

Appendix D

Drainage Evaluation Criteria and Methodology

Wekiva Parkway/SR 46 Realignment PD&E Study

Drainage Evaluation Criteria and Methodology

PREPARED FOR: Orlando-Orange County Expressway Authority
and
Florida Department of Transportation - District Five

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The proposed Wekiva Parkway is one component of a comprehensive plan developed at the direction of former Governor Jeb Bush. Through a 2003 Executive Order, and the subsequent 2004 State Statute entitled the "*Wekiva Parkway and Protection Act*", the Wekiva River Basin Commission was created and tasked with certain priorities for growth management and a sustainable environment, including master stormwater management, water supply protection, land use strategies, and land acquisition for conservation. The legislation recognizes the importance of the Wekiva Parkway since it would complete the missing link in the Western Beltway around metropolitan Orlando and provide a safe, high capacity east-west travel facility between Lake County and Seminole County.

The Wekiva Parkway PD&E Study is jointly managed by the Orlando-Orange County Expressway Authority and District Five of the Florida Department of Transportation. The project is composed of the following:

- **The Wekiva Parkway**, a four-lane divided (expandable to six-lane divided) limited access facility, which would begin in Orange County at the planned terminus of the John Land Apopka Expressway at US 441 just west of CR 437 and extend to the north/northeast into Lake County, turning east and crossing the Wekiva River into Seminole County and terminating at I-4. The portion of the Wekiva Parkway in Orange County is expected to be tolled. The approximate length of the Wekiva Parkway is 20.94 miles, with 8.16 miles in Orange County, 7.37 miles in Lake County and 5.41 miles in Seminole County.
- **SR 46 Reconstruction and Realignment** which would begin at the SR 46/US 441 interchange in Lake County and extend along the existing SR 46 corridor to the east, then turning southeast on a new alignment and entering Orange County with a systems interchange connection at the Wekiva Parkway. It is expected that the SR 46 improvements would provide six-lane divided controlled access along the existing alignment from US 441 to east of Round Lake Road, while the remaining alignment to the southeast is expected to be limited access. The approximate length of the SR 46 Reconstruction and Realignment is 4.79 miles, with 4.01 miles in Lake County and 0.78 mile in Orange County.

- **CR 46A Realignment**, a two-lane rural (expandable to four-lane rural) roadway, which would begin on existing CR 46A in east Lake County and extend to the south on a new alignment and tie into existing SR 46 with an access connection to the Wekiva Parkway. The approximate length of the CR 46A realignment is 2.72 miles.
- **Wekiva Parkway Access Improvements** would be required in Lake County between the realignment of CR 46A and the Wekiva River to allow access to the private property along existing SR 46. It is proposed that the Wekiva Parkway would carry all traffic crossing between Seminole and Lake Counties, and provisions for access would be required for several properties in this area of Lake County and Seminole County.

The project study area is graphically shown on the next page, which includes the following section-township-range:

