DRAFT Location Hydraulics Report

Poinciana Parkway Extension

Project Development and Environment (PD&E) Study

From CR 532 to North of I-4/SR 429 Interchange

Osceola and Polk Counties, Florida

Financial Project ID (FPID) No. 446581-1
ETDM No.: 14445

Prepared By:
RS&H, Inc.
1715 N. Westshore Blvd., Suite 600
Tampa, FL 33607

March 2023

DRAFT Location Hydraulics Report

PD&E Study Poinciana Parkway Extension
Florida's Turnpike Enterprise
Financial Project ID 446581-1
Draft 2023

This DRAFT Location Hydraulic Report is based solely upon the information made available to or gathered by RS&H. RS&H does not assume responsibility for conditions, which did not come to knowledge, or conditions not recognized as unacceptable at the time this report was prepared. RS&H has performed these drainage calculations and recommendations in a manner consistent with sound practices and that level of care and skill normally exercised by members of the profession operating under similar circumstances.

I, Erik N. Scott, hereby certify that this report, as listed above, is true and correct, represents the described work and is in accordance with the requirements of this project.

This item has been digitally signed and sealed by Erik N. Scott on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

RS&H, Inc.
1715 N. Westshore Blvd., Suite 600
Tampa, Florida 33607
Certificate of Authorization No. EB00005620
Erik N. Scott, P.E. No. 72944

EXECUTIVE SUMMARY

Florida's Turnpike Enterprise (FTE) is conducting a Project Development and Environment (PD&E) study to evaluate extending Poinciana Parkway (SR 538) from County Road 532 (CR 532) to Interstate 4 (I-4)/State Road 429 (SR 429) interchange, modifying the I-4/SR 429 interchange to accommodate the Poinciana Parkway connection, and increasing capacity of SR 429 from I-4/SR 429 interchange to the SR 429/Sinclair Road interchange. The total project length is approximately four miles. The proposed project lies within Osceola and Polk Counties. Multiple corridors and various roadway geometrics have been evaluated as part of the overall process. For the purposes of this document the drainage was based on a 6-lane divided rural typical section. The purpose of this PD&E study is to evaluate engineering and environmental data and document information that will aid FTE in determining the location, type, and preliminary design of the proposed improvements.

The proposed improvements will require approximately 7 new cross culverts for the new alignment of SR 538 and 5 culvert extensions for the existing cross culverts along SR 429 and Interstate 4.

The proposed Poinciana Parkway Extension will result in impacts to the adjacent Federal Emergency Management Agency (FEMA) floodplains. The anticipated 100-year floodplain encroachments due to the proposed roadway improvements have been identified and quantified within this report. The impacts to the floodplain associated with the proposed improvements is classified as "Minimum Encroachments". "Minimal Encroachments" on a floodplain occur when there is floodplain involvement but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts.

The datum used for this study is North American Vertical Datum of 1988 (NAVD-88). The datum shift from NGVD-29 is (-)0.87-ft, with NAVD-88 being the lower elevation of the two.

$$\text{NAVD-88} = \text{NGVD-29} + \text{datum shift}$$

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

Florida's Turnpike Enterprise (FTE) is conducting a Project Development and Environment (PD&E) study to evaluate extending Poinciana Parkway (SR 538) from County Road 532 (CR 532) to Interstate 4 (I-4)/State Road 429 (SR 429) interchange and modifying the I-4/SR 429 interchange to accommodate the Poinciana Parkway connection to north of Sinclair Road. The total project length is approximately four miles. The project study area lies within Osceola and Polk Counties. Multiple corridors and various roadway geometrics have been evaluated as part of the overall process. The drainage analysis is based on the proposed 6-lane divided rural typical section. The purpose of this PD&E study is to evaluate engineering and environmental data and document information that will aid FTE in determining the location, type, and preliminary design of the proposed improvements.

2.0 PROJECT DESCRIPTION

The intent of this Location Hydraulics Report (LHR) is to identify the potential 100-year (base) floodplain encroachments resulting from the roadway improvements evaluated in this study. In accordance with 23 Code of Federal Regulation (CFR) 650 Subpart A, Section 650.111, floodplains are to be protected. The intent of these regulations is to avoid possible long- and short-term adverse impacts associated with the modification of floodplains as a result of development. These regulations urge that where impacts are anticipated, alternatives should be sought out where practical and that development incompatible with floodplain values should be avoided. Conclusions and recommendations were developed using the best available data and conceptual roadway alignment and typical sections. The cross-drain lengths and exact locations shall be verified during the design phase, when survey is available.

The proposed project lies within Osceola and Polk Counties, Florida. **Table 2-1** lists the Section, Township, and Ranges of the project. A Project Location Map is provided in **Figure 2-1.** A USGS Quad Map is provided in **Figure 2-2.**

Table 2-1: Section, Township, and Range

Range	Township	Section(s)
27E	25S	25, 26, 27, 35, 36

The datum used for this study is North American Vertical Datum of 1988 (NAVD-88). The datum shift from NGVD-29 is (-)0.87-ft, with NAVD-88 being the lower elevation of the two.

NAVD-88 = NGVD-29 + datum shift

Figure 2-1: Project Location Map

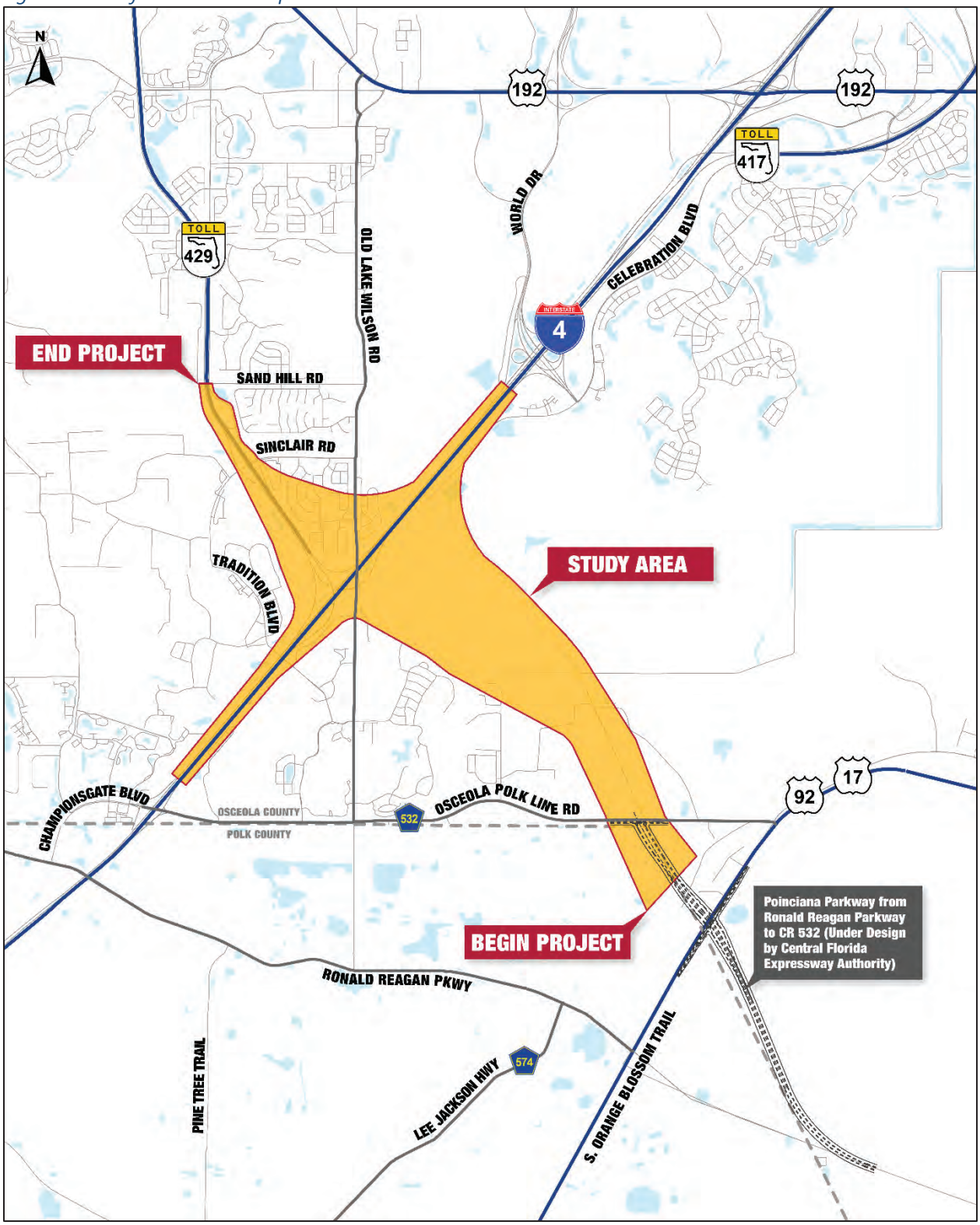
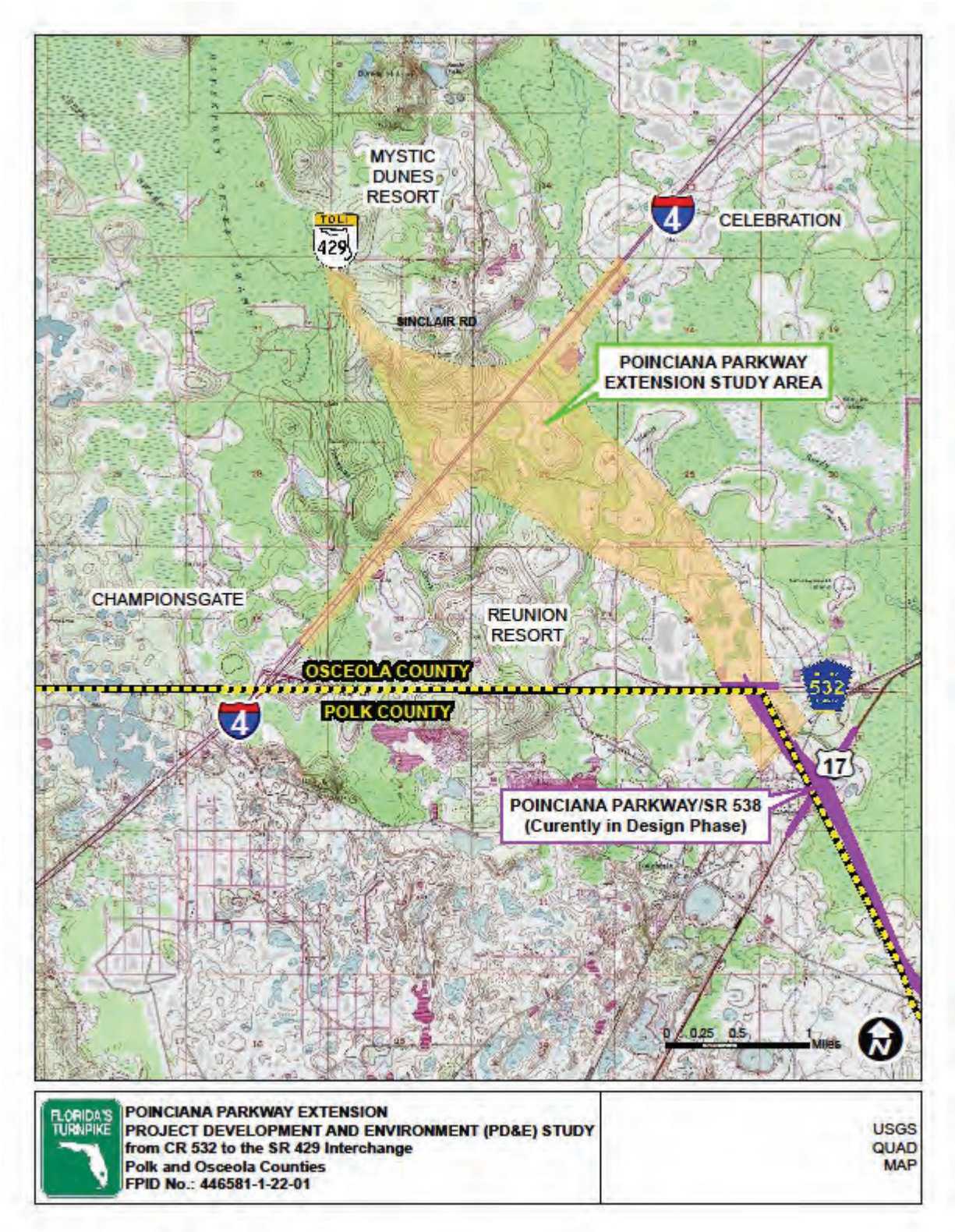


Figure 2-2: USGS Quad Map



3.0 EXISTING CONDITIONS

The Poinciana Parkway Extension will be a new facility between CR 532 and I-4/SR 429 interchange. The existing land along the project corridor is primarily wooded. The general slope of the topography is from west to east. There is one major waterway located within these limits, Davenport Creek.

The existing Turnpike corridor from the I-4/SR 429 interchange to north of Sinclair Road is a four-lane divided roadway consisting of 12-ft travel lanes with 4-foot paved inside shoulders and 10-foot paved outside shoulders. **Figure 3-1** depicts the existing SR 429 typical section. A concurrent PD&E study, Widening Western Beltway (SR 429), is underway and is proposed to be completed by early 2023. The improvements would widen the existing SR 429 corridor from 4-lanes to 8-lanes. At the time of writing the Poinciana Parkway Extension is scheduled to precede the Widening Western Beltway improvements, however this is subject to change. **Figure 3-2** depicts the planned widened SR 429 typical section. In general, stormwater runoff sheet flows from the roadway into roadside ditches that convey runoff to offsite ponds for treatment and attenuation. In some locations runoff is collected within a shoulder gutter with inlets and piped to a pond.

Figure 3-1: Existing SR 429 Typical Section

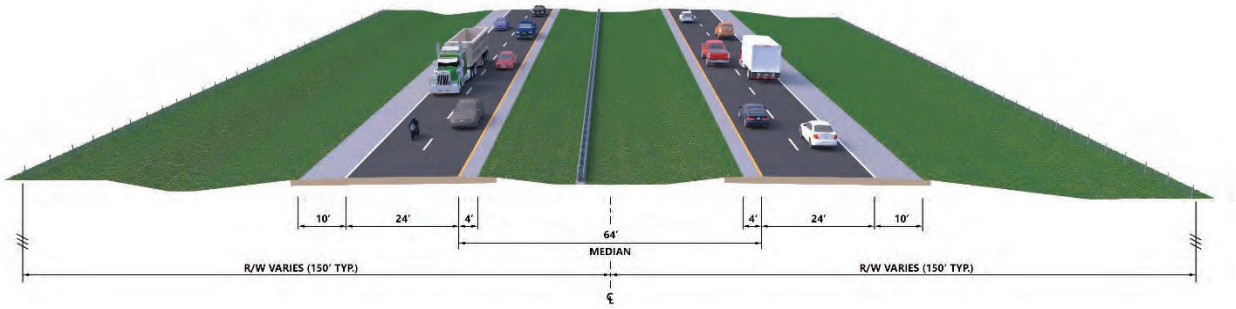
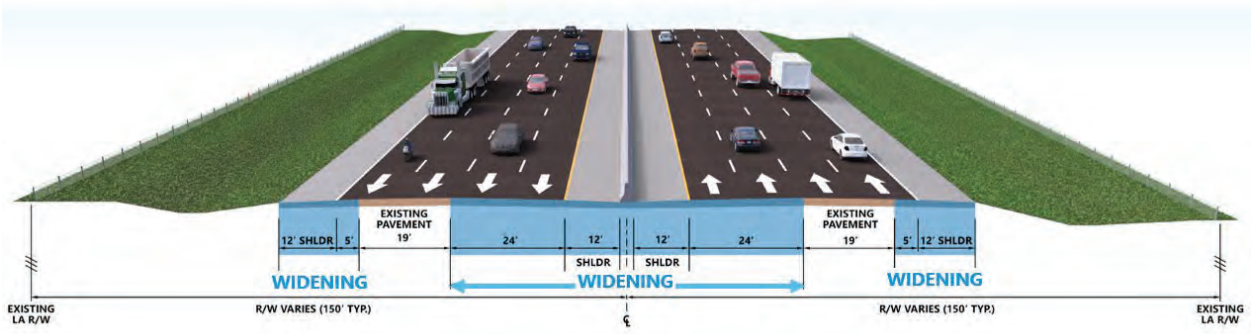


Figure 3-2: Planned SR 429 Typical Section



The Florida Department of Environmental Protection (FDEP) has identified 3 waterbodies along the corridor. **Table 3-1** lists the waterbody identification numbers (WBIDs) and their respective name.

Table 3-1: Project WBID's

WBID	Waterbody Name
3170K	Davenport Creek
3170C	Reedy Creek above Lake Russell
3170F7	Reedy Creek in RCID (Lower)

There are three major outfalls along the corridor, Davenport Creek, Davenport Creek Tributary 3, and Davenport Creek Tributary 4. Davenport Creek begins northwest of the I-4/SR 429 interchange and flows south under I-4, then turns east to discharge into Reedy Creek. For the portions of the corridor outside of the Davenport Creek basin, runoff discharges into a series of shallow swales/ditches which flow east into Reedy Creek. 12 basins have been identified within the limits of the study area. Basin divides have been developed from existing permit information and supplemented with LiDAR data and field review. Cross drain information was obtained from existing plans. Naming conventions for basins and cross drains correspond with the existing permits, where possible. Basin and sub-basin divides are detailed on the basin maps included in **Appendix A.** **Table 3-2** provides a summary of existing cross drains in each basin.

Table 3-2: Existing Cross Drains per Basin

Basin ID	Cross Drain ID	Baseline	Size
107	CD-9	CR 545	3~42"
105	CD-10	I-4	2~7'x4'
105	CD-11	Ramp A	2~7'x4'
109	CD-12	I-4	42"
105	CD-13	CR 545	24"
105	CD-14	SR 429	54"
202	CD-15	SR 429	24"
201	CD-16	SR 429	42"

Note: Basin ID 107 and 105 are sub-basin within Basin Interchange.

Straight line diagram can be found in **Appendix H.**

3.1 SOILS

The soils within the proposed corridor between CR 532 and Interstate 4 are primarily “Somewhat poorly drained” and “Very poorly drained”. From Interstate 4 to north of Sinclair Road, the soils are typically “Excessively drained” within the right-of-way. Outside of the right-of-way soils are “Poorly drained”. The Natural Resource Conservation Service (NRCS) Web Soil Survey of Osceola County was used to determine the soil types within the project limits. The Soil Survey indicates that much of the project corridor consists of fine sands and muck. Refer to **Appendix B** for a Soils Map.

3.2 LAND USE

The land use within the study limits is primarily classified as unimproved pasture, wooded, and uplands. The areas adjacent to the project right-of-way consist of golf course and single family residential and land uses. Please refer to **Appendix C** for the Land Use Map.

3.3 CROSS CULVERTS

There are 8 existing culverts within the project limits. **Table 3-3** provides a summary of the existing culverts.

Table 3-3: Existing Culverts

Station	Cross Culvert Size	Existing Length (ft)	Number of Barrels	Culvert ID	Notes
827+70	42"	148	3	CD-9	CR 545
5340+96	7'x4'	316	2	CD-10	I-4
666+72	7'x4'	89	2	CD-11	Ramp A
5369+47	42"	420	1	CD-12	I-4
627+50	24"	222	1	CD-13	CR 545
6366+32	54"	437	1	CD-14	SR 429
6397+76	24"	303	1	CD-15	SR 429
6429+91	42"	221	1	CD-16	SR 429

3.4 BRIDGE STRUCTURES

There are a number of existing bridges associated with the existing interchange, however none are over water bodies.

3.5 FLOODPLAINS AND FLOODWAYS

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) for Osceola County has been reviewed to determine the extents of the FEMA floodplains within the project limits. **Table 3-4** provides a summary of the FEMA FIRMs, including their effective dates. The FEMA FIRMs are provided in **Appendix D**.

Table 3-4: Summary of FEMA FIRMs

FEMA Panel No.	Effective Date
12097C0040G	June 18, 2013
12097C0045G	June 18, 2013

The applicable Flood Insurance Study (FIS) for this project is the Osceola County FIS 12097CV000A (effective June 18, 2013). There is one regulatory floodway within this project corridor associated with Davenport Creek. **Table 3-5** provides a summary of the floodplain areas within the project limits.

Table 3-5: Floodplain Areas

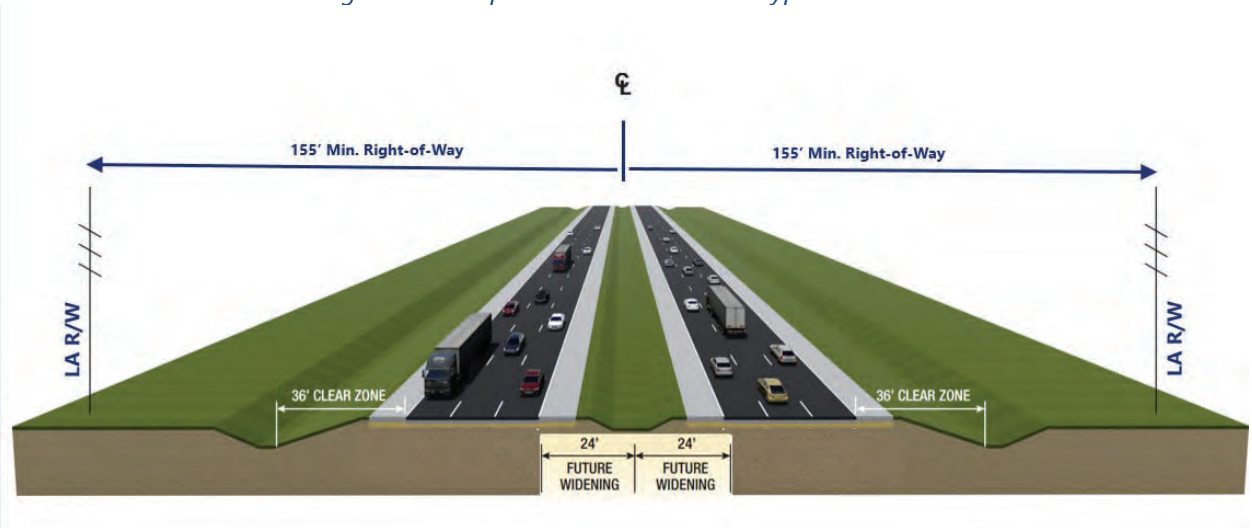
Location ID	Centerline / Baseline	From Station	To Station	Side	Floodplain / Waterbody Name	FIRM Panel No.	Floodplain Zone	FEMA 100-yr Floodplain Elevation (ft)
1	SR 429	6426+50	6445+00	LT/RT	Davenport Creek Swamp	12097C0040G	AE	106.00
2	SR 538/SR 429	6336+00	6400+00	LT	Davenport Creek Trib No. 3	12097C0040G	A	-
3	SR 538	6324+00	6330+00	LT	Davenport Creek	12097C0040G	AE	84.00
4	SR 538	6290+00	6311+50	LT/RT	Davenport Creek Trib No. 4	12097C0040G	A	-
5	SR 538	6260+50	6277+30	LT/RT	Davenport Creek Trib No. 4	12097C0040G	A	-
6	SR 538	6235+00	6247+10	LT/RT	Isolated Wetland	12097C0040G	A	-
7	SR 538	6223+00	6228+00	LT/RT	Isolated Wetland	12097C0040G	A	-

During the original SR 429 design, floodplain encroachment areas were mitigated using the importer/exporter methodology. This methodology allows the surplus storage within stormwater management facilities to count towards offsetting floodplain encroachment. There are no existing dedicated floodplain compensation sites within the existing SR 429 study area.

4.0 PROPOSED CONDITIONS

The recommended improvements consist of a new 6-lane divided roadway from CR 532 to Interstate 4 (SR 538) and modifications to the existing I-4/SR 429 interchange to just north of Sinclair Road. The proposed SR 538 typical section for the mainlines is shown in **Figure 4-1**.

