	**4550**	0 50	0 50	0 47					0 00	0 00	37 19	35 66	35 66	34 91	0 748	12	0 8315	Full	4 48		
		0 00	0 00	0 00	10 00	0 33	7 41	0 47		3 52			35 44	34 91						2 96	0 0120
DBI C	1 90 00	0 00	0 00	0 00						**3 52**	1 53	0 00	34 44	33 91	0 530	12	0 5889		3 77		
4550	**4660**	0 10	0 60	0 57					0 00	0 00	36 66	34 82	34 82	34 67	0 148	18	0 1347	Full	2 36		
		0 00	0 00	0 00	10 33	0 78	7 33	0 57		4 18			35 16	34 67						7 60	0 0120
DBI C	1 110 00	0 00	0 00	0 00						**4 18**	1 84	0 00	33 66	33 17	0 490	18	0 4455		4 30		
4660	**4767**	0 12	0 72	0 68					0 00	0 00	36 17	34 62	34 62	34 58	0 043	24	0 0398	Full	1 56		
		0 00	0 00	0 00	11 11	1 15	7 15	0 68		4 89			34 92	34 58						13 81	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**4 89**	1 55	0 00	32 92	32 58	0 340	24	0 3178		4 40		
4767	**4874**	0 12	0 84	0 80					0 00	0 00	35 83	34 31	34 31	34 26	0 054	24	0 0506	Full	1 75		
		0 00	0 00	0 00	12 26	1 02	6 91	0 80		5 51			34 58	34 26						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**5 51**	1 52	0 00	32 58	32 26	0 320	24	0 2991		4 27		
4874	**4981**	0 12	0 96	0 91					0 00	0 00	35 51	34 01	34 01	33 94	0 067	24	0 0623	Full	1 95		
		0 00	0 00	0 00	13 27	0 92	6 71	0 91		6 12			34 26	33 94						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**6 12**	1 50	0 00	32 26	31 94	0 320	24	0 2991		4 27		
4981	**5088**	0 12	1 08	1 03					0 00	0 00	35 19	33 70	33 70	33 62	0 080	24	0 0750	Full	2 14		
		0 00	0 00	0 00	14 19	0 83	6 54	1 03		6 71			33 94	33 62						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**6 71**	1 49	0 00	31 94	31 62	0 320	24	0 2991		4 27		
5088	**5195**	0 12	1 20	1 14					0 00	0 00	34 87	33 39	33 39	33 30	0 095	24	0 0887	Full	2 32		
		0 00	0 00	0 00	15 02	0 77	6 40	1 14		7 30			33 62	33 30						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**7 30**	1 48	0 00	31 62	31 30	0 320	24	0 2991		4 27		
5195	**5302**	0 12	1 32	1 25					0 00	0 00	34 55	33 09	33 09	32 98	0 111	24	0 1033	Full	2 51		
		0 00	0 00	0 00	15 79	0 71	6 28	1 25		7 88			33 30	32 98						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**7 88**	1 46	0 00	31 30	30 98	0 320	24	0 2991		4 27		
5302	**5409**	0 12	1 44	1 37					0 00	0 00	34 23	32 79	32 79	32 66	0 127	24	0 1187	Full	2 69		
		0 00	0 00	0 00	16 50	0 66	6 17	1 37		8 44			32 98	32 66						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**8 44**	1 44	0 00	30 98	30 66	0 320	24	0 2991		4 27		
5409	**5516**	0 12	1 56	1 48					0 00	0 00	33 91	32 47	32 47	32 33	0 144	24	0 1350	Full	2 87		
		0 00	0 00	0 00	17 17	0 62	6 08	1 48		9 01			32 66	32 33						13 61	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**9 01**	1 44	0 00	30 66	30 33	0 330	24	0 3084		4 33		
5516	**5623**	0 12	1 68	1 60					0 00	0 00	33 58	32 17	32 17	32 01	0 163	24	0 1522	Full	3 04		
		0 00	0 00	0 00	17 79	0 59	5 99	1 60		9 56			32 33	32 01						13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**9 56**	1 41	0 00	30 33	30 01	0 320	24	0 2991		4 27		
5623	**5730**	0 12	1 80	1 71					0 00	0 00	33 26	31 30	31 30	30 98	0 320	24	0 2991	Partial	4 70		
		0 00	0 00	0 00	18 37	0 38	5 91	1 71		10 11			32 01	31 69				super		13 40	0 0120
DBI C	1 107 00	0 00	0 00	0 00						**10 11**	1 96	0 00	30 01	29 69	0 320	24	0 2991		4 27		

Units ENGLISH

Basin 2

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Undeveloped / Rangeland / Forest: TN=1.150 TP=0.55				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

Total pre-development catchment area:	21.70	AC
Total post-development catchment or BMP analysis area:	21.46	AC
Pre-development Non DCIA CN:	89.25	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	82.62	
Post-development DCIA percentage:	52.30	%
Estimated Area of BMP (used for rainfall excess not loadings)	5.91	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**	29.455	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.409	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	64.012	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	8.587	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin 2

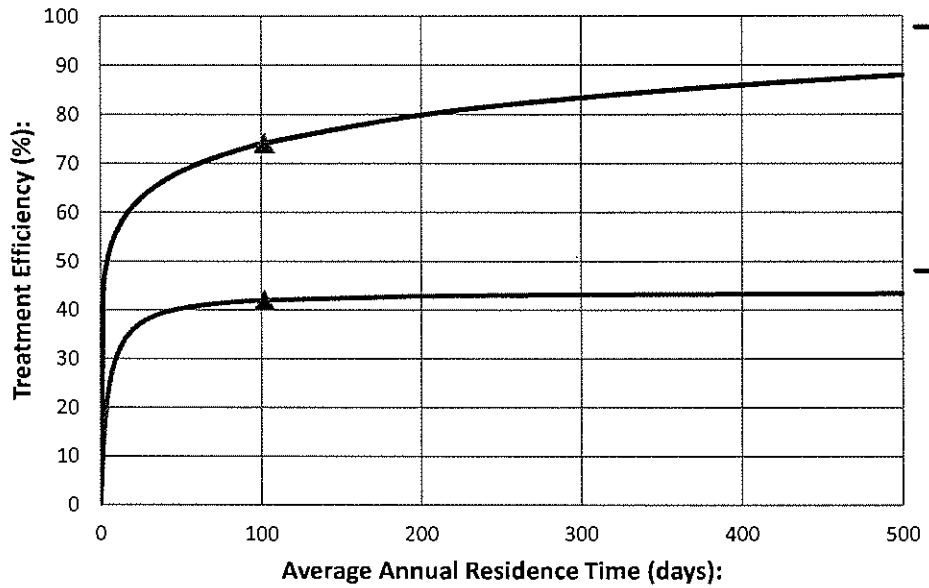
WET DETENTION:

WET DETENTION POND SERVING:

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	21.700	0.000	0.000	0.000	ac
Total post-development catchment area:	15.550	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	102.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	53.985				%
Total **Phosphorus** removal required:	83.595				%
Total **Nitrogen** removal efficiency provided:	41.949				%
Total **Phosphorous** removal efficiency provided:	74.156				%
Is the wet detention sufficient:	NO				

Wet Detention Pond Characteristics:

Permanent Pool Depth:	11.86	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	8.844	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

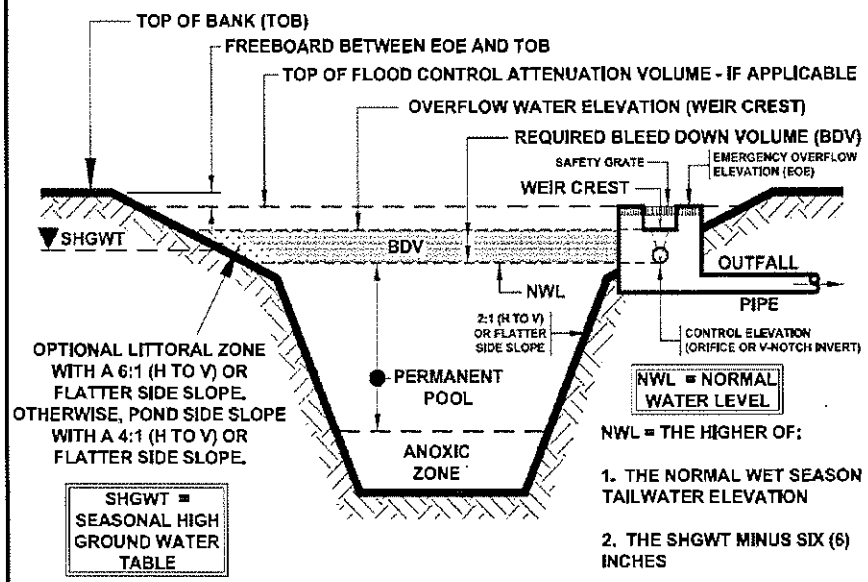
Basin 2

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	20.734				%
Remaining treatment efficiency needed (**Phosphorus**):	36.520				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	11/14/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/30/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B1 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	1.92	161.28
Open Space - Fair Conditions	St. Johns (40%)	B/D	69	7.70	531.30
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	3.85	265.65
Open Space - Fair Conditions	Pomello (10%)	C	79	1.92	151.68
Open Space - Fair Conditions	Felda (10%)	D	84	1.92	161.28
Open Space - Fair Conditions	Canova (10%)	B/D	69	1.92	132.48
Impervious (Paved parking, roads, etc.)			98	5.16	505.68
Pond Footprint	St. Johns	B/D	69	4.59	316.71
			TOTALS	**28.98**	**2226.06**

COMPOSITE CN	**76.81**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	3.02	3.11	**7.52**
SJRWMD Open Basin	10 yr / 24 hr	7.50	3.02	4.80	**11.58**
SJRWMD Open Basin	25 yr / 24 hr	8.60	3.02	5.80	**14.02**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	11/14/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DCP	11/14/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B1 - Snburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	St. Johns (40%)	B/D	69	3.51	242.19
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	1.76	121.44
Open Space - Fair Conditions	Pomello (10%)	C	79	0.88	69.52
Open Space - Fair Conditions	Felda (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	Canova (10%)	B/D	69	0.88	60.72
Impervious (Paved parking, roads, etc.)			98	15.60	1528.80
Pond NWL			100	3.25	325.00
Pond pervious area	St. Johns	B/D	69	1.34	92.46
			TOTALS	**28.98**	**2587.97**

COMPOSITE CN	89.30

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.20	4.38	**10.58**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.20	6.23	**15.05**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.20	7.31	**17.66**

URS

MADE BY:	DTL	DATE: 11/14/13	JOB NO.	240216-4-28-1
CHECKED BY:	DEP	DATE: 12/30/14		
CALCULATIONS FOR:	Basin B	POND: B1	BASIN:	Basin B - Suburban Best Fit

Water Quality

Total Basin Area =	28.98 ac
Paved Area =	15.60 ac
Pond Area at NWL =	3.25 ac

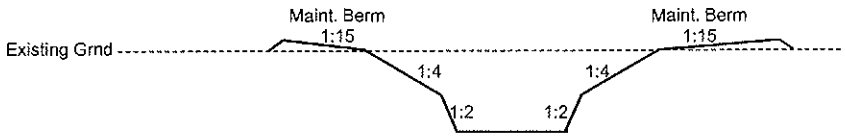
A.	1.0 " Over Total Basin Area =	2.42	Ac-Ft	
B.	2.5 " Over Paved Area =	3.25	Ac-Ft	
Required Treatment (PAV) =		**3.25**	Ac-Ft	
Required Attenuation (Post - Pre) =		**3.06**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =		**3.47**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =		**3.64**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =		**6.89**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =		**6.31**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
14.00	**Pond R/W** (1:2 max slope tie down)	5.00				
						14.83
18.00	**Out Berm**	4.59	4.21	1.00	4.21	
						10.62
17.00	**Inside Berm**	3.83	3.73	1.00	3.73	
						6.89
16.00	Provided Treatment Vol. + Attentuation Vol.	3.64	3.64	0.00	0.00	
						6.89
16.00	Required Treatment Vol. + Attentuation Vol.	3.64	3.62	0.16	0.58	
						6.31
15.84	Estimated Stormsewer Tailwater	3.61	3.52	0.87	3.06	
						3.25
14.97	Required Treatment Vol. (PAV)	3.44	3.34	0.97	3.25	
14.00	**Normal Water Level**	3.25				
12.00		2.88				
6.00	**Bottom**	2.33				

Required Treatment Vol. + Attentuation Vol. =	6.89 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	6.89 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	16.00 Ft	Provided Treatment Vol. + Atteutuation Stage =	16.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 6.31 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 15.84 Ft



Additional 20% of Pond R/W = 6.00 ac

URS

MADE BY:	DTL	DATE:	11/14/13	JOB NO.	240216-4-28-1
CHECKED BY:	DeP	DATE:	05/12/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: B1		BASIN:	Basin B - Suburban Best Fit

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	15.60	0.95	14.82
Roadway Pervious Area	8.79	0.20	1.76
Pond Pervious Area	1.34	0.20	0.27
Pond Area at NWL	3.25	1.00	3.25
Total	**28.98**		20.10

Composite C = **0.69**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.75 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.13 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
18.00	Out. Berm	4.59				
17.00	In. Berm	3.83				
16.00		3.64				
14.97	(PAV)	3.44				
14.00	(NWL)	3.25				21.76
			3.07	2.00	6.13	
12.00		2.88				15.63
			2.61	6.00	15.63	
6.00	Bottom	2.33				

Permanent Pool Volume Provided = **21.76 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **64.1 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.70 ft**

URS

MADE BY: DTL | DATE: 11/14/13 | JOB NO. 240216-4-28-1
CHECKED BY: DCP | DATE: 5/12/15
PROJECT: SR 46 PD&E | POND: B1 | BASIN: Basin B - Suburban Best Fit

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 15.84 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 24.39 ac

3) Lowest gutter elevation in Basin for HGL check

Station	158+15
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	17.30 **

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.46 ft

5) Pipe length from Pond to lowest gutter point = 540 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.68	
int. =	6.50	in/hr
A =	24.39	ac
Q =	107.80	cfs
Manning's n =	0.012	
Sum K =	2.40	
V =	4.54	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.24 trial
<actual HL - OK
n = Manning's n
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.5 ft
66 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 14.0 ft. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DCF	04/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B2 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	1.92	161.28
Open Spaee - Fair Conditions	St. Johns (40%)	B/D	69	7.70	531.30
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	3.85	265.65
Open Space - Fair Conditions	Pomello (10%)	C	79	1.92	151.68
Open Space - Fair Conditions	Felda (10%)	D	84	1.92	161.28
Open Space - Fair Conditions	Canova (10%)	B/D	69	1.92	132.48
Impervious (Paved parking, roads, etc.)			98	5.16	505.68
Pond Footprint	St. Johns	B/D	69	4.58	316.02
			TOTALS	**28.97**	**2225.37**

COMPOSITE CN	76.82

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	3.02	3.11	7.52
SJRWMD Open Basin	10 yr / 24 hr	7.50	3.02	4.80	11.58
SJRWMD Open Basin	25 yr / 24 hr	8.60	3.02	5.81	14.01

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	4/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B2 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	St. Johns (40%)	B/D	69	3.51	242.19
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	1.76	121.44
Open Space - Fair Conditions	Pomello (10%)	C	79	0.88	69.52
Open Space - Fair Conditions	Felda (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	Canova (10%)	B/D	69	0.88	60.72
Impervious (Paved parking, roads, etc.)			98	15.60	1528.80
Pond NWL			100	3.32	332.00
Pond pervious area	St. Johns	B/D	69	1.26	86.94
			TOTALS	**28.97**	**2589.45**

COMPOSITE CN	89.38

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.19	4.39	**10.60**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.19	6.24	**15.07**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.19	7.32	**17.68**

URS

MADE BY:	DTL	DATE: 02/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE: 04/20/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: B2	BASIN:	Basin B

Water Quality

Total Basin Area =	28.97	ac
Paved Area =	15.60	ac
Pond Area at NWL =	3.32	ac

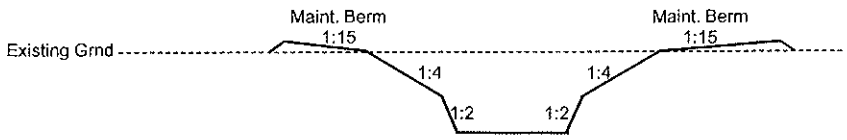
A.	1.0 " Over Total Basin Area =	2.41	Ac-Ft	
B.	2.5 " Over Paved Area =	3.25	Ac-Ft	
Required Treatment (PAV) =		**3.25**	Ac-Ft	
Required Attenuation (Post - Pre) =		**3.08**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =		**3.49**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =		**3.66**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =		**6.91**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =		**6.33**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
14.00	**Pond R/W** (1:2 max slope tie down)	4.97				
						15.01
18.00	**Out Berm**	4.58	4.23	1.00	4.23	
						10.79
17.00	**Inside Berm**	3.87	3.78	1.00	3.78	
						7.01
16.00	Provided Treatment Vol. + Attentuation Vol.	3.69	3.68	0.03	0.10	
						6.91
15.97	Required Treatment Vol. + Attentuation Vol.	3.68	3.67	0.16	0.58	
						6.33
15.82	Estimated Stormsewer Tailwater	3.65	3.57	0.86	3.08	
						3.25
14.95	Required Treatment Vol. (PAV)	3.49	3.41	0.95	3.25	
14.00	**Normal Water Level**	3.32				
12.00		2.97				
6.00	**Bottom**	2.46				

Required Treatment Vol. + Attentuation Vol. =	6.91 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	7.01 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	15.97 Ft	Provided Treatment Vol. + Attentuation Stage =	16.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. =	6.33 Ac-Ft
Estimated Stormsewer Tailwater Elevation =	15.82 Ft



Additional 20% of Pond R/W = 5.96 ac

URS

MADE BY:	DTL	DATE:	2/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE:	04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND:	B2	BASIN:	Basin B

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	15.60	0.95	14.82
Roadway Pervious Area	8.79	0.20	1.76
Pond Pervious Area	1.26	0.20	0.25
Pond Area at NWL	3.32	1.00	3.32
Total	**28.97**		20.15

Composite C = **0.70**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.76 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.14 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
18.00	Out. Berm	4.58				
17.00	In. Berm	3.87				
15.97		3.68				
14.95	(PAV)	3.49				
14.00	(NWL)	3.32				22.58
			3.15	2.00	6.29	
12.00		2.97				16.29
			2.72	6.00	16.29	
6.00	Bottom	2.46				

Permanent Pool Volume Provided = **22.58 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **66.4 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.80 ft**

URS

MADE BY: DTL | DATE: 02/20/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: B2 | BASIN: Basin B

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 15.82 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 24.39 ac

3) Lowest gutter elevation in Basin for HGL check

Station	158+15
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	17.30

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.49 ft

5) Pipe length from Pond to lowest gutter point = 780 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.68	
int. =	6.50	in/hr
A =	24.39	ac
Q =	107.80	cfs
Manning's n =	0.012	
Sum K =	2.41	
V =	4.54	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.45 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.5 ft
66 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 14.0 ft. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	4/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B3 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	1.92	161.28
Open Space - Fair Conditions	St. Johns (40%)	B/D	69	7.70	531.30
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	3.85	265.65
Open Space - Fair Conditions	Pomello (10%)	C	79	1.92	151.68
Open Space - Fair Conditions	Felda (10%)	D	84	1.92	161.28
Open Space - Fair Conditions	Canova (10%)	B/D	69	1.92	132.48
Impervious (Paved parking, roads, etc.)			98	5.16	505.68
Pond Footprint	St. Johns	B/D	69	4.92	339.48
			TOTALS	**29.31**	**2248.83**

COMPOSITE CN	**76.73**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	3.03	3.11	**7.59**
SJRWMD Open Basin	10 yr / 24 hr	7.50	3.03	4.79	**11.69**
SJRWMD Open Basin	25 yr / 24 hr	8.60	3.03	5.79	**14.15**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-t			DATE
BASIN DESIGNATION:	Basin B	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin B / Pond B3 - Suburban Best Fit					
Open Space - Fair Conditions	Basinger (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	St. Johns (40%)	B/D	69	3.51	242.19
Open Space - Fair Conditions	Immokalee (20%)	B/D	69	1.76	121.44
Open Space - Fair Conditions	Pomello (10%)	C	79	0.88	69.52
Open Space - Fair Conditions	Felda (10%)	D	84	0.88	73.92
Open Space - Fair Conditions	Canova (10%)	B/D	69	0.88	60.72
Impervious (Paved parking, roads, etc.)			98	15.60	1528.80
Pond NWL			100	3.31	331.00
Pond pervious area	St. Johns	B/D	69	1.61	111.09
			TOTALS	**29.31**	**2612.60**

COMPOSITE CN	89.14

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.22	4.36	**10.66**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.22	6.21	**15.17**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.22	7.29	**17.81**

URS

MADE BY:	DTL	DATE: 02/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DLP	DATE: 04/20/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: B3	BASIN:	Basin B

