CDM

Wekiva Parkway and Protection Act
Master Stormwater Management Plan Support

FINAL REPORT





Prepared for:

St. Johns River Water Management District

LAKE COUNTY
City of Eustis
City of Mount Dora

SEMINOLE COUNTY
City of Altamonte Springs
City of Lake Mary
City of Longwood

ORANGE COUNTY
City of Apopka
Town of Eatonville
Town of Oakland
City of Ocoee
City of Orlando
City of Winter Garden

Final Report - November 2005
Updated - March 2006

Contents

Executive Summary

ES.1 Introduction ES-1
ES.2 Data Collection and Regional Information ES-3
ES.3 Stakeholder Stormwater Management Policies ES-3
ES.4 Assess and Prioritize Existing Deficiencies ES-3
ES.5 Identification of Regional Projects ES-5
ES.6 Feasibility of Stormwater Reuse ES-8
ES.7 Evaluation of Stormwater Management Programs ES-8
ES.8 Recommendations and Schedule ES-10

Section 1 Introduction

1.1 Legislative Background 1-1
1.2 Master Stormwater Management Plan 1-2
1.3 Wekiva Basin Legislative History 1-4
1.3.1 Wekiva River Protection Act 1-4
1.3.2 Wekiva-Ocala Greenway 1-6
1.3.3 Outstanding Florida Water 1-6
1.3.4 Wild and Scenic River Designation 1-6
1.3.5 Florida Aquatic Preserve 1-7
1.4 Objective 1-7

Section 2 Wekiva Study Area Regional Information

2.1 Wekiva Study Area 2-1
2.1.1 Data Collection 2-1
2.2 GIS Mapping Data 2-1
2.3 Topographic Data 2-2
2.4 Land Use 2-2
2.5 Soils 2-4
2.6 Watersheds 2-5
2.6.1 Subbasins 2-8
2.7 Rainfall 2-9
2.7.1 Precipitation Characteristics and Trends 2-10
2.8 Surface Water Stages & Flows 2-11
2.8.1 Steamflow Characteristics and Trends 2-12
2.8.2 Lake Level Characteristics and Trends 2-14
2.9 Water Quality 2-15
2.9.1 Water Quality Monitoring 2-15
2.9.2 TMDL Related Issues 2-17
2.9.2.1 Basin Status Reports 2-18
2.9.2.2 TMDL Activities 2-20
2.10 Groundwater 2-23

2.10.1 Hydrogeology of the Aquifer Systems 2-23
2.10.1.1 Surficial Aquifer System 2-23
2.10.1.2 Intermediate Confining Unit 2-23
2.10.1.3 Floridan Aquifer System 2-23
2.10.2 Groundwater Flow 2-24
2.10.2.1 Surficial Aquifer System 2-24
2.10.2.2 Intermediate Confining Unit 2-24
2.10.2.3 Floridan Aquifer System 2-25
2.10.2.4 Regional Groundwater Flow 2-25
2.10.3 Recharge 2-26
2.10.3.1 Recharge Criteria Rulemaking 2-29
2.10.4 Projected Drawdowns 2-30
2.10.5 Groundwater Contamination 2-31
2.11 Wekiva Aquifer Vulnerability Assessment 2-32
2.12 Drainage Wells 2-32
2.13 Public Lands 2-34

Section 3 Stakeholder Stormwater Management Policies

3.1 Introduction 3-1
3.2 Lake County 3-1
3.2.1 Level of Service 3-1
3.2.2 NPDES MS4 Permit 3-2
3.2.3 Stormwater System Inspection and Maintenance 3-2
3.2.4 Redevelopment Control Measures 3-3
3.2.5 Current Water Resources Funding Mechanisms 3-5
3.3 City of Eustis 3-5
3.3.1 Level of Service 3-5
3.3.2 NPDES MS4 Permit 3-6
3.3.3 Stormwater System Inspection and Maintenance 3-6
3.3.4 Redevelopment Control Measures 3-7
3.3.5 Current Water Resources Funding Mechanisms 3-7
3.4 City of Mount Dora 3-8
3.4.1 Level of Service 3-8
3.4.2 NPDES MS4 Permit 3-9
3.4.3 Stormwater System Inspection and Maintenance 3-10
3.4.4 Redevelopment Control Measures 3-10
3.4.5 Current Water Resources Funding Mechanisms 3-11
3.5 Orange County 3-11
3.5.1 Level of Service 3-11
3.5.2 NPDES MS4 Permit 3-12
3.5.3 Stormwater System Inspection and Maintenance 3-13
3.5.4 Redevelopment Control Measures 3-15

3.5.5 Current Water Resources Funding Mechanisms 3-15
3.6 City of Apopka 3-16
3.6.1 Level of Service 3-16
3.6.2 NPDES MS4 Permit 3-17
3.6.3 Stormwater System Inspection and Maintenance 3-18
3.6.4 Redevelopment Control Measures 3-18
3.6.5 Current Water Resources Funding Mechanisms 3-19
3.7 Town of Eatonville 3-19
3.7.1 Level of Service 3-19
3.7.2 NPDES MS4 Permit 3-19
3.7.3 Stormwater System Inspection and Maintenance 3-20
3.7.4 Redevelopment Control Measures 3-20
3.7.5 Current Water Resources Funding Mechanisms 3-21
3.8 Town of Oakland 3-21
3.8.1 Level of Service 3-21
3.8.2 NPDES MS4 Permit 3-22
3.8.3 Stormwater System Inspection and Maintenance 3-22
3.8.4 Redevelopment Control Measures 3-22
3.8.5 Current Water Resources Funding Mechanisms 3-22
3.9 City of Ocoee 3-23
3.9.1 Level of Service 3-23
3.9.2 NPDES MS4 Permit 3-23
3.9.3 Stormwater System Inspection and Maintenance 3-24
3.9.4 Redevelopment Control Measures 3-24
3.9.5 Current Water Resources Funding Mechanisms 3-24
3.10 City of Orlando 3-25
3.10.1 Level of Service 3-25
3.10.2 NPDES MS4 Permit 3-28
3.10.3 Stormwater System Inspection and Maintenance 3-29
3.10.4 Redevelopment Control Measures 3-29
3.10.5 Current Water Resources Funding Mechanisms 3-30
3.11 City of Winter Garden 3-30
3.11.1 Level of Service 3-30
3.11.2 NPDES MS4 Permit 3-31
3.11.3 Stormwater System Inspection and Maintenance 3-32
3.11.4 Redevelopment Control Measures 3-32
3.11.5 Current Water Resources Funding Mechanisms 3-33
3.12 Seminole County 3-34
3.12.1 Level of Service 3-34
3.12.2 NPDES MS4 Permit 3-36
3.12.3 Stormwater System Inspection and Maintenance 3-36
3.12.4 Redevelopment Control Measures 3-38

3.12.5 Current Water Resources Funding Mechanisms 3-39
3.13 City of Altamonte Springs 3-39
3.13.1 Level of Service 3-39
3.13.2 NPDES MS4 Permit 3-42
3.13.3 Stormwater System Inspection and Maintenance 3-42
3.13.4 Redevelopment Control Measures 3-43
3.13.5 Current Water Resources Funding Mechanisms 3-43
3.14 City of Lake Mary 3-43
3.14.1 Level of Service 3-43
3.14.2 NPDES MS4 Permit 3-44
3.14.3 Stormwater System Inspection and Maintenance 3-45
3.14.4 Redevelopment Control Measures 3-45
3.14.5 Current Water Resources Funding Mechanisms 3-45
3.15 City of Longwood 3-46
3.15.1 Level of Service 3-46
3.15.2 NPDES MS4 Permit 3-46
3.15.3 Stormwater System Inspection and Maintenance 3-47
3.15.4 Redevelopment Control Measures 3-47
3.15.5 Current Water Resources Funding Mechanisms 3-48

Section 4 Existing Deficiencies & Prioritization

4.1 Introduction 4-1
4.2 Existing Deficiencies 4-1
4.3 Prioritization & Ranking 4-2
4.4 Recommendations 4-4

Section 5 Wekiva Study Area Management Strategies

5.1 Introduction 5-1
5.2 Methodology 5-1
5.2.1 Subbasin Prioritization & Ranking 5-1
5.2.2 Management Strategies 5-3
5.2.2.1 Strategy No. 1 – Surface Water Conservation, Groundwater Protection & Reuse 5-4
5.2.2.2 Strategy No. 2 – Surface Water Treatment and Flood Control 5-4
5.2.3 Overall Ranking 5-7
5.2.4 Applying Management Strategies 5-8
5.3 Identified Projects – Management Strategy No. 1 5-8
5.3.1 Subbasin BW-002 5-9
5.3.2 Subbasin LW-002 5-10
5.3.3 Subbasin BW-008 5-12
5.3.4 Subbasin BW-031 5-13
5.3.5 Subbasin BWC-010 5-14

5.4 Identified Projects – Management Strategy No. 2 5-15
5.4.1 Subbasin LW-008 5-15
5.4.2 Subbasin AP-002 5-17
5.4.3 Subbasin GT-001 5-19
5.4.4 Subbasin BW-020 5-20
5.4.5 Subbasin GT-007 5-21
5.5 Conceptual Cost Estimates 5-23

Section 6 Feasibility of Stormwater Reuse

6.1 Introduction 6-1
6.2 Purpose & Methodology 6-1
6.3 Results 6-3
6.4 Advantages and Disadvantages 6-4
6.5 Conclusions 6-5

Section 7 Evaluation of Stormwater Management Programs

7.1 Introduction 7-1
7.2 Redevelopment Measures 7-1
7.2.1 Stakeholder Redevelopment Policies 7-1
7.2.1.1 Redevelopment Stormwater Practices 7-2
7.3 Stormwater Inspection and Maintenance 7-4
7.3.1 Stormwater Operations and Maintenance Evaluation Guidance 7-5
7.4 Funding Mechanisms 7-6
7.4.1 Existing Funding Sources 7-7
7.4.2 New Funding Sources 7-9
7.4.3 Other Funding Sources 7-12
7.4.4 Summary of Funding Sources 7-16
7.4.5 Recommendations 7-18
7.5 Summary of Recommendations 7-18
7.6 Schedule 7-18

Section 8 References

Appendices

Appendix A Wekiva Parkway and Protection Act
Appendix B Land Use
Appendix C NPDES MS4 Permit Maintenance Schedules
Appendix D Existing Deficiencies
Appendix E Pollutant Load Analysis
Appendix F Conceptual Cost Estimates
Appendix G Water Balance Model Description

Figures

Figure ES-1 Wekiva Study Area ES-2
Figure ES-2 Studied Watersheds within the WSA ES-4
Figure ES-3 Management Strategy No.1 – Resulting Ranking ES-6
Figure ES-4 Management Strategy No.2 – Resulting Ranking ES-7
Figure 1-1 Wekiva River System 1-1
Figure 1-2 Wekiva Study Area 1-1
Figure 2-1 Aerial Photography 2-2
Figure 2-2 Base Map 2-2
Figure 2-3 Digital 1-foot Topographic Contours 2-2
Figure 2-4 5-foot Topographic Contours 2-2
Figure 2-5 Existing Land Use 2-3
Figure 2-6 Existing Land Use Breakdown 2-3
Figure 2-7 Future Land Use 2-3
Figure 2-8 Future Land Use Breakdown 2-3
Figure 2-9 Hydrologic Soil Groups 2-5
Figure 2-10 Major Watersheds 2-5
Figure 2-11 Subbasin Boundaries 2-8
Figure 2-12 Rainfall Monitoring Locations 2-9
Figure 2-13 Historic Average Monthly Rainfall – NOAA Stations 2-9
Figure 2-14 Annual Rainfall and 5-Year Moving Average of Annual Rainfall at Orlando, FL, 1931 – 2000 2-11
Figure 2-15 Streamflow & Surface Water Level Monitoring Sites 2-12
Figure 2-16 USGS Stations – Wekiva River Daily Streamflow 2-12
Figure 2-17 USGS Stations – Wekiva River Tributaries Daily Streamflow 2-12
Figure 2-18 USGS Stations – Wekiva River & Tributaries Surface Water Levels 2-12
Figure 2-19 Duration of Daily Discharge for the Wekiva River 2-13
Figure 2-20 Water Quality Sampling Stations 2-15
Figure 2-21 Florida Map Showing FDEP Basin Rotation Schedule 2-18
Figure 2-22 Potentially Impaired WBIDs in the Wekiva Planning Unit of the Middle St. Johns Watershed 2-19
Figure 2-23 Potentially Impaired WBIDs in the Lake Harris Planning Unit of the Ocklawaha Watershed 2-21
Figure 2-24 Potentially Impaired WBIDs in the Lake Apopka Planning Unit of the Ocklawaha Watershed 2-22
Figure 2-25 Verified Impaired Water Bodies 2-22
Figure 2-26 Hydrologic Cross-Section of the Middle St. Johns Groundwater Basin Wekiva Study Area 2-23
Figure 2-27 Physiographic Provinces 2-25
Figure 2-28 Estimated Recharge in the Wekiva Study Area 2-25
Figure 2-29 Floridan Aquifer – Projected Change in Groundwater Elevation (2000 to 2025) 2-31

Figure 2-30 Surficial Aquifer – Projected Change in Groundwater Elevation (2000 to 2025) 2-31
Figure 2-31 Areas of Groundwater Contamination (Floridan Aquifer) 2-31
Figure 2-32 WAVA Zones 2-32
Figure 2-33 Drainage Wells 2-33
Figure 2-34 Public Lands 2-34
Figure 4-1 Areas Studies 4-1
Figure 5-1 Management Strategy No.1 – Assigned Ranking 5-8
Figure 5-2 Management Strategy No.2 – Assigned Ranking 5-8
Figure 5-3 Management Strategy No.1 – Decision Making Flow Diagram 5-8
Figure 5-4 Management Strategy No.2 – Decision Making Flow Diagram 5-8
Figure 5-5 Example Subbasins for Applying Management Strategies 5-9
Figure 5-6 Subbasin BW-002 5-9
Figure 5-7 Subbasin LW-002 5-11
Figure 5-8 Subbasin BW-008 5-12
Figure 5-9 Subbasin BW-031 5-13
Figure 5-10 Subbasin BWC-010 5-14
Figure 5-11 Subbasin LW-008 5-16
Figure 5-12 Subbasin AP-002 5-17
Figure 5-13 Subbasin GT-001 5-19
Figure 5-14 Subbasin BW-020 5-20
Figure 5-15 Subbasin GT-007 5-21
Figure 6-1 Average Monthly Runoff Versus Irrigation Demands 6-1
Figure 6-2 Storage Required to Prevent a Shortage of Irrigation Water 6-2

Tables

Table ES-1 Level that Redevelopment Policies are Addressed ES-9
Table ES-2 Summary of Recommendations ES-10
Table ES-3 Recommended Schedule ES-10
Table 1-1 Jurisdictions within the Wekiva Study Area 1-2
Table 2-1 Data Collection Matrix 2-1
Table 2-2 Hydrologic Soil Group Breakdown 2-5
Table 2-3 Long Term Monthly Average Rainfall 2-9
Table 2-4 USGS Station Characteristics 2-12
Table 2-5 Historic Streamflow Variability 2-12
Table 2-6 Lake County, Orange County, Seminole County and St. Johns River Water Management District Water Quality Monitoring 2-15
Table 2-7 Summary of Impaired WBIDs 2-18
Table 2-8 Summary of Verified Impaired WBIDs 2-20
Table 2-9 Water Balance Estimates for the Wekiva Springfield 2-27
Table 2-10 Drainage Wells within the Wekiva Study Area 2-33
Table 3-1 City of Mount Dora LOS Stormwater Standards 3-9
Table 3-2 Orange County LOS Stormwater Standards 3-12
Table 3-3 City of Ocoee LOS Stormwater Standards 3-23
Table 3-4 City of Orlando LOS Stormwater Standards 3-26
Table 3-5 Seminole County Design Storm Criteria 3-34
Table 3-6 City of Altamonte Springs Stormwater LOS 3-41
Table 3-7 City of Lake Mary LOS Stormwater Standards 3-43
Table 3-8 City of Longwood LOS Stormwater Standards 3-46
Table 3-9 City of Longwood Stormwater Utility Fees 3-49
Table 4-1 Inventory of Stormwater Master Plan/Discharge Studies 4-1
Table 4-2 Existing Deficiencies – Prioritization and Ranking 4-3
Table 5-1 Subbasin Ranking Matrix – Management Strategy #1 5-8
Table 5-2 Subbasin Ranking Matrix – Management Strategy #2 5-8
Table 5-3 Planning Level Conceptual Cost Estimates 5-23
Table 6-1 Storage Requirements as a Function of Irrigation Commitment 6-2
Table 7-1 Stormwater Inspection & Maintenance – Lake County 7-4
Table 7-2 Stormwater Inspection & Maintenance – City of Eustis 7-4
Table 7-3 Stormwater Inspection & Maintenance – City of Mount Dora 7-4
Table 7-4 Stormwater Inspection & Maintenance – Orange County 7-4
Table 7-5 Stormwater Inspection & Maintenance – City of Apopka 7-4
Table 7-6 Stormwater Inspection & Maintenance – Town of Eatonville 7-4
Table 7-7 Stormwater Inspection & Maintenance – Town of Oakland 7-4
Table 7-8 Stormwater Inspection & Maintenance – City of Ocoee 7-4
Table 7-9 Stormwater Inspection & Maintenance – City of Orlando 7-4
Table 7-10 Stormwater Inspection & Maintenance – City of Winter Garden 7-4
Table 7-11 Stormwater Inspection & Maintenance – Seminole County 7-4

Table 7-12 Stormwater Inspection & Maintenance – City of Altamonte Springs 7-4
Table 7-13 Stormwater Inspection & Maintenance – City of Lake Mary 7-4
Table 7-14 Stormwater Inspection & Maintenance – City of Longwood 7-4
Table 7-15 Summary of Recommendations.....7-18
Table 7-16 Recommended Schedule.....7-18

Acronyms

AP	Apopka Basin
AS	Alexander Springs Basin
BFE	Base Flood Elevation
BLS	Below Land Surface
BMAP	Basin Management Action Plan
BMP	best management practice
BOD	Biochemical Oxygen Demand
BW	Big Wekiva River Basin
BWC	Black Water Creek Basin
CIP	Capital Improvement Project
CRA	Community Redevelopment Agency
CSO	Combined Sewer Overflow
CUP	Consumptive Use Permit
CWA	Clean Water Act
CWP	Center for Watershed Protection
DCA	Department of Community Affairs
DCIA	Directly Connected Impervious Area
DO	Dissolved Oxygen
DOH	Department of Health
DOQQ	Digital Orthophoto Quarter Quadrangle
DU	Dwelling Units
ECFRPC	East Central Florida Regional Planning Council
EDB	Ethylene Dibromide
EDU	Equivalent Drainage Unit
EPA	Environmental Protection Agency
ERP	Environmental Resource permitting
ERU	Equivalent Residential Unit
ESM	Engineering Standards Manual
F.A.C.	Florida Administrative Code
FAVA	Florida Aquifer Vulnerability Assessment
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FGS	Florida Geologic Survey
FIRM	Flood Insurance Rate Maps
FLUCCS	Florida Land Use/Land Cover and Forms Classification System
F.S.	Florida Statutes
FTE	Full Time Equivalency
FY	Fiscal Year

GIS	Geographical Information System
GT	Golden Triangle Basin
HGL	Hydraulic Grade Line
HSPF	Hydrologic Simulation Program Fortran®
ICPR	Interconnected Channel and Pond Routing
IWR	Impaired Waters Rule
LA	Load Allocation
LCWA	Lake County Water Authority
LE	Lake Eustis Basin
LID	Low Impact Development
LiDAR	Light Detection and Ranging
LOS	Level Of Service
LOWESS	Locally Weighted Scatterplot Smoothing
LW	Little Wekiva River Basin
MA	Maintenance Areas
MFL	Minimum Flows And Levels
MGD	Million Gallons Per Day
MON	Monroe Basin
MOS	Margin Of Safety
MS4	Municipal Separate Storm Sewer System
MSBU	Municipal Service Benefit Unit
MSJRB	Middle St. John's River Basin
MSMP	Master Stormwater Management Plan
MSTU	Municipal Service Taxing Unit
NAD	North American Datum
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resource Conservation Service
NWRC	Northwest Recreation Center
O&M	Operations And Maintenance
OAWP	Office of Agricultural Water Policy
OCEPD	Orange County Environmental Protection Division
OFW	Outstanding Florida Water
OSTDS	Onsite Sewage Treatment And Disposal Systems
OUSWMM	Orlando Urban Stormwater Management Manual
PEC	Professional Engineering Consultants, Inc.
PET	potential evapotranspiration
PLRG	Pollution Load Reduction Goal

PMP	Probable maximum precipitation
PWRCA	Priority water resource caution area
REV	Rate-Efficiency-Volume
RIB	Rapid Infiltration Basin
SB	Senate Bill
SET	Stormwater Education Toolkit
SFWMD	South Florida Water Management District
SIB	Stormwater Infiltration Basins
SJRWMD	St. Johns River Water Management District
SOL	Soldiers Creek Basin
STORET	Storage and Retrieval
SWIM	Surface Water Improvement and Management
TMDL	Total Maximum Daily Load
TSD	Treatment, Storage and Disposal
TSI	Trophic State Index
TV	Temporal Variability
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAVA	Wekiva Aquifer Vulnerability Assessment
WBID	Water Body Identification
WLA	Wasteload Allocation
WMD	Water Management District
WMM	Watershed Management Model
WPA	Wekiva River Protection Act
WPPA	Wekiva Parkway and Protection Act
WSA	Wekiva Study Area
WWTP	Wastewater Treatment Plant
YL	Yankee Lake Basin

Executive Summary

ES.1 Introduction

In 2004, Governor Jeb Bush signed the Wekiva Parkway and Protection Act (WPPA) into law which authorizes the building of the Wekiva Parkway and provides protection to the Wekiva River system. This legislation was in response to the Wekiva Basin Coordinating Committee's Report entitled *Recommendations for Enhanced Land Use Planning Strategies and Development Standards to Protect Water Resources of the Wekiva River Basin* (March 2004). The intent of the Committee's recommendations and subsequent implementation is to improve and assure protection of surface water and groundwater resources in the Wekiva Study Area (WSA), which encompasses approximately 473 square miles in Central Florida (See **Figure ES-1**). Local governments affected by the WPPA include Lake County, City of Eustis, City of Mount Dora, Orange County, City of Apopka, Town of Eatonville, Town of Oakland, City of Ocoee, City of Orlando, City of Winter Garden, Seminole County, City of Altamonte Springs, City of Lake Mary, and the City of Longwood (Stakeholders).

Chapter 369.319, F.S. of the WPPA requires the affected local governments to develop a Master Stormwater Management Plan (MSMP) for their portion of the WSA that:

1) Assess existing problems and deficiencies in the community;

2) Identify projects to meet long-range needs;

3) Establish priorities to address existing deficiencies;

4) Establish measures to address redevelopment;

5) Establish a schedule to complete needed improvements;

6) Evaluate the feasibility of stormwater reuse; and,

7) Include requirements for inspection and maintenance of facilities.

8) Identification of a funding source

Because of the complexity of the issues, the SJRWMD initiated an effort with CDM to cooperatively work with the affected Stakeholders to develop a MSMP for the WSA that meet the requirements of the WPPA. This cooperative approach promoted the development of a consistent plan rather than developing a piecemeal approach by individual governments. The Florida Department of Community Affairs who is responsible for implementation of the Act was a cooperative partner in the Stakeholder effort. This cooperation was a key factor in the success of this project.

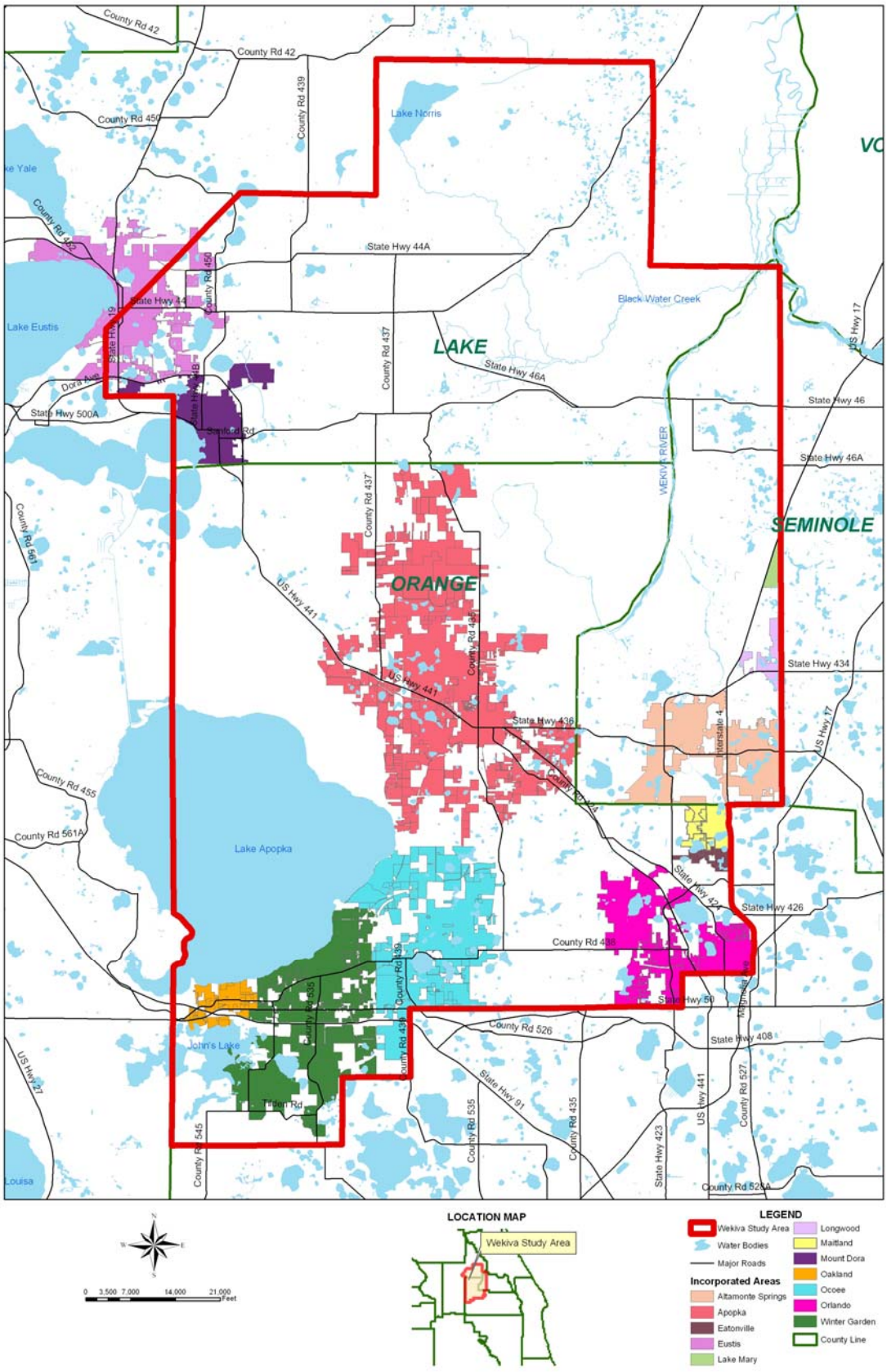


Figure ES-1 – Wekiva Study Area

ES.2 Data Collection and Regional Information

CDM performed an extensive data collection and review effort in order to provide a better understanding of the regional issues related to both surface water and groundwater in the WSA. Characteristics of the WSA including topography, land use, soils, major watersheds and subbasins, rainfall, surface water stages and flows, water quality monitoring, total maximum daily loads (TMDLs), hydrogeology, groundwater flow, recharge, projected drawdowns, groundwater contamination, Wekiva Aquifer Vulnerability Assessment (WAVA), drainage wells and public lands are all described in detail in the MSMP. The data presented were used extensively in developing the subsequent portions of the MSMP.

ES.3 Stakeholder Stormwater Management Policies

CDM reviewed comprehensive plans, code of ordinances, land development codes and permits, and obtained feedback from the Stakeholders in order to provide a summary of each individual Stakeholder's policies. Detailed information presented for each Stakeholder included the adopted level of service (LOS) for stormwater management facilities, National Pollutant Discharge Elimination System (NPDES) permitting for municipal separate storm sewer systems (MS4s), stormwater system inspection and maintenance, redevelopment control measures (as they relate to water quantity and quality) and current water resources funding mechanisms.

ES.4 Assess and Prioritize Existing Deficiencies

CDM developed an inventory of existing stormwater master plans and drainage studies that have been completed or are in the process of being completed by the Stakeholders to date. These studies were then individually reviewed to identify existing problem areas. Some problem areas were also identified through correspondence with Stakeholders as they were not part of an existing study. **Figure ES-2** presents the areas of the WSA that have been studied in detail. Through the Stakeholder process, this list of deficiencies was refined and a ranking methodology was developed to prioritize problems based on their importance to the goals of the Act.

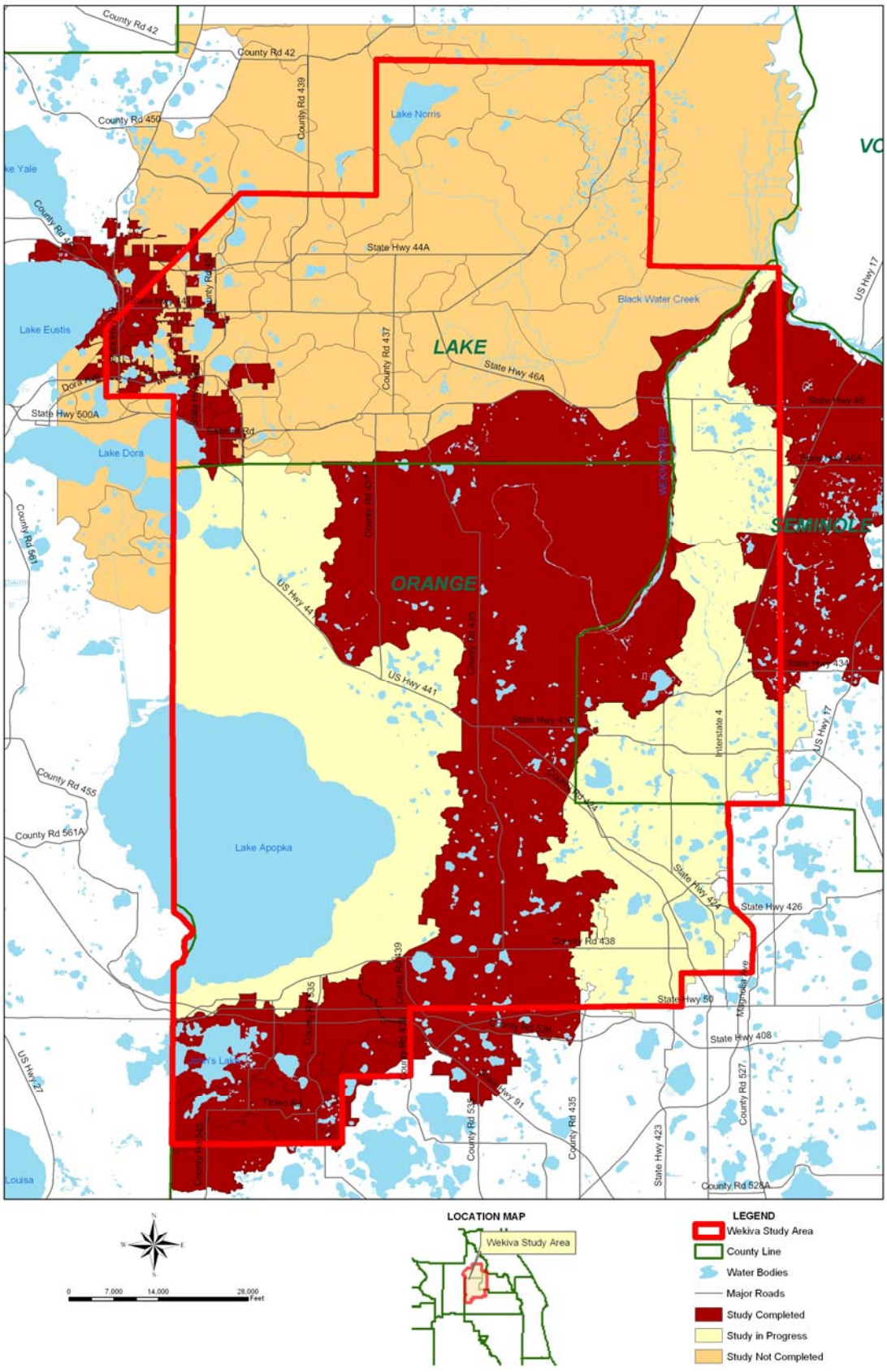


Figure ES-2 – Studied Watersheds within the WSA

ES.5 Identification of Regional Projects

CDM, with input from the Stakeholders, developed a methodology to evaluate and apply long-term management strategies in order to identify regional projects. Based on review of the goals of the WPPA, the following two regional strategies were considered:

1) **Surface Water Conservation, Groundwater Protection and Reuse; and,**

2) **Surface Water Treatment and Flood Control.**

Using a watershed approach, CDM developed a methodology for prioritizing subbasins within the WSA to apply these two strategies. The prioritized subbasins are presented in **Figure ES-3** and **Figure ES-4**.

Once prioritized, CDM identified best management practices (BMPs) that could be applied to meet the goal of each strategy. BMPs identified under Management Strategy No. 1 include stormwater reuse, the use of reservoirs and ponds, no net loss of floodplains, stormwater infiltration basins (SIBs), the use of buffers, promotion of green development or low impact development (LID), and continuation of the SJRWMD recharge rule for development. BMPs identified under Management Strategy No. 2 include source controls, no net loss of floodplains, retention, detention, swales, buffers, end-of-pipe treatments, alum/chemical treatment, drainage well (recharge well) and treatment system, agricultural nonpoint source management, green roofs, water wise landscaping and reduced turf area, pervious pavement, public education/outreach of proper management and use of fertilizers, and green development or LID. As can be seen from this list for each strategy, there are some BMPs that if implemented, help meet the long-term goals under both management strategies, and are therefore repeated.

Based on the resulting ranking, CDM selected example subbasins under each management strategy (for a total of 10 subbasins) to show how each management strategy could be applied to identify regional projects. These 10 example subbasins were then evaluated to show how various BMPs, depending on the characteristics of the subbasin, can help meet the long term goals of each strategy. It is the intent of this document to provide a protocol for each Stakeholder to follow in order to identify site specific BMPs that promote the goals of the WPPA that can then be integrated into a Capital Improvement Project (CIP) program. For the 10 example subasins, CDM then developed conceptual cost estimates for those BMPs that appear feasible. Conceptual costs ranged between $200,000 and $6,000,000 depending on the characteristics of the area.

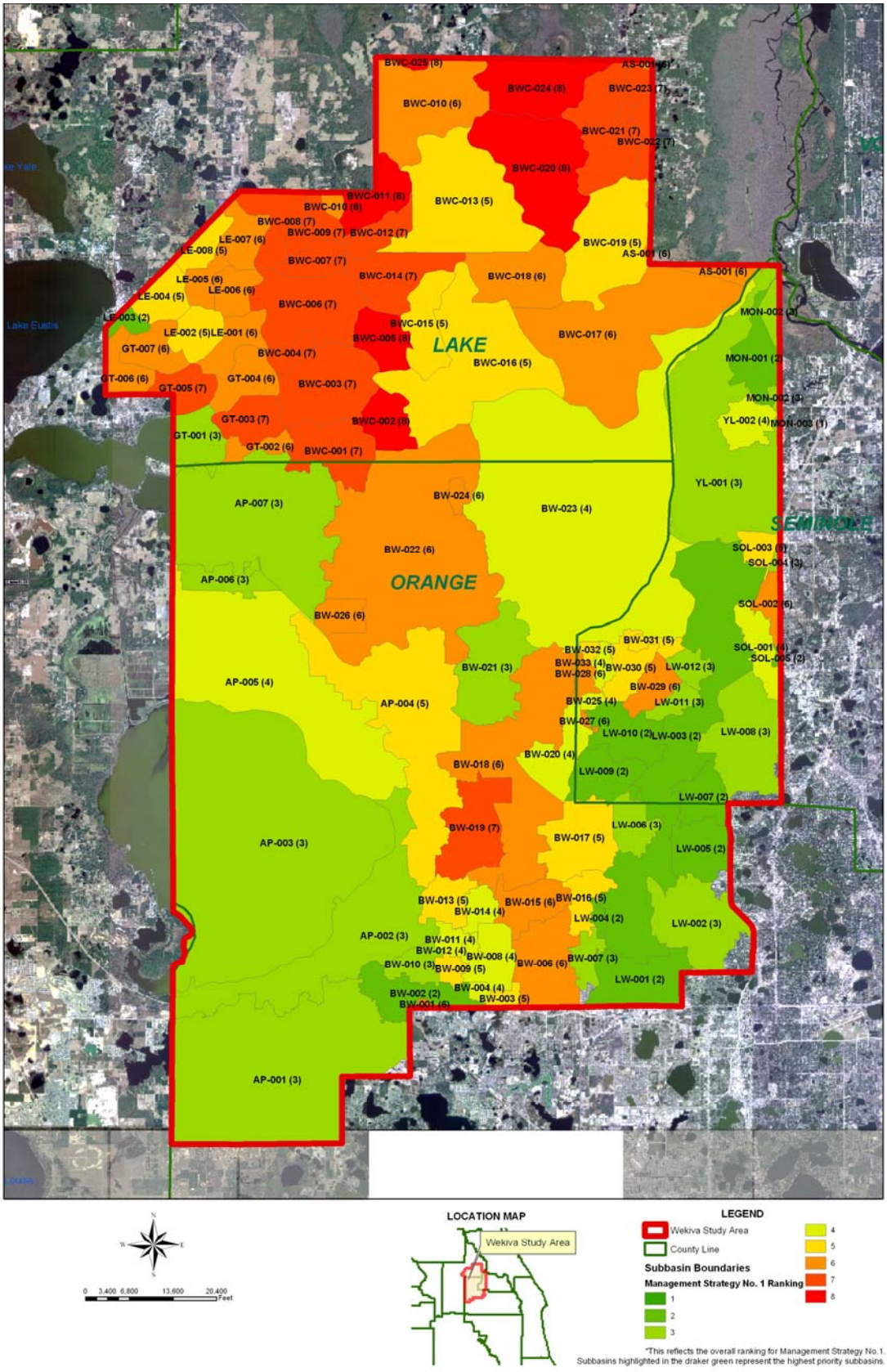


Figure ES-3 – Management Strategy No. 1-Resulting Ranking

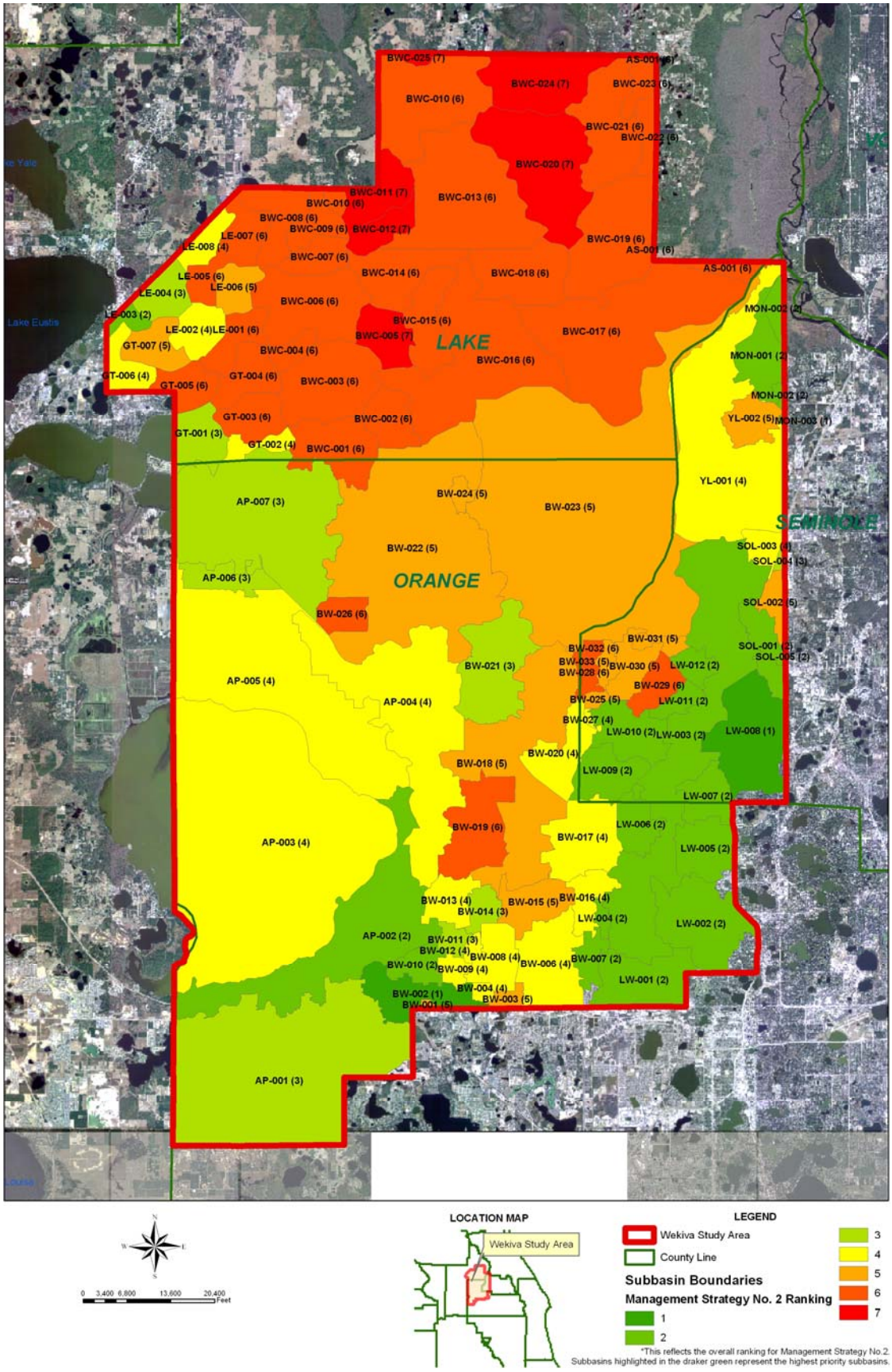


Figure ES-4 – Management Strategy No. 2-Resulting Ranking

ES.6 Feasibility of Stormwater Reuse

As the future of a sustainable water supply in Central Florida becomes more uncertain, water conservation practices and reuse become more attractive. The idea of stormwater reuse as an alternative water supply for irrigation has been suggested as a viable option that would help promote recharge and lower consumptive use of potable water supplies. As part of the MSMP, CDM conceptually evaluated the feasibility of using stormwater runoff as a source of irrigation water. The result of the conceptual analysis indicated that stormwater reuse may be feasible on a continuous basis when demand is 50 percent or less of the available supply. Additionally, it does not appear possible to provide sufficient storage to completely equalize supplies and demands, based on a desire to reuse 100 percent of the available runoff. At commitments beyond 70 percent of the long term average runoff, the analysis suggests that it is unlikely that reuse at these levels would be feasible due to the volume of storage required to equalize seasonal differences in supply (runoff) and demand (irrigation).