Figure 4-1: Proposed SR 538 Mainline Typical Section



4.1 CROSS CULVERTS

The proposed roadway improvements will require culvert extensions to some of the existing cross drains along SR 429 and I-4. **Table 4-1** provides the projected improvements and modifications to each cross culvert. The existing box culverts are recommended to be extended rather than replaced; however, this should be analyzed further during the design phase based on the latest culvert inspection reports and history of maintenance repairs for each culvert.

Table 4-1: Proposed Improvements to Cross Culverts within Project Limits

Station	Baseline	Cross Culvert Size	Number of Barrels	Culvert ID	Existing Length (ft)	Proposed Length (ft)	Proposed Improvement
6216+06	SR 538	24"	1	CD-1	-	432	New
6224+88	SR 538	24"	1	CD-2	-	290	New
6242+54	SR 538	36"	1	CD-3	-	240	New
6264+81	SR 538	48"	1	CD-4	-	240	New
6275+32	SR 538	78"	1	CD-5	-	240	New
6295+22	SR 538	12'x4'	3	CD-6	-	240	New
6301+38	SR 538	60"	1	CD-7	-	110	New
827+70	CR 545	42"	3	CD-9	127	148	Extend
5340+96	I-4	7'x4'	2	CD-10	316	386	Extend
666+72	Ramp A	7'x4'	2	CD-11	89	181	Extend
5369+47	I-4	42"	1	CD-12	310	348	Extend
627+50	CR 545	24"	1	CD-13	222	222	No Change
6366+32	SR 429	54"	1	CD-14	437	837	Reroute
6397+76	SR 429	24"	1	CD-15	303	494	Extend
6429+91	SR 429	42"	1	CD-16	221	295	Extend

Existing cross drains which are anticipated to be extended, as well as new cross drains were evaluated for hydraulic adequacy. Preliminary hydraulic calculations were developed to include the change in flow and/or culvert length. These calculations have been provided in **Appendix E**. For existing culverts, as-built plans and permit data was used to recreate the existing condition calculations and then updated to reflect the proposed condition. New cross drains were preliminarily sized using the runoff from the 100-yr event. Basins with less than 600-ac in area were calculated using the rational method; basins greater than 600-ac utilized the regression equations. The Florida Department of Transportation Drainage Manual identifies the 50-yr event as the design storm for interstate facilities. However, because these cross drains are associated with the FEMA 100-yr floodplain and to ensure Section 4.4 Backwater criteria is satisfied, the 100-yr storm event was used for preliminary design purposes and for long range cost estimating.

As shown in Table 4-1 above CD-14 (SR 429 CD-2) is proposed to be rerouted due to a conflict with the proposed pond within the interchange. However, the following should be noted. The offsite area which

discharged into the SR 429 right-of-way via sheet flow during the original design of SR 429 which ultimately was conveyed through the corridor via cross drain CD-14 (SR 429 CD-2) has been developed into a residential community, Encore Resort at Reunion. As a result of this development, runoff from the offsite area is collected within closed storm sewer systems and discharged into a series of stormwater management facilities which provide treatment and attenuation prior to discharging into the SR 429 right-of-way. Based on the permit data for Encore Resort at Reunion (ERP 49-01107-P), discharge rates leaving their stormwater management facilities were significantly reduced. As noted in the original SR 429 permit the flow rates anticipated for CD-2 were identified as 77-cfs, 85-cfs, and 145-cfs for the 50-yr, 100-yr, and 500-yr storm events, respectively. The discharge rate associated with the Encore Resort at Reunion Pond 1B which discharges into SR 429 right-of-way near CD-2 are as follows from the permitted ICPR model: 2.77-cfs (100-yr/24-hr) and 20.49-cfs (100-yr/72-hr), see **Appendix F** for permit data. Based on the permit data it would appear the overall flow discharging to existing CD-2 has been reduced from what the initial runoff rate was during the original design. This reduction in flow will compensate for the increase in friction and bend losses associated with the proposed culvert. For the purposes of this report the design flows from the permit and the proposed length were utilized for the analysis. The permit calculations state the existing ground the right-of-way is at elevation 102.50-ft. Though the proposed calculations show an increase in headwater elevation, which may be conservative based on the reduction of offsite flow, the 100-yr storm remains within the right-of-way. Additional analysis will need to be performed during design to determine the optimal layout and size of CD-14.

4.2 BRIDGE STRUCTURES

The proposed SR 538 corridor will require a bridge over Davenport Creek. A number of bridges are proposed along the corridor, but these are associated with the I-4/SR 429 interchange and will not traverse waterbodies.

4.3 FLOODPLAINS AND FLOODWAYS

The anticipated floodplain impacts due to the proposed roadway improvements were estimated to determine potential impacts to the 100-year floodplains and necessary compensation volumes. The exact impact volume from the proposed improvements will need to be assessed during the design phase, when survey, geotechnical data, and proposed cross sections are available. Floodplain impacts will be mitigated within dedicated floodplain compensation sites along the corridor. The South Florida Water Management District (SFWMD) does allow the use of the importer/exporter method, which allows floodplain compensation within stormwater management facilities along the corridor. For the purposes of this document, this approach will not be considered for new facilities, but should be implemented during design to reduce offsite right-of-way needs. Please note additional coordination with Reedy Creek Improvement District (RCID) will be required as well. Floodplain impact calculations have been provided for each floodplain encroachment location in **Appendix E**.

The project will impact the 100-year floodplain through both longitudinal and transverse impacts. The floodplain encroachment areas were quantified based on the FEMA 100-year base flood elevations (BFEs) and the existing ground elevations using 1-foot LiDAR contours. The existing SR 429 profile grades

and proposed SR 538 profiles were used to estimate the floodplain impacts. The floodplain impacts may increase during the design phase if modifications to the profile are necessary.

Floodplain Impact Location 1 & 2

This floodplain is located between Sta. 7427+00 and 7439+00 for the northbound lanes (Location 1) and 6426+00 and 6435+00 for the southbound lanes (Location 2). The anticipated impacts are approximately 0.85 ac-ft and 0.48 ac-ft, respectively. With the proposed northbound SR 429 ramp improvements from Sinclair Road there is anticipated to be encroachment into the adjacent wetland. This fill can be offset at the terminus of the ramp near Sand Hill Road where the mainline is being shifted to the west. To offset impacts to the floodplain located west of the existing corridor as a result of the proposed mainline shift, a retaining wall is being proposed. This will greatly reduce encroachment into the floodplain. Only a small area of encroachment is anticipated at the south end of the proposed wall limits. This encroachment volume can be offset by removing some of the existing side slope embankment associated with the southbound lanes. The use of a dedicated offsite floodplain compensation site is not anticipated for these locations.

Floodplain Impact Location 3

This floodplain is located between Sta. 6391+00 and 6400+00. The anticipated impacts are approximately 4.13 ac-ft. Davenport Creek Tributary No. 3 runs adjacent to the SR 429 corridor. With the new I-4 connector ramps, a significant amount of fill is anticipated. Floodplain compensation can be provided in two locations. The first location is under the proposed bridges for the SR 429/I-4 interchange ramps within the interchange ponds, similar to the existing condition. The second location would be a dedicated floodplain compensation site located adjacent to proposed Pond 202 Alternative 1, within the same parcel identified for BSN202 Alternative 1. The anticipated impact volume provided is assuming the worst-case scenario of no retaining walls to minimize encroachments.

Floodplain Impact Location 4

This floodplain is located between Sta. 5336+00 and 5341+00. The anticipated impacts are approximately 0.47 ac-ft and are associated with the upstream Davenport Creek No. 3 culvert extension. The amount of fill associated with the culvert extension is minimal; a rise in BFE is not anticipated as a result of the proposed improvements. Minor grading around the headwall could be excavated to offset the encroachment volume.

Floodplain Impact Location 5

This floodplain is located between Sta. 5342+00 and 5344+00. The anticipated impacts are approximately 0.08 ac-ft and are associated with the downstream Davenport Creek No. 3 culvert extension. The amount of fill associated with the culvert extension is minimal; a rise in BFE is not anticipated as a result of the proposed improvements. Minor grading around each of the endwall could be excavated to offset the encroachment volume.

Floodplain Impact Location 6

This floodplain is located between Sta. 5359+00 and 5364+00. The anticipated impacts are approximately 2.06 ac-ft within an unnamed Davenport Creek Tributary and are a result of proposed Pond 108B. This pond is anticipated to be constructed as part of the FDOT District 5 improvements to Interstate 4. Mitigation of these impacts is anticipated to occur within the proposed Pond 108A and Pond 108B.

Floodplain Impact Location 7

This floodplain is located between Sta. 1035+00 and 1042+00. The anticipated impacts are approximately 4.63 ac-ft and are associated with an unnamed Davenport Creek Tributary. Mitigation of these encroachments can be provided in an offsite parcel located adjacent to the existing floodplain. The parcel of land identified for Interchange Pond Alternative 2 would be the ideal location for a floodplain compensation site. During design the importer/exporter methodology should be utilized for proposed ponds, Pond 108A and Pond 108B to reduce the size of offsite compensation measures.

Floodplain Impact Location 8

This floodplain is located between Sta. 1028+00 and 1033+00. The anticipated impacts are approximately 0.89 ac-ft and are associated with an unnamed Davenport Creek Tributary. Mitigation of these encroachments can be provided within an offsite floodplain compensation site at the location of Interchange Pond Alternative 2. It may be feasible to provide compensation between the connector ramps, however this will require final grading to determine the extent of available area.

Floodplain Impact Location 9

This floodplain is located between Sta. 6307+00 and 6313+00. The anticipated impacts are approximately 2.06 ac-ft and are associated with Davenport Creek in the vicinity of FIS cross section A-A. Mitigation of these encroachments can be provided in the parcel shown for Pond 203 Alternative 2.

Floodplain Impact Location 10

This floodplain is located between Sta. 6298+00 and 6307+00. The anticipated impacts are approximately 0.81 ac-ft and are associated with Davenport Creek, outside of the Zone AE portion. Mitigation of these encroachments can be provided in the parcel shown for Pond 203 Alternative 2.

Floodplain Impact Location 11

This floodplain is located between Sta. 6293+00 and 6298+00. The anticipated impacts are approximately 3.86 ac-ft and are associated with Davenport Creek Tributary No. 4. Mitigation of these encroachments can be provided in the parcel shown for Pond 203 Alternative 3.

Floodplain Impact Location 12

This floodplain is located between Sta. 6261+00 and 6277+00. The anticipated impacts are approximately 19.66 ac-ft. This portion is associated with the confluence of Davenport Creek, Davenport Creek Tributary No. 4, and Reedy Creek. Mitigation of these encroachments can either be provided in the parcel shown for Pond 204 Alternative 2 or Pond 204 Alternative 1. These calculations are conservative and do not include the use of retaining walls or bridges to reduce floodplain encroachments.

Floodplain Impact Location 13

This floodplain is located between Sta. 6235+00 and 6247+00. The anticipated impacts are approximately 8.51 ac-ft and are associated with an isolated wetland. Mitigation of these encroachments can be provided within any of the parcels shown for Basin 205: Pond 205 Alternative 1, Pond 205 Alternative 2, or Pond 205 Alternative 3. These calculations are conservative and do not include the use of retaining walls or bridges to reduce floodplain encroachments. It should be noted there is a large amount of muck identified in this area, which may necessitate the use of a bridge in this area. Additional geotechnical information and analysis will be required to identify surcharging tolerances.

Floodplain Impact Location 14

This floodplain is located between Sta. 6223+00 and 6228+00. The anticipated impacts are approximately 2.25 ac-ft and are associated with an isolated wetland. Mitigation of these encroachments can be mitigated with the same measures as Floodplain Impact Location 13. Though these two locations are isolated in the existing condition, once the roadway is constructed roadside swales can provide a connection between the two locations.

Table 4-2: Mainline Floodplain Encroachment Areas

Location ID	From Station	To Station	Side	Floodplain / Waterbody Name	Floodplain Zone	FEMA 100-yr Floodplain Elevation (ft)	Encroachment Amount (ac-ft)
1	7427+00	7439+00	RT	Davenport Creek Swamp	AE	160.00	0.85
2	6426+00	6435+00	LT	Davenport Creek Swamp	AE	106.00	0.48
3	6391+00	6400+00	LT	Davenport Creek Trib No. 3	A	100.00*	4.13
4	5336+00	5341+00	LT	Davenport Creek Trib No. 3	A	94.50*	0.47
5	5342+00	5344+00	RT	Davenport Creek Trib No. 3	A	94.10*	0.08
6	5359+00	5364+00	RT	Unnamed Davenport Creek Trib	AE	83.00	2.06
7	1035+00	1042+00	RT	Unnamed Davenport Creek Trib	AE	83.00	4.63

Location ID	From Station	To Station	Side	Floodplain / Waterbody Name	Floodplain Zone	FEMA 100-yr Floodplain Elevation (ft)	Encroachment Amount (ac-ft)
8	1028+00	1033+00	LT/RT	Unnamed Davenport Creek Trib	AE	83.00	0.89
9	6307+00	6313+00	LT/RT	Davenport Creek	AE	80.00	2.06
10	6298+00	6307+00	LT/RT	Davenport Creek	A	77.00*	0.81
11	6293+00	6298+00	LT/RT	Davenport Creek Trib No. 4	A	76.00*	3.86
12	6261+00	6277+00	LT/RT	Davenport Creek/Reedy Creek	A	76.00*	19.66
13	6235+00	6247+00	LT/RT	Isolated Wetland	A	85.00*	8.51
14	6223+00	6228+00	LT/RT	Isolated Wetland	A	87.00*	2.25

* - Zone A elevations were approximated using LiDAR data.

4.4 PROJECT CLASSIFICATION

The floodplain areas within the project limits are associated with creeks and wetlands located within and adjacent to the project corridor. The encroachments into the existing floodplain associated with the new corridor and improvements to SR 429 are to be classified as "Minimal Encroachments". "Minimal Encroachments" on a floodplain occur when there is floodplain involvement but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying FDOT's drainage design standards and following the Water Management Districts' procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

4.5 RISK EVALUATION

The proposed improvements were evaluated to determine whether there would be adverse floodplain impacts. The project will not affect existing floodplain elevations or extents. There will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes as the result of construction of this project. Therefore, it has been determined that encroachments are not significant.

4.6 COORDINATION WITH LOCAL AGENCIES

Pre-Application Meetings were held with the Florida Department of Environmental Protection (FDEP), South Florida Water Management District (SFWMD) and Reedy Creek Improvement District (RCID). Please refer to **Appendix G** for the Pre-Application Meeting Minutes.

4.7 HISTORY OF FLOODING

The majority of this project is a new alignment with no existing data. There are no documented flooding issues along the SR 429 portion of the corridor.

5.0 RECOMMENDATIONS AND CONCLUSIONS

The new roadway and proposed improvements to the I-4/SR 429 interchange will result in impacts to the adjacent FEMA floodplains. The anticipated floodplain encroachments due to the proposed roadway improvements have been calculated and provided within this document. In addition, mitigation alternatives have been identified for each encroachment. The floodplain impact calculations are conservative and should be revised during design when survey, geotechnical data, and proposed cross sections are available. Floodplain compensation should be provided in stormwater management facilities to the maximum extent possible during design to reduce the need for right-of-way.

Replacement drainage structures for this project are limited to hydraulically equivalent structures which are not expected to increase the backwater surface elevations. The limitations to the hydraulic equivalency proposed are due to restrictions imposed by the geometrics of design, existing development, cost feasibility, or practicability. The proposed corridor location was selected from a number of alternatives. It was determined that this alignment was the most viable option based a number of factors. See the Preliminary Engineering Report for more information.

Though the project will encroach into the 100-yr floodplain in a number of locations, these encroachments are considered “Minimal Encroachments”. The encroachments will offset with dedicated floodplain compensation sites. There will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes as the result of construction of this project. Therefore, it has been determined that these encroachments are not significant.

6.0 REFERENCES

FDEP Map Direct

FDOT Drainage Manual (2023)

FDOT Drainage Design Guide (2023)

FDOT Project Development and Environment Manual (2020)

FEMA FIRM Maps for Osceola County

FEMA Flood Map Service Center

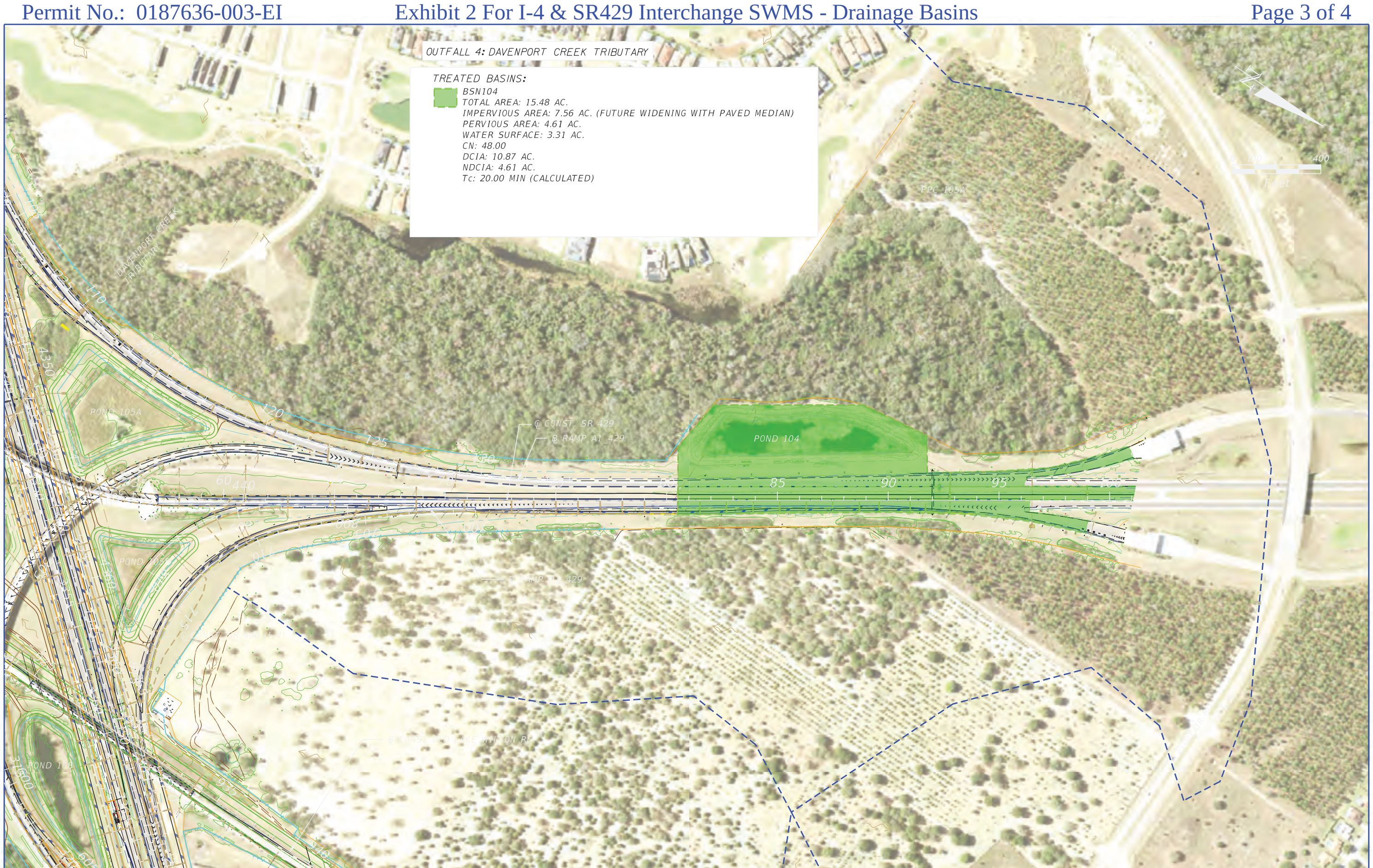
Flood Insurance Studies for Osceola County NRCS Web Soil Survey

Environmental Resource Permit Applicant’s Handbook Volume I (2018)

SFWMD ePermitting

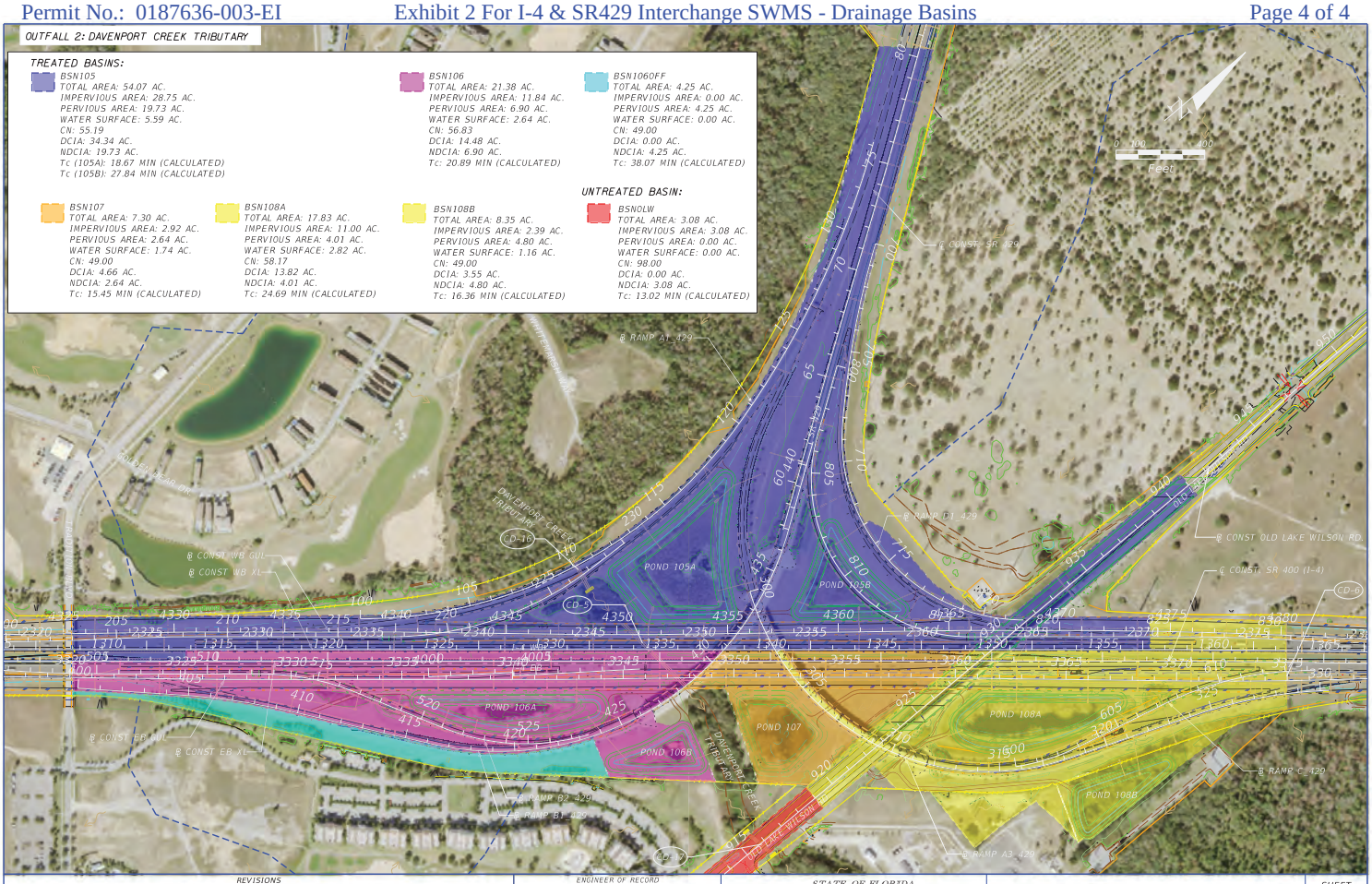
SFWMD Environmental Resource Permit Applicant’s Handbook Volume II (2018)