Water Quality

Total Basin Area =	29.31	ac
Paved Area =	15.60	ac
Pond Area at NWL =	3.31	ac

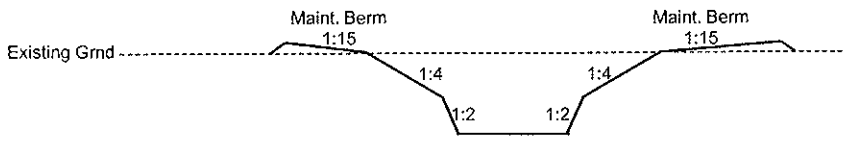
A.	1.0 " Over Total Basin Area =	2.44	Ac-Ft	
B.	2.5 " Over Paved Area =	3.25	Ac-Ft	
Required Treatment (PAV) =		**3.25**	Ac-Ft	
Required Attenuation (Post - Pre) =		**3.07**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =		**3.48**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =		**3.66**	Ac-Ft	25yr / 24hr
Required Treament Vol. + Attentuation Vol. =		**6.91**	Ac-Ft	25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =		**6.32**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
16.50	**Pond R/W** (1:2 max slope tie down)	5.10				
						15.45
18.00	**Out Berm**	4.92				
			4.47	1.00	4.47	
						10.98
17.00	**Inside Berm**	4.01				
			3.89	1.00	3.89	
						7.09
16.00	Provided Treatment Vol. + Attentuation Vol.	3.78				
			3.77	0.05	0.17	
						6.91
15.95	Required Treatment Vol. + Attentuation Vol.	3.77				
			3.75	0.16	0.60	
						6.32
15.80	Estimated Stormsewer Tailwater	3.73				
			3.63	0.85	3.07	
						3.25
14.95	Required Treatment Vol. (PAV)	3.53				
			3.42	0.95	3.25	
14.00	**Normal Water Level**	3.31				
12.00		2.85				
6.00	**Bottom**	2.18				

Required Treatment Vol. + Attentuation Vol. =	6.91 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	7.09 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	15.95 Ft	Provided Treatment Vol. + Attentuation Stage =	16.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 6.32 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 15.80 Ft



Additional 20% of Pond R/W = 6.12 ac

URS

MADE BY:	DTL	DATE:	2/20/14	PROJECT NO.:	240216-4-28-1
CHECKED BY:	DEP	DATE:	04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND:	B3	BASIN:	Basin B

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	15.60	0.95	14.82
Roadway Pervious Area	8.79	0.20	1.76
Pond Pervious Area	1.61	0.20	0.32
Pond Area at NWL	3.31	1.00	3.31
Total	**29.31**		20.21

Composite C = **0.69**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **4.78 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **7.17 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
18.00	Out. Berm	4.92				
17.00	In. Berm	4.01				
15.95		3.77				
14.95	(PAV)	3.53				
14.00	(NWL)	3.31				21.25
			3.08	2.00	6.16	
12.00		2.85				15.09
			2.52	6.00	15.09	
6.00	Bottom	2.18				

Permanent Pool Volume Provided = **21.25 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **62.3 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.42 ft**

URS

MADE BY: DTL | DATE: 02/20/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: B3 | BASIN: Basin B

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 15.80 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 24.39 ac

3) Lowest gutter elevation in Basin for HGL check

Station	158+15
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	17.30

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.51 ft

5) Pipe length from Pond to lowest gutter point = 1590 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.68
int. = 6.50 in/hr
A = 24.39 ac
Q = 107.80 cfs

Manning's n = 0.012
Sum K = 2.47
V = 3.81 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.43 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 6.0 ft
72 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 14.0 ft. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

Basin B

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data

Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Single-Family: TN=2.070 TP=0.327				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	28.98	AC
Total post-development catchment or BMP analysis area:	28.98	AC
Pre-development Non DCIA CN:	76.61	
Pre-development DCIA percentage:	0.00	%
Post-development Non OCIA CN:	79.16	
Post-development DCIA percentage:	53.83	%
Estimated Area of BMP (used for rainfall excess not loadings)	4.59	AC

Pre-development Annual Mass Loading - **Nitrogen:**	27.923	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	4.411	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	99.560	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	13.356	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non OCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:

USE DEFAULT CONCENTRATIONS

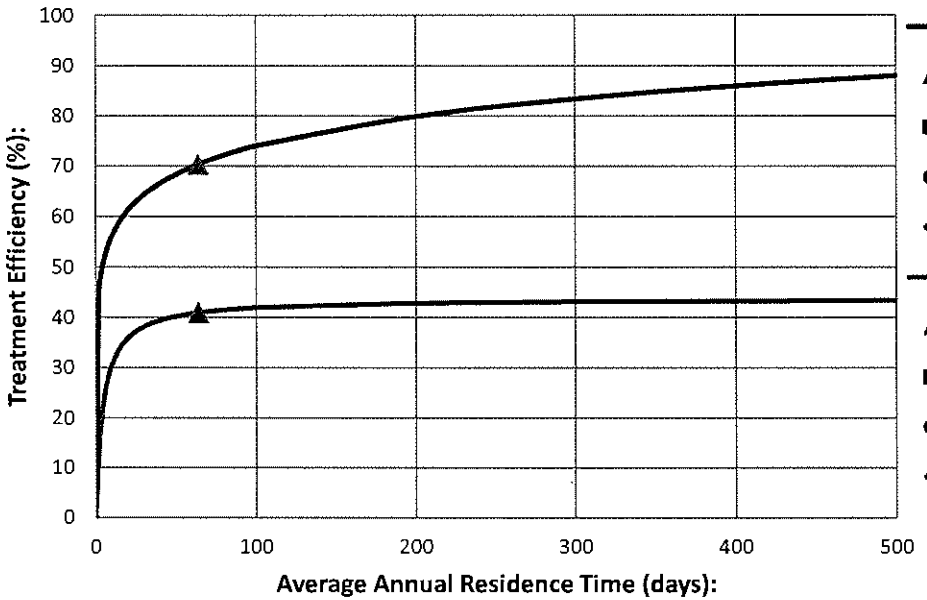
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin B

WET DETENTION:

WET DETENTION POND SERVING:	Basin B				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	28.980	0.000	0.000	0.000	ac
Total post-development catchment area:	24.390	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	64.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	71.953				%
Total **Phosphorus** removal required:	66.972				%
Total **Nitrogen** removal efficiency provided:	40.948				%
Total **Phosphorous** removal efficiency provided:	70.315				%
Is the wet detention sufficient:	NO				
Wet Detention Pond Characteristics:					
Permanent Pool Depth:	10.71	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	8.631	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

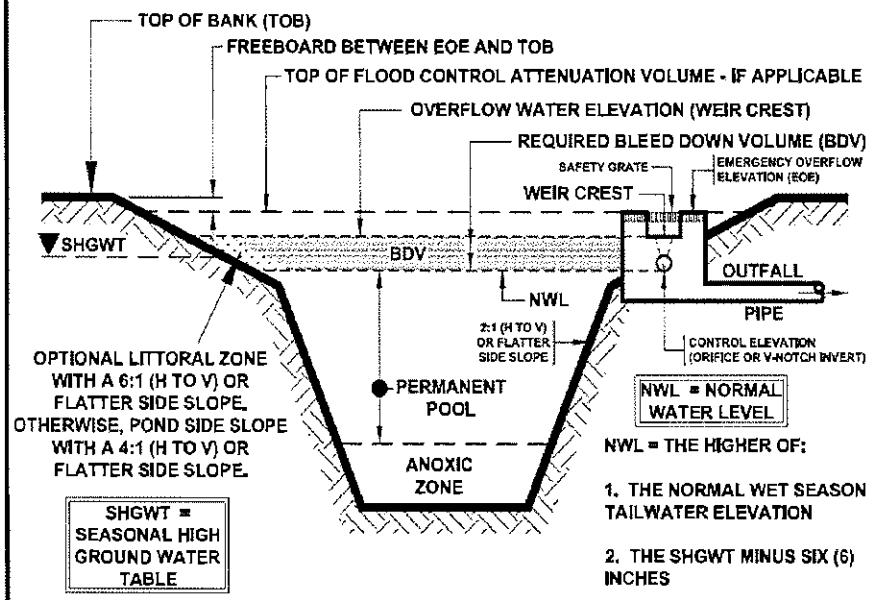
Basin B

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	52.506				%
Remaining treatment efficiency needed (**Phosphorus**):	0.000				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	CJH	11/13/2013
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	1/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C1 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	6.64	524.56
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	1.33	91.77
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	3.98	274.62
Open Space - Fair Conditions	Basinger (10%)	D	84	1.33	111.72
Impervious (Paved parking, roads, etc.)			98	3.74	366.52
Pond footprint	St. Johns	B/D	69	3.33	229.77
			TOTALS	**20.35**	**1598.96**

COMPOSITE CN	78.57

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P -0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.73	3.28	**5.57**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.73	5.00	**8.47**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.73	6.02	**10.20**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.73	10.80	**18.31**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	CJH	11/13/2013
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	11/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C1 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	2.96	233.84
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.59	40.71
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	1.78	122.82
Open Space - Fair Conditions	Basinger (10%)	D	84	0.59	49.56
Impervious (Paved parking, roads, etc.)			98	11.10	1087.80
Pond NWL			100	2.45	245.00
Pond pervious area	St. Johns	B/D	69	0.88	60.72
			TOTALS	**20.35**	**1840.45**

COMPOSITE CN	90.44

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.06	4.50	**7.64**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.06	6.37	**10.79**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.06	7.45	**12.63**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.06	12.41	**21.04**

URS

MADE BY: CJH DATE: 11/14/2013 PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: C1 BASIN: Basin C

Water Quality

Total Basin Area = 20.35 ac
Paved Area = 11.10 ac
Pond Area at NWL = 2.45 ac

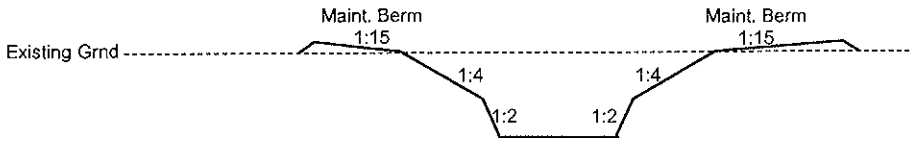
A.	1.0 " Over Total Basin Area =	1.70	Ac-Ft	
B.	2.5 " Over Paved Area =	2.31	Ac-Ft	
	Required Treatment (PAV) =	**2.31**	Ac-Ft	
	Required Attenuation (Post - Pre) =	**2.07**	Ac-Ft	3yr / 24hr
	Required Attenuation (Post - Pre) =	**2.32**	Ac-Ft	10yr / 24hr
	Required Attenuation (Post - Pre) =	**2.43**	Ac-Ft	25yr / 24hr
	Required Attenuation (Post - Pre) =	**2.73**	Ac-Ft	100yr/ 72hr
	Required Treament Vol. + Attentuation Vol. =	**5.04**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
	Required Treatment Vol. + Stormsewer Attentuation Vol. =	**4.38**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
16.00	**Pond R/W** (1:2 max slope tie down)	3.40				
17.00	**Out Berm**	3.33				11.00
			3.08	1.00	3.08	
16.00	**Inside Berm**	2.83				7.92
			2.77	1.00	2.77	
15.00	Provided Treatment Vol. + Attentuation Vol.	2.70				5.15
			2.70	0.04	0.12	
14.96	Required Treatment Vol. + Attentuation Vol.	2.70				**5.04**
			2.68	0.24	0.65	
14.71	Estimated Stormsewer Tailwater	2.67				**4.38**
			2.62	0.79	2.07	
13.92	Required Treatment Vol. (PAV)	2.57				**2.31**
			2.51	0.92	2.31	
13.00	**Normal Water Level**	2.45				
11.00		2.21				
5.00	Bottom	1.87				

Required Treatment Vol. + Attentuation Vol. = 5.04 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 14.96 Ft
Provided Treatment Vol. + Attentuation Vol. = 5.15 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 15.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 4.38 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 14.71 Ft



Additional 20% of Pond R/W = 4.08 AC

URS

MADE BY:	CJH	DATE: 11/14/2013	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DeP	DATE: 01/20/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: C1	BASIN: Basin C

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	11.10	0.95	10.55
Roadway Pervious Area	5.92	0.20	1.18
Pond Pervious Area	0.88	0.20	0.18
Pond Area at NWL	2.45	1.00	2.45
Total	**20.35**		14.36

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **3.39 ac-ft**

Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **5.09 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
17.00	Out. Berm	3.33				
16.00	In. Berm	2.83				
14.96		2.70				
13.92	(PAV)	2.57				
13.00	(NWL)	2.45				16.90
			2.33	2.00	4.66	
11.00		2.21				12.24
			2.04	6.00	12.24	
5.00	Bottom	1.87				

Permanent Pool Volume Provided = **16.90 ac-ft**

Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **69.7 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.90 ft**

URS

MADE BY: CJH | DATE: 11/14/2013 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: C1 | BASIN: Basin C

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 14.71 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 17.02 ac

3) Lowest gutter elevation in Basin for HGL check

Station	226+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	16.30

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.59 ft

5) Pipe length from Pond to lowest gutter point = 900 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.69
int. = 6.50 in/hr
A = 17.02 ac
Q = 76.33 cfs

Manning's n = 0.012
Sum K = 2.42
V = 3.89 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.22 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.0 ft
60 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEV	04/15/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C2 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	6.64	524.56
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	1.33	91.77
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	3.98	274.62
Open Space - Fair Conditions	Basinger (10%)	D	84	1.33	111.72
Impervious (Paved parking, roads, etc.)			98	3.74	366.52
Pond footprint	St. Johns	B/D	69	3.33	229.77
			TOTALS	**20.35**	**1598.96**

COMPOSITE CN	**78.57**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.73	3.28	**5.57**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.73	5.00	**8.47**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.73	6.02	**10.20**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.73	10.80	**18.31**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	DTL	02/20/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	6/15/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C2 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	2.96	233.84
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.59	40.71
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	1.78	122.82
Open Space - Fair Conditions	Basinger (10%)	D	84	0.59	49.56
Impervious (Paved parking, roads, etc.)			98	11.10	1087.80
Pond NWL			100	2.45	245.00
Pond pervious area	St. Johns	B/D	69	0.88	60.72
			TOTALS	**20.35**	**1840.45**

COMPOSITE CN	90.44

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.06	4.50	**7.64**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.06	6.37	**10.79**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.06	7.45	**12.63**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.06	12.41	**21.04**

URS

MADE BY: DTL DATE: 02/20/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: C2 BASIN: Basin C

Water Quality

Total Basin Area = 20.35 ac
Paved Area = 11.10 ac
Pond Area at NWL = 2.45 ac

A.	1.0 " Over Total Basin Area =	1.70	Ac-Ft	
B.	2.5 " Over Paved Area =	2.31	Ac-Ft	
	Required Treatment (PAV) =	**2.31**	Ac-Ft	
	Required Attenuation (Post - Pre) =	**2.07**	Ac-Ft	3yr / 24hr
	Required Attenuation (Post - Pre) =	**2.32**	Ac-Ft	10yr / 24hr
	Required Attenuation (Post - Pre) =	**2.43**	Ac-Ft	25yr / 24hr
	Required Attenuation (Post - Pre) =	**2.73**	Ac-Ft	100yr/ 72hr
	Required Treament Vol. + Attentuation Vol. =	**5.04**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
	Required Treatment Vol. + Stormsewer Attentuation Vol. =	**4.38**	Ac-Ft	3yr / 24hr closed system

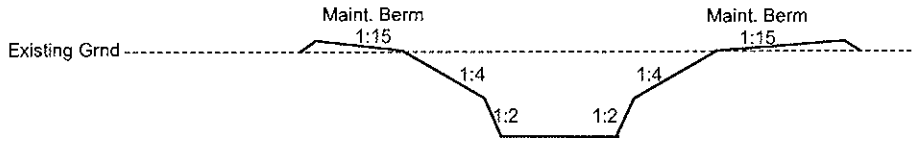
Stage Storage Calculations

ELEV. (ft)	Deseription	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
15.00	**Pond R/W** (1:2 max slope tie down)	3.47				
17.00	**Out Berm**	3.33	3.08	1.00	3.08	11.00
16.00	**Inside Berm**	2.83	2.77	1.00	2.77	7.92
15.00	Provided Treatment Vol. + Attentuation Vol.	2.70	2.70	0.04	0.12	5.15
14.96	Required Treatment Vol. + Attentuation Vol.	2.70	2.68	0.24	0.65	**5.04**
14.71	Estimated Stormsewer Tailwater	2.67	2.62	0.79	2.07	**4.38**
13.92	Required Treatment Vol. (PAV)	2.57	2.51	0.92	2.31	**2.31**
13.00	**Normal Water Level**	2.45				
11.00		2.21				
5.00	Bottom	1.86				

Required Treatment Vol. + Attentuation Vol. = 5.04 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 14.96 Ft

Provided Treatment Vol. + Attentuation Vol. = 5.15 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 15.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 4.38 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 14.71 Ft



Additional 20% of Pond R/W = 4.16 AC

URS

MADE BY: DTL DATE: 02/20/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP DATE: 04/20/14
CALCULATIONS FOR: SR 46 PD&E POND: C2 BASIN: Basin C

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	11.10	0.95	10.55
Roadway Pervious Area	5.92	0.20	1.18
Pond Pervious Area	0.88	0.20	0.18
Pond Area at NWL	2.45	1.00	2.45
Total	**20.35**		14.36

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **3.39 ac-ft**
Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **5.09 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
17.00	Out. Berm	3.33				
16.00	In. Berm	2.83				
14.96		2.70				
13.92	(PAV)	2.57				
13.00	(NWL)	2.45				16.87
			2.33	2.00	4.66	
11.00		2.21				12.21
			2.04	6.00	12.21	
5.00	Bottom	1.86				

Permanent Pool Volume Provided = **16.87 ac-ft**
Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **69.6 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.89 ft**

URS

MADE BY: DTL | DATE: 11/14/2013 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: C2 | BASIN: Basin C

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 14.71 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 17.02 ac

3) Lowest gutter elevation in Basin for HGL check

Station	226+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	16.30

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.59 ft

5) Pipe length from Pond to lowest gutter point = 400 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.69
int. = 6.50 in/hr
A = 17.02 ac
Q = 76.33 cfs

Manning's n = 0.012
Sum K = 2.39
V = 4.80 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.36 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.5 ft
54 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C3 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	6.64	524.56
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	1.33	91.77
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	3.98	274.62
Open Space - Fair Conditions	Basinger (10%)	D	84	1.33	111.72
Impervious (Paved parking, roads, etc.)			98	3.74	366.52
Pond footprint	St. Johns	B/D	69	3.34	230.46
			TOTALS	**20.36**	**1599.65**

COMPOSITE CN	**78.57**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.73	3.28	**5.57**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.73	5.00	**8.48**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.73	6.02	**10.21**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.73	10.80	**18.32**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin C	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DCP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin C / Pond C3 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (50%)	C	79	2.96	233.84
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.59	40.71
Open Space - Fair Conditions	St. Johns (30%)	B/D	69	1.78	122.82
Open Space - Fair Conditions	Basinger (10%)	D	84	0.59	49.56
Impervious (Paved parking, roads, etc.)			98	11.10	1087.80
Pond NWL			100	2.47	247.00
Pond pervious area	St. Johns	B/D	69	0.87	60.03
			TOTALS	**20.36**	**1841.76**

COMPOSITE CN	90.46

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.05	4.51	**7.65**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.05	6.37	**10.80**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.05	7.45	**12.64**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.05	12.41	**21.06**

URS

MADE BY: DTL DATE: 02/25/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DSP DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: C3 BASIN: Basin C

Water Quality

Total Basin Area = 20.36 ac
Paved Area = 11.10 ac
Pond Area at NWL = 2.47 ac

A.	1.0 " Over Total Basin Area =	1.70	Ac-Ft
B.	2.5 " Over Paved Area =	2.31	Ac-Ft
Required Treatment (PAV) =		**2.31**	Ac-Ft

Required Attenuation (Post - Pre) =	**2.08**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**2.33**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**2.44**	Ac-Ft	25yr / 24hr
Required Attenuation (Post - Pre) =	**2.74**	Ac-Ft	100yr/ 72hr
Required Treament Vol. + Attentuation Vol. =	**5.05**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**4.39**	Ac-Ft	3yr / 24hr closed system

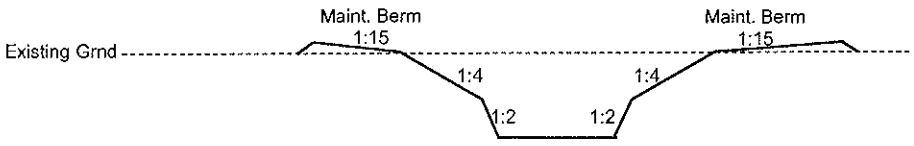
Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
15.00	**Pond R/W** (1:2 max slope tie down)	3.47				
						11.06
17.00	**Out Berm**	3.34				
			3.09	1.00	3.09	
16.00	**Inside Berm**	2.84				7.97
			2.78	1.00	2.78	
15.00	Provided Treatment Vol. + Attentuation Vol.	2.72				5.19
			2.71	0.05	0.14	
14.95	Required Treatment Vol. + Attentuation Vol.	2.71				**5.05**
			2.70	0.25	0.66	
14.70	Estimated Stormsewer Tailwater	2.68				**4.39**
			2.63	0.79	2.08	
13.91	Required Treatment Vol. (PAV)	2.58				**2.31**
			2.53	0.91	2.31	
13.00	**Normal Water Level**	2.47				
11.00		2.23				
5.00	Bottom	1.90				

Required Treatment Vol. + Attentuation Vol. = 5.05 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 14.95 Ft

Provided Treatment Vol. + Attentuation Vol. = 5.19 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 15.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 4.39 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 14.70 Ft



Additional 20% of Pond R/W = 4.16 AC

URS

MADE BY: DTL DATE: 02/25/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DSF DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: C3 BASIN: Basin C