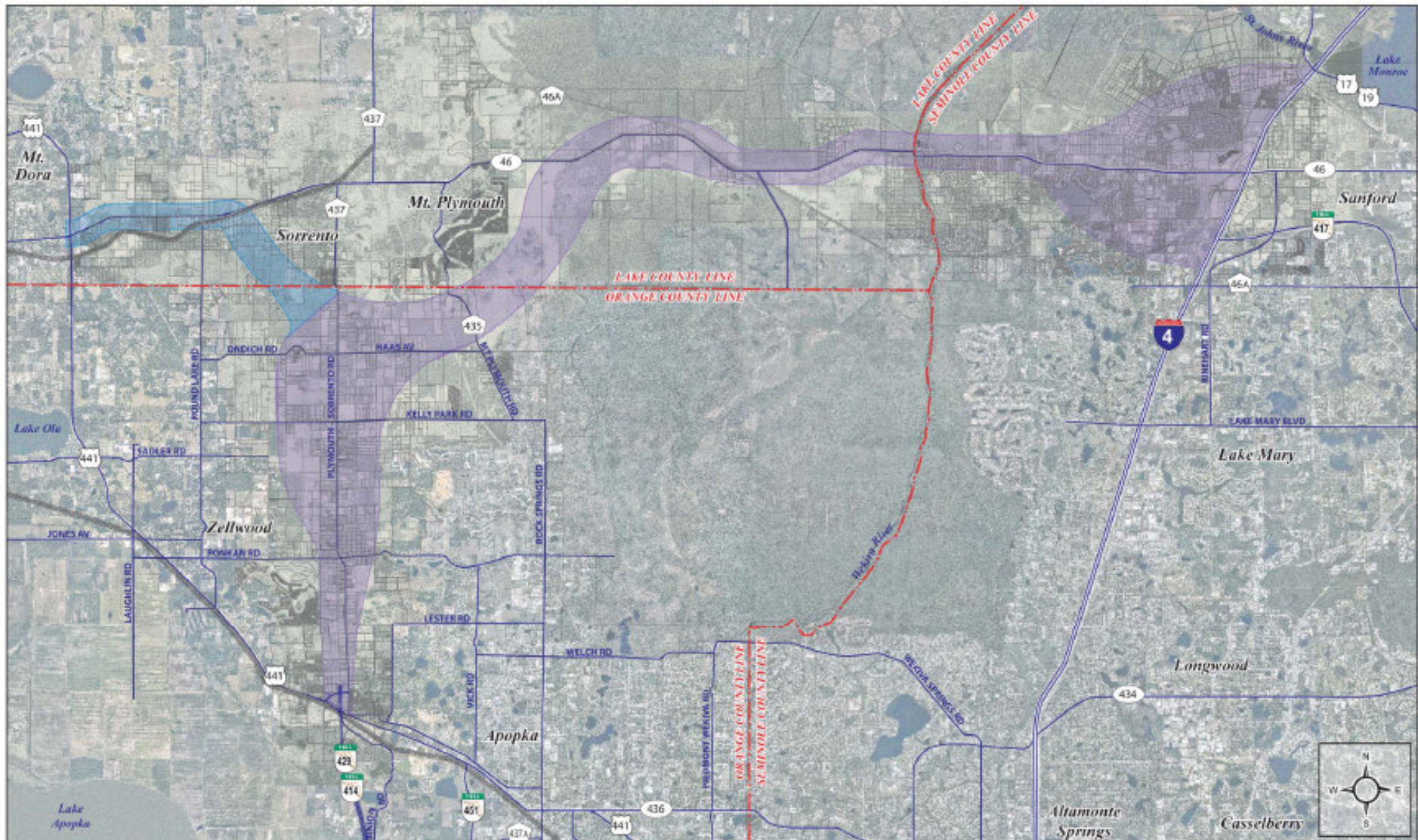
- T19S; R27E; S 26, 27, 28, 29, 32, 33, 34, 35, 36
- T19S; R28E; S 23, 24, 25, 26, 27, 28, 33, 34
- T19S; R29E; S 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 36, 38, 39
- T19S; R30E; S 17, 18, 19, 20, 29, 30, 31, 38, 39
- T20S; R27E; S 1, 2, 12, 13, 24, 25, 36
- T20S; R28E; S 4, 5, 6, 7, 8, 18, 19, 30, 31
- T21S; R27E; S 1
- T21S; R28E; S 6

Located within Orange, Lake, and Seminole Counties and the St. Johns River Water Management District (SJRWMD), drainage criteria for the Florida Department of Transportation (FDOT), Orange County, and SJRWMD apply with permitting through the Florida Department of Environmental Protection (FDEP).

In addition, the Wekiva River Basin Commission was created under Chapter 369.324, F.S. to “monitor and ensure the implementation of the recommendations of the Wekiva River Basin Coordination Committee for the Wekiva Study Area”.

The overall drainage basins within the project limits are the Wekiva River and Lake Monroe Planning Units of the Middle St. Johns River Basin; and the Lake Apopka and Lake Harris Planning Units of the Oklawaha River Basin as mapped by SJRWMD. Within these basin mappings numerous sub-basins have been identified within the study corridor, which outfall to rivers, lakes, wetlands, and unnamed depressions in the vicinity of the project corridor. The majority of the proposed facility is on a new alignment; however, portions of the project in Lake and Seminole Counties follow the existing SR 46 alignment, which was mostly constructed before drainage criteria were developed. Existing drainage along SR 46 consists mainly of intermittent roadside ditches, driveway culverts, cross drains, and ditch blocks and were primarily installed to address specific problem areas along the alignment.