APPENDIX A – DRAINAGE MAPS



REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			DC TRIBUTARY OUTFALL PROPOSED BASIN MAP	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	Renato E. Chuw, PE PE No. 56050 Inwood Consulting Engineers, Inc. Certificate of Authorization No. 7074 3000 Dovera Drive, Suite 200, Oviedo, Florida 32765 P 407.971.8850	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 400	OSCEOLA	431456-1-52-01		

mlaos 3/19/2018 3:43:08 PM c:\pwworking\aecom_na\mlaos\dms31135\OUTFALL_4C_POST_BASIN_MAP.DGN



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Renato E. Chuw, PE
PE No. 56050
Inwood Consulting Engineers, Inc.
Certificate of Authorization No. 7074
3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
P 407.971.8850

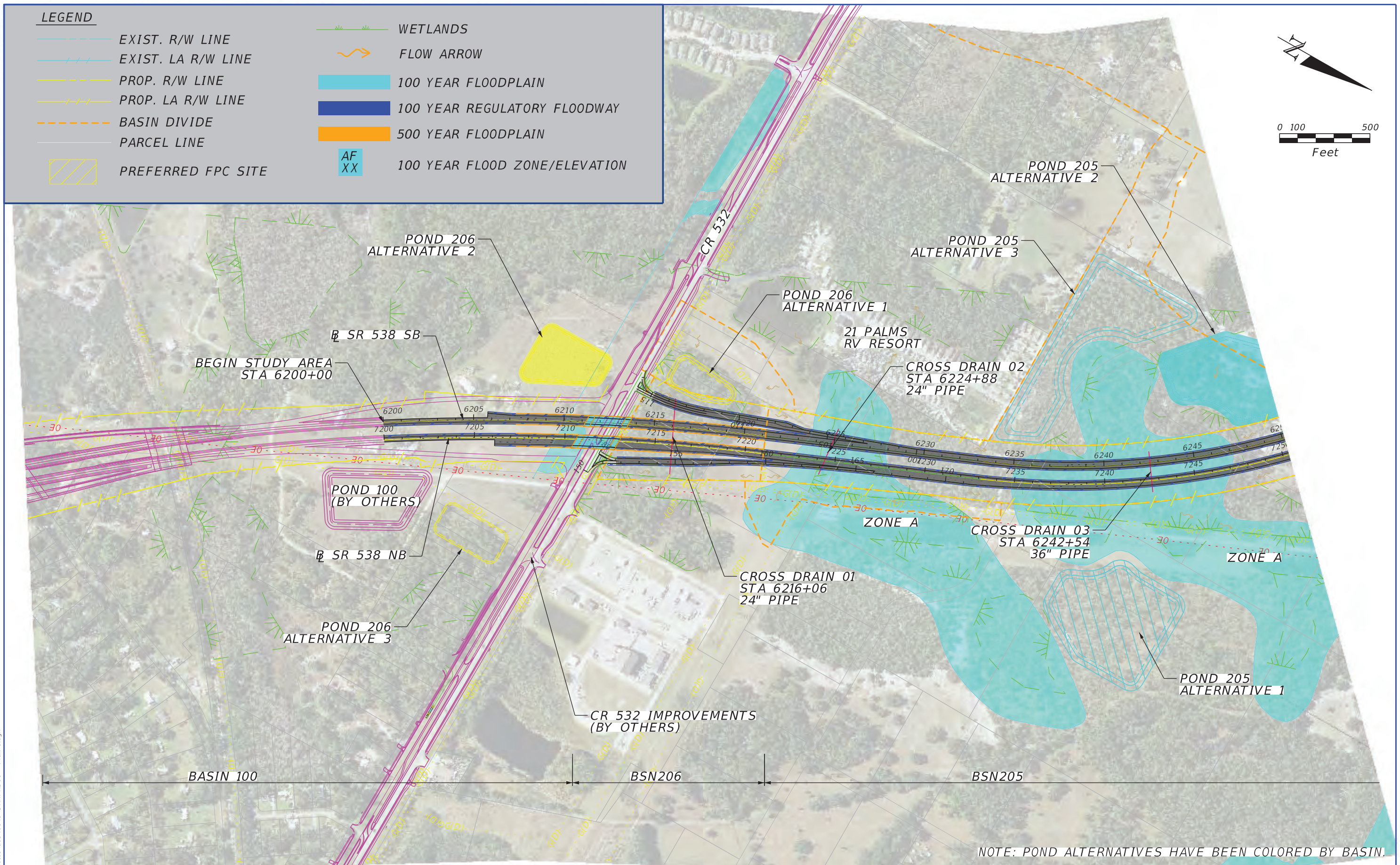
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 400	OSCEOLA	431456-1-52-01

DC TRIBUTARY OUTFALL
PROPOSED BASIN MAP

SHEET NO.

mlaos 3/19/2018 8:03:47 AM c:\pwworking\aecom_na\mlaos\dms31135\OUTFALL_2C_POST_BASIN_MAP.DGN



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

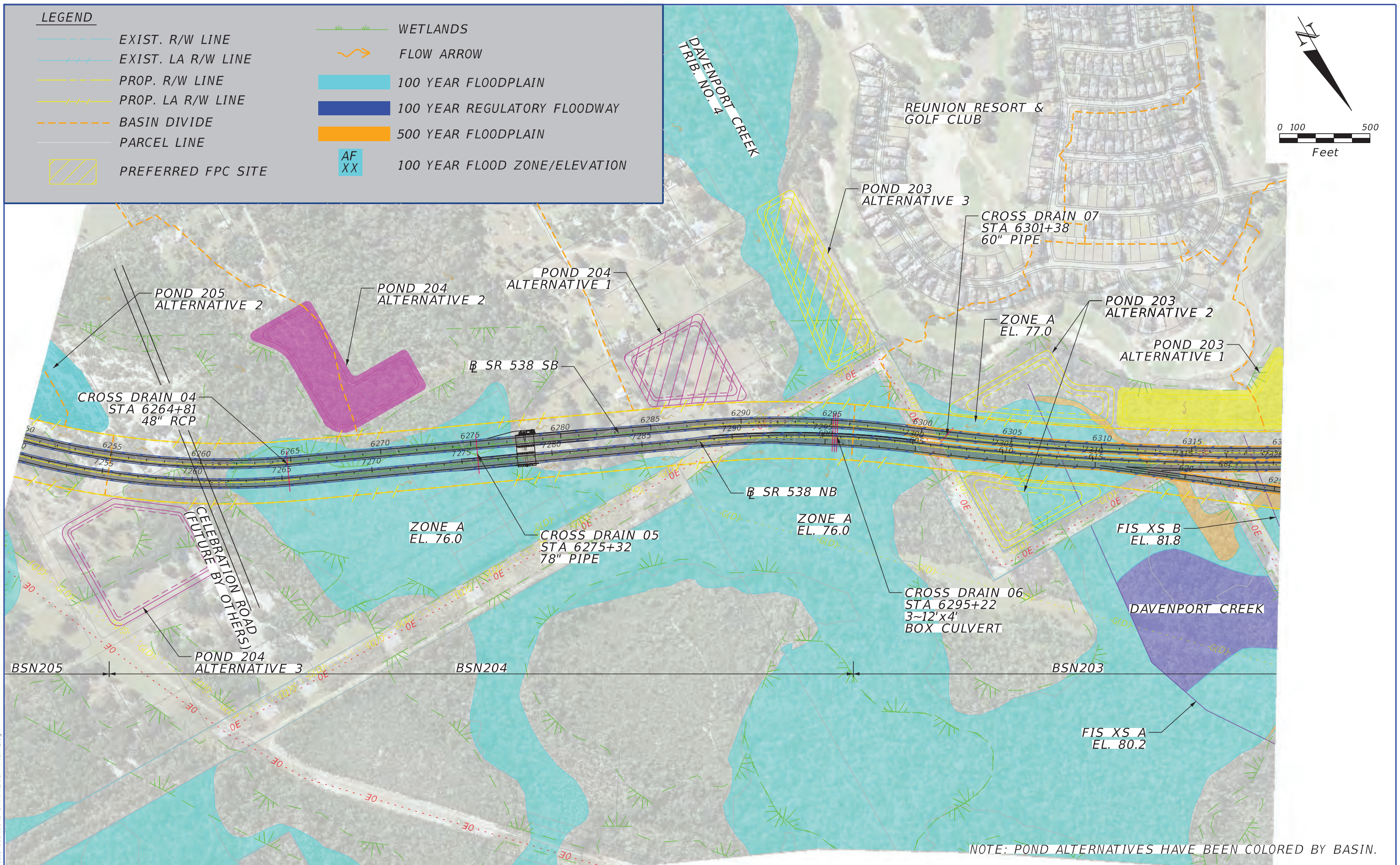
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 538	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 1

3/16/2023 4:30:56 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 1.dgn



3/16/2023 4:31:24 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 2.dgn

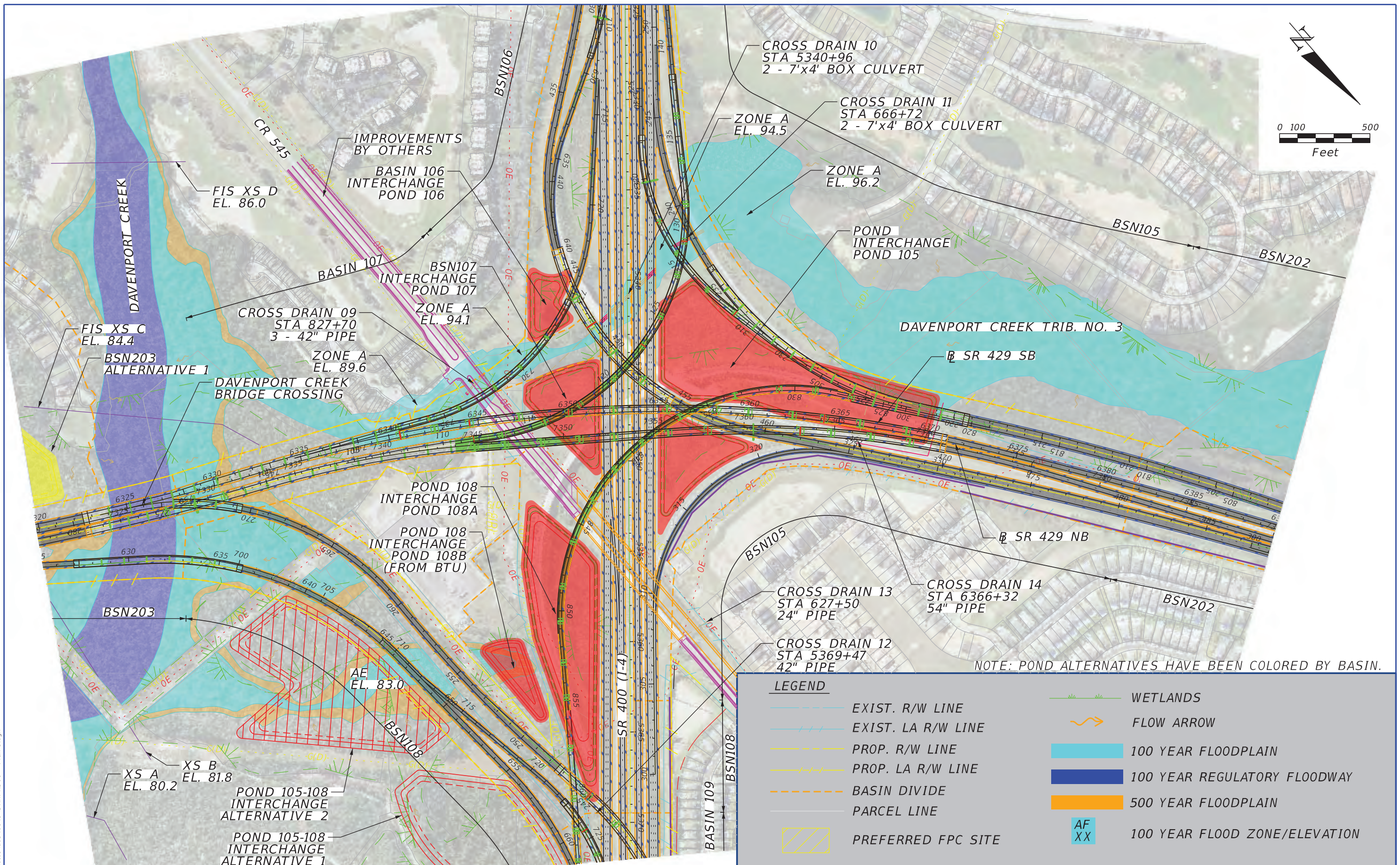
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 538	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 2



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

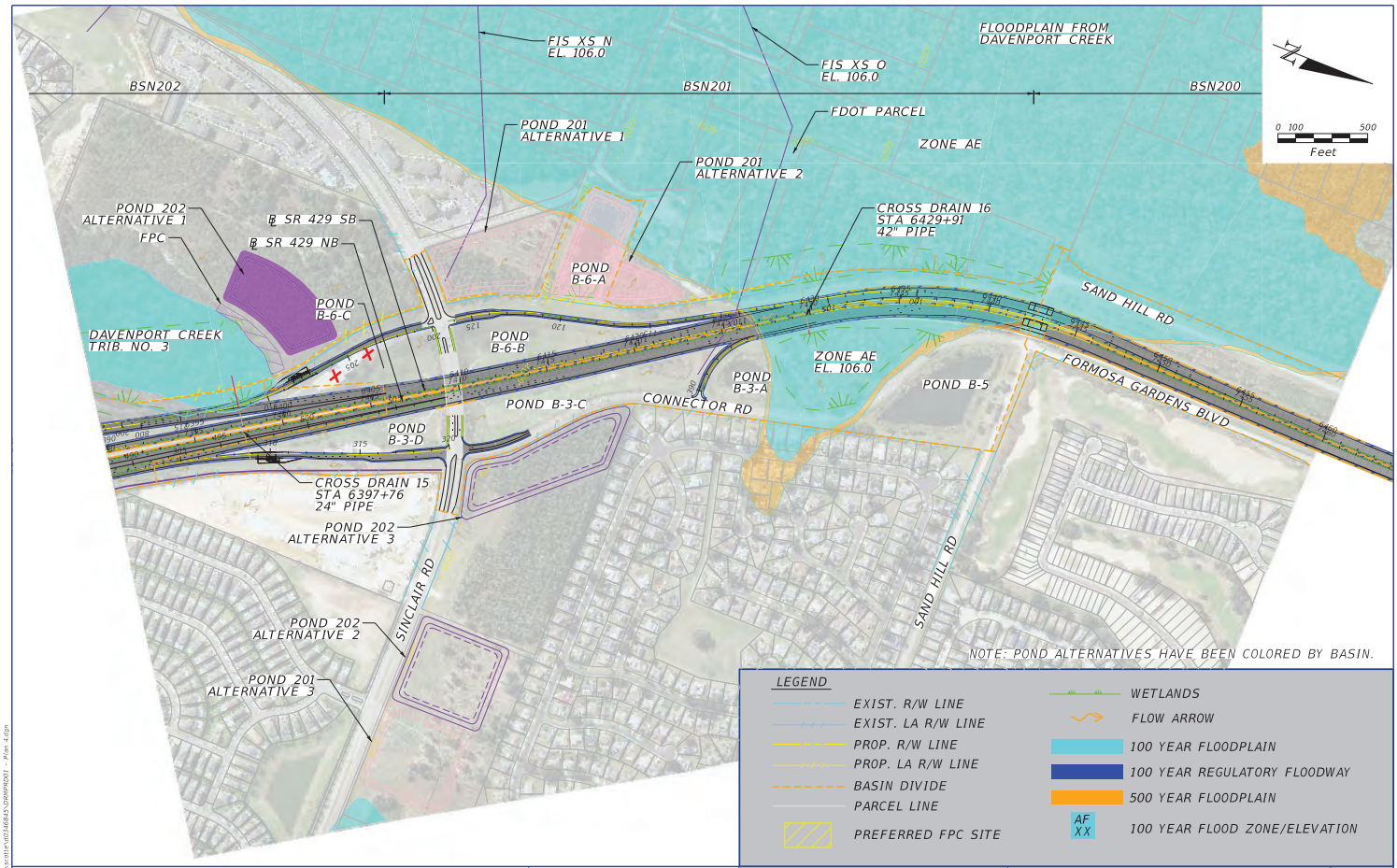
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 538	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 3

3/16/2023 4:31:50 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 3.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

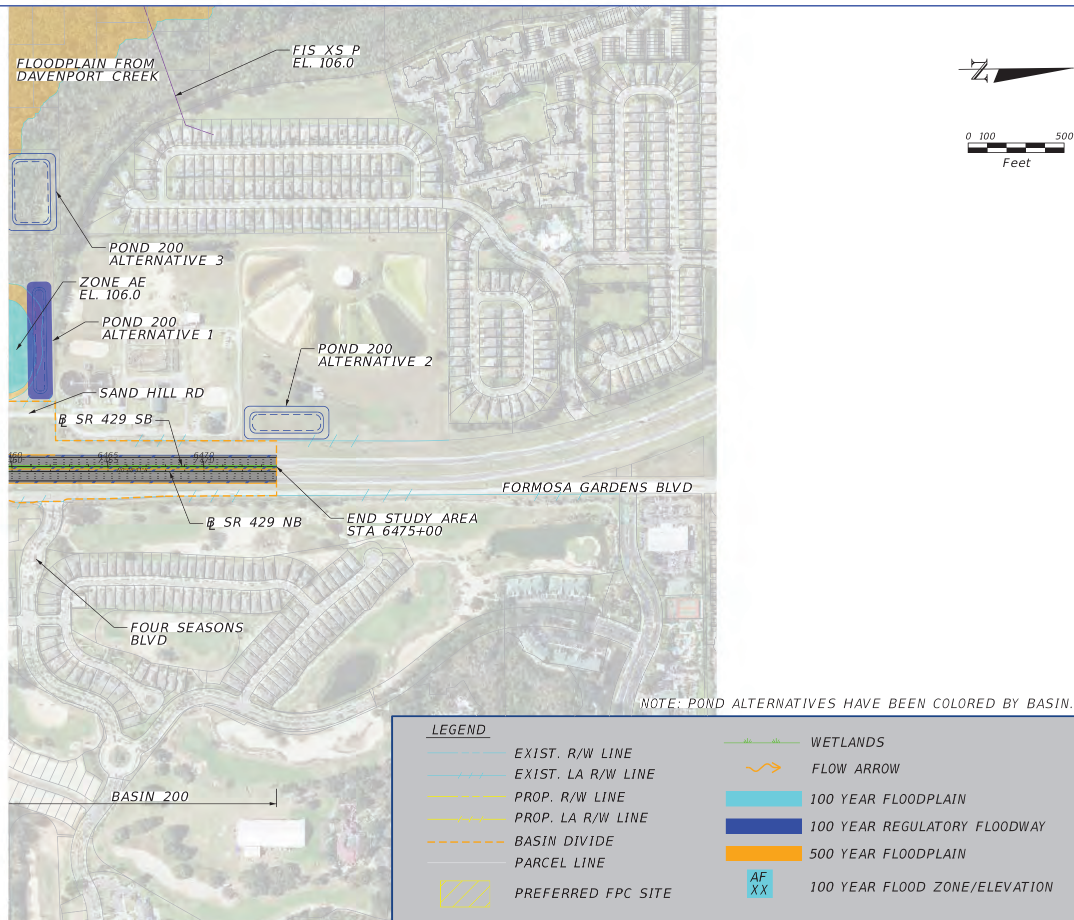
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 429	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 4

3/16/2023 4:32:14 PM sscox
C:\Dgn_Work\sscox\446581\DRAINMAP01 - Plan 4.dgn



NOTE: POND ALTERNATIVES HAVE BEEN COLORED BY BASIN.

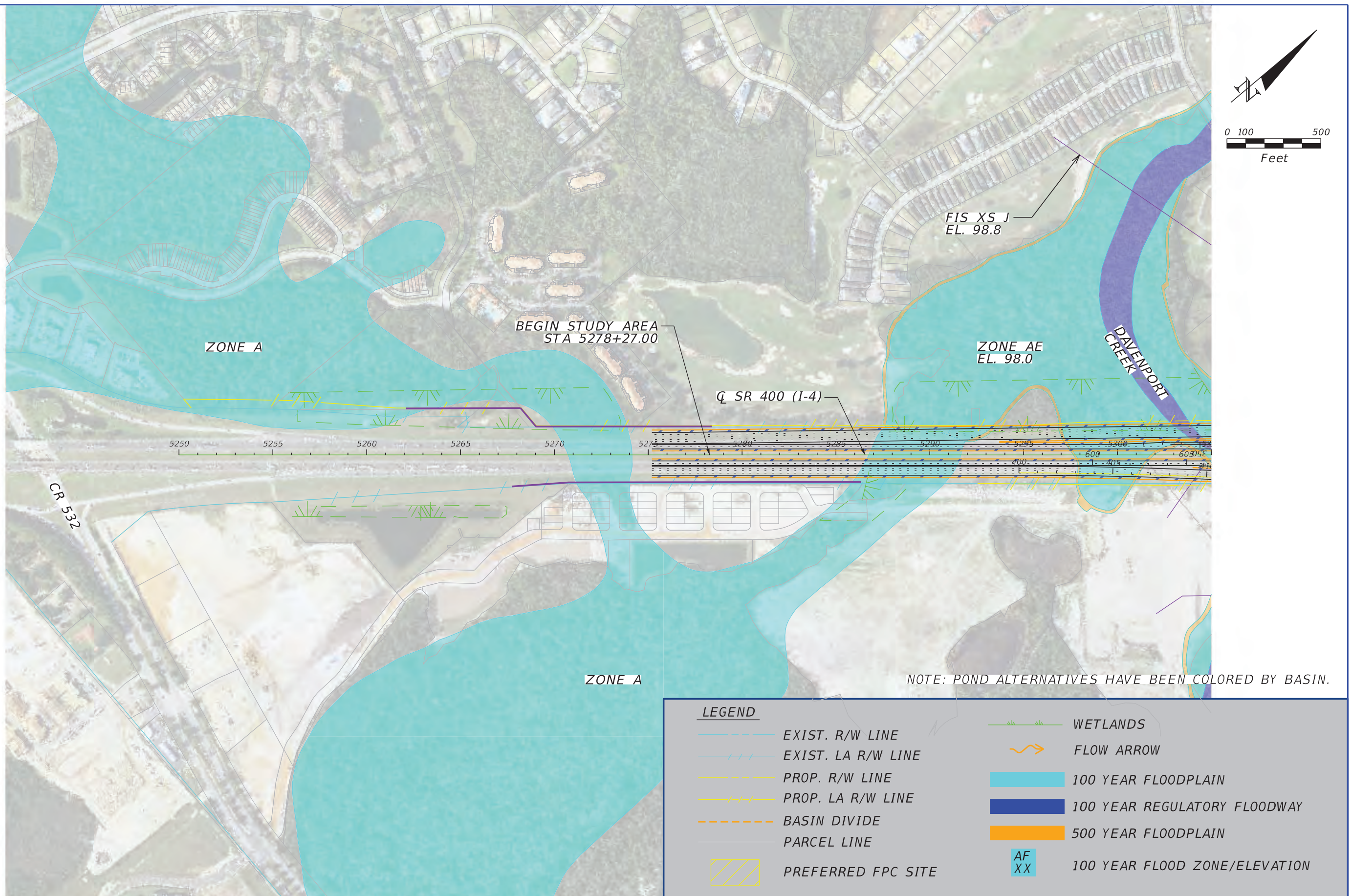
LEGEND

- EXIST. R/W LINE
- EXIST. LA R/W LINE
- PROP. R/W LINE
- PROP. LA R/W LINE
- BASIN DIVIDE
- PARCEL LINE
- PREFERRED FPC SITE
- WETLANDS
- FLOW ARROW
- 100 YEAR FLOODPLAIN
- 100 YEAR REGULATORY FLOODWAY
- 500 YEAR FLOODPLAIN
- AF XX 100 YEAR FLOOD ZONE/ELEVATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			DRAINAGE MAP	SHEET NO.
ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
SR				5