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	11.10	0.95	10.55
Roadway Pervious Area	5.92	0.20	1.18
Pond Pervious Area	0.87	0.20	0.17
Pond Area at NWL	2.47	1.00	2.47
Total	**20.36**		14.37

Composite C = **0.71**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **3.40 ac-ft**
Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **5.10 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
17.00	Out. Berm	3.34				
16.00	In. Berm	2.84				
14.95		2.71				
13.91	(PAV)	2.58				
13.00	(NWL)	2.47				17.09
			2.35	2.00	4.70	
11.00		2.23				12.39
			2.07	6.00	12.39	
5.00	Bottom	1.90				

Permanent Pool Volume Provided = **17.09 ac-ft**
Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **70.4 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.92 ft**

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: C3 | BASIN: Basin C

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 14.70 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 17.02 ac

3) Lowest gutter elevation in Basin for HGL check

Station	226+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	16.30

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.60 ft

5) Pipe length from Pond to lowest gutter point = 100 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.69
int. = 6.50 in/hr
A = 17.02 ac
Q = 76.33 cfs

Manning's n = 0.012
Sum K = 2.37
V = 6.07 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.60 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.0 ft
48 in

Basin C

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use: Undeveloped / Rangeland / Forest: TN=1.150 TP=0.55				
CLICK ON CELL BELOW TO SELECT				
Post-development land use: Highway: TN=1.640 TP=0.220				
Total				

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	20.35	AC
Total post-development catchment or BMP analysis area:	20.35	AC
Pre-development Non DCIA CN:	78.57	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	81.37	
Post-development DCIA percentage:	54.54	%
Estimated Area of BMP (used for rainfall excess not loadings)	3.33	AC

Pre-development Annual Mass Loading - **Nitrogen:**	12.248	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.586	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	71.413	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	9.580	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

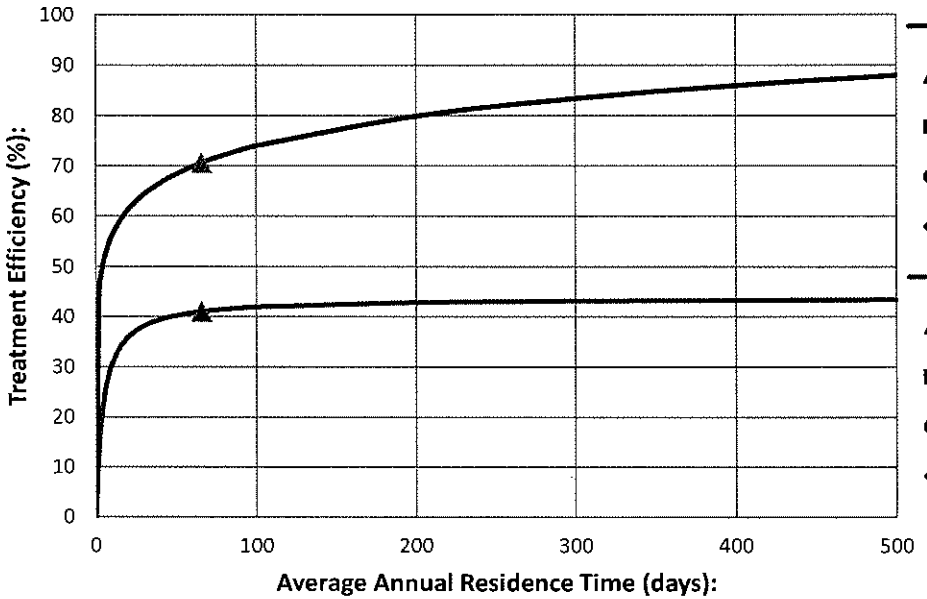
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin C

WET DETENTION:

WET DETENTION POND SERVING:	Basin C				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	20.350	0.000	0.000	0.000	ac
Total post-development catchment area:	17.020	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	66.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	82.849				%
Total **Phosphorus** removal required:	93.885				%
Total **Nitrogen** removal efficiency provided:	41.027				%
Total **Phosphorous** removal efficiency provided:	70.565				%
Is the wet detention sufficient:	NO				
Wet Detention Pond Characteristics:					
Permanent Pool Depth:	10.77	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	6.385	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

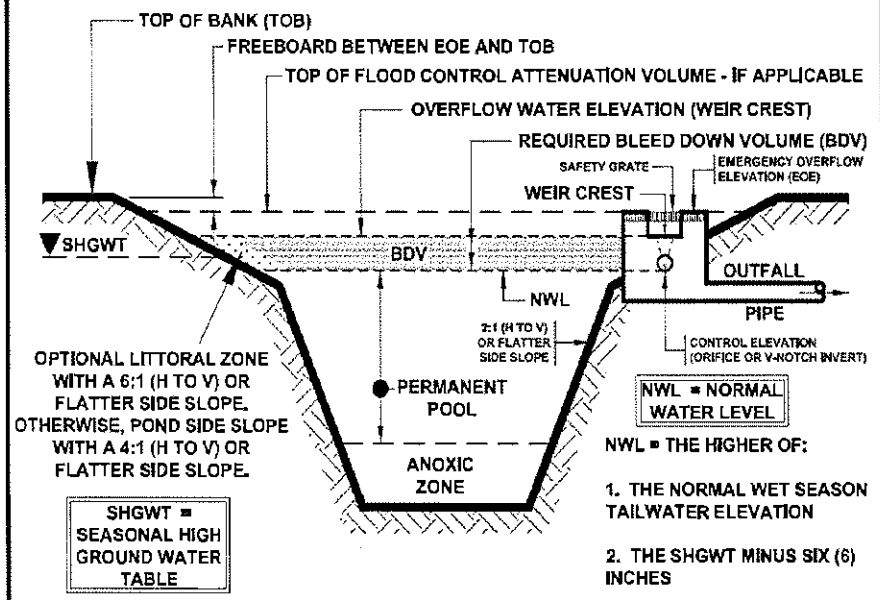
Basin C

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	70.917				%
Remaining treatment efficiency needed (**Phosphorus**):	79.226				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	CJH	11/13/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D1 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	3.20	252.80
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.53	36.57
Open Space - Fair Conditions	Basinger (20%)	D	84	1.07	89.88
Open Space - Fair Conditions	Paola (10%)	A	49	0.53	25.97
Impervious (Paved parking, roads, etc.)			98	1.47	144.26
Pond footprint	Pomello	C	79	1.47	116.13
			TOTALS	**8.27**	**665.61**

COMPOSITE CN	**80.46**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.43	3.47	**2.39**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.43	5.21	**3.59**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.43	6.25	**4.31**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.43	11.07	**7.63**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	CJH	11/13/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	11/18/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D1 - Suburbau Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	1.46	115.34
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.24	16.84
Open Space - Fair Conditions	Basinger (20%)	D	84	0.49	41.16
Open Spaee - Fair Conditions	Paola (10%)	A	49	0.24	11.96
Impervious (Paved parking, roads, etc.)			98	4.36	427.28
Pond NWL			100	0.84	84.00
Pond pervious area	Pomello	C	79	0.63	49.77
			TOTALS	**8.27**	**746.34**

COMPOSITE CN	**90.27**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.08	4.49	**3.09**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.08	6.35	**4.37**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.08	7.43	**5.12**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.08	12.39	**8.53**

URS

MADE BY:	DTL	DATE: 11/15/13	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DRP	DATE: 04/20/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: D1	BASIN: Basin D

Water Quality

Total Basin Area =	8.27 ac
Paved Area =	4.36 ac
Pond Area at NWL =	0.84 ac

A.	1.0 " Over Total Basin Area =	0.69	Ac-Ft
B.	2.5 " Over Paved Area =	0.91	Ac-Ft
	Required PAV =	**0.91**	Ac-Ft

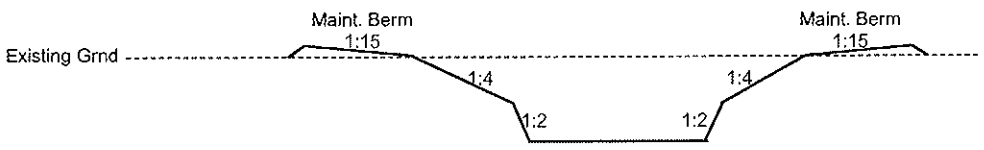
Required Attenuation (Post - Pre) =	**0.70**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**0.78**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**0.81**	Ac-Ft	25yr / 24hr
Required Attenuation (Post - Pre) =	**0.91**	Ac-Ft	100yr/ 72hr
Required Treament Vol. + Attentuation Vol. =	**1.81**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**1.61**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
21.00	**Pond R/W** (1:2 max slope tie down)	1.67				
			1.29	1.00	1.29	
25.00	**Out Berm**	1.47				4.22
			1.07	1.00	1.07	
24.00	**Inside Berm**	1.11				2.93
			1.02	0.05	0.05	
23.00	Provided Treatment Vol. + Attentuation Vol.	1.02				1.86
			1.01	0.20	0.20	
22.95	Required Treatment Vol. + Attentuation Vol.	1.02				**1.81**
			0.97	0.72	0.69	
22.75	Estimated Stormsewer Tailwater	1.00				**1.61**
			0.89	1.03	0.91	
22.03	Required Treatment Vol. (PAV)	0.93				**0.91**
21.00	**Normal Water Level**	0.84				
19.00		0.68				
13.00	Bottom	0.45				

Required Treatment Vol. + Attentuation Vol. =	1.81 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	1.86 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	22.95 Ft	Provided Treatment Vol. + Attentuation Stage =	23.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 1.61 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 22.75 Ft



Additional 20% of Pond R/W = 2.00 AC

URS

MADE BY: CJH DATE: 11/15/13 PROJECT NO.: 240216-4-28-1
CHECKED BY: DCF DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: D1 BASIN: Basin D

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	4.36	0.95	4.14
Roadway Pervious Area	2.44	0.20	0.49
Pond Pervious Area	0.63	0.20	0.13
Pond Area at NWL	0.84	1.00	0.84
Total	**8.27**		5.60

Composite C = **0.68**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **1.32 ac-ft**
Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **1.98 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
25.00	Out. Berm	1.47				
24.00	In. Berm	1.11				
23.00		1.02				
22.03	(PAV)	0.93				
21.00	(NWL)	0.84				4.91
			0.76	2.00	1.52	
19.00		0.68				3.39
			0.57	6.00	3.39	
13.00	Bottom	0.45				

Permanent Pool Volume Provided = **4.91 ac-ft**
Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **52.0 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **5.85 ft**

URS

MADE BY: DTL | DATE: 11/15/13 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: D1 | BASIN: Basin D

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 22.75 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 6.80 ac

3) Lowest gutter elevation in Basin for HGL check

Station	276+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	24.20

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.45 ft

5) Pipe length from Pond to lowest gutter point = 85 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.68
int. = 6.50 in/hr
A = 6.80 ac
Q = 30.05 cfs

Manning's n = 0.012
Sum K = 2.37
V = 4.25 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.81 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 3.0 ft
36 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	[illegible]	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D2 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	3.20	252.80
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.53	36.57
Open Space - Fair Conditions	Basinger (20%)	D	84	1.07	89.88
Open Space - Fair Conditions	Paola (10%)	A	49	0.53	25.97
Impervious (Paved parking, roads, etc.)			98	1.47	144.26
Pond footprint	Pomello	C	79	1.47	116.13
			TOTALS	**8.27**	**665.61**

COMPOSITE CN	80.46

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.43	3.47	**2.39**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.43	5.21	**3.59**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.43	6.25	**4.31**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.43	11.07	**7.63**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DCP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D2 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	1.46	115.34
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.24	16.84
Open Space - Fair Conditions	Basinger (20%)	D	84	0.49	41.16
Open Space - Fair Conditions	Paola (10%)	A	49	0.24	11.96
Impervious (Paved parking, roads, etc.)			98	4.36	427.28
Pond NWL			100	0.90	90.00
Pond pervious area	Pomello	C	79	0.57	45.03
			TOTALS	**8.27**	**747.60**

COMPOSITE CN	90.42

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.06	4.50	**3.10**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.06	6.36	**4.38**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.06	7.45	**5.13**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.06	12.41	**8.55**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DRP	DATE: 04/20/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: D2	BASIN: Basin D

Water Quality

Total Basin Area =	8.27	ac
Paved Area =	4.36	ac
Pond Area at NWL =	0.90	ac

A.	1.0	" Over Total Basin Area =	0.69	Ac-Ft
B.	2.5	" Over Paved Area =	0.91	Ac-Ft
		Required PAV =	**0.91**	Ac-Ft

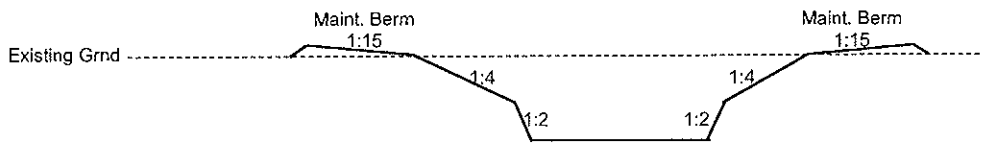
Required Attenuation (Post - Pre) =	**0.71**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**0.79**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**0.83**	Ac-Ft	25yr / 24hr
Required Attenuation (Post - Pre) =	**0.92**	Ac-Ft	100yr/ 72hr
Required Treament Vol. + Attentuation Vol. =	**1.83**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**1.62**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
21.00	**Pond R/W** (1:2 max slope tie down)	1.66				
25.00	**Out Berm**	1.47				4.37
			1.31	1.00	1.31	
24.00	**Inside Berm**	1.14				3.06
			1.10	1.00	1.10	
23.00	Provided Treatment Vol. + Attentuation Vol.	1.06				1.96
			1.06	0.12	0.13	
22.88	Required Treatment Vol. + Attentuation Vol.	1.05				**1.83**
			1.04	0.20	0.21	
22.68	Estimated Stormsewer Tailwater	1.03				**1.62**
			1.01	0.71	0.71	
21.97	Required Treatment Vol. (PAV)	0.98				**0.91**
			0.94	0.97	0.91	
21.00	**Normal Water Level**	0.90				
19.00		0.76				
13.00	Bottom	0.55				

Required Treatment Vol. + Attentuation Vol. =	1.83 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	1.96 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	22.88 Ft	Provided Treatment Vol. + Attentuation Stage =	23.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. =	1.62 Ac-Ft
Estimated Stormsewer Tailwater Elevation =	22.68 Ft



Additional 20% of Pond R/W = 1.99 AC

URS

MADE BY: DTL DATE: 02/25/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: D2 BASIN: Basin D

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	4.36	0.95	4.14
Roadway Pervious Area	2.44	0.20	0.49
Pond Pervious Area	0.57	0.20	0.11
Pond Area at NWL	0.90	1.00	0.90
Total	**8.27**		5.64

Composite C = **0.68**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **1.33 ac-ft**
Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **2.00 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
25.00	Out. Berm	1.47				
24.00	In. Berm	1.14				
23.00		1.06				
21.97	(PAV)	0.98				
21.00	(NWL)	0.90				5.59
			0.83	2.00	1.66	
19.00		0.76				3.93
			0.66	6.00	3.93	
13.00	Bottom	0.55				

Permanent Pool Volume Provided = **5.59 ac-ft**
Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **58.7 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.21 ft**

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DLP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: D2 | BASIN: Basin D

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 22.68 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 6.80 ac

3) Lowest gutter elevation in Basin for HGL check

Station	276+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	24.20

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.52 ft

5) Pipe length from Pond to lowest gutter point = 660 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.68	
int. =	6.50	in/hr
A =	6.80	ac
Q =	30.05	cfs
Manning's n =	0.012	
Sum K =	2.40	
V =	3.12	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.86 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 3.5 ft
42 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D3 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	3.20	252.80
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.53	36.57
Open Space - Fair Conditions	Basinger (20%)	D	84	1.07	89.88
Open Space - Fair Conditions	Paola (10%)	A	49	0.53	25.97
Impervious (Paved parking, roads, etc.)			98	1.47	144.26
Pond footprint	Pomello	C	79	1.47	116.13
			TOTALS	**8.27**	**665.61**

COMPOSITE CN	**80.46**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.43	3.47	**2.39**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.43	5.21	**3.59**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.43	6.25	**4.31**
FDOT Critical Duration	100 yr / 72 hr	13.60	2.43	11.07	**7.63**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin D	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DCP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin D / Pond D3 - Suburban Best Fit					
Open Space - Fair Conditions	Pomello (60%)	C	79	1.46	115.34
Open Space - Fair Conditions	Immokalee (10%)	B/D	69	0.24	16.84
Open Space - Fair Conditions	Basinger (20%)	D	84	0.49	41.16
Open Space - Fair Conditions	Paola (10%)	A	49	0.24	11.96
Impervious (Paved parking, roads, etc.)			98	4.36	427.28
Pond NWL			100	0.88	88.00
Pond pervious area	Pomello	C	79	0.59	46.61
			TOTALS	**8.27**	**747.18**

COMPOSITE CN	90.37

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	1.07	4.50	**3.10**
SJRWMD Open Basin	10 yr / 24 hr	7.50	1.07	6.36	**4.38**
SJRWMD Open Basin	25 yr / 24 hr	8.60	1.07	7.44	**5.13**
FDOT Critical Duration	100 yr / 72 hr	13.60	1.07	12.40	**8.54**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 04/20/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: D3	BASIN: Basin D

Water Quality

Total Basin Area =	8.27 ac
Paved Area =	4.36 ac
Pond Area at NWL =	0.88 ac

A.	1.0 " Over Total Basin Area =	0.69	Ac-Ft
B.	2.5 " Over Paved Area =	0.91	Ac-Ft
	Required PAV =	**0.91**	Ac-Ft

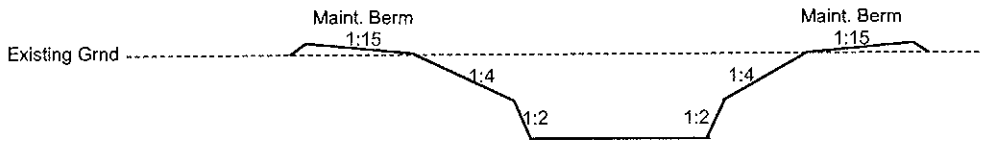
Required Attenuation (Post - Pre) =	**0.71**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**0.79**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**0.82**	Ac-Ft	25yr / 24hr
Required Attenuation (Post - Pre) =	**0.92**	Ac-Ft	100yr/ 72hr
Required Treament Vol. + Attentuation Vol. =	**1.82**	Ac-Ft	100yr/ 72hr FDOT Critical Duration
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**1.62**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
21.00	**Pond R/W** (1:2 max slope tie down)	1.66				
25.00	**Out Berm**	1.47				4.32
			1.30	1.00	1.30	
24.00	**Inside Berm**	1.13				3.02
			1.09	1.00	1.09	
23.00	Provided Treatment Vol. + Attentuation Vol.	1.05				1.93
			1.04	0.10	0.10	
22.90	Required Treatment Vol. + Attentuation Vol.	1.04				**1.82**
			1.03	0.20	0.21	
22.70	Estimated Stormsewer Tailwater	1.02				**1.62**
			0.99	0.71	0.70	
21.99	Required Treatment Vol. (PAV)	0.96				**0.91**
			0.92	0.99	0.91	
21.00	**Normal Water Level**	0.88				
19.00		0.73				
13.00	Bottom	0.51				

Required Treatment Vol. + Attentuation Vol. =	1.82 Ac-Ft	Provided Treatment Vol. + Attentuation Vol. =	1.93 Ac-Ft
Required Treatment Vol. + Attentuation Stage =	22.90 Ft	Provided Treatment Vol. + Attentuation Stage =	23.00 Ft (1 Ft freeboard)

Required Treatment Vol. + Stormsewer Attentuation Vol. = 1.62 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 22.70 Ft



Additional 20% of Pond R/W = 1.99 AC

URS

MADE BY: DTL DATE: 02/25/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP DATE: 04/30/14
CALCULATIONS FOR: SR 46 PD&E POND: D3 BASIN: Basin D

Permanent Pool Calculations

Basin Characteristics

Land Use	Area (ac)	Runoff Coeff.	Product
Roadway Paved Area	4.36	0.95	4.14
Roadway Pervious Area	2.44	0.20	0.49
Pond Pervious Area	0.59	0.20	0.12
Pond Area at NWL	0.88	1.00	0.88
Total	**8.27**		5.63

Composite C = **0.68**

Wet Season Normal Rainfall (P) = **31 in**

Min. Permanent Pool Vol. = Area x Composite C x P x 14 / 153 / 12 = **1.33 ac-ft**
Min. Permanent Pool Vol. Req. if Littoral Zone is Not Provided = 1.5 x Min Perm Pool Vol. = **2.00 ac-ft**

Stage Storage Calc.