As suggested by CDM's analysis and research done by others, stormwater reuse may be feasible up to a certain point, however additional study is needed to address the following concerns when considering this type of system in the WSA:

- The feasibility of stormwater reuse is site-specific and would need to be evaluated on a case by case basis as site conditions can vary greatly throughout the WSA (e.g., soils, recharge capacity, temporal and spatial distribution of rainfall, and local irrigation demand); and
- The relationship of stormwater reuse to the proposed pre-development/post-development match (Section 369.318 (4) of the WPPA) in the WSA would have to be assessed.

ES.7 Evaluation of Stormwater Management Programs

CDM used the information documented under each Stakeholder's stormwater management policies to provide an evaluation for redevelopment, stormwater inspection and maintenance and current funding mechanisms.

Redevelopment

Each of the Stakeholders' regulations that address redevelopment was reviewed to identify current requirements as they relate to stormwater management for water quantity and quality. A general summary of the level that each Stakeholders regulations address redevelopment is presented in **Table ES-1**.

Table ES-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Level that Redevelopment Policies are Addressed

Clearly Defined	Moderately Defined	Broadly Defined
Lake County	City of Eustis	Town of Oakland
City of Mount Dora	City of Apopka	
Orange County	Town of Eatonville	
City of Orlando	City of Ocoee	
City of Winter Garden	City of Altamonte Springs	
Seminole County	City of Lake Mary	
City of Longwood		

Stormwater Maintenance and Inspection

The benefit of stormwater operations and maintenance (O&M) to a community is realized in three general ways:

- The useful life of the stormwater infrastructure is extended through proper operation and routine maintenance of these assets resulting in a cost savings by delaying the need for major rehabilitation or replacement of these assets.

- Cleaning of catch basins, culverts, and stream channels maintains the hydraulic capacity of these items, thus lessening the likelihood of flooding in the vicinity of these structures as compared to a non-maintained state.

- Regular removal of trash, debris, sediment, and excess vegetation from the stormwater system improves water quality of streams and downstream waterways as well as the aesthetic value of these areas to the community. Regular street sweeping and greenway maintenance achieves similar results.

Information on the current stormwater inspection and maintenance practices was provided by each of the Stakeholders. Based on this feedback, CDM summarized the maintenance operations, inspections, contracted services and equipment for each Stakeholder. As O&M programs can vary greatly amongst Stakeholders based on individual needs and constraints (e.g., staffing, equipment, funding), it is recommended that each Stakeholder evaluate improvements to their maintenance programs based on the information presented in this MSMP and their own familiarity with their respective programs. The use of a standard rating system, such as a level of service for maintenance described in detail in the MSMP itself, could be used to evaluate such a program.

Funding Mechanisms

As part of the MSMP, a discussion of types of funding alternatives for stormwater services as well as their advantages and disadvantages was provided. Most of the funding sources discussed in the MSMP apply to cities and counties but are limited in their application to a multi-city and county program. Of course, all of the cities and county participants have revenues from ad valorem taxes collected within the three counties (Lake, Orange and Seminole). Many of the municipalities have stormwater utility fees; but none of the counties do. Thus, the use of an existing funding source to provide revenues for the entire WSA would be difficult to implement.

Therefore, in order to implement the recommendations made throughout the MSMP, a dedicated continuous funding source should be established for projects and programs in the WSA. Currently, 10 out of the 13 local governments have established such a funding mechanism in the form of a stormwater utility. The overall concept of a joint stormwater utility as a method of funding projects within the WSA would be too difficult to implement and faces several challenges. It is recommended that the affected Stakeholders that currently do not have a dedicated stormwater funding mechanism, such as a utility, consider developing one in order to fund the planning, implementation and O&M of projects within the WSA. In addition to a dedicated stormwater fund it is recommended that the Stakeholders develop a joint planning agreement that would allow them to plan and implement regional projects in the WSA that are part of the CIP.

ES.8 Recommendations & Schedule

It is important to recognize the recommendations made throughout the MSMP are those for the Stakeholders to consider, however determining those recommendations which are feasible and affordable and which may be reflected in future policy changes are the responsibility of the local governments. Recommendations made throughout the report are summarized in **Table ES-2**. This table identifies each recommendation, where it is referenced in the MSMP, as well as the identified Stakeholders that each recommendation applies to. Finally, a recommended schedule, shown in **Table ES-3,** to complete the needed improvements was developed with input from the Stakeholders in order to address the recommendations summarized in Table ES-2.

Table ES-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Summary of Recommendations

			Jurisdiction													
Recommendation No.	Recommendation Description	MSMP Reference	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
1	For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2.	Appendix E - Section E.4.2, Section E.5, Table E-17, Section 5.2.2	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP.	Section 4.3, Table 4-2, Appendix D	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements.	Figure 4-1, Section 4.4	√		√											
4	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied)	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied)	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions.	Section 6.4	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management.	Section 7.2.1		√			√	√	√	√				√		√
8	Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs.	Appendix C	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Develop a pro-active routine inspection and maintenance program of stormwater facilities.	Section 7.3	√													
10	Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program.	Section 7.3	√	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA.	Section 7.4.5	√			√			√				√			
12	Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects.	Section 7.4.5	√	√	√	√	√	√	√	√	√	√	√	√	√	√

* These are recommendations that the local governments should consider, however determining those recommendations that are feasible and affordable are the responsibility of the local governments.

Table ES-3
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Recommended Schedule

Recommendation No.	Recommendation Description	Comments	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2.	Dependent on planning horizons for build-out conditions for each Stakeholder.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
2	Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP.	Implement identified recommendations for 20 percent of the prioritized deficiencies every 5 years.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
3	Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements.	Evaluate 1 basin (i.e. watershed) every 5 years.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
4a	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
4b	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years						♦	♦	♦	♦	♦	♦	♦	♦	♦	♦										
4c	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years											♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
4d	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "7" and "8", implementation of financially feasible projects the following 5 years																♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
5a	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
5b	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years						♦	♦	♦	♦	♦	♦	♦	♦	♦	♦										
5c	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years											♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
5d	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "7" implementation of financially feasible projects the following 5 years																♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
6	For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions.	Evaluate 1 basin (i.e. watershed) every 5 years, reference watershed list	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
7	Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management.	5 year duration or as directed by the Wekiva Parkway & Protection Act Legislation	♦	♦	♦	♦	♦																				
8	Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs.		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
9	Develop a pro-active routine inpection and maintenance program of stormwater facilities.	5 year duration	♦	♦	♦	♦	♦																				
10	Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program.	5 year duration	♦	♦	♦	♦	♦																				
11	Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA.	10 year duration or as directed by the Wekiva Parkway & Protection Act Legislation	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
12	Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects.	5 year duration	♦	♦	♦	♦	♦																				

*It is recommended the schedule should be updated every 5 years at a minimum

Section 1
Introduction

1.1 Legislative Background

Due to the increasing development pressures within Central Florida, in 2002, Governor Jeb Bush created the Wekiva River Basin Task Force to evaluate and recommend the most appropriate location for the proposed Wekiva Parkway that would connect State Road (SR) 429 and Interstate 4 (I-4) in Seminole County. Due to the environmentally sensitive lands in the Wekiva River Basin that construction of the Wekiva Parkway may negatively impact, careful consideration had to be given to those alternatives that would cause the least disruption and provide the greatest protection to the Wekiva Basin ecosystem. The Wekiva River is significant because it is one of the few remaining near-pristine riverine systems in central Florida. The Wekiva River is a major tributary of the St. Johns River and its headwaters begin at the confluence of Wekiva Spring Run and Rock Spring Run (see **Figure 1-1**). Waters that constitute the upper reaches of the Wekiva River emanate from both the Floridan aquifer in the form of natural springs and from surface water runoff of approximately 130 square miles of watershed. The Little Wekiva River and Black Water Creek are two major tributaries of the Wekiva. Blackwater Creek drains an additional 126 square miles of watershed into the lower reaches of the Wekiva, just upstream of the St. Johns River.

Recommendations by the Task Force were submitted in a final report to the Governor in January 2003. Subsequently, Governor Bush created the Wekiva River Basin Coordinating Committee (the Committee) by Executive Order 2003-112 in July 2003. This Committee was created as a forum to identify land use planning strategies and development standards that are consistent with protected property rights and which improve and assure protection of surface and groundwater resources, including the recharge potential of the Wekiva River system. The Wekiva River Basin Coordinating Committee's Final Report was prepared in March, 2004, with the following recommendations:

- Build the Wekiva Parkway;
- Protect the Wekiva River Basin Environment;
- Promote Innovative Planning & Development; and
- Implementation.

In addition to these recommendations, the Committee also delineated the Wekiva Study Area (WSA), shown in **Figure 1-2**, which includes the land area that contributes surface and groundwater to the Wekiva River and the various springs located in this area. The WSA is comprised of approximately 304,666 acres or 473 square miles. Based on this delineation, the following local governments located within the WSA are shown in **Table 1-1**.

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig1-1.mxd

County Rd 42
CAMP LA-NO-CHE
Lake Norris
ST. JOHNS RIVER
BLACKWATER
State Hwy 44A
UNNAMED@SSF
TRICKLE
GREEN ALGAE BOIL
BLUE ALGAE BOIL
SHARKSTOOTH
MARKEE
BOULDER
State Hwy 44
Black Water Creek
US Hwy 17
MESSANT
MOCCASIN
BLUEBERRY
SEMINOLE
PALM(Lake)
County Rd 437
LAKE
DROTY
State Hwy 46A
SNAIL
SLAND
HARDEN
NOVA
State Hwy 46
WEKIVA RIVER
State Hwy 46A
SULPHUR
ROCK
SEMINOLE
ORANGE
WITHERINGTON
LITTLE WEKIVA RIVER
Interstate 4
US Hwy 17
WEKIWA
MIAMI(Seminole)
State Hwy 434
STARBUCK
GINGER ALE

N
W E
S

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP

Wekiva Study Area

LEGEND

- Springs
- County Line
- Water Bodies
- Major Roads

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

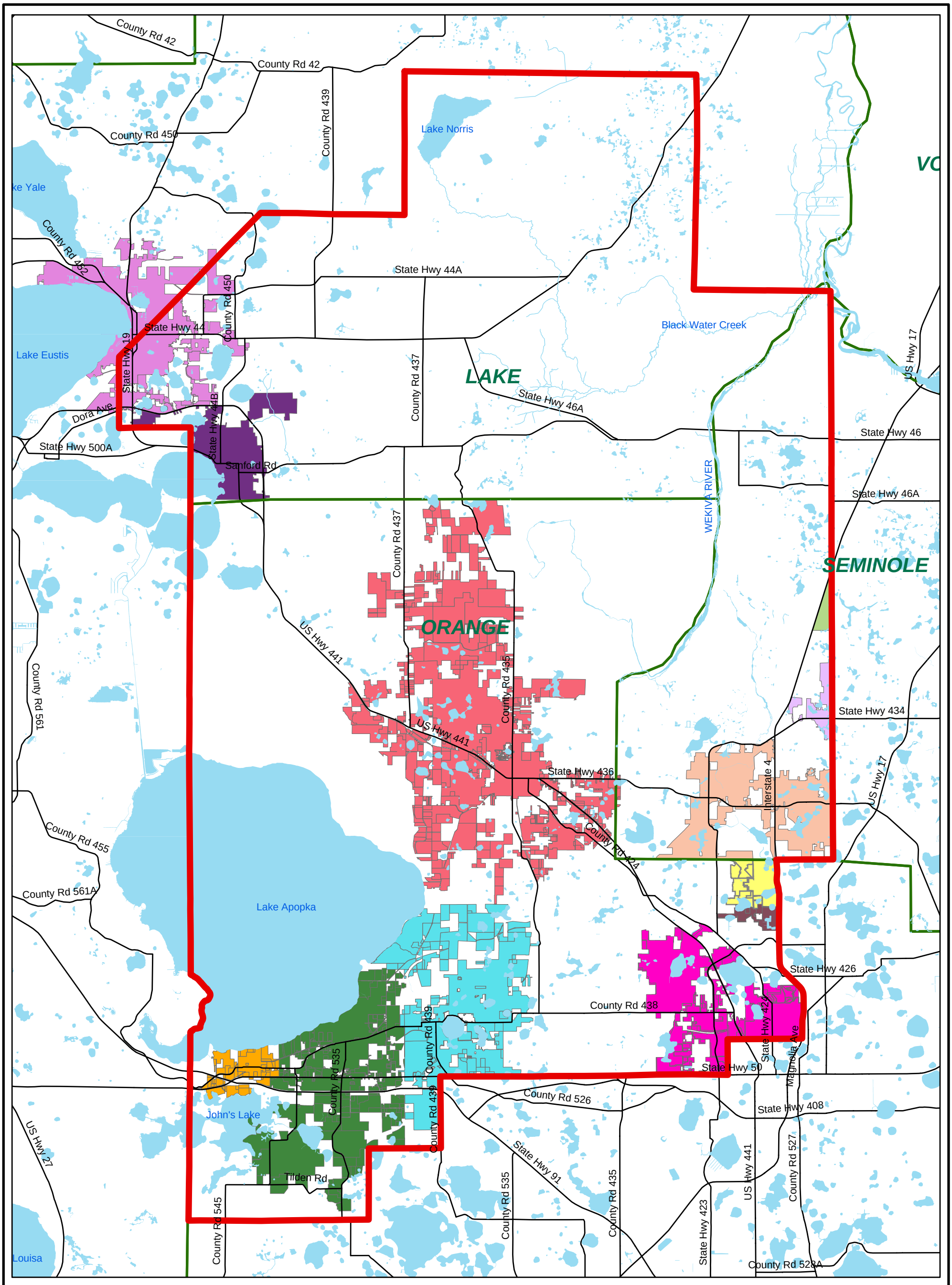
CDM

Figure 1-1
Wekiva River System

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig1-1.mxd



Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 1-2
Wekiva Study Area

Table 1-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Jurisdictions within the Wekiva Study Area

Jurisdiction	Land Area	% of the WSA
Lake County	94,259 acres	31.0%
City of Eustis	3,327 acres	1.1%
City of Mount Dora	3,150 acres	1.0%
Orange County	118,104 acres	39.0%
City of Apopka	18,914 acres	6.0%
Town of Eatonville	432 acres	0.1%
City of Maitland	1,065 acres	0.3%
Town of Oakland	1,111 acres	0.4%
City of Ocoee	8,570 acres	2.8%
City of Orlando	5,930 acres	1.9%
City of Winter Garden	9,023 acres	3.0%
Seminole County	34,543 acres	11.3%
City of Altamonte Springs	5,332 acres	1.8%
City of Lake Mary	290 acres	0.1%
City of Longwood	623 acres	0.2%

On June 29, 2004 Florida Governor Jeb Bush signed the Wekiva Parkway and Protection Act (WPPA) into law. The WPPA, found in Part III of Chapter 369, Florida Statutes (F.S.), implements the findings and recommendations of the Wekiva River Basin Coordinating Committee's Final Report. A copy of the WPPA is provided in **Appendix A**.

The Wekiva River Basin Commission (Commission) was established as a result of the legislation (Section 369.324, F.S.). The Commission, which is comprised of 18 members, is responsible for monitoring and ensuring the implementation of state, regional and local efforts consistent with the Committee's recommendations. The Commission reports annually to the Governor, the Florida Legislature and the Department of Community Affairs (DCA) on implementation progress and recommendations for funding assistance to local governments required for planning and implementation.

1.2 Master Stormwater Management Plan

Under the initiative to "Protect the Wekiva River Basin Environment", the Committee stated the following concerns in its Final Report:

- In general, Florida springs are threatened by actual and potential flow reductions and declining water quality;
- Due to the increase in population, there has been a drastic increase in water use as well as extensive land use changes;

- In the past 30 years, Florida springs have exhibited increased nutrient loading and lowered water flow. Increased nutrient loadings are attributed to fertilizers, septic tanks and wastewater treatment facilities that discharge treated effluent to groundwater. Declining water levels are due to rainfall variation, decreases in aquifer storage due to increased withdrawals and reduced recharge; and

- The health and vitality of the springs is directly influenced by activities and land uses within the springshed.

The Committee's recommendations when taken as a whole are intended to achieve the objective of improving and assuring protection of surface water and groundwater resources. According to the Committee's final report, "to sustain surface water resources, the volume of water discharging to surface waters from new development should be managed to sustain a healthy, functioning ecosystem. Water from point and non-point sources must be adequately treated before discharging to surface waters." Additionally the report goes on to state that "to sustain groundwater resources, the volume of recharge that occurs after development must be no less than the volume before development. Recharge must be adequately treated consistent with the rules of the [Florida] Department of Environmental Protection and the St. Johns River Water Management District (SJRWMD). The quality of surface waters and groundwater recharge should be improved, where possible, by addressing existing problems."

Based on these objectives, Recommendation 7 in the Committee's final report, which was subsequently adopted as Section 369.319, F.S. of the WPPA, specifically requires that each local government within the Wekiva Study Area must develop a master stormwater management plan (MSMP). According to the WPPA, the MSMP shall contain the following components:

1) Assess existing problems and deficiencies in the community;

2) Identify projects to meet long-range needs;

3) Establish priorities to address existing deficiencies;

4) Establish measures to address redevelopment;

5) Establish a schedule to complete needed improvements;

6) Evaluate the feasibility of stormwater reuse; and,

7) Include requirements for inspection and maintenance of facilities.

The legislation goes on to state that the MSMP must identify a funding source, such as a stormwater utility fee, to fund implementation of the plan and maintenance program. In addition, the local government must establish a water reuse and

irrigation program that allows for reuse of stormwater on a site basis for development over a certain size threshold (to be determined by the local government) or on a jurisdiction-wide basis to minimize pumpage of groundwater for nonpotable usage.

In January 2005, CDM was retained by the SJRWMD, Lake County, the City of Eustis, the City of Mount Dora, Orange County, the City of Apopka, the Town of Eatonville, the Town of Oakland, the City of Ocoee, the City of Orlando, the City of Winter Garden, Seminole County, the City of Altamonte Springs, the City of Lake Mary and the City of Longwood (Stakeholders) to develop an MSMP for the WSA. The City of Maitland is developing an MSMP independently from this effort.

This MSMP satisfies requirements 1 though 7 previously listed as well as identification of a funding source. The remaining requirement (i.e., establish a water reuse and irrigation program that allows for reuse of stormwater on a site basis for development over a size threshold to be determined by the local government or on a jurisdiction-wide basis to minimize pumpage of groundwater for nonpotable usage) will be completed independently by the Stakeholders and is not part of this MSMP.

1.3 Wekiva Basin Legislative History

Special regulatory requirements and activities to address issues facing the Wekiva River Basin date back to before the adoption of the WPPA. These include the Wekiva River Protection Act (WPA) and designation of the Wekiva-Ocala Greenway and Florida Forever Projects. The Wekiva River and its tributaries have also received designations as Outstanding Florida Waters (OFW), a National Wild and Scenic River, and a Florida Aquatic Preserve.

1.3.1 Wekiva River Protection Act

In 1988, the Florida Legislature passed the Wekiva River Protection Act, which requires the river's surrounding local governments to amend their comprehensive plans and land development rules to deter wetlands losses and to promote protection of wildlife and their habitats. The act gives local governments the authority to create rules to treat stormwater runoff and provides long-term protection for the area. Additionally, Chapters 40C-4, -40, -41 and -42 of the Florida Administrative Code (F.A.C.) establish additional surface water management standards and criteria for the Wekiva River Hydrologic Basin, which includes the Little Wekiva River Basin. Some of the highlights of the rule, which was revised in February 2005, include more restrictive environmental resource permitting (ERP) guidelines such as the following:

- Recharge Standard - Three inches of runoff from all directly connected impervious areas must be retained within the project area for projects or portions of projects in Most Effective Recharge Areas. As an alternative, applicants may demonstrate that the post-development recharge capacity is equal to or greater than the pre-development recharge capacity.

- Storage Standard - A system may not cause a net reduction in flood storage within the 100-year floodplain of a stream or other watercourse which has a drainage area of more than one square mile and which has a direct hydrologic connection to Little Wekiva River, Wekiva River, or Black Water Creek.

- Standard for Erosion and Sediment Control and Water Quality - A Water Quality Protection Zone will extend one half mile from the Wekiva River, Little Wekiva River north of State Road 436, Black Water Creek, Rock Springs Run, Seminole Creek, and Sulphur Run, and will also extend one quarter mile from any wetland abutting an Outstanding Florida Water. An erosion and sediment control plan must be submitted as part of the surface water management permit application for a surface water management system. For a project which will be located wholly or partially within 100 feet of an OFW or within 100 feet of any wetland abutting such a water, an applicant must provide reasonable assurance that the construction or alteration of the system will not cause sedimentation within these wetlands or waters and that filtration of runoff will occur prior to discharge into these wetlands and waters.

- Standard for Limiting Drawdown - A Water Quantity Protection Zone will extend 300 feet landward of the landward extent of Black Water Swamp and the wetlands abutting the Wekiva River, Little Wekiva River, Rock Springs Run, Black Water Creek, Sulphur Run, Seminole Creek, Lake Norris, and Lake Dorr. As part of providing reasonable assurance that the standard is met, where any part of a system located within this zone will cause a drawdown, the applicant must provide reasonable assurance that construction, alteration, operation, or maintenance of the system will not cause ground water table drawdowns which would adversely affect the functions provided by the referenced wetlands.

- Standard for Riparian Wildlife Habitat - The applicant must provide reasonable assurance that the construction or alteration of a system will not adversely affect the abundance, food sources, or habitat (including its use to satisfy nesting, breeding and resting needs) of aquatic or wetland dependent species provided by the following designated Riparian Habitat Protection Zone:

  1. The wetlands abutting the Wekiva River, Little Wekiva River downstream of Maitland Boulevard, Rock Springs Run, Black Water Creek, Sulphur Run, or Seminole Creek;

  2. The uplands which are within 50 feet landward of the landward extent of the wetlands above.

  3. The uplands which are within 550 feet landward of the stream's edge as defined, for the purpose of this subsection, as the waterward extent of the forested wetlands abutting the Wekiva River, Little Wekiva River downstream of the northernmost crossing of the Little Wekiva River with S.R. 434, Rock Springs Run, Black Water Creek, Sulphur Run or Seminole Creek. In the

absence of forested wetlands abutting these streams, the stream's edge shall be defined, for the purpose of this subsection, as the mean annual surface water elevation of the stream: however, if hydrologic records are unavailable, the landward extent of the herbaceous emergent wetland vegetation growing in these streams shall be considered to be the stream's edge.

1.3.2 Wekiva-Ocala Greenway

The State of Florida began acquiring property in the Wekiva-Ocala Greenway in the 1960s. Under the 10-year Florida Forever program established by Governor Bush, the state plans to acquire a 75,000 acre tract will form a continuous corridor linking the Wekiva Springs State Park, Rock Springs Run State Reserve, Lower Wekiva River Aquatic Preserve, Hontoon Island State Park and the Ocala National Forest. Currently, over half the total lands needed to complete the greenway are in public ownership. The State has conserved more than 42,000 acres through the Florida Forever program to create a greenway around the Orlando metropolitan area.

The goal of this program is to expand the greenway in order to protect the region's springs, rivers and lakes and provide habitat for more than 50 Florida black bears. The greenway also has recreational value in that it provides the public with access to natural areas for camping, swimming, hiking and canoeing.

1.3.3 Outstanding Florida Water

In addition to the five surface water classifications that have been established for waters of the state (62-302.400 F.A.C.), a water body may be designated as an Outstanding Florida Water (OFW) (62-302.700 F.A.C.). An OFW is a water body recognized worthy of special protection because of its natural attributes. This special designation is applied to certain waters, and is intended to protect existing good water quality. Most of the OFWs are areas managed by the state or federal government as parks, wildlife refuges, preserves, marine sanctuaries, estuarine research reserves, certain waters within state or national forests, scenic and wild rivers, or aquatic preserves. According to 62-302.700 F.A.C., an OFW designation has been given to waters within Wekiwa Springs State Park (Orange and Seminole Counties), Lower Wekiva River State Preserve (Lake and Seminole Counties), Rock Springs Run State Reserve (Orange County) and Wekiva River Buffers (Seminole County).

1.3.4 Wild and Scenic River Designation

On October 13, 2000, portions of the Wekiva River system were designated as a National Wild and Scenic River under the Federal Wild and Scenic Rivers Act (Public Law 90-542). The intent of the Act is to preserve certain selected rivers and their immediate environments which "…possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values…" The designated portions of the Wekiva River system include: 1) the Wekiva River from its confluence with the St. Johns River to Wekiwa Springs; 2) Rock Springs Run

from its headwaters at Rock Springs to the confluence with the Wekiwa Springs Run; and 3) Black Water Creek from the outflow from Lake Norris to the confluence with the Wekiva River.

According to the National Park Service, the basis for the designation is that "the Wekiva River Basin is a complex ecological system of rivers, springs, seepage areas, lakes, streams, sinkholes, wetland prairies, hardwood hammocks, pine flatwoods and sand pine scrub communities. Water quality is exhibited in two ways. Several streams are clear due to being spring-fed. Others are blackwater; blackwater streams receive most of their flow from precipitation resulting in annual rainy season over-bank flows. The Wekiva and its tributaries are in superb ecological condition. The basin is almost entirely within Florida State lands and supports many species of plant and animal life, some of which are endangered, threatened, or of special concern."

1.3.5 Florida Aquatic Preserve

In 1975, the Florida Legislature enacted the Aquatic Preserve Act (Chapter 258.35-258.45, Florida Statutes). The intent of the act was to ensure the future protection of the natural condition of aquatic preserves. There are currently 41 aquatic preserves within the state of Florida which encompass almost two million acres. The Wekiva River Aquatic Preserve was established on June 23, 1975 through the Florida Aquatic Preserve Act. Senate Bill 762 was passed by the Legislature In June 1985, which subsequently expanded the boundary of the Wekiva River Aquatic Preserve to include approximately 20 miles of the St. Johns River.

The Wekiva River Aquatic Preserve is comprised of approximately 19,000 acres of submerged lands and is within the Little Wekiva, Wekiva and Blackwater Creek watersheds. The Wekiva River Aquatic Preserve was designated for factors such as ecological importance, habitat, and special geomorphic and archaeological features.

1.4 Objective

As the title of this study implies, the focus is on the management of surface water resources within the WSA. However, during the development of this MSMP careful consideration was given to the recommendations made in the Committee's final report as well as the overall intent of the WPPA throughout the process. Although the intent of this MSMP is not the management of groundwater resources, there is a portion of this study devoted to this topic. It is important to keep in mind the effect that management decisions related to surface water resources ultimately have an impact on groundwater resources and the springs. Therefore, this MSMP aims not only to provide data and recommendations to improve or alleviate problems related to surface water conveyance and quality, but also to improve the quality and quantity of groundwater and ultimately the discharge to the springs within the WSA through these same recommendations.

Section 2
Wekiva Study Area Regional Information

2.1 Wekiva Study Area

The Wekiva Study Area (WSA) is approximately 304,666 acres in size, or 473 square miles and is generally defined by the land area that contributes groundwater recharge to the Wekiva River and the springs. Local governments within its boundaries include Lake County, City of Eustis, City of Mount Dora, Orange County, City of Apopka, Town of Eatonville, City of Maitland, Town of Oakland, City of Ocoee, City of Orlando, City of Winter Garden, Seminole County, City of Altamonte Springs, City of Lake Mary and the City of Longwood.

This section of the MSMP will provide regional information about the WSA related to both surface water and groundwater. Detailed descriptions of the WSA regarding topography, land use, public lands, soils, major watersheds and subbasins, rainfall, surface water stages and flows, water quality monitoring, and total maximum daily loads (TMDLs) are provided in the following sub-sections. As mentioned in Section 1, although this is an MSMP, it is important to address groundwater flow and those issues affecting the aquifer, as activities on the land surface can have both a direct and indirect impact on the resulting water quality and quantity in the springs. Hydrogeology of the aquifer, groundwater flow, recharge, projected drawdowns, groundwater contamination, aquifer vulnerability, and drainage wells are also discussed in this section.

2.1.1 Data Collection

As part of the MSMP effort, CDM met individually with each Stakeholder to discuss and identify the types of information that were available. A matrix showing the results of this data collection effort are provided in **Table 2-1**. Major categories of data requested from the Stakeholders included geographical information system (GIS) data, existing drainage studies and/or stormwater master plans, level of service (LOS), problem areas, hydrologic data, water quality data, existing stormwater permits, best management practices (BMPs), septic tank information, point source data, redevelopment control measures as they relate to water quality and quantity, reuse system information, inspection and maintenance of stormwater facilities and current funding mechanisms.

2.2 GIS Mapping Data

GIS mapping data was widely available from the Stakeholders, agencies (e.g., SJRWMD and FDEP) and the East Central Florida Regional Planning Council's (ECFRPC) GIS clearinghouse. Throughout this process, CDM developed a GIS map library containing coverages that were applicable to this MSMP from the various jurisdictions and agencies. GIS mapping data is used frequently throughout this document to support information provided in the MSMP. The 2004 aerial digital orthophoto quarter quadrangles (DOQQs) were obtained from the SJRWMD and are

Table 2-1
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Data Collection Matrix

Data Category	Lake County		Eustis		Mount Dora		Orange County		Apopka		Eatonville		Oakland		Ocoee		Orlando		Winter Garden		Seminole County		Altamonte Springs		Lake Mary		Longwood	
Existing Stormwater Deficiencies & Data	Available	Obtained	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O	A	O
1. GIS Mapping Data																												
a. Parcels	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
b. Roads	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
c. Topography	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
d. Land Use	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
e. Environmental Features	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√	√	√	√	√	√	√	√	√	N	N	√	√
f. Flooding Problems	√	√	√	√	NA	NA	√	√	√	√	√	√	NA	NA	N	N	√	√	N	N	√	√	√	√	NA	NA	√	√
g. Water Quality Problems	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√	√	√	N	N	√	√	√	√	NA	NA	√	√
h. Aerial Photography	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. Existing Studies & Reports																												
a. Completed Stormwater Master Plans/Drainage Studies	N	N	√	√	√	√	√	√	√	√	N	N	NA	NA	√	√	√	√	√	√	√	√	√	√	N	N	√	√
b. Stormwater Models/Supporting Documentation	N	N	N	N	NA	NA	√	√	√	√	√	√	NA	NA	√	√	√	√	√	√	√	√	√	√	N	N	√	√
c. Integrated Surface Water/Groundwater Models	N	N	NA	NA	NA	NA	√	√	√	√	√	√	NA	NA	√	√	√	√	N	N	√	√	√	√	√	√	√	√
3. Adopted Level of Service	N	N	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4. Problem Areas																												
a. Water Quantity/Flooding	√	√	√	√	NA	NA	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	N	N	√	√
b. Water Quality	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	N	N	√	√
c. Groundwater	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
d. Water Conservation	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√
5. General																												
a. Rainfall	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√
b. Soils	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
c. Imperviousness	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√	√	√	√	√	√	√	√	√	√	√	√	√
d. Surface Water Stage/Flows	√	√	√	√	NA	NA	√	√	√	√	√	√	N	N	NA	NA	√	√	√	√	√	√	√	√	N	N	√	√
e. Groundwater Well & Stage Data	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
f. Permits	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√
g. Water Quality Data	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√
h. Stormwater Inventory	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√
Pollutant Load Analysis																												
1. Regional BMPs (type & tributary served)	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√
2. Septic Tank Inventory	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	N	N	√	√
3. Point Source Data	N	N	NA	NA	NA	NA	NA	NA	NA	NA	√	√	NA	NA	√	√	NA	NA	√	√	NA	NA	√	√	NA	NA	√	√
Redevelopment- Water quality/quantity																												
1. Current development & redevelopment control measures	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. Proposed development & redevelopment control measures	NA	NA	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Reclaimed Water Systems																												
1. Existing reuse system data/water conservation measures	N	N	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2. Planned reuse system data/water conservation measures	N	N	√	√	√	√	√	√	√	√	√	√	N	N	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√
Inspection & Maintenance of Stormwater Facilities																												
1. Procedures (e.g., staffing, major equipment, contract services, frequency)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	NA	NA	√	√
Funding Sources																												
1. Current Water Resources Funding Mechanisms	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

A - Available
O - Obtained
√ - Yes
N - Not Available
NA - Not Applicable
Have Obtained from Jurisdiction
Have Obtained From County
Have Obtained From Agency

shown in **Figure 2-1**. The imagery was obtained between December 2003 and March 2004 and has a one (1) meter ground resolution. A base map showing the study area boundary, jurisdictional boundaries, water bodies, roads and parcels is provided in **Figure 2-2**.

2.3 Topographic Data

One-foot digital contour data for a portion of the study area was available from the SJRWMD and the coverage is shown in **Figure 2-3**. The 1-foot topographic contours generated by the SJRWMD were assembled from section-size ArcInfo coverages using stereo plotting techniques and low altitude aerial photography. This data set was developed over a period of three years using aerial photography taken from 1980s through early 1990s. Additionally, the digital 5-foot topographic contours are also available for the entire WSA from the SJRWMD which were digitized from the United States Geological Survey (USGS) 1:24,000 scale 7.5 by 7.5 minute topographic map. This coverage is shown in **Figure 2-4**. Based on the 5-foot topographic coverage, elevations in the WSA range from approximately 225 ft National Geodetic Vertical Datum (NGVD) in the southwest corner of the WSA in Orange County on the WSA Boundary to the west of Lake Avalon, to approximately 5 ft-NGVD where Blackwater Creek and the Wekiva River converge.

Many of the Stakeholders also have 1-foot topographic contours available for their jurisdiction on hard copy maps. More recently, some jurisdictions including Orange County and Seminole County have developed 1-foot topographic contours for portions of their jurisdictions using light detection and ranging (LiDAR) technology.