3/16/2023 4:32:38 PM scotte



3/16/2023 4:33:00 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 6.dgn

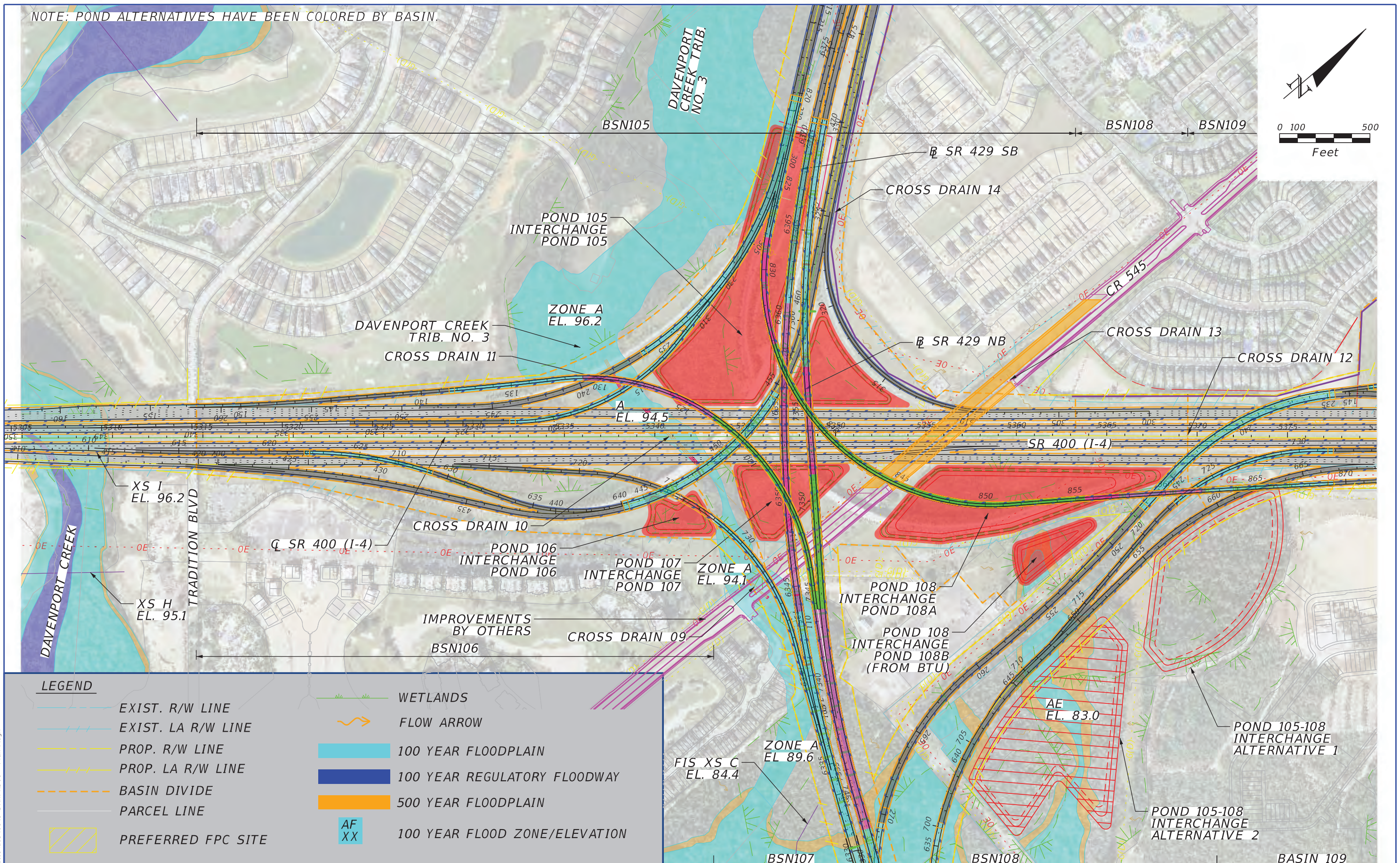
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 429	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 6



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

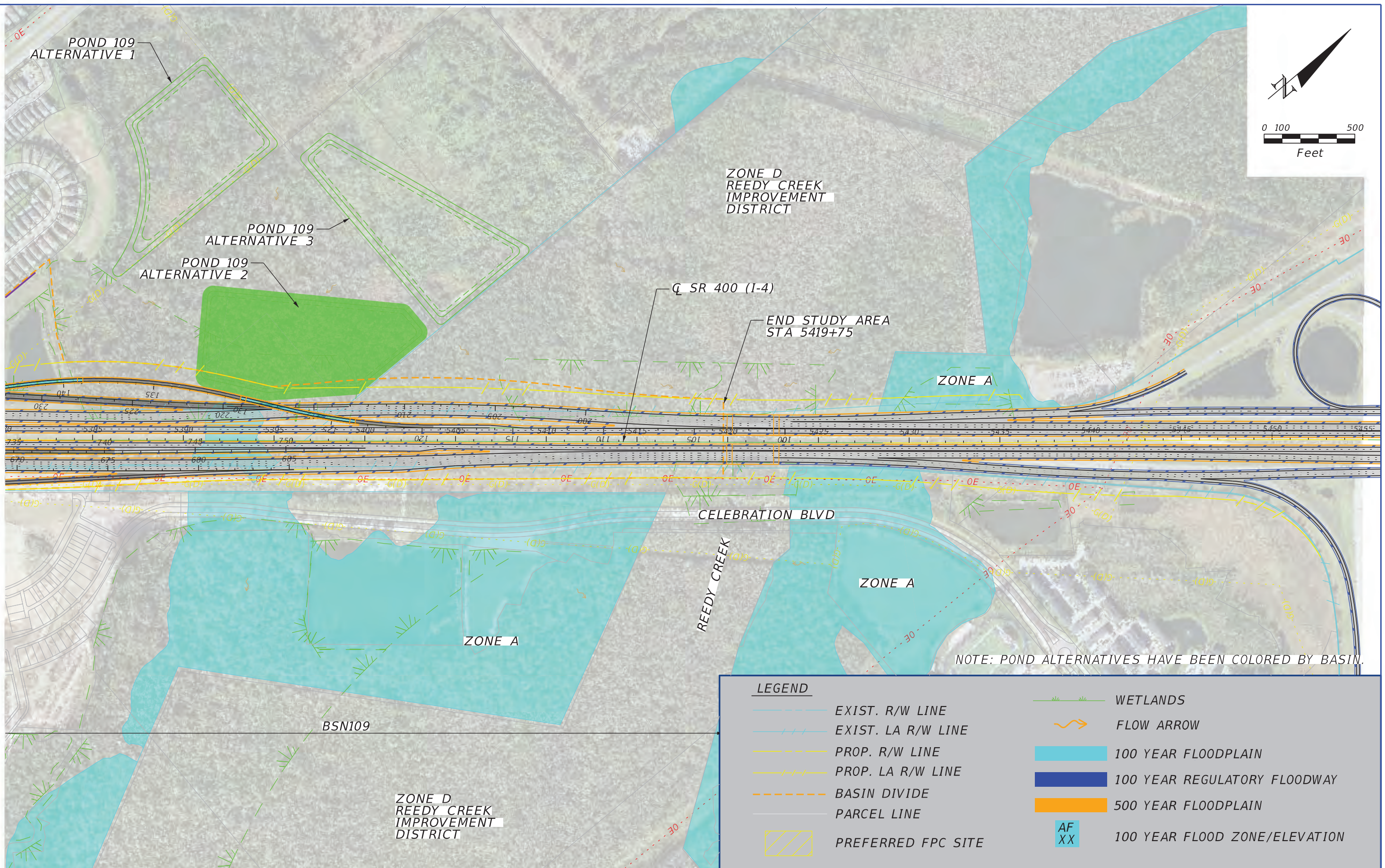
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 538	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO.
7

3/16/2023 4:33:28 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 7.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

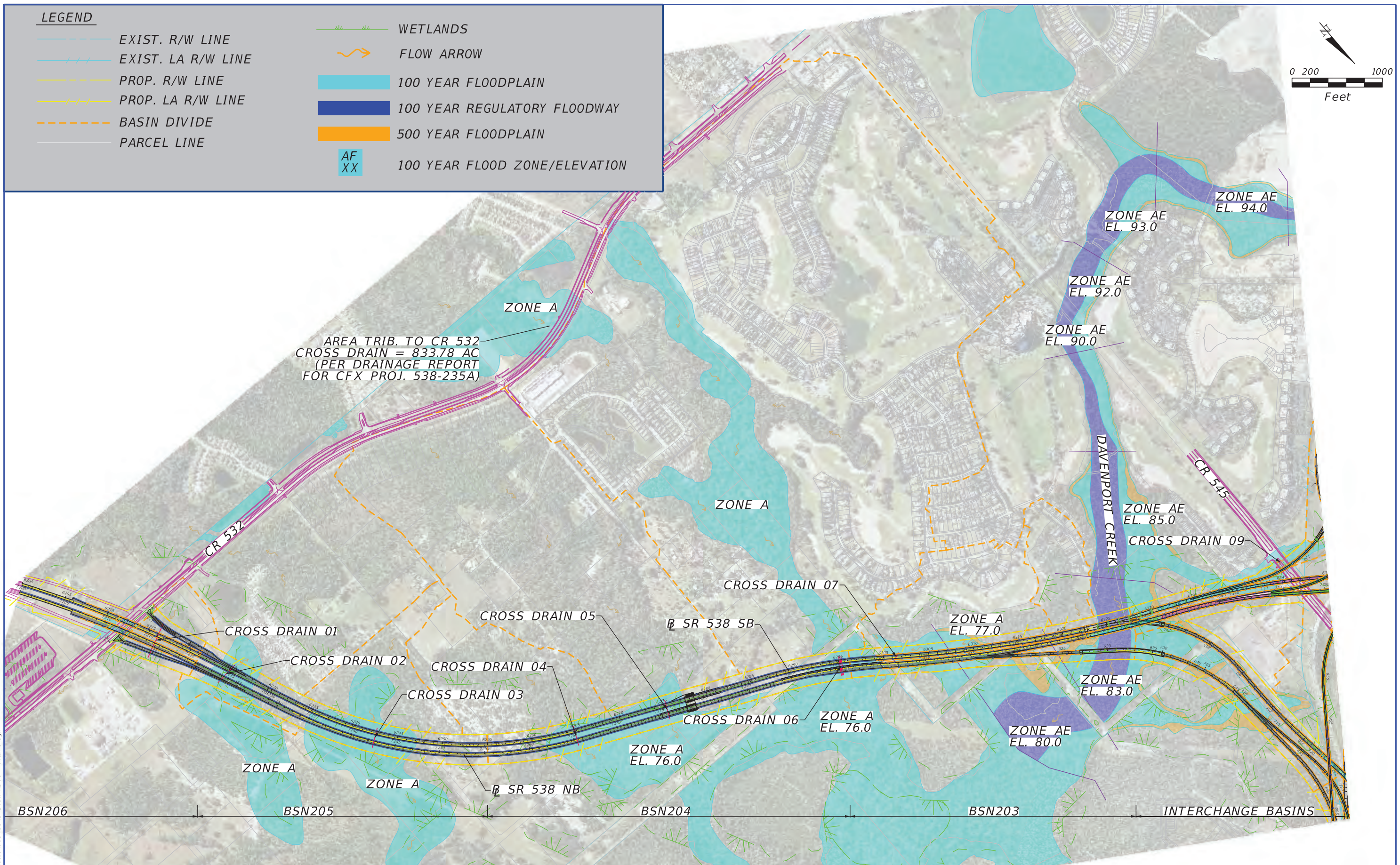
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 538	OSCEOLA	446581-1

DRAINAGE MAP

SHEET NO. 8

3/16/2023 4:34:07 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 8.dgn



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 538	OSCEOLA	446581-1

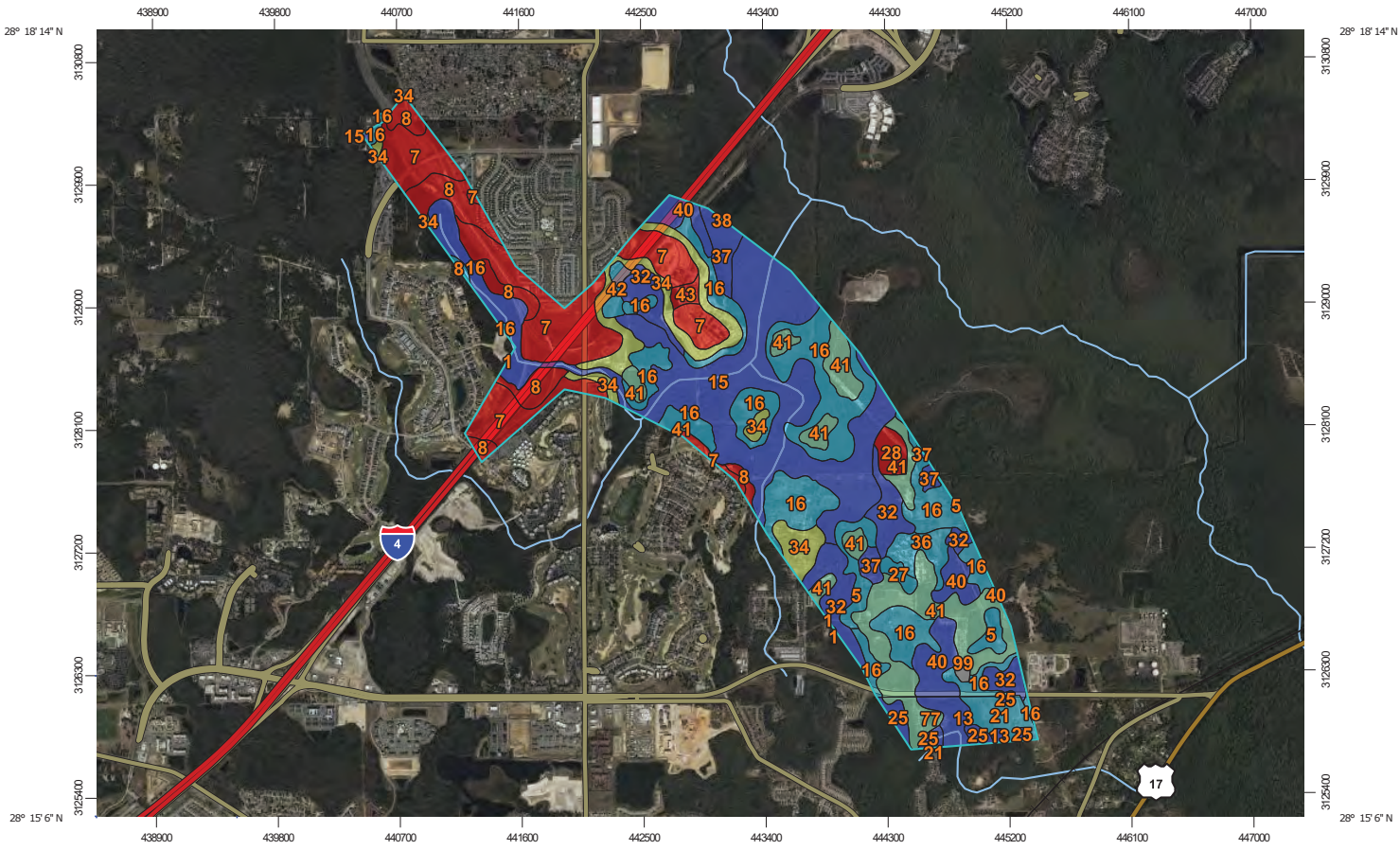
DRAINAGE MAP

SHEET NO. 9

3/16/2023 4:34:41 PM scotte
c:\pw_work\csh_pw\scotte\d0346845\DRMPRD01 - Plan 9.dgn

APPENDIX B – SOIL MAPS

Drainage Class—Osceola County, Florida, and Polk County, Florida



Map Scale: 1:40,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 1500 3000 6000 9000

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Osceola County, Florida
Survey Area Data: Version 19, Aug 27, 2021

Soil Survey Area: Polk County, Florida
Survey Area Data: Version 19, Aug 27, 2021

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jan 6, 2022—Mar 21, 2022

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

Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Adamsville sand, 0 to 2 percent slopes	Somewhat poorly drained	0.2	0.0%
5	Basinger fine sand, 0 to 2 percent slopes	Poorly drained	35.1	2.0%
7	Candler sand, 0 to 5 percent slopes	Excessively drained	252.9	14.5%
8	Candler sand, 5 to 12 percent slopes	Excessively drained	87.4	5.0%
15	Hontoon muck, frequently ponded, 0 to 1 percent slopes	Very poorly drained	390.9	22.3%
16	Immokalee fine sand, 0 to 2 percent slopes	Poorly drained	319.5	18.3%
27	Ona fine sand, 0 to 2 percent slopes	Poorly drained	8.4	0.5%
28	Paola sand, 0 to 5 percent slopes	Excessively drained	16.5	0.9%
32	Placid fine sand, frequently ponded, 0 to 1 percent slopes	Very poorly drained	107.2	6.1%
34	Pomello fine sand, 0 to 5 percent slopes	Moderately well drained	105.4	6.0%
36	Pompano fine sand, 0 to 2 percent slopes	Poorly drained	26.3	1.5%
37	Pompano fine sand, frequently ponded, 0 to 1 percent slopes	Very poorly drained	37.8	2.2%
38	Riviera fine sand, 0 to 2 percent slopes	Poorly drained	0.3	0.0%
40	Samsula muck, frequently ponded, 0 to 1 percent slopes	Very poorly drained	72.8	4.2%
41	Satellite sand, 0 to 2 percent slopes	Somewhat poorly drained	177.8	10.2%
42	Smyrna fine sand, 0 to 2 percent slopes	Poorly drained	10.5	0.6%
43	St. Lucie fine sand, 0 to 5 percent slopes	Excessively drained	7.9	0.5%
99	Water		3.0	0.2%
Subtotals for Soil Survey Area			**1,659.9**	**94.9%**
Totals for Area of Interest			**1,749.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
13	Samsula muck, frequently ponded, 0 to 1 percent slopes	Very poorly drained	23.0	1.3%
21	Immokalee sand	Poorly drained	29.5	1.7%
25	Placid and Myakka fine sands, depressional	Very poorly drained	20.2	1.2%
77	Satellite sand, 0 to 2 percent slopes	Somewhat poorly drained	16.8	1.0%
Subtotals for Soil Survey Area			**89.5**	**5.1%**
Totals for Area of Interest			**1,749.4**	**100.0%**

Description

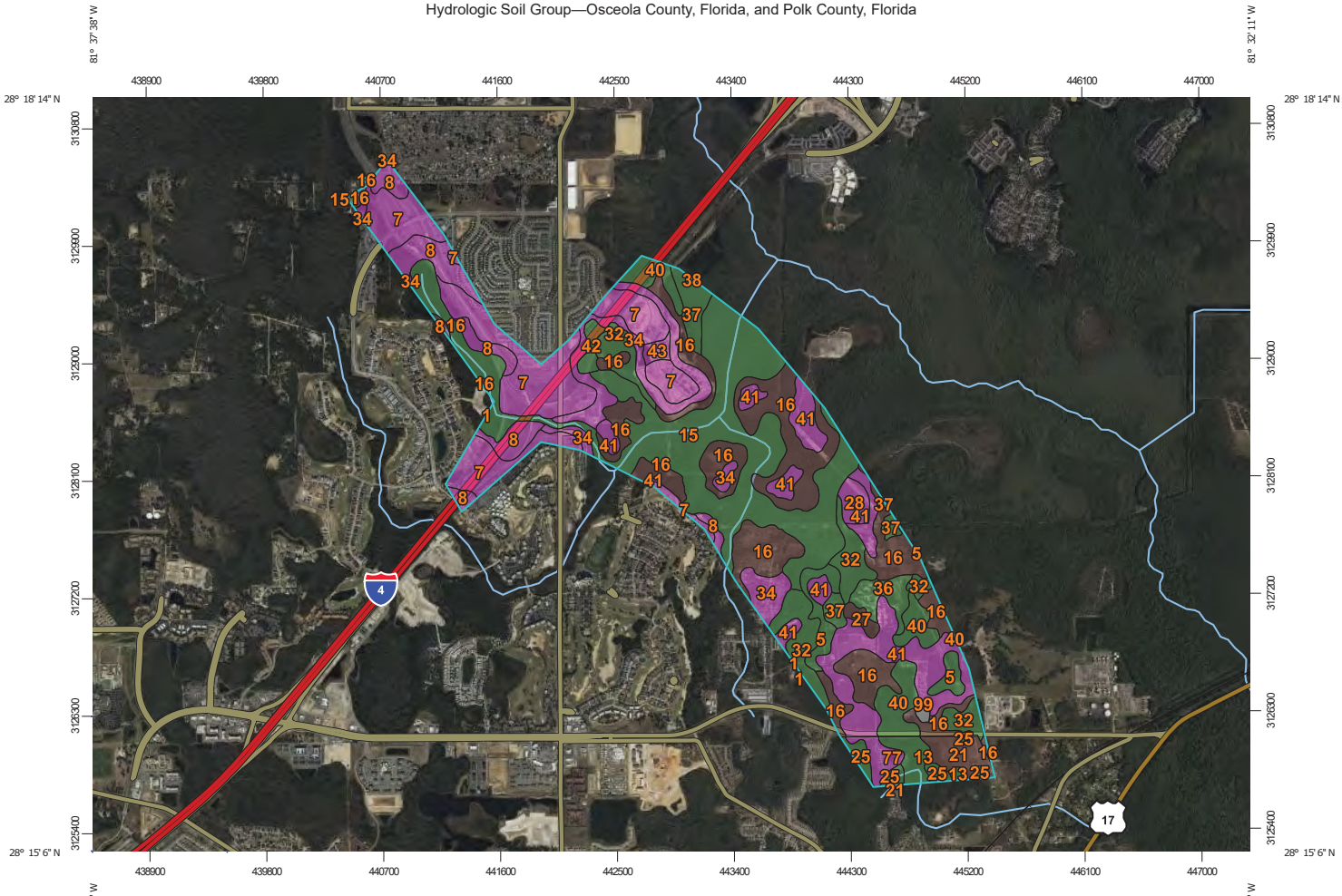
"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Map Scale: 1:40,800 if printed on A landscape (11" x 8.5") sheet.