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
25.00	Out. Berm	1.47				
24.00	In. Berm	1.13				
23.00		1.05				
21.99	(PAV)	0.96				
21.00	(NWL)	0.88				5.33
			0.81	2.00	1.61	
19.00		0.73				3.72
			0.62	6.00	3.72	
13.00	Bottom	0.51				

Permanent Pool Volume Provided = **5.33 ac-ft**
Resident Time Provided = Perm. Pool Vol. Provided *153*12 / Area / C / P = **56.1 Days**

Note: An additional 50% permanent pool volume is provided in lieu of providing a littoral zone.
(See SJRWMD PIM Vol II Section 8.7)

Mean Depth = Permanent Pool Volume / Area at NWL = **6.06 ft**

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: [illegible] | DATE: 04/25/14
PROJECT: SR 46 PD&E | POND: D3 | BASIN: Basin D

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 22.70 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 6.80 ac

3) Lowest gutter elevation in Basin for HGL check

Station	276+60
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	24.20

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.50 ft

5) Pipe length from Pond to lowest gutter point = 1170 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.68	
int. =	6.50	in/hr
A =	6.80	ac
Q =	30.05	cfs
Manning's n =	0.012	
Sum K =	2.44	
V =	3.12	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.25 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 3.5 ft
42 in

Basin D

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Single-Family: TN=2.070 TP=0.327				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

Total pre-development catchment area:	8.27	AC
Total post-development catchment or BMP analysis area:	8.27	AC
Pre-development Non DCIA CN:	80.46	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	81.64	
Post-development DCIA percentage:	52.72	%
Estimated Area of BMP (used for rainfall excess not loadings)	1.47	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**	10.161	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.605	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.891	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.741	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

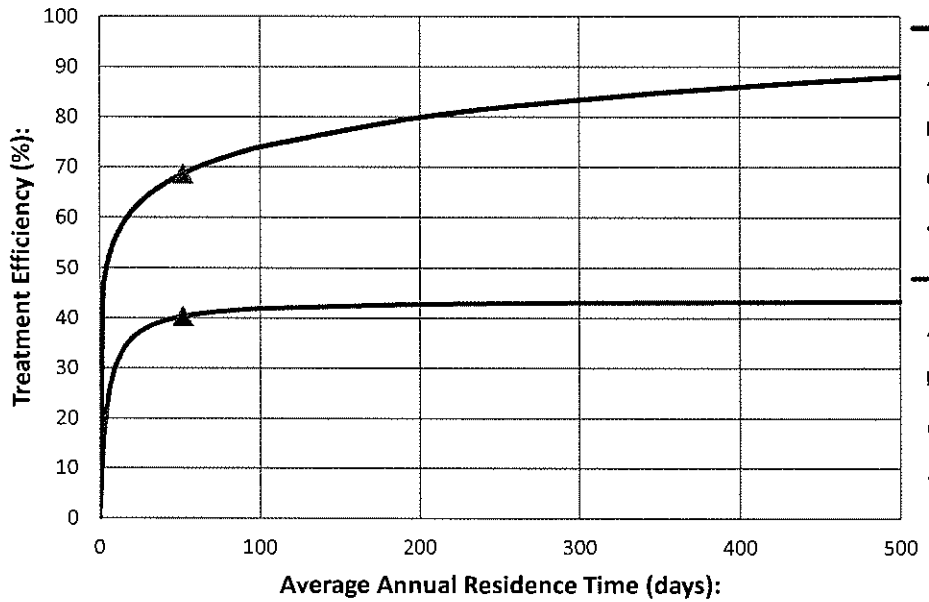
CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin D

WET DETENTION:

WET DETENTION POND SERVING:	Basin D				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	8.270	0.000	0.000	0.000	ac
Total post-development catchment area:	6.800	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days):	52.00				days
Littoral Zone used in the design:	NO				
Littoral Zone efficiency credit (user specifies 10, 15, or 20%):					%
Total **Nitrogen** removal required:	63.569				%
Total **Phosphorus** removal required:	57.099				%
Total **Nitrogen** removal efficiency provided:	40.351				%
Total **Phosphorous** removal efficiency provided:	68.633				%
Is the wet detention sufficient:	NO				
Wet Detention Pond Characteristics:					
Permanent Pool Depth:	10.34	0.00	0.00	0.00	ft
Minimum Permanent Pool Volume:	1.965	0.000	0.000	0.000	ac-ft



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.

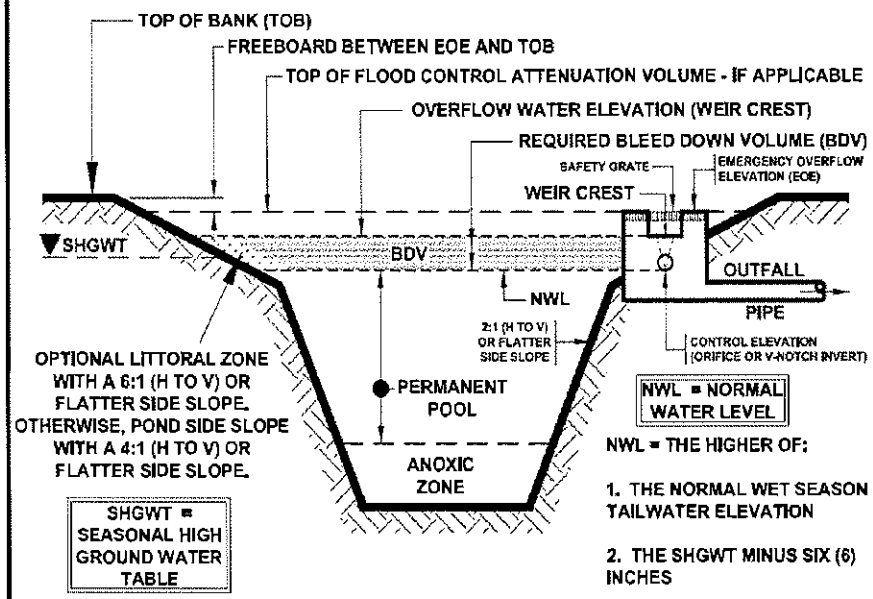
Basin D

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH WET DETENTION.

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Remaining treatment efficiency needed (**Nitrogen**):	38.924				%
Remaining treatment efficiency needed (**Phosphorus**):	0.000				%



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin E	MADE BY:	CJH	11/19/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DET	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin E / Pond E2 - Suburban Typical					
Open Space - Fair Conditions	Pomello (40%)	C	79	1.43	113.20
Open Space - Fair Conditions	Basinger (20%)	D	84	0.72	60.48
Open Space - Fair Conditions	Astatula (40%)	A	49	1.43	70.21
Impervious (Paved parking, roads, etc.)			98	1.15	113.05
Pond footprint	Astatula	A	49	1.45	71.05
			TOTALS	**6.19**	**427.99**

COMPOSITE CN	69.15

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	4.46	2.42	**1.25**
SJRWMD Open Basin	10 yr / 24 hr	7.50	4.46	3.94	**2.03**
SJRWMD Open Basin	25 yr / 24 hr	8.60	4.46	4.88	**2.52**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin E	MADE BY:	CJH	11/19/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	11/25/13

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin E / Pond E2 - Suburban Typical					
Open Space - Fair Conditions	Pomello (40%)	C	79	0.69	54.86
Open Space - Fair Conditions	Basinger (20%)	D	84	0.35	29.16
Open Space - Fair Conditions	Astatula (40%)	A	49	0.69	34.03
Impervious (Paved parking, roads, etc.)			98	3.00	294.00
Pond pervious area	Astatula	A	49	1.45	71.05
			TOTALS	**6.19**	**483.10**

COMPOSITE CN	78.10

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.80	3.24	**1.67**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.80	4.94	**2.55**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.80	5.96	**3.07**

URS

MADE BY:	CJH	DATE: 11/19/13	PROJECT NO.: 240216-4-28-1	
CHECKED BY:	DEP	DATE: 01/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: E2	BASIN: Basin E	

Water Quality

Total Basin Area = 6.19 ac
Paved Area = 3.00 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.26	Ac-Ft
B.	1.25 " Over Paved Area =	0.31	Ac-Ft
	Required PAV for off-line retention =	**0.31**	Ac-Ft

On-Line Dry Retention

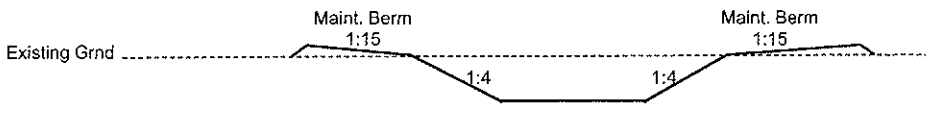
0.50 " Over Total Basin Area + Required off-line PAV =	**0.57**	Ac-Ft
Required Attenuation (Post - Pre) =	**0.42**	Ac-Ft 3yr / 24hr
Required Attenuation (Post - Pre) =	**0.51**	Ac-Ft 10yr / 24hr
Required Attenuation (Post - Pre) =	**0.55**	Ac-Ft 25yr / 24hr
Required Treatment Vol. + Attenuation Vol. =	**1.12**	Ac-Ft 25yr / 24hr SJRWMD Open basin
Required Treatment Vol. + Stormsewer Attenuation Vol. =	**0.99**	Ac-Ft 3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
23.00	**Pond R/W** (1:2 max slope tie down)	1.59				
			1.29	1.00	1.29	
26.00	**Out Berm**	1.45				4.29
			1.08	1.00	1.08	
25.00	**Inside Berm**	1.12				3.00
			1.01	0.79	0.80	
24.00	Provided Treatment Vol. + Attenuation Vol.	1.04				1.92
			0.97	0.14	0.14	
23.21	Required Treatment Vol. + Attenuation Vol.	0.98				**1.12**
			0.95	0.44	0.42	
23.07	Estimated Stormsewer Tailwater	0.97				**0.99**
			0.93	0.13	0.12	
22.63	Required Treatment Vol. (PAV)	0.93				**0.57**
			0.90	0.50	0.45	
22.50		0.92				0.45
22.00	**Bottom**	0.88				

Required Treatment Vol. + Attenuation Vol. = 0.99 Ac-Ft
Required Treatment Vol. + Attenuation Stage = 23.21 Ft.
Provided Treatment Vol. + Attenuation Vol. = 1.92 Ac-Ft
Provided Treatment Vol. + Attenuation Stage = 24.00 Ft.

Required Treatment Vol. + Stormsewer Attenuation Vol. = 0.99 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 23.07 Ft.



Additional 20% of Pond R/W = 1.91 ac

URS

MADE BY: CJH DATE: 11/19/13 PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP DATE: 01/30/14
PROJECT: SR 46 PD&E POND: E2 BASIN: Basin E

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 23.07 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 4.74 ac

3) Lowest gutter elevation in Basin for HGL check

Station	296+64
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	24.40

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.33 ft

5) Pipe length from Pond to lowest gutter point = 320 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.68
int. = 6.50 in/hr
A = 4.74 ac
Q = 20.93 cfs

Manning's n = 0.012
Sum K = 2.38
V = 2.96 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.59 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 3.0 ft
36 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin E	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin E / Pond E3 - Suburban Typical					
Open Space - Fair Conditions	Pomello (40%)	C	79	1.43	113.20
Open Space - Fair Conditions	Basinger (20%)	D	84	0.72	60.48
Open Space - Fair Conditions	Astatula (40%)	A	49	1.43	70.21
Impervious (Paved parking, roads, etc.)			98	1.15	113.05
Pond footprint	Astatula	A	49	1.45	71.05
			TOTALS	**6.19**	**427.99**

COMPOSITE CN	69.15

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> $S = (1000 / CN) - 10$ (inches)

2) DETERMINE RUNOFF - R ----------> $R = (P - 0.2*S)^2 / (P + 0.8*S)$ (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	4.46	2.42	**1.25**
SJRWMD Open Basin	10 yr / 24 hr	7.50	4.46	3.94	**2.03**
SJRWMD Open Basin	25 yr / 24 hr	8.60	4.46	4.88	**2.52**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin E	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	[illegible]	04/30/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin E / Pond E3 - Suburban Typical					
Open Space - Fair Conditions	Pomello (40%)	C	79	0.69	54.86
Open Space - Fair Conditions	Basinger (20%)	D	84	0.35	29.16
Open Space - Fair Conditions	Astatula (40%)	A	49	0.69	34.03
Impervious (Paved parking, roads, etc.)			98	3.00	294.00
Pond pervious area	Astatula	A	49	1.45	71.05
			TOTALS	**6.19**	**483.10**

COMPOSITE CN	78.10

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.80	3.24	**1.67**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.80	4.94	**2.55**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.80	5.96	**3.07**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1	
CHECKED BY:	DEP	DATE: 04/30/14		
CALCULATIONS FOR:	SR 46 PD&E	POND: E3	BASIN: Basin E	

Water Quality

Total Basin Area = 6.19 ac
Paved Area = 3.00 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.26	Ac-Ft
B.	1.25 " Over Paved Area =	0.31	Ac-Ft
	Required PAV for off-line retention =	**0.31**	Ac-Ft

On-Line Dry Retention

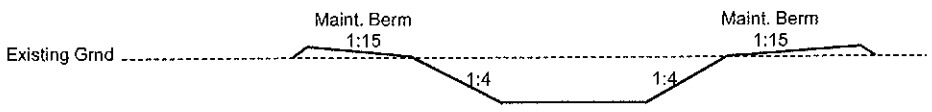
0.50 " Over Total Basin Area + Required off-line PAV =		**0.57**	Ac-Ft
Required Attenuation (Post - Pre) =		**0.42**	Ac-Ft 3yr / 24hr
Required Attenuation (Post - Pre) =		**0.51**	Ac-Ft 10yr / 24hr
Required Attenuation (Post - Pre) =		**0.55**	Ac-Ft 25yr / 24hr
Required Treatment Vol. + Attenuation Vol. =		**1.12**	Ac-Ft 25yr / 24hr SJRWMD Open basin
Required Treatment Vol. + Stormsewer Attenuation Vol. =		**0.99**	Ac-Ft 3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
22.00	**Pond R/W** (1:2 max slope tie down)	1.64				
			1.29	1.00	1.29	
26.00	**Out Berm**	1.45				4.27
			1.08	1.00	1.08	
25.00	**Inside Berm**	1.12				2.99
			1.00	0.78	0.78	
24.00	Provided Treatment Vol. + Attenuation Vol.	1.04				1.91
			0.97	0.14	0.14	
23.22	Required Treatment Vol. + Attenuation Vol.	0.97				**1.12**
			0.94	0.44	0.41	
23.08	Estimated Stormsewer Tailwater	0.96				**0.99**
			0.92	0.14	0.13	
22.64	Required Treatment Vol. (PAV)	0.92				**0.57**
			0.89	0.50	0.45	
22.50		0.91				0.45
22.00	**Bottom**	0.87				

Required Treatment Vol. + Attenuation Vol. = 0.99 Ac-Ft
Required Treatment Vol. + Attenuation Stage = 23.22 Ft.
Provided Treatment Vol. + Attenuation Vol. = 1.91 Ac-Ft
Provided Treatment Vol. + Attenuation Stage = 24.00 Ft.

Required Treatment Vol. + Stormsewer Attenuation Vol. = 0.99 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 23.08 Ft.



Additional 20% of Pond R/W = 1.97 ac

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: E3 | BASIN: Basin E

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 23.08 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 4.74 ac

3) Lowest gutter elevation in Basin for HGL check

Station	296+64
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	24.40

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.32 ft

5) Pipe length from Pond to lowest gutter point = 102 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.68	
int. =	6.50	in/hr
A =	4.74	ac
Q =	20.93	cfs
Manning's n =	0.012	
Sum K =	2.37	
V =	4.26	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.89 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 2.5 ft
30 in

PONDS Version 3.3.0229
Retention Pond Recovery - Refined Method
Copyright 2008
Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	SR 46 PD&E
Simulation Description:	Pond E : Volume below the weir elevation has been used as a slug load
Project Number:	
Engineer :	DTL
Supervising Engineer:	
Date:	11-19-2013

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	7.11
Water Table Elevation, [WT] (ft datum):	19.61
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	0.80
Fillable Porosity, [n] (%):	25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	0.8
Maximum Area For Unsaturated Infiltration, [Av] (ft²):	38277.9

Information obtained from Preliminary Roadway Soil Survey PD&E Study for SR 46 Ardaman & Assoc., Inc.

Geometry Data

Equivalent Pond Length, [L] (ft):	306.0
Equivalent Pond Width, [W] (ft):	126.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
22.00	38277.9
25.00	48727.4
26.00	63061.7

Scenario Input Data

Scenario 1 :: 24829.2 ft³ slug load

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 24829.2

Initial ground water level (ft datum) default, 19.61

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	
1.500	

PONDS Version 3.3.0229
Retention Pond Recovery - Refined Method
Copyright 2008
Devo Seereeram, Ph.D., P.E.

Detailed Results :: *Scenario 1 :: 24829.2 ft³ slug load*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	4138.2000	0.0000	19.610	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	4138.2000	0.0000	22.631	0.35443	0.00000	24829.2	2.1	0.0	U/P
2.400	0.0000	0.0000	22.555	0.35443	0.00000	24829.2	3062.2	0.0	U/P
6.000	0.0000	0.0000	22.440	0.35443	0.00000	24829.2	7655.6	0.0	U/P
12.000	0.0000	0.0000	22.246	0.30973	0.00000	24829.2	15311.2	0.0	U/P
* 24.000	0.0000	0.0000	21.957	0.11016	0.00000	24829.2	24829.2 *	0.0	U/S
36.000	0.0000	0.0000	21.840	0.00000	0.00000	24829.2	24829.2	0.0	S
48.000	0.0000	0.0000	21.759	0.00000	0.00000	24829.2	24829.2	0.0	S
60.000	0.0000	0.0000	21.694	0.00000	0.00000	24829.2	24829.2	0.0	S
72.000	0.0000	0.0000	21.640	----	----	24829.2	24829.2	0.0	N.A.

* Recovers entire PAU in 24 hours

Basin E

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A- Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Single-Family: TN=2.070 TP=0.327				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

Total pre-development catchment area:	6.19	AC
Total post-development catchment or BMP analysis area:	6.19	AC
Pre-development Non DCIA CN:	69.15	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	59.35	
Post-development DCIA percentage:	46.47	%
Estimated Area of BMP (used for rainfall excess not loadings)	1.45	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**	3.585	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.566	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	16.278	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.184	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin E

RETENTION BASIN:

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

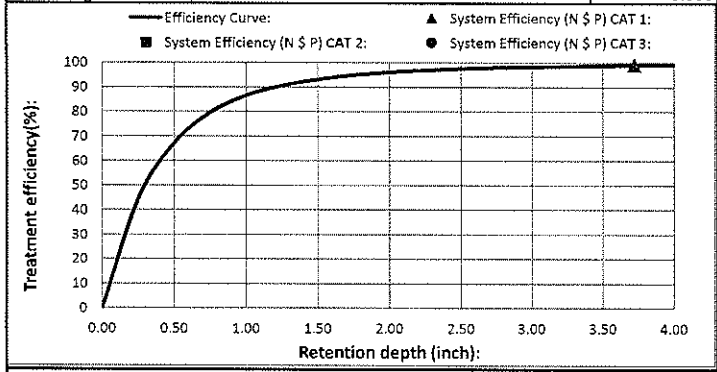
GO TO STORMWATER TREATMENT ANALYSIS

ERROR MESSAGE WINDOW FOR SINGLE RETENTION BASIN:

RETENTION BASIN SERVING:	Basin E				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Watershed area:	4.740	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	77.976				%
Required Treatment Eff (**Phosphorus**):	74.064				%
Required retention depth over the watershed to meet required efficiency:	0.720	0.000	0.000	0.000	in
Required water quality retention volume:	0.284	0.000	0.000	0.000	ac-ft

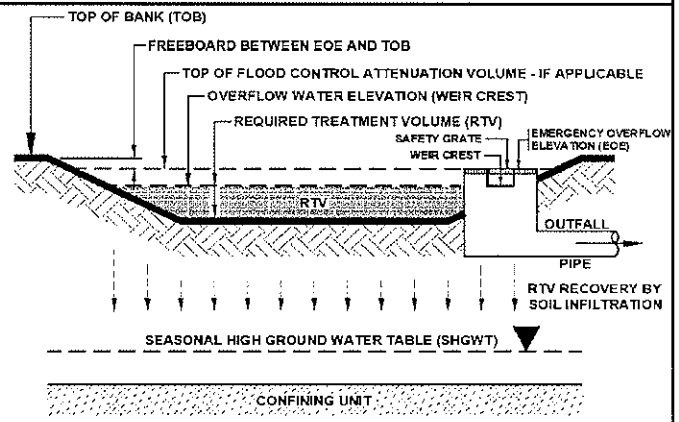
RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (use only if there is a need for additional removal efficiencies in a series of BMPs) :

Provided retention depth (inches over the watershed area):	3.722				in
Provided treatment efficiency (**Nitrogen**):	99.023	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	99.023	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	0.000				%
Remaining retention depth needed:	0.000	0.000	0.000	0.000	in



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment.** The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered.