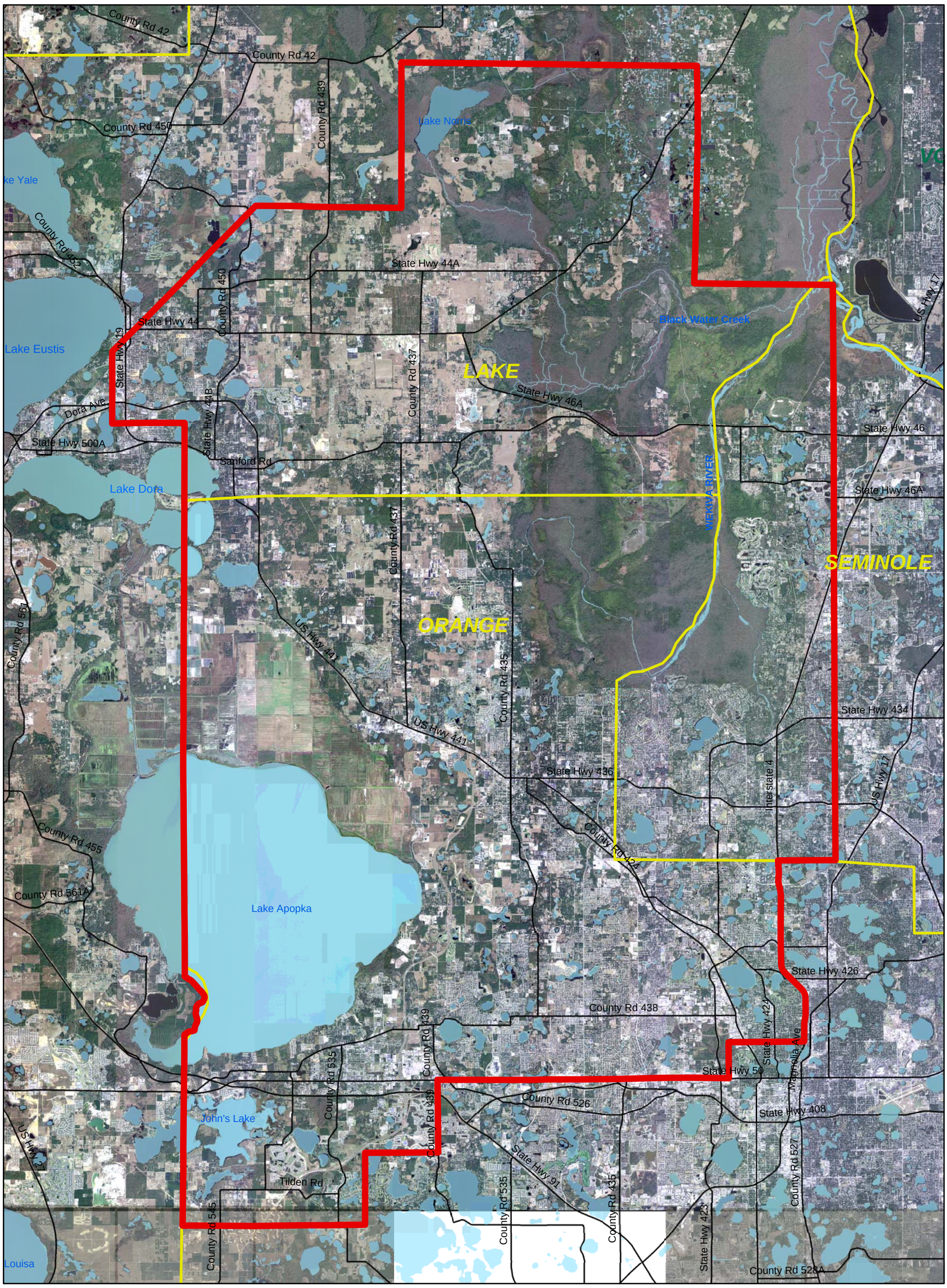
2.4 Land Use

For existing land use, digital GIS coverages were obtained from Lake County (1990), Orange County (1997), Seminole County (1995) and the City of Ocoee (date unknown). The County land use coverages also covered incorporated areas as well. Due to the year specified for each of these coverages, CDM compared them to the 2004 DOQQs to verify their accuracy in terms of land cover. Since a lot of development has occurred in the years since each of these existing land use coverages were developed, there were significant differences between the coverages and the DOQQs. For the purposes of this MSMP, the accuracy of land cover is important especially when developing the pollutant load analysis (Appendix E). CDM then obtained the Land Use and Land Cover (2000) GIS layer for Lake, Orange and Seminole Counties developed by the SJRWMD. This layer represents land cover and land use that was based on 1999 and 2000 color infrared aerial photography and was developed by the SJRWMD to support many of the District's critical projects or programs, including Pollution Load Reduction Goal (PLRG) development, land acquisition, land management, water supply planning, floodplain management, and surface and ground water quality monitoring.

honourdm

7/11/05

E:\Projects\92471\44812\GIS\Fig2-1.mxd

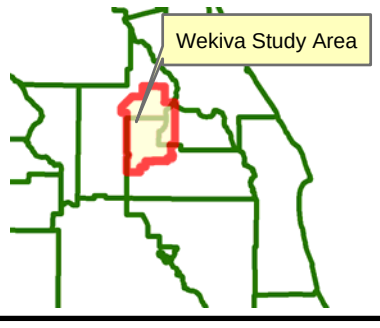


Source: 2004 DOQQs, SJRWMD

N
W E
S

0 3,500 7,000 14,000 21,000 28,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

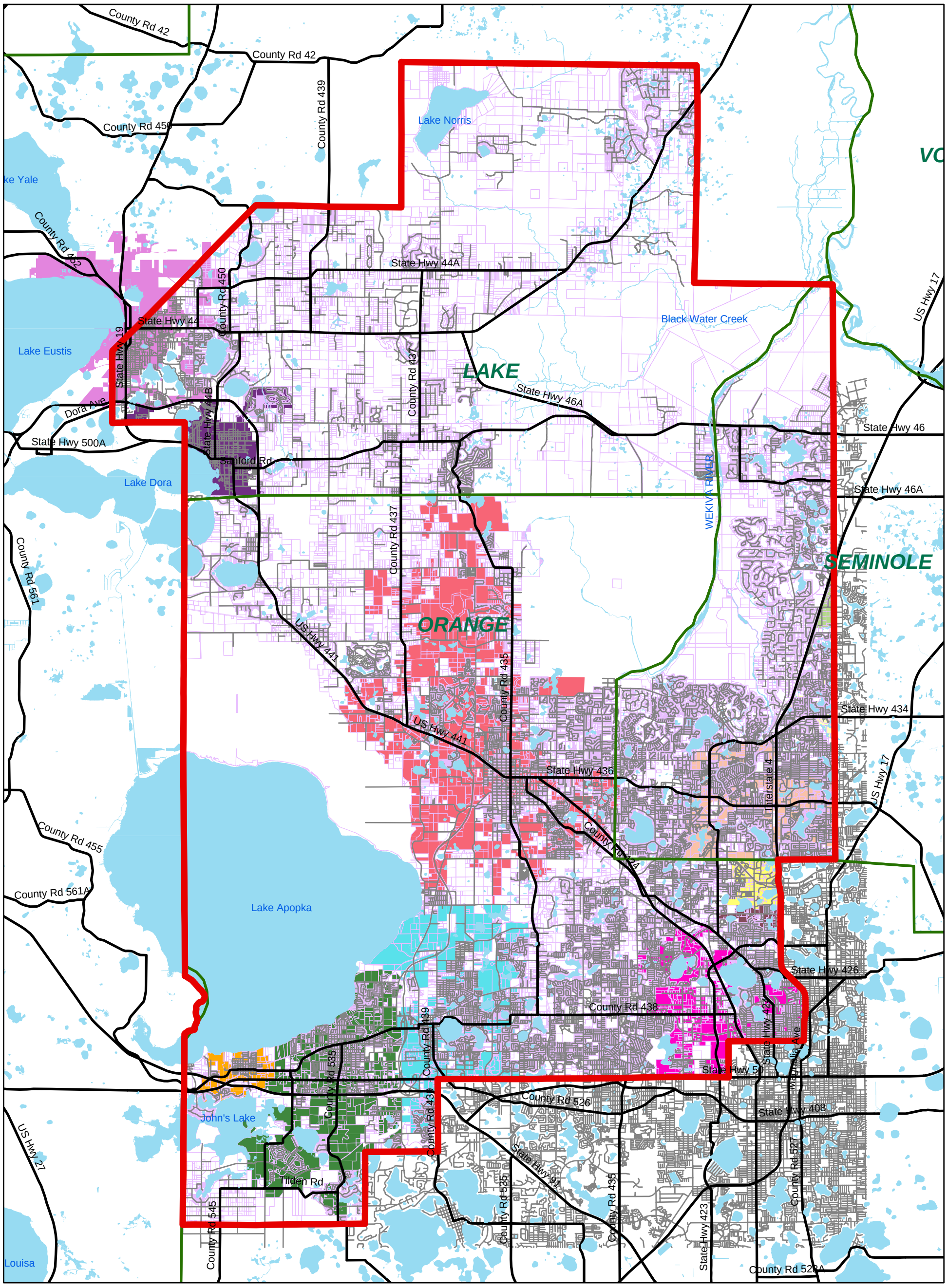
CDM

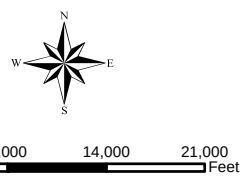
Figure 2-1
Aerial Photography

honourdm

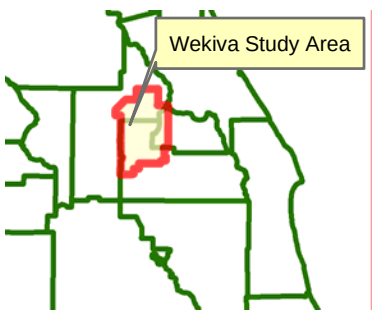
7/11/05

E:\Projects\9247\44812\GIS\Fig2-2.mxd





LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads
- Roads
- Parcels

Incorporated Areas

- Altamonte Springs
- Apopka
- Eatonville
- Eustis
- Lake Mary
- Longwood
- Maitland
- Mount Dora
- Oakland
- Ocoee
- Orlando
- Winter Garden

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

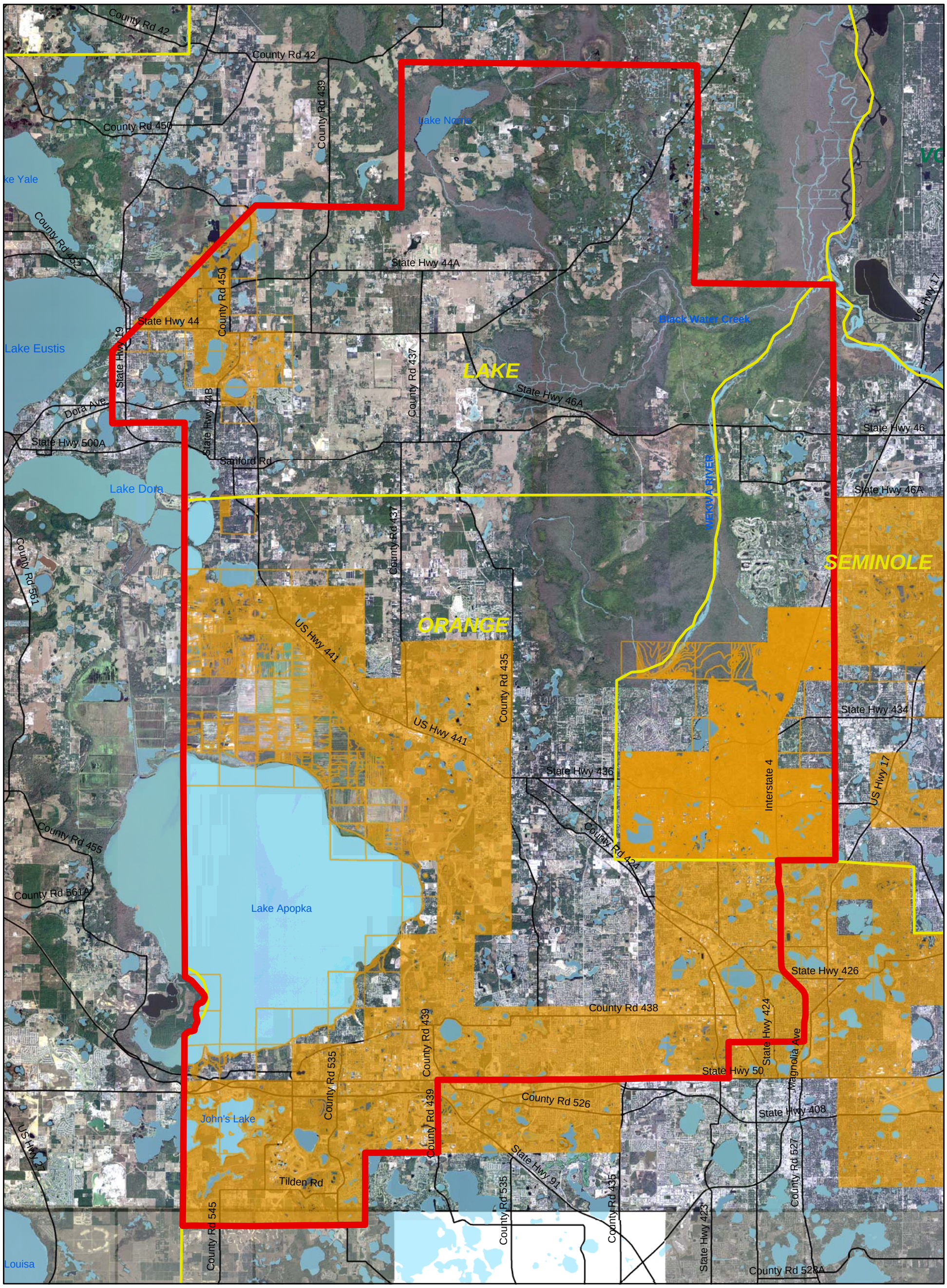
CDM

Figure 2-2
Base Map

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig2-3.mxd

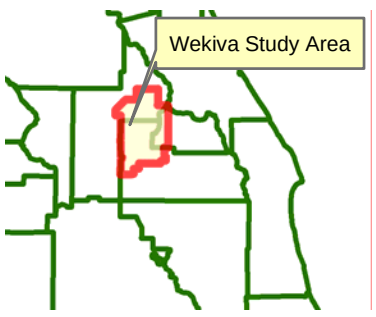


Source: 2004 DOQQs, SJRWMD

N
W E
S

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads
- 1-foot Coverage

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-3
Digital 1-foot Topographic Contours

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig2-4.mxd

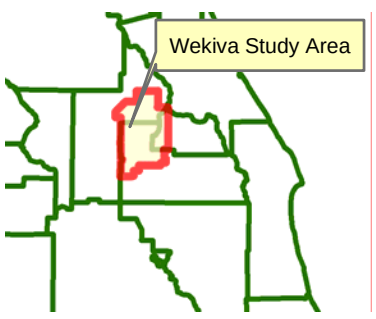
County Rd 42
County Rd 42
County Rd 450
County Rd 439
Lake Norris
ke Yale
County Rd 452
State Hwy 44A
State Hwy 44
County Rd 450
State Hwy 19
Lake Eustis
Black Water Creek
U.S Hwy 17
LAKE
County Rd 437
State Hwy 46A
Dora Ave
State Hwy 500A
State Hwy 44B
Sanford Rd
State Hwy 46
WEKIVA RIVER
Lake Dora
State Hwy 46A
County Rd 561
County Rd 437
SEMINOLE
ORANGE
US Hwy 441
County Rd 435
US Hwy 441
State Hwy 434
State Hwy 436
Interstate 4
US Hwy 17
County Rd 455
County Rd 424
County Rd 561A
Lake Apopka
State Hwy 424
State Hwy 426
County Rd 438
County Rd 439
County Rd 535
County Rd 439
Magnolia Ave
State Hwy 50
County Rd 526
State Hwy 408
John's Lake
US Hwy 27
County Rd 535
County Rd 439
State Hwy 91
Tilden Rd
County Rd 435
County Rd 527
County Rd 545
State Hwy 423
Louisa
County Rd 528A

Source: 2004 DOQQs, SJRWMD

N
W E
S

0 3,500 7,000 14,000 21,000
Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- 5-foot Topogrpahic Contour
- Major Roads

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-4
5-foot Topographic Contours

Using the 1999 and 2000 DOQQs, the SJRWMD applied photo interpretation to assign land use/land cover categories throughout their jurisdiction. The coding scheme uses the modified Florida Land Use/Land Cover and Forms Classification System (FLUCCS). When comparing the SJRWMD land use and land cover GIS layer to the most recent DOQQs, it more accurately reflected existing conditions than the original existing land use coverages provided by the jurisdictions. The land use/land cover layers for Lake, Orange and Seminole Counties were merged into a single coverage and clipped to the WSA boundary. A table showing the FLUCCS codes and land use categories for existing land use conditions is provided in **Appendix B**. Since there are a large number of FLUCCS codes used in the existing land use coverage, CDM reassigned more general land use categories for simplification purposes which are also shown in Appendix B. The resulting existing land use coverage for the WSA is shown in **Figure 2-5**. A breakdown of the land use is shown in **Figure 2-6**. Under existing land use conditions, forest (15 percent), wetlands (15 percent), water bodies (14 percent) and medium density residential (11 percent) are the dominating types of land use and comprise 55 percent of the WSA.

The future land use coverage was obtained from the East Central Florida Regional Planning Council (ECFRPC) Central Florida GIS Clearinghouse. The "Generalized Future Land Use – 2004" GIS coverages for Lake, Orange and Seminole Counties were obtained. The ECFRPC collected future land use maps and/or shape files from each of the counties and their respective municipalities and merged them into a single coverage by county. All of the data sets were reprojected into the Florida State Plane East North American Datum (NAD) 1983 coordinate system. Future land use polygons were aligned using parcel files from March 2004 as a basemap, and were reclassified based on generalized future land use categories for the Central Florida region. CDM merged the three County future land use coverages and clipped them to the WSA boundary. A table showing the original jurisdiction's future land use designation, the ECFRPC's generalized category and the general land use reassigned by CDM is also provided in Appendix B.

After comparing this resulting future land use coverage to the existing land use coverage for the WSA developed from the SJRWMD's land use and land cover GIS layer, there were noticeable discrepancies between the acreages for developed land uses (i.e., residential, commercial, industrial, institutional, roads, transportation) where these were greater under existing conditions than future conditions. To correct this, CDM took those areas already developed from the existing land use coverage and merged them into the future land use coverage, so that the future conditions represent a more built out condition than the existing conditions.

The resulting future land use coverage is shown in **Figure 2-7**. A breakdown of the land use acreages for future conditions is provided in **Figure 2-8**. Under future land use conditions, very low density residential (15 percent), water bodies (14 percent), wetlands (14 percent) low density residential (13 percent) and medium density residential (12 percent) are the dominant types of land uses and account for approximately 68 percent of the WSA.

honourdm

7/11/05

E:\Projects\92471\44812\GIS\Fig2-5.mxd

Lake Yale

Lake Eustis

neola

innehaha

LAKE

ORANGE

SEMINOLE

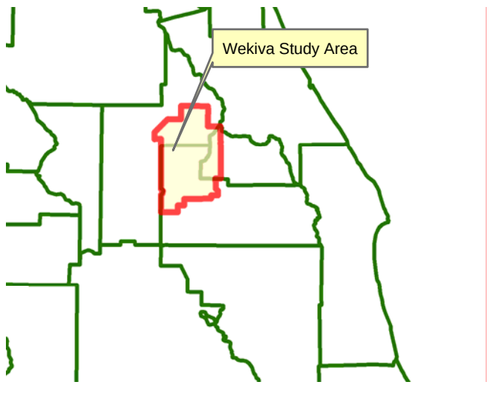
VOLUSIA

Source: Land Use & Land Cover (2000), SJRWMD
Landuse designations shown represent generalized information which may not correspond to the existing landuse designations depicted on local government comprehensive plan maps.

N
W E
S

0 4,750 9,500 19,000 Feet

LOCATION MAP



LEGEND

Wekiva Study Area
County Line

Existing Land Use

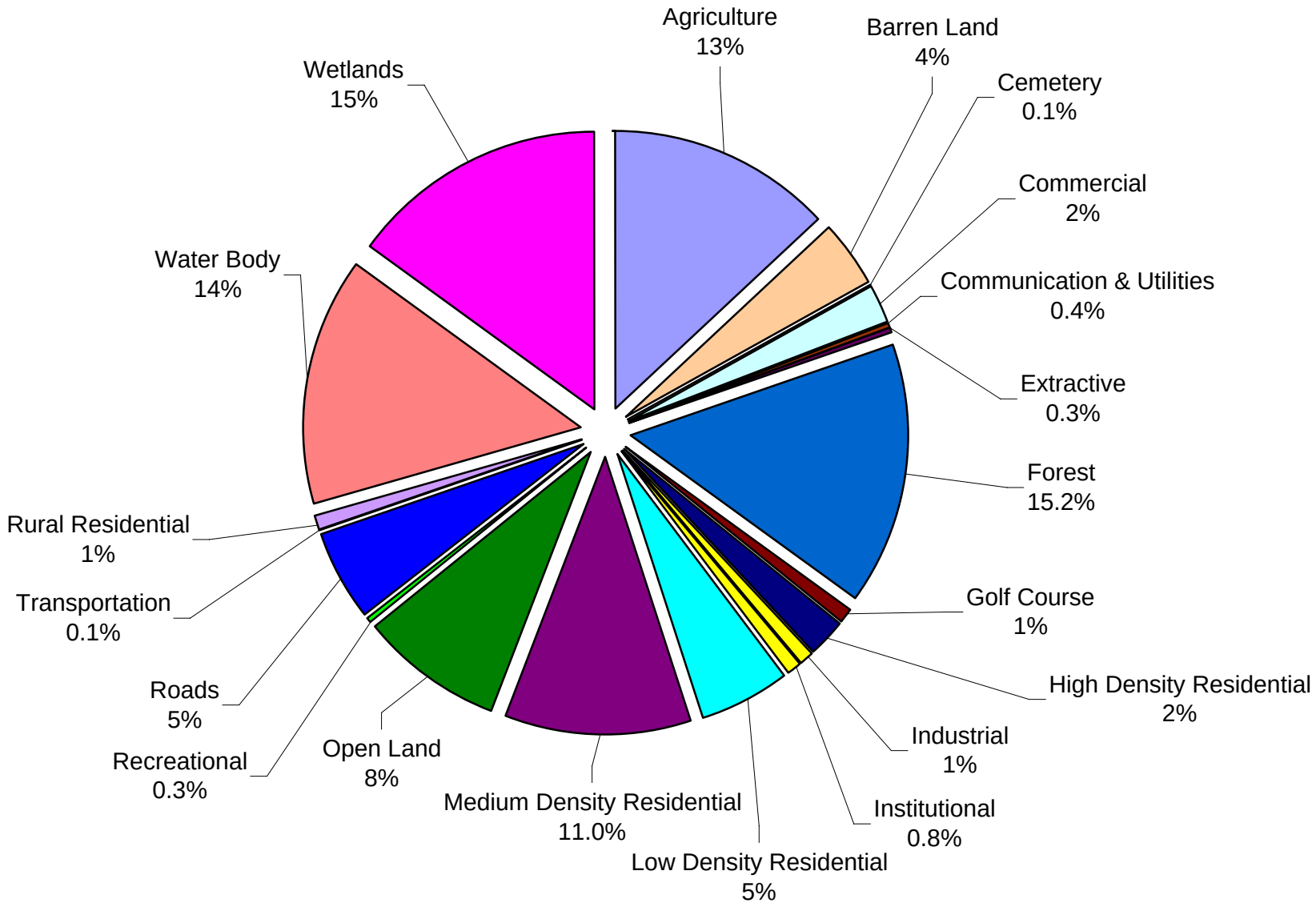
- Agriculture
- Agriculture - Feeding Operations
- Agriculture - Field Crops
- Agriculture - Nurseries
- Agriculture - Pasture
- Agriculture - Row Crops
- Agriculture - Specialty Farms
- Agriculture - Tree Crops
- Barren Land
- Cemetery
- Commercial
- Communication & Utilities
- Extractive
- Forest
- Golf Course
- High Density Residential
- Industrial
- Institutional
- Low Density Residential
- Medium Density Residential
- Open Land
- Recreational
- Roads
- Rural Residential
- Transportation
- Water Body
- Wetlands
- Water Bodies

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-5
Existing Land Use

Figure 2-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Existing Land Use Breakdown



honourdm

7/11/05

E:\Projects\92471448121GIS\Fig2-7.mxd

Lake Yale

Lake Eustis

neola

innehaha

VOLUSIA

LAKE

SEMINOLE

ORANGE

Landuse categories displayed in figure represent generalized information which may not correspond to the future landuse designations depicted on local government comprehensive plan maps.

N

W E

S

0 4,750 9,500 19,000 28,500 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line

Future Land Use

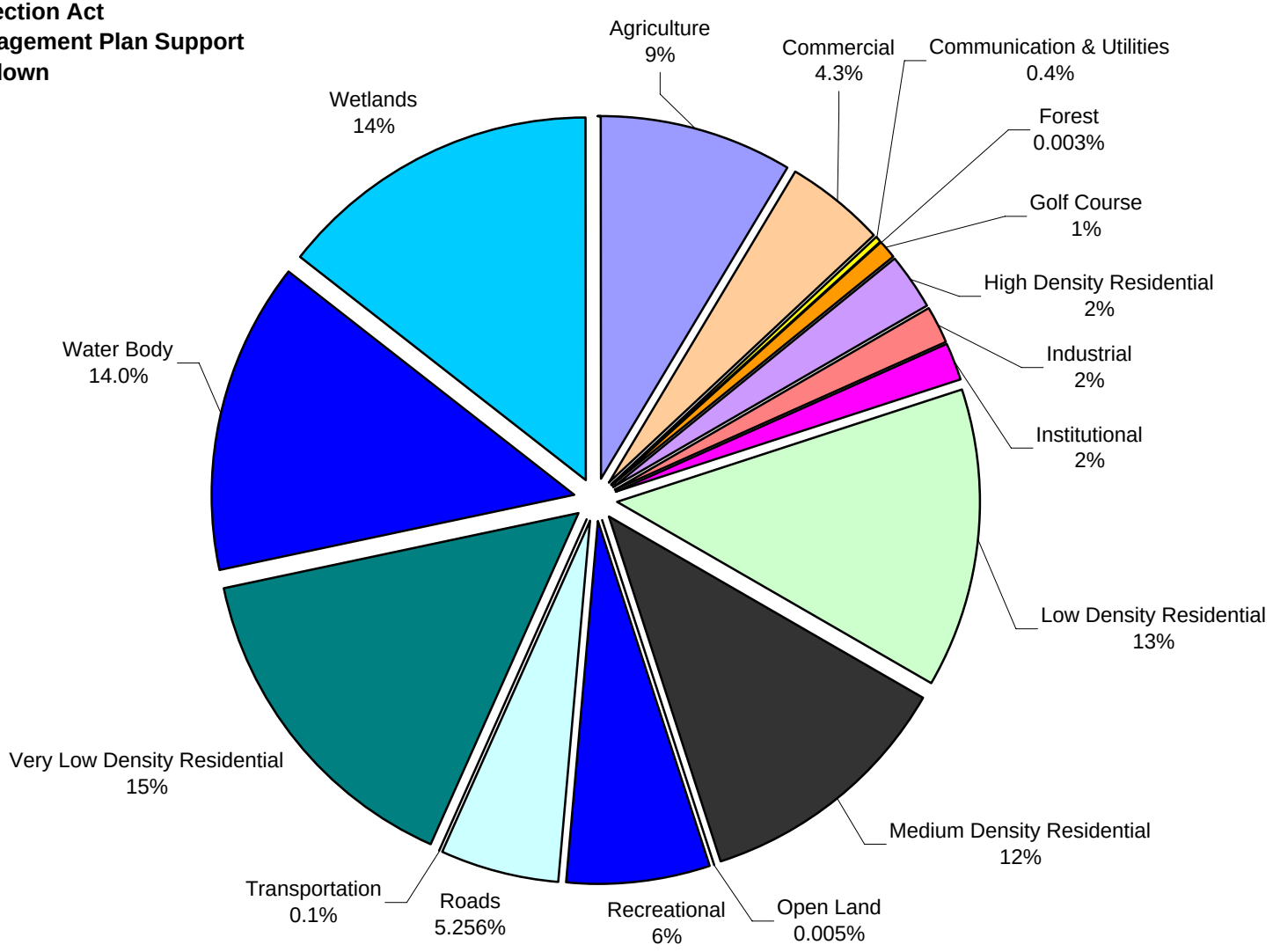
- Agriculture
- Agriculture - Feeding Operations
- Agriculture - Field Crops
- Agriculture - Nurseries
- Agriculture - Pasture
- Agriculture - Row Crops
- Agriculture - Specialty Farms
- Agriculture - Tree Crops
- Barren Land
- Cemetery
- Commercial
- Communication & Utilities
- Forest
- Golf Course
- High Density Residential
- Industrial
- Institutional
- Low Density Residential
- Medium Density Residential
- Open Land
- Recreational
- Roads
- Transportation
- Very Low Density Residential
- Water Body
- Wetlands
- Water Bodies

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-7
Future Land Use

Figure 2-8
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future Land Use Breakdown



The density for the various types of residential land uses defined from the metadata from the "Generalized Future Land Use – 2004" GIS coverages for Lake, Orange and Seminole Counties developed by ECFRPC according to the number of dwelling units (DU) per acre and are as follows:

- Very Low Density Residential – 1 DU/acre or less.
- Low Density Residential – 2 to 5 DU/acre.
- Medium Density Residential – 6 to 12 DU/acre.
- High Density Residential – greater than 12 DU/acre.

The dwelling units assigned to residential land use categories used by the SJRWMD in their Land Use and Land Cover (2000) GIS coverage may vary slightly from those listed above. In order to accurately establish consistency between the existing and future GIS layers, a detailed parcel analysis along with photo interpretation would have to be completed, which is beyond the scope of this MSMP. At the time this MSMP was prepared, the ECFRPC was in the process of developing an existing land use coverage for the WSA. The land uses presented herein represent generalized information which may not correspond to the existing and future land uses depicted in local government comprehensive plans.

2.5 Soils

Soils data are typically used to evaluate stormwater runoff, infiltration, and recharge potential for pervious areas. Information on soil types was obtained from the SJRWMD's website where the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Surveys for Lake (1975), Orange (1989) and Seminole (1990) Counties were available in digital format. The data contained in these coverages are generally the most detailed level of soil geographic data developed by the SJRWMD and NRCS. The soil coverages for the individual counties were then merged together and clipped to the WSA boundary. It is important to note that the source coverages do not edge match across county boundaries. During the mapping phase of the SJRWMD and NRCS data development process, soils scientists did not attempt to match the delineations developed for other counties.

Each soil type is assigned to a soils series, hydric soil status, drainage condition (i.e., excessively drained, moderately well drained, poorly drained, somewhat poorly drained, or very poorly drained) and to a Hydrologic Soil Group (A, B, C, or D) established by the NRCS. Hydrologic Soil Group A is comprised of soils having very high infiltration potential and low runoff potential. Those soils with moderate infiltration rates when thoroughly wetted are classified as Hydrologic Soil Group B. Group C soils are those soils with low infiltration rates while Hydrologic Soil Group D is characterized by soils with a very low infiltration potential and a high runoff potential. The other two categories fall between B and D soil groups. Dual class soils

(e.g., B/D) are soils assigned to two hydrologic groups. The first letter represents drained areas and the second letter represents undrained areas. The hydrologic soil groups for the WSA are shown on **Figure 2-9**. A summary of the soil types and their associated hydrologic groups for the WSA is provided in **Table 2-2**. According to the breakdown shown on this table, "A" soils are the dominant hydrologic soils group in the WSA and comprises approximately 42 percent of the WSA. B/D and D hydrologic groups are the next predominant hydrologic soils groups and comprise approximately 19 and 16 percent, respectively of the WSA.

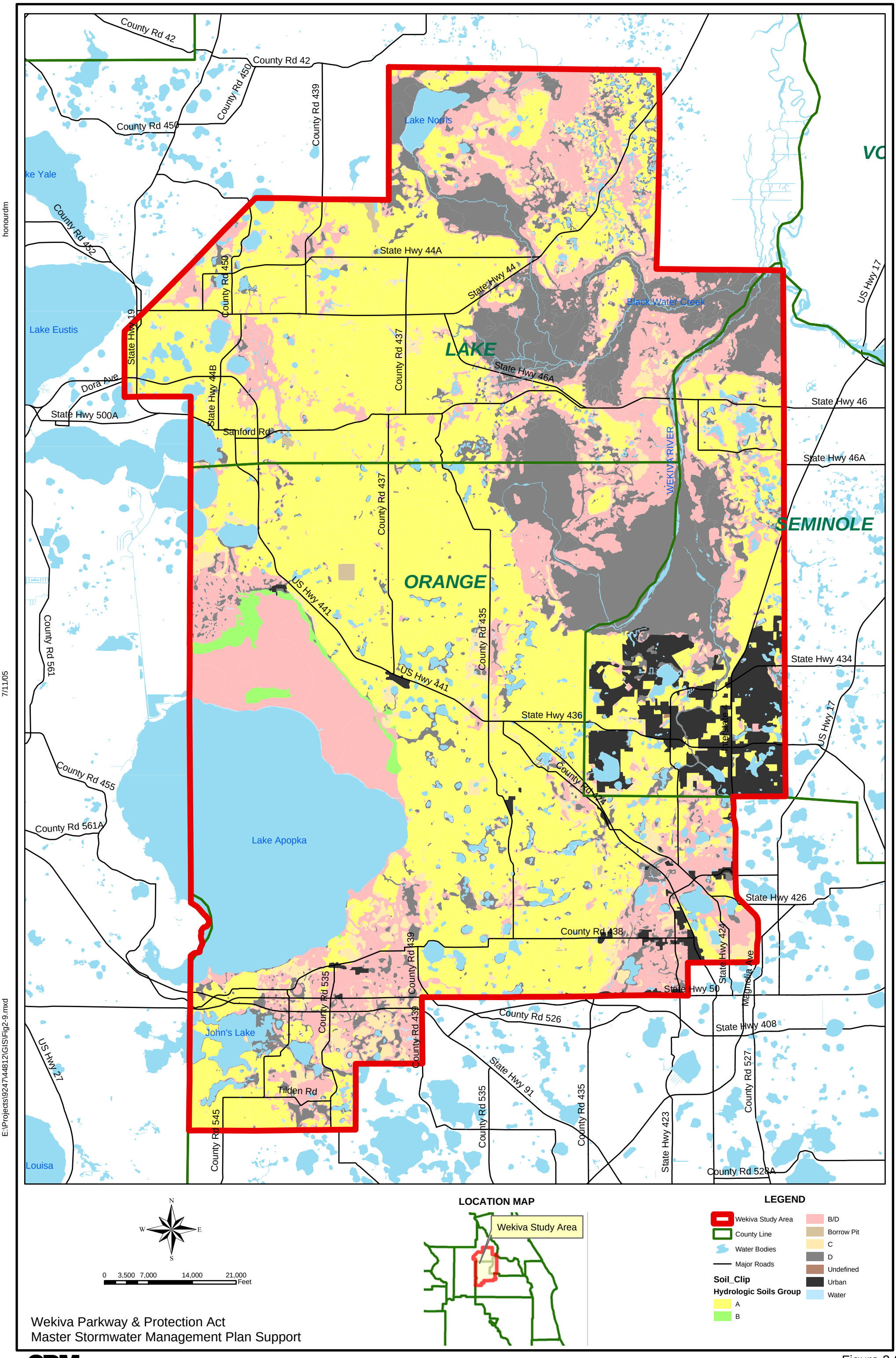
2.6 Watersheds

CDM collected and compiled digital GIS coverages of the major watershed boundaries within the WSA, from the Stakeholders. There are 10 major watersheds within the WSA and their boundaries are shown on **Figure 2-10**. A brief description of each major watershed is provided in the following paragraphs.

Lake Apopka Basin The Lake Apopka Basin occupies approximately 129.8 square miles within the WSA and is the largest watershed. Both the Town of Oakland and City of Winter Garden are located entirely within the Apopka basin while portions of unincorporated Orange County, the City of Apopka and the City of Ocoee are also within the basin. Lake Apopka is the receiving water for surface water and runoff generated in this watershed, with the exception of some closed or landlocked areas. The Lake Apopka Basin is within the larger Upper Ocklawaha River Basin and surface water from the lake is conveyed through the Apopka-Beauclair Canal which eventually discharges into Lake Beauclair, Lake Dora, Lake Eustis and Lake Griffin. Once surface water is conveyed through this chain of lakes, it eventually discharges into the Ocklawaha River and then ultimately into the St. Johns River.

Due to the severely degraded water quality in Lake Apopka caused by a long history of agricultural practices occurring on the shores of the lake, the Lake Apopka Restoration Act of 1985 passed to implement a program for lake restoration. Additionally, Florida's Surface Water Improvement and Management (SWIM) Act, fashioned after the Lake Apopka Restoration Act, was passed in 1987, which also addressed Lake Apopka as well as other waters in the state (Battoe, 2005). .The SJRWMD partnered with local, state and federal agencies in 1985 to implement this program and since that time, this partnership has achieved the following accomplishments:

- Purchased more than 19,000 acres of agricultural land along the lake's north shore, reducing the discharge of phosphorus from the farms and providing an opportunity to restore the former marshes to wetlands;
- Reflooded 2,000 acres of the former Duda Farm to begin wetland restoration;
- Developed and began operating the first phase of a marsh filtration system along the northwestern shore to filter pollutants from the lake water;



N
W E
S

0 3,500 7,000 14,000 21,000
Feet

LOCATION MAP

LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

Soil_Clip

Hydrologic Soils Group

- A
- B
- B/D
- Borrow Pit
- C
- D
- Undefined
- Urban
- Water

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

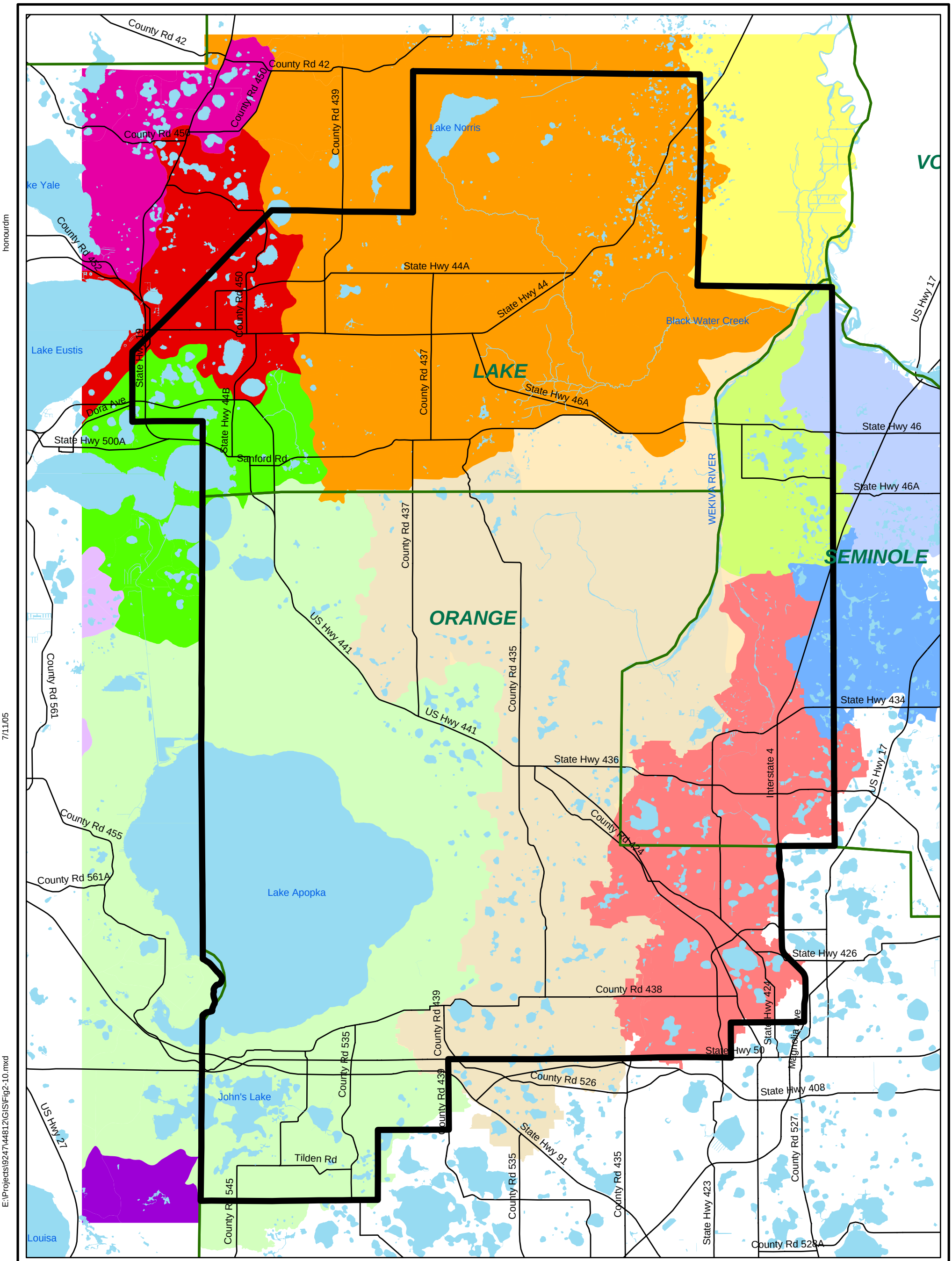
Figure 2-9
Hydrologic Soil Groups

Table 2-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Hydrologic Soil Group Breakdown

Soil Name	Acres	Percentage	Hydrologic Groups
APOPKA	530.9	0.2%	A
ARCHBOLD	1,175.4	0.4%	A
ASTATULA	8,218.6	2.7%	A
CANDLER	72,316.5	23.8%	A
FLORAHOME	647.3	0.2%	A
KENDRICK	5.4	0.0%	A
LAKE	2,541.0	0.8%	A
MILLHOPPER	306.6	0.1%	A
ORLANDO	774.0	0.3%	A
ORSINO	428.2	0.1%	A
PAOLA	3,622.4	1.2%	A
ST. LUCIE	4,721.3	1.6%	A
TAVARES	32,260.8	10.6%	A
UDORTHENTS	110.0	0.0%	A
Total A Soils	**127,658.6**	**42.0%**	
CANOVA	1,386.1	0.5%	B
OKEELANTA	441.9	0.1%	B
Total B Soils	**1,828.0**	**0.6%**	
BASINGER	539.9	0.2%	B/D
BRIGHTON	1,140.2	0.4%	B/D
CHOBEE	1.1	0.0%	B/D
EAUGALLIE	485.5	0.2%	B/D
ELLZEY	17.7	0.0%	B/D
EVERGLADES	22.4	0.0%	B/D
FELDA	1,522.3	0.5%	B/D
GATOR	5,419.7	1.8%	B/D
HONTOON	16.5	0.0%	B/D
IMMOKALEE	8,276.3	2.7%	B/D
MALABAR	646.7	0.2%	B/D
MYAKKA	11,256.8	3.7%	B/D
OCOEE	1,993.8	0.7%	B/D
OKLAWAHA	2.3	0.0%	B/D
ONA	1,622.6	0.5%	B/D
PINEDA	9.8	0.0%	B/D
PINELLAS	28.6	0.0%	B/D
PLACID	1,937.7	0.6%	B/D
POMPANO	1,412.0	0.5%	B/D
SAMSULA	2,691.4	0.9%	B/D
SMYRNA	9,751.6	3.2%	B/D
ST. JOHNS	2,258.0	0.7%	B/D
TERRA CEIA	4,022.5	1.3%	B/D
WABASSO	2,071.0	0.7%	B/D
WAUCHULA	830.8	0.3%	B/D
Total B/D Soils	**57,977.0**	**19.1%**	
ADAMSVILLE	383.5	0.1%	C
ARENTS	1,377.3	0.5%	C

Table 2-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Hydrologic Soil Group Breakdown

Soil Name	Acres	Percentage	Hydrologic Groups
CASSIA	1,450.5	0.5%	C
LOCHLOOSA	443.1	0.1%	C
POMELLO	8,068.1	2.7%	C
SEFFNER	950.1	0.3%	C
SPARR	892.4	0.3%	C
ZOLFO	4,552.6	1.5%	C
Total C Soils	**18,117.6**	**6.0%**	
ANCLOTE	14,133.2	4.7%	D
BASINGER	9,994.6	3.3%	D
BLUFF	4,693.7	1.5%	D
EMERALDA	8,167.5	2.7%	D
FELDA	804.2	0.3%	D
FELLOWSHIP	2.4	0.0%	D
FLORIDANA	215.5	0.1%	D
MANATEE	303.8	0.1%	D
MARTEL	28.7	0.0%	D
NITTAW	4,751.8	1.6%	D
PLACID	2,293.9	0.8%	D
POMPANO	1,190.2	0.4%	D
SAMSULA	572.5	0.2%	D
SANIBEL	1,864.8	0.6%	D
WAUBERG	161.0	0.1%	D
Total D Soils	**49,177.7**	**16.2%**	
Total	**254,759.0**	**83.9%**	
UNDEFINED	26.3	0.0%	
URBAN LAND	10,836.8	3.6%	
Total Other	**10,863.2**	**3.6%**	
Water	**38,163.2**	**12.6%**	Water
Total	**303,785.4**	**100.0%**	



Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-10
Major Watersheds

- Harvested more than 9 million pounds of gizzard shad, thereby eliminating the phosphorus held in their bodies and reducing the fertilization of algae from their waste;

- Replanted six native wetland species of vegetation in the water along the lake's shoreline, which helps restore fish and wildlife habitat; and,

- Worked with the Friends of Lake Apopka and the ECFRPC to develop a plan to ensure that future development does not negatively impact the lake.

The SJRWMD reports that Lake Apopka is showing signs of rebounding. Since 1995, there has been a 32 percent decline in phosphorus levels in the lake which has resulted in a 30 percent increase in water clarity. With continued restoration activities, the SJRWMD anticipates even more dramatic improvements in Lake Apopka in the future. Additionally, legislation was adopted for the Lake Apopka hydrologic basin that limits phosphorus discharge from new development and sets the total phosphorus criterion for Lake Apopka to 55 parts per billion (ppb).