All waters within study limits have been designated Class III waters except the Wekiva River and tributaries, which are designated as an Outstanding Florida Water (OFW), an Aquatic Preserve, and a Wild and Scenic River per Chapter 62-302 F.A.C. The proposed condition of the Project includes a limited access highway, including toll plazas and interchanges with the local roadway network.



LEGEND
 Wekiva Parkway Study Corridor
 SR 46 Realignment Study Corridor

Exhibit 1-1
 Project Study Area



For this improvement, the following criteria were collected from applicable portions of:

Legislation	Wekiva River Protection Act, Chapter 369.301, F.S Wekiva Parkway and Protection Act, Chapter 369 Part III, F.S.
FDOT	Drainage Manual (1/2007) Drainage Manual Volumes 2A, 2B and 3 (1987)- Reference Stormwater Management Facility Handbook (1/2004) Cross Drains Handbook (8/1996) - Reference
SJRWMD/FDEP	Applicant's Handbook: Management and Storage of Surface Waters (11/11/2003) Applicant's Handbook: Regulation of Stormwater Management Systems (2/1/2005)
Orange County/OOCEA	Orange County Code of Ordinances, Codified through Ord. No. 2004-12, enacted Sept. 21, 2004. (Supplement No. 51)

WATER QUANTITY (ATTENUATION) AND WATER QUALITY (TREATMENT) CRITERIA

A. Attenuation Criteria

1. Closed Basins: Closed basins occur when there is no surface discharge for the 100-year storm within which the following criteria apply:
 - a) SJRWMD: The post-development volume of direct runoff must not exceed the pre-development (*historic*) volume of direct runoff for the 25 year / 96 hour storm. For areas located within the Oklawaha River Basin the peak discharge for the 10-year-design storm must be met.
 - b) FDOT: The design of a retention/detention system that is of sufficient size to ensure that the post-development discharge volume does not exceed the pre-development discharge volume for the critical duration storm events. The volume to meet critical duration is estimated using the 100-year/240-hour storm for closed basins.
 - c) Orange County: The storage of runoff from the post-developed 100-year / 24-hour storm.
2. Open Basins: Open basins occur when there is a positive discharge.
 - a) SJRWMD: The post-development peak discharge must not exceed the pre-development peak discharge for the 25-year / 24-hour duration event. For areas located within the Oklawaha River Basin the peak discharge for the 10-year-design storm must be met.
 - b) FDOT: The design of a retention/detention system that is of sufficient size to ensure that the post-development discharge volume does not exceed the pre-development discharge rate for the critical duration storm events.
 - c) Orange County: Consistent with SJRWMD requirements.

B. Treatment Criteria for Discharge to Class III Waters

1. Wet detention: For wet detention systems the design treatment volume is the greater of the following:
 - a) One inch of runoff over the drainage area
 - b) 2.5 inches times the impervious area (excluding water bodies)The average length to width ratio of the pond must be at least 2:1
2. Dry retention: The first flush of runoff should be routed to the retention pond and percolated into the ground. For systems discharging to Class III receiving water bodies, the rule specifies one of the following:
 - a) Off-line retention of the first one half inch of runoff or 1.25 inches of runoff from the impervious area, whichever is greater.
 - b) On-line retention of and additional one half inch of runoff from the drainage area over the volume specified above.
 - c) On-line retention that provides the percolation of the runoff from the three-year, one-hour storm.
 - d) On-line retention of the runoff from one inch of rainfall or 1.25 inches of runoff from the impervious area, whichever is greater, for areas with less than 40% impervious and SCS type A hydrologic soils.