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

View Media Mixes

	Catchment 1	Catchment 2	Catchment 3	Catchment 4
If using media mix as a filter before water enters the ground, specify type				
Average Nitrogen concentration in the filter effluent entering groundwater in mg/L	0.000	0.000	0.000	0.000
Average Phosphorus concentration in the filter effluent entering groundwater in mg/L	0.000	0.000	0.000	0.000

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin F	MADE BY:	CJH	11/13/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin F / Pond F2 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	3.80	186.20
Impervious (Paved parking, roads, etc.)			98	1.72	168.56
Pond footprint	Astatula	A	49	0.99	48.51
			TOTALS	6.51	**403.27**

COMPOSITE CN	61.95

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	6.14	1.82	**0.99**
SJRWMD Open Basin	10 yr / 24 hr	7.50	6.14	3.17	**1.72**
SJRWMD Open Basin	25 yr / 24 hr	8.60	6.14	4.02	**2.18**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin F	MADE BY:	CJH	11/13/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/14/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin F / Pond F2 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	1.84	90.16
Impervious (Paved parking, roads, etc.)			98	3.68	360.64
Pond pervious area	Astatula	A	49	0.99	48.51
			TOTALS	**6.51**	**499.31**

COMPOSITE CN	76.70

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	3.04	3.10	**1.68**
SJRWMD Open Basin	10 yr / 24 hr	7.50	3.04	4.78	**2.60**
SJRWMD Open Basin	25 yr / 24 hr	8.60	3.04	5.79	**3.14**

URS

MADE BY:	DTL	DATE: 11/13/13	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 6/13/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: F2	BASIN: Basin F

Water Quality

Total Basin Area = 6.51 ac
Paved Area = 3.68 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.27	Ac-Ft
B.	1.25 " Over Paved Area =	0.38	Ac-Ft
	Required PAV for off-line retention =	**0.38**	Ac-Ft

On-Line Dry Retention

0.50 " Over Total Basin Area + Required off-line PAV = **0.65** Ac-Ft

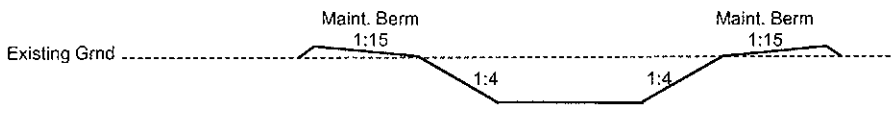
Required Attenuation (Post - Pre) =	**0.70**	Ac-Ft	3yr / 24hr
Required Attenuation (Post - Pre) =	**0.88**	Ac-Ft	10yr / 24hr
Required Attenuation (Post - Pre) =	**0.96**	Ac-Ft	25yr / 24hr
Required Treatment Vol. + Attenuation Vol. =	**1.62**	Ac-Ft	25yr / 24hr SJRWMD Open basin
Required Treatment Vol. + Stormsewer Attenuation Vol. =	**1.35**	Ac-Ft	3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
26.00	**Pond R/W** (1:2 max slope tie down)	1.07				
			0.86	1.00	0.86	
28.00	**Out Berm**	0.99				4.82
			0.70	1.00	0.70	
27.00	**Inside Berm**	0.73				3.96
			0.59	2.79	1.64	
26.00	Provided Treatment Vol. + Attenuation Vol.	0.67				3.26
			0.49	0.53	0.26	
23.21	Required Treatment Vol. + Attenuation Vol.	0.51				**1.62**
			0.43	1.64	0.70	
22.68	Estimated Stormsewer Tailwater	0.48				1.35
			0.38	0.04	0.02	
21.04	Required Treatment Vol. (PAV)	0.38				**0.65**
			0.32	2.00	0.64	
21.00		0.38				0.64
19.00	**Bottom**	0.26				

Required Treatment Vol. + Attenuation Vol. = 1.62 Ac-Ft
Required Treatment Vol. + Attenuation Stage = 23.21 Ft
Provided Treatment Vol. + Attenuation Vol. = 3.26 Ac-Ft
Provided Treatment Vol. + Attenuation Stage = 26.00 Ft

Required Treatment Vol. + Stormsewer Attenuation Vol. = 1.35 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 22.68 Ft



Additional 20% of Pond R/W = 1.28 ac

URS

MADE BY: CJH DATE: 11/13/13 PROJECT NO.: 240216-4-28-1
CHECKED BY: DATE: 04/30/14
PROJECT: SR 46 PD&E POND: F2 BASIN: Basin F

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 22.68 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see calcs attached 5.52 ac

3) Lowest gutter elevation in Basin for HGL check

Station	310+52
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	25.90

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 3.22 ft

5) Pipe length from Pond to lowest gutter point = 500 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.70
int. = 6.50 in/hr
A = 5.52 ac
Q = 25.12 cfs

Manning's n = 0.012
Sum K = 2.39
V = 5.12 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 2.56 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 2.5 ft
30 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin F	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin F / Pond F3- Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	3.80	186.20
Impervious (Paved parking, roads, etc.)			98	1.72	168.56
Pond footprint	Astatula	A	49	0.99	48.51
			TOTALS	**6.51**	**403.27**

COMPOSITE CN	61.95

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	6.14	1.82	**0.99**
SJRWMD Open Basin	10 yr / 24 hr	7.50	6.14	3.17	**1.72**
SJRWMD Open Basin	25 yr / 24 hr	8.60	6.14	4.02	**2.18**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin F	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin F / Pond F3- Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	1.84	90.16
Impervious (Paved parking, roads, etc.)			98	3.68	360.64
Pond pervious area	Astatula	A	49	0.99	48.51
			TOTALS	6.51	**499.31**

COMPOSITE CN	76.70

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	3.04	3.10	**1.68**
SJRWMD Open Basin	10 yr / 24 hr	7.50	3.04	4.78	**2.60**
SJRWMD Open Basin	25 yr / 24 hr	8.60	3.04	5.79	**3.14**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DTP	DATE: 04/30/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: F3	BASIN: Basin F

Water Quality

Total Basin Area = 6.51 ac
Paved Area = 3.68 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.27	Ac-Ft
B.	1.25 " Over Paved Area =	0.38	Ac-Ft
	Required PAV for off-line retention =	**0.38**	Ac-Ft

On-Line Dry Retention

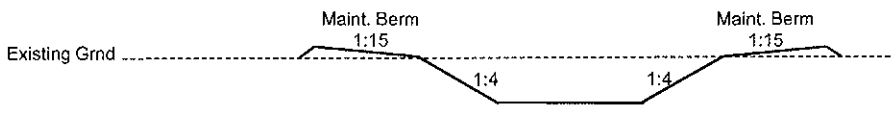
0.50 " Over Total Basin Area + Required off-line PAV =	**0.65**	Ac-Ft
Required Attenuation (Post - Pre) =	**0.70**	Ac-Ft 3yr / 24hr
Required Attenuation (Post - Pre) =	**0.88**	Ac-Ft 10yr / 24hr
Required Attenuation (Post - Pre) =	**0.96**	Ac-Ft 25yr / 24hr
Required Treatment Vol. + Attenuation Vol. =	**1.62**	Ac-Ft 25yr / 24hr SJRWMD Open basin
Required Treatment Vol. + Stormsewer Attenuation Vol. =	**1.35**	Ac-Ft 3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
34.00	Pond R/W (1:2 max slope tie down)	1.24				
						4.41
28.00	**Out Berm**	0.99	0.85	1.00	0.85	
						3.56
27.00	**Inside Berm**	0.70	0.67	1.00	0.67	
						2.89
26.00	Provided Treatment Vol. + Attenuation Vol.	0.64	0.56	2.25	1.27	
						1.62
23.75	Required Treatment Vol. + Attenuation Vol.	0.49	0.47	0.57	0.27	
						1.35
23.18	Estimated Stormsewer Tailwater	0.46	0.40	1.74	0.70	
						0.65
21.44	Required Treatment Vol. (PAV)	0.35	0.33	0.44	0.15	
						0.51
21.00		0.32	0.25	2.00	0.51	
19.00	**Bottom**	0.19				

Required Treatment Vol. + Attenuation Vol. = 1.62 Ac-Ft
Required Treatment Vol. + Attenuation Stage = 23.75 Ft
Provided Treatment Vol. + Attenuation Vol. = 2.89 Ac-Ft
Provided Treatment Vol. + Attenuation Stage = 26.00 Ft

Reqnired Treatment Vol. + Stormsewer Attenuation Vol. = 1.35 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 23.18 Ft



Additional 20% of Pond R/W = 1.49 ac

URS

MADE BY: DTL DATE: 02/25/14 PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP DATE: 04/20/14
PROJECT: SR 46 PD&E POND: F3 BASIN: Basin F

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 23.18 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see calcs attached 5.52 ac

3) Lowest gutter elevation in Basin for HGL check

Station	310+52
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	25.90

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 2.72 ft

5) Pipe length from Pond to lowest gutter point = 470 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.70
int. = 6.50 in/hr
A = 5.52 ac
Q = 25.12 cfs

Manning's n = 0.012
Sum K = 2.39
V = 5.12 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 2.46 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 2.5 ft
30 in

PONDS Version 3.3.0229
Retention Pond Recovery - Refined Method

Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	SR 46 PD&E
Simulation Description:	Pond F : Volume below the weir elevation has been used as a slug load
Project Number:	
Engineer :	DTL
Supervising Engineer:	
Date:	11-19-2013

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	5.00
Water Table Elevation, [WT] (ft datum):	16.00
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	11.20
Fillable Porosity, [n] (%):	25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	11.2
Maximum Area For Unsaturated Infiltration, [Av] (ft^2):	11532.7

Information obtained from Preliminary Roadway Soil Survey PD&E Study for SR 46 Andersen & Assoc., Inc.

Geometry Data

Equivalent Pond Length, [L] (ft):	206.0
Equivalent Pond Width, [W] (ft):	56.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft^2)
19.00	11532.7
27.00	31627.7
28.00	43262.1

Scenario Input Data

Scenario 1 :: 28314 ft³ slug load

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 28314

Initial ground water level (ft datum) default, 16.00

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	
1.500	

Detailed Results :: *Scenario 1 :: 28314 ft³ slug load*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	4719.0000	0.0000	16.000	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	4719.0000	0.0000	21.013	1.49499	0.00000	28314.0	9.0	0.0	U/P
2.400	0.0000	0.0000	20.175	0.99279	0.00000	28314.0	13033.0	0.0	U/S
6.000	0.0000	0.0000	19.976	0.18719	0.00000	28314.0	15868.1	0.0	S
12.000	0.0000	0.0000	19.764	0.11829	0.00000	28314.0	18775.3	0.0	S
24.000	0.0000	0.0000	19.481	0.07437	0.00000	28314.0	22476.5	0.0	S
36.000	0.0000	0.0000	19.262	0.05650	0.00000	28314.0	25200.5	0.0	S
48.000	0.0000	0.0000	19.082	0.03604	0.00000	28314.0	27357.9	0.0	S
*60.000	0.0000	0.0000	18.813	0.01107	0.00000	28314.0	28314.0	0.0	S
72.000	0.0000	0.0000	18.497	----	----	28314.0	28314.0	0.0	N.A.

*Recovers entire PAU in 60 hours.

Basin F

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:	Undeveloped / Rangeland / Forest: TN=1.150 TP=0.5				
with default EMCs	CLICK ON CELL BELOW TO SELECT				
Post-development land use:	Highway: TN=1.640 TP=0.220				
with default EMCs		Total			

Total pre-development catchment area:	6.51	AC
Total post-development catchment or BMP analysis area:	6.51	AC
Pre-development Non DCIA CN:	61.95	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	49.00	
Post-development DCIA percentage:	56.53	%
Estimated Area of BMP (used for rainfall excess not loadings)	0.99	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**	1.334	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.064	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	21.577	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.895	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

	CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:					
	CLICK ON CELL BELOW TO SELECT				
Post-development land use:					
		Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Basin F

RETENTION BASIN:

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

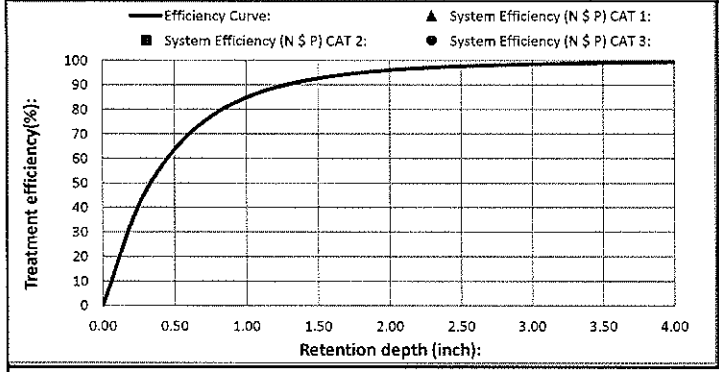
RETENTION BASIN SERVING:	Basin F				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Watershed area:	5.520	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	93.817				%
Required Treatment Eff (**Phosphorus**):	97.796				%
Required retention depth over the watershed to meet required efficiency:	2.636	0.000	0.000	0.000	in
Required water quality retention volume:	1.213	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (use only if there is a need for additional removal efficiencies in a series of BMPs) :

Provided retention depth (inches over the watershed area):	6.009				in
Provided treatment efficiency (**Nitrogen**):	99.289	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	99.289	0.000	0.000	0.000	%.
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	0.000				%
Remaining retention depth needed:	0.000	0.000	0.000	0.000	in

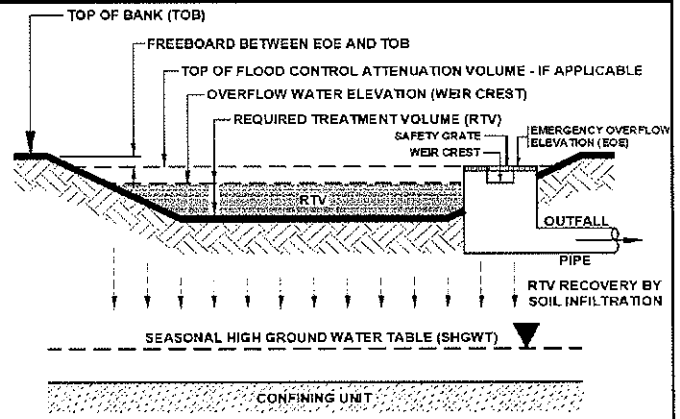
ERROR MESSAGE WINDOW FOR SINGLE RETENTION BASIN:

WARNING: THE PROVIDED RETENTION EXCEEDS THE HIGHEST RETENTION ASSOCIATED WITH THE RETENTION EFFICIENCY TABLES (SEE APPENDIX D OF THE HARPER REPORT DATED JUNE 2007). THE SPREADSHEET WILL COMPUTE THE EFFICIENCY BASED ON THE 4.00 INCHES OF RETENTION



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered.



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

View Media Mixes

	Catchment 1	Catchment 2	Catchment 3	Catchment 4
If using media mix as a filter before water enters the ground, specify type				
Average Nitrogen concentration in the filter effluent entering groundwater in mg/L	0.000	0.000	0.000	0.000
Average Phosphorus concentration in the filter effluent entering groundwater in mg/L	0.000	0.000	0.000	0.000

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin G	MADE BY:	DTL	11/18/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DCP	01/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin G / Pond G2 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	8.62	422.38
Impervious (Paved parking, roads, etc.)			98	3.96	388.08
Pond footprint	Astatula	A	49	2.33	114.17
			TOTALS	**14.91**	**924.63**

COMPOSITE CN	62.01

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	6.13	1.82	**2.26**
SJRWMD Open Basin	10 yr / 24 hr	7.50	6.13	3.18	**3.95**
SJRWMD Open Basin	25 yr / 24 hr	8.60	6.13	4.03	**5.01**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin G	MADE BY:	DTL	11/18/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin G / Pond G2 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	3.75	183.52
Impervious (Paved parking, roads, etc.)			98	8.83	865.46
Pond pervious area	Astatula	A	49	2.33	114.17
			TOTALS	**14.91**	**1163.15**

COMPOSITE CN	78.03

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.82	3.23	**4.01**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.82	4.93	**6.13**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.82	5.95	**7.39**

URS

MADE BY:	DTL	DATE: 11/18/13	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DCP	DATE: 04/30/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: G2	BASIN: Basin G

Water Quality

Total Basin Area = 14.91 ac
Paved Area = 8.83 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.62	Ac-Ft
B.	1.25 " Over Paved Area =	0.92	Ac-Ft
	Required PAV for off-line retention =	0.92	Ac-Ft

On-Line Dry Retention

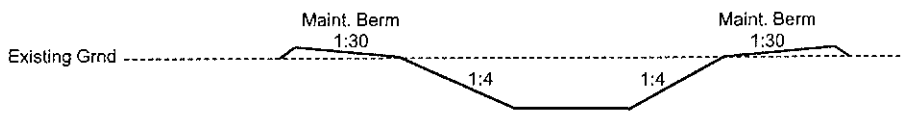
0.50 " Over Total Basin Area + Required off-line PAV =	1.54	Ac-Ft
Required On-Line Treatment (PAV) =	1.54	Ac-Ft
Required Attenuation (Post - Pre) =	1.75	Ac-Ft (3yr / 24hr)
Required Attenuation (Post - Pre) =	2.18	Ac-Ft (10yr / 24hr)
Required Attenuation (Post - Pre) =	2.39	Ac-Ft (25yr / 24hr)
Required Treament Vol. + Attentuation Vol. =	3.93	Ac-Ft (25yr / 24hr SJRWMD Open Basin)
Required Treatment Vol. + Stormsewer Attentuation Vol. =	3.29	Ac-Ft (3yr / 24hr closed system)

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
52.00	**Pond R/W** (1:2 max slope tie down)	2.63				
						7.12
47.00	**Out Berm**	2.33				
			2.12	0.50	1.06	
46.50	**Inside Berm**	1.91				6.06
			1.86	1.00	1.86	
45.50	Provided Treatment Vol. + Attentuation Vol.	1.81				4.20
			1.80	0.15	0.27	
45.35	Required Treatment Vol. + Attentuation Vol.	1.79				3.93
			1.77	0.36	0.64	
44.99	Estimated Stormsewer Tailwater	1.75				3.29
			1.70	1.03	1.75	
43.96	Required Treatment Vol. (PAV)	1.65				1.54
			1.60	0.96	1.54	
43.00	**Bottom**	1.55				

Required Treatment Vol. + Attentuation Vol. = 3.93 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 45.35 Ft
Provided Treatment Vol. + Attentuation Vol. = 4.20 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 45.50 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 3.29 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 44.99 Ft



Additional 20% of Pond R/W = 3.16 AC

URS

MADE BY: DTL DATE: 11/18/13 PROJECT NO.: 240216-4-28-1
CHECKED BY: DCP DATE: 04/30/14
PROJECT: SR 46 PD&E POND: G2 BASIN: Basin G

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 44.99 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or POST CN worksheet 12.58 ac

3) Lowest gutter elevation in Basin for HGL check

Station	326+73
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	46.20

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.21 ft

5) Pipe length from Pond to lowest gutter point = 85 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.73
int. = 6.50 in/hr
A = 12.58 ac
Q = 59.40 cfs

Manning's n = 0.012
Sum K = 2.37
V = 4.73 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.94 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.0 ft
48 in

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin G	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DCP	04/16/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin G / Pond G3 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	8.62	422.38
Impervious (Paved parking, roads, etc.)			98	3.96	388.08
Pond footprint	Astatula	A	49	2.34	114.66
			TOTALS	**14.92**	**925.12**

COMPOSITE CN	**62.01**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	6.13	1.82	**2.27**
SJRWMD Open Basin	10 yr / 24 hr	7.50	6.13	3.17	**3.95**
SJRWMD Open Basin	25 yr / 24 hr	8.60	6.13	4.03	**5.01**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin G	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin G / Pond G3 - Suburban Best Fit					
Open Space - Fair Conditions	Astatula (100%)	A	49	3.75	183.52
Impervious (Paved parking, roads, etc.)			98	8.83	865.46
Pond pervious area	Astatula	A	49	2.34	114.66
			TOTALS	14.92	**1163.64**

COMPOSITE CN	78.01

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.82	3.23	**4.01**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.82	4.93	**6.13**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.82	5.95	**7.40**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 04/30/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: G3	BASIN: Basin G

Water Quality

Total Basin Area = 14.92 ac
Paved Area = 8.83 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.62	Ac-Ft
B.	1.25 " Over Paved Area =	0.92	Ac-Ft
	Required PAV for off-line retention =	**0.92**	Ac-Ft

On-Line Dry Retention

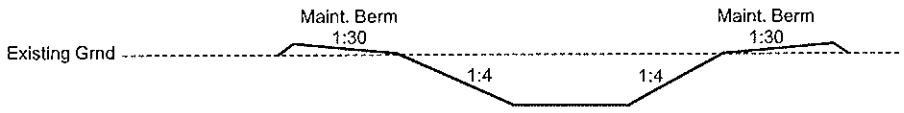
0.50 " Over Total Basin Area + Required off-line PAV =	**1.54**	Ac-Ft
Required On-Line Treatment (PAV) =	**1.54**	Ac-Ft
Required Attenuation (Post - Pre) =	**1.75**	Ac-Ft (3yr / 24hr)
Required Attenuation (Post - Pre) =	**2.18**	Ac-Ft (10yr / 24hr)
Required Attenuation (Post - Pre) =	**2.39**	Ac-Ft (25yr / 24hr)
Required Treament Vol. + Attentuation Vol. =	**3.93**	Ac-Ft (25yr / 24hr SJRWMD Open Basin)
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**3.29**	Ac-Ft (3yr / 24hr closed system)

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
56.00	**Pond R/W** (1:2 max slope tie down)	2.91				
47.00	**Out Berm**	2.34				6.99
			2.12	0.50	1.06	
46.50	**Inside Berm**	1.89				5.93
			1.83	1.00	1.83	
45.50	Provided Treatment Vol. + Attentuation Vol.	1.78				4.10
			1.77	0.10	0.17	
45.40	Required Treatment Vol. + Attentuation Vol.	1.77				3.93
			1.75	0.36	0.64	
45.04	Estimated Stormsewer Tailwater	1.73				3.29
			1.67	1.05	1.75	
43.99	Required Treatment Vol. (PAV)	1.61				1.54
			1.56	0.99	1.54	
43.00	**Bottom**	1.50				

Required Treatment Vol. + Attentuation Vol. = 3.93 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 45.40 Ft
Provided Treatment Vol. + Attentuation Vol. = 4.10 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 45.50 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 3.29 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 45.04 Ft



Additional 20% of Pond R/W = 3.49 AC

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP | DATE: 04/30/14
PROJECT: SR 46 PD&E | POND: G3 | BASIN: Basin G

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 45.04 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or POST CN worksheet 12.58 ac

3) Lowest gutter elevation in Basin for HGL check

Station	326+73
Baseline	CL46
Offset (ft)	34.50
Elevation (ft)	46.20

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.16 ft

5) Pipe length from Pond to lowest gutter point = 105 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.73
int. = 6.50 in/hr
A = 12.58 ac
Q = 59.40 cfs

Manning's n = 0.012
Sum K = 2.37
V = 4.73 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.97 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.0 ft
48 in

PONDS Version 3.3.0229
Retention Pond Recovery - Refined Method

Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	SR 46 PD&E
Simulation Description:	Pond G : Volume below the weir elevation has been used as a slug load
Project Number:	
Engineer :	DTL
Supervising Engineer:	
Date:	11-18-2013

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	28.93
Water Table Elevation, [WT] (ft datum):	40.43
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	10.00
Fillable Porosity, [n] (%):	25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	10.0
Maximum Area For Unsaturated Infiltration, [Av] (ft^2):	67588.5

Information obtained from Preliminary Roadway Soil Survey PD&E Study for SR 46 Ardaman & Assoc., Inc.