Big Wekiva River Basin The Big Wekiva River Basin is the second largest watershed in the WSA and comprises approximately 125 square miles of the study area. Several jurisdictions are located within this basin including portions of unincorporated Orange, Lake and Seminole Counties, the City of Apopka and the City of Ocoee. As the name implies, the receiving water for this watershed is the Wekiva River; however, over 50 percent of the watershed (approximately 68.2 square miles) is considered to be landlocked or have limited discharge (i.e., those areas that discharge via a pump system or intermittently). These areas mostly occur in the southern and western portions of the watershed. The lakes south of Clarcona-Ocoee Road are primarily land locked and include Lake Sherwood, Lake Lotta and Crooked Lake. Two lakes within the basin, Lake Sparling and Dwarf Lake, have limited discharge.

Black Water Creek Basin The Black Water Creek Basin occupies approximately 115.9 square miles of the WSA and is located entirely within unincorporated Lake County. Blackwater Creek discharges into the lower reaches of the Wekiva River, just upstream of the St. Johns River. Lake Norris, located in the north central portion of the WSA, is the headwaters of Black Water Creek. Several subbasins, especially on the western side of the watershed are landlocked subbasins and do not discharge to the Wekiva River.

Little Wekiva River Basin The Little Wekiva River Basin is located in the north central portion of Orange County and the western portion of Seminole County. The cities of Orlando, Altamonte Springs, Maitland and the Town of Eatonville are also located in this watershed. The entire watershed is approximately 47.5 square miles in size. The Little Wekiva River itself is approximately 15 miles long and is the predominant drainage feature in the basin. Its main stem flows northward from Lake Lawne, just north of S.R. 50 in Orange County, through Lake Orlando (formerly Lake Wekiva), through Lake Lotus, Trout Lake and the eastern portion of the City of

Altamonte Springs, and eventually discharges through the southern reaches of the Lower Wekiva River Preserve until it empties into the Wekiva River. There are several subbasins within this watershed that discharge to the Little Wekiva River via pump stations and are otherwise closed subbasins (i.e., no positive outfall except through the pump station). These are the Cranes Roost subbasin located in Seminole County, and the Woodsmere and Long Lake subbasins located in Orange County.

The Little Wekiva River Basin is a highly urbanized watershed that in the past has been plagued with chronic sedimentation problems in the river due to:

- An increase in rate of flow and velocities from the area's urbanization;
- Minimal upstream stormwater storage and treatment due to much development occurring before current stormwater regulations;
- Erosion and flooding, which cause public safety concerns; and
- Adverse environmental and water quality impacts from the movement and deposit of sediments, and increased volumes and flows due to runoff.

To date, the SJRWMD, Orange County, Seminole County, and the City of Altamonte Springs have implemented 16 successful erosion control countermeasure projects throughout the river to help offset the sedimentation problems.

Yankee Lake Basin The Yankee Lake Basin, located in the northeastern corner of the WSA lies entirely within unincorporated Seminole County and consists of approximately 17.2 square miles. A portion of this basin discharges to the Wekiva River either through Yankee Lake or via overland flow into the Wekiva Preserve. Much of the basin, however, is landlocked (primarily in the Heathrow area) or has limited discharge.

Golden Triangle Basin The Golden Triangle basin is named for the spatial location of the Cities of Eustis, Mount Dora and Tavares. Within the WSA, the Golden Triangle Basin consists of approximately 13.4 square miles and includes portions of the City of Eustis, the City of Mount Dora and unincorporated Lake County. The predominant hydrologic features within this basin are Lake Dora, Lake Beauclair, Lake Carlton and the Wolf Branch Sink. Wolf Branch is an important feature as it drains a 5-square mile area to Wolf Sink which has a direct connection to the upper Floridan aquifer. The estimated rate of conductance of Wolf Sink (i.e., the rate at which the sink conducts water to the underlying aquifer) is 1.48 cubic feet per second per foot of head difference (United States Geological Survey (USGS), 1996). Due to the existing land use practices surrounding the sink as well as future zoning in this area, there is concern for potential water quality contamination to both surface water and the receiving groundwater at the sink. This hydrologic feature will be addressed in more detail later in the MSMP.

Lake Eustis Basin The Lake Eustis Basin is located in the northwest corner of the WSA and consists of 12.5 square miles within the WSA boundary. Portions of both the City of Eustis and unincorporated Lake County are within the basin. As its name implies, the main receiving water body for the basin is Lake Eustis; however, the portion of the Lake Eustis Basin within the WSA is largely made up of areas with depressional lakes that are the receiving waters for the smaller subbasins. These include Loch Leven, Lake Joanna, Lake Swatara, Lake Lincoln and Lake Eldorado.

Soldiers Creek Basin The Soldiers Creek Basin is located along the east central edge of the WSA and approximately 4.4 square miles of the basin is located within the study area. The City of Longwood, the City of Lake Mary and portions of unincorporated Seminole County are located within this part of the basin. The majority of the Soldiers Creek Basin within the WSA is considered to be landlocked, while the remainder of the basin discharges into Soldiers Creek which ultimately discharges into Lake Jesup.

Monroe Basin A small portion (approximately 3.6 square miles) of the Monroe Basin is located in the northeastern part of the WSA. This portion of the Monroe Basin is located entirely within unincorporated Seminole County. Lake Monroe is the receiving water body for this 3.6 square mile area which ultimately discharges to the St. Johns River.

Alexander Springs Basin A very small portion of the Alexander Springs Basin (approximately 1.2 square miles) is included within the northeast part of the WSA. This area lies within unincorporated Lake County.

2.6.1 Subbasins

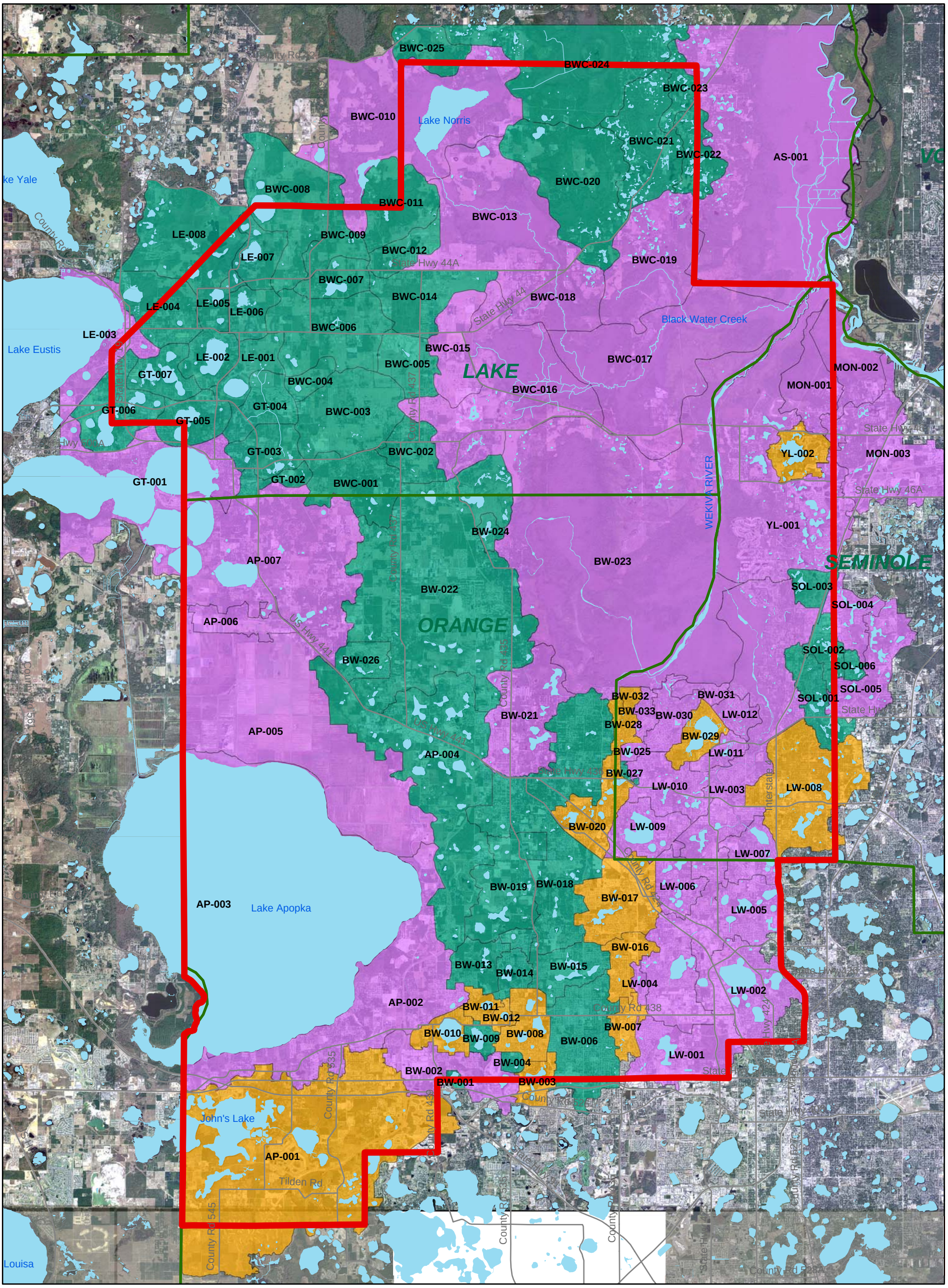
As described in the previous section, there are a number of watersheds within the WSA that are tributary to various surface water systems as well as a large number of landlocked or limited discharge areas. CDM compiled a subbasin map for the entire WSA to have a better understanding of how surface water systems function in the study area. Subbasin boundaries were obtained from the Stakeholders as many of the watersheds within the WSA have already been studied in detail through stormwater master plans or drainage studies (which will be discussed in more detail in Section 5 of this MSMP). Based on the available delineated subbasin boundaries from the Stakeholders, there are a total of 102 subbasins within the WSA (see **Figure 2-11)**. The subbasins were assigned an identification code with a prefix to denote the major basin they were within, and subsequently numbered so each subbasin was assigned a unique ID. The following prefixes were used to denote the major basins:

- AP – Apopka Basin
- AS – Alexander Springs Basin
- BW – Big Wekiva River Basin

honourdm

7/11/05

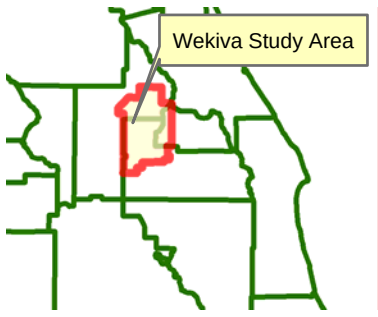
E:\Projects\9247\44812\GIS\Fig2-11.mxd



N
W E
S

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

Subbasins

- Limited Discharge
- Open
- Landlocked

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-11
Subbasin Boundaries

- BWC – Black Water Creek Basin
- GT – Golden Triangle Basin
- LE – Lake Eustis Basin
- LW – Little Wekiva River Basin
- MON – Monroe Basin
- SOL – Soldiers Creek Basin
- YL – Yankee Lake Basin

In addition to compiling the subbasins for the WSA, CDM also considered the characteristics of each subbasin: whether it has a free outfall to a larger conveyance system, is landlocked, or has limited discharge. This information was obtained largely from detailed stormwater master plans and drainage studies completed for basins within the WSA, as well as review of topographic contours where a detailed study was not available. As can be seen from Figure 2-11, the large majority of the landlocked or limited discharge subbasins lie along the central portion of the WSA in a northwesterly orientation. From this coverage it was estimated that approximately 151 square miles, or 32 percent of the WSA is comprised of landlocked areas. These landlocked areas are predominately within the Big Wekiva, Black Water Creek, Golden Triangle and Lake Eustis basins. Approximately 48 square miles, or 10 percent, of the WSA consists of areas with limited surface water discharge (i.e., subbasins that discharge intermittently, through a pump system, or are served by drainage wells). The remaining 58 percent (272 square miles) of the WSA has free outfalls and discharges to surface water conveyance systems.

2.7 Rainfall

Rainfall is monitored throughout the WSA by both agencies and local governments. Due to the abundance of data and the number of monitoring sites, CDM summarized historical rainfall data obtained from the National Oceanic & Atmospheric Administration (NOAA) rainfall stations. Monitoring efforts by other agencies and local governments were also recognized but not summarized in detail.

There were a number of NOAA stations identified within the vicinity of the WSA. CDM obtained and reviewed a listing of these stations along with their associated data. This list was then narrowed down to those stations with a long-term period of record (i.e., 15 years and greater) and complete data sets. This list of NOAA stations along with their period of record and long-term monthly average rainfall data are provided in **Table 2-3** while their locations are shown on **Figure 2-12**. Monthly rainfall data for each of these stations were also plotted and are shown on **Figure 2-13.**

Table 2-3
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Long Term Monthly Average Rainfall

					Average Monthly Rainfall											
STATION	**TYPE**	**LATITUDE (decimal degrees)**	**LONGITUDE (decimal degrees)**	**Period of Record**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
LISBON	NOAA	28.867	-81.783	1958-present	3.03	3.16	4.12	2.47	3.66	6.32	6.17	6.46	6.10	2.63	2.07	2.56
CLERMONT 9S	NOAA	28.450	-81.717	1948-present	2.56	2.88	3.86	2.51	3.22	7.70	7.59	7.58	6.35	2.74	2.09	2.47
ALEXANDER SPRINGS 3 SE	NOAA	29.050	-81.550	1956-1979	2.57	2.91	2.99	2.18	4.11	6.89	7.79	7.70	6.10	2.77	1.36	2.09
LAKE HART	NOAA	28.383	-81.183	1948-1979	2.12	2.74	3.25	2.25	3.41	7.22	7.19	6.41	6.79	3.43	1.69	2.11
LAKE HIAWASSEE	NOAA	28.533	-81.467	1948-1964	2.06	2.73	3.78	3.06	3.42	6.25	7.00	6.90	7.72	3.68	1.98	2.02
ORLANDO INTL AP	NOAA	28.433	-81.333	1974-present	2.36	2.39	3.47	2.56	3.70	7.62	7.68	6.85	6.28	2.77	2.39	2.54
ORLANDO WSO AIRPORT	NOAA	28.550	-81.333	1948-1974	2.00	3.29	3.53	2.66	3.16	6.72	8.13	7.21	6.87	3.95	1.74	2.09
SANFORD	NOAA	28.800	-81.267	1956-present	2.78	3.15	4.05	2.35	3.17	6.88	7.01	7.64	6.42	3.63	2.30	2.39
				Average:	2.44	2.91	3.63	2.50	3.48	6.95	7.32	7.09	6.58	3.20	1.95	2.28

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig2-12.mxd

ALEXANDER SPRINGS 3 SE

South Twin Lk

Lk Norris

Lake Norris

VOLUSIA

Lake Yale

Mallard Lake

Owens Pond

LISBON

Lk Seneca

Lake Eustis

Black Water Creek

Lake Eustis

Lk Joanna

LAKE

Wekiva Park

LAKE MONROE

SR46 at SR46A

State Hwy 46

SANFORD

USGS 284759081232100

ORLANDO SANFORD AIRPORT

Lake Dora

Smith Lk Zellwood

Rock Spg Wells

WEKIVA RIVER

Lake Emma

Crossing Rain Gauge

Lk Maggiore

US Hwy 441

Apopka L&D

Wekiva Sprgs Sp

Wekiva Marina

Interstate 4

Lk Brantley

Charlotte St

Flowway North

Duda Site 16

Clay Island Weather

North Marsh West

USGS 284051081234300

Clay Island

South Marsh

Lynwood STP

Bear Lk

SEMINOLE

Lk Apopka Dedc Tw

South Marsh East

South Marsh West

Clonts Farm S6IFAS

Altamonte SP STP

US Hwy 441

Lk Apopka Cntr

Smith Island 27

Smith Island 27

Lake Apopka

Trout Lake

Percolation Ponds

Winter Garden STP

County Rd 438

Lake Minneola

Turnpike

Starke Lk

ORLANDO WSO AIRPORT

LAKE HIAWASSEE

John's Lake

Lake Minnehaha

Flat Lake

State Hwy 91

State Hwy 436

Lake Louisa

CLERMONT 9S

Lake Tibet

State Hwy 528

ORLANDO INTL AP

ORANGE

LAKE HART

N

W

E

S

0 0.5 1 2 3 4 5 6 Miles

LOCATION MAP

Wekiva Study Area

LEGEND

SJRWMD Stations

FREQUENCY

Unknown

Continuous

Daily

USGS Real Time Station

NOAA Rainfall Stations

Wekiva Study Area

County Line

Water Bodies

Major Roads

Incorporated Areas

Altamonte Springs

Apopka

Eatonville

Eustis

Lake Mary

Longwood

Maitland

Mount Dora

Oakland

Ocoee

Orlando

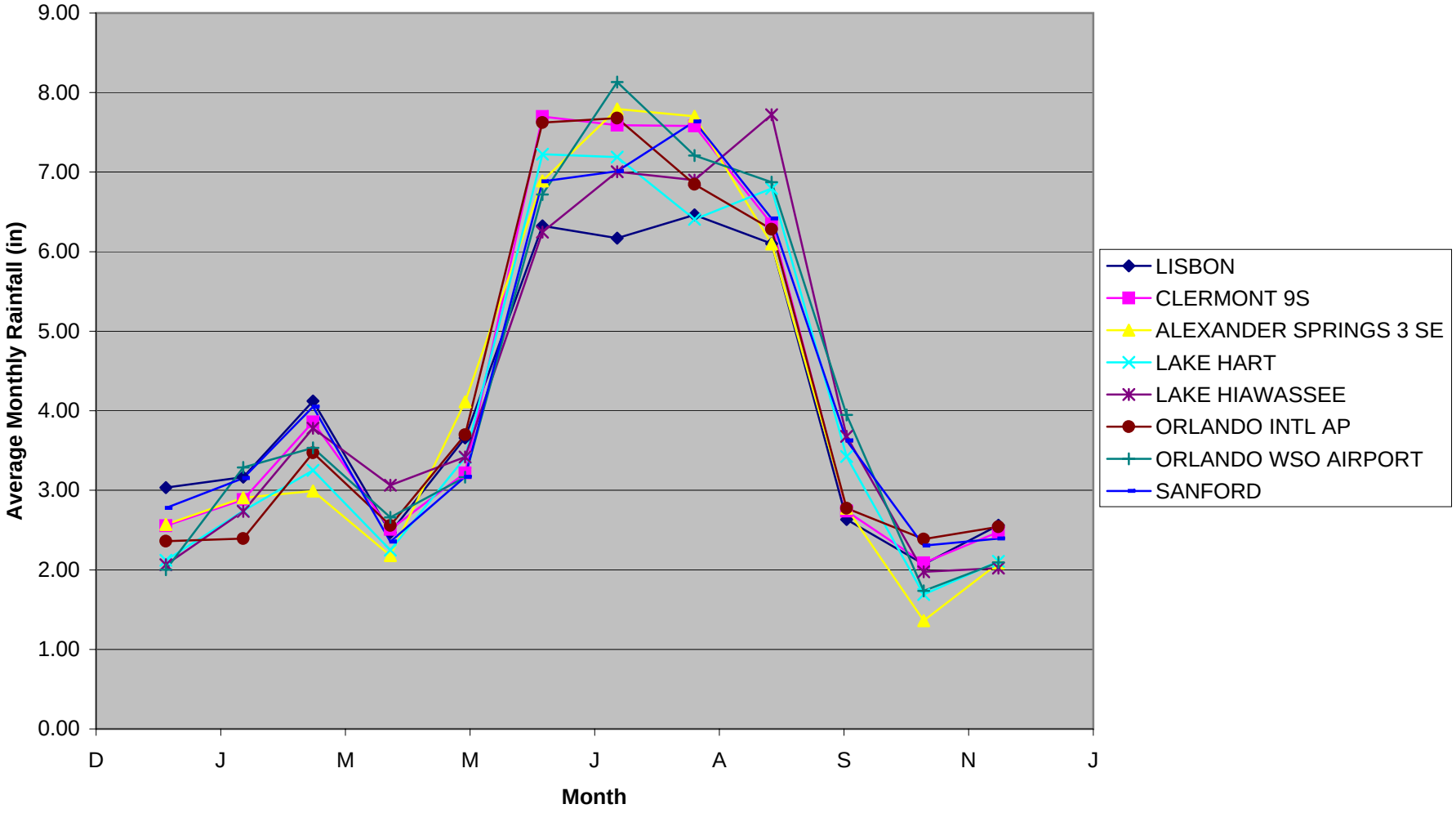
Winter Garden

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-12
Rainfall Monitoring Locations

Figure 2-13
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
Historic Average Monthly Rainfall
NOAA Stations



The USGS also has two real-time stations within the WSA (also shown on Figure 2-12) at the following locations:

- Seminole County Rain Gage At Longwood, FL (USGS 284051081234300)
- Lake Sylvan Park Rain Gage near Paola, FL (USGS 284759081232100)

In addition to the NOAA and USGS stations, the Division of Hydrologic Data Services of the SJRWMD also collects hydrologic and meteorological data to measure changes in surface water levels, aquifer levels and monthly rainfall totals. The SJRWMD prepares a monthly Hydrologic Conditions Report that is available on its website where rainfall statistics are summarized for the SJRWMD's jurisdiction. In the vicinity of the WSA, there were approximately 43 identified stations that the SJRWMD monitors for rainfall amongst other hydrologic conditions. These are stations that are either currently being monitored or have been monitored in the past, and their locations are also shown on Figure 2-12. In addition to the SJRWMD, many of the Stakeholders also record rainfall data within the WSA including Orange County, City of Apopka, City of Ocoee, City of Orlando, City of Winter Garden, Lake County, City of Mount Dora, City of Eustis, and the City of Altamonte Springs.

2.7.1 Precipitation Characteristics and Trends

The USGS recently completed a study entitled the *Hydrology and Water Quality of Lakes and Streams in Orange County, Florida* (German & Adamski, 2005) where records of precipitation were compiled for nine NOAA stations in or adjacent to Orange County. These stations included Clermont, Fort Drum, Kissimmee, Lisbon, Melbourne, Orlando, Sanford, Titusville and Vero Beach. From their analysis of these precipitation records, most of the rainfall in Orange County occurs from June through September, commonly referred to as the wet season; the remaining 8 months referred to as the dry season. The wettest month in Orange County is typically July with an average monthly rainfall total of almost 8 inches. More than half of the annual total rainfall in Orange County typically falls during the wet season.

In the 2005 USGS study, a non-parametric statistical procedure, the Kendall Tau test, was used to quantify temporal trends in rainfall, streamflow and lake levels. The test is used to determine if changes are evidence of real trends rather than just random sequences of variation. As it is non-parametric, it is not affected by outlying values. The Kendall Tau test was used to determine if there were significant temporal trends in annual rainfall at the nine NOAA stations evaluated by the USGS. Total rainfall at Orlando shows a slight cyclical pattern as depicted in **Figure 2-14**.

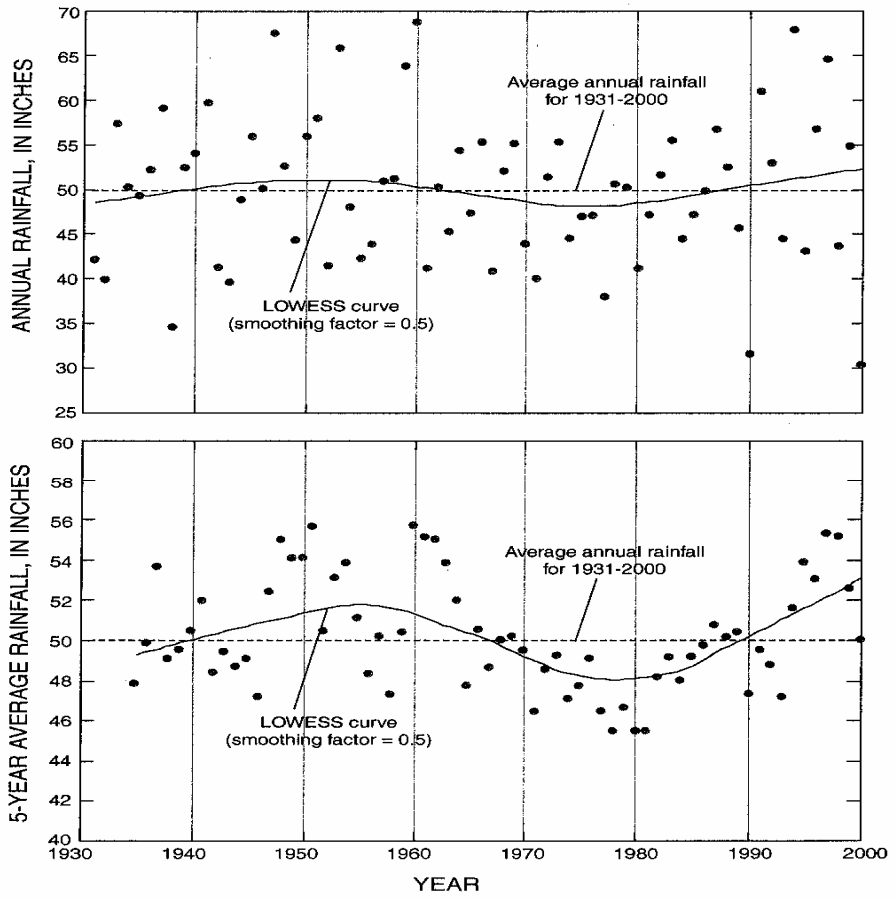


Figure 2-14 – Annual Rainfall and 5-Year Moving Average of Annual Rainfall at Orlando, FL, 1931-2000

Taken from: *Hydrology and Water Quality in Lakes and Streams in Orange County, Florida*, USGS Scientific Investigations Report 2005-5052

According to the USGS, although the cyclic variation is small compared to year to year variation, these cyclical variations could have subtle effects on streamflow and lake levels. The effects may be more noticeable with lakes as they probably have a longer "memory" of antecedent rainfall compared to streams. Thus water levels in lakes may tend to follow a pattern similar to the cyclical pattern indicated in Figure 2-14 if other factors affecting lake water levels have relatively small impacts.

2.8 Surface Water Stages & Flows

There has also been an abundant amount of monitoring done for surface water levels and flows throughout the WSA. Federal and State agencies as well as local governments have programs in place that monitor these type of hydrologic data on a regular basis. The following paragraphs describe the monitoring that is performed by various agencies for streamflow and surface water levels.

USGS

There were 8 stations identified within the vicinity of the WSA where the USGS measures streamflow and/or surface water levels. These stations include:

- USGS 02234635 Wekiva River Near Apopka, FL (streamflow)
- USGS 02234990 Little Wekiva River Near Altamonte Springs, FL (real-time station that measures streamflow and surface water levels)
- USGS 02234998 Little Wekiva River Near Longwood, FL (streamflow)
- USGS 02235000 Wekiva River Near Sanford, FL (streamflow and surface water level)
- USGS 02235200 Blackwater Creek Near Cassia, FL (real-time station that measures streamflow and surface water levels)
- USGS 02237700 Apopka-Beauclair Canal Near Astatula, FL (real-time station that measures streamflow)
- USGS 02237734 Wolf Branch At Railroad Near Mt. Dora, FL (streamflow)
- USGS 022349993 Wekiva River At Old RR Crossing Near Sanford, FL (streamflow)

A summary of these station characteristics is provided in **Table 2-4** and the locations of these USGS stations are shown on **Figure 2-15**. As there were numerous stations for the Wekiva River and its tributaries, the historical daily streamflow for these water bodies were plotted and are shown on **Figures 2-16** and **2-17**. The historical surface water levels for USGS 02234990, USGS 02235000, and USGS 02235200 are shown on **Figure 2-18**.

SJRWMD

There are also a number of sites throughout the WSA that are either currently monitored or have been monitored in the past by the SJRWMD. The types of stations where both streamflow and/or surface water levels are measured include marsh systems (mainly related to the restoration effort at Lake Apopka), lakes, springs and streams. The locations of these stations are also shown on Figure 2-15.

2.8.1 Streamflow Characteristics and Trends

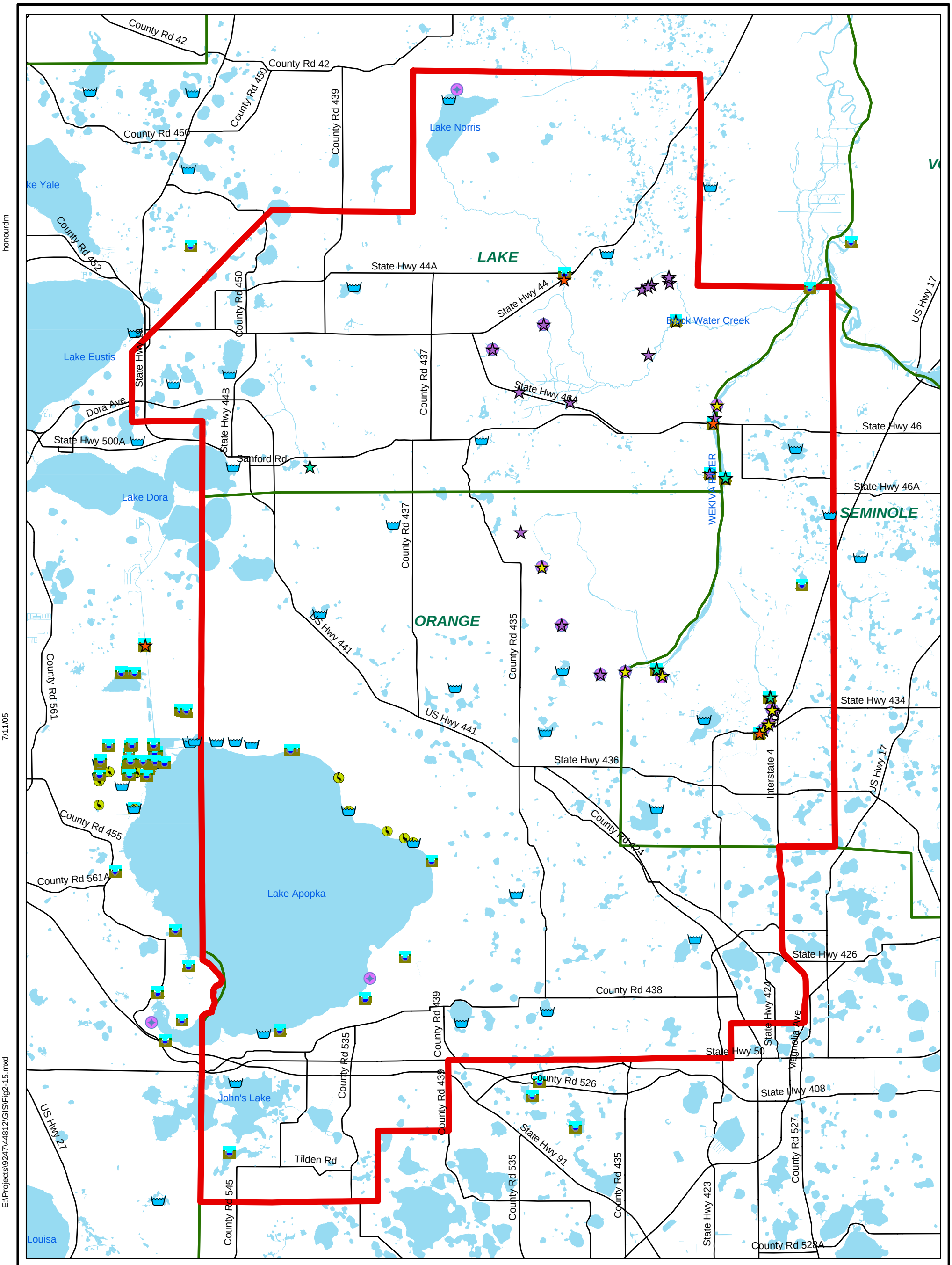
In 1998, the USGS initiated a 4-year study to provide an assessment of surface water conditions in selected lakes and streams in Orange County including basin hydrology, streamflow statistics, lake levels and water quality. The data and findings of this study were published in the 2005 USGS report entitled "Hydrology and Water Quality of Lakes and Streams in Orange County, Florida." In this study, the USGS collected and analyzed historical streamflow data for 13 stations in Orange County. **Table 2-5** shows the variability in historic stream flow data for those water bodies in

Table 2-4
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
USGS Station Characteristics

STATION ID	Location	TYPE	Drainage Area (sq miles)	LATITUDE	LONGITUDE	Data Type	Available Data
02234635	WEKIVA RIVER NR APOPKA, FLA.	USGS	58.3	28°42'48"	81°26'44"	Peak Streamflow	1996-1999
						Daily Streamflow	1995-2002
02234990	LITTLE WEKIVA RIVER NR ALTAMONTE SPRINGS, FL	USGS	42.4	28°41'13"	81°23'50"	Peak Streamflow	1972-2004
						Daily Streamflow	1972-2004
						Surface Water Elevation	1972-present
02234998	LITTLE WEKIVA RIVER NR LONGWOOD,FL	USGS	44.5	28°42'07"	81°23'32"	Peak Streamflow	1996-1999
						Daily Streamflow	1995-2002
02235000	WEKIVA RIVER NR SANFORD, FLA	USGS	189	28°48'54"	81°25'10"	Peak Streamflow	1936-2004
						Daily Streamflow	1935-2004
						Surface Water Elevation	1931-present
02235200	BLACKWATER CREEK NEAR CASSIA, FL	USGS	126	28°52'28.31"	81°29'21.78"	Peak Streamflow	1962-2004
						Daily Streamflow	1967-2004
						Surface Water Elevation	1962 - present
02237700	APOPKA-BEAUCLAIR CANAL NR ASTATULA, FLA	USGS	184	28°43'20"	81°41'06"	Peak Streamflow	1959-2004
						Daily Streamflow	1958-2004
						Surface Water Elevation*	1942 - 2001
02237734	WOLF BRANCH AT RAILROAD NR MT.DORA, FLA	USGS	4.7	28°47'47"	81°36'30"	Peak Streamflow	1993-2004
						Daily Streamflow	1992-2004
022349993	WEKIVA RIVER AT OLD RR CROSSING NR SANFORD,FL	USGS	185	28°47'33"	81°24'49"	Peak Streamflow	1996-2001
						Daily Streamflow	1995-2002

Data was obtained from the USGS NWISWeb Data for the Nation

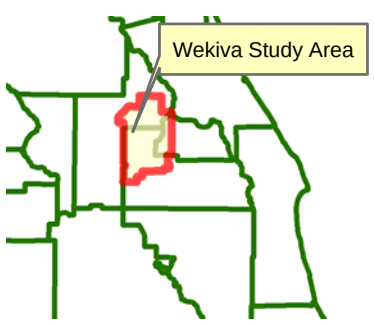
* incomplete dataset



N
W E
S

0 3,400 6,800 13,600 20,400 27,200 Feet

LOCATION MAP



LEGEND

Surface Water Monitoring Stations (USGS)
- Streamflow
- Streamflow and Surface Water Level
- Active Discharge (SRJWMD current measurements)
- Inactive Discharge (SJRWMD past measurements)
- Wekiva Study Area

Surface Water Sites
STATION TYPE
- Lake
- Marsh
- Spring
- Surface Water
- County Line
- Water Bodies
- Major Roads

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-15
Streamflow & Surface Water Level Monitoring Sites

Figure 2-16
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
USGS Stations - Wekiva River
Daily Streamflow

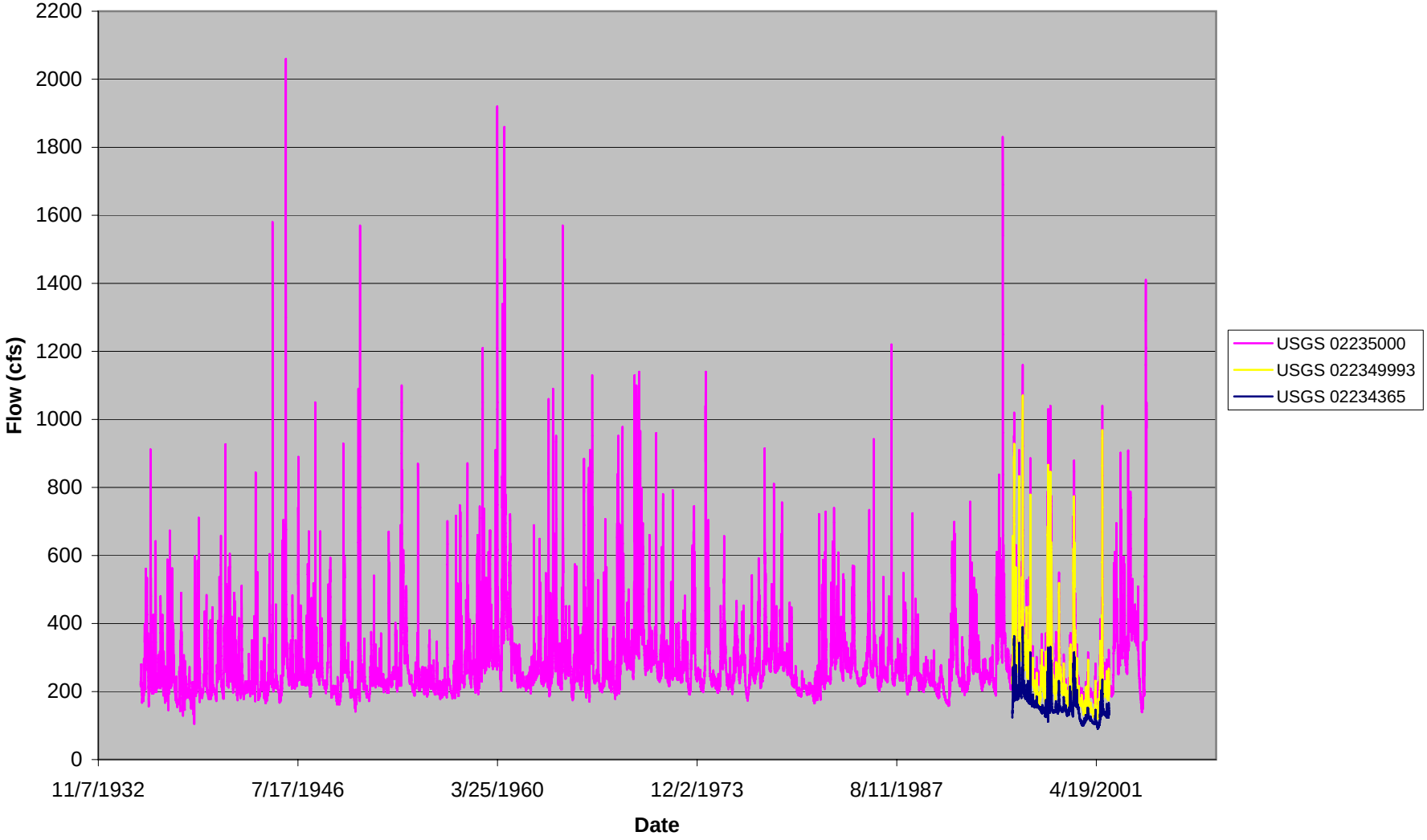


Figure 2-17
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
USGS Stations - Wekiva River Tributaries
Daily Streamflow