N

0 500 1000 2000 3000 Meters

0 1500 3000 6000 9000 Feet

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Osceola County, Florida
Survey Area Data: Version 19, Aug 27, 2021

Soil Survey Area: Polk County, Florida
Survey Area Data: Version 19, Aug 27, 2021

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jan 6, 2022—Mar 21, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Adamsville sand, 0 to 2 percent slopes	A	0.2	0.0%
5	Basinger fine sand, 0 to 2 percent slopes	A/D	35.1	2.0%
7	Candler sand, 0 to 5 percent slopes	A	252.9	14.5%
8	Candler sand, 5 to 12 percent slopes	A	87.4	5.0%
15	Hontoon muck, frequently ponded, 0 to 1 percent slopes	A/D	390.9	22.3%
16	Immokalee fine sand, 0 to 2 percent slopes	B/D	319.5	18.3%
27	Ona fine sand, 0 to 2 percent slopes	B/D	8.4	0.5%
28	Paola sand, 0 to 5 percent slopes	A	16.5	0.9%
32	Placid fine sand, frequently ponded, 0 to 1 percent slopes	A/D	107.2	6.1%
34	Pomello fine sand, 0 to 5 percent slopes	A	105.4	6.0%
36	Pompano fine sand, 0 to 2 percent slopes	A/D	26.3	1.5%
37	Pompano fine sand, frequently ponded, 0 to 1 percent slopes	A/D	37.8	2.2%
38	Riviera fine sand, 0 to 2 percent slopes	A/D	0.3	0.0%
40	Samsula muck, frequently ponded, 0 to 1 percent slopes	A/D	72.8	4.2%
41	Satellite sand, 0 to 2 percent slopes	A	177.8	10.2%
42	Smyrna fine sand, 0 to 2 percent slopes	A/D	10.5	0.6%
43	St. Lucie fine sand, 0 to 5 percent slopes	A	7.9	0.5%
99	Water		3.0	0.2%
Subtotals for Soil Survey Area			**1,659.9**	**94.9%**
Totals for Area of Interest			**1,749.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
13	Samsula muck, frequently ponded, 0 to 1 percent slopes	A/D	23.0	1.3%
21	Immokalee sand	B/D	29.5	1.7%
25	Placid and Myakka fine sands, depressional	A/D	20.2	1.2%
77	Satellite sand, 0 to 2 percent slopes	A	16.8	1.0%
Subtotals for Soil Survey Area			**89.5**	**5.1%**
Totals for Area of Interest			**1,749.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

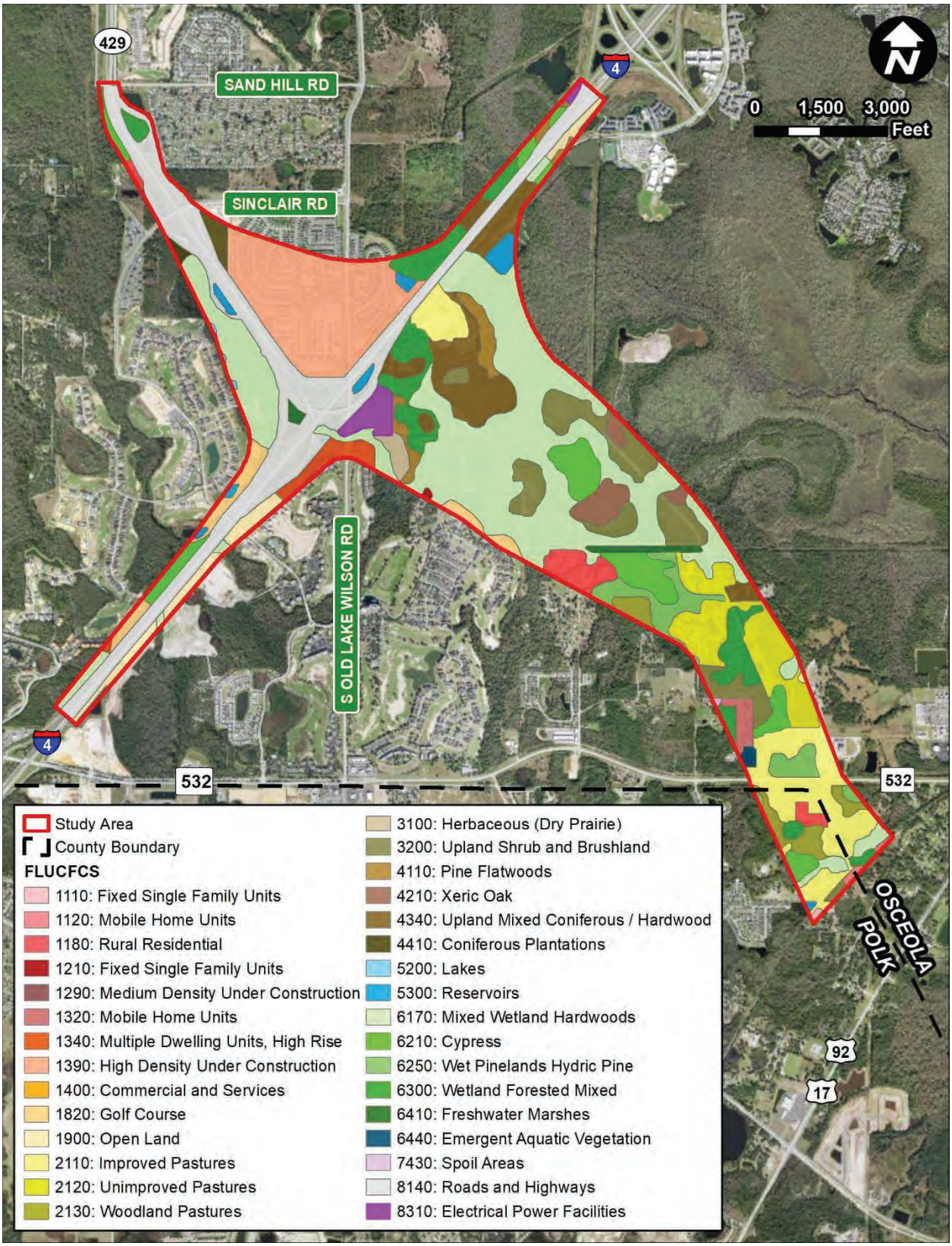
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

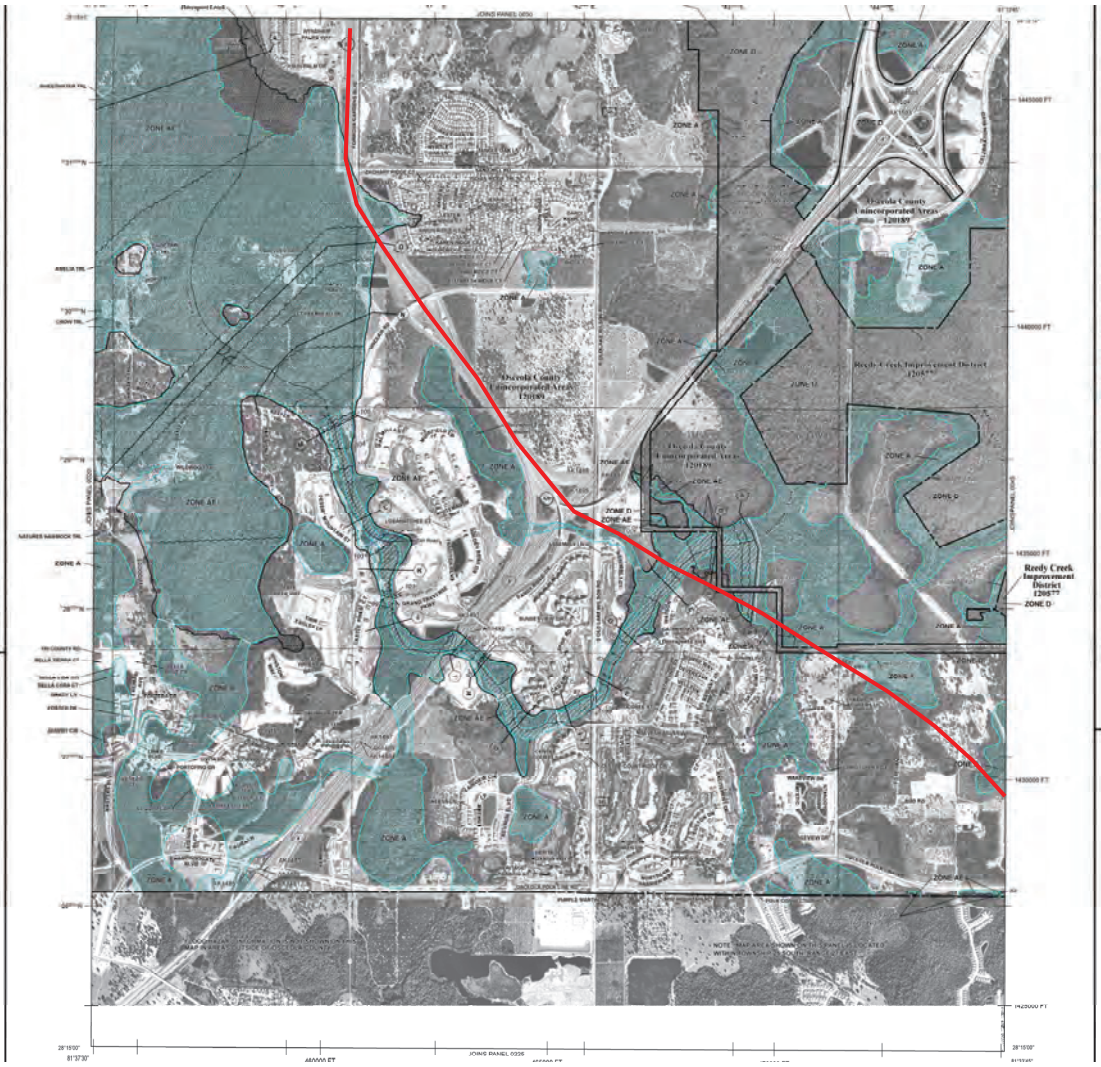
Tie-break Rule: Higher

APPENDIX C – LAND USE MAP

Figure 2-7: Existing Land Use



APPENDIX D – FEMA MAPS



NFIP

PANEL 0040G

FIRM

FLOOD INSURANCE RATE MAP

OSCEOLA COUNTY, FLORIDA AND INCORPORATED AREAS

PANEL 40 OF 900

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

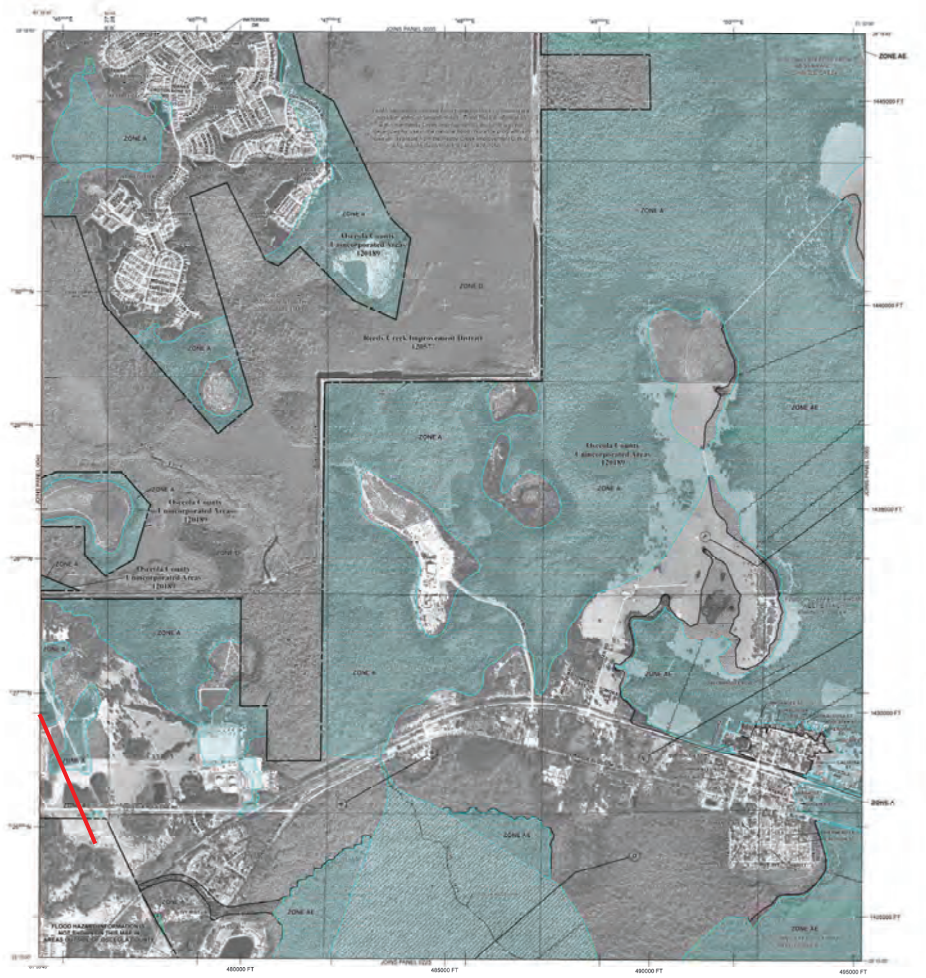
COMMUNITY	NUMBER	PANEL	SUFFIX
OSCEOLA COUNTY	120189	0040	G
REEDY CREEK IMPROVEMENT DISTRICT	120677	0040	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
12097C0040G

MAP REVISED

NOTES TO USERS



LEGEND

MAP SCALE 1" = 1000'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0045G

FIRM

FLOOD INSURANCE RATE MAP

OSCEOLA COUNTY, FLORIDA

AND INCORPORATED AREAS

PANEL 45 OF 900

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

MAP NUMBER 12097C0045G

MAP REVISED JUNE 18, 2013

Federal Emergency Management Agency

APPENDIX E – FLOODPLAIN AND CROSS DRAIN CALCULATIONS

FLOODPLAIN CALCULATIONS

RS&H

FLOODPLAIN IMPACTS

POINCIANA PARKWAY EXTENSION
from CR 532 to North of I-4/SR 429 Interchange

FLORIDA'S TURNPIKE

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 3/23/2022
Checked: ENS
Date: 8/2/2022

Location: 1
Alignment: 429_NB
Beginning Station: 7427+00
End Station: 7439+00
Side: RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
106.0	0.17		0.85	100-year BFE
		0.17		
105.0	0.17		0.68	
		0.17		
104.0	0.17		0.51	
		0.17		
103.0	0.17		0.34	
		0.17		
102.0	0.17		0.17	
		0.17		
101.0	0.17		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 3/23/2022
Checked: ENS
Date: 8/2/2022

Location: 2
Alignment: 429_SB
Beginning Station: 6426+00
End Station: 6435+00
Side: LT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
106.0	0.08		0.48	100-year BFE
		0.08		
105.0	0.08		0.40	
		0.08		
104.0	0.08		0.32	
		0.08		
103.0	0.08		0.24	
		0.08		
102.0	0.08		0.16	
		0.08		
101.0	0.08		0.08	
		0.08		
100.0	0.08		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 3/23/2022
Checked: ENS
Date: 8/2/2022

Location: 3
Alignment: 429_SB
Beginning Station: 6391+00
End Station: 6400+00
Side: LT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
100.0	4.13		4.13	Closest fit to Zone A linework per LiDAR
		4.13		
99.0	4.13		0.00	

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 4
Alignment: I-4 CL
Beginning Station: 5336+00
End Station: 5341+00
Side: LT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
94.5	0.57		0.47	100-year HY-8 Headwater Elev from BTU
		0.24		
94.0	0.40		0.23	
		0.23		
93.0	0.05		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 5
Alignment: I-4 CL
Beginning Station: 5342+00
End Station: 5344+00
Side: RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
94.1	0.07		0.08	100-year HY-8 Headwater Elev from BTU
		0.06		
93.0	0.04		0.02	
		0.02		
92.0	0.00		0.000	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 6
Alignment: I-4 CL
Beginning Station: 5359+00
End Station: 5364+00
Side: RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
83.0	1.38		2.06	100-year BFE
		1.22		
82.0	1.06		0.84	
		0.84		
81.0	0.61		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 7
Alignment: 429_R_C1
Beginning Station: 1035+00
End Station: 1042+00
Side: RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
83.0	1.29		4.63	100-year BFE
		1.27		
82.0	1.24		3.36	
		1.22		
81.0	1.20		2.14	
		1.18		
80.0	1.15		0.97	
		0.97		
79.0	0.78		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 8
Alignment: 429_R_C1
Beginning Station: 1028+00
End Station: 1033+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
83.0	0.69		0.89	100-year BFE
		0.48		
82.0	0.27		0.41	
		0.23		
81.0	0.18		0.18	
		0.14		
80.0	0.09		0.05	
		0.05		
79.0	0.00		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/15/2022
Checked: ENS
Date: 8/2/2022

Location: 9
Alignment: 429_SB
Beginning Station: 6307+00
End Station: 6313+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
80.0	0.88		2.06	100-year BFE
		0.75		
79.0	0.62		1.31	
		0.54		
78.0	0.45		0.78	
		0.42		
77.0	0.38		0.36	
		0.36		
76.0	0.34		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/15/2022
Checked: ENS
Date: 8/2/2022

Location: 10
Alignment: 429_SB
Beginning Station: 6298+00
End Station: 6307+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
77.0	1.29		0.81	Closest fit to Zone A linework per LiDAR
		0.81		
76.0	0.32		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 7/28/2022
Checked: ENS
Date: 8/2/2022

Location: 11
Alignment: 429_SB
Beginning Station: 6293+00
End Station: 6298+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
76.0	1.95		3.86	Closest fit to Zone A linework per LiDAR
		1.77		
75.0	1.58		2.09	
		1.43		
74.0	1.27		0.67	
		0.67		
73.0	0.06		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 7/28/2022
Checked: ENS
Date: 8/2/2022

Location: 12
Alignment: 429_SB
Beginning Station: 6261+00
End Station: 6277+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
76.0	10.40		19.66	Closest fit to Zone A linework per LiDAR
		10.11		
75.0	9.81		9.56	
		9.56		
74.0	9.30		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 2/23/2022
Checked: ENS
Date: 8/2/2022

Location: 13
Alignment: 429_SB
Beginning Station: 6235+00
End Station: 6247+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
85.0	7.66		8.51	Closest fit to Zone A linework per LiDAR
		6.17		
84.0	4.68		2.34	
		2.34		
83.0	0.00		0.00	
		0.00		

RS&H, Inc.
FPID: 446581-1
FLOODPLAIN IMPACT VOLUME CALCULATIONS

By: CAB
Date: 7/28/2022
Checked: ENS
Date: 8/2/2022

Location: 14
Alignment: 429_SB
Beginning Station: 6223+00
End Station: 6228+00
Side: LT/RT

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)	Comments
87.0	3.08		2.25	Closest fit to Zone A linework per LiDAR
		1.90		
86.0	0.71		0.36	
		0.36		
85.0	0.00			
		0.00		

CROSS DRAIN CALCULATIONS

Project Number:	446581-1	By:	CAB
Description:	Poinciana Parkway Extension	Date:	2/28/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 01 **STATION:** 6216+06

AREAS (A)	Area (ac)		**C**	**(A * C)**
Impervious (road)	0.23		0.90	0.207
Grass, Sandy soil, 0-2 % slopes:	3.91		0.20	0.782
Woodlands, Clayey soil, 0-2% slopes:	2.13		0.20	0.426
SUM	**6.27**	**ac**		**1.415**
COMPOSITE C COEFFICIENT	0.23			
100 YEAR C VALUE ADJUSTMENT (1.25*C)	**0.28**			

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 26.5 min (from Tc worksheet)

I_{100} = 6.80 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA

= 12.03 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 12.03 cfs

V= 4.5 ft/s

A = 2.67 ft^2

D_{calc}= 22.14 inches

D= 24 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 01
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Grass											
Manning's Roughness coeff., n	0.240											
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft				
100-Year Intensity, i_{100}	8.50	in/hr		in		in		in				
Elevation 1, E_1	88.00	ft		ft		ft		ft				
Elevation 2, E_2	87.53	ft		ft		ft		ft				
Land Slope, $s = (E_1 - E_2) / L$	0.005	ft/ft		ft/ft		ft/ft		ft/ft				
$Tt = 0.93 * (n * L)^{0.6} / (i_{100}^{0.4} * s^{0.3})$	18.33	min		hr		hr		hr				
	18.3	+		+		+		=	18.3	min		

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass											
k, Based on Flow Type	16.135											
Flow Length, L	540	ft		ft		ft		ft				
Elevation 1, E_1	87.53	ft		ft		ft		ft				
Elevation 2, E_2	85.00	ft		ft		ft		ft				
Watercourse Slope, $s = (E_1 - E_2) / L$	0.005	ft/ft		ft/ft		ft/ft		ft/ft				
Velocity, $V=kS^{0.5}$	1.10	ft/s		ft/s		ft/s		ft/s				
$T_2 = L / V$	8.15	min		hr		hr		hr				
	8.1	+		+		+		=	8.1	min		

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

Open Channel	Front Slope, s_1		:1		:1		:1		:1			
	Bottom width, B		ft		ft		ft		ft			
	Back Slope, s_2		:1		:1		:1		:1			
	Depth, H		ft		ft		ft		ft			
Pipe	Diameter, D		in		in		in		in			
Cross Sectional Flow Area, a			sq ft		sq ft		sq ft		sq ft			
Wetted Perimeter, P_w			ft		ft		ft		ft			
Hydraulic radius, $r = a / P_w$			ft		ft		ft		ft			
Flow Length, L			ft		ft		ft		ft			
Elevation 1, E_1			ft		ft		ft		ft			
Elevation 2, E_2			ft		ft		ft		ft			
Channel Slope, $s = (E_1 - E_2) / L$			ft/ft		ft/ft		ft/ft		ft/ft			
Manning's Roughness coeff., n												
Velocity, $V = 1.49 * r^{2/3} * s^{1/2} / n$			ft/s		ft/s		ft/s		ft/s			
$T_t = L / (3600 * V)$			hr		hr		hr		hr			
			+		+		+		=	0.0	min	

Total Time of Concentration

Tc = **26.5** **min**

Project Number:	446581-1	By:	CAB
Description:	Poinciana Parkway Extension	Date:	2/28/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 02 **STATION:** 6224+88

AREAS (A)	Area (ac)		**C**	**(A * C)**
Residential Small Lots, Sandy soil, 0-2 % slopes:			0.45	0
Residential Large Lots, Sandy soil, 0-2 % slopes:			0.30	0
Grass, Sandy soil, 0-2 % slopes:	1.82		0.20	0.364
Woodlands, Clayey soil, 0-2% slopes:	2.51		0.20	0.502
SUM	**4.33**	**ac**		**0.866**
COMPOSITE C COEFFICIENT	0.20			
100 YEAR C VALUE ADJUSTMENT (1.25*C)	**0.25**			

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 46.8 min (from Tc worksheet)

I_{100} = 5.30 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA

= 5.74 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 5.74 cfs

V= 4.5 ft/s

A = 1.27 ft^2

D_{calc}= 15.29 inches

D= 18 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 02
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Grass										
Manning's Roughness coeff., n	0.240										
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft			
100-Year Intensity, i_{100}	7.20	in/hr		in		in		in			
Elevation 1, E_1	88.00	ft		ft		ft		ft			
Elevation 2, E_2	87.75	ft		ft		ft		ft			
Land Slope, s = (E_1 - E_2) / L	0.003	ft/ft		ft/ft		ft/ft		ft/ft			
Tt = 0.93 * (n * L)$^{0.6}$ / ($i_{100}^{0.4}$ * s$^{0.3}$)	25.63	min		hr		hr		hr			
	25.6	+		+		+		=	25.6	min	

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass										
k, Based on Flow Type	16.135										
Flow Length, L	1050	ft		ft		ft		ft			
Elevation 1, E_1	87.75	ft		ft		ft		ft			
Elevation 2, E_2	85.00	ft		ft		ft		ft			
Watercourse Slope, s = (E_1 - E_2) / L	0.003	ft/ft		ft/ft		ft/ft		ft/ft			
Velocity, V=kS$^{0.5}$	0.83	ft/s		ft/s		ft/s		ft/s			
T_2 = L / V	21.19	min		hr		hr		hr			
	21.2	+		+		+		=	21.2	min	

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

Open Channel	Front Slope, s_1		:1		:1		:1		:1		
	Bottom width, B		ft		ft		ft		ft		
	Back Slope, s_2		:1		:1		:1		:1		
	Depth, H		ft		ft		ft		ft		
Pipe	Diameter, D		in		in		in		in		
Cross Sectional Flow Area, a			sq ft		sq ft		sq ft		sq ft		
Wetted Perimeter, P_w			ft		ft		ft		ft		
Hydraulic radius, r = a / P_w			ft		ft		ft		ft		
Flow Length, L			ft		ft		ft		ft		
Elevation 1, E_1			ft		ft		ft		ft		
Elevation 2, E_2			ft		ft		ft		ft		
Channel Slope, s = (E_1 - E_2) / L			ft/ft		ft/ft		ft/ft		ft/ft		
Manning's Roughness coeff., n											
Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ / n			ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)			hr		hr		hr		hr		
			+		+		+		=	0.0	min

Total Time of Concentration

Sub-Basin Tc = **46.8** **min**

Project Number:	446581-1	By:	CAB
Description:	Poinciana Parkway Extension	Date:	2/28/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 03 **STATION:** 6242+54

AREAS (A)	Area (ac)	**C**	**(A * C)**
Residential Small Lots, Sandy soil, 0-2 % slopes:		0.45	0
Residential Large Lots, Sandy soil, 0-2 % slopes:		0.30	0
Grass, Sandy soil, 0-2 % slopes:	4.08	0.20	0.816
Woodlands, Clayey soil, 0-2% slopes:	23.68	0.20	4.736
SUM	**27.76** **ac**		**5.552**