Geometry Data

Equivalent Pond Length, [L] (ft):	372.0
Equivalent Pond Width, [W] (ft):	182.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft^2)
43.00	67588.5
46.50	83353.1
47.00	101610.4

Scenario Input Data

Scenario 1 :: 67082.4 ft³ slug load

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 67082.4

Initial ground water level (ft datum) default, 40.43

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	
1.500	

Detailed Results :: *Scenario 1 :: 67082.4 ft³ slug load*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	11180.4000	0.0000	40.430	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	11180.4000	0.0000	43.961	7.82126	0.00000	67082.4	46.9	0.0	U/P
2.400	0.0000	0.0000	43.263	3.53429	0.00000	67082.4	49177.6	0.0	U/S
6.000	0.0000	0.0000	43.206	0.25751	0.00000	67082.4	53038.6	0.0	S
12.000	0.0000	0.0000	43.146	0.16940	0.00000	67082.4	57146.2	0.0	S
24.000	0.0000	0.0000	43.065	0.11352	0.00000	67082.4	62669.6	0.0	S
36.000	0.0000	0.0000	43.002	0.05107	0.00000	67082.4	66954.5	0.0	S
*48.000	0.0000	0.0000	42.831	0.00148	0.00000	67082.4	67082.4	0.0	S
60.000	0.0000	0.0000	42.692	0.00000	0.00000	67082.4	67082.4	0.0	S
72.000	0.0000	0.0000	42.577	----	----	67082.4	67082.4	0.0	N.A.

* Recovers the entire PAV in 48 hours.

Basin 6

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS: \ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use: Single Family: TN=2.070 TP=0.327				
with default EMCs: CLICK ON CELL BELOW TO SELECT				
Post-development land use: Highway: TN=1.640 TP=0.220				
with default EMCs: Total				

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	14.91 AC	
Total post-development catchment or BMP analysis area:	14.91 AC	
Pre-development Non DCIA CN:	62.01	
Pre-development DCIA percentage:	0.00 %	
Post-development Non DCIA CN:	49.00	
Post-development DCIA percentage:	59.22 %	
Estimated Area of BMP (used for rainfall excess not loadings)	2.33 AC	

Pre-development Annual Mass Loading - **Nitrogen:**	5.523 kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.872 kg/year
Post-development Annual Mass Loading - **Nitrogen:**	51.456 kg/year
Post-development Annual Mass Loading - **Phosphorus:**	6.903 kg/year

CATCHMENT NO.2 CHARACTERISTICS: \ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

CATCHMENT NO.3 CHARACTERISTICS: \ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

CATCHMENT NO.4 CHARACTERISTICS: \ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
Total				

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	AC	
Total post-development catchment or BMP analysis area:	AC	
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:	%	
Post-development Non DCIA CN:		
Post-development DCIA percentage:	%	
Estimated Area of BMP (used for rainfall excess not loadings)	AC	

Pre-development Annual Mass Loading - **Nitrogen:**	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	kg/year

Basin G

RETENTION BASIN:

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

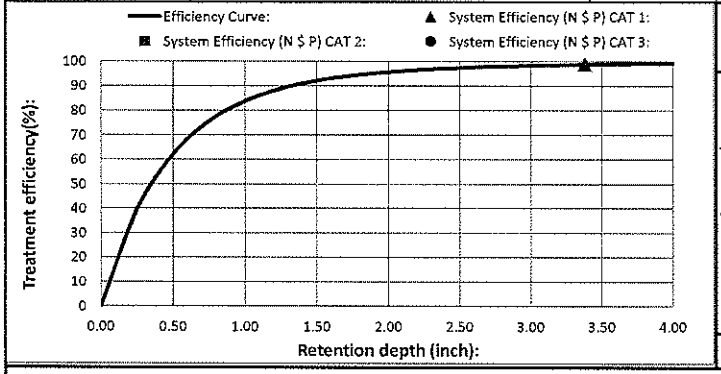
RETENTION BASIN SERVING: **Basin G**

	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Watershed area:	12.580	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	89.267				%
Required Treatment Eff (**Phosphorus**):	87.360				%
Required retention depth over the watershed to meet required efficiency:	1.288	0.000	0.000	0.000	in
Required water quality retention volume:	1.350	0.000	0.000	0.000	ac-ft

ERROR MESSAGE WINDOW FOR SINGLE RETENTION BASIN:

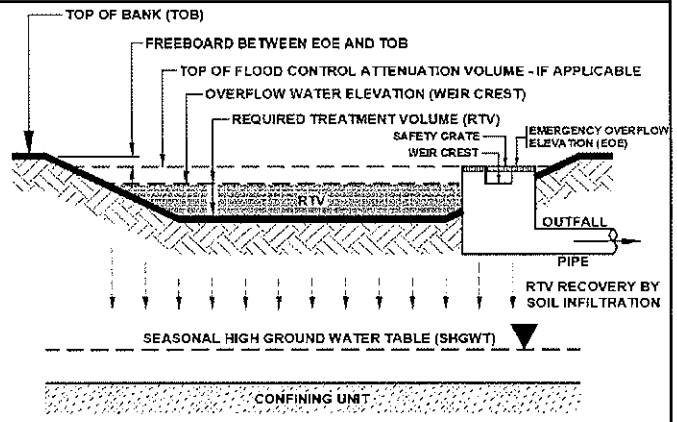
RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (use only if there is a need for additional removal efficiencies in a series of BMPs) :

Provided retention depth (inches over the watershed area):	3.380				in
Provided treatment efficiency (**Nitrogen**):	98.701	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	98.701	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	0.000				%
Remaining retention depth needed:	0.000	0.000	0.000	0.000	in



NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered.



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

View Media Mixes

	Catchment 1	Catchment 2	Catchment 3	Catchment 4
If using media mix as a filter before water enters the ground, specify type				
Average Nitrogen concentration in the filter effluent **entering groundwater** in mg/L	0.000	0.000	0.000	0.000
Average Phosphorus concentration in the filter effluent **entering groundwater** in mg/L	0.000	0.000	0.000	0.000

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	11/18/13
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DRP	04/10/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H1 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	4.88	239.12
Impervious (Paved parking, roads, etc.)			98	4.05	396.90
Pond footprint	Astatula	A	49	1.98	97.02
			TOTALS	10.91	**733.04**

COMPOSITE CN	67.19

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	4.88	2.25	**2.04**
SJRWMD Open Basin	10 yr / 24 hr	7.50	4.88	3.73	**3.39**
SJRWMD Open Basin	25 yr / 24 hr	8.60	4.88	4.65	**4.22**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	11/18/13
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H1 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	1.49	73.01
Impervious (Paved parking, roads, etc.)			98	7.44	729.12
Pond pervious area	Astatula	A	49	1.98	97.02
			TOTALS	**10.91**	**899.15**

COMPOSITE CN	82.42

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.13	3.66	**3.33**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.13	5.43	**4.94**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.13	6.48	**5.89**

URS

MADE BY:	DTL	DATE: 11/18/13	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 01/30/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: H1	BASIN: Basin H

Water Quality

Total Basin Area = 10.91 ac
Paved Area = 7.44 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.45	Ac-Ft
B.	1.25 " Over Paved Area =	0.78	Ac-Ft
	Required PAV for off-line retention =	0.78	Ac-Ft

On-Line Dry Retention

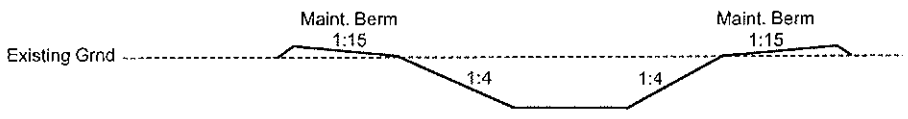
0.50 " Over Total Basin Area + Required off-line PAV =	1.23	Ac-Ft
Required On-Line Treatment (PAV) =	1.23	Ac-Ft
Required Attenuation (Post - Pre) =	1.29	Ac-Ft (3yr / 24hr)
Required Attenuation (Post - Pre) =	1.55	Ac-Ft (10yr / 24hr)
Required Attenuation (Post - Pre) =	1.67	Ac-Ft (25yr / 24hr)
Required Treament Vol. + Attentuation Vol. =	2.90	Ac-Ft (25yr / 24hr SJRWMD Open Basin)
Required Treatment Vol. + Stormsewer Attentuation Vol. =	2.52	Ac-Ft (3yr / 24hr closed system)

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
41.00	**Pond R/W** (1:2 max slope tie down)	2.41				
47.00	**Out Berm**	1.98				9.57
			1.73	1.00	1.73	
46.00	**Inside Berm**	1.47				7.84
			1.41	1.00	1.41	
45.00	Provided Treatment Vol. + Attentuation Vol.	1.35				6.43
			1.16	3.04	3.53	
41.96	Required Treatment Vol. + Attentuation Vol.	0.98				2.90
			0.95	0.40	0.38	
41.56	Estimated Stormsewer Tailwater	0.93				2.52
			0.83	1.56	1.30	
40.00	Required Treatment Vol. (PAV)	0.74				1.23
			0.61	2.00	1.23	
38.00	**Bottom**	0.49				

Required Treatment Vol. + Attentuation Vol. = 2.90 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 41.96 Ft
Provided Treatment Vol. + Attentuation Vol. = 6.43 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 45.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 2.52 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 41.56 Ft



Additional 20% of Pond R/W = 2.89 AC

URS

MADE BY: DTL | DATE: 11/18/13 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: H1 | BASIN: Basin H

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 41.56 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 8.93 ac

3) Lowest gutter elevation in Basin for HGL check

Station	400+00
Baseline	CL46
Offset (ft)	10.00
Elevation (ft)	41.90

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 0.34 ft

5) Pipe length from Pond to lowest gutter point = 120 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.82
int. = 6.50 in/hr
A = 8.93 ac
Q = 47.88 cfs

Manning's n = 0.012
Sum K = 2.37
V = 2.44 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.25 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 5.0 ft
60 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 39.5 ft along SR 46. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

As an option, untreated stormwater runoff from CR 426 could be conveyed to proposed Pond H1 to compensate for the amount proposed roadway improvements along SR 46 that can not be hydraulically collected.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/10/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H2 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	4.88	239.12
Impervious (Paved parking, roads, etc.)			98	4.05	396.90
Pond footprint	Astatula	A	49	1.95	95.55
			TOTALS	**10.88**	**731.57**

COMPOSITE CN	67.24

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	4.87	2.25	**2.04**
SJRWMD Open Basin	10 yr / 24 hr	7.50	4.87	3.74	**3.39**
SJRWMD Open Basin	25 yr / 24 hr	8.60	4.87	4.65	**4.22**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H2 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	1.49	73.01
Impervious (Paved parking, roads, etc.)			98	7.44	729.12
Pond pervious area	Astatula	A	49	1.95	95.55
			TOTALS	**10.88**	**897.68**

COMPOSITE CN	82.51

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.12	3.67	**3.33**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.12	5.44	**4.94**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.12	6.49	**5.89**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 2/28/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: H2	BASIN: Basin H

Water Quality

Total Basin Area = 10.88 ac
Paved Area = 7.44 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.45	Ac-Ft
B.	1.25 " Over Paved Area =	0.78	Ac-Ft
	Required PAV for off-line retention =	**0.78**	Ac-Ft

On-Line Dry Retention

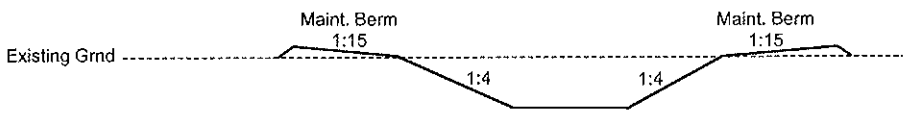
0.50 " Over Total Basin Area + Required off-line PAV =	**1.23**	Ac-Ft
Required On-Line Treatment (PAV) =	**1.23**	Ac-Ft
Required Attenuation (Post - Pre) =	**1.29**	Ac-Ft 3yr / 24hr
Required Attenuation (Post - Pre) =	**1.55**	Ac-Ft 10yr / 24hr
Required Attenuation (Post - Pre) =	**1.67**	Ac-Ft 25yr / 24hr
Required Treament Vol. + Attentuation Vol. =	**2.90**	Ac-Ft 25yr / 24hr SJRWMD Open Basin
Required Treatment Vol. + Stormsewer Attentuation Vol. =	**2.52**	Ac-Ft 3yr / 24hr closed system

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
56.00	**Pond R/W** (1:2 max slope tie down)	2.47				
47.00	**Out Berm**	1.95				11.15
			1.75	1.00	1.75	
46.00	**Inside Berm**	1.55				9.40
			1.50	1.00	1.50	
45.00	Provided Treatment Vol. + Attentuation Vol.	1.46				7.90
			1.27	3.93	5.00	
41.07	Required Treatment Vol. + Attentuation Vol.	1.09				**2.90**
			1.07	0.35	0.37	
40.72	Estimated Stormsewer Tailwater	1.06				**2.52**
			0.99	1.30	1.29	
39.42	Required Treatment Vol. (PAV)	0.93				**1.23**
			0.87	1.42	1.23	
38.00	**Bottom**	0.80				

Required Treatment Vol. + Attentuation Vol. = 2.90 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 41.07 Ft
Provided Treatment Vol. + Attentnation Vol. = 7.90 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 45.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 2.52 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 40.72 Ft



Additional 20% of Pond R/W = 2.96 AC

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DET | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: H2 | BASIN: Basin H

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 40.72 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 8.93 ac

3) Lowest gutter elevation in Basin for HGL check

Station	400+00
Baseline	CL46
Offset (ft)	10.00
Elevation (ft)	41.90

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.18 ft

5) Pipe length from Pond to lowest gutter point = 400 ft

6) Rational Method for contributing runoff - Q=CiA

C =	0.82	
int. =	6.50	in/hr
A =	8.93	ac
Q =	47.88	cfs
Manning's n =	0.012	
Sum K =	2.39	
V =	3.81	fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 0.91 trial
<actual HL - OK
n = Manning's n
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.0 ft
48 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 39.5 ft along SR 46. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

As an option, untreated stormwater runoff from CR 426 could be conveyed to proposed Pond H2 to compensate for the amount proposed roadway improvements along SR 46 that can not be hydraulically collected.

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	PRE	CHECKED BY:	DEP	04/18/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H3 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	4.88	239.12
Impervious (Paved parking, roads, etc.)			98	4.05	396.90
Pond footprint	Astatula	A	49	1.98	97.02
			TOTALS	**10.91**	**733.04**

COMPOSITE CN	**67.19**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	4.88	2.25	**2.04**
SJRWMD Open Basin	10 yr / 24 hr	7.50	4.88	3.73	**3.39**
SJRWMD Open Basin	25 yr / 24 hr	8.60	4.88	4.65	**4.22**

URS				
PROJECT TITLE:	SR 46 PD&E			
PROJECT NUMBER:	240216-4-28-1			DATE
BASIN DESIGNATION:	Basin H	MADE BY:	DTL	02/25/14
BASIN ANALYSIS (PRE/POST):	POST	CHECKED BY:	DEP	04/16/14

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Basin H / Pond H3 - Urban					
Open Space - Fair Conditions	Astatula (100%)	A	49	1.49	73.01
Impervious (Paved parking, roads, etc.)			98	7.44	729.12
Pond pervious area	Astatula	A	49	1.98	97.02
			TOTALS	**10.91**	**899.15**

COMPOSITE CN	82.42

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S ----------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R ----------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) ----------> V(R) = (R / 12)*BASIN AREA (acres-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Open Basin	3 yr / 24 hr	5.60	2.13	3.66	**3.33**
SJRWMD Open Basin	10 yr / 24 hr	7.50	2.13	5.43	**4.94**
SJRWMD Open Basin	25 yr / 24 hr	8.60	2.13	6.48	**5.89**

URS

MADE BY:	DTL	DATE: 02/25/14	PROJECT NO.: 240216-4-28-1
CHECKED BY:	DEP	DATE: 04/30/14	
CALCULATIONS FOR:	SR 46 PD&E	POND: H3	BASIN: Basin H

Water Quality

Total Basin Area = 10.91 ac
Paved Area = 7.44 ac

Off-Line Dry Retention

A.	0.50 " Over Total Basin Area =	0.45	Ac-Ft
B.	1.25 " Over Paved Area =	0.78	Ac-Ft
	Required PAV for off-line retention =	0.78	Ac-Ft

On-Line Dry Retention

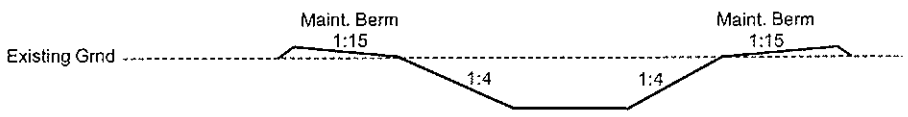
0.50 " Over Total Basin Area + Required off-line PAV =	1.23	Ac-Ft
Required On-Line Treatment (PAV) =	1.23	Ac-Ft
Required Attenuation (Post - Pre) =	1.29	Ac-Ft (3yr / 24hr)
Required Attenuation (Post - Pre) =	1.55	Ac-Ft (10yr / 24hr)
Required Attenuation (Post - Pre) =	1.67	Ac-Ft (25yr / 24hr)
Required Treament Vol. + Attentuation Vol. =	2.90	Ac-Ft (25yr / 24hr SJRWMD Open Basin)
Required Treatment Vol. + Stormsewer Attentuation Vol. =	2.52	Ac-Ft (3yr / 24hr closed system)

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
56.00	**Pond R/W** (1:2 max slope tie down)	2.48				
47.00	**Out Berm**	1.98				11.63
			1.79	1.00	1.79	
46.00	**Inside Berm**	1.59				9.84
			1.55	1.00	1.55	
45.00	Provided Treatment Vol. + Attentuation Vol.	1.50				8.30
			1.32	4.10	5.39	
40.90	Required Treatment Vol. + Attentuation Vol.	1.13				2.90
			1.12	0.34	0.38	
40.56	Estimated Stormsewer Tailwater	1.10				2.52
			1.04	1.24	1.30	
39.32	Required Treatment Vol. (PAV)	0.99				1.23
			0.93	1.32	1.23	
38.00	**Bottom**	0.87				

Required Treatment Vol. + Attentuation Vol. = 2.90 Ac-Ft
Required Treatment Vol. + Attentuation Stage = 40.90 Ft
Provided Treatment Vol. + Attentuation Vol. = 8.30 Ac-Ft
Provided Treatment Vol. + Attentuation Stage = 45.00 Ft

Required Treatment Vol. + Stormsewer Attentuation Vol. = 2.52 Ac-Ft
Estimated Stormsewer Tailwater Elevation = 40.56 Ft



Additional 20% of Pond R/W = 2.98 AC

URS

MADE BY: DTL | DATE: 02/25/14 | PROJECT NO.: 240216-4-28-1
CHECKED BY: DEP | DATE: 05/12/14
PROJECT: SR 46 PD&E | POND: H3 | BASIN: Basin H

Hydraulic Grade Line Clearance Calculations

1) Estimated tailwater elevation in the pond (for preliminary storm sewer design) = 40.56 ft

2) Calculation of post-development area for HGL check

Baseline	From Station	To Station	Length (ft)	Roadway width (ft)	Area (ac)
				Total	

or see Post CN worksheet 8.93 ac

3) Lowest gutter elevation in Basin for HGL check

Station	400+00
Baseline	CL46
Offset (ft)	10.00
Elevation (ft)	41.90

4) Allowable Head Loss = lowest gutter el - est. tailwater el = 1.34 ft

5) Pipe length from Pond to lowest gutter point = 710 ft

6) Rational Method for contributing runoff - Q=CiA

C = 0.82
int. = 6.50 in/hr
A = 8.93 ac
Q = 47.88 cfs

Manning's n = 0.012
Sum K = 2.41
V = 3.81 fps

7) Estimation of Pipe Size

HL = [4.61*(n^2)*L*(Q^2)]/(D^5.33) + K(V^2)/2g

HL = Allowable Head Loss (ft) 1.21 trial
n = Manning's n <actual HL - OK
L = Length (ft)
Q = Runoff (cfs)
D = Pipe diameter (ft)
K = coefficient for minor losses
V = pipe velocity (fps)
g = gravitational constant (32.2 ft/sec^2)

8) Estimated Pipe Diameter to satisfy the conditions = 4.0 ft
48 in

** Please note: Seminole County Lidar data indicate elevations of the existing roadway within this basin to be approximately 39.5 ft along SR 46. Thus, portions of the proposed roadway profile will need to be elevated to obtain the lowest gutter elevation used in this HGL clearance calculation.