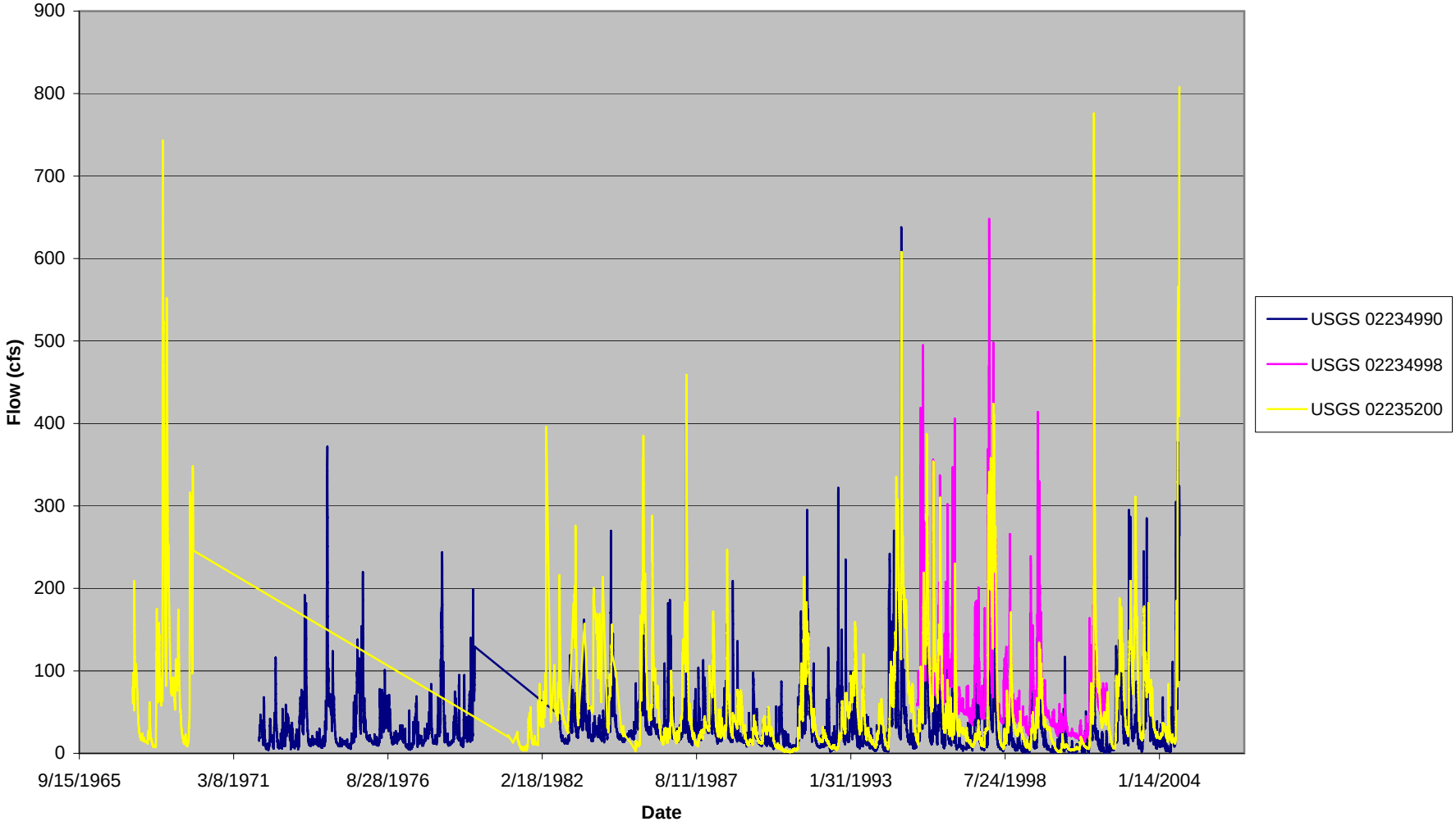


Figure 2-18
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
USGS Stations - Wekiva River & Tributaries
Surface Water Levels

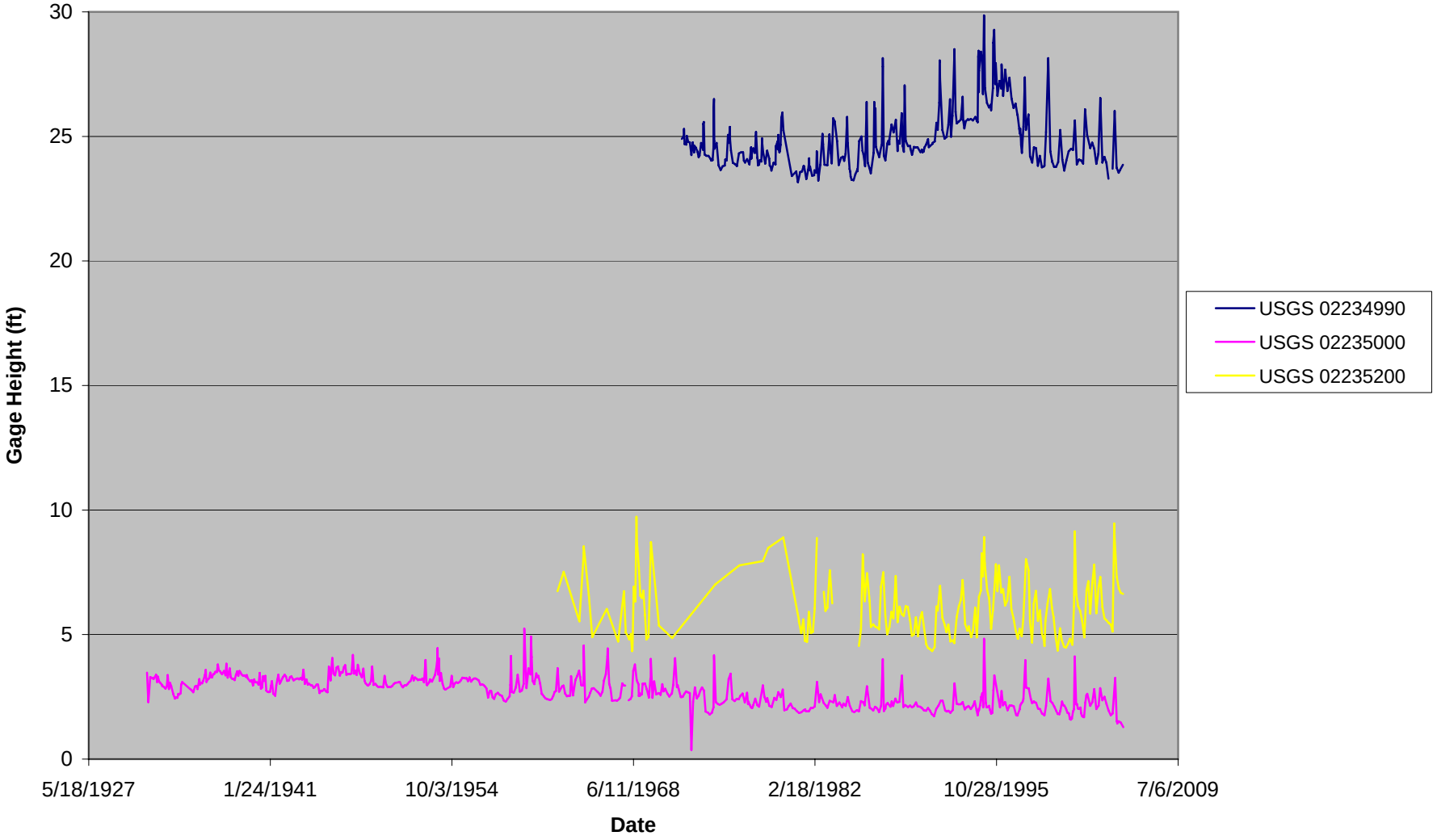


Table 2-5
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Historic Streamflow Variability

				Annual 1-day high flow (cfs)			Annual 7-day low flow (cfs)			Annual Daily Flow (cfs)			
Station Name	**USGS Identifier**	**Period of Record**	**Total Drainage Area (sq mi)**	**Min**	**Median**	**Max**	**Min**	**Median**	**Max**	**Min**	**Median**	**Max**	**Annual Median Runoff (in/yr)**
Little Wekiva River near Altamonte	02234990	1973-2000	90.7	69	257	638	0.6	7.3	15.7	8.2	38	68	5.6
Wekiva River near Sanford	02235000	1936-2000	189	260	792	2060	105	191	257	197	279	500	20
Apopka-Beauclair Canal near Astatula	02237700	1959-1999	184	25	428	754	0	10	92	10	57	263	4.4

Source: Hydrology and Water Quality of Lakes and Streams in Orange County, Florida (USGS, 2005)

the WSA. In this table, the annual 1-day high flow represents the maximum daily mean streamflow for one day, and the annual 7-day, low flow is the minimum daily mean streamflow for 7 consecutive days. Runoff is the median annual streamflow expressed as an equivalent depth of water over the entire drainage that results from the median flow for 1 year. For all the stations evaluated in Orange County, the minimum 7-day, low flow was generally less than 7 cfs, with the exception of the Wekiva River station near Sanford (USGS 02235000). The USGS identified the cause of the relatively high 7-day, low flow as the discharge from Wekiva Springs, Rock Springs and the other springs that contribute flow to the river. Like the 7-day, low flow, the runoff for the Wekiva River is substantially higher than the other drainage basins, due to its relatively constant discharge from the springs that sustain flow in the stream. Most of the flow in the Apopka-Beauclair Canal emanates from Lake Apopka and evaporation from the lake probably results in relatively low runoff into the canal.

The seasonal pattern of streamflow was also evaluated in this study and is shown by the daily duration hydrograph for the Wekiva River in **Figure 2-19**. The hydrograph shows the daily maximum, median and minimum streamflow for each year of the period of record. As can be seen in this figure, minimum daily streamflow is generally lowest in June right after the dry season has ended and before the onset of the wet season. There is less of a pattern for maximum annual streamflows as relatively high streamflows demonstrate the effects of an extreme rainfall event; which can occur in any season, although it is usually in the wet season.

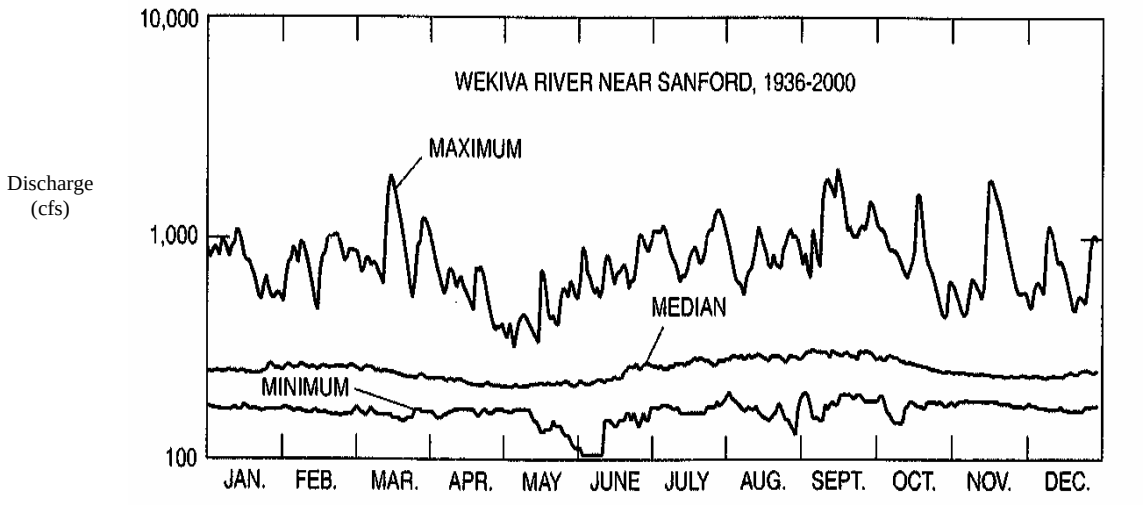


Figure 2-19 – Duration of Daily Discharge for the Wekiva River

Taken from: *Hydrology and Water Quality in Lakes and Streams in Orange County, Florida*, USGS Scientific Investigations Report 2005-5052

The 2005 USGS study also statistically examined streamflow characteristics for temporal trends using the Kendall Tau test and results indicated changes in annual mean streamflow, 1-day, high streamflow or 7-day, low streamflow at 9 of the 13 stations evaluated. The study found significant temporal trends in the 7-day, low streamflow for both the Wekiva and Little Wekiva Rivers. A significant decrease in 7-day, low streamflows at the Little Wekiva River near Altamonte Springs (USGS 02234990) was observed, however was only apparent since 1986. From 1971 to 1986, the 7-day, low streamflow in the river appeared to increase. This pattern in low flow is probably attributed to the discharge of treated wastewater into the stream. As many as seven wastewater plants and a citrus processing plant discharged into the stream in the past. Currently, only the Swofford WWTP and water reclamation facility operated by the City of Altamonte Springs discharge treated effluent into the river. Discharge from this plant was curtailed in the late 1980s when Project Apricot came on-line and a water reuse plan was instituted by the City.

Conversely, an increase in the 7-day, low flow was indicated by the Kendall Tau test for the Wekiva River. The analysis shows that low flows in the Wekiva River tended to increase until 1960 and from then indicates no trend. The increase in low flow may be attributed to basin modifications that began in the 1920s and possible increases in discharge from Wekiva Springs and Rock Springs since 1960. Basin modifications took place mainly in the Little Wekiva watershed which involved construction of drainage ditches and the extension of the basin by installing lake level control structures on several of the historically landlocked lakes. The USGS cited the flushing of the springs' vents to remove silt and debris during a period of high discharge in 1960 as a possible explanation for the increased discharge from the springs. This flushing could improve the conveyance of the spring vents and therefore increase discharge.

Although the Kendall Tau test indicated no temporal trend in annual mean streamflows in the Wekiva River, a double mass plot shows a change toward greater streamflow relative to rainfall beginning in 1959. A double-mass analysis was used to observe possible changes in rainfall-streamflow relations that might be caused by basin development. A comparison of mean annual streamflow from 1934 to 1958 to mean annual streamflow from 1959 to 2000 indicates an increase in annual mean streamflow since 1959. Again the USGS cited the flushing of the springs' vents as a possible explanation for this trend. No trends were observed for the 1-day high streamflow for either the Wekiva or Little Wekiva Rivers.

2.8.2 Lake Level Characteristics and Trends

Lake level characteristics can be highly variable among the lakes themselves and can be affected by factors such as temporal rainfall distribution, degree of urbanization, groundwater seepage and anthropogenic influences (i.e., pumping, control structures, drainage wells). The 2005 USGS study evaluated trends in lake levels from estimated annual mean water levels and temporal trends were only determined for lakes with more than 15 years of record. Of the 83 lakes evaluated by the study, the lakes in the

WSA where significant downward trends in water levels for the entire period of record were observed include: Lake Alpharetta, Lake Avalon, Lake Gem, Lake Orlando, Lake Page, Lake Pleasant, Lake Stanley, Long Lake and Spring Lake. The study cites the extreme high water level conditions that existed in many lakes in 1960 after 2 years of relatively high rainfall as the reason for predominance of downward trends in the long term record. As a result of the high rainfall during these 2 years, historical high water levels occurred in many lakes in 1960 or 1961. These high water levels persisted at least into 1961 at many lakes and likely had an effect on trend testing of the entire period of record for many lakes, especially those where record-keeping began around this time. Flooding during this 1959 to 1960 time period also prompted the construction of approximately 35 additional drainage wells in Orange County. Most of these wells are still operational and are effective for flood control. Lakes in the WSA evaluated in the study that showed significant upwards trend in water level included Bay Lake, Lake Bell, Lake Bosse, Lake Daniel, Lake Gandy, Lake Ivanhoe, Lake Lawne, Lake Lockhart and Lake Ola. It is important to note though that for most of the lakes evaluated in the study, there has not been a uniform pattern of declining or increasing water level over the period of record. Instead there have been periods of decreasing water levels and periods of increasing water levels. Following the period of decline that followed 1960, there was eventually an upward water level trend in many lakes. This pattern of lake level fluctuation is similar to the pattern of rainfall, especially the 5-year moving average shown in Figure 2-14.

2.9 Water Quality

This section provides a summary of the current water quality monitoring that is done within the WSA and addresses TMDL issues that Stakeholders are currently facing or will have to face in years to come. Although it is beyond the scope of this MSMP to define the status of water quality for each water body within the WSA, CDM summarized the current monitoring programs by the Stakeholders to identify who is performing monitoring, which water bodies are routinely sampled, the frequency of sampling as well as the parameters sampled for.

2.9.1 Water Quality Monitoring

SJRWMD and local governments have water quality monitoring programs in place that monitor surface water throughout the WSA. The monitoring programs include sampling for biological, chemical, physical and metal parameters. The trophic state index (TSI) is also routinely calculated for many of the water bodies within the WSA. Several water bodies within the WSA are also sampled as part of the Total Maximum Daily Load (TMDL) program, which will be discussed in further detail in section 2.9.2. A summary of the water bodies sampled which includes sampling characteristics such as the period of record, frequency of sampling and parameters is provided in **Table 2-6**. The sample station locations are shown on **Figure 2-20**.

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Lake County Water Quality Monitoring

Water Body	Station Name	Frequency	Period of Record	Al	Alk	BOD5	Ca	Chla	Cl	Cloud Cover	COD	Color	Cond	Depth	DO	Fcoli	Hardness	K	Mg	Organic Nitrogen as N	Na	NH3	Ni	NOx	OP	pH	Secchi	SO4	Tcoliform	TDS	Temp Air	Temp Water	TKN	TN	TOC	TP	TSS	Turb	Wind Direction	Wind Speed	TSI
Andrew's Lake	Andrew's Lk Ctr	Once	7/5/1995			√					√		√	√	√							√		√		√	√			√		√	√		√	√				√
Franklin Lake	Franklin, Lk @ Mt Dora	Once	8/27/1987										√		√											√															
Lake of the Woods	Lake of the Woods @ Brautcheck Property	Once	8/27/1998										√											√		√							√	√		√		√			√
Seminole Spring	Seminole Spring1	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Seminole Spring	Seminole Spring2	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Seminole Spring	Seminole Spring3	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Tracy Canal	Tracy Canal Dn/Mag Jones	Monthly	4/4/03-6/20/03												√																						√				
Tracy Canal	Tracy Canal Up/Mag Jones	Monthly	3/24/03-6/20/03		√		√		√	√		√	√	√		√		√	√		√			√	√	√	√		√	√	√	√	√	√		√	√	√	√	
Sunset Pond	Sunset Lk W Shr 313 Pond Rd Mt Dora	Monthly	8/16/88-12/17/02		√		√	√	√			√			√	√	√	√	√		√			√		√		√	√	√			√	√	√	√		√			
Island Lake (Near Umatilla)	Island Lk NW Shr off Lonely Ln	Once	7/25/2001		√		√	√	√	√		√	√	√	√	√	√	√	√		√			√	√	√	√	√	√	√	√	√		√	√	√		√		√	
Island Lake (Near Umatilla)	Island Lk W Shr	Once	8/28/2002		√		√	√	√	√		√	√	√	√	√	√	√	√		√			√	√	√			√	√	√	√	√	√			√		√	
Wolf Branch	Wolf Branch @ CC of MtD	Once	10/21/1992		√	√			√					√	√					√		√		√	√	√					√	√	√		√	√	√			√
Wolf Branch	Wolf Branch @ RR Clvt	Twice	10/21/92, 1/5/93		√	√			√					√	√					√		√		√	√	√					√	√	√		√	√	√			√
Wolf Branch	Wolf Branch @ SR46	Twice	10/21/92, 1/5/93		√	√			√					√	√					√		√		√	√	√					√	√	√		√	√	√			√
Wolf Branch	Wolf Branch @ WB Rd	Twice	10/21/92, 1/5/93		√	√			√					√	√					√		√		√	√	√					√	√	√		√	√	√			√
Wolf Branch	Wolf Branch @ Wolf Sink	Twice	10/21/92, 1/5/93		√	√			√				√		√					√		√		√	√	√					√	√	√		√	√	√			√
Wolf Branch	Wolf Branch@DoraPine WWTP	Twice	10/21/92, 1/5/93		√	√			√					√	√					√		√		√	√	√					√	√	√		√	√	√			√
Wekiva Falls	Wekiva Falls Swim Basin	Once	9/29/1993		√	√		√	√				√		√											√					√					√	√			
Wekiva River	Wekiva R @ W. Falls Canal	Once	9/29/1993		√	√		√	√				√		√											√					√					√	√			
Wekiva Falls	Wekiva Falls Boat Basin	Once	9/29/1993		√	√		√	√				√		√											√					√					√	√			
Moccasin Spring	Moccasin Spring	Once	3/31/2004		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Snail Spring Main Boil	Snail Spring Main Boil	Twice	3/31/04, 9/01/04		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Markee Spring	Markee Spring	Once	4/1/2004		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Droty Spring	Droty Spring	Twice	3/31/04, 9/01/04		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Blue Algae Spring	Blue Algae Spring	Once	4/1/2004		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Blueberry Spring	Blueberry Spring	twice	4/01/04, 9/01/04		√		√		√	√		√	√		√		√	√	√		√			√		√		√		√	√	√	√		√		√	√	√	√	
Lake Seneca	Lake Seneca @ South Shore off Lk Seneca Rd	Twice	7/24/01, 2/26/02		√		√	√	√			√	√	√	√	√		√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√		√		√	√
Blackwater Creek	Blackwater Creek@ Lake Norris Rd	Quarterly	3/24/81-10/12/00			√		√	√				√									√			√	√				√			√		√	√	√			√
Blackwater Creek	Blackwater Creek @ Bridge in Seminole WMA	3 times/yr	2/22/00-3/24/03					√	√			√			√	√										√	√		√			√		√		√		√			√
Loch Leven	Lock Leven @ West Shore off Loch Leven Ln	Bi-annually	3/29/01-2/26/02		√		√	√	√			√	√	√	√	√	√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Loch Leven	Lock Leven Center	Once	6/27/1995								√		√	√	√							√		√		√	√			√		√	√		√	√				
Joanna Lake	Joanna Lake South West Lobe Center @ Eustis	Intermittent	4/05/88-6/27/95		√	√		√	√		√		√	√	√							√		√		√	√			√		√	√		√	√	√			√
Joanna Lake	Joanna Lake @ County Park off E. Lk Joanna Dr.	Monthly	11/28/00-12/08/04		√		√	√	√			√	√	√	√			√		√		√	√	√		√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Joanna Lake	Joanna Lake Center @ Eustis	Intermittent	4/05/88-7/4/00		√	√		√	√		√		√	√	√								√			√	√			√		√	√		√	√	√			√
Lake Gertrude	Lake Gertrude Site 1	Once	1/30/2001		√		√	√	√			√					√	√	√		√			√		√		√		√		√	√	√	√		√			
Lake Gertrude	Lake Gertrude Site 2	Once	1/30/2001		√		√	√	√			√					√	√	√		√			√		√		√		√		√	√	√			√			
Lake Gertrude	Lake Gertrude Site 3	Once	1/30/2001		√		√	√	√			√					√	√	√		√			√		√		√		√		√	√	√			√			
Lake Gertrude	Lake Gertrude SW Shore @ County Park	Twice	8/28/21, 2/26/02		√		√	√	√			√	√	√	√			√		√		√		√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Dora Lake	Dora Lake East Lobe Center	Quarterly	3/9/81-11/17/04		√	√	√	√	√			√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Dora Lake	Dora Lake Middle Lobe Center	Twice	3/19/81, 9/8/95																															√							
Dora Lake	Dora Lake West Lobe Center	Quarterly	3/9/81-11/17/04		√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Lake Carlton	Lake Carlton @ West Shore off Churchill-Smith Ln	Twice	12/27/00, 7/23/01		√		√	√	√			√	√	√	√	√		√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Lake Carlton	Carlton Lake Center	Twice	3/19/81, 7/14/02		√		√	√	√			√	√	√	√			√	√	√		√			√	√	√	√	√				√	√	√	√		√		√	√
Apopka-Beauclair Canal	Apopka-Beauclair Canal @ CR449 Bridge	Quarterly	3/9/81-8/12/04		√	√		√	√		√		√	√	√								√		√		√	√				√	√	√		√		√			√
Apopka-Beauclair Canal	Apopka-Beauclair Canal @ Structure Upstream Side	Quarterly	4/12/82-11/17/04		√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Lake Woodward	Lake Woodward East Shore @ Lk Woodward Dr	Twice	7/24/01, 2/26/02		√		√	√	√			√	√	√	√	√	√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√	√	√		√		√	√
Lake Dalhousie	Lake Dalhousie	Annually	3/29/2001-3/25/2003		√		√	√	√			√	√	√	√	√	√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Fish Lake	Fish Lake	Once	7/25/2001		√		√	√				√	√	√	√			√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√		√		√	√
Lake Beauclair	Lake Beauclair	Quarterly	3/9/81-11/17/04		√	√	√	√	√			√	√	√	√	√		√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
West Crooked Lake	West Crooked Lake	Once	7/24/2001		√	√	√	√	√			√	√	√	√	√		√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Clear Lake	Clear Lake	Twice	1/21/96, 6/27/95			√					√		√	√	√								√		√		√			√		√	√		√	√				
East Crooked Lake	East Crooked Lake	Annually	7/24/01-7/29/04	√			√	√	√			√	√	√	√	√		√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Lake Eldorado	Lake Eldorado	Twice	3/29/01, 2/26/02		√		√	√	√			√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√
Lake Myrtle	Lake Myrtle	Once	6/30/1995			√					√		√	√	√							√		√		√	√			√		√	√		√	√				
Lake Norris	Lake Norris	Once	7/25/2001		√		√	√	√			√	√	√	√	√		√	√	√		√			√	√	√	√	√	√	√	√	√	√	√	√		√		√	√
Lake Swatara	Lake Swatara	Once	6/27/1995 0:00			√					√		√	√	√							√		√		√	√			√		√	√		√	√				

UNK = Unknown

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
SJRWMD Water Quality Monitoring

Groundwater Springs Sampling Program

Water Body	Station Name	Frequency	Period of Record	Ca	Cl	Cond	F-	K	Mg	Na	NOx	OP	pH	SO4	TDS	Temp Water	TN	TP
Wekiva Springs	Wekiva Springs nr Altamonte Springs	Quarterly	1956-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Rock Springs	Rock Springs nr Apopka	Quarterly	1931-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Miami Springs	Miami Springs nr Longwood	Quarterly	1960-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Sanlando Springs	Sanlando Springs nr Longwood	Quarterly	1956-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Palm Springs	Palm Springs nr Longwood	Quarterly	1956-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Starbuck Springs	Starbuck Spring nr Longwood	Quarterly	1944-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Witherington Spg	Witherington Springs nr Apopka	SemiAnnual	1960-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Seminole Springs	Seminole Springs nr Sorrento	Quarterly	1972-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Messant Springs	Messant Springs nr Sorrento	Quarterly	1960-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
La Noche Springs	La Noche Springs nr Paisley	Annually	1972-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Lake Apopka/Upper Ockalwaha River Water Quality Sampling Program

Water Body	Station Name	Frequency	Period of Record	Ag	Al	Alk	As	Ba	Ca	Cd	Chl-a	Chl-b	Chl-c	Cl	Cloud Cover	Color	Cond	Cr	Cu	Depth	DO	DOC	Fe	Hardness	K(t)-Field	K	Mg	Mn	Na	NH4	Ni	NOx	Pb	Pheophytin	pH	PO4	Secchi	Se	SiO2	Si	SO4	Sr	TDS	Temp Air
Lake Apopka	Lk Apopka east of Apopka Spg mouth of Gourd	Monthly	1/16/1991	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Lake Apopka Center Station	Bi-weekly	8/16/1985	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Lake Apopka North	Monthly	10/21/1986	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Beauclair Canal	Canal entrance to Lake Beauclair	Monthly	3/7/1989	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Apopka Beauclair Canal	Apopka Beauclair Canal at Apopka Lock and Dam	Bi-weekly	10/3/1985	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Ola	Lake Ola, center	Quarterly	1/27/2000	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Carlton	Center of Lake Carlton	Monthly	8/30/1999	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Dora	Center of Lake Dora	Monthly	10/3/1985	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Dora	Lake Dora; Center of East pool	Monthly	10/12/1999	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Florida Department of Environmental Protection Temporal Variability (TV) Network monitoring program

Water Body	Station Name	Frequency	Period of Record	Ag	Al	Alk	Apparent Color-Unfiltered	As	Ba	Be	Ca	Cd	Chl-a	Chl-b	Chl-c	Cl	Cloud Cover	Color	Cond	Cr	Cu	Depth	DO	DOC	F	Fe	Fcoli	Hardness	K	Mg	Mn	Na	NH4	Ni	NOx	Pb	Pheophytin	pH	PO4	Salinity	Sb	Secchi	Se	SiO2
Lake Dora	Lake Dora Center Lobe	Bi-monthly	7/31/1995-Present	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Blackwater Creek	Blackwater Creek at Hwy 44	Bi-monthly	5/11/1995-Present	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Blackwater Creek	Blackwater Creek at Carter Property Bridge	Bi-monthly	5/11/1995-Present	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Little Wekiva River	Little Wekiva River at Hwy 434	Bi-monthly	5/24/1995-Present	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Wekiva River	Wekiva River Near Sanford	Bi-monthly	5/24/1995-Present	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	

Middle St. Johns River Basin Sampling program

Water Body	Station Name	Frequency	Period of Record	Ag	Alk	Al	As	Ba	Be	Ca	Cd	Chl-a	Chl-b	Chl-c	Cl	Cloud Cover	Color	Cond	Cr	Cu	Depth	DO	DOC	F	Fe	Hardness	Hg	K	Mg	Mn	N	Na	NH4	Ni	NOx	Pb	Pheophytin	pH	PO4	Sb	Secchi	Se	SiO2	Si
St. John's River	SJR - Downstream of Power Plant	Monthly	3/1/1996-Present									√										√									√													
Blackwater Creek	Blackwater Cr Upstream of Wekiva River	Monthly	5/03 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Wekiva River	Wekiva River Upstream of Blackwater Creek	Monthly	10/02 - Present	√	√	√	√	√	√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√
Lake Norris	Lake Norris Center	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Norris	Lake Norris Dock	Monthly	4/03 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Norris	Lake Norris-Tracy Canal	Monthly	10/02 - Present	√	√	√	√	√	√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√
Little Wekiva River	Little Wekiva Upstream of Wekiva River	Monthly	10/02 - Present	√	√	√	√	√	√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√
Little Wekiva River	Little Wekiva – Springs Landing Blvd (alternate for LW-UWR)	Monthly	2/04 - 9/04	√	√	√	√	√	√	√	√				√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√		√
Rock Spring Run	Rock Spring Run	Monthly	10/02 - Present	√	√	√	√	√	√	√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√		√	√	√	√	√	√	√
Wekiva River	Wekiva River Upstream - Little Wekiva	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Wekiva River	Wekiva River – Wekiva Marina (alternate for WR-ULW)	Monthly	2/04 - 9/04	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
SJRWMD Water Quality Monitoring

Groundwater Springs Sampling Program

Water Body	Station Name	Frequency	Period of Record
Wekiva Springs	Wekiva Springs nr Altamonte Springs	Quarterly	1956-Present
Rock Springs	Rock Springs nr Apopka	Quarterly	1931-Present
Miami Springs	Miami Springs nr Longwood	Quarterly	1960-Present
Sanlando Springs	Sanlando Springs nr Longwood	Quarterly	1956-Present
Palm Springs	Palm Springs nr Longwood	Quarterly	1956-Present
Starbuck Springs	Starbuck Spring nr Longwood	Quarterly	1944-Present
Witherington Spg	Witherington Springs nr Apopka	SemiAnnual	1960-Present
Seminole Springs	Seminole Springs nr Sorrento	Quarterly	1972-Present
Messant Springs	Messant Springs nr Sorrento	Quarterly	1960-Present
La Noche Springs	La Noche Springs nr Paisley	Annually	1972-Present

Lake Apopka/Upper Ockalwaha River Water Quality Sampling Program

Water Body	Station Name	Frequency	Period of Record	Temp Water	TKN	TOC	TP	TSS	Turb	Weather	Wind Direction	Wind Speed	Zn
Lake Apopka	Lk Apopka east of Apopka Spg mouth of Gourd	Monthly	1/16/1991	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Lake Apopka Center Station	Bi-weekly	8/16/1985	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Lake Apopka North	Monthly	10/21/1986	√	√	√	√	√	√	√	√	√	√
Lake Beauclair Canal	Canal entrance to Lake Beauclair	Monthly	3/7/1989	√	√	√	√	√	√	√	√	√	√
Apopka Beauclair Canal	Apopka Beauclair Canal at Apopka Lock and Dam	Bi-weekly	10/3/1985	√	√	√	√	√	√	√	√	√	√
Lake Ola	Lake Ola, center	Quarterly	1/27/2000	√	√	√	√	√	√	√	√	√	√
Lake Carlton	Center of Lake Carlton	Monthly	8/30/1999	√	√	√	√	√	√	√	√	√	√
Lake Dora	Center of Lake Dora	Monthly	10/3/1985	√	√	√	√	√	√	√	√	√	√
Lake Dora	Lake Dora; Center of East pool	Monthly	10/12/1999	√	√	√	√	√	√	√	√	√	√

Florida Department of Environmental Protection Temporal Variability (TV) Network monitoring program

Water Body	Station Name	Frequency	Period of Record	Si	SO4	Sr	Stage	Stream Velocity	TColi	TDS	Temp Air	Temp Water	TKN	Tl	TOC	TP	TSS	Turb	V	Weather	Wind Direction	Wind Speed	Zn
Lake Dora	Lake Dora Center Lobe	Bi-monthly	7/31/1995-Present		√	√				√	√	√	√	√	√	√	√	√	√	√	√	√	√
Blackwater Creek	Blackwater Creek at Hwy 44	Bi-monthly	5/11/1995-Present	√	√	√	√	√		√	√	√	√		√	√	√	√		√	√	√	√
Blackwater Creek	Blackwater Creek at Carter Property Bridge	Bi-monthly	5/11/1995-Present	√	√	√	√	√		√	√	√	√		√	√	√	√		√	√	√	√
Little Wekiva River	Little Wekiva River at Hwy 434	Bi-monthly	5/24/1995-Present	√	√	√	√	√	√	√	√	√	√		√	√	√	√		√	√	√	√
Wekiva River	Wekiva River Near Sanford	Bi-monthly	5/24/1995-Present	√	√	√	√	√	√	√	√	√	√		√	√	√	√		√	√	√	√

Middle St. Johns River Basin Sampling program

Water Body	Station Name	Frequency	Period of Record	Sn	SO4	Sr	TDS	Temp Air	Temp Water	TKN	Tl	TOC	TP	TSS	Turb	V	Weather	Wind Direction	Wind Speed	Zn
St. John's River	SJR - Downstream of Power Plant	Monthly	3/1/1996-Present									√	√	√	√					
Blackwater Creek	Blackwater Cr Upstream of Wekiva River	Monthly	5/03 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Wekiva River	Wekiva River Upstream of Blackwater Creek	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√
Lake Norris	Lake Norris Center	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Norris	Lake Norris Dock	Monthly	4/03 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Norris	Lake Norris-Tracy Canal	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Little Wekiva River	Little Wekiva Upstream of Wekiva River	Monthly	10/02 - Present	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√
Little Wekiva River	Little Wekiva – Springs Landing Blvd (alternate for LW-UWR)	Monthly	2/04 - 9/04	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√
Rock Spring Run	Rock Spring Run	Monthly	10/02 - Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Wekiva River	Wekiva River Upstream - Little Wekiva	Monthly	10/02 - Present	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√
Wekiva River	Wekiva River – Wekiva Marina (alternate for WR-ULW)	Monthly	2/04 - 9/04	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Orange County Water Quality Monitoring

Water Body	Station Name	Frequency	Period of Record	ACIDITY	Ag	Al	Algae	Alk	As	B	Ba	Be	BOD5	Ca	Cd	Chl-a	Chl-b	Chl-c	Cl-	Co	COD	Color	Cond	Cr	Cu	Depth	DO	Fe	Fcoli	Fecal Strep	Hardness	Hg	K	Macro.	Mg	Mn	Mo	Na	NH3	Ni	Organic N	NO2	NO3	NOx	OP	P.AERU.	Pb	pH	Phaeophytin
Lake Maggiore	Lake Maggiore	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Lake Marshall	Lake Marshall	Quarterly/Historical	2/14/94-5/03/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Ola	Lake Ola	Quarterly	2/25/92-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Avalon	Lake Avalon	Quarterly/Historical	8/01/89-5/11/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Beulah	Lake Beulah	Quarterly	8/28/73-Present				√	√	√			√	√	√							√		√		√	√	√	√	√	√		√	√		√	√		√	√			√				√		√	
Lake Beauclair	Lake Beauclair	Quarterly	5/19/80-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Carlton	Lake Carlton	Quarterly	1/20/99-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Black Lake	Black Lake	Quarterly/Historical	5/19/93-3/06/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Cortez	Lake Cortez	Quarterly	1/29/02-Present										√									√	√		√	√	√	√			√							√					√	√			√	√		
Crooked Lake	Crooked Lake	Quarterly	2/26/1997		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Florence	Lake Florence	Bi-ennially	6/03/02-Present		√	√		√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√	√	√	√	√		√	√	√
Alpharetta	Alpharetta North	Quarterly/Historical	10/30/97-3/17/99		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Alpharetta	Alpharetta South	Quarterly/Historical	10/30/97-5/19/1998		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Julia	Lake Julia	Quarterly	10/30/97-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Long Lake	Long Lake	Quarterly	10/30/97-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Lotta North	Lake Lotta North	Quarterly	2/26/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Lotta South	Lake Lotta South	Quarterly	2/26/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake McCoy	Lake McCoy	Quarterly	2/26/97-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Olympia	Lake Olympia	Quarterly	2/26/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Page	Lake Page	Quarterly	3/27/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Piedmont	Lake Piedmont	Quarterly	1/29/02-Present										√									√	√		√	√	√	√			√							√					√	√			√	√		
Johns Lake	Johns Lake E	Quarterly/Historical	2/15/89-7/08/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Johns Lake	Johns Lake W	Quarterly/Historical	2/15/89-7/07/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Lake Pleasant	Lake Pleasant	Quarterly	3/27/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Prevatt	Lake Prevatt	Quarterly	2/13/89-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Spring Lake	Spring Lake	Quarterly	2/26/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Starke Lake	Starke Lake	Quarterly	3/21/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Trout Lake	Trout Lake	Quarterly	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK		UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Blue Lake	Blue Lake	Bi-annually	1/29/02-6/04/02										√									√	√		√	√	√	√			√							√					√	√			√	√		
Lake Prima Vista	Lake Prima Vista	Quarterly	3/21/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Sand Lake	Sand Lake	Quarterly	02/23/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√		√	√	√	√	√	√	√	√			√	√		
Lake Stanley	Stanley	Bi-montly	2/12/04-Present		√	√		√	√	√	√	√		√	√	√	√	√	√	√		√	√	√	√	√	√	√			√		√		√	√	√	√	√	√	√	√			√	√	√	
Lake Lucy	Lucy	Quarterly	2/12/2004-Present		√	√		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√		√		√	√	√	√	√	√	√	√			√	√	√	
Border Lake	Border Lake	Bi-annually	1/29/02-6/04/02										√									√	√		√	√		√			√							√					√	√			√	√		
Lake McDade	Lake McDade	Bi-annually	1/29/02-6/04/02										√									√	√		√	√	√	√			√							√					√	√			√	√		
Wekiva River	Big Wekiva at Camp Joy Southern Baptist	Quarterly	1/24/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√			√	√		
Wekiva River	Big Wekiva at Camp Joy Main Site	Quarterly/Historical	6/13/01-1/14/02		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√			√	√		
Wekiva River	Big Wekiva at Wekiva Springs	Quarterly	2/23/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√			√	√		
Wekiva River	Big Wekiva at SR 46	Quarterly/Historical	1/24/89-1/14/02		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√			√	√		
Wekiva River	Big Wekiva at Marina	Quarterly	1/24/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Faith	Lake Faith	Quarterly	1/08/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Ivanhoe East	Lake Ivanhoe East Lobe	Quarterly	1/31/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Ivanhoe West	Lake Ivanhoe West	Quarterly	1/31/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-West Shore, 100' out at Smith's Island	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-Gourd Neck Springs, Over Boil	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-South Shore, 100' out at Oakland	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-East Side of Lake (Fisherman's Paradise)	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-Middle of Lake	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-West Side of Lake (Smith's Island)	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-Northeast Shore, 100' out from Outer Dike at 2 Story Pumphouse	Quarterly/Historical	2/24/87-8/22/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-North Shore, at mouth of Apopka-Beauclair Canal	Quarterly/Historical	2/24/87-5/03/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Apopka	Apopka-West Shore, 100' out at Smith's Island	Quarterly/Historical	1/24/94-5/03/00		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Lawne	Lake Lawne Mid Lobe	Quarterly	3/21/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Lawne	Lake Lawne North Lobe	Quarterly	3/20/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Lawne	Lake Lawne South Lobe	Quarterly	3/20/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Little Lake Fairview	Little Lake Fairview	Quarterly	3/01/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Shadow	Lake Shadow	Quarterly	2/10/97-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Silver	Lake Silver	Quarterly	2/22/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Orlando	Lake Orlando	Quarterly	3/21/94-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Fairview N	Lake Fairview North Lobe	Quarterly	3/21/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Fairview S	Lake Fairview S	Quarterly	3/21/89-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Lovely	Lake Lovely	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Lake Weston	Lake Weston	Quarterly	3/22/94-Present		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Gandy	Lake Gandy	Quarterly	3/22/94-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Lake Hill	Lake Hill	Quarterly	3/01/94-Present		√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√			√	√		
Little Wekiva River	Little Wekiva at Silver Star Rd.	Quarterly	1/25/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√			√	√		
Little Wekiva River	Little Wekiva at 441	Quarterly	2/14/94-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√			√	√		
Little Wekiva River	Little Wekiva at Oranole Rd.	Quarterly	1/25/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√			√	√		

UNK = Unknown

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Orange County Water Quality Monitoring