COMPOSITE C COEFFICIENT 0.20
100 YEAR C VALUE ADJUSTMENT (1.25*C) **0.25**

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 58.3 min (from Tc worksheet)
I_{100} = 4.60 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA
= 31.92 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 31.92 cfs
V= 4.5 ft/s

A = 7.09 ft^2

D_{calc}= 36.07 inches
D= 36 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 03
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Grass											
Manning's Roughness coeff., n	0.240											
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft				
100-Year Intensity, i_{100}	8.50	in/hr		in		in		in				
Elevation 1, E_1	92.00	ft		ft		ft		ft				
Elevation 2, E_2	91.00	ft		ft		ft		ft				
Land Slope, $s = (E_1 - E_2) / L$	0.010	ft/ft		ft/ft		ft/ft		ft/ft				
$Tt = 0.93 * (n * L)^{0.6} / (i_{100}^{0.4} * s^{0.3})$	13.55	min		hr		hr		hr				
	13.5	+		+		+		=	13.5	min		

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass											
k, Based on Flow Type	16.135											
Flow Length, L	2467	ft		ft		ft		ft				
Elevation 1, E_1	91.00	ft		ft		ft		ft				
Elevation 2, E_2	83.00	ft		ft		ft		ft				
Watercourse Slope, $s = (E_1 - E_2) / L$	0.003	ft/ft		ft/ft		ft/ft		ft/ft				
Velocity, $V=kS^{0.5}$	0.92	ft/s		ft/s		ft/s		ft/s				
$T_2 = L / V$	44.75	min		hr		hr		hr				
	44.7	+		+		+		=	44.7	min		

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

Open Channel	Front Slope, s_1		:1		:1		:1		:1			
	Bottom width, B		ft		ft		ft		ft			
	Back Slope, s_2		:1		:1		:1		:1			
	Depth, H		ft		ft		ft		ft			
Pipe	Diameter, D		in		in		in		in			
Cross Sectional Flow Area, a			sq ft		sq ft		sq ft		sq ft			
Wetted Perimeter, P_w			ft		ft		ft		ft			
Hydraulic radius, $r = a / P_w$			ft		ft		ft		ft			
Flow Length, L			ft		ft		ft		ft			
Elevation 1, E_1			ft		ft		ft		ft			
Elevation 2, E_2			ft		ft		ft		ft			
Channel Slope, $s = (E_1 - E_2) / L$			ft/ft		ft/ft		ft/ft		ft/ft			
Manning's Roughness coeff., n												
Velocity, $V = 1.49 * r^{2/3} * s^{1/2} / n$			ft/s		ft/s		ft/s		ft/s			
$T_t = L / (3600 * V)$			hr		hr		hr		hr			
			+		+		+		=	0.0	min	

Total Time of Concentration

Sub-Basin Tc = **58.3** **min**

Project Number:	446581-1	By:	CAB
Description:	Poinciana Parkway Extension	Date:	2/28/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 04 **STATION:** 6264+81

AREAS (A)	Area (ac)	**C**	**(A * C)**
Residential Small Lots, Sandy soil, 0-2 % slopes:		0.45	0
Residential Large Lots, Sandy soil, 0-2 % slopes:		0.30	0
Grass, Sandy soil, 0-2 % slopes:	5.75	0.20	1.15
Woodlands, Clayey soil, 0-2% slopes:	38.74	0.20	7.748
SUM	**44.49 ac**		**8.898**

COMPOSITE C COEFFICIENT 0.20
100 YEAR C VALUE ADJUSTMENT (1.25*C) **0.25**

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 46.9 min (from Tc worksheet)
I_{100} = 5.20 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA
= 57.84 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 57.84 cfs
V= 4.5 ft/s

A = 12.85 ft^2

D_{calc}= 48.54 inches
D= 48 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 04
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Grass											
Manning's Roughness coeff., n	0.240											
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft				
100-Year Intensity, i_{100}	8.50	in/hr		in		in		in				
Elevation 1, E_1	93.00	ft		ft		ft		ft				
Elevation 2, E_2	92.00	ft		ft		ft		ft				
Land Slope, $s = (E_1 - E_2) / L$	0.010	ft/ft		ft/ft		ft/ft		ft/ft				
$Tt = 0.93 * (n * L)^{0.6} / (i_{100}^{0.4} * s^{0.3})$	13.55	min		hr		hr		hr				
	13.5	+		+		+		=	13.5	min		

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass											
k, Based on Flow Type	16.135											
Flow Length, L	1786	ft		ft		ft		ft				
Elevation 1, E_1	92.00	ft		ft		ft		ft				
Elevation 2, E_2	85.00	ft		ft		ft		ft				
Watercourse Slope, $s = (E_1 - E_2) / L$	0.004	ft/ft		ft/ft		ft/ft		ft/ft				
Velocity, $V=kS^{0.5}$	1.01	ft/s		ft/s		ft/s		ft/s				
$T_2 = L / V$	29.47	min		hr		hr		hr				
	29.5	+		+		+		=	29.5	min		

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

		Channel										
Open Channel	Front Slope, s_1	15.00	:1		:1		:1		:1			
	Bottom width, B	40.00	ft		ft		ft		ft			
	Back Slope, s_2	15.00	:1		:1		:1		:1			
	Depth, H	1.00	ft		ft		ft		ft			
Pipe	Diameter, D		in		in		in		in			
Cross Sectional Flow Area, a		55.00	sq ft		sq ft		sq ft		sq ft			
Wetted Perimeter, P_w		70.07	ft		ft		ft		ft			
Hydraulic radius, $r = a / P_w$		0.78	ft		ft		ft		ft			
Flow Length, L		721	ft		ft		ft		ft			
Elevation 1, E_1		85.00	ft		ft		ft		ft			
Elevation 2, E_2		74.00	ft		ft		ft		ft			
Channel Slope, $s = (E_1 - E_2) / L$		0.015	ft/ft		ft/ft		ft/ft		ft/ft			
Manning's Roughness coeff., n		0.050										
Velocity, $V = 1.49 * r^{2/3} * s^{1/2} / n$		3.13	ft/s		ft/s		ft/s		ft/s			
$T_t = L / (3600 * V)$		0.06	hr		hr		hr		hr			
		3.8	+		+		+		=	3.8	min	

Total Time of Concentration

Sub-Basin Tc = **46.9** **min**

Project Number: 446581-1
Description: Poinciana Parkway Extension

By: CAB
Date: 2/28/2022
Chk: ENS

PROPOSED CROSS DRAIN 05 **STATION:** 6275+32

AREAS (A)	Area (ac)		**C**	**(A * C)**
Residential Small Lots, Sandy soil, 0-2 % slopes:	8.25		0.45	3.7125
Residential Large Lots, Sandy soil, 0-2 % slopes:	15.24		0.30	4.572
Grass, Sandy soil, 0-2 % slopes:	21.78		0.20	4.356
Woodlands, Clayey soil, 0-2% slopes:	127.36		0.20	25.472
SUM	**172.63**	**ac**		**38.1125**

COMPOSITE C COEFFICIENT 0.22
100 YEAR C VALUE ADJUSTMENT (1.25*C) **0.28**

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 99.4 min (from Tc worksheet)
I_{100} = 3.20 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA
= 152.45 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 152.45 cfs
V= 4.5 ft/s

A = 33.88 ft^2

D_{calc}= 78.81 inches
D= 78 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 05
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Grass											
Manning's Roughness coeff., n	0.240											
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft				
100-Year Intensity, i_{100}	7.50	in/hr		in		in		in				
Elevation 1, E_1	93.00	ft		ft		ft		ft				
Elevation 2, E_2	92.50	ft		ft		ft		ft				
Land Slope, $s = (E_1 - E_2) / L$	0.005	ft/ft		ft/ft		ft/ft		ft/ft				
$Tt = 0.93 * (n * L)^{0.6} / (i_{100}^{0.4} * s^{0.3})$	19.03	min		hr		hr		hr				
	19.0	+		+		+		=	19.0	min		

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass											
k, Based on Flow Type	16.135											
Flow Length, L	2425	ft		ft		ft		ft				
Elevation 1, E_1	92.50	ft		ft		ft		ft				
Elevation 2, E_2	87.00	ft		ft		ft		ft				
Watercourse Slope, $s = (E_1 - E_2) / L$	0.002	ft/ft		ft/ft		ft/ft		ft/ft				
Velocity, $V=kS^{0.5}$	0.77	ft/s		ft/s		ft/s		ft/s				
$T_2 = L / V$	52.60	min		hr		hr		hr				
	52.6	+		+		+		=	52.6	min		

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

		Channel											
Open Channel	Front Slope, s_1	15.00	:1		:1		:1		:1				
	Bottom width, B	20.00	ft		ft		ft		ft				
	Back Slope, s_2	12.00	:1		:1		:1		:1				
	Depth, H	1.00	ft		ft		ft		ft				
Pipe	Diameter, D		in		in		in		in				
Cross Sectional Flow Area, a		33.50	sq ft		sq ft		sq ft		sq ft				
Wetted Perimeter, P_w		47.07	ft		ft		ft		ft				
Hydraulic radius, $r = a / P_w$		0.71	ft		ft		ft		ft				
Flow Length, L		2730	ft		ft		ft		ft				
Elevation 1, E_1		87.00	ft		ft		ft		ft				
Elevation 2, E_2		74.00	ft		ft		ft		ft				
Channel Slope, $s = (E_1 - E_2) / L$		0.005	ft/ft		ft/ft		ft/ft		ft/ft				
Manning's Roughness coeff., n		0.050											
Velocity, $V = 1.49 * r^{2/3} * s^{1/2} / n$		1.64	ft/s		ft/s		ft/s		ft/s				
$T_t = L / (3600 * V)$		0.46	hr		hr		hr		hr				
		27.8	+		+		+		=	27.8	min		

Total Time of Concentration

Sub-Basin Tc = **99.4** **min**

Project Number:	104-0125-001	By:	CAB
Description:	Poinciana Parkway Extension	Date:	8/1/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 06 **STATION:** 6295+22

REGRESSION CALCULATION:

South of CR 532 - from CFX report ICPR model

Basin ID	**Area (ac)**	Area (sq mi)
LWR	257.90	
OLWR	426.00	
Bhouses_Pre	17.90	
B05	6.51	
B05A	0.68	
B05B	21.81	
B10	13.97	
B10A	1.42	
B10B	1.94	
B10C	74.64	
B10D	9.12	
B10E	1.90	
Total	**833.78**	**1.30**

North of CR 532 - from LiDAR Topo

	Area (ac)	Area (sq mi)
-	532.89	
Total	**532.89**	**0.83**

Total Basin Area to CD

acres	**sq. mi**
1366.67	**2.14**

Storage Areas (ST):

Area (sf)	**Area (ac)**	**Area (sf)**	**Area (ac)**
2791332	64.0801653	2488693	57.13253
4775753	109.636203	313209	7.190289
1724931	39.5989669		
689168	15.8211203		
1818289	41.7421717		
11799473	270.878627	2801902	64.32282

Total ST in Basin Area

acres	**ST**
335.2014463	**0.25**

Regression Equation Formulas

Table B-12: USGS Regression Equations – Natural Flow Conditions - Region 3

Peak Runoff Equation	Standard Error of Prediction (%)
$Q_2 = 72.7\ A^{0.741}\ (ST+1)^{-0.589}$	87
$Q_5 = 164\ A^{0.704}\ (ST+1)^{-0.587}$	62
$Q_{10} = 250\ A^{0.686}\ (ST+1)^{-0.592}$	56
$Q_{25} = 390\ A^{0.668}\ (ST+1)^{-0.601}$	53
$Q_{50} = 517\ A^{0.656}\ (ST+1)^{-0.608}$	53
$Q_{100} = 664\ A^{0.646}\ (ST+1)^{-0.616}$	54
$Q_{200} = 833\ A^{0.638}\ (ST+1)^{-0.625}$	56
$Q_{500} = 1094\ A^{0.629}\ (ST+1)^{-0.638}$	59

Q_T = Peak runoff rate for return period of T-years, in cfs
A = Drainage area, in miles^2
ST = Basin storage, the percentage of the drainage basin occupied by lakes, reservoirs, swamps, and wetland. In-channel storage of a temporary nature, resulting from detention ponds or roadway embankments, is not included in the computation of ST

Basin Characteristic	Range of Applicability
Drainage Area (A)	0.41 miles^2 (262.4 acres) to 3,244 miles^2
Storage Area (ST)	0.18% to 48.04%

Q2	112.09
Q5	245.97
Q10	369.46
Q25	567.42
Q50	744.24
Q100	946.96
Q500	1532.80

Project Number:	104-0125-001	By:	CAB
Description:	Poinciana Parkway Extension	Date:	8/1/2022
		Chk:	

PROPOSED CROSS DRAIN 06 **STATION:** 6295+21.95

See HY-8 for Sizing

Sta. (ft)	Elevation	Mannings, n
0	77	0.07
60	76	0.07
109	75	0.07
128	74	0.05
156	73	0.05
191	73	0.05
339	74	0.07
352	75	0.07
368	76	0.07
398	77	0
60	0	0

Q50	744.24
Q100	946.96
Q500	1532.80
US INV	74
DS INV	73

3- 12'x4' BOX CULVERT TO REDUCE HEADWATER

HY-8 Culvert Analysis Report CD 6

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 744.24 cfs

Design Flow: 946.96 cfs

Maximum Flow: 1532.80 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-06

Headwater Elevation (ft)	Total Discharge (cfs)	CD-06_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
78.01	744.24	744.24	0.00	1
78.31	823.10	823.10	0.00	1
78.62	901.95	901.95	0.00	1
78.80	946.96	946.96	0.00	1
79.27	1059.66	1059.66	0.00	1
79.62	1138.52	1138.52	0.00	1
79.98	1217.38	1217.38	0.00	1
80.37	1296.23	1296.23	0.00	1
80.78	1375.09	1375.09	0.00	1
81.21	1453.94	1453.94	0.00	1
81.67	1532.80	1532.80	0.00	1
99.30	3251.49	3251.49	0.00	Overtopping

Culvert Data: CD-06_PR

Table 2 - Culvert Summary Table: CD-06_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
744.24 cfs	744.24 cfs	78.01	4.01	2.207	5-S2n	1.91	2.37	1.95	2.28	10.61	1.77
823.10 cfs	823.10 cfs	78.31	4.31	2.558	5-S2n	2.04	2.53	2.08	2.39	10.98	1.83
901.95 cfs	901.95 cfs	78.62	4.62	2.924	5-S2n	2.17	2.69	2.22	2.50	11.27	1.88
946.96 cfs	946.96 cfs	78.80	4.80	3.139	5-S2n	2.24	2.78	2.30	2.56	11.45	1.91
1059.66 cfs	1059.66 cfs	79.27	5.27	3.698	5-S2n	2.42	3.00	2.49	2.70	11.84	1.98
1138.52 cfs	1138.52 cfs	79.62	5.62	4.535	5-S2n	2.54	3.14	2.61	2.79	12.10	2.02
1217.38 cfs	1217.38 cfs	79.98	5.98	4.888	5-S2n	2.66	3.29	2.74	2.89	12.36	2.06
1296.23 cfs	1296.23 cfs	80.37	6.37	5.259	5-S2n	2.78	3.43	2.86	2.97	12.57	2.10
1375.09 cfs	1375.09 cfs	80.78	6.78	5.647	5-S2n	2.89	3.57	2.99	3.06	12.79	2.13
1453.94 cfs	1453.94 cfs	81.21	7.21	6.052	5-S2n	3.00	3.70	3.10	3.15	13.01	2.17
1532.80 cfs	1532.80 cfs	81.67	7.67	6.475	5-S2n	3.12	3.83	3.22	3.23	13.21	2.20

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 74.00 ft,

Outlet Elevation (invert): 73.00 ft

Culvert Length: 215.00 ft,

Culvert Slope: 0.0047

Site Data - CD-06_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 74.00 ft

Outlet Station: 215.00 ft

Outlet Elevation: 73.00 ft

Number of Barrels: 3

Culvert Data Summary - CD-06_PR

Barrel Shape: Concrete Box

Barrel Span: 12.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-06

Table 3 - Downstream Channel Rating Curve (Crossing: CD-06)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
744.24	75.28	2.28	1.77	0.24	0.25
823.10	75.39	2.39	1.83	0.25	0.25
901.95	75.50	2.50	1.88	0.26	0.25
946.96	75.56	2.56	1.91	0.27	0.25
1059.66	75.70	2.70	1.98	0.29	0.26
1138.52	75.79	2.79	2.02	0.30	0.26
1217.38	75.89	2.89	2.06	0.31	0.26
1296.23	75.97	2.97	2.10	0.32	0.26
1375.09	76.06	3.06	2.13	0.32	0.26
1453.94	76.15	3.15	2.17	0.33	0.26
1532.80	76.23	3.23	2.20	0.34	0.27

Tailwater Channel Data - CD-06

Tailwater Channel Option: Irregular Channel

Channel Slope: Irregular Channel

User Defined Channel Cross-Section

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	77.00	0.0700

2	60.00	76.00	0.0700
3	109.00	75.00	0.0700
4	128.00	74.00	0.0500
5	156.00	73.00	0.0500
6	191.00	73.00	0.0500
7	339.00	74.00	0.0700
8	352.00	75.00	0.0700
9	368.00	76.00	0.0700
10	398.00	77.00	0.0000

Roadway Data for Crossing: CD-06

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 99.30 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

Project Number:	446581-1	By:	CAB
Description:	Poinciana Parkway Extension	Date:	2/28/2022
		Chk:	ENS

PROPOSED CROSS DRAIN 07 **STATION:** 6301+38

AREAS (A)	Area (ac)		**C**	**(A * C)**
Residential Small Lots, Sandy soil, 0-2 % slopes:	9.38		0.45	4.221
Grass, Sandy soil, 0-2 % slopes:	12.94		0.20	2.588
Woodlands, Clayey soil, 0-2% slopes:	15.92		0.20	3.184
SUM	**38.24**	**ac**		**9.993**

COMPOSITE C COEFFICIENT 0.26
100 YEAR C VALUE ADJUSTMENT (1.25*C) **0.33**

RAINFALL INTENSITIES (I)

Source: FDOT Drainage Manual, Zone 7 IDF Curves

Tc = 31.7 min (from Tc worksheet)
I_{100} = 6.40 in/hr

DESIGN DISCHARGES (Q)

Q_{100} = CIA
= 79.94 cfs

SIZE PIPE FOR V = 4.5 FT/S

A = Q / V Q= 79.94 cfs
V= 4.5 ft/s

A = 17.77 ft^2

D_{calc}= 57.07 inches
D= 60 inches

POINCIANA PARKWAY DRAINAGE STUDY	Comp. By:	CAB
	Date:	2/28/2022
	Chk. By:	
	Job No:	

Time of Concentration Calculations

Structure Name: CROSS DRAIN 07
Condition: Post-Development

Overland Flow [Drainage Design Guide Eq. 2.2-4]

Surface Description	Woods									
Manning's Roughness coeff., n	0.450									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
100-Year Intensity, i_{100}	8.50	in/hr		in		in		in		
Elevation 1, E_1	93.00	ft		ft		ft		ft		
Elevation 2, E_2	91.00	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.020	ft/ft		ft/ft		ft/ft		ft/ft		
$Tt = 0.93 * (n * L)^{0.6} / (i_{100}^{0.4} * s^{0.3})$	14.97	min		hr		hr		hr		
	15.0	+		+		+		=	15.0	min

Shallow Concentrated Flow [Drainage Design Guide Eq. 2.2-5]

Surface Description	Grass									
k, Based on Flow Type	16.135									
Flow Length, L	270	ft		ft		ft		ft		
Elevation 1, E_1	91.00	ft		ft		ft		ft		
Elevation 2, E_2	82.00	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.033	ft/ft		ft/ft		ft/ft		ft/ft		
Velocity, $V=kS^{0.5}$	2.95	ft/s		ft/s		ft/s		ft/s		
T_2 = L / V	1.53	min		hr		hr		hr		
	1.5	+		+		+		=	1.5	min

Open Channel Flow [Drainage Design Guide Eq. 2.2-8]

		Channel									
Open Channel	Front Slope, s_1	4.00	:1		:1		:1		:1		
	Bottom width, B	4.00	ft		ft		ft		ft		
	Back Slope, s_2	4.00	:1		:1		:1		:1		
	Depth, H	1.00	ft		ft		ft		ft		
Pipe	Diameter, D		in		in		in		in		
Cross Sectional Flow Area, a		8.00	sq ft		sq ft		sq ft		sq ft		
Wetted Perimeter, P_w		12.25	ft		ft		ft		ft		
Hydraulic radius, r = a / P_w		0.65	ft		ft		ft		ft		
Flow Length, L		1430	ft		ft		ft		ft		
Elevation 1, E_1		82.00	ft		ft		ft		ft		
Elevation 2, E_2		75.00	ft		ft		ft		ft		
Channel Slope, s = (E_1 - E_2) / L		0.005	ft/ft		ft/ft		ft/ft		ft/ft		
Manning's Roughness coeff., n		0.050									
Velocity, $V = 1.49 * r^{2/3} * s^{1/2} / n$		1.57	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)		0.25	hr		hr		hr		hr		
		15.2	+		+		+		=	15.2	min

Total Time of Concentration

Sub-Basin Tc = **31.7** **min**

HY-8 Culvert Analysis Report CD-9 EX

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 250.00 cfs

Design Flow: 288.80 cfs

Maximum Flow: 370.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-09_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-09_EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
93.45	250.00	250.00	0.00	1
93.73	262.00	262.00	0.00	1
94.00	274.00	273.36	0.15	35
94.08	288.80	276.25	12.22	8
94.12	298.00	277.09	20.54	6
94.14	310.00	278.24	31.43	5
94.17	322.00	279.62	41.80	4
94.20	334.00	280.97	52.62	4
94.23	346.00	282.18	63.50	4
94.25	358.00	283.23	74.52	4
94.27	370.00	284.19	85.62	4
94.00	273.20	273.20	0.00	Overtopping

Culvert Data: CD-09_EX

Table 2 - Culvert Summary Table: CD-09_EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
250.00 cfs	250.00 cfs	93.45	5.31	5.406	7-M2c	3.50	2.85	2.85	1.80	9.95	0.00
262.00 cfs	262.00 cfs	93.73	5.59	5.688	7-M2c	3.50	2.91	2.91	1.80	10.23	0.00
274.00 cfs	273.36 cfs	94.00	5.88	5.964	7-M2c	3.50	2.96	2.96	1.80	10.50	0.00
288.80 cfs	276.25 cfs	94.08	5.95	6.035	7-M2c	3.50	2.97	2.97	1.80	10.58	0.00
298.00 cfs	277.09 cfs	94.12	5.97	6.079	7-M2c	3.50	2.98	2.98	1.80	10.60	0.00
310.00 cfs	278.24 cfs	94.14	6.01	6.103	7-M2c	3.50	2.98	2.98	1.80	10.63	0.00
322.00 cfs	279.62 cfs	94.17	6.04	6.131	7-M2c	3.50	2.99	2.99	1.80	10.66	0.00
334.00 cfs	280.97 cfs	94.20	6.08	6.160	7-M2c	3.50	2.99	2.99	1.80	10.69	0.00
346.00 cfs	282.18 cfs	94.23	6.11	6.185	7-M2c	3.50	3.00	3.00	1.80	10.72	0.00
358.00 cfs	283.23 cfs	94.25	6.14	6.209	7-M2c	3.50	3.00	3.00	1.80	10.75	0.00
370.00 cfs	284.19 cfs	94.27	6.16	6.233	7-M2c	3.50	3.01	3.01	1.80	10.78	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 88.04 ft,

Outlet Elevation (invert): 87.79 ft

Culvert Length: 127.00 ft,

Culvert Slope: 0.0020

Site Data - CD-09_EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.04 ft

Outlet Station: 127.00 ft

Outlet Elevation: 87.79 ft

Number of Barrels: 3

Culvert Data Summary - CD-09_EX

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-09_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-09_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
250.00	89.59	1.80
262.00	89.59	1.80
274.00	89.59	1.80
288.80	89.59	1.80
298.00	89.59	1.80
310.00	89.59	1.80
322.00	89.59	1.80
334.00	89.59	1.80
346.00	89.59	1.80
358.00	89.59	1.80
370.00	89.59	1.80