As an option, untreated stormwater runoff from CR 426 could be conveyed to proposed Pond H3 to compensate for the amount proposed roadway improvements along SR 46 that can not be hydraulically collected.

PONDS Version 3.3.0229
Retention Pond Recovery - Refined Method

Devo Seereeram, Ph.D., P.E.

Project Data

Project Name:	SR 46 PD&E
Simulation Description:	Pond H : Volume below the weir elevation has been used as a slug load
Project Number:	
Engineer :	DTL
Supervising Engineer:	
Date:	11-18-2013

Aquifer Data

Base Of Aquifer Elevation, [B] (ft datum):	22.36
Water Table Elevation, [WT] (ft datum):	33.36
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	20.00
Fillable Porosity, [n] (%):	25.00
Unsaturated Vertical Infiltration Rate, [Iv] (ft/day):	20.0
Maximum Area For Unsaturated Infiltration, [Av] (ft²):	21424.4

Information obtained from Preliminary Roadway Soil Survey PD&E study for SR 46 Ardaman & Assoc., Inc.

Geometry Data

Equivalent Pond Length, [L] (ft):	561.0
Equivalent Pond Width, [W] (ft):	38.0

Ground water mound is expected to intersect the pond bottom

Stage vs Area Data

Stage (ft datum)	Area (ft²)
38.00	21424.4
46.00	63945.9
47.00	86076.5

Scenario Input Data

Scenario 1 :: 53578.8 ft³ slug load

Hydrograph Type: Slug Load
Modflow Routing: Routed with infiltration

Treatment Volume (ft³) 53578.8

Initial ground water level (ft datum) default, 33.36

Time After Storm Event (days)	Time After Storm Event (days)
0.100	2.000
0.250	2.500
0.500	3.000
1.000	
1.500	

Detailed Results :: *Scenario 1 :: 53578.8 ft³ slug load*

Elapsed Time (hours)	Inflow Rate (ft³/s)	Outside Recharge (ft/day)	Stage Elevation (ft datum)	Infiltration Rate (ft³/s)	Overflow Discharge (ft³/s)	Cumulative Inflow Volume (ft³)	Cumulative Infiltration Volume (ft³)	Cumulative Discharge Volume (ft³)	Flow Type
0.000	8929.8000	0.0000	33.360	0.00000	0.00000	0.0	0.0	0.0	N.A.
0.002	8929.8000	0.0000	40.002	4.95926	0.00000	53578.8	29.8	0.0	U/P
2.400	0.0000	0.0000	38.522	3.19686	0.00000	53578.8	41674.8	0.0	U/S
6.000	0.0000	0.0000	38.098	0.50882	0.00000	53578.8	51464.5	0.0	S
* 12.000	0.0000	0.0000	37.182	0.06526	0.00000	53578.8	53578.8 *	0.0	S
24.000	0.0000	0.0000	36.248	0.00000	0.00000	53578.8	53578.8	0.0	S
36.000	0.0000	0.0000	35.739	0.00000	0.00000	53578.8	53578.8	0.0	S
48.000	0.0000	0.0000	35.413	0.00000	0.00000	53578.8	53578.8	0.0	S
60.000	0.0000	0.0000	35.183	0.00000	0.00000	53578.8	53578.8	0.0	S
72.000	0.0000	0.0000	35.010	----	----	53578.8	53578.8	0.0	N.A.

* Recovers entire PAU in 12 hours

Basin H

WATERSHED CHARACTERISTICS

GO TO STORMWATER TREATEMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

SELECT CATCHMENT CONFIGURATION

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

CATCHMENT NO.1 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use: Agricultural - General: TN=2.790 TP=0.431				
with default EMCs: CLICK ON CELL BELOW TO SELECT				
Post-development land use: Highway: TN=1.640 TP=0.220				
with default EMCs	Total			

Total pre-development catchment area:	10.91	AC
Total post-development catchment or BMP analysis area:	10.91	AC
Pre-development Non DCIA CN:	67.19	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	49.00	
Post-development DCIA percentage:	68.19	%
Estimated Area of BMP (used for rainfall excess not loadings)	1.98	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - Nitrogen:	7.597	kg/year
Pre-development Annual Mass Loading - Phosphorus:	1.174	kg/year
Post-development Annual Mass Loading - Nitrogen:	41.866	kg/year
Post-development Annual Mass Loading - Phosphorus:	5.616	kg/year

CATCHMENT NO.2 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
	Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - Nitrogen:		kg/year
Pre-development Annual Mass Loading - Phosphorus:		kg/year
Post-development Annual Mass Loading - Nitrogen:		kg/year
Post-development Annual Mass Loading - Phosphorus:		kg/year

CATCHMENT NO.3 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
	Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - Nitrogen:		kg/year
Pre-development Annual Mass Loading - Phosphorus:		kg/year
Post-development Annual Mass Loading - Nitrogen:		kg/year
Post-development Annual Mass Loading - Phosphorus:		kg/year

CATCHMENT NO.4 CHARACTERISTICS:

\ If mixed land uses (side calculation)

CLICK ON CELL BELOW TO SELECT	Land use	Area Acres	non DCIA CN	%DCIA
Pre-development land use:				
CLICK ON CELL BELOW TO SELECT				
Post-development land use:				
	Total			

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated Area of BMP (used for rainfall excess not loadings)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

CLICK ON CELL BELOW TO SELECT:
USE DEFAULT CONCENTRATIONS

Pre-development Annual Mass Loading - Nitrogen:		kg/year
Pre-development Annual Mass Loading - Phosphorus:		kg/year
Post-development Annual Mass Loading - Nitrogen:		kg/year
Post-development Annual Mass Loading - Phosphorus:		kg/year

Basin H

RETENTION BASIN:

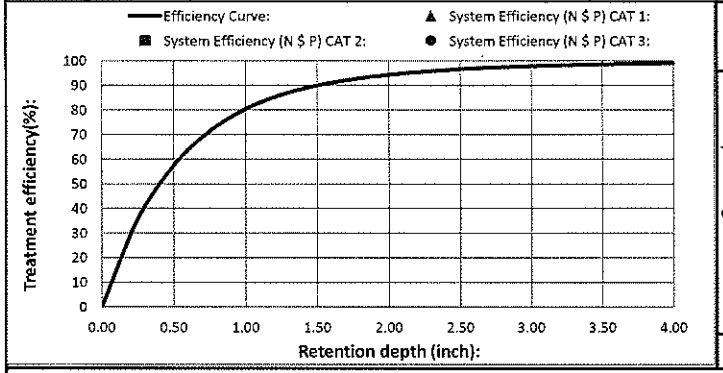
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	Basin H				
	Catchment 1	Catchment 2	Catchment 3	Catchment 4	
Watershed area:	8.930	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	81.854				%
Required Treatment Eff (**Phosphorus**):	79.104				%
Required retention depth over the watershed to meet required efficiency:	1.071	0.000	0.000	0.000	in
Required water quality retention volume:	0.797	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (use only if there is a need for additional removal efficiencies in a series of BMPs) :

Provided retention depth (inches over the watershed area):	7.072				in
Provided treatment efficiency (**Nitrogen**):	98.943	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	98.943	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	0.000				%
Remaining retention depth needed:	0.000	0.000	0.000	0.000	in

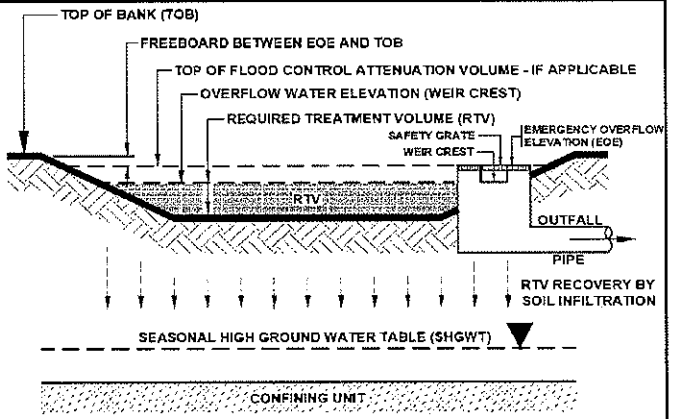


NOTE FOR TREATEMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered.

ERROR MESSAGE WINDOW FOR SINGLE RETENTION BASIN:

WARNING: THE PROVIDED RETENTION EXCEEDS THE HIGHEST RETENTION ASSOCIATED WITH THE RETENTION EFFICIENCY TABLES (SEE APPENDIX D OF THE HARPER REPORT DATED JUNE 2007). THE SPREADSHEET WILL COMPUTE THE EFFICIENCY BASED ON THE 4.00 INCHES OF RETENTION



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

View Media Mixes

	Catchment 1	Catchment 2	Catchment 3	Catchment 4
If using media mix as a filter before water enters the ground, specify type				
Average Nitrogen concentration in the filter effluent **entering groundwater** in mg/L	0.000	0.000	0.000	0.000
Average Phosphorus concentration in the filter effluent **entering groundwater** in mg/L	0.000	0.000	0.000	0.000

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

APPENDIX G

Pond Alternatives Location Plans

MATCH LINE A-A

STERLING MEADOWS

KLONDIKE PL

CAMERON AVE

WHITES SITE DEVELOPMENT

SR 415 WIDENING
FPN 407355-1-52-01
DONE BY OTHERS

EXIST POND

N

0 50 200

Feet

EXIST R/W

SR 46 WIDENING
FPN 240216-2-52-01
DONE BY OTHERS

BEGIN PROJECT
STA 0+00.00

415

46

KANGAROO MARATHON

EXIST R/W

PROPOSED R/W

℄ SR 46

5

10

℄ SR 46 STA 0+00.00

℄ SR 46 STA 14+00.00

EXIST R/W

RACE TRAC

EAST LAKE MARY BLVD

EXIST R/W

BEGIN CONSTRUCTION
STA 7+13.36

PROPOSED R/W

MATCH LINE A-A

CAMERON AVE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

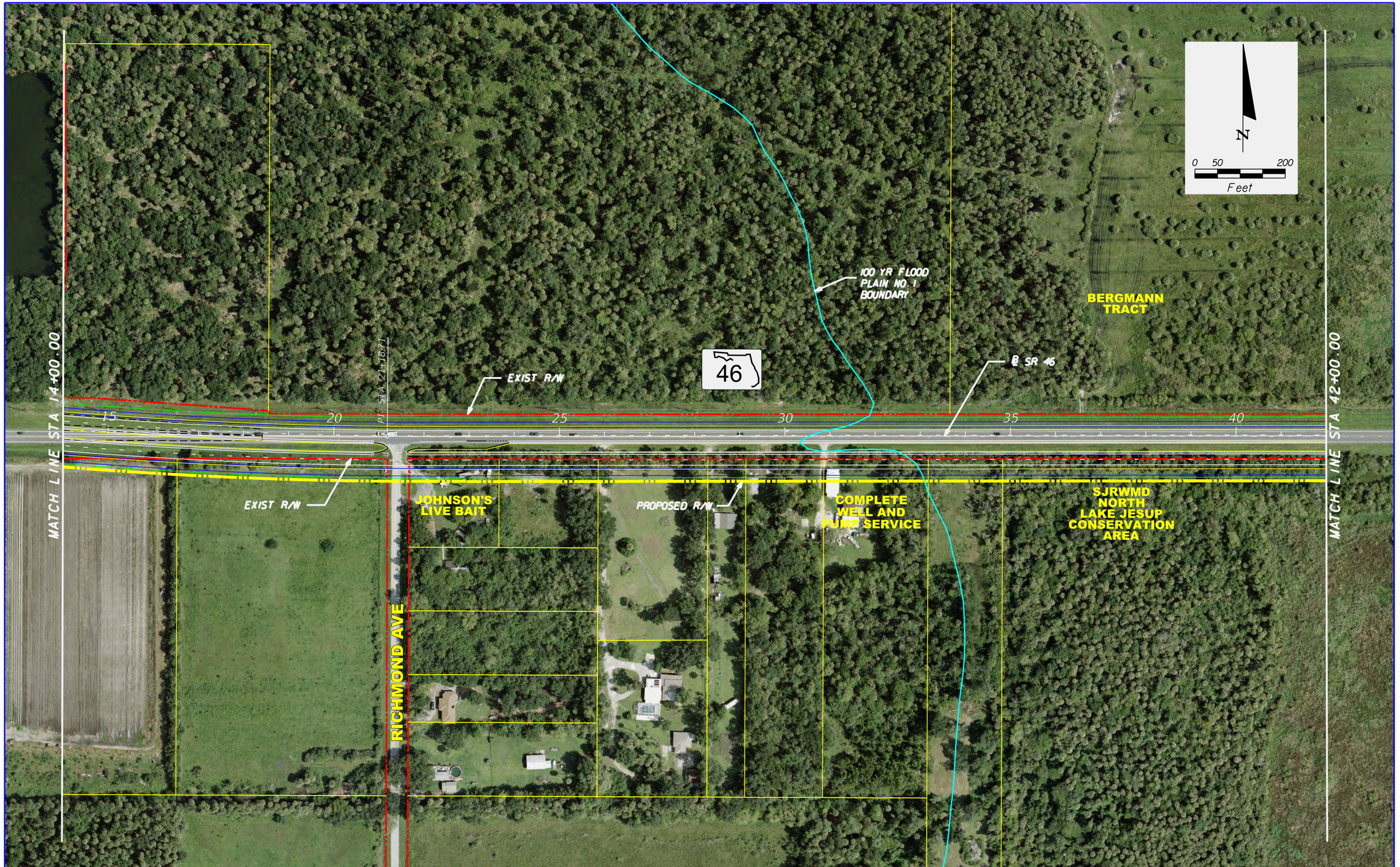
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:09:36 PM I:\Projects\2722145 SR46 PDE\roadway\plan\alternatives\suburban south\planrd3_DTL.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

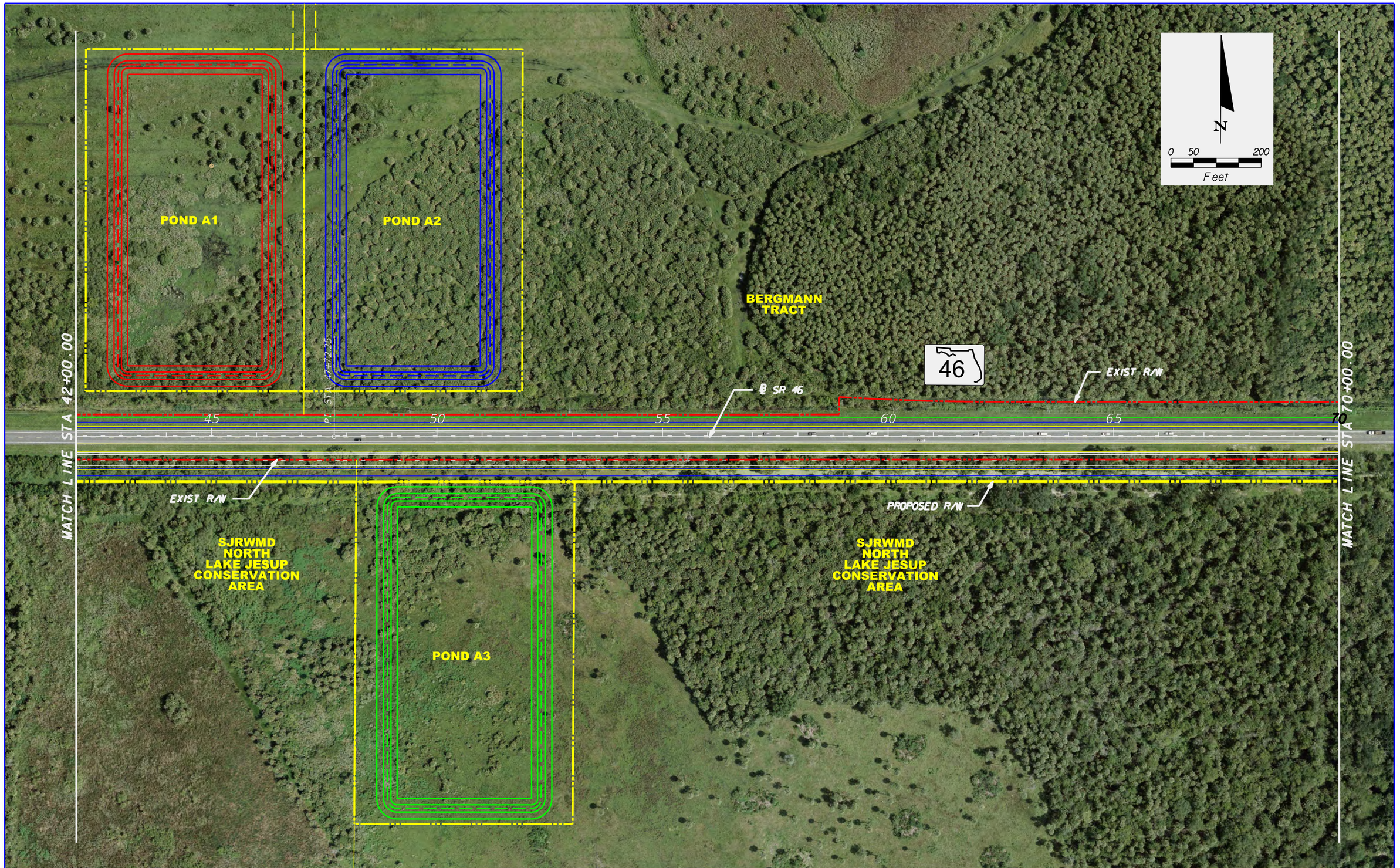
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:12:00 PM I:\Projects\2722145 SR46 PDE\roadway\plan\alternatives\suburban south\planrd4.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

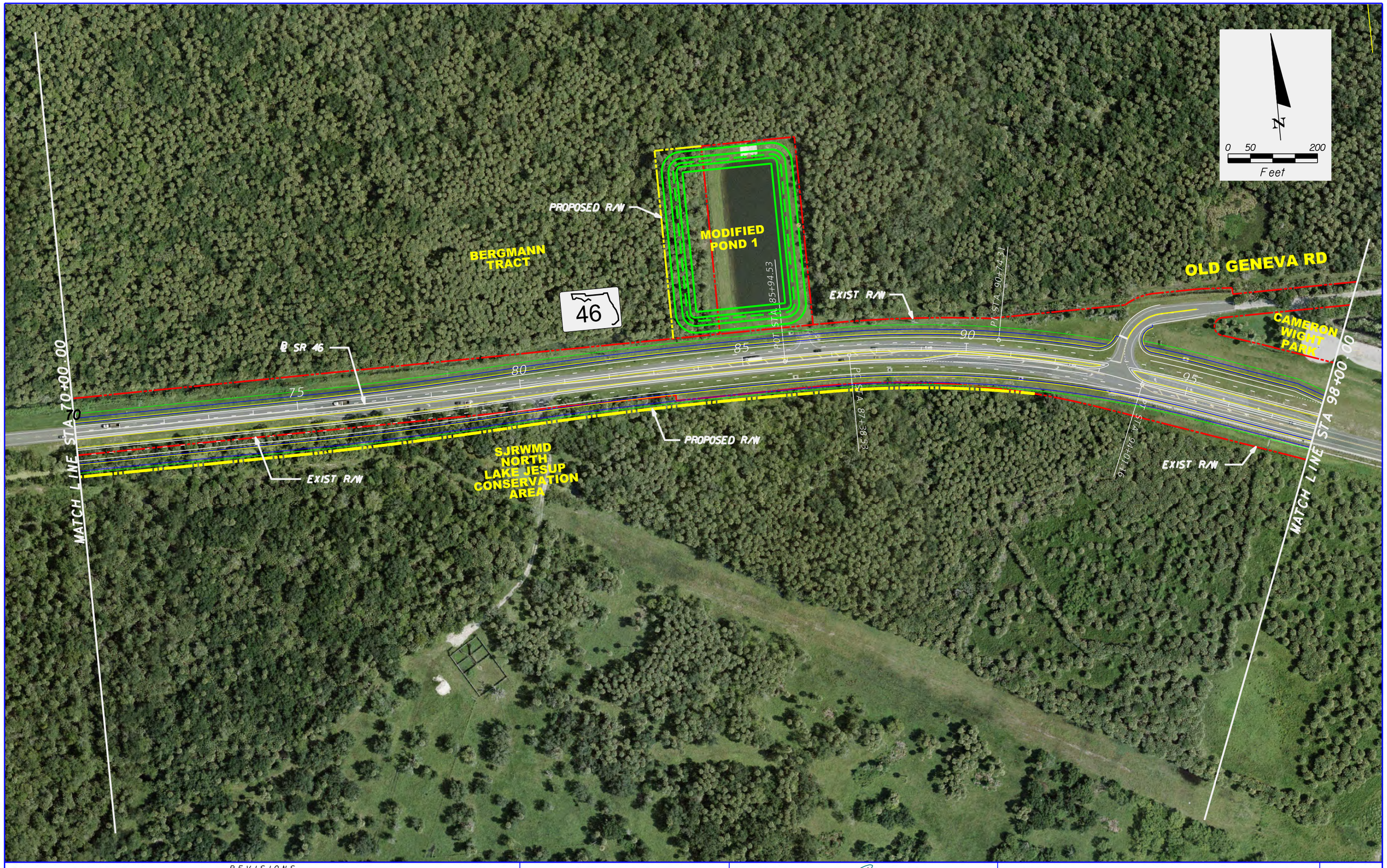
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:15:16 PM I:\Projects\2722145 SR46 PDE\roadway\plan\alternatives\suburban south\planrd5.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:16:50 PM I:\Projects\27722145 SR46 PDE\roadway\plan\alternatives\suburban south\planrd6.dgn