Water Body	Station Name	Frequency	Period of Record	Sb	Se	Secchi	Sn	SO4	STD.PL.	Tcoli	Temp Water	TDS	TKN	Tl	TN	TP	TS	TSS	Turb	VSS	V	Zn
Lake Maggiore	Lake Maggiore	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Lake Marshall	Lake Marshall	Quarterly/Historical	2/14/94-5/03/00	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Ola	Lake Ola	Quarterly	2/25/92-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Avalon	Lake Avalon	Quarterly/Historical	8/01/89-5/11/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Lake Beulah	Lake Beulah	Quarterly	8/28/73-Present			√			√	√	√					√						
Lake Beauclair	Lake Beauclair	Quarterly	5/19/80-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Carlton	Lake Carlton	Quarterly	1/20/99-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Black Lake	Black Lake	Quarterly/Historical	5/19/93-3/06/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Cortez	Lake Cortez	Quarterly	1/29/02-Present			√					√	√	√		√	√		√	√			√
Crooked Lake	Crooked Lake	Quarterly	2/26/1997	√	√	√	√	√		√	√	√	√	√		√	√	√	√		√	√
Lake Florence	Lake Florence	Bi-ennially	6/03/02-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Alpharetta	Alpharetta North	Quarterly/Historical	10/30/97-3/17/99	√	√	√	√	√		√	√	√	√	√		√	√	√	√		√	√
Alpharetta	Alpharetta South	Quarterly/Historical	10/30/97-5/19/1998	√	√	√	√	√		√	√	√	√	√		√	√	√	√		√	√
Lake Julia	Lake Julia	Quarterly	10/30/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Long Lake	Long Lake	Quarterly	10/30/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lotta North	Lake Lotta North	Quarterly	2/26/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lotta South	Lake Lotta South	Quarterly	2/26/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake McCoy	Lake McCoy	Quarterly	2/26/97-Present	√	√	√	√	√		√	√	√	√	√		√	√	√	√		√	√
Lake Olympia	Lake Olympia	Quarterly	2/26/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Page	Lake Page	Quarterly	3/27/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Piedmont	Lake Piedmont	Quarterly	1/29/02-Present			√					√	√	√		√	√		√	√			√
Johns Lake	Johns Lake E	Quarterly/Historical	2/15/89-7/08/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√
Johns Lake	Johns Lake W	Quarterly/Historical	2/15/89-7/07/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Pleasant	Lake Pleasant	Quarterly	3/27/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Prevatt	Lake Prevatt	Quarterly	2/13/89-Present	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√
Spring Lake	Spring Lake	Quarterly	2/26/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Starke Lake	Starke Lake	Quarterly	3/21/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Trout Lake	Trout Lake	Quarterly	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Blue Lake	Blue Lake	Bi-annually	1/29/02-6/04/02			√					√	√	√		√	√		√	√			√
Lake Prima Vista	Lake Prima Vista	Quarterly	3/21/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Sand Lake	Sand Lake	Quarterly	02/23/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Stanley	Stanley	Bi-montly	2/12/04-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lucy	Lucy	Quarterly	2/12/2004-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Border Lake	Border Lake	Bi-annually	1/29/02-6/04/02			√					√	√	√		√	√		√	√			√
Lake McDade	Lake McDade	Bi-annually	1/29/02-6/04/02			√					√	√	√		√	√		√	√			√
Wekiva River	Big Wekiva at Camp Joy Southern Baptist	Quarterly	1/24/89-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Wekiva River	Big Wekiva at Camp Joy Main Site	Quarterly/Historical	6/13/01-1/14/02	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Wekiva River	Big Wekiva at Wekiva Springs	Quarterly	2/23/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Wekiva River	Big Wekiva at SR 46	Quarterly/Historical	1/24/89-1/14/02	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Wekiva River	Big Wekiva at Marina	Quarterly	1/24/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Faith	Lake Faith	Quarterly	1/08/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Ivanhoe East	Lake Ivanhoe East Lobe	Quarterly	1/31/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Ivanhoe West	Lake Ivanhoe West	Quarterly	1/31/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-West Shore, 100' out at Smith's Island	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-Gourd Neck Springs, Over Boil	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-South Shore, 100' out at Oakland	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-East Side of Lake (Fisherman's Paradise)	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-Middle of Lake	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-West Side of Lake (Smith's Island)	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-Northeast Shore, 100' out from Outer Dike at 2 Story Pumphouse	Quarterly/Historical	2/24/87-8/22/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-North Shore, at mouth of Apopka-Beauclair Canal	Quarterly/Historical	2/24/87-5/03/00	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Apopka	Apopka-West Shore, 100' out at Smith's Island	Quarterly/Historical	1/24/94-5/03/00	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lawne	Lake Lawne Mid Lobe	Quarterly	3/21/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lawne	Lake Lawne North Lobe	Quarterly	3/20/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Lawne	Lake Lawne South Lobe	Quarterly	3/20/89-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Little Lake Fairview	Little Lake Fairview	Quarterly	3/01/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Shadow	Lake Shadow	Quarterly	2/10/97-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Silver	Lake Silver	Quarterly	2/22/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Orlando	Lake Orlando	Quarterly	3/21/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Fairview N	Lake Fairview North Lobe	Quarterly	3/21/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Fairview S	Lake Fairview S	Quarterly	3/21/89-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Lake Lovely	Lake Lovely	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Lake Weston	Lake Weston	Quarterly	3/22/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Gandy	Lake Gandy	Quarterly	3/22/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√
Lake Hill	Lake Hill	Quarterly	3/01/94-Present	√	√	√	√	√	√	√	√	√	√	√		√	√	√	√	√	√	√
Little Wekiva River	Little Wekiva at Silver Star Rd.	Quarterly	1/25/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Little Wekiva River	Little Wekiva at 441	Quarterly	2/14/94-Present	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√		√	√
Little Wekiva River	Little Wekiva at Oranole Rd.	Quarterly	1/25/89-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

UNK = Unknown

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Seminole County Water Quality Monitoring

Water Body	Station Name	Frequency	Period of Record	Ag	Al	Alk	As	Ba	Be	BOD5	Ca	Cd	Chla	Co	Cond	Cr	Cu	Depth	DO	Fcoli	Fe	Grease	Hardness	K	Mg	Mn	Na	NH3	Ni	NO2	NO3	NOx	OP	Pb
Bear Lake	Bear Lake	Daily	3/01/04-Present										√		√				√															
Wekiva River	Wekiva River	Quarterly	3/1/04-Present										√		√				√															
Little Wekiva River	Little Wekiva River	Daily	3/1/04-9/18/04										√		√				√															
Lake Adelaide	Lake Adelaide	Twice	9/15/04, 5/11/05										√		√				√															
Lake Asher	Lake Asher	Quarterly	2/17/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Bear Lake	Bear Lake	Quarterly	11/18/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Lake Brantley	Lake Brantley	Quarterly	11/25/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Cub Lake	Cub Lake	Quarterly	2/17/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Lake Florida	Lake Florida	3 times/yr	5/11/04-9/15/04										√		√				√													√		
Lake Harriet	Lake Harriet	Quarterly	10/28/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Island Lake	Island Lake	Quarterly	10/19/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√			√
Little Wekiva River	Little Wekiva River	Quarterly	5/20/04-Present			√				√			√		√				√	√								√		√	√		√	
Little Bear Lake	Little Bear Lake	Quarterly	5/12/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Linden Lake	Linden Lake	Quarterly	3/10/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Little Wekiva River	Little Wekiva River	Quarterly	12/30/98-Present	√			√		√	√		√	√		√	√	√		√	√		√	√						√	√	√		√	√
Little Wekiva River	Little Wekiva River	Quarterly	7/27/04-Present			√				√			√		√				√	√								√		√	√		√	
Mirror Lake	Mirror Lake	Quarterly	11/18/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Lake Myrtle	Lake Myrtle	Quarterly	9/18/97-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Lake Mobile	Lake Mobile	3 times	6/07/04-12/07/04			√				√			√		√				√	√								√		√	√		√	
Lake Marion	Lake Marion	Twice	9/15/04, 12/07/04			√				√			√		√				√	√								√		√	√		√	
Lake Markham	Lake Markham	Quarterly	10/19/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Lake Orienta	Lake Orienta	3 times	5/11/04-12/07/04										√		√				√													√		
Ross Lake	Ross Lake	Quarterly	10/19/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Bear Lake	Bear Lake	Daily	11/08/01-4/30/03										√					√	√															
Spring Lake	Spring Lake	Quarterly	2/23/99-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Sylvan Lake	Sylvan Lake	Quarterly	10/19/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Wekiva (sand) Lake	Wekiva (sand) Lake	Quarterly	11/25/98-Present				√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√			√
Little Wekiva River	Little Wekiva River	Quarterly	9/07/00-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√
Yankee Lake	Yankee Lake	Quarterly	10/19/98-Present	√	√	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√		√	√	√	√	√	√	√	√	√		√	√

*Sampling information is for Seminole County Public Works; Seminole County Environmental Services also samples water bodies.

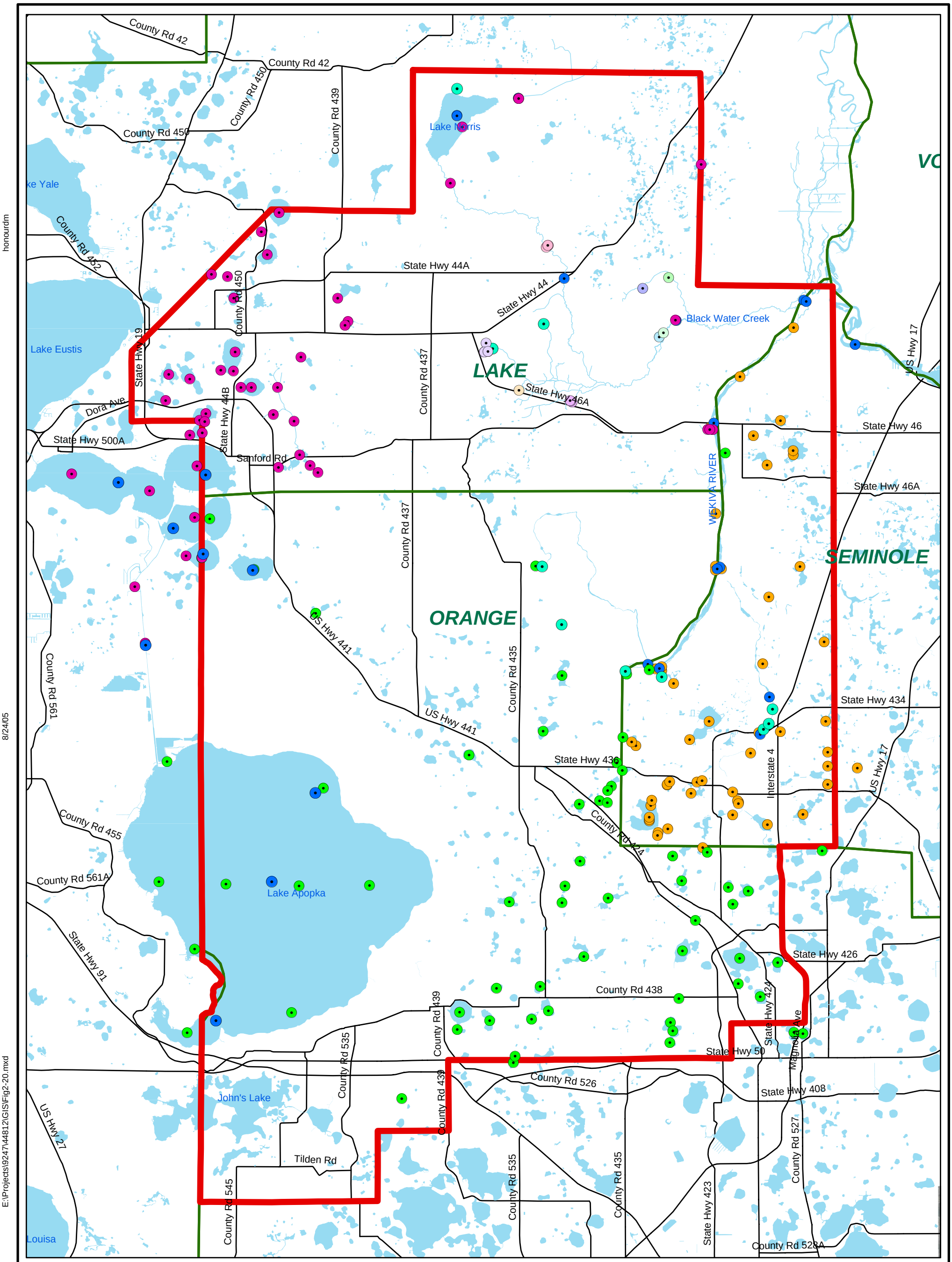
Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Seminole County Water Quality Monitoring

Water Body	Station Name	Frequency	Period of Record	pH	Phenol	Sb	Se	Secchi	TDS	Temp	TKN	Tl	TN	TP	TSS	Turb	V	Zn	TSI
Bear Lake	Bear Lake	Daily	3/01/04-Present	√					√	√						√			
Wekiva River	Wekiva River	Quarterly	3/1/04-Present	√					√	√						√			
Little Wekiva River	Little Wekiva River	Daily	3/1/04-9/18/04	√					√	√						√			
Lake Adelaide	Lake Adelaide	Twice	9/15/04, 5/11/05					√		√	√		√	√		√			√
Lake Asher	Lake Asher	Quarterly	2/17/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Bear Lake	Bear Lake	Quarterly	11/18/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Lake Brantley	Lake Brantley	Quarterly	11/25/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Cub Lake	Cub Lake	Quarterly	2/17/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Lake Florida	Lake Florida	3 times/yr	5/11/04-9/15/04	√				√		√	√		√	√		√			√
Lake Harriet	Lake Harriet	Quarterly	10/28/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Island Lake	Island Lake	Quarterly	10/19/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Little Wekiva River	Little Wekiva River	Quarterly	5/20/04-Present	√						√	√			√	√	√			√
Little Bear Lake	Little Bear Lake	Quarterly	5/12/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Linden Lake	Linden Lake	Quarterly	3/10/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Little Wekiva River	Little Wekiva River	Quarterly	12/30/98-Present	√	√	√	√			√	√	√		√	√	√		√	√
Little Wekiva River	Little Wekiva River	Quarterly	7/27/04-Present	√						√	√			√	√	√			√
Mirror Lake	Mirror Lake	Quarterly	11/18/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Lake Myrtle	Lake Myrtle	Quarterly	9/18/97-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Lake Mobile	Lake Mobile	3 times	6/07/04-12/07/04	√				√			√	√		√	√	√			√
Lake Marion	Lake Marion	Twice	9/15/04, 12/07/04	√				√			√	√		√	√	√			√
Lake Markham	Lake Markham	Quarterly	10/19/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Lake Orienta	Lake Orienta	3 times	5/11/04-12/07/04	√				√		√	√		√	√		√			√
Ross Lake	Ross Lake	Quarterly	10/19/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	
Bear Lake	Bear Lake	Daily	11/08/01-4/30/03	√					√	√						√			
Spring Lake	Spring Lake	Quarterly	2/23/99-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Sylvan Lake	Sylvan Lake	Quarterly	10/19/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Wekiva (sand) Lake	Wekiva (sand) Lake	Quarterly	11/25/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Little Wekiva River	Little Wekiva River	Quarterly	9/07/00-Present	√		√	√	√		√	√	√		√	√	√	√	√	√
Yankee Lake	Yankee Lake	Quarterly	10/19/98-Present	√		√	√	√		√	√	√		√	√	√	√	√	√

*Sampling information is for Seminole County Public Works; Seminole County Environmental Services also samples

Table 2-6
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Water Quality Definitions

Symbol	Parameter
Ag	Silver
Al	Aluminum
Alk	Alkalinity
As	Arsenic
B	Boron
Ba	Barium
Be	Beryllium
BOD5	Biochemical Oxygen Demand
Ca	Calcium
Cd	Cadmium
Chl-a	Chlorophyll A
Chl-b	Chlorophyll B
Chl-c	Chlorophyll C
Cl	Chlorine
Co	Cobalt
Cond	Conductivity
Cr	Chromium
Crypto	Cryptosproidium
Cu	Copper
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
F-	Flouride
Fe	Iron
Fcoli	Fecal Coliform
Hg	Mercury
HPC	Heterotrophic Plate Count
K(t)-Field	Decay Constant
K	Potassium
Mg	Magnesium
Mn	Manganese
Mo	Molybdenum
Na	Sodium
NH3	Ammonia
NH4	Ammonium
Ni	Nickle
NO3	Nitrate
NO2	Nitrite
NOx	Nitrite + Nitrate
OP	Ortho Phosphorus
P.AERU.	Pseudomonas aeruginosa
Pb	Lead
PO4	Phosphate
Sb	Antimony
Secchi	Secchi Depth
Se	Selenium
SiO2	Silica
Si	Silicon
Sn	Tin
SO4	Sulfate
Sr	Strontium
STD. PL	Standard Plate Count
Tcoli	Total Coliform
TDS	Total Dissolved Solids
Temp Air	Air Temperature
Temp Water	Water Temperature
Tl	Thallium
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorous
TSI	Trophic State Index
TSS	Total Suspended Solids
Turb	Turbidity
V	Vandium
VSS	Volital Suspended Solids
Zn	Zinc



Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-20
Water Quality Sampling Stations

honourdm
8/24/05
E:\Projects\92474\44812\GIS\Fig2-20.mxd

SJRWMD

SJRWMD conducts a number of surface water quality sampling programs within the WSA. These sites are either currently monitored or have been monitored in the past through the Middle St. John's River Basin (MSJRB) program, the Groundwater Division (which samples the springs), the Lake Apopka and Upper Ocklawaha programs, and FDEP Temporal Variability (TV) Network monitoring program. The SJRWMD samples a total of 35 sites within the WSA.

Local Governments

In a partnership with the City of Altamonte Springs, City of Lake Mary, City of Casselberry, City of Longwood, City of Oviedo, City of Sanford, City of Winter Springs, SJRWMD and the USEPA; Seminole County and the University of South Florida developed the Seminole County Watershed Resources Atlas, which is available to the public at www.seminole.wateratlas.usf.edu, to house monitoring data for the lakes and streams throughout Seminole County. The atlas includes water body physical characteristics, location, hydrology, ecology, history and recreation, and water quality information.

Lake County has a similar Water Resources Atlas that was developed by Lake County, Lake County Water Authority (LCWA), the University of South Florida, the Florida Center for Community Design and Research and the SJRWMD, available at www.lake.wateratlas.usf.edu. Data are provided to both atlases by many organizations, agencies, and citizen groups including EPA, FDEP, SWFWMD, USGS, SJRWMD, Florida Fish and Wildlife Conservation Commission, Florida Center for Community Design and Research, LAKEWATCH, the Community Watershed Fund, Seminole, Lake, Orange and Volusia Counties, and the Florida Natural Areas Inventory.

Several jurisdictions conduct separate surface water quality monitoring programs in addition to these partnerships. Orange County, the City of Altamonte Springs and the City of Orlando currently and historically have monitored the rivers and lakes within their jurisdictions. Since the 1980s, the Orange County Environmental Protection Division (EPD) has conducted water quality sampling within 13 basins including the WSA. The EPD adopted FDEPs surface water quality standards, and analyzes collected samples in the Division's own laboratory for chemical, physical, biological and metal parameters.

The City of Altamonte Springs has conducted water quality sampling at Crane's Roost for the past five years, monitoring biological, chemical and physical conditions. Sampling is only conducted when lake levels are high and there is a discharge from Crane's Roost to the Little Wekiva River. Water quality samples are taken upstream and downstream of the discharge points as well as in the middle of the lake.

The City of Orlando's water quality sampling program began in 1990. Of the 104 water bodies in the city, between 91 and 95 have been sampled. Sampling is focused

on natural lakes and manmade lakes with major public access. The Stormwater Utility Division's Lake Enhancement Section maintains a Lake Water Quality database where the historical and current water quality of the City's lakes is available to the public. Sampling is usually done during the summer months due to the frequency of rain events.

2.9.2 TMDL Related Issues

As required by Section 303(d) of the Federal Clean Water Act, the State of Florida must develop total maximum daily loads (TMDLs) for impaired waters. An "impaired water" is a water body that does not meet the assigned designated uses. A TMDL is the maximum loading of a particular pollutant that can be discharged in a surface water and still meet its designated uses and applicable water quality standards. However, the term TMDL also refers to the overall process involved in the assessment and restoration of impaired waters. According to Subsection 303(d) of the Clean Water Act (CWA) and Section 403.067, Florida Statutes, impaired waters are "those not meeting applicable water quality standards, a broad term that includes designated uses, water quality criteria, the Florida antidegradation policy, and moderating provisions" (Chapter 62-303, FAC). For each of the impaired waters, where the impairment is due to abatable, human-induced causes, Florida must define the TMDL. Pursuant to United States Environmental Protection Agency (EPA) TMDL regulations, the TMDL is expressed as follows:

$$TMDL = WLA + LA + MOS$$

where:

WLA = the Wasteload Allocation for point sources,

LA = a Load Allocation for nonpoint sources including natural background conditions, and

MOS = a margin of safety (implicit or explicit).

In Florida, the TMDL process is multi-phased and includes the identification, verification, and listing of impaired waters, followed by the development and implementation of the TMDL. First, FDEP develops a planning list of impaired waters based on existing data. FDEP then prepares a verified list following the collection of additional corroborating water quality, biological, or other data. The verified list is adopted by the FDEP Secretary as the basin specific 303(d) List to be sent to EPA in compliance with the CWA. Once a water body is adopted on the verified list of impaired waters, then the next phase of the TMDL process is the development of a TMDL, including the initial allocation of allowable loads. The next phase of the TMDL process is the development of the Basin Management Action Plan (BMAP), or the TMDL implementation plan, in which detailed allocations of allowable loadings to

point and nonpoint sources is done and load reduction strategies are evaluated. The following lists Florida's phased approach:

Phase 1	Data Compilation and Assessment
Phase 2	Collection and Assessment of Additional Data
Phase 3	Determination of Total Maximum Daily Load
Phase 4	Development of Allocation and Basin Management Action Plan (BMAP)
Phase 5	Implementation of the TMDL

FDEP implements the five phases of the TMDL program described above using a watershed approach (i.e., managing water resources within their natural boundaries). To implement the watershed approach for all water bodies in Florida, FDEP divided each of the six FDEP Districts into five geographically based groups of watersheds. A map of the groups is shown in the inset (**Figure 2-21**).

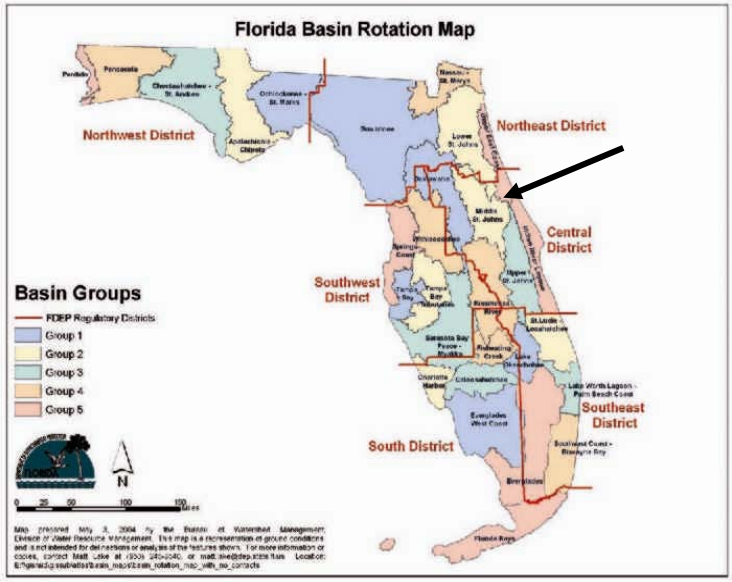


Figure 2-21 - Florida Map Showing FDEP Basin Rotation Schedule

Taken from: *Florida's Total Maximum Daily Load Program: the First Five Years – A Report to the Legislature and Governor. FDEP, Division of Water Resources, February 2005*

2.9.2.1 Basin Status Reports

The WSA is located within two FDEP Basins: the Middle St. Johns River Basin, identified by FDEP as a Group 2 Basin and the Ocklawaha Basin (Group 1).

For the Middle St. Johns River, the Wekiva River Watershed is defined as the Wekiva River Planning Unit (FDEP, 2003). According to the Basin Status report for the Wekiva River Planning Unit a number of WBIDs (Water Body Identification) are identified as potentially impaired. These are listed in **Table 2-7**. There are 32 WBIDs listed including the Wekiva River, Wekiva Spring and Little Wekiva River. Potentially impaired WBIDs in the Wekiva Planning Unit are shown in **Figure 2-22**.

Table 2-7
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Summary of Impaired WBIDs

Wekiva River Planning Unit - Middle St. Johns			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	BOD	Coliform	Biology	Pest-Fish	Mercury	Turbidity
2929A	Blackwater Creek	Stream	✓	✓	✓							
2929C	Lake Dorr	Lake									✓	
2956	Wekiva River	Stream		✓	✓							
2956A	Wekiva River	Stream	✓	✓	✓							
2956B	Wekiva River Lower	Stream			✓							
2956C	Wekiva Spring (Orange)	Spring			✓							
2967	Rock Springs Run	Spring		✓	✓			✓				
2987	Little Wekiva River	Stream	✓	✓				✓				
2987A	Spring Lake	Lake	✓									
2987B	Wekiva River NW Ave T	Stream							✓			
2993	Lake Prevatt	Lake	✓	✓	✓							
2998B	Lake Mobile	Lake	✓									
2998C	Lake Orienta	Lake	✓									
3000	Lake Pearl	Lake	✓									
3002D	Starke Lake	Lake	✓	✓								
3002E	Lake Primavista	Lake	✓	✓								
3002G	Lake Lotta	Lake	✓									
3002H	Lake Sherwood	Lake	✓		✓							
3002I	Lake Rose	Lake	✓									
3002J	Lake Miawassee	Lake	✓	✓								
3002K	Lake Olivia	Lake	✓									
3004	Little Wekiva Canal	Stream	✓	✓	✓			✓				
3004B	Lake Fairview	Lake	✓	✓								
3004C	Lake Lawne	Lake	✓	✓								
3004D	Silver Lake	Lake	✓									
3004G	Bay Lake	Lake	✓									
3004H	Little Lake Fairview	Lake	✓									
3004I	Lake Rose	Lake	✓	✓								
3004J	Lake Gandy	Lake			✓							
3004K	Lake Wekiva/Orlando	Lake	✓									
3004N	Lake Fairview	Lake	✓	✓								
3011A	Lake Weston	Lake	✓									
Count		32	25	14	10	0	0	3	1	0	1	0

Apopka Planning Unit - Ocklawaha Basin			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	BOD	Coliform	Biology	Pest-Fish	Mercury	Turbidity
2835B	Lake Apopka	Lake	✓							✓		✓
2835C	Gourd Neck Spring	Spring	✓		✓							
2856	Apopka Marsh	Stream			✓	✓						
2875	Black Lake Outlet	Lake				✓						
2873C	Johns Lake	Lake	✓	✓								✓
2873B	Lake Avalon	Lake	✓	✓								
2869	Unnamed Drain	Stream							✓			
Count		7	4	2	2	2	0	0	1	1	0	2

Lake Harris Planning Unit - Ocklawaha Basin			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	BOD	Coliform	Biology	Pest-Fish	Mercury	Turbidity
2831A	Dora Canal	Stream	✓		✓							
2831B	Lake Dora	Lake	✓	✓		✓						
2834C	Lake Beauclair	Lake	✓									
2835A	Lake Apopka Outlet	Stream	✓		✓		✓					
2836B	Lake Ola	Lake		✓								
2837B	Lake Carlton	Lake	✓		✓	✓						
Count		6	5	2	3	2	1	0	0	0	0	0

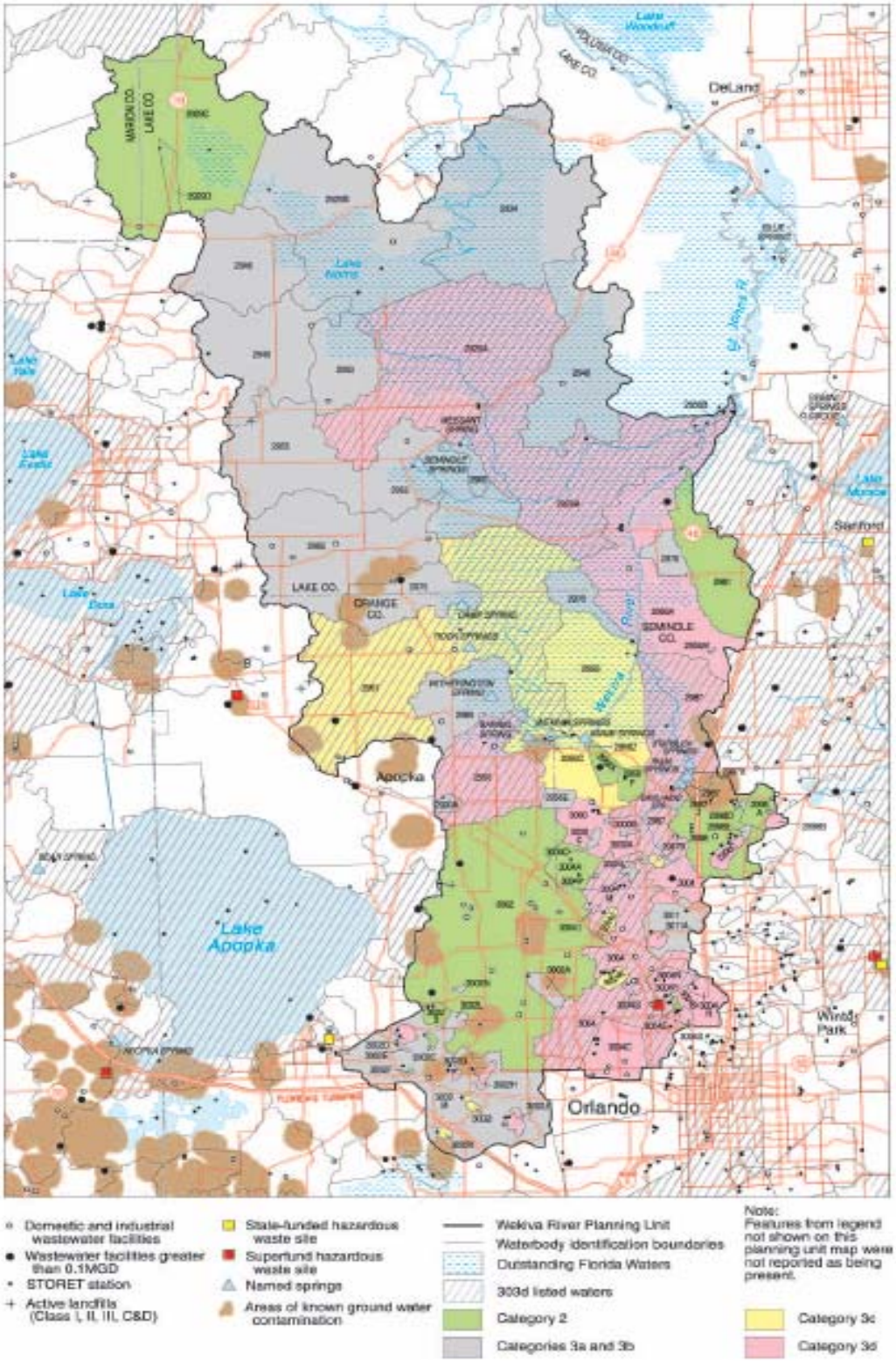


Figure 2-22 Potentially Impaired WBIDs in the Wekiva Planning Unit of the Middle St. Johns Watershed.

Taken from: *Basin Status Report: Middle St. Johns. FDEP, Division of Water Resources, March 2003*

The major constituents listed that cause impairment are Nutrients, Metals, and Total and/or Fecal Coliform. Biology (which means a failure of the bioassessment tests) and Mercury were listed only once for this Planning Unit.

In the Ocklawaha Basin (FDEP, 2001), the southwestern portion of the Wekiva River Study area includes the Lake Harris Planning Unit and the Lake Apopka Planning Unit. All of the Lake Harris Planning Unit impaired WBIDs are outside of the Wekiva Study area very close to the boundary. The Basin Status Report was updated in September 2003 and 3 more WBIDs were added; all 7 impaired WBIDs are listed in **Table 2-8**. Impaired WBIDs in the Lake Harris Planning Unit and the Apopka Planning Unit are shown in **Figure 2-23** and **Figure 2-24** respectively.

According to the Impaired Waters Rule (IWR), FDEP formalizes the adoption of the list of impaired waters in two steps. The first step analyzes existing data for 10 years to produce a planning list (see Table 2-7). The second step is to list the impaired water bodies after additional data are collected and/or additional scrutiny of the data has been completed. This list is called the Verified List and it is adopted by the FDEP Secretary to become part of the 303(d) List of Impaired Waters for which TMDLs are to be completed. Table 2-8 lists the adopted Verified Lists for the Ocklawaha and Middle St. Johns WBIDs as well as the Delisted WBIDs.

2.9.2.2 TMDL Activities

Section 369.318 (8) of the WPPA requires that by December 1, 2005, the SJRWMD shall establish pollution load reduction goals (PLRGs) for the WSA to assist FDEP in adopting TMDLs for impaired waters within the WSA (**Figure 2-25)** by December 1, 2006. FDEP is actively working on the TMDLs for the impaired WBIDs in the Wekiva Planning Unit listed in Table 2-8. However, since none of the work has been completed, none of the TMDL results are available for this document. FDEP will be working to meet the legislative requirement to develop TMDLs for impaired waters in the study area by Dec. 1, 2006. This would include TMDLs in the Wekiva Planning Unit for the following water bodies: Cowpen Pond (mercury), Little Wekiva (fecal and total coliforms), Little Wekiva Canal (DO, BOD, fecals, nutrients), Spring Lake (nutrients), Lake Florida (nutrients), Lake Orienta (nutrients), Lake Adalaide (nutrients), Starke Lake (nutrients), Lake Primavista (nutrients), Lake Lotta (nutrients), Prairie Lake (nutrients), Lake Lawne (nutrients), Bay Lake (nutrients), Bear Gulley Lake (nutrients), and Lake Lucien (nutrients).

On the western edge of the WSA, FDEP and others have completed significant work on the Lake Apopka WBID and the development of a BMAP for the Lake Harris Area lakes is nearing completion. FDEP has already developed a phosphorus TMDL for Lake Apopka, Lake Beauclair, Lake Carlton, Lake Dora, and Lake Eustis.

Table 2-8
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Summary of Verified Impaired WBIDs

Wekiva River Planning Unit - Middle St. Johns			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	Coliform	Fecal	Pest-Fish	Mercury	Turbidity	TSS	Year
2987	Little Wekiva River	Stream					✓						2008
2987A	Spring Lake	Lake	✓										2008
2998C	Lake Orienta	Lake	✓										2008
2934A	Cowpen Pond	Lake								✓			2011
2998A	Lake Florida	Lake	✓										2008
2998E	Lake Adalaide	Lake	✓										2008
3002D	Starke Lake	Lake	✓										2008
3002E	Lake Primavista	Lake	✓										2008
3002G	Lake Lotta	Lake	✓										2008
3002N	Prairie Lake	Lake	✓										2008
3004	Little Wekiva Canal	Stream	✓		✓		✓						2008
3004C	Lake Lawne	Lake	✓										2008
3004D	Silver Lake	Lake	✓										2008
3004G	Bay Lake	Lake	✓										2008
3011C	Lake Lucien	Lake								✓			2011
Delisted													
2929A	Black Water Creek	Stream	✓	✓	✓								
2956C	Wekiva Spring (Orange)	Stream	✓				✓						
2987	Little Wekiva River	Stream	✓										
2993	Lake Prevatt	Lake	✓				✓						
3004	Little Wekiva Canal	Stream					✓						
Apopka Planning Unit - Ocklawaha Basin			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	Coliform	Fecal	Pest-Fish	Mercury	Turbidity	TSS	Year
2835B	Lake Apopka	Lake	✓						✓				2011
2835C	Gourd Neck Spring	Spring	✓										2002
Lake Harris Planning Unit - Ocklawaha Basin			Pollutant									
WBID	Waterbody Segment	Type	Nutrients	Metals	DO	Ammonia	Coliform	Fecal	Pest-Fish	Mercury	Turbidity	TSS	Year
2831A	Dora Canal	Stream	✓		✓								2007
2831B	Lake Dora	Lake	✓			✓							2002
2834C	Lake Beauclair	Lake	✓										2003
2835A	Lake Apopka Outlet	Lake	✓		✓								2002
2837	Lake Carlton Outlet	Lake	✓										2002
Delisted													
2831B	Lake Dora	Lake		✓									
2834C	Lake Beauclair	Lake				✓							
2835A	Lake Apopka Outlet	Lake				✓					✓	✓	

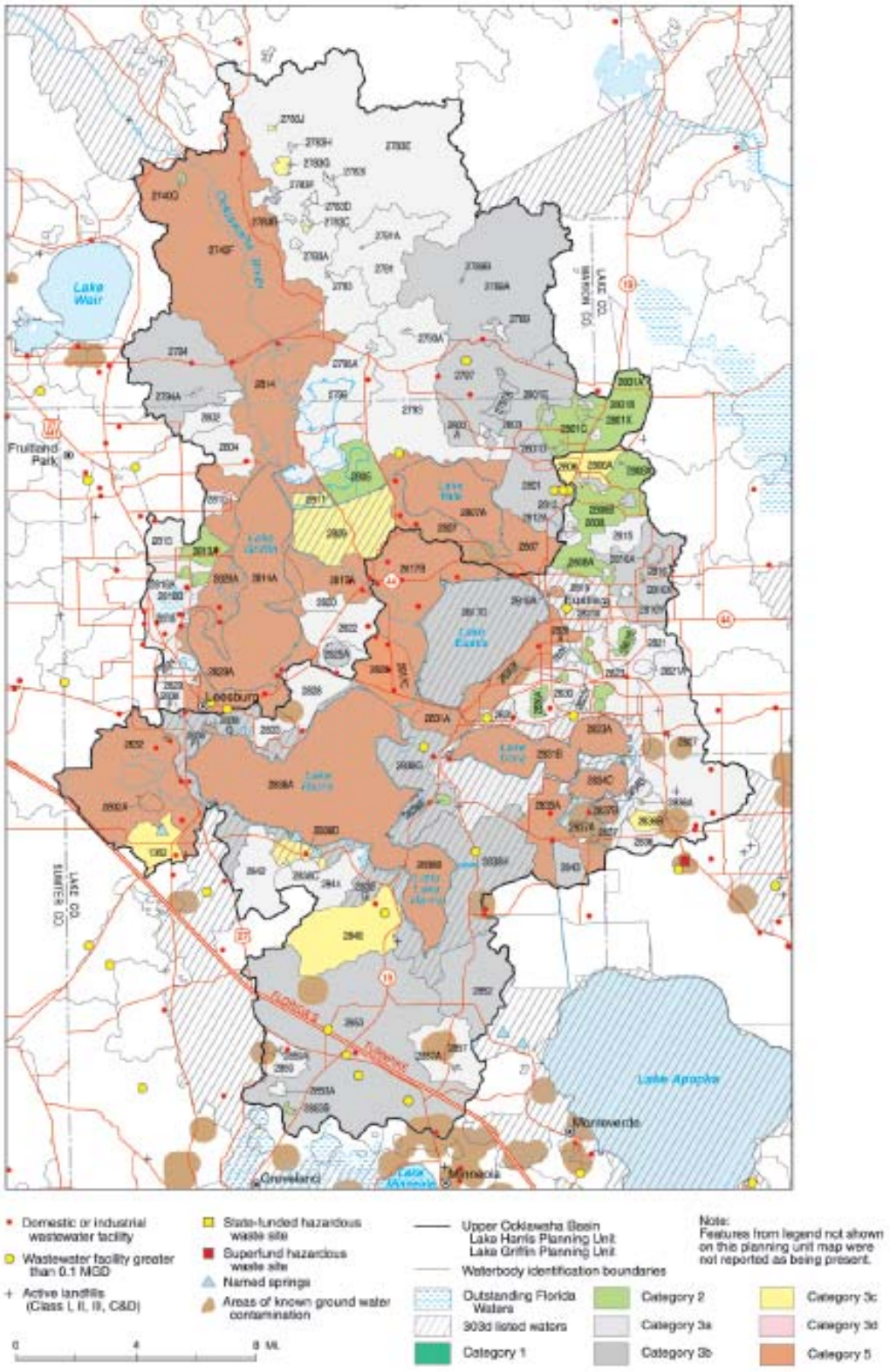


Figure 2-23 Potentially Impaired WBIDs in the Lake Harris Planning Unit of the Ocklawaha Watershed.