C. Treatment Criteria for Discharge to Class I, Class II, Class III waters which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting, and OFWs (Wekiva River and Tributaries) the following criteria will apply:

1. Wet detention
 - a) An additional fifty percent of both the required treatment and permanent pool volumes, or
 - b) Pre-treatment of the stormwater prior to the stormwater entering the wet detention pond. The level of pre-treatment must be at least the required for retention, underdrain, exfiltration, or swale systems.
2. Dry retention
 - a) An additional fifty percent of the applicable treatment volume required for off-line retention.
 - b) An additional fifty percent of the applicable treatment volume required for on-line retention.
 - c) On-line retention of the runoff from the three-year, one-hour storm.
 - d) On-line retention that provides at least an additional fifty percent of the runoff volume from one inch of rainfall or 1.25 inches of runoff from the impervious area, whichever is greater, for areas with less than 40 percent impervious and SCS type A hydrologic soils.

- D. Recharge: Projects or portions of projects in Most Effective Recharge Areas must retain three inches of runoff from the directly connected impervious area within the project area or, demonstrate that the post-development recharge will be equal to or greater than the pre-development recharge.

- E. Special Basin Criteria: Although there are special basin criteria and erosion control standards in portions of the project, the Lake Apopka basin phosphorous criteria is the one that is relative to the planning activities as part of this study. For the Lake Apopka basin, the post-development total phosphorous load discharged can not exceed the pre-development total phosphorous load discharged from the project area.

METHODOLOGY TO MEET WATER QUANTITY (ATTENUATION) AND WATER QUALITY (TREATMENT) CRITERIA

1. For the Viable Alternatives, the attenuation volumes will be used to size one pond per basin for comparison purposes. On-site basin boundaries will be from right-of-way to right-of-way based on the profile assumed for this study. The amount of existing and new pavement will be determined to calculate the impervious and pervious areas within the basin. For the Preferred Alternatives, volumes will be calculated for attenuation, treatment, and recharge, when applicable.
2. The SCS Technical Release 55 Method (SCS TR-55) will be used to determine the pre-development and post-development runoff as follows:

$$Q = (P - 0.2 S)^2 / (P + 0.8 P), \text{ where } S = 1000 / \text{CN} - 10$$

3. The Soil Conservation Service Soil Surveys of Orange, Lake, and Seminole Counties will be used to determine the soil types that determined the applicable Curve Numbers and to assess whether wet or dry ponds are appropriate. Most of the ponds for this project are dry retention ponds because of the relatively deep groundwater table. Dry ponds located in Hydrologic Soil Group A soils are assumed to recover through the existing soils.
4. The runoff excess will be calculated by subtracting the pre-development runoff from the post-development runoff for the FDOT and SJRWMD storms, except for closed basins within Orange County, which require the total post development runoff to be stored. The largest of these values will be used as the estimated volume required to meet attenuation criteria based on the following rainfall values:
 - a) Closed Basins:
 - i. The FDOT 100-year / 240-hour storm is assumed to be the critical storm for a closed basin based on final design experience. The precipitation for the 100-year / 240-hour storm is 18.8 inches based on the FDOT Zone 7 Intensity-Duration-Frequency curve (FDOT Drainage Manual). The difference in runoff from the 100-year/240-hour storm was used to estimate the FDOT stormwater requirements for the Viable Alternatives. Values will be refined for the Preferred Alternative, if needed.
 - ii. The SJRWMD 25-year / 96-hour storm is assumed to address all SJRWMD attenuation criteria based on final design experience. Additional special basin criteria for attenuation are for smaller storms; therefore, smaller runoff volumes. The 25-year / 96-hour storm precipitation is 11.0 inches based on the Maximum Rainfall for Northeast Florida (SJRWMD Technical Publication 88-3). The difference in runoff from the 25-year / 96-hour storm was used to estimate the SJRWMD stormwater requirements for the Viable Alternatives. Values will be refined for the Preferred Alternative, if needed.