CATFISH COVE

100 YR FLOOD PLAIN NO. 1 BOUNDARY

ST. JOHNS RIVER

GOVERNMENT CUT

VOLUSIA COUNTY

SEMINOLE COUNTY

100 YR FLOOD PLAIN NO. 1 BOUNDARY

EXIST R/W

N

0 50 200

Feet

CAMERON WIGHT PARK

MATCH LINE STA 98+00.00

@ SR 46

P.I. STA. 121+17.30

100 105 110 115 120 125

EXIST R/W

SJRWMD NORTH LAKE JESUP CONSERVATION AREA

SEMINOLE COUNTY

VOLUSIA COUNTY

46

P.C. STA. 115+01.30

100 YR FLOOD PLAIN NO. 1 BOUNDARY

CHANNEL B

SJRWMD NORTH LAKE JESUP CONSERVATION AREA

MATCH LINE STA 126+00.00

100 YR FLOOD PLAIN NO. 1 BOUNDARY

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:18:51 PM I:\Projects\2722145 SR46 PDE\roadway\plan\alternatives\suburban south\planrd7.dgn

VOLUSIA COUNTY

SEMINOLE COUNTY

ST. JOHNS RIVER

100 YR FLOOD PLAIN NO. 1 BOUNDARY

100 YR FLOOD PLAIN NO. 1 BOUNDARY

N

0 50 200

Feet

COMP POND 2

MODIFIED POND 2

EXIST R/W

PROPOSED R/W

W OSCEOLA RD

EXIST R/W

B SR 46

46

MATCH LINE STA 126+00.00

PT STA 127+31.42

EXIST R/W

PC STA 143+71.67

MATCH LINE STA 154+00.00

SWAMP LN

CLERK CIR

100 YR FLOOD PLAIN NO. 1 BOUNDARY

SJRWMD NORTH LAKE JESUP CONSERVATION AREA

LEGEND:

- PAVEMENT TO BE REMOVED
- EXIST R/W LINE
- PROPOSED R/W LINE
- PROPERTY LINE
- RETENTION AREA

REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

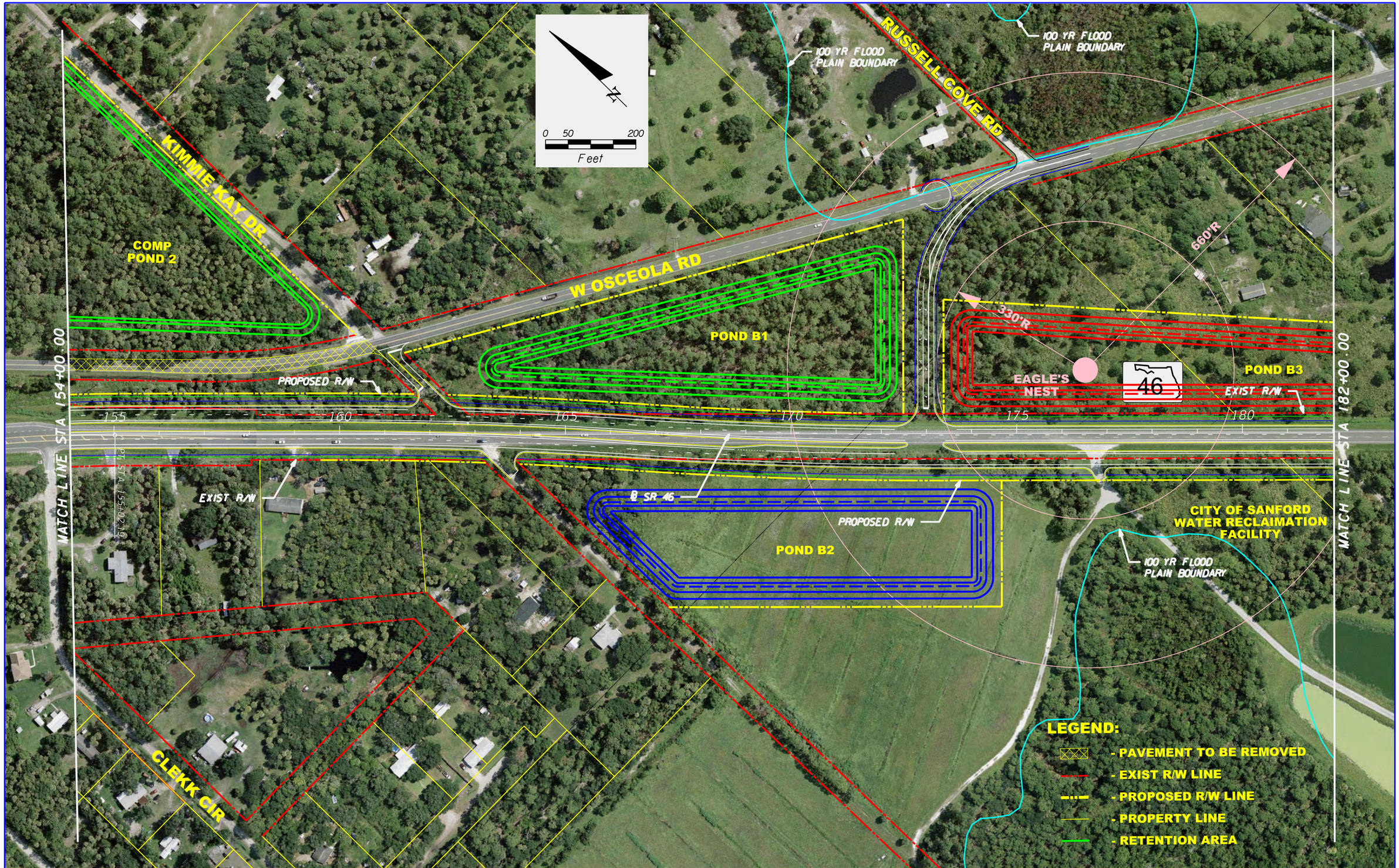
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:20:26 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd8.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:24:31 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd9.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

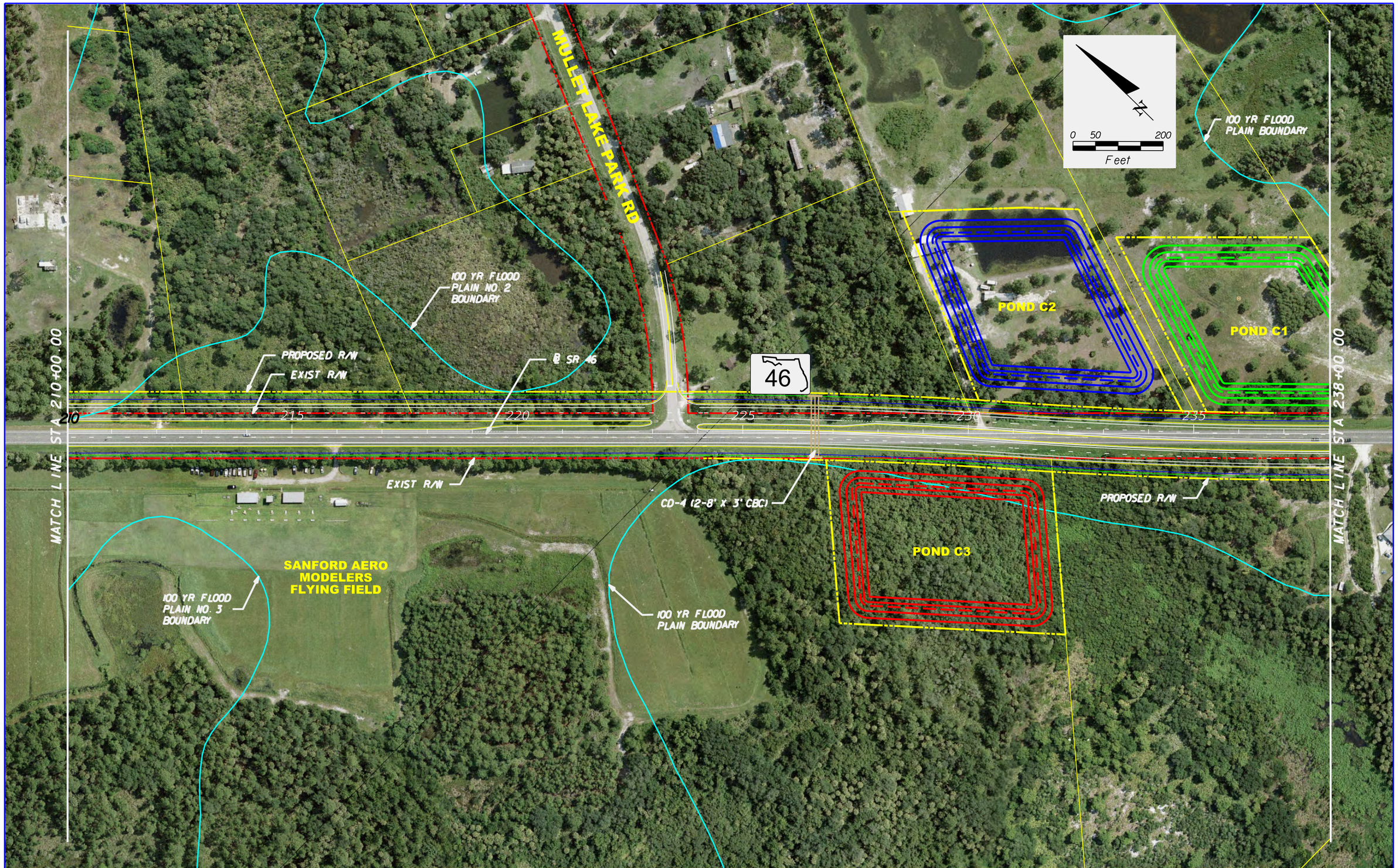
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:26:19 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd10.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:27:38 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrdll.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

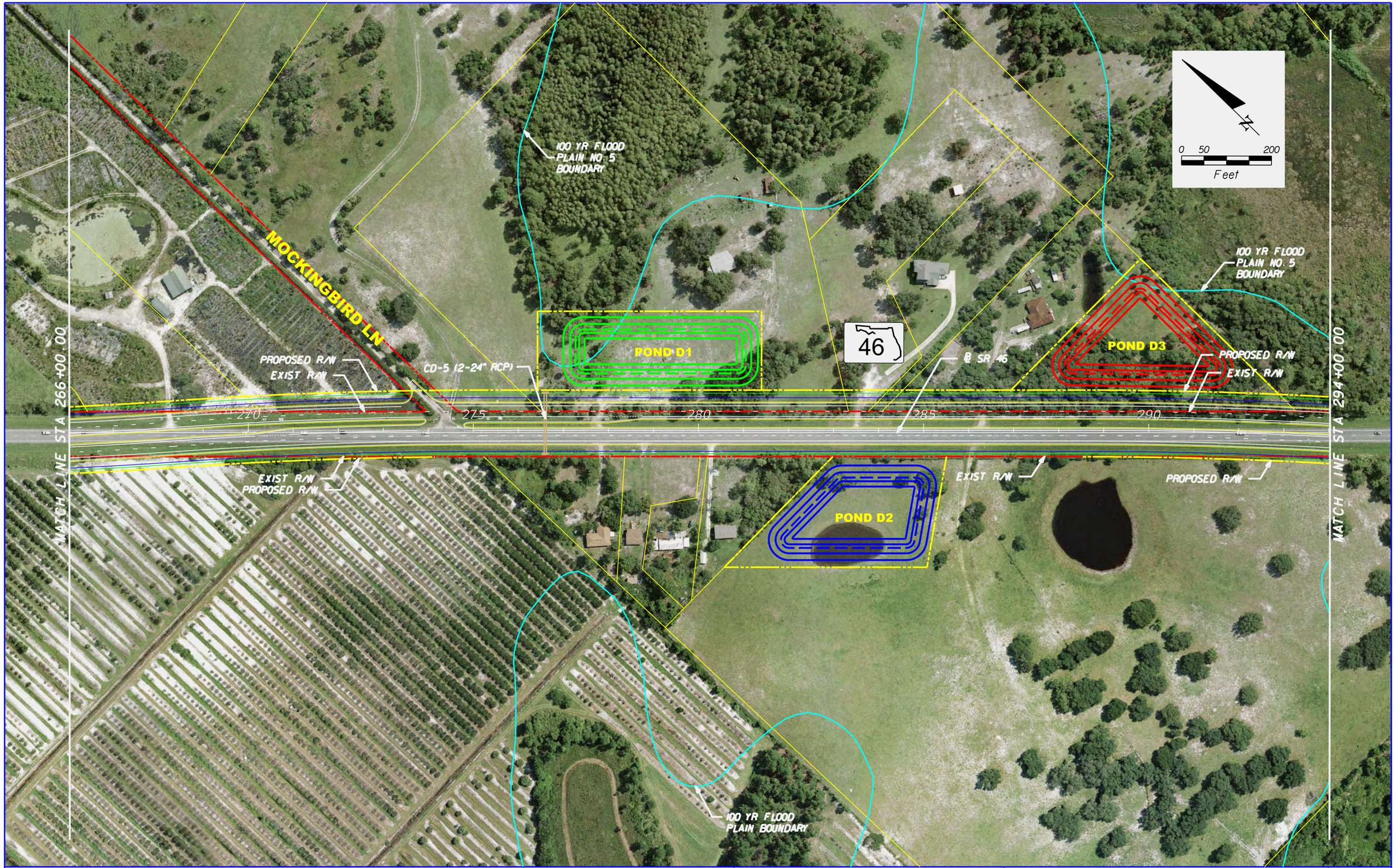
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:31:03 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd12.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

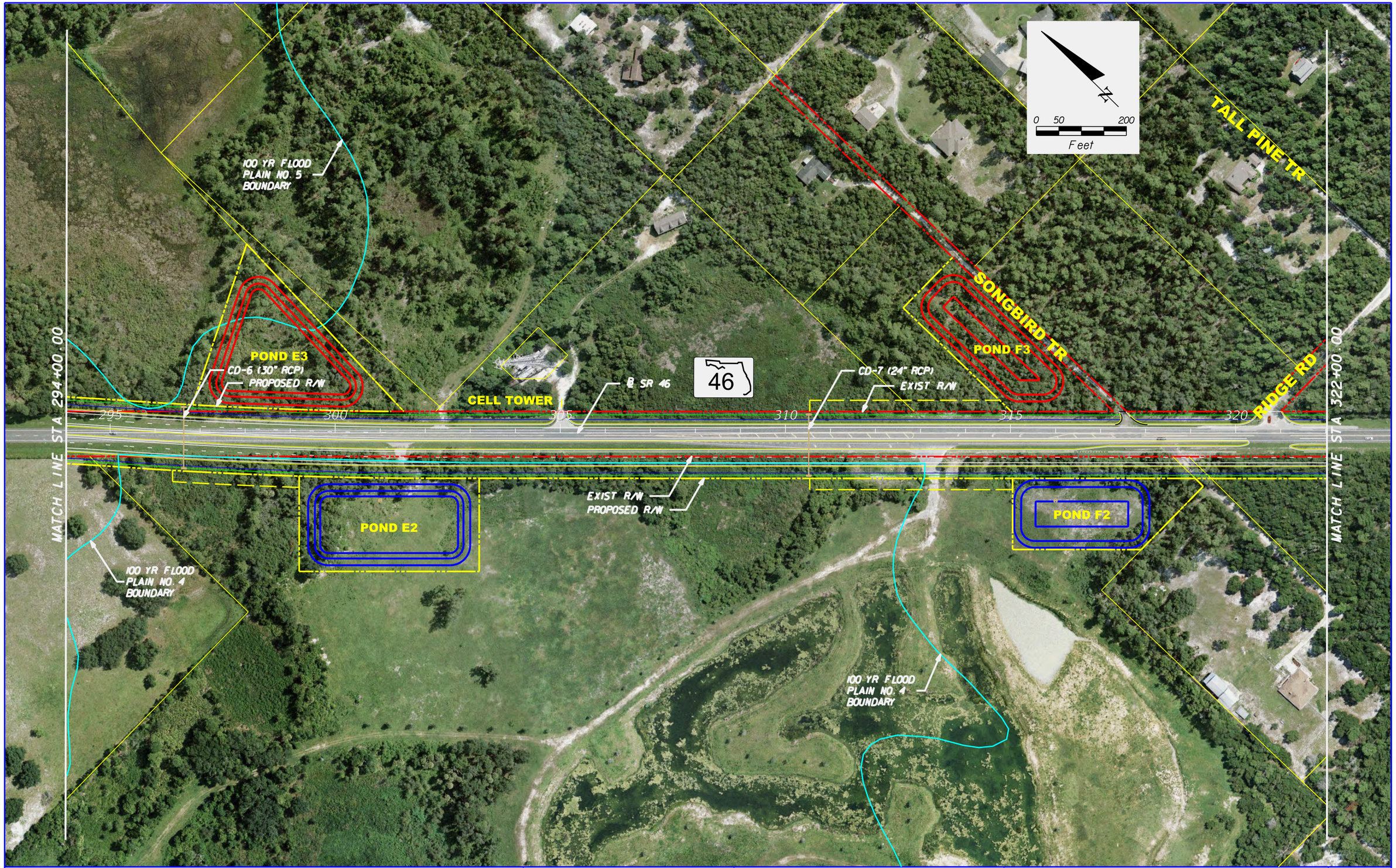
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:32:31 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd13.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:33:54 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd14.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:35:15 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd15.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:36:23 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd16.dgn

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

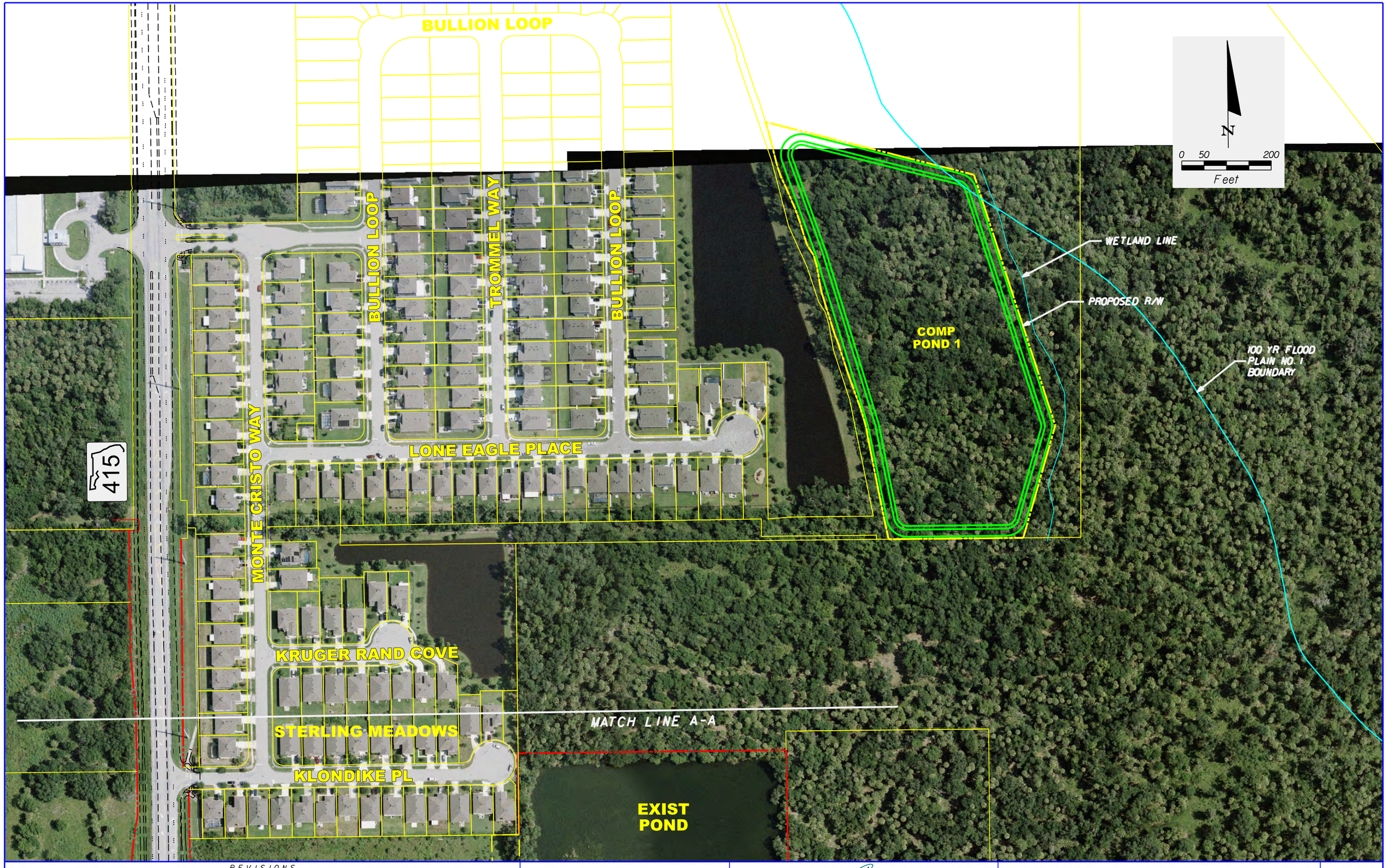
SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:37:39 PM I:\Projects\2722145 SR46 PDE\roadway\plan\suburban\planrd17.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

POND ALTERNATIVES LOCATION PLANS

SHEET NO.

danh_lee 4/1/2014 5:39:23 PM I:\Projects\2722145 SR46 PDE\drainage\flood comp pond 1.dgn