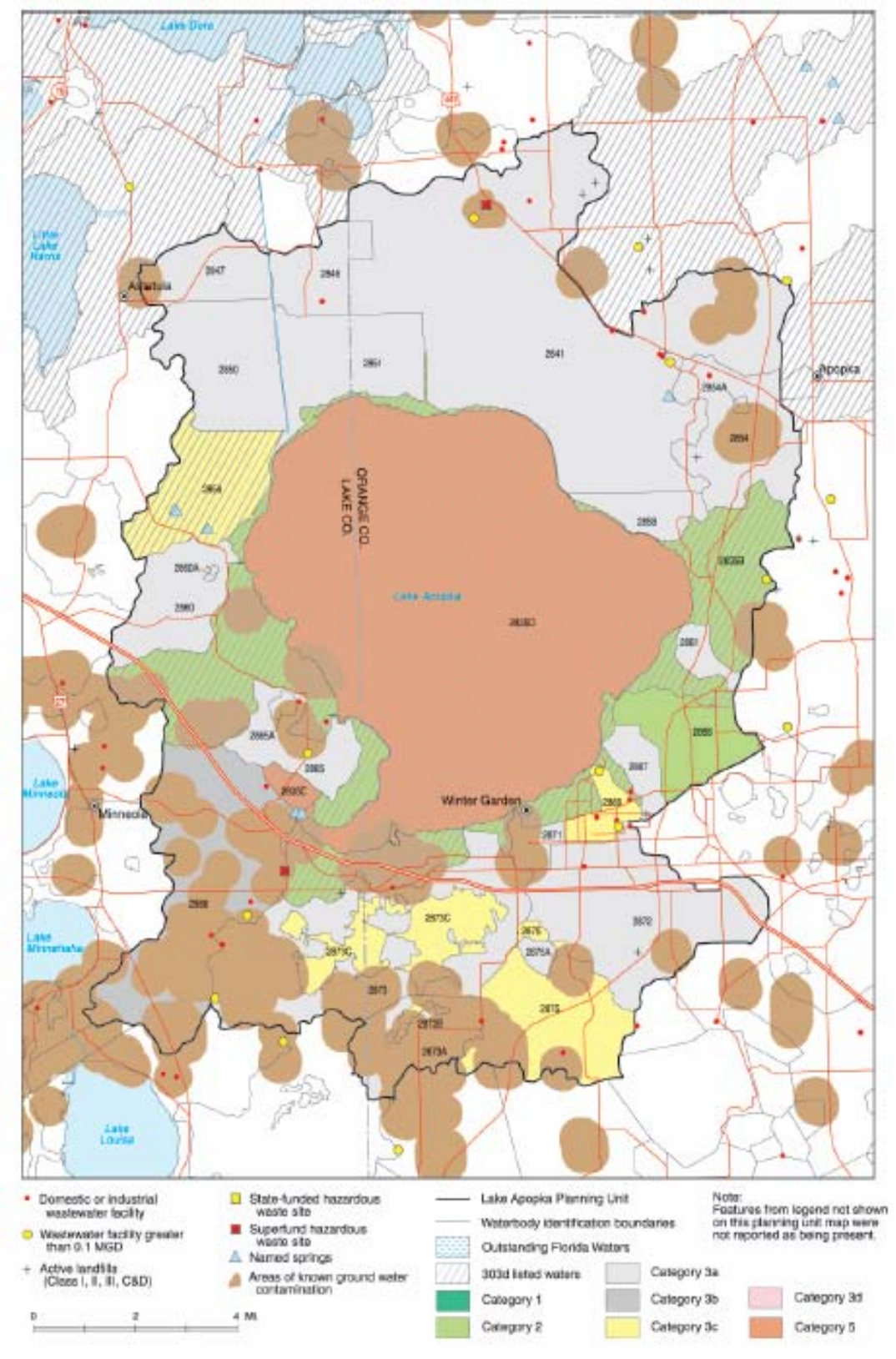
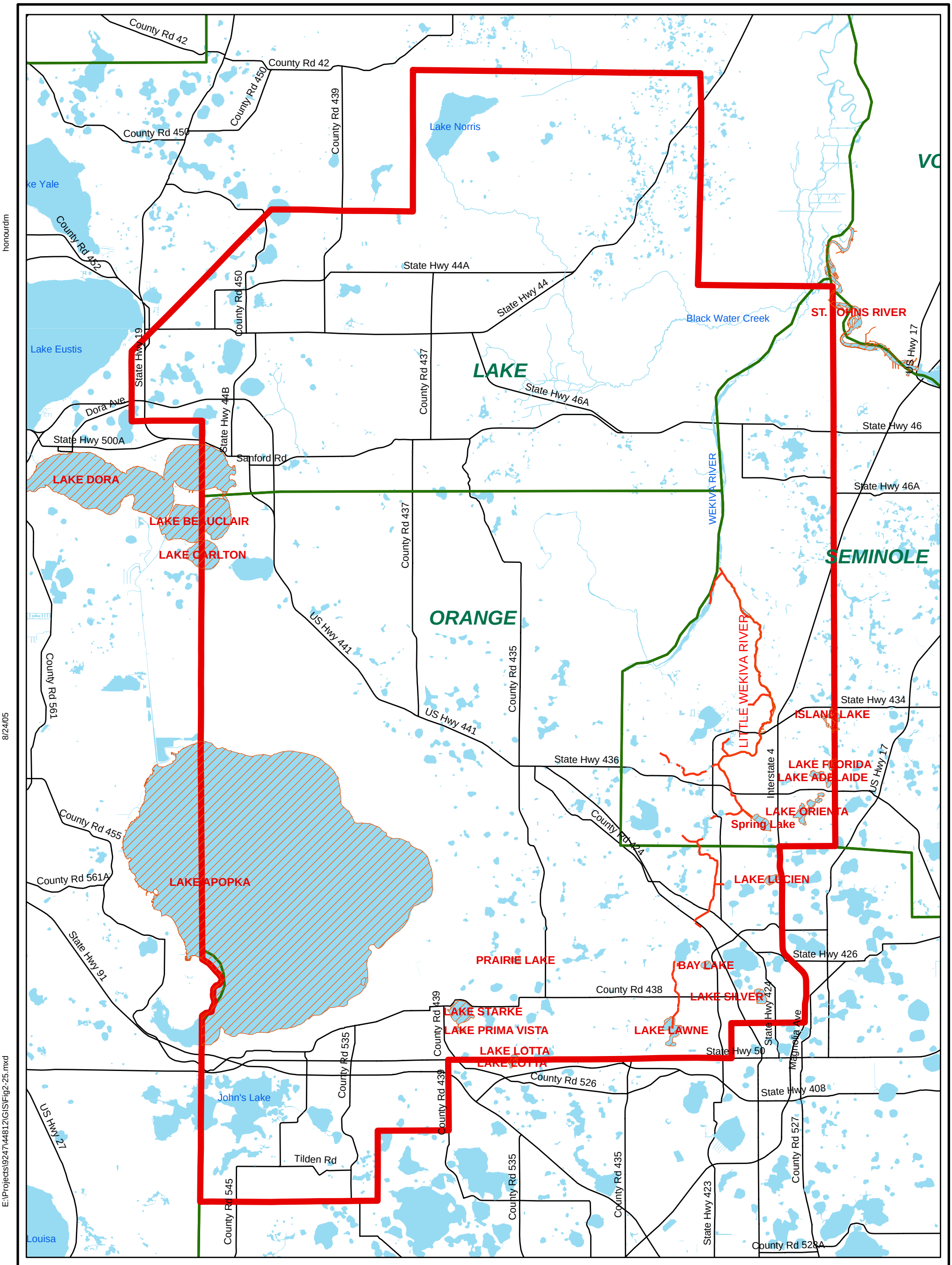


Figure 2-24 Potentially Impaired WBIDs in the Lake Apopka Planning Unit of the Ocklawaha Watershed



honourdm

8/24/05

E:\Projects\9247\44812\GIS\Fig2-25.mxd

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-25
Verified Impaired Water Bodies

2.10 Groundwater

This section provides background information on groundwater resources in the WSA. The different aquifer systems, groundwater flow, recharge, projected drawdowns due to pumping, and areas of groundwater contamination within the WSA will all be discussed in the following sub-sections.

2.10.1 Hydrogeology of the Aquifer Systems

The hydrogeologic units in the WSA are the surficial aquifer system, the intermediate confining unit, and the Floridan aquifer system. The surficial aquifer system, formerly referred to as the "water table aquifer" contains water under primarily unconfined conditions. The intermediate confining unit consists of lower permeability sediments that confine the water in the Floridan aquifer system. The Floridan aquifer system has two major water-bearing units; the upper Floridan aquifer and the lower Floridan aquifer, these are separated by a less permeable semi-confining unit (Miller, 1986; Spechler and Halford, 2001; others). Hydrologic cross-sections of the Middle St. Johns Groundwater Basin, which includes the Wekiva Basin, are included on **Figure 2-26**.

2.10.1.1 Surficial Aquifer System

The surficial aquifer system is defined in Florida as the permeable hydrogeologic unit contiguous with land surface that is comprised principally of unconsolidated to poorly indurated clastic deposits (and in some areas well-indurated carbonate rock). The surficial aquifer system contains the water table aquifer and water within it under mainly unconfined conditions, although low permeability beds may cause semi-confined or locally-confined conditions (Southeastern Geological Society, 1986). The geology of the surficial aquifer system consists primarily of plio-pliestocene undifferentiated deposits. The upper pliestocene deposits consist primarily of quartz sands, with local deposits of shell and thin beds of clay. The lower Pliocene aged sediments consist of interbedded deposits of sand, shell fragments, and sandy clay (Spechler and Halford, 2001).

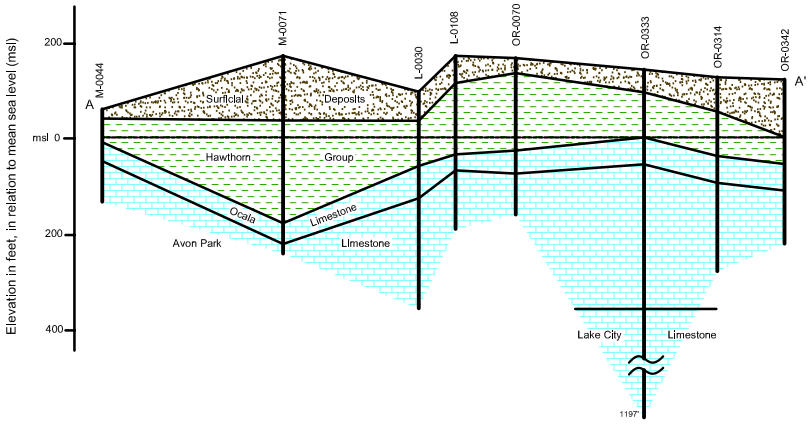
2.10.1.2 Intermediate Confining Unit

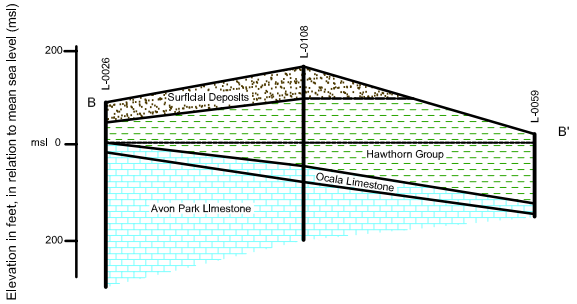
The intermediate confining unit includes all rocks that lie between and collectively retard the exchange of water between the overlying surficial aquifer system and the underlying Floridan aquifer system (Southeastern Geological Society, 1986). The intermediate confining unit strata belong to the mostly Miocene-aged Hawthorn Group. The Hawthorn Group consists of interbedded locally highly phospatic clay, silt, sand, limestone, and dolomite (Spechler and Halford, 2001).

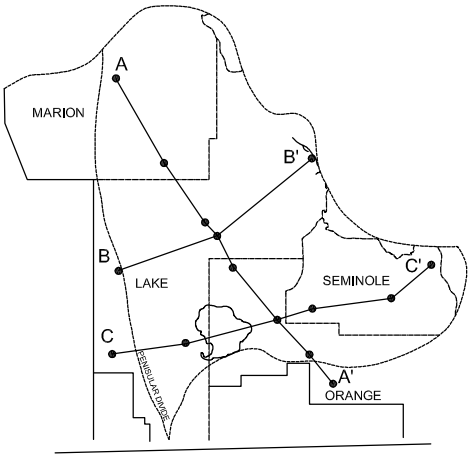
2.10.1.3 Floridan Aquifer System

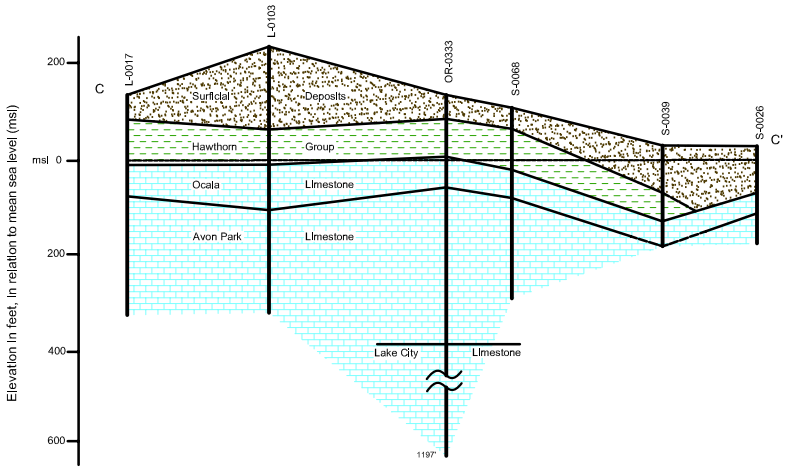
Miller (1986) defined the Floridan Aquifer System as consisting of a "vertically continuous sequence of carbonate rocks of generally high permeability that are mostly of middle and late Tertiary age and hydraulically connected in varying degrees and whose permeability is, in general, an order to several orders of magnitude greater

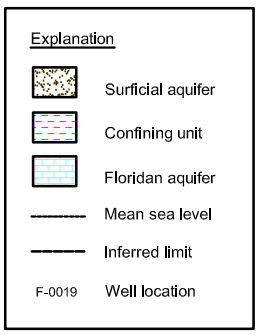
J:\9247\44812\ Geology 08/17/05 07:58:40 turnerss











Note: The USGS combines the Lake City and Avon Park limestone, calling them the Avon Park Formation (Miller, 1982)

Source: McKenzie-Arenberg, M., and G. Szell, 1990, TPSJ 90-11, SJRWMD, Palatka, Florida

Figure 2-26
Hydrologic Cross-Section of the Middle St. Johns Groundwater Basin
Wekiva Study Area

CDM

than that of those rocks that bound the system above and below". In the WSA, the Floridan aquifer system consists of the Ocala Limestone (late Eocene), Avon Park Formation (middle Eocene), and Oldsmar Formation (early Eocene). The boundary between the Ocala Limestone and Hawthorn Group (and thus between the Floridan aquifer system and intermediate confining unit) is an unconformity (Barraclough, 1962).

It has long been recognized that like most carbonate aquifers, the Floridan aquifer system is heterogeneous, consisting of a number of relatively thin aquifers separated by relatively impermeable beds (e.g., Barraclough, 1962; and many others). Miller (1986) formally subdivided the Floridan aquifer system into three principal zones; the Upper Floridan aquifer, middle semiconfining unit, and lower Floridan aquifer. Miller's hydrostratigraphic division of the Floridan aquifer system is now almost universally accepted. In the WSA, the upper Floridan aquifer consists of the Ocala Limestone and the upper part of the Avon Park Formation. The middle semiconfining unit consists of the middle part of the Avon Park Formation and the lower Floridan aquifer consists of the lower Avon Park Formation and the Oldsmar Formation. The middle semiconfining unit is more similar to a relatively low transmissivity aquifer rather than an impervious unit (Spechler and Halford, 2001).

2.10.2 Groundwater Flow

The following section describes the groundwater flow components in the surficial aquifer system, intermediate confining unit, and Floridan aquifer system over the WSA. In addition, this section includes a brief description of the regional groundwater flow system.

2.10.2.1 Surficial Aquifer System

The surficial aquifer system receives recharge from rainfall; irrigation water derived from groundwater, surface water bodies, and reclaimed water; and septic tank effluent. The largest rates of recharge occur where the soils of the unsaturated zone consist of permeable sand and overland runoff is minimal. The Floridan aquifer also supplies recharge in lowland areas where the potentiometric surface of the Floridan aquifer is higher than the potentiometric surface of the surficial aquifer system. Water discharges from the surficial aquifer system from evapo-transpiration, seepage to surface water bodies, pumping, and downward leakance to the Floridan aquifer system in areas where the potentiometric surface of the surficial aquifer is higher than that of the Floridan aquifer (McGurk and Presley, 2002).

2.10.2.2 Intermediate Confining Unit

The thickness of the intermediate confining unit is highly variable, resulting in highly varying degrees in vertical movement of water between the surficial aquifer system and the Floridan aquifer. In areas where the unit is thick or where it contains much clay, leakance through the unit is very low. In these areas, water in the surficial aquifer moves primarily laterally and is discharged into surface water bodies (Miller,

1986). Leakance of the intermediate confining unit calibrated in regional flow models for east-central Florida ranged from $1x10^{-5}$/day to $4x10^{-3}$/day (Murray and Halford, 1996) and from $1x10^{-6}$/day to 0.8/day (McGurk and Presley, 2002). The thickness of the intermediate confining unit in the study area ranges from less than 50 feet in Lake and Seminole Counties to approximately 150 feet along the Mt. Dora Ridge in northern Orange County. In the areas where the intermediate confining unit is thinnest sinkholes are common. These sinkholes, which are often filled with permeable surficial sands, provide direct avenues for water from the surficial aquifer system to recharge the underlying Floridan aquifer system (Spechler and Halford, 2001). In addition to sinkholes, several springs are present east of the Mt. Dora Ridge where the intermediate confining unit is thinnest, creating pathways for water from the Floridan aquifer to discharge to the surface.

2.10.2.3 Floridan Aquifer System

Naturally occurring recharge to the Floridan aquifer system is derived almost entirely from downward leakage from the surficial aquifer system. Low rates of recharge occur where the water levels in the surficial aquifer system are only slightly above the potentiometric surface of the Upper Floridan aquifer, or where the intermediate confining unit is sufficiently thick to retard downward leakance. Low-rate recharge areas coincide with topographically low or flat areas where the water table is consistently near land surface. High rates of recharge occur where the vertical gradient between the surficial aquifer and the Floridan aquifer system is the greatest, or where the intermediate confining unit is thinnest. High-rate recharge areas coincide with highlands characterized by sandy ridges with deep water table soils and karst topography, and where there are few perennial streams to collect overland runoff (McGurk and Presley, 2002).

2.10.2.4 Regional Groundwater Flow

The Mt. Dora Ridge runs diagonally across the WSA from the northwest toward the southeast (see **Figure 2-27**). This region is characterized by higher elevations, thicker sandy surficial deposits, and karst topography. Recharge of the Floridan aquifer system from downward leakance from the surficial aquifer system is greatest in this area with isolated recharge values in excess of 20 inches per year (see **Figure 2-28**). Highlands like the Mount Dora Ridge contain numerous internally drained lakes and depressions, are areas of effective recharge to the Floridan aquifer system and, thus, are important to water supply (USGS, 2005).

East of the Mt. Dora Ridge there is a significant decrease in elevation to the Marion Uplands to the northeast and the Osceola Plain in the southeast of the study area. In this area the potentiometric surface of the Upper Floridan aquifer is near or greater than the potentiometric surface of the surficial aquifer system, resulting in several springs, most notable is Wekiva Spring. In areas surrounding these springs, as well as, the Wekiva River and St. Johns River, discharge from the Floridan aquifer occurs.

honourdm

8/14/05

E:\Projects\9247\44812\GIS\Fig2-27.mxd

Lake Norris

ke Yale

Lake Eustis

Marion Upland

Black Water Creek

St. Johns River Offset

LAKE

WEKIVA RIVER

SEMINOLE

ORANGE

Osceola Plain

Mount Dora Ridge

Orlando Ridge

Central Valley

Lake Apopka

Orlando Ridge

John's Lake

Lake Wales Ridge

Louisa

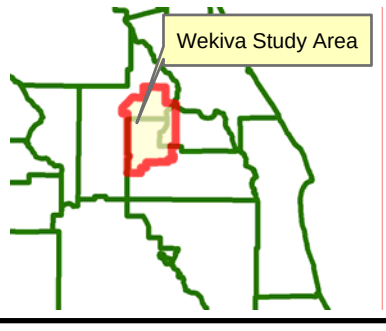
N

W E

S

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

Wekiva Study Area

County Line

Water Bodies

Physiographic Provinces

Central Valley

Lake Wales Ridge

Marion Upland

Mount Dora Ridge

Orlando Ridge

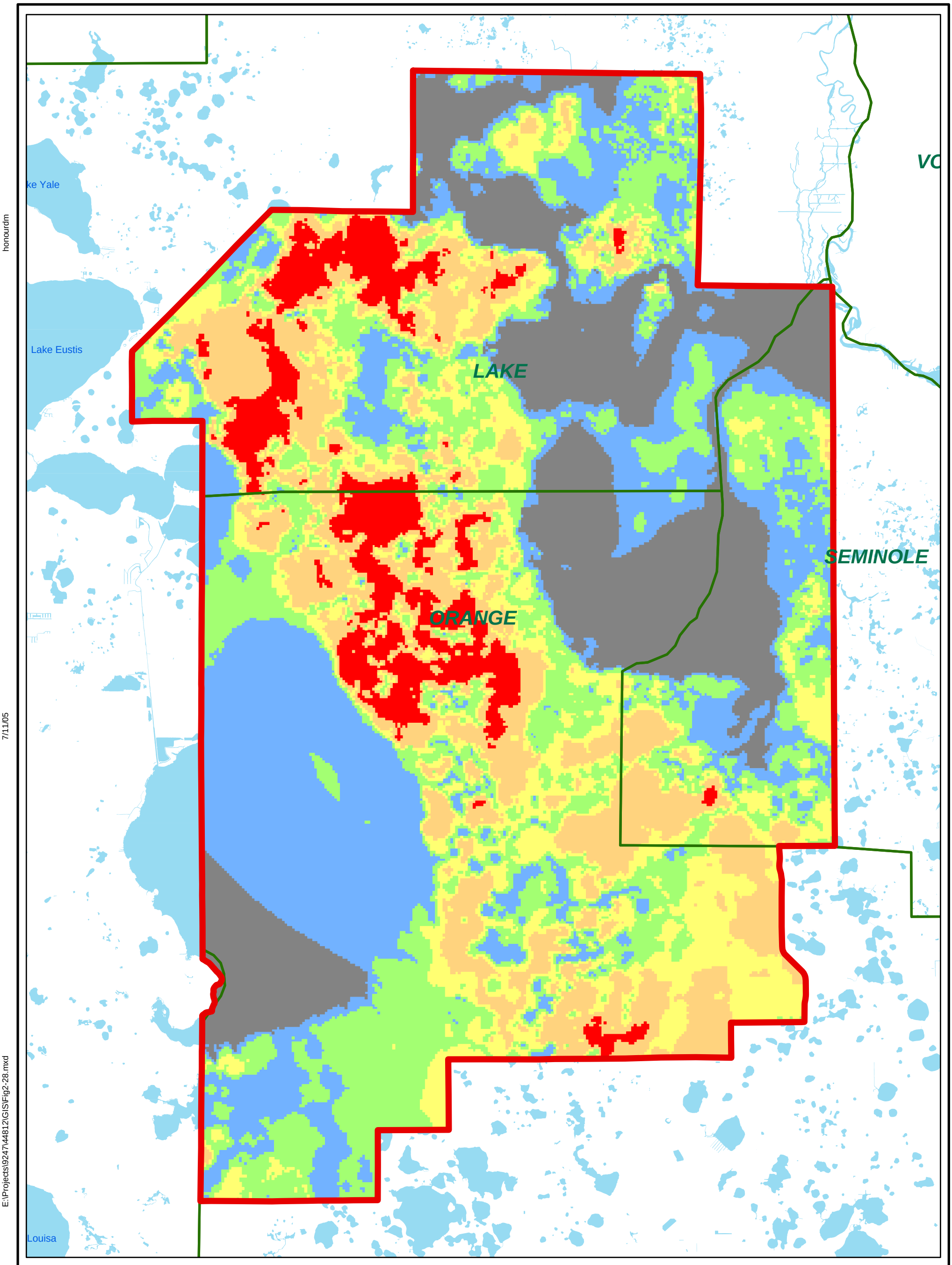
Osceola Plain

St. Johns River Offset

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-27
Physiographic Provinces



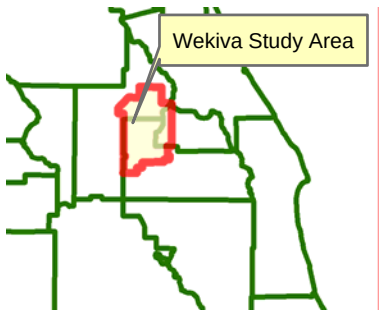
Source: Recharge Areas of the Floridan Aquifer in the St. Johns River Water Management District (SJRWMD, 2005).

N
W E
S

0 3,500 7,000 14,000 21,000 Feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies

Recharge Range

- Discharge Area
- 0 - 4 In/Yr
- 4 -8 In/Yr
- 8 - 12 In/Yr
- 12 - 20 In/Yr
- More than 20 In/Yr

CDM

Figure 2-28
Estimated Recharge in the Wekiva Study Area

The western most portion of the study area consists of the Central Valley. In this region the potentiometric surface of the surficial aquifer system is only slightly above the potentiometric surface of the Floridan aquifer resulting in little to no recharge of the Floridan aquifer. This region is also dominated by Lake Apopka, which results in high values of evaporation in this area.

Regional groundwater flow in the Floridan aquifer is from the southwest toward the northeast. High-rate recharge occurs to the Floridan aquifer in the Mt. Dora Ridge region, groundwater flows to the northeast in the Floridan aquifer, and the water is discharged back to the surficial aquifer system in the lowland areas in the east.

2.10.3 Recharge

Recharge to the Floridan aquifer system occurs naturally from downward leakage of water from the surficial aquifer system, and directly from precipitation in places where the intermediate confining unit is missing. Recharge can also occur artificially through drainage wells and discharge of treated effluent (Adamski & German, 2004). Recharge to the upper Floridan aquifer can also occur in areas where the elevation of the water table is higher than the potentiometric surface of the aquifer. Adamski and German (2004) also cited that in western Orange County, natural recharge rates can be as high as 25 inches/yr, whereas in much of Orange County, the rate is less than 10 inches/yr.

The Floridan aquifer recharge map shown in Figure 2-28 is the 2004 update to the map originally published in Technical Publication SJ93-5, "Recharge Areas of the Floridan Aquifer in the St. Johns River Water Management District." The recharge map provides a regional assessment of recharge to the Floridan aquifer. The map is intended to be used as a regional planning aid for groundwater resource management and is not intended for site-specific assessments.

Boniol et. al. (1993) calculated recharge rates to the Floridan aquifer based on an analysis of the hydraulic pressure differences between the surficial aquifer water table and the Floridan potentiometric surface, and on the leakance of water through the confining unit separating the aquifers. The study cited that recharge also occurs directly from infiltrating rainfall where the limestone of the Floridan aquifer is at or near land surface. Significant recharge may also occur where the confining unit is breached by sinkholes and sinkhole-related features, depending on the hydrogeologic relationships between the surficial and Floridan aquifers.

The study used the following mathematical operations to determine confining unit leakance, hydraulic pressure differences between the surficial and Floridan aquifers, and recharge to the Floridan aquifer:

Hydraulic Pressure Difference = Water Table Elevation - Floridan Potentiometric Surface Elevation

Leakance = Vertical Hydraulic Conductivity of Confining Unit / Thickness of Confining Unit

Recharge = Hydraulic Pressure Difference * Leakance

A literature review was performed of existing regional groundwater models that have been completed in the vicinity of the WSA in order to identify recharge values that have been applied. **Table 2-9** summarizes and compares the parameters used in each study for the purpose of developing a water balance.

Table 2-9
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Water Balance Estimates For the Wekiva Springshed

Source of Water Balance Estimate	Spechler & Halford, 2001	Boniol *et al*., 1993	McGurk & Presley, 2002	HydroGeologic, 2005	Wanielista, *et al.*, 2005
Analysis/Modeling Period	1970-1996	1993	1995 and 2020	1995 and 1999 - 2025	1995
Analytical Basis	Transient Modeling	Darcy's Law	Steady State Modeling	Transient Modeling	Transient Modeling
Type of Analysis/Modeling	3D GW Flow Modeling	GIS mapping based calculations	3D GW Flow Modeling	3D Integrated GW/SW Flow Modeling	3D Integrated GW/SW Flow Modeling
Focus of Analysis/Modeling	Floridan Aquifer Water Levels & Flows	Floridan Aquifer Recharge	Floridan Aquifer Water Levels & Flows	Surficial & Floridan Aquifer Water Levels & Flows	Delineation of Wekiva springshed & how development affects recharge & springflow
Water Balance Time Period	1970-1996	1993	1995	1995	1995
Water Balance Reference Layer	Surficial & Floridan Aquifers	Floridan Aquifer	Surficial Aquifer	Surficial & Floridan Aquifers	Surficial Aquifer
Inflow Terms					
Rainfall	51	-	Fig. 33 42-57	Fig 3.1 40-60	49
Irrigation – private golf course & agricultural	1.3	-	Fig. 36 0-20 (<5)	Fig 3.2 0-90	-
Irrigation – from public water supply for landscaping			Fig. 37 0 - <5 (2)		
Reclaimed water			Fig. 34 (0)		
Septic system discharges			Fig. 35 0 – 5 (1)	Fig 3.3 0-9	
Inflow to Drainage Wells	0.4	-	1 – 10	0.5 avg	-

Table 2-9
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Water Balance Estimates For the Wekiva Springshed

Source of Water Balance Estimate	Spechler & Halford, 2001	Boniol *et al*., 1993	McGurk & Presley, 2002	HydroGeologic, 2005	Wanielista, *et al.*, 2005
Outflow Terms					
Evapotranspiration	39	-	Fig. 29 47 max 27 – 47	36 avg <30 - >45	24
Surface Water discharge	11	-	-		-
Spring discharge		-	-		-
Overland Runoff		-	Fig. 40 <1 - >10 (<1)	9.7 avg	-
Groundwater Discharge		-	-		-
Infiltration	-	>12	15 – 45	Fig 3.4 57 avg. 10 – 80	7.3 avg. 3.2 – 12
Pumpage from Floridan Aquifer	2.5	-	-	6.9 avg	-
Net Lateral Flow in Surficial Aquifer	0	-	-		-
Net Lateral Flow in Floridan Aquifer	<1	-	-		
Recharge Terms					
Surficial Aquifer Net Recharge	Fig. 53 0 – 25 (20)		Fig. 41 <5 – 45 (20)	57 avg. 10 – 80	7.3 avg. 3.2 - 12
Floridan Aquifer Net Recharge		0 - >12	Fig. 56 <5 - >20 (10)		0 - >12

Notes:

When available, report displays are cited, including Figures, Tables, and page numbers.

Ranges and typical values are presented in this format: "min – max (typical)".

All water balance estimates are inches per year.

Spechler R. and K. Halford 2001. *Hydrology, Water Quality and Simulated Effects of Groundwater Withdrawals from the Floridan Aquifer System, Seminole County and Vicinity, Florida*. USGS Water Resources Investigations Report 01-4182.

Boniol D, Williams M. and D. Munch, 1993. *Mapping Recharge to the Floridan Aquifer Using a Geographic Information System in then St. Johns River Water Management District.* St. Johns River Water Management District Technical Publication SJ93-5.

McGurk B. and P. Presley, 2002. *Simulation of the Effects of Groundwater Withdrawals on the Floridan Aquifer System in East-Central Florida - Model Expansion And Revision*. St. Johns River Water Management District Technical Publication SJ2002-3.

HydroGeologic, 2005. *Development of an Integrated Surface Water/Ground Water Model (ISGM) in Western Orange and Seminole Counties, Florida - Final Report*. Prepared for the St. Johns River Water Management District.

Wanelista, M. Hulstein, E., Yuan, L., and G.T. Yeh, 2005. *Wekiva Area Water Budget*. Prepared by the University of Central Florida Stormwater Academy for the Florida Department of Transportation.

2.10.3.1 Recharge Criteria Rulemaking

As part of the WPPA legislation, the SJRWMD is also to address rulemaking as per Section 369.318 (4) and (6) which state:

> *"By March 1, 2005, the SJRWMD, in conjunction with the Department of Environmental Protection, shall initiate rulemaking to amend the recharge criteria in Rule 40C-41.063(3), F.A.C., to provide that the post-development recharge volume conditions within the Wekiva Study Area approximate pre-development recharge volume conditions. The SJRWMD shall study and undertake this rulemaking to accomplish this standard on a development-specific basis. The rule shall permit the utilization of existing permitted municipal master stormwater systems with adequate capacity to meet the new standards in lieu of onsite retention and shall provide applicants with the ability to submit appropriate geotechnical information demonstrating that a specific site is not within a most effective recharge area of the Wekiva Springshed."*
>
> *"The SJRWMD shall conduct an analysis of the impact of redevelopment projects in the Wekiva River basin upon aquifer recharge and shall consider whether to adopt a rule amendment to require those redevelopment projects exceeding a specified threshold to meet the Wekiva Basin recharge criteria. The effect of redevelopment upon aquifer recharge shall be analyzed and then the costs of regulation shall be analyzed."*

As a separate effort, CDM provided support to the SJRWMD with the rulemaking process using a phased approach described as follows:

Phase I
CDM performed a review of several related documents and after this brief literature review determined that the Floridan aquifer supplies the major springs of the springshed and that water supply demands are the principal factor affecting spring flows.

Phase II
This phase was targeted at performing the engineering evaluations to develop a methodology that can be used to estimate the pre- and post-development recharge volumes for a typical development within the Wekiva River Springshed. As mandated by the legislature, evaluation results will support the development of design standards that will help preserve and potentially enhance pre-development recharge volume evaluated as surface infiltration.

Correlations between local development (i.e., within the Springshed) and spring flow reductions may seem to be strong, but this may be due to the coincident lowering of the Floridan aquifer's piezometric levels due to pumping across a much wider area than the local springsheds. Given the difficulty of showing direct cause-and-effect results from maintaining, or improving upon, the recharge of rainfall-runoff volumes, CDM recommended a simpler, more generalized approach that relies upon ease-of implementation, instead of modeling that may be difficult to perform, and which may not demonstrate the benefits adequately.

This approach used surface rainfall-runoff-infiltration modeling; with the emphasis placed on simulating the recharge process in the form of infiltration but not performing integrated groundwater-surface water modeling. Evidence that infiltration (recharge) volumes are maintained, rather than demonstrating the effects on spring flows, is needed. This is based on understanding that (a) the governing legislation stipulates maintaining recharge and (b) several factors besides local site-specific recharge, affect spring flows.

The current recharge rule (3 inches retention over the directly connected impervious area (DCIA) on Type A soils) has been in effect since 1987.

The long-term protection plan for the springs in the Wekiva Springshed consists of both demand and supply components, including control of Floridan aquifer drawdown and maintenance of Floridan aquifer recharge. CDM established the mass balance relationship for different soil type and percentage DCIA combinations to develop a methodology that can be used to estimate the pre- and post-development recharge volumes for a typical development within the Wekiva River Springshed. The modeling showed that for Type A soil with 75% DCIA and a 72-hour recovery period, 90% capture was seen at about 2-inches. The current 3 inch rule, therefore, represents an adequate approach for meeting the Wekiva Rulemaking objectives. It includes a safety factor as well for areas that may not have sufficient recharge.

The following *DRAFT* recommendations for this phase of the study were made:

- The current 3-inch rule is working well and the water quality 1-inch requirement generally sets the surface water facility area. In addition, the flood control requirements for the 25-year storm establish the facility volume. The Wekiva Recharge rule for these cases effectively requires a retention Best Management Practice (BMP).

- A safety factor may be defined for these recharge systems.

- The BMP Treatment Train concept is recommended to treat and recharge runoff. Improved landscape irrigation methods (i.e. landscape swales, vegetated buffer strips) along parking lots, roadways and rear yards should also be encouraged to provide reuse of stormwater runoff and could reduce potable water demand for irrigation.

2.10.4 Projected Drawdowns

Florida Statutes require the water management districts to conduct water supply assessments every 5 years to determine the following:

- Existing legal uses, reasonably anticipated future needs, existing and reasonably anticipated sources of water and conservation efforts

- Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs, and to sustain the water resources and related natural systems

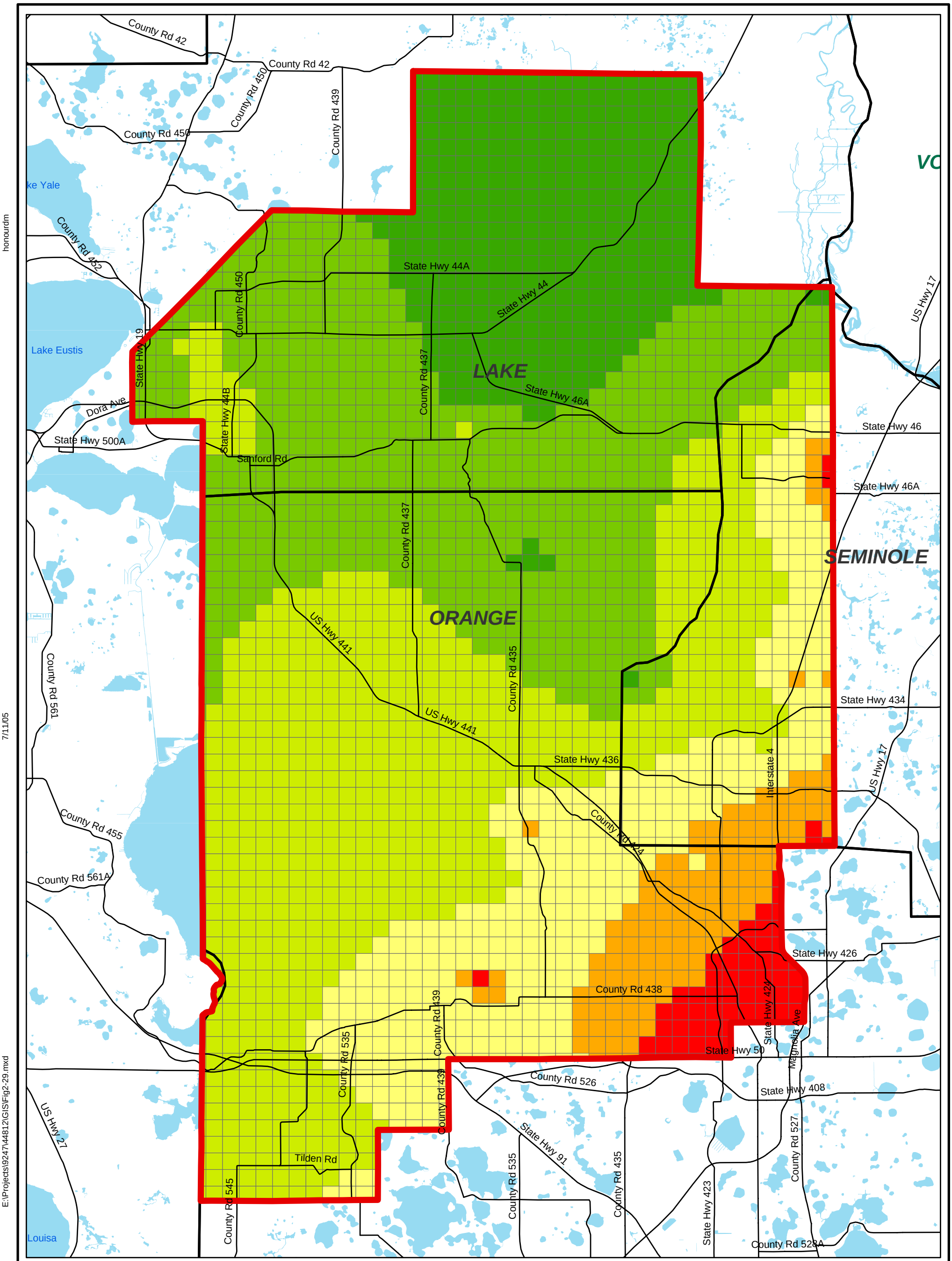
The SJRWMD completed the Draft 2003 Water Supply Assessment which is the first update to the initial 1998 assessment. The 2003 Water Supply Assessment projects water use to the year 2025, and will be used to update the SJRWMD's 2005 District Water Supply Plan. In the SJRWMD's jurisdiction, public supply demand is projected to increase by 80% by the year 2025. This accounts for 70% of the total water use demand.

Based on the assessment, the SJRWMD identified priority water resource caution areas (PWRCAs). These are areas where the SJRWMD has determined that current and anticipated sources of water and conservation efforts are not adequate to meet projected needs for the planning period and sustain the water resources and related natural systems. To meet the projected demand in 2025, the SJRWMD has determined that alternative management strategies will need to be implemented and/or alternative water supplies will need to be developed. Based on review of the Draft 2003 Water Supply Assessment, the entire WSA is considered to be a PWRCA.

As part of the assessment, the SJRWMD developed regional groundwater flow models to predict the potential reductions in surficial aquifer levels and spring discharges. GIS coverages of the potential reduction in the Floridan and surficial aquifer levels in the WSA were provided by the SJRWMD and are shown in **Figures 2-29** and **2-30**, respectively. As can be seen from Figure 2-29, the greatest projected water level decline (greater than 5 feet) in the Floridan Aquifer is concentrated in the southeast corner of the WSA primarily within the City of Orlando limits. The areas in the WSA with the greatest projected water level declines (i.e., greater than 2 feet) for the surficial aquifer are not as uniform as those projected for the Floridan aquifer, but are mainly concentrated in the City of Ocoee, the south central portion of Orange County, the City of Altamonte Springs, the City of Longwood and the eastern portion of Seminole County.