- iii. The 100-year / 24-hour (10.56 inches) will be used to estimate the Orange County requirements for closed basins.
- b) Open Basins:
 - i. The FDOT 100-year / 8-hour storm is assumed to be the critical storm for open basin based on final design experience. The precipitation for the 100-year / 8-hour storm is 8.0 inches based on the FDOT Zone 7 Intensity-Duration-Frequency curve (FDOT Drainage Manual). The difference in runoff from the 100-year / 8-hour storm was used to estimate the FDOT stormwater requirements for the Viable Alternatives. Estimates for all the 100-year duration storms will be calculated for the Preferred Alternative.
 - ii. The SJRWMD 25-year / 24-hour storm is assumed to address all SJRWMD attenuation criteria based on final design experience. Additional special basin criteria for attenuation are for smaller storms; therefore, smaller runoff volumes. The 25-year/24-hour precipitation is 8.64 inches based on the Maximum Rainfall for Northeast Florida (SJRWMD Technical Publication 88-3). The difference in runoff from the 25-year / 24-hour storm was used to estimate the SJRWMD stormwater requirements for the Viable Alternatives. Values will be refined for the Preferred Alternative, if needed.
5. An estimate of treatment criteria will be made using the basin and impervious areas from item 1 for the Preferred Alternative only.
6. For the Wekiva Study Area (also known as the Wekiva Recharge Protection Zone), ponds located with Hydrologic Soil Group A soils are assumed to be within the Most Effective Recharge and the 3-inch volume will be assessed for the preferred alternative only. (With the exception of the easternmost project limits, within Township19 South, Range 30 East, the entire study corridor is located within the Wekiva Study Area.) This value was calculated for each basin for the Viable Alternatives and will be refined for the Preferred Alternative, if needed.
7. Using the attenuation volume for the Viable Alternatives stormwater sites were identified as follows:
 - a) Select locations within parcels impacted by the roadway right-of-way in lieu of leaving an unused remnant.
 - b) Use parcels that have impacted access because of the roadway alignment.
 - c) Consider vacant, undeveloped parcels based on field and aerial evaluations.
 - d) Avoid wetland impacts to the extent possible unless the alternative means a residential or business impact, or when only wetlands are available. Wetland ditches, surface waters, and permitted stormwater ponds shown are based on National Wetlands Inventory (NWI) data and field review.
 - e) Identify floodplains and utilities, avoid and minimize impacts, if feasible.

8. Pond layout will incorporate the following construction and maintenance considerations:
 - a) Ponds shall be designed to provide a minimum 20 feet of horizontal clearance between the top edge of the normal pool elevation and the right-of-way line and a 15-ft wide maintenance berm at a slope of 1V:8H or flatter.
 - b) The inside corners of the maintenance berm shall have a minimum radius of 30-ft to provide acceptable turning radius for maintenance vehicles.
 - c) One foot freeboard above the maximum design stage is required to compensate for grading irregularities.
 - d) Ponds shall be accessible from the right of way or have an access easement.
9. Stage storage calculations will be used to determine the storage volume available to assure the volume estimates are met and a reasonable safety margin is used.
10. For the Preferred Alternative, the attenuation, treatment, phosphorous, and/or recharge volumes will be documented as needed and a second stormwater option will be developed using the goals in item 7 above. For interchange basins in which ponds are in the infield and/or in the areas currently owned by OOCEA or FDOT, only one stormwater option will be shown.

PROTECTION FROM FLOODING

1. Systems discharging to closed lakes adjacent to properties of more than one ownership shall not cause an increase in total pre-development flood storage. A system will not cause a net reduction in flood storage if compensating storage is provided outside or if flood rights are purchased. Minimization and compensation will be used for this study to ensure no adverse affect.
2. A system may not cause a net reduction in flood storage within a 10-yr floodplain, except for structures elevated on pilings or traversing works. Traversing work, works or other structures shall cause no more than one foot increase in the 100-yr flood elevation immediately upstream and no more than 0.10 foot increase in the 100-yr flood elevation 500 feet upstream. A system will not cause a net reduction in flood storage within a 10-yr floodplain if compensating storage is provided outside the 10-yr floodplain. Compensation shall be provided through excavation of a volume of uplands equivalent to the loss of storage within the regulatory floodplain. For this study, 1:1 volume replacement for the 10-year floodplain will be used.
3. For the Preferred Alternative, cross drains will be evaluated for proposed locations to ensure there is no significant increase in headwater for the design storms. The FDOT velocity method with a design frequency of 50 years will be used to estimate culvert sizes. Wekiva Parkway is considered a high use or essential roadway and an evacuation route; therefore, the 50-year storm event applies. HY-8 will be used to determine approximate cross drain sizes for the purposes of cost estimates. The actual design and associated profile requirements will occur during the final design efforts.