Tailwater Channel Data - CD-09_EX

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.59 ft

Roadway Data for Crossing: CD-09_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 94.00 ft

Roadway Surface: Paved

Roadway Top Width: 47.00 ft

HY-8 Culvert Analysis Report CD-9 PR

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 250.00 cfs

Design Flow: 288.80 cfs

Maximum Flow: 370.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-09_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-09_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
93.54	250.00	250.00	0.00	1
93.83	262.00	262.00	0.00	1
94.04	274.00	269.81	3.70	17
94.09	288.80	272.26	16.23	7
94.12	298.00	273.36	24.25	5
94.15	310.00	274.63	35.06	5
94.18	322.00	275.75	45.68	4
94.21	334.00	276.85	56.71	4
94.24	346.00	277.09	68.40	4
94.26	358.00	278.19	79.60	4
94.28	370.00	279.18	90.14	3
94.00	268.11	268.11	0.00	Overtopping

Culvert Data: CD-09_PR

Table 2 - Culvert Summary Table: CD-09_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
250.00 cfs	250.00 cfs	93.54	5.31	5.477	7-M2c	3.50	2.85	2.85	1.83	9.95	0.00
262.00 cfs	262.00 cfs	93.83	5.59	5.771	7-M2c	3.50	2.91	2.91	1.83	10.23	0.00
274.00 cfs	269.81 cfs	94.04	5.79	5.975	7-M2c	3.50	2.94	2.94	1.83	10.42	0.00
288.80 cfs	272.26 cfs	94.09	5.85	6.031	7-M2c	3.50	2.95	2.95	1.83	10.48	0.00
298.00 cfs	273.36 cfs	94.12	5.88	6.059	7-M2c	3.50	2.96	2.96	1.83	10.50	0.00
310.00 cfs	274.63 cfs	94.15	5.91	6.092	7-M2c	3.50	2.96	2.96	1.83	10.54	0.00
322.00 cfs	275.75 cfs	94.18	5.94	6.121	7-M2c	3.50	2.97	2.97	1.83	10.56	0.00
334.00 cfs	276.85 cfs	94.21	5.97	6.149	7-M2c	3.50	2.97	2.97	1.83	10.59	0.00
346.00 cfs	277.09 cfs	94.24	5.97	6.178	7-M2c	3.50	2.98	2.98	1.83	10.60	0.00
358.00 cfs	278.19 cfs	94.26	6.00	6.202	7-M2c	3.50	2.98	2.98	1.83	10.62	0.00
370.00 cfs	279.18 cfs	94.28	6.03	6.224	7-M2c	3.50	2.98	2.98	1.83	10.65	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 88.06 ft,

Outlet Elevation (invert): 87.76 ft

Culvert Length: 148.00 ft,

Culvert Slope: 0.0020

Site Data - CD-09_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 88.06 ft

Outlet Station: 148.00 ft

Outlet Elevation: 87.76 ft

Number of Barrels: 3

Culvert Data Summary - CD-09_PR

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-09_PR

Table 3 - Downstream Channel Rating Curve (Crossing: CD-09_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
250.00	89.59	1.83
262.00	89.59	1.83
274.00	89.59	1.83
288.80	89.59	1.83
298.00	89.59	1.83
310.00	89.59	1.83
322.00	89.59	1.83
334.00	89.59	1.83
346.00	89.59	1.83
358.00	89.59	1.83
370.00	89.59	1.83

Tailwater Channel Data - CD-09_PR

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 89.59 ft

Roadway Data for Crossing: CD-09_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 94.00 ft

Roadway Surface: Paved

Roadway Top Width: 47.00 ft

HY-8 Culvert Analysis Report CD-10 Existing

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 227.90 cfs

Design Flow: 263.80 cfs

Maximum Flow: 348.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-10_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-10 EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
94.46	227.90	227.90	0.00	1
94.63	239.91	239.91	0.00	1
94.80	251.92	251.92	0.00	1
94.98	263.80	263.80	0.00	1
95.07	275.94	275.94	0.00	1
95.16	287.95	287.95	0.00	1
95.26	299.96	299.96	0.00	1
95.35	311.97	311.97	0.00	1
95.44	323.98	323.98	0.00	1
95.53	335.99	335.99	0.00	1
95.62	348.00	348.00	0.00	1
100.00	672.61	672.61	0.00	Overtopping

Culvert Data: CD-10 EX

Table 2 - Culvert Summary Table: CD-10 EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
227.90 cfs	227.90 cfs	94.46	3.41	3.727	3-M2t	3.38	2.02	2.95	2.95	5.52	0.00
239.91 cfs	239.91 cfs	94.63	3.53	3.899	3-M2t	3.52	2.09	3.16	3.16	5.42	0.00
251.92 cfs	251.92 cfs	94.80	3.65	4.075	3-M2t	3.65	2.16	3.37	3.37	5.34	0.00
263.80 cfs	263.80 cfs	94.98	3.77	4.253	3-M2t	3.78	2.23	3.58	3.58	5.26	0.00
275.94 cfs	275.94 cfs	95.07	3.89	4.344	3-M2t	4.00	2.29	3.61	3.61	5.46	0.00
287.95 cfs	287.95 cfs	95.16	4.00	4.434	3-M2t	4.00	2.36	3.63	3.63	5.66	0.00
299.96 cfs	299.96 cfs	95.26	4.12	4.525	3-M2t	4.00	2.42	3.66	3.66	5.85	0.00
311.97 cfs	311.97 cfs	95.35	4.24	4.616	3-M2t	4.00	2.49	3.69	3.69	6.04	0.00
323.98 cfs	323.98 cfs	95.44	4.36	4.708	3-M2t	4.00	2.55	3.72	3.72	6.23	0.00
335.99 cfs	335.99 cfs	95.53	4.48	4.800	3-M2t	4.00	2.62	3.74	3.74	6.41	0.00
348.00 cfs	348.00 cfs	95.62	4.60	4.892	3-M2t	4.00	2.68	3.77	3.77	6.59	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 90.73 ft,

Outlet Elevation (invert): 90.50 ft

Culvert Length: 315.60 ft,

Culvert Slope: 0.0007

Site Data - CD-10 EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 90.73 ft

Outlet Station: 315.60 ft

Outlet Elevation: 90.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-10 EX

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-10_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-10_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
227.90	93.45	93.45	0.00
263.80	94.08	94.08	0.00
348.00	94.27	94.27	0.00

Tailwater Channel Data - CD-10_EX

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: Enter Rating Curve

Roadway Data for Crossing: CD-10_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 100.00 ft

Roadway Surface: Paved

Roadway Top Width: 170.00 ft

HY-8 Culvert Analysis Report CD-10 PR

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 227.90 cfs

Design Flow: 263.80 cfs

Maximum Flow: 348.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-10_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-10_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
94.49	227.90	227.90	0.00	1
94.66	239.91	239.91	0.00	1
94.84	251.92	251.92	0.00	1
95.01	263.80	263.80	0.00	1
95.11	275.94	275.94	0.00	1
95.20	287.95	287.95	0.00	1
95.29	299.96	299.96	0.00	1
95.38	311.97	311.97	0.00	1
95.47	323.98	323.98	0.00	1
95.57	335.99	335.99	0.00	1
95.75	348.00	348.00	0.00	1
100.00	648.12	648.12	0.00	Overtopping

Culvert Data: CD-10_PR

Table 2 - Culvert Summary Table: CD-10_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
227.90 cfs	227.90 cfs	94.49	3.41	3.757	3-M2t	3.39	2.02	3.00	3.00	5.43	0.00
239.91 cfs	239.91 cfs	94.66	3.53	3.929	3-M2t	3.52	2.09	3.21	3.21	5.34	0.00
251.92 cfs	251.92 cfs	94.84	3.65	4.105	3-M2t	3.66	2.16	3.42	3.42	5.26	0.00
263.80 cfs	263.80 cfs	95.01	3.77	4.283	3-M2t	3.78	2.23	3.63	3.63	5.19	0.00
275.94 cfs	275.94 cfs	95.11	3.89	4.375	3-M2t	4.00	2.29	3.66	3.66	5.39	0.00
287.95 cfs	287.95 cfs	95.20	4.00	4.467	3-M2t	4.00	2.36	3.68	3.68	5.58	0.00
299.96 cfs	299.96 cfs	95.29	4.12	4.559	3-M2t	4.00	2.42	3.71	3.71	5.77	0.00
311.97 cfs	311.97 cfs	95.38	4.24	4.651	3-M2t	4.00	2.49	3.74	3.74	5.96	0.00
323.98 cfs	323.98 cfs	95.47	4.36	4.744	3-M2t	4.00	2.55	3.77	3.77	6.15	0.00
335.99 cfs	335.99 cfs	95.57	4.48	4.840	7-M2t	4.00	2.62	3.79	3.79	6.33	0.00
348.00 cfs	348.00 cfs	95.75	4.60	5.023	7-M2t	4.00	2.68	3.82	3.82	6.51	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 90.73 ft,

Outlet Elevation (invert): 90.45 ft

Culvert Length: 386.00 ft,

Culvert Slope: 0.0007

Site Data - CD-10_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 90.73 ft

Outlet Station: 386.00 ft

Outlet Elevation: 90.45 ft

Number of Barrels: 2

Culvert Data Summary - CD-10_PR

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-10_PR

Table 3 - Downstream Channel Rating Curve (Crossing: CD-10_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
227.90	93.45	93.45	0.00
263.80	94.08	94.08	0.00
348.00	94.27	94.27	0.00

Tailwater Channel Data - CD-10_PR

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: Enter Rating Curve

Roadway Data for Crossing: CD-10_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 100.00 ft

Roadway Surface: Paved

Roadway Top Width: 170.00 ft

HY-8 Culvert Analysis Report CD-11 EX

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 222.60 cfs

Design Flow: 257.20 cfs

Maximum Flow: 332.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-11_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-11_EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
96.05	222.60	222.60	0.00	1
96.16	233.54	233.54	0.00	1
96.27	244.48	244.48	0.00	1
96.39	257.20	257.20	0.00	1
96.48	266.36	266.36	0.00	1
96.59	277.30	277.30	0.00	1
96.69	288.24	288.24	0.00	1
96.79	299.18	299.18	0.00	1
96.90	310.12	310.12	0.00	1
97.01	321.06	321.06	0.00	1
97.12	332.00	332.00	0.00	1
102.00	697.53	697.53	0.00	Overtopping

Culvert Data: CD-11_EX

Table 2 - Culvert Summary Table: CD-11_EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
222.60 cfs	222.60 cfs	96.05	3.36	3.428	2-M2c	3.23	1.99	1.99	1.91	8.00	0.00
233.54 cfs	233.54 cfs	96.16	3.47	3.539	2-M2c	3.35	2.05	2.05	1.92	8.13	0.00
244.48 cfs	244.48 cfs	96.27	3.58	3.647	2-M2c	3.47	2.12	2.12	1.94	8.25	0.00
257.20 cfs	257.20 cfs	96.39	3.70	3.772	2-M2c	3.60	2.19	2.19	1.95	8.39	0.00
266.36 cfs	266.36 cfs	96.48	3.79	3.861	2-M2c	3.70	2.24	2.24	2.09	8.49	0.00
277.30 cfs	277.30 cfs	96.59	3.90	3.965	2-M2c	3.81	2.30	2.30	2.25	8.61	0.00
288.24 cfs	288.24 cfs	96.69	4.01	4.069	3-M2t	4.00	2.36	2.41	2.41	8.53	0.00
299.18 cfs	299.18 cfs	96.79	4.11	4.173	3-M2t	4.00	2.42	2.58	2.58	8.29	0.00
310.12 cfs	310.12 cfs	96.90	4.22	4.279	3-M2t	4.00	2.48	2.74	2.74	8.08	0.00
321.06 cfs	321.06 cfs	97.01	4.33	4.387	3-M2t	4.00	2.54	2.91	2.91	7.89	0.00
332.00 cfs	332.00 cfs	97.12	4.44	4.498	3-M2t	4.00	2.59	3.07	3.07	7.72	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 92.62 ft,

Outlet Elevation (invert): 92.55 ft

Culvert Length: 89.00 ft,

Culvert Slope: 0.0008

Site Data - CD-11_EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.62 ft

Outlet Station: 89.00 ft

Outlet Elevation: 92.55 ft

Number of Barrels: 2

Culvert Data Summary - CD-11_EX

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-11_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-11_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
222.60	94.46	94.46	0.00
257.20	94.50	94.50	0.00
332.00	95.62	95.62	0.00

Tailwater Channel Data - CD-11_EX

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: Enter Rating Curve

Roadway Data for Crossing: CD-11_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 102.00 ft

Roadway Surface: Paved

Roadway Top Width: 45.00 ft

HY-8 Culvert Analysis Report CD-11 PR

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 222.60 cfs

Design Flow: 257.20 cfs

Maximum Flow: 332.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-11_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-11_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
96.09	222.60	222.60	0.00	1
96.20	233.54	233.54	0.00	1
96.31	244.48	244.48	0.00	1
96.43	257.20	257.20	0.00	1
96.52	266.36	266.36	0.00	1
96.62	277.30	277.30	0.00	1
96.73	288.24	288.24	0.00	1
96.84	299.18	299.18	0.00	1
96.95	310.12	310.12	0.00	1
97.06	321.06	321.06	0.00	1
97.17	332.00	332.00	0.00	1
102.00	697.52	697.52	0.00	Overtopping

Culvert Data: CD-11_PR

Table 2 - Culvert Summary Table: CD-11_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
222.60 cfs	222.60 cfs	96.09	3.36	3.465	2-M2c	3.25	1.99	1.99	1.98	8.00	0.00
233.54 cfs	233.54 cfs	96.20	3.47	3.576	2-M2c	3.37	2.05	2.05	1.99	8.13	0.00
244.48 cfs	244.48 cfs	96.31	3.58	3.686	2-M2c	3.49	2.12	2.12	2.01	8.25	0.00
257.20 cfs	257.20 cfs	96.43	3.70	3.811	2-M2c	3.62	2.19	2.19	2.02	8.39	0.00
266.36 cfs	266.36 cfs	96.52	3.79	3.900	2-M2c	3.72	2.24	2.24	2.16	8.49	0.00
277.30 cfs	277.30 cfs	96.62	3.90	4.005	3-M2t	3.84	2.30	2.32	2.32	8.53	0.00
288.24 cfs	288.24 cfs	96.73	4.01	4.110	3-M2t	4.00	2.36	2.48	2.48	8.29	0.00
299.18 cfs	299.18 cfs	96.84	4.11	4.217	3-M2t	4.00	2.42	2.65	2.65	8.07	0.00
310.12 cfs	310.12 cfs	96.95	4.22	4.326	3-M2t	4.00	2.48	2.81	2.81	7.88	0.00
321.06 cfs	321.06 cfs	97.06	4.33	4.438	3-M2t	4.00	2.54	2.98	2.98	7.71	0.00
332.00 cfs	332.00 cfs	97.17	4.44	4.552	3-M2t	4.00	2.59	3.14	3.14	7.55	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 92.62 ft,

Outlet Elevation (invert): 92.48 ft

Culvert Length: 181.00 ft,

Culvert Slope: 0.0008

Site Data - CD-11_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 92.62 ft

Outlet Station: 181.00 ft

Outlet Elevation: 92.48 ft

Number of Barrels: 2

Culvert Data Summary - CD-11_PR

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-11_PR

Table 3 - Downstream Channel Rating Curve (Crossing: CD-11_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
222.60	94.46	94.46	0.00
257.20	94.50	94.50	0.00
332.00	95.62	95.62	0.00

Tailwater Channel Data - CD-11_PR

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: Enter Rating Curve

Roadway Data for Crossing: CD-11_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 2000.00 ft

Crest Elevation: 102.00 ft

Roadway Surface: Paved

Roadway Top Width: 45.00 ft

HY-8 Culvert Analysis Report CD-14 EX

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 77.00 cfs

Design Flow: 85.00 cfs

Maximum Flow: 145.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-14_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-14_EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.01	77.00	77.00	0.00	1
101.26	85.00	85.00	0.00	1
101.44	90.60	90.60	0.00	1
101.68	97.40	97.40	0.00	1
101.94	104.20	104.20	0.00	1
102.21	111.00	111.00	0.00	1
102.51	117.80	117.80	0.00	1
102.82	124.60	124.60	0.00	1
103.14	131.40	131.40	0.00	1
103.49	138.20	138.20	0.00	1
103.85	145.00	145.00	0.00	1
105.00	164.78	164.78	0.00	Overtopping

Culvert Data: CD-14_EX

Table 2 - Culvert Summary Table: CD-14_EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
77.00 cfs	77.00 cfs	101.01	3.87	7.014	4-FFf	2.92	2.56	4.50	6.90	4.84	0.00
85.00 cfs	85.00 cfs	101.26	4.12	7.257	4-FFf	3.14	2.70	4.50	6.90	5.34	0.00
90.60 cfs	90.60 cfs	101.44	4.30	7.442	4-FFf	3.30	2.79	4.50	6.90	5.70	0.00
97.40 cfs	97.40 cfs	101.68	4.52	7.682	4-FFf	3.52	2.90	4.50	6.90	6.12	0.00
104.20 cfs	104.20 cfs	101.94	4.74	7.939	4-FFf	3.78	3.00	4.50	6.90	6.55	0.00
111.00 cfs	111.00 cfs	102.21	4.98	8.214	4-FFf	4.50	3.10	4.50	6.90	6.98	0.00
117.80 cfs	117.80 cfs	102.51	5.22	8.506	4-FFf	4.50	3.19	4.50	6.90	7.41	0.00
124.60 cfs	124.60 cfs	102.82	5.47	8.816	4-FFf	4.50	3.29	4.50	6.90	7.83	0.00
131.40 cfs	131.40 cfs	103.14	5.74	9.143	4-FFf	4.50	3.37	4.50	6.90	8.26	0.00
138.20 cfs	138.20 cfs	103.49	6.01	9.487	4-FFf	4.50	3.46	4.50	6.90	8.69	0.00
145.00 cfs	145.00 cfs	103.85	6.31	9.849	4-FFf	4.50	3.54	4.50	6.90	9.12	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 94.00 ft,

Outlet Elevation (invert): 93.00 ft

Culvert Length: 437.00 ft,

Culvert Slope: 0.0023

Site Data - CD-14_EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 94.00 ft

Outlet Station: 437.00 ft

Outlet Elevation: 93.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-14_EX

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-14_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-14_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
77.00	99.90	6.90
85.00	99.90	6.90
90.60	99.90	6.90
97.40	99.90	6.90
104.20	99.90	6.90
111.00	99.90	6.90
117.80	99.90	6.90
124.60	99.90	6.90
131.40	99.90	6.90
138.20	99.90	6.90
145.00	99.90	6.90

Tailwater Channel Data - CD-14_EX

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.90 ft

Roadway Data for Crossing: CD-14_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 105.00 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 77.00 cfs

Design Flow: 85.00 cfs

Maximum Flow: 145.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-14_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-14_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.53	77.00	77.00	0.00	1
101.89	85.00	85.00	0.00	1
102.16	90.60	90.60	0.00	1
102.51	97.40	97.40	0.00	1
102.89	104.20	104.20	0.00	1
103.29	111.00	111.00	0.00	1
103.72	117.80	117.80	0.00	1
104.18	124.60	124.60	0.00	1
104.66	131.40	131.40	0.00	1
105.03	138.20	136.48	1.58	26
105.09	145.00	137.24	7.64	7
105.00	136.06	136.06	0.00	Overtopping

Culvert Data: CD-14_PR

Table 1 - Culvert Summary Table: CD-14_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
77.00 cfs	77.00 cfs	101.53	3.87	7.533	4-FFf	3.55	2.56	4.50	7.17	4.84	0.00
85.00 cfs	85.00 cfs	101.89	4.12	7.890	4-FFf	4.50	2.70	4.50	7.17	5.34	0.00
90.60 cfs	90.60 cfs	102.16	4.30	8.161	4-FFf	4.50	2.79	4.50	7.17	5.70	0.00
97.40 cfs	97.40 cfs	102.51	4.52	8.513	4-FFf	4.50	2.90	4.50	7.17	6.12	0.00
104.20 cfs	104.20 cfs	102.89	4.74	8.891	4-FFf	4.50	3.00	4.50	7.17	6.55	0.00
111.00 cfs	111.00 cfs	103.29	4.98	9.294	4-FFf	4.50	3.10	4.50	7.17	6.98	0.00
117.80 cfs	117.80 cfs	103.72	5.22	9.723	4-FFf	4.50	3.19	4.50	7.17	7.41	0.00
124.60 cfs	124.60 cfs	104.18	5.47	10.177	4-FFf	4.50	3.29	4.50	7.17	7.83	0.00
131.40 cfs	131.40 cfs	104.66	5.74	10.656	4-FFf	4.50	3.37	4.50	7.17	8.26	0.00
138.20 cfs	136.48 cfs	105.03	5.94	11.031	4-FFf	4.50	3.44	4.50	7.17	8.58	0.00
145.00 cfs	137.24 cfs	105.09	5.98	11.088	4-FFf	4.50	3.44	4.50	7.17	8.63	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 94.00 ft,

Outlet Elevation (invert): 92.83 ft

Culvert Length: 837.00 ft,

Culvert Slope: 0.0014

Site Data - CD-14_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 94.00 ft

Outlet Station: 837.00 ft

Outlet Elevation: 92.83 ft

Number of Barrels: 1

Culvert Data Summary - CD-14_PR

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: CD-14_PR

Table 2 - Downstream Channel Rating Curve (Crossing: CD-14_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
77.00	99.90	7.17
85.00	99.90	7.17
90.60	99.90	7.17
97.40	99.90	7.17
104.20	99.90	7.17
111.00	99.90	7.17
117.80	99.90	7.17
124.60	99.90	7.17
131.40	99.90	7.17
138.20	99.90	7.17
145.00	99.90	7.17

Tailwater Channel Data - CD-14_PR

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.90 ft

Roadway Data for Crossing: CD-14_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 105.00 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report CD-15 EX

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20.00 cfs

Design Flow: 22.00 cfs

Maximum Flow: 37.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-15_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-15_EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.41	20.00	20.00	0.00	1
108.74	22.00	22.00	0.00	1
109.00	23.40	23.40	0.00	1
109.33	25.10	25.10	0.00	1
109.68	26.80	26.80	0.00	1
110.07	28.50	28.50	0.00	1
110.47	30.20	30.20	0.00	1
110.90	31.90	31.90	0.00	1
111.35	33.60	33.60	0.00	1
111.85	35.30	35.30	0.00	1
112.37	37.00	37.00	0.00	1
116.00	43.57	43.57	0.00	Overtopping

Culvert Data: CD-15_EX

Table 2 - Culvert Summary Table: CD-15_EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00 cfs	20.00 cfs	108.41	2.91	0.0*	5-JS1f	0.95	1.61	2.00	6.00	6.37	0.00
22.00 cfs	22.00 cfs	108.74	3.24	0.067	5-JS1f	1.01	1.67	2.00	6.00	7.00	0.00
23.40 cfs	23.40 cfs	109.00	3.50	0.536	5-JS1f	1.04	1.72	2.00	6.00	7.45	0.00
25.10 cfs	25.10 cfs	109.33	3.83	1.144	5-JS1f	1.09	1.76	2.00	6.00	7.99	0.00
26.80 cfs	26.80 cfs	109.68	4.18	1.795	5-JS1f	1.14	1.80	2.00	6.00	8.53	0.00
28.50 cfs	28.50 cfs	110.07	4.57	2.489	5-JS1f	1.18	1.84	2.00	6.00	9.07	0.00
30.20 cfs	30.20 cfs	110.47	4.97	3.225	5-S2n	1.23	1.87	1.24	6.00	14.76	0.00
31.90 cfs	31.90 cfs	110.90	5.40	4.004	5-S2n	1.27	1.89	1.27	6.00	15.12	0.00
33.60 cfs	33.60 cfs	111.35	5.85	4.826	5-JS1f	1.32	1.91	2.00	6.00	10.70	0.00
35.30 cfs	35.30 cfs	111.85	6.35	5.690	5-JS1f	1.37	1.83	2.00	6.00	11.24	0.00
37.00 cfs	37.00 cfs	112.37	6.87	6.597	5-JS1f	1.42	1.76	2.00	6.00	11.78	0.00

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 105.50 ft,

Outlet Elevation (invert): 96.00 ft

Culvert Length: 303.15 ft,

Culvert Slope: 0.0314

Site Data - CD-15_EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 105.50 ft

Outlet Station: 303.00 ft

Outlet Elevation: 96.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-15_EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-15_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-15_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
20.00	102.00	6.00
22.00	102.00	6.00
23.40	102.00	6.00
25.10	102.00	6.00
26.80	102.00	6.00
28.50	102.00	6.00
30.20	102.00	6.00
31.90	102.00	6.00
33.60	102.00	6.00
35.30	102.00	6.00
37.00	102.00	6.00

Tailwater Channel Data - CD-15_EX

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 102.00 ft

Roadway Data for Crossing: CD-15_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 116.00 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report CD-15 PR

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20.00 cfs

Design Flow: 22.00 cfs

Maximum Flow: 37.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-15_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-15_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.42	20.00	20.00	0.00	1
108.76	22.00	22.00	0.00	1
109.01	23.40	23.40	0.00	1
109.34	25.10	25.10	0.00	1
109.70	26.80	26.80	0.00	1
110.08	28.50	28.50	0.00	1
110.48	30.20	30.20	0.00	1
110.91	31.90	31.90	0.00	1
111.37	33.60	33.60	0.00	1
111.86	35.30	35.30	0.00	1
116.01	37.00	36.46	0.33	46
116.00	36.45	36.45	0.00	Overtopping

Culvert Data: CD-15_PR

Table 2 - Culvert Summary Table: CD-15_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00 cfs	20.00 cfs	108.42	2.92	0.714	5-JS1f	1.10	1.61	2.00	6.00	6.37	0.00
22.00 cfs	22.00 cfs	108.76	3.26	1.600	5-JS1f	1.17	1.67	2.00	6.00	7.00	0.00
23.40 cfs	23.40 cfs	109.01	3.51	2.270	5-JS1f	1.22	1.72	2.00	6.00	7.45	0.00
25.10 cfs	25.10 cfs	109.34	3.84	3.139	5-JS1f	1.28	1.76	2.00	6.00	7.99	0.00
26.80 cfs	26.80 cfs	109.70	4.20	4.068	5-JS1f	1.34	1.80	2.00	6.00	8.53	0.00
28.50 cfs	28.50 cfs	110.08	4.58	0.0*	5-JS1f	1.40	1.84	2.00	6.00	9.07	0.00
30.20 cfs	30.20 cfs	110.48	4.98	0.0*	5-JS1f	1.47	1.87	2.00	6.00	9.61	0.00
31.90 cfs	31.90 cfs	110.91	5.41	0.0*	5-JS1f	1.54	1.89	2.00	6.00	10.15	0.00
33.60 cfs	33.60 cfs	111.37	5.87	0.0*	5-JS1f	1.62	1.91	2.00	6.00	10.70	0.00
35.30 cfs	35.30 cfs	111.86	6.36	0.0*	5-JS1f	1.72	1.83	2.00	6.00	11.24	0.00
37.00 cfs	36.46 cfs	116.01	6.72	10.508	4-FFf	2.00	1.75	2.00	6.00	11.60	0.00

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 105.50 ft,

Outlet Elevation (invert): 96.00 ft

Culvert Length: 494.09 ft,

Culvert Slope: 0.0192

Site Data - CD-15_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 105.50 ft

Outlet Station: 494.00 ft

Outlet Elevation: 96.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-15_PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: CD-15_PR

Table 3 - Downstream Channel Rating Curve (Crossing: CD-15_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
20.00	102.00	6.00
22.00	102.00	6.00
23.40	102.00	6.00
25.10	102.00	6.00
26.80	102.00	6.00
28.50	102.00	6.00
30.20	102.00	6.00
31.90	102.00	6.00
33.60	102.00	6.00
35.30	102.00	6.00
37.00	102.00	6.00

Tailwater Channel Data - CD-15_PR

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 102.00 ft

Roadway Data for Crossing: CD-15_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 116.00 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report CD-16 EX

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51.00 cfs

Design Flow: 58.00 cfs

Maximum Flow: 99.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-16_EX

Headwater Elevation (ft)	Total Discharge (cfs)	CD-16_EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
104.64	51.00	51.00	0.00	1
104.97	58.00	58.00	0.00	1
105.10	60.60	60.60	0.00	1
105.37	65.40	65.40	0.00	1
105.65	70.20	70.20	0.00	1
105.96	75.00	75.00	0.00	1
106.28	79.80	79.80	0.00	1
106.62	84.60	84.60	0.00	1
106.99	89.40	89.40	0.00	1
107.37	94.20	94.20	0.00	1
107.69	99.00	97.98	0.73	36
107.68	97.84	97.84	0.00	Overtopping

Culvert Data: CD-16_EX

Table 2 - Culvert Summary Table: CD-16_EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00 cfs	51.00 cfs	104.64	3.47	4.336	4-FFf	3.50	2.23	3.50	3.50	5.30	0.00
58.00 cfs	58.00 cfs	104.97	3.81	4.669	4-FFf	3.50	2.39	3.50	3.50	6.03	0.00
60.60 cfs	60.60 cfs	105.10	3.94	4.803	4-FFf	3.50	2.44	3.50	3.50	6.30	0.00
65.40 cfs	65.40 cfs	105.37	4.20	5.067	4-FFf	3.50	2.53	3.50	3.50	6.80	0.00
70.20 cfs	70.20 cfs	105.65	4.47	5.352	4-FFf	3.50	2.63	3.50	3.50	7.30	0.00
75.00 cfs	75.00 cfs	105.96	4.76	5.656	4-FFf	3.50	2.71	3.50	3.50	7.80	0.00
79.80 cfs	79.80 cfs	106.28	5.07	5.980	4-FFf	3.50	2.79	3.50	3.50	8.29	0.00
84.60 cfs	84.60 cfs	106.62	5.40	6.325	4-FFf	3.50	2.87	3.50	3.50	8.79	0.00
89.40 cfs	89.40 cfs	106.99	5.75	6.690	4-FFf	3.50	2.93	3.50	3.50	9.29	0.00
94.20 cfs	94.20 cfs	107.37	6.12	7.074	4-FFf	3.50	3.00	3.50	3.50	9.79	0.00
99.00 cfs	97.98 cfs	107.69	6.43	7.392	4-FFf	3.50	3.05	3.50	3.50	10.18	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 100.30 ft,

Outlet Elevation (invert): 100.00 ft

Culvert Length: 221.00 ft,

Culvert Slope: 0.0014

Site Data - CD-16_EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.30 ft

Outlet Station: 221.00 ft

Outlet Elevation: 100.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-16_EX

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-16_EX

Table 3 - Downstream Channel Rating Curve (Crossing: CD-16_EX)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	103.50	3.50
58.00	103.50	3.50

60.60	103.50	3.50
65.40	103.50	3.50
70.20	103.50	3.50
75.00	103.50	3.50
79.80	103.50	3.50
84.60	103.50	3.50
89.40	103.50	3.50
94.20	103.50	3.50
99.00	103.50	3.50

Tailwater Channel Data - CD-16_EX

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.50 ft

Roadway Data for Crossing: CD-16_EX

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 107.68 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

HY-8 Culvert Analysis Report CD-16 PR

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51.00 cfs

Design Flow: 58.00 cfs

Maximum Flow: 99.00 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-16_PR

Headwater Elevation (ft)	Total Discharge (cfs)	CD-16_PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
104.80	51.00	51.00	0.00	1
105.18	58.00	58.00	0.00	1
105.33	60.60	60.60	0.00	1
105.63	65.40	65.40	0.00	1
105.96	70.20	70.20	0.00	1
106.30	75.00	75.00	0.00	1
106.67	79.80	79.80	0.00	1
107.07	84.60	84.60	0.00	1
107.48	89.40	89.40	0.00	1
107.70	94.20	91.83	2.13	21
107.73	99.00	92.12	6.59	5
107.68	91.56	91.56	0.00	Overtopping

Culvert Data: CD-16_PR

Table 2 - Culvert Summary Table: CD-16_PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00 cfs	51.00 cfs	104.80	3.47	4.497	4-FFf	3.50	2.23	3.50	3.50	5.30	0.00
58.00 cfs	58.00 cfs	105.18	3.81	4.877	4-FFf	3.50	2.39	3.50	3.50	6.03	0.00
60.60 cfs	60.60 cfs	105.33	3.94	5.031	4-FFf	3.50	2.44	3.50	3.50	6.30	0.00
65.40 cfs	65.40 cfs	105.63	4.20	5.332	4-FFf	3.50	2.53	3.50	3.50	6.80	0.00
70.20 cfs	70.20 cfs	105.96	4.47	5.657	4-FFf	3.50	2.63	3.50	3.50	7.30	0.00
75.00 cfs	75.00 cfs	106.30	4.76	6.004	4-FFf	3.50	2.71	3.50	3.50	7.80	0.00
79.80 cfs	79.80 cfs	106.67	5.07	6.375	4-FFf	3.50	2.79	3.50	3.50	8.29	0.00
84.60 cfs	84.60 cfs	107.07	5.40	6.768	4-FFf	3.50	2.87	3.50	3.50	8.79	0.00
89.40 cfs	89.40 cfs	107.48	5.75	7.185	4-FFf	3.50	2.93	3.50	3.50	9.29	0.00
94.20 cfs	91.83 cfs	107.70	5.93	7.404	4-FFf	3.50	2.97	3.50	3.50	9.54	0.00
99.00 cfs	92.12 cfs	107.73	5.96	7.430	4-FFf	3.50	2.97	3.50	3.50	9.57	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 100.30 ft,

Outlet Elevation (invert): 100.00 ft

Culvert Length: 295.00 ft,

Culvert Slope: 0.0010

Site Data - CD-16_PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.30 ft

Outlet Station: 295.00 ft

Outlet Elevation: 100.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-16_PR

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: CD-16_PR

Table 3 - Downstream Channel Rating Curve (Crossing: CD-16_PR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	103.50	3.50
58.00	103.50	3.50

60.60	103.50	3.50
65.40	103.50	3.50
70.20	103.50	3.50
75.00	103.50	3.50
79.80	103.50	3.50
84.60	103.50	3.50
89.40	103.50	3.50
94.20	103.50	3.50
99.00	103.50	3.50

Tailwater Channel Data - CD-16_PR

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.50 ft

Roadway Data for Crossing: CD-16_PR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 107.68 ft

Roadway Surface: Paved

Roadway Top Width: 60.00 ft

APPENDIX F – FLOODPLAIN PERMIT DATA

SR 429 PERMIT DATA

Section IV
Floodplain Analysis

Note:
ALL ELEVATIONS ARE NAVD '88 DATUM
(NAVD '88 EL 0.00 = NGVD '29 EL 0.87
For example: 95.00 shown in the plans is equal to 95.87 NGVD '29.

FLOODPLAIN ENCROACHMENT AND MITIGATION.

This section addresses the floodplain encroachment and mitigation based on the post development conditions. The proposed Beltway Section 1 will encroach into two FEMA 100-year floodplains associated with Davenport Tributary and Davenport Creek Swamp.

Davenport Tributary Floodplain

In the vicinity of I-4 the interchange ramps will cross and encroach upon the 100-year floodplain associated with Davenport Tributary. The Davenport Tributary is shown as a 100-year floodplain on FEMA flood hazard map No. 1201890025C dated 11/20/96. No 100-year elevations are shown on the FEMA Map. The 100-year elevations were determined from cross drain calculations (CD-1), I-4 drainage map, and comparing the FEMA 100-year floodplain limits to USGS quad sheet contours and project cross section data. Seasonal High Water elevations were estimated from stain lines on culverts and existing ground elevations at wetland lines. See Appendix 3 – Design High Waters.

The proposed project encroaches into the 100-year floodplain of Davenport Tributary at seven locations.

Ramp C embankment, from Sta. 421+74 to Sta. 436+00, encroaches into the 100-year floodplain associated with Wetland 1-6. The 100-year elevation was estimated from the High Water data taken from I-4 drainage map adjusted for NAVD 88. SHW was taken from a stain line on the 42-inch cross drain at Sta. 135+00 BL I-4. Wetland 1-6 discharges to Davenport Tributary.

CR 545 embankment, from Sta. 608+00 to Sta. 611+00, encroaches into the 100-year floodplain associated with Wetland 1-1 as CR 545 crosses Davenport Tributary. The 100-year elevation was taken from the CD-1 calculations. The SHW was taken from stain line on the downstream end of CD-1D under CR 545.

Pond F-2-B north berm encroaches slightly into the 100-year floodplain associated with Wetland 1-2 and the Davenport Tributary. The 100-year elevation was taken from the CD-1 calculations. The SHW was interpolated between the SHW determined from stain lines on the I-4 box culvert and the culvert under CR 545.

Ramp A embankment, from Sta. 245+00 to Sta. 257+00, encroaches into the 100-year floodplain associated with wetland 1-3. The 100-year high water is taken from the CD-1 calculations. The SHW is taken from a stain line on the I-4 box culvert.

Ramp A embankment, from Sta. 257+00 to Sta. 270+05, encroaches into the 100-year floodplain associated with wetland 1-3. The 100-year elevation is interpolated between the 100 year High water from the CD-1 calculations and the 100-year elevation estimated at the upper end of the Davenport Tributary. The SHW is taken as existing ground elevation at the wetland line.

The Beltway, from Sta. 93+00 to Sta. 99+00, encroaches upon the 100-year floodplain of the upper end of the Davenport Tributary. The 100-year elevation was estimated from comparing the FEMA flood hazard maps to the USGS contour map and adjusting these elevations to NAVD 88 project datum. SHW was estimated from elevations of existing ground at wetland lines.

Encroachment volumes were computed using the average end area method from roadway or pond berm sections taken through the encroachment sections. Encroachment calculations are found in Volume II.

Mitigation for these encroachments is provided in seven storm water ponds that discharge to Davenport Tributary, Ponds F-2-A, F-2-B, F-4-A, F-4-B, F-7, G-1, and B-2. Floodplain mitigation volume is computed as the volume in these ponds between the control elevation and the 100-year tail water at the pond. Mitigation volume calculations follow the encroachment calculations in Volume II.

Encroachment and mitigation volumes in the Davenport Tributary Basin are summarized in Table IV-1. There is a net gain in 100-year floodplain volume in the Davenport Tributary Basin. Encroachment and mitigation volumes are computed for each location then totaled for Davenport Tributary floodplain. The encroachment locations and mitigation locations within this floodplain are located sufficiently close so there will be no significant increase in flood stages due to localized loss of floodplain storage.

There is no official floodway associated with the Davenport Tributary floodplain. The project will add a new crossing of Davenport Tributary for Ramp A and will replace the existing triple 30-inch pipes under CR 545 to triple 42-inch pipes. Cross drain calculations for the CD-1 system of three cross drains in series demonstrate that the existing conveyance for the 100 year flow in Davenport Tributary will be maintained through the project with less than 0.1 foot of rise in 100-year high water upstream of the interchange. Descriptions of proposed cross drains are found in Section V. Cross drain calculations are found in Volume II.

Davenport Creek Swamp Floodplain

North of Sinclair Road, the Beltway and Ramps E & F will encroach into the 100-year floodplain associated with Davenport Creek Swamp. The Davenport Creek Swamp is shown as a 100-year floodplain on FEMA flood hazard map 1201890025C dated 11/20/96. No 100-year elevations are shown on the FEMA map. The 100-year elevations were estimated from comparing the FEMA 100-year floodplain area to USGS quad sheet contours and adjusting the elevation to the NAVD 1988 project datum. Seasonal High Water elevations were estimated from existing ground elevations at the wetland lines or from vegetative indicators in the wetlands.

The proposed project encroaches into the 100-year floodplain of Davenport Creek Swamp at five locations.

The Beltway embankment, between Sta. 123+00 and Sta. 142+12 BL SR 429, encroaches into the 100-year floodplain associated with Wetland 1-9.

WWTP Access Road and Pond B-4, between Sta. 142+12 and Sta. 152+00 BL SR 429, encroaches into the 100-year floodplain associated with Wetland 1-7 and Davenport Creek Swamp.

WWTP Access Road and Pond B-4, between Sta. 152+00 and Sta. 160+00 BL SR 429, encroaches into the 100-year floodplain associated with Wetland 1-7 and Davenport Creek Swamp.

The Sinclair to Sand Hill Connector Road, between Sta. 925+00 to 937+00 BL Connector Road, encroaches into the 100-year floodplain associated with Wetland 1-7 and Davenport Creek Swamp.

The Pond B-6 berm, between Sta. 18+00 and 21+00, BL Sinclair ROW encroaches into the 100-year floodplain associated with Wetland 1-10 and Davenport Creek Swamp.

Encroachment volumes were computed using the average end area method from roadway or pond berm sections taken through the encroachment sections. Encroachment calculations are found in Volume II.

Mitigation for these floodplain encroachments will be provided in five storm water ponds (B-3-A, B-3-B, B-4, B-5, and B-6-A) between the control elevation and the 100-year tail water. Mitigation volume calculations follow the encroachment calculations in Volume II.

Encroachment and mitigation volumes in Davenport Creek Swamp are summarized in Table IV-2. There is a net gain in 100-year floodplain volume in the Davenport Creek Swamp Basin. The encroachment locations and mitigation locations within this

floodplain are located sufficiently close so there will be no significant increase in flood stages due to localized loss of floodplain storage.

There is no official floodway associated with the Davenport Creek Swamp floodplain. The project encroaches into the flood fringe of the floodplain and does not cross the main flow path.

FPN: 403497_2_32_01
PROJ: W. Beltway / I-4 Interchange
SUBJ: Floodplain Encroachment / Mitigation Summary

SHT ___ OF ___ PN: C100003822.00
BY: SEY DATE: 5-25-01
CK: JTW DATE: 5-25-01

ENCROACHMENT SITES	FLOODPLAIN ASSOCIATED WITH	S.H.W. ELEV. (Ft ngvd)	100 YR ELEV. (Ft ngvd)	ENCROACHMENT VOLUME (Ac Ft)
Ramp C Sta. 421+74 to 436+00	Davenport Tributary	85.3	88.3	9.88
CR 545 Sta. 608+00 to 611+00	Davenport Tributary	87.8	90.2	0.21
Pond F-2-B North Berm (BOB 100.2)	Davenport Tributary	91.8	95.0	0.05
Ramp A Sta. 245+00 to 257+00	Davenport Tributary	93.5	96.3	3.88
Ramp A Sta. 257+00 to 270+05	Davenport Tributary	95.0	98.2	12.33
Pond B-2 Berm Sta. 82+00 to 91+00	Davenport Tributary	99.0	100.7	0.02
Beltway Sta. 93+00 to 99+00	Davenport Tributary	100.0	102.0	0.95
TOTAL ENCROACHMENT VOLUME	Davenport Tributary			27.32

MITIGATION SITES		CONTROL ELEV. (Ft ngvd)	100 YR ELEV. (Ft ngvd)	MITIGATION VOLUME (Ac Ft)
Pond F-2A	Davenport Tributary	93.2	95.0	3.12
Pond F-2B	Davenport Tributary	93.2	95.0	1.39
Pond F-4A	Davenport Tributary	93.5	96.25	9.32
Pond F-4B	Davenport Tributary	93.5	96.25	4.54
Pond F-7	Davenport Tributary	93.0	95.0	4.88
Pond G-1	Davenport Tributary	85.3	88.3	8.57
Pond B-2	Davenport Tributary	99.0	100.7	6.26
TOTAL MITIGATION VOLUME	Davenport Tributary			38.08

NET CHANGE IN 100 YR FLOOD PLAIN VOLUME	Davenport Tributary			10.77

Note:
ALL ELEVATIONS ARE NAVD '88 DATUM
(NAVD '88 EL 0.00 = NGVD '29 EL 0.87)
For example: 95.00 shown in the plans is equa
to 95.87 NGVD '29.

FPN: 403497_2_32_01
PROJ: W. Beltway / I-4 Interchange
SUBJ: Floodplain Encroachment / Mitigation Summary

SHT ___ OF ___ PN: C100003822.00
BY: SEY DATE: 5-24-01
CK: JTW DATE: 5-24-01

ENCROACHMENT SITES	FLOODPLAIN ASSOCIATED WITH	S.H.W. ELEV. (Ft ngvd)	100 YR ELEV. (Ft ngvd)	ENCROACHMENT VOLUME (Ac Ft)
Beltway Sta. 123+00 to 142+12	Davenport Creek	100.5	105.0	36.23
Access Road & Pond B-4 Sta. 142+12 to 152+00	Davenport Creek	101.0	105.5	14.35
Access Road & Pond B-4 Sta. 152+00 to 160+00	Davenport Creek	101.5	105.8	-0.47
Connector Road 925+00 to 937+00	Davenport Creek	101.0	105.0	1.72
Pond B-6 Sta. 18+00 to 21+00	Davenport Creek	99.5	104.1	3.03
TOTAL ENCROACHMENT VOLUME	Davenport Creek			54.86

MITIGATION SITES		CONTROL ELEV. (Ft ngvd)	100 YR ELEV. (Ft ngvd)	MITIGATION VOLUME (Ac Ft)
Pond B-3A	Davenport Creek	101.0	105.0	6.15
Pond B-3B	Davenport Creek	101.0	105.0	2.53
Pond B-4	Davenport Creek	101.0	105.5	17.48
Pond B-5	Davenport Creek	101.0	105.0	16.00
Pond B-6	Davenport Creek	99.5	104.1	16.61
TOTAL MITIGATION VOLUME	Davenport Creek			58.77

NET CHANGE IN 100 YEAR FLOODPLAIN VOLUME	Davenport Creek	3.91

Note:
ALL ELEVATIONS ARE NAVD '88 DATUM
(NAVD '88 EL 0.00 = NGVD '29 EL 0.87)
For example: 95.00 shown in the plans is equal to 95.87 NGVD '29.

Section IV

Flood Plain Impact

Davenport Creek Flood Plain Impacts

A portion of the proposed alignment impacts the Davenport Creek flood plain in the vicinity of Stations 221+00 – 251+00. The 100-year flood plain elevation for this area is 107 NAVD. Proposed is compensating storage that will offset the impacts so as the net fill and runoff volume displaced/created will be less than the predevelopment 100-year conditions. This is accomplished using an excavated area adjacent to the proposed pond (stations 234+00 – 240+00 left side) and enlarging the proposed stormwater treatment pond so that the combination of the two ponds will provide an equivalent amount of volume that is displaced by the fill required for the proposed roadway. Table 1 provides the estimated impacts to the Davenport Creek flood plain based on the proposed roadway and the excavated area adjacent the roadway. These volumes were computed using a normal seasonal high water table elevation of 101.5 and a peak 100-year stage of 107.0.

Table 1 – Davenport Creek Impacts

Station	Fill		Excavation	
	Area ft^2	Volume ac-ft	Area ft^2	Volume ac-ft
221+00.00	0		0	
		0.52		0.00
222+00.00	457		0	
		1.22		0.00
223+00.00	610		0	
		1.94		0.00
224+00.00	1084		0	
		2.67		0.00
225+00.00	1245		0	
		2.98		0.00
226+00.00	1350		0	
		3.16		0.00
227+00.00	1400		0	
		3.34		0.00
228+00.00	1510		0	
		3.43		0.00
229+00.00	1480		0	
		3.51		0.00
230+00.00	1580		0	
		3.88		0.00
231+00.00	1800		0	
		3.64		0.00
232+00.00	1375		0	
		2.71		0.00
233+00.00	982		0	
		1.59		0.00
234+00.00	407		0	
		0.47		2.35
235+00.00	0		2047	