2.10.5 Groundwater Contamination

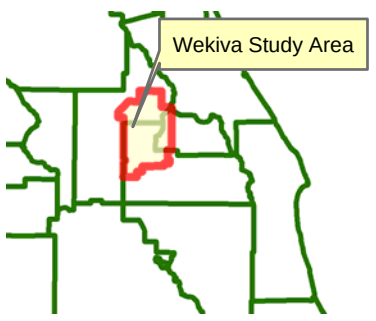
A program for prevention of contamination of new potable water wells within areas of known groundwater contamination (Chapter 62-524, F.A.C.) was established in 1988. The responsibility of permitting these new wells was subsequently delegated from FDEP to the respective water management districts. Through this program, areas of groundwater contamination were delineated and are shown on **Figure 2-31** for the WSA. The large majority of delineated areas with and around the WSA are contaminated with the pesticide ethylene dibromide (EDB). EDB, which was primarily used in agricultural practices as a soil fumigant, was banned by EPA in the early 1980s. Other contaminants in the WSA that were identified include arsenic, chromium, lead, mercury, sodium, benzene and nitrates.



Source: Draft 2003 Water Supply Assessment, SJRWMD

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Major Roads

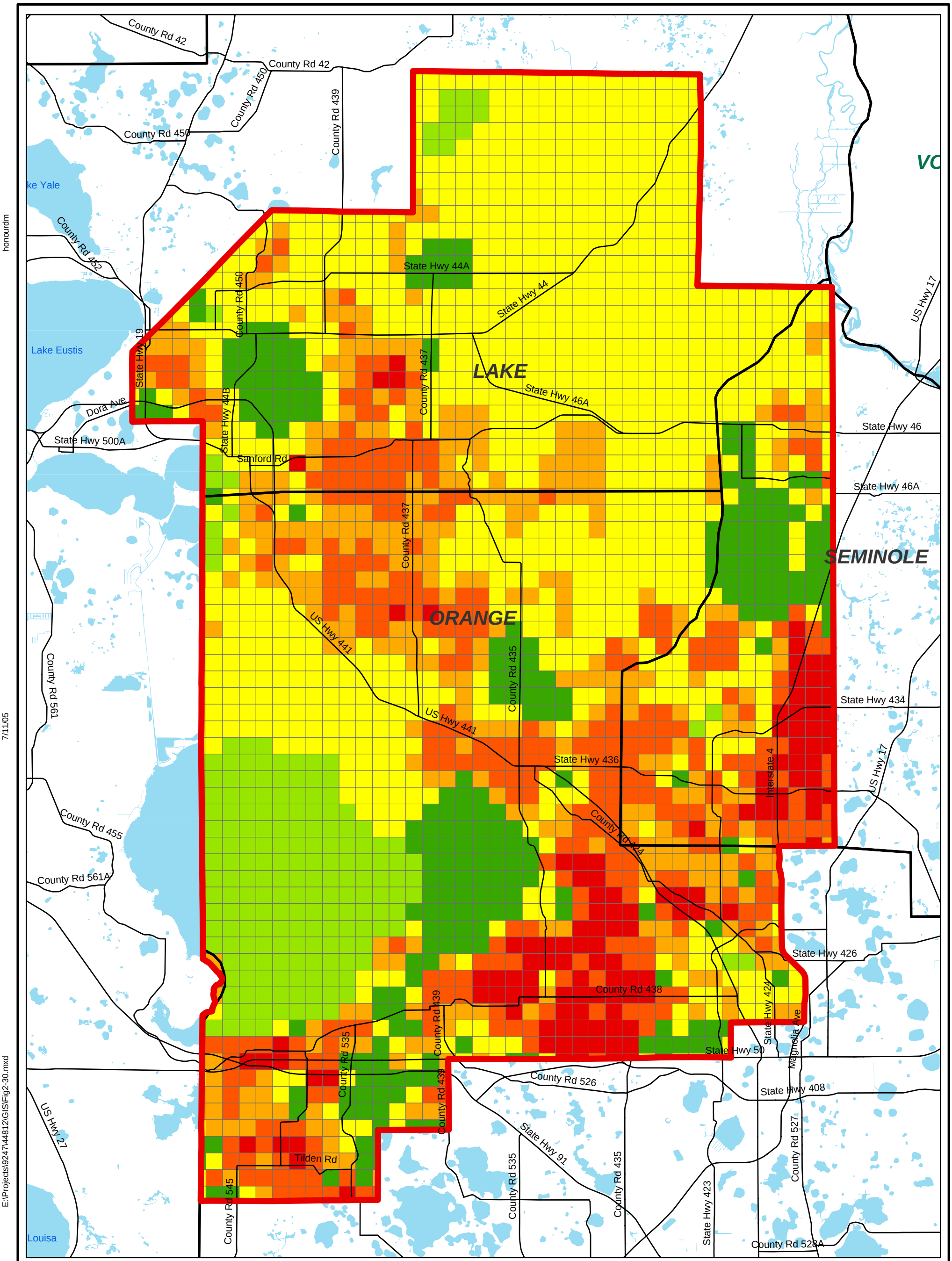
Water Level Decline

- 0 to 1 feet
- 1 to 2 feet
- 2 to 3 feet
- 3 to 4 feet
- 4 to 5 feet
- > 5 feet
- Water Bodies

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

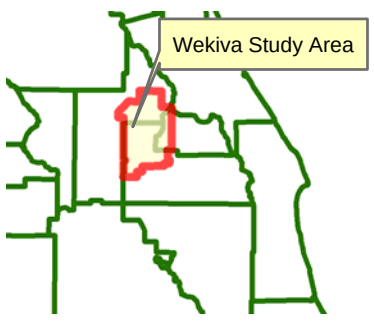
Figure 2-29
Floridan Aquifer - Projected Change in Groundwater Elevation (2000 to 2025)



Source: Draft 2003 Water Supply Assessment, SJRWMD

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Major Roads
- Water Bodies

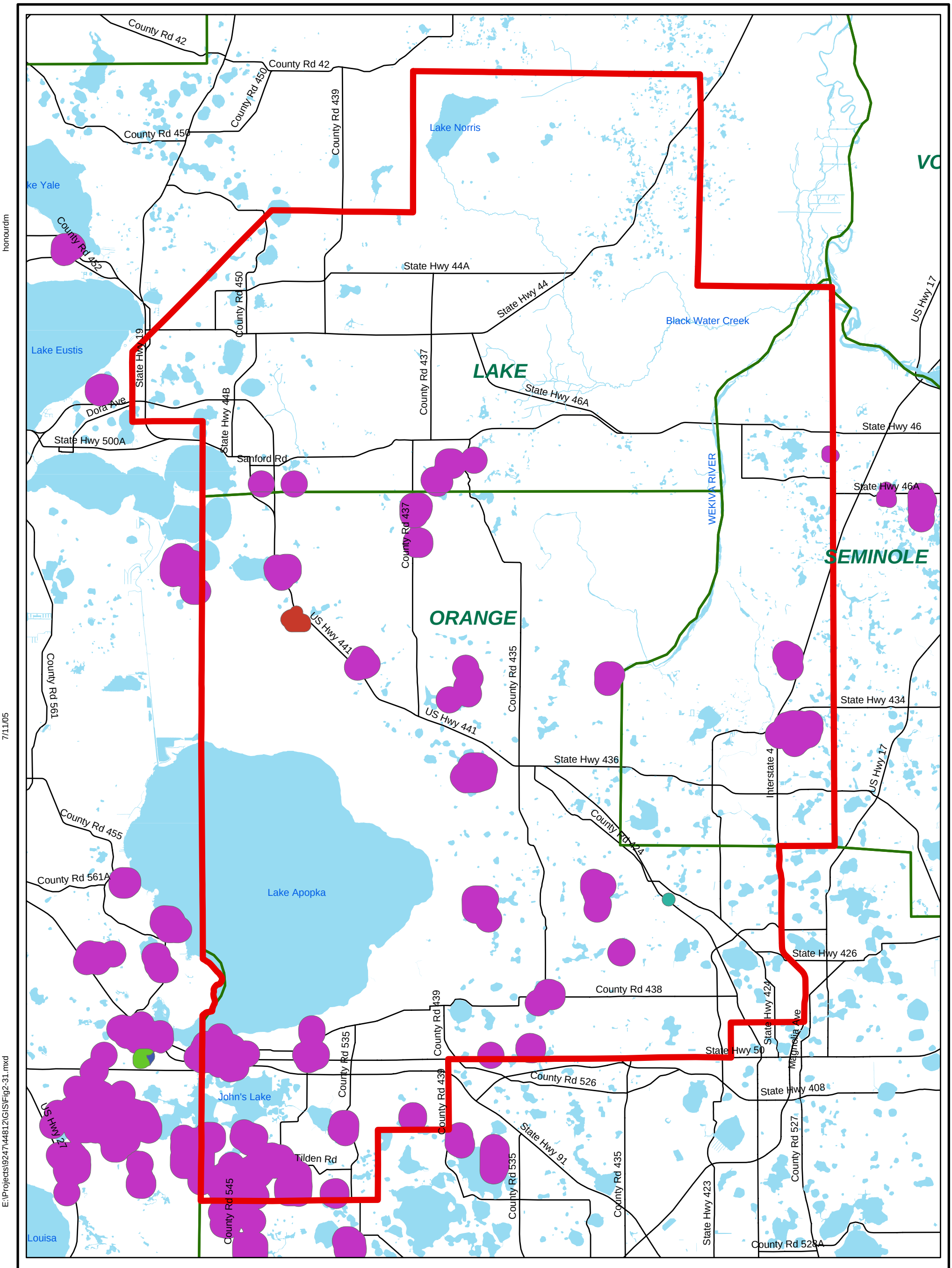
Water Level Decline

- Water Level Increase
- No Change in Water Level
- < 0.5 feet
- 0.5 to 1 feet
- 1 to 2 feet
- > 2 feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-30
Surficial Aquifer - Projected Change in Groundwater Elevation (2000 to 2025)



honourdm

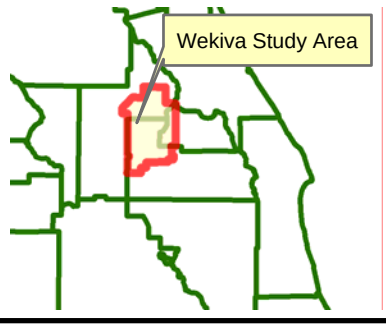
7/11/05

E:\Projects\9247\44812\GIS\Fig2-31.mxd

Source: New Potable Well Permitting in Delineated Areas, Chapter 62-524, FAC, 6/27/2000

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

Areas of Groundwater Contamination
Constituents
- Metals, Nitrate & Benzene
- Metals, Trichloroethene, Benzene
- Metals, Trichloroethene, Benzene, EDB
- Benzene
- EDB

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-31
Areas of Groundwater Contamination (Floridan Aquifer)

2.11 Wekiva Aquifer Vulnerability Assessment

In the WSA, springs are fed by rainfall and irrigation that percolates through the ground to the aquifer or directly through conduits such as sinkholes. FDEP's 2004 report, *A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area*, studied the efficacy and applicability of water quality and wastewater treatment standards needed to achieve nitrogen reductions protective of surface and groundwater quality within the WSA. The report states that "…the health of spring systems can either be slowly or much more rapidly influenced by activities and land uses within the recharge basin". Several studies by the State's water management districts, the United States Geologic Survey (USGS) and the Florida Geologic Survey (FGS) have demonstrated the connections between land activities and water quality in the aquifer. In order to better characterize these connections, the FGS applied a modeling technique used in the statewide Florida Aquifer Vulnerability Assessment (FAVA) to the WSA. The result was a coverage, also known as the Wekiva Aquifer Vulnerability Assessment (WAVA), that defines three major protection zones in the WSA (see **Figure 2-32**). It is based on soil permeability, buffered effective karst features, thickness of the intermediate confining unit and the head difference between the surficial and Floridan aquifer systems. A more detailed description of how this coverage was developed is provided in a report entitled "Report of Investigation No. 104, Wekiva Aquifer Vulnerability Assessment" prepared for the FGS (2005). The vulnerability zones are defined as the following:

- More Vulnerable – those areas expected to most directly (time of travel and reduced natural attenuation) affect the resulting water quality at the springs in the WSA.

- Vulnerable – those areas that still contribute water to the springs, but over a longer period of time and allowing somewhat greater natural attenuation of nitrogen.

- Less Vulnerable – those areas where flow to the springs is thought to be minimal or non-existent.

Within the WSA, the More Vulnerable Zone accounts for approximately 19.5% of the land area, the Vulnerable Zone accounts for 49.3%, while the Less Vulnerable Zone accounts for 31.2% of the land area.

2.12 Drainage Wells

Drainage wells are widely used for the disposal of stormwater by underground injection wells into the aquifer. It is estimated that in Central Florida approximately 40 percent of the aquifer recharge is through drainage wells (Sheffield et. al., 1995). In the State of Florida, drainage wells are currently regulated under FDEP's Underground Injection Control Program and the applicable rules are included in Chapter 62-528, F.A.C. Drainage wells are classified as Class V wells under Group 6, stormwater wells. These are defined as those wells used to drain surface fluid, primarily stormwater runoff or for lake level control, into a subsurface formation.

honourdm

honourdm

7/11/05

E:\Projects\9247\44812\GIS\Fig2-32.mxd

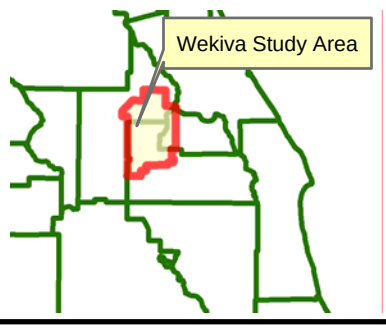
County Rd 42
County Rd 42
County Rd 450
County Rd 450
County Rd 439
Lake Norris
ke Yale
County Rd 452
State Hwy 44A
State Hwy 44
Black Water Creek
US Hwy 17
County Rd 450
State Hwy 19
Lake Eustis
LAKE
County Rd 437
State Hwy 46A
Dora Ave
State Hwy 44B
State Hwy 500A
Sanford Rd
State Hwy 46
WEKIVA RIVER
State Hwy 46A
County Rd 437
SEMINOLE
ORANGE
US Hwy 441
County Rd 435
County Rd 561
US Hwy 441
State Hwy 434
State Hwy 436
Interstate 4
US Hwy 17
County Rd 427
County Rd 455
County Rd 561A
Lake Apopka
State Hwy 426
County Rd 439
County Rd 466
State Hwy 424
Magnolia Ave
State Hwy 50
County Rd 535
County Rd 439
County Rd 526
State Hwy 408
John's Lake
US Hwy 27
State Hwy 91
County Rd 527
Tilden Rd
County Rd 545
County Rd 535
County Rd 435
State Hwy 423
Louisa
County Rd 528A

Source: Florida Geologic Survey

N
W
E
S

0 3,500 7,000 14,000 21,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

WAVA Zones

- Most Vulnerable
- Vulnerable
- Less Vulnerable

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-32
WAVA Zones

Rule 65-528.605 requires that new Class V wells be constructed so that their intended use does not violate the water quality standards of Chapter 62-520, F.A.C. (Ground Water Classes, Standards, and Exemptions) at the point of discharge. For those projects that are designed to recharge aquifers with surface water of comparable quality, or projects designed to transfer water across or between aquifers of comparable quality for the purpose of storage or conservation are required to meet federal primary as well as state primary and secondary drinking water standards at the point of discharge for projects. Those wells that were in existence prior to when the rule was adopted in 1982 were "grandfathered" in and may continue to operate as intended. According to Sheffield et. al., permits for existing wells would be required in the following cases:

- If an existing well is no longer used for its intended purposes, FDEP may require that it be plugged and abandoned;
- If FDEP finds a well is causing violations of primary drinking water standards or is affecting public health;
- To alter an existing well other than routine maintenance, or repair work to restore a well to its original condition; and
- Casing modifications, deepening of the well and changes to inlet elevation.

Construction permit criteria for new wells would also apply to the types of modifications listed above (i.e., they would require to meet federal primary, and state primary and secondary drinking water standards).

Drainage wells have been somewhat controversial as they are directly connected to the aquifer, and may potentially affect the groundwater quality if the surface water discharging through the drainage well is polluted. Pollutants of concern in untreated stormwater runoff are nutrients, solids, bacteria and viruses (Sheffield et. al., 1995). However, in many areas, drainage wells are the sole source of drainage, especially in land locked subbasins or those lakes that have no free outfall. If drainage wells are closed in these areas, there is a greater potential for flooding during the wet season. Recharge through drainage wells in Orange County is estimated to be between 38 to 50 mgd on average (Adamski and German, 2004).

The Central Florida Drainage Well Inventory prepared by Hartman & Associates, Inc. (2003), was referenced to identify those drainage wells within the WSA and shown on **Figure 2-33**. There are approximately 96 drainage wells within the WSA and their location and status are summarized in **Table 2-10**. These 96 drainage wells are located within 25 of the delineated subbasins in the WSA. Of these 25 subbasins, 14 are closed or limited discharge subbasins while the remaining 11 are subbasins with a free surface water outfall. According to the inventory status, of the 97 drainage wells within the WSA, 2 are classified as abandoned, 43 are active, 2 are capped, 2 are clogged, 1 is inaccessible, 1 is plugged, 41 are lost (i.e. buried, not locatable), and 5 need work.

honourdm

7/11/05

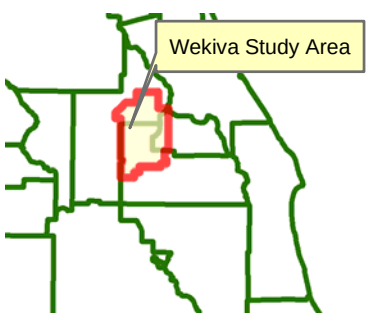
E:\Projects\9247\44812\GIS\Fig2-33.mxd

County Rd 42
County Rd 42
County Rd 450
County Rd 439
Lake Norris
Lake Yale
County Rd 452
State Hwy 44A
County Rd 450
State Hwy 44
State Hwy 19
Lake Eustis
Black Water Creek
US Hwy 17
LAKE
County Rd 437
State Hwy 46A
Dora Ave
State Hwy 44B
State Hwy 500A
Sanford Rd
State Hwy 46
WEKIVA RIVER
State Hwy 46A
County Rd 561
County Rd 437
SEMINOLE
ORANGE
US Hwy 441
County Rd 435
Interstate 4
State Hwy 434
State Hwy 436
US Hwy 441
County Rd 456
County Rd 424
County Rd 561A
Lake Apopka
State Hwy 91
County Rd 438
State Hwy 50
County Rd 526
John's Lake
County Rd 535
County Rd 439
State Hwy 408
US Hwy 27
Tilden Rd
State Hwy 436
County Rd 545
County Rd 535
County Rd 435
State Hwy 423
County Rd 523
County Rd 523A
ke Louisa

Source: Central Florida Drainage Well Inventory, Hartman & Associates, 2003; City of Apopka

0 3,500 7,000 14,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads

Drainage Wells

- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed

Incorporated Areas

- Altamonte Springs
- Apopka
- Eatonville
- Eustis
- Lake Mary
- Longwood
- Maitland
- Mount Dora
- Oakland
- Ocoee
- Orlando
- Winter Garden

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-33
Drainage Wells

Table 2-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Drainage Wells within the Wekiva Study Area

Unique ID	Longitude (Decimal Degrees)	Latitude (Decimal Degrees)	Address 1	Address 2	Owner	Drainage Source	Status
13	-81.43765	28.55738	Colonial Drive	Mercy Drive	City of Orlando	lake	active
18	-81.41509	28.60045	Lee Road	Orange Blossom Trail (441)	City of Orlando	lake	active
19	-81.38139	28.57603	Oberlin Avenue	Spruce Street	City of Orlando	street	active
20	-81.39362	28.57124	Westmoreland Drive	Princeton Street	City of Orlando	street	active
21	-81.39813	28.56912	Yale Street	Northumberland Avenue	City of Orlando	street	active
35	-81.42232	28.57817	Silverstar Road	Eunice Avenue	City of Orlando	street	active
51	-81.38380	28.58000	Harrison Avenue	Rosevear Street	City of Orlando	street	lost
52	-81.38649	28.58495	Golfview Boulevard	Par Street	City of Orlando	street	active
78	-81.40476	28.57661	Taft Avenue	Cumbe Avenue	Orange County	street	active
119	-81.38716	28.57867	Eagle	Par	City of Orlando	creek	needs work
120	-81.38549	28.57927	Hazel Court	Greens Street	City of Orlando	street	active
127	-81.42287	28.59475	Lake Breeze Drive	Bay Breeze Road	Orange County	creek	needs work
161	-81.38329	28.57507	Helen Avenue	Winter Park Street	City of Orlando	street	capped
162	-81.38119	28.57481	Winter Park Street	Oberlin Avenue	City of Orlando	street	clogged
163	-81.38027	28.57476	Winter Park Street	Amhurst Avenue	City of Orlando	street	needs work
164	-81.38276	28.58007	Helen Avenue	Rosevear Street	City of Orlando	street	clogged
165	-81.38070	28.57940	Steele Street	Amherst Avenue	City of Orlando	street	capped
195	-81.38666	28.59989	Lee Road	I- 4	Orange County	lake	active
207	-81.40109	28.60023	Pleasant Oak Lane	Goddard Avenue	Orange County	street	active
208	-81.40441	28.60763	Van Ness St.	Goddard Avenue	Orange County	creek	active
209	-81.39746	28.59104	Meadows Avenue	Grant Blvd.	Orange County	lake	needs work
210	-81.40456	28.58019	Knollwood Dr.	Crestwood Dr.	Orange County	street	active
211	-81.42538	28.62863	Groome Way	Magnolia Homes road	Orange County	lake	active
214	-81.43554	28.61535	Corona Drive	US 441	Orange County	lake	active
215	-81.37610	28.64855	Barclay Ave.	Broadview Ave.	City of Altamonte Springs	lake	active
216	-81.44940	28.59361	White Heron Dr.	Pine Hills Rd.	Orange County	lake	active
217	-81.43571	28.65293	Eden Park Dr.	Bunnell Rd.	Jess Williams	street	active
218	-81.46315	28.64329	Vulcan Rd.	Apopka Blvd.	Orange County	lake	active
219	-81.51793	28.67907	Hawthorne Avenue	Magnolia Street	FDOT	lake	active
220	-81.48425	28.65795	Sugar Pine Road	Apopka Blvd.	Baxter Long	lake	active
221	-81.47083	28.65904	Piedmont-Wekiva Rd.	Orange Blossom Trail	Orange County	lake	active
222	-81.50088	28.58458	Lowman Ave.	Northgate Dr.	City fo Ocoee	lake	active
223	-81.49961	28.57140	Good Homes Road	Lake Lucy Road	Orange County	lake	active
224	-81.50919	28.57887	Johio Shores Rd.	New Victor Rd.	City fo Ocoee	lake	active
225	-81.56521	28.58056	West Crown Point Rd.	Crown Point Cross Rd.	Orange County	street	active
226	-81.56710	28.57246	Crown Point Rd.	Plant	Orange County	street	needs work
227	-81.57102	28.55574	E. Story Rd.	Carter Road	Mc Millian Bros	street	active
228	-81.57530	28.55205	9th. Street	Highway 50	Orange County	street	active
230	-81.50242	28.55208	50	Good Homes Road	Orange County	lake	active
233	-81.58457	28.50869	Banana Bay Drive	Winter Garden- Vineland Road (535)	Orange County	lake	active
235	-81.58716	28.53485	Winter Garden- Vineland(535)	Daniels Rd.	CHARLOTTE ROPER	street	active
236	-81.45808	28.56669	Ben Hogan Circle	Hastings Street	Orange County	lake	active
239	-81.43441	28.56225	Colony Way	Mercy Drive	Orange County	lake	active
255	-81.58933	28.55191	Water Street	Walker Street	Orange County	street	active
256	-81.54128	28.57047	Lake Shore Drive	Oakland Avenue	City of Ocoee	lake	active

Table 2-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Drainage Wells within the Wekiva Study Area

Unique ID	Longitude (Decimal Degrees)	Latitude (Decimal Degrees)	Address 1	Address 2	Owner	Drainage Source	Status
257	-81.52294	28.58093	Flewelling Avenue	Ridgefield Avenue	City of Ocoee	lake	active
261	-81.39200	28.59118	Meadows Avenue	Grant Blvd.	Orange County	lake	active
263	-81.58961	28.52881	SR 535	Daniels Road	Orange County	lake	active
274	-81.50889	28.55200	50	Lake Lotta	Orange County	lake	lost
275	-81.53492	28.55178	US 50 Colonial Drive	Old Winter Garden Road	FDOT	lake	lost
276	-81.55369	28.57167	Franklin St.	Ocoee-Apopka (437)	Unknown	street	lost
277	-81.38750	28.58822	Little Lake Fairview	N/A	City of Orlando	lake	lost
278	-81.39300	28.59278	Meadowbrook Avenue	Riordan Way	Orange County	lake	lost
286	-81.46847	28.67272	436	Wekiva Springs Road	Orange County	street	lost
287	-81.49714	28.67222	441	436	FDOT	lake	lost
288	-81.50533	28.67372	Highland Avenue	US 441	City of Apopka	street	plugged
289	-81.45617	28.57750	Pine Hills Rd.	south of Silverstar near retention pond	Orange County	lake	lost
290	-81.45192	28.58606	Pine Hills Rd.	Champagne	Orange County	lake	lost
291	-81.45842	28.60250	Lake Sparling	Hubbard Landfill	Orange County	lake	lost
294	-81.37008	28.67111	Royal Palm	Sabel Palm Circle	L. T. Bryan	lake	lost
295	-81.45911	28.59214	Midget Drive	South Kentucky Road	City of Winter Park	lake	lost
296	-81.38311	28.64192	Woodlake	Dover	Hans Schweizer	lake	lost
297	-81.43800	28.67047	436	Campus Loop	Forest Lake Acadamy	reclaimed	abandoned
298	-81.42250	28.57631	Eunice Avenue	Bengert Street	Orange County	street	lost
299	-81.59094	28.51497	535	N/A	Charlotte Roper	lake	lost
300	-81.42647	28.60694	441	Rosewood	City of Orlando	lake	lost
301	-81.42144	28.60503	US 441	Rosamond Drive	N/A	street	lost
302	-81.42261	28.60114	Parkway Center	441	City of Orlando	lake	inaccessible
303	-81.41261	28.59736	US 441	Lee Road	City of Orlando	lake	lost
304	-81.42067	28.57822	Silver Star	Eunice	City of Orlando	street	abandoned
305	-81.40225	28.57150	Princeton (Smith)	Florida	City of Orlando	street	lost
306	-81.40247	28.57106	Green Street	Rio Grande	N/A	street	lost
307	-81.39347	28.56933	Westmoreland	Yale	City of Orlando	street	lost
310	-81.37711	28.57956	Steele	Formosa	City of Orlando	street	lost
311	-81.56292	28.57125	438	535	H.C. Tilden	street	lost
312	-81.62000	28.56000	Henschen Street	Water Street	R.L. Smith	creek	active
313	-81.57314	28.52225	McKinnen Rd.	Water Point Blvd.	Unknown	lake	lost
315	-81.51511	28.65903	Kaley Street	Orange Avenue	N/A	street	lost
316	-81.55447	28.67208	Lust Road	S. Binion Road	Plymouth Citrus	street	lost
330	-81.39547	28.59739	Alton Ave.	Estill Ave	St Marks Catholic Church	street	lost
335	-81.61294	28.52672	Avalon Road	CR 535	N/A	street	lost
348	-81.52194	28.69206	Apopka High School	N/A	N/A	street	lost
366	-81.37569	28.58578	Jewel Avenue	Formosa Avenue	City of Orlando	street	lost
390	-81.37569	28.57658	Spruce St.	Cornell Ave.	City of Orlando	street	lost
401	-81.43636	28.56739	Mercy Drive	N/A	City of Orlando	lake	lost
402	-81.39739	28.57111	Northumberland Ave.	Princeton	City of Orlando	street	lost
416	-81.40386	28.58919	Interlaken Road	N/A	Nydegger Investments	lake	lost
425	-81.45639	28.61858	Long Peak Drive	Lake Sparling Road	Orange County	lake	lost
433	-81.37551	28.58175	Cornell Ave.	Par St.	City of Orlando	street	lost
435	-81.38332	28.57479	Helen Ave.	Winter Park St.	City of Orlando	street	lost

Table 2-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Drainage Wells within the Wekiva Study Area

Unique ID	Longitude (Decimal Degrees)	Latitude (Decimal Degrees)	Address 1	Address 2	Owner	Drainage Source	Status
436	-81.38316	28.57479	Winter Park St.	Helen Ave.	City of Orlando	street	lost
446	-81.40458	28.58020	Crestwood Drive	Knollwood Drive	N/A	street	lost
467	-81.44602	28.61775	Mustang Way	Rose Avenue	Orange County	lake	active
475	-81.51357	28.67616	Lake Ave.	Btwn 2nd. St. and 1st St.	City of Apopka	street	active
489	-81.45944	28.59222	Meadowbrook Avenue	Riordan Way	Orange County	lake	lost
492	-81.37438	28.64931	Barclay Avenue	Fernwood Drive	City of Altamonte Springs	lake	active
495	-81.37617	28.64825	Barclay Avenue		City of Altamonte Springs	lake	active

In addition to the drainage wells shown in Figure 2-33, the City of Altamonte Springs has cited two possible drainage wells on the north side of Lake Adelaide, however their locations have not yet been verified by the City.

2.13 Public Lands

Existing public lands, as well as potential or pending acquisitions for the future Wekiva Parkway, were identified within the WSA. The SJRWMD provided information on those lands currently owned by the district. Lake County also had information available on other government owned lands (i.e., not owned by the SJRWMD) within the county boundaries. Additionally, the GIS coverages for state parks (1999) and the Wekiva Aquatic Preserve (1997) were obtained from FDEP's website. These are shown in **Figure 2-34**.

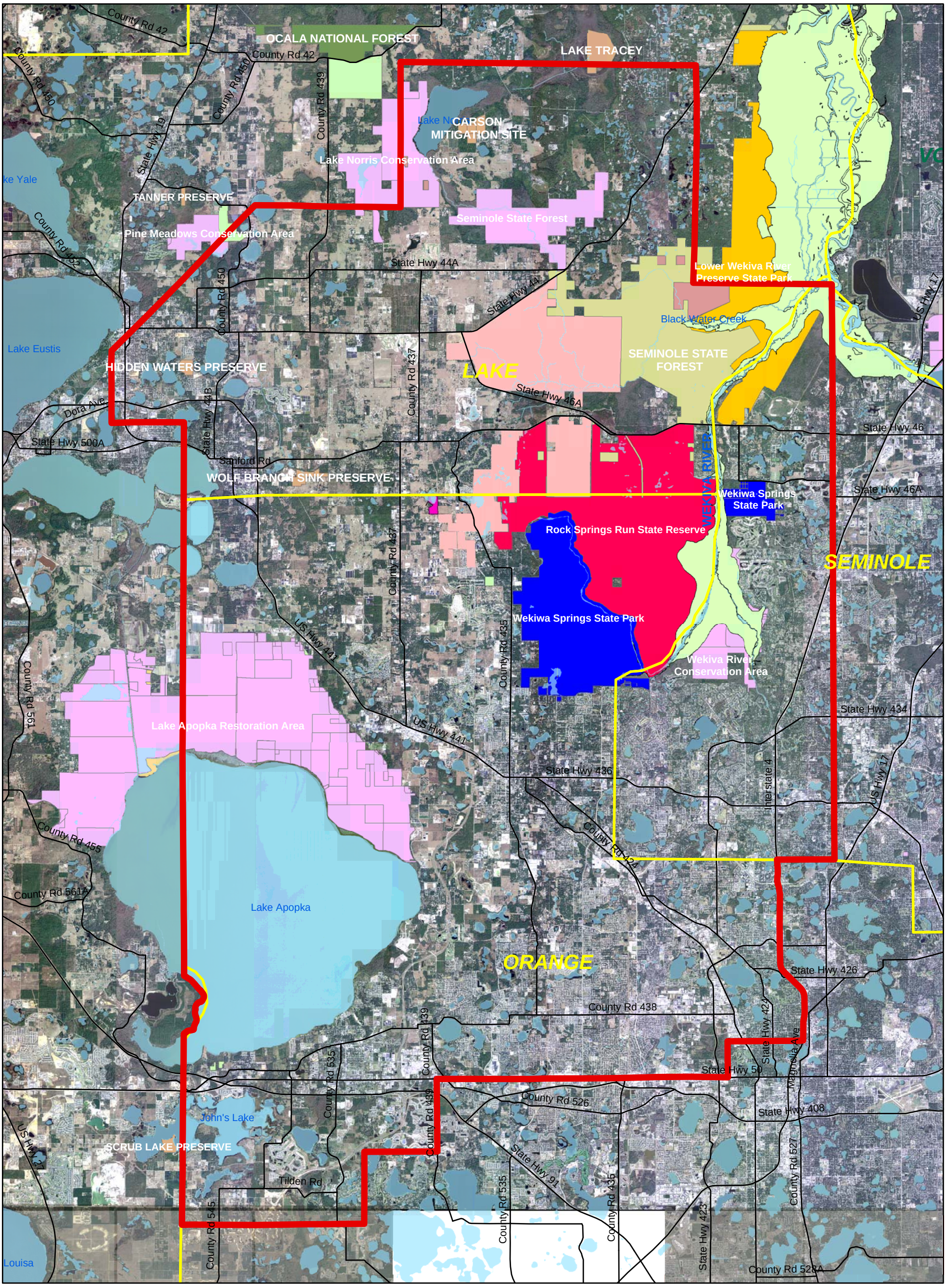
In addition to the existing public lands, Section 369.317, F.S. of the WPPA, requires that certain tracts of land be acquired for right-of-way for the future Wekiva Parkway, as well as "to protect the surface water and groundwater resources of Lake, Orange, and Seminole counties, …including recharge within the springshed that provides for the Wekiva River system…Acquisition of the lands described in this section is also necessary to alleviate pressure from growth and development affecting the surface and groundwater resources within the recharge area." These include lands known as Neighborhood Lakes, a 1,587 acre parcel located in Orange and Lake Counties; Seminole Woods/Swamp, a 5,353 acre parcel located in Lake County; New Garden Coal; a 1,605 acre parcel in Lake County; and Pine Plantation, a 617 acre tract consisting of eight individual parcels within the Apopka City limits.

There are approximately 23,791 acres or 37 square miles of land currently owned by the SJRWMD in and immediately adjacent to the WSA. The three state parks (Rock Springs Run State Preserve, Lower Wekiva River Preserve and Wekiva Springs State Park) comprise approximately 26,435 acres or 41 square miles within the WSA. There are approximately 8,303 acres or 12.9 square miles of land owned by governmental and local agencies other than the SJRWMD. Potential land acquisitions as part of the WPPA total 10,038 or 15.6 square miles. Orange County also recently acquired approximately 76 acres of land near Lake Lucie along the Lake County border. Therefore, the total of all government owned land shown on Figure 2-34 is approximately 106.6 square miles or 22.5 percent of the WSA. This land area does not account for the smaller individual parks owned by the individual Stakeholders that are dispersed throughout the WSA.

honourdm

8/17/05

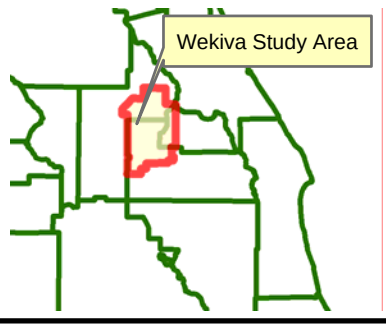
E:\Projects\92474\44812\GIS\Fig2-34.mxd



N
W E
S

0 7,000 14,000 28,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Major Roads
- Water Bodies
- Orange County Recent Land Acquisition
- Potential Wekiva Parkway Land Acquisition
- Wekiva River Aquatic Preserve

State Parks

- Lower Wekiva River Preserve State Park
- Rock Springs Run State Reserve
- Wekiwa Springs State Park

Government Lands (in Lake Co.)

- FEDERAL
- STATE
- SJRWMD
- LCWA
- PRIVATE
- OTHER

District Owned Lands

- SJRWMD owns full title to the land
- Conservation Easement
- Joint Ownership
- 77

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 2-34
Public Lands

Section 3
Stakeholder Stormwater Management Policies

3.1 Introduction

This section summarizes the Stakeholders' current policies as they relate to stormwater management. CDM reviewed comprehensive plans, code of ordinances, land development codes and permits, and obtained feedback from the Stakeholders in order to provide a summary of each individual Stakeholder's policies. In this section, information is provided for each Stakeholder on adopted level of service (LOS), National Pollutant Discharge Elimination System (NPDES) permitting, stormwater system inspection and maintenance, redevelopment control measures (as they relate to water quantity and quality) and current water resources funding mechanisms. Level of service is generally defined as: an indicator of the extent or degree of service provided by (or proposed to be provided by) a public facility based on, and related to, the operational characteristics of the public facility.

3.2 Lake County

Unincorporated Lake County occupies approximately 146 square miles or 31 percent of the WSA. The portion of Lake County in the WSA is largely undeveloped and its predominant land uses are forest, agriculture, wetlands and open lands. Black Water Creek, Big Wekiva River, Golden Triangle, Lake Eustis and Alexander Springs watersheds are all within unincorporated Lake County.

3.2.1 Level of Service

Section 9.06.00 of the Lake County Code of Ordinances specifies the current requirements for stormwater management. Performance criteria for stormwater management systems (Section 9.06.05(k)) state that stormwater facilities be designed to perform as follows:

1. Bridges - Hydraulic profile should be below the top cord of the bridge for the 50-year, 24-hour storm.

2. Stormwater detention and retention ponds which are contributory to land-locked areas with no positive outlet, should be designed for the 25-year, 96-hour storm.

3. Canals, ditches, or culverts external to the development, and stormwater detention or retention basins which are part of a project that is not contributory to a land-locked areas with no positive outlet, should be designed for the 25-year, 24-hour storm.

4. Stormwater flooding for all arterial and collector roads should not exceed one-half (1/2) of the roadway width. For all local roads, stormwater flooding should not exceed the crown of the road for the 10-year, 24-hour storm.

5. Storm sewers and roadside swales should be designed such that the hydraulic gradient is 1.0 foot below the gutter line or edge of pavement for arterial roadways; and 0.5 feet below the gutter line or edge of the pavement for collector and local roadways for the 10-year, 24-hour storm.

3.2.2 NPDES MS4 Permit

Lake County is regulated under the NPDES Phase II program which regulates small municipal separate storm sewer systems (MS4). The County was issued a generic permit for discharge of stormwater (Permit No. FLR04E106) from FDEP in September 2004. Under this permit, the County must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the County to comply with six (6) defined minimum control measures:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

Under each of these minimum control measures, the County has committed to implement various BMPs throughout the life of the permit in order to achieve compliance.

3.2.3 Stormwater System Inspection and Maintenance

The County also has a section of its Code of Ordinances (Section 9.06.08) devoted to stormwater maintenance. The County's code requires that installed stormwater systems be maintained by the legal entity responsible for maintenance and that all stormwater management permit applications should contain documentation sufficient to demonstrate that the operation and maintenance entity is the legal entity empowered and obligated to perpetually maintain the stormwater management facilities. The County also requires an approved written operation and maintenance plan which should contain the following minimum criteria:

- Demonstration of the ability of an entity to provide adequate maintenance;
- Written agreement of acceptance of an entity to maintain the facilities;
- Specific maintenance activities to be performed;
- Frequency of maintenance activity; and,
- Measurable objective of maintenance activity.

The County recognizes the following entities as acceptable to operate and maintain stormwater management facilities:

- Local governmental units including the County, municipalities, or municipal service taxing units or municipal benefit taxing units;
- Active water control districts or drainage districts, community development districts or special assessment districts; and,
- Non-profit corporations including homeowners associations, property owners associations, condominium owners associations, or master associations under certain conditions which ensure that the corporation has the financial, legal, and administrative capability to provide for the long-term operation and maintenance of the facilities.

Lake County is divided into three Maintenance Areas (MA) within the Road Operations Division. Combined, the three MAs total 71 staff and 123 pieces of equipment. County owned equipment include trucks, tractors, compactor/rollers, loaders/backhoes, dump trucks, flatbeds, water trucks and irrigation pumps. Currently, maintenance frequency and structure inspections are complaint driven. However, the County is moving toward scheduled maintenance and inspection activities with the mapping of the drainage infrastructure.

In addition to County staff and County-owned equipment, the Road Operations Division maintains a contract with an outside contractor for ditch cleaning services (Gradall®) which is funded to 0.75 full time equivalency (FTE). The Road Operations Division also contracts for pipe cleaning.

3.2.4 Redevelopment Control Measures

The County's Code of Ordinances was reviewed for stormwater management requirements related to redevelopment. Under Chapter V, Concurrency Management addresses the requirements for development. Section 5.01.02 identifies exemptions for development with negligible impacts. This is considered development that will cause negligible impacts in public facilities and services, and are exempt from the County's concurrency management review. Such development includes:

1. Interior renovations or alterations and exterior maintenance to existing structures which do not involve a change in use;
2. Demolitions, except in conjunction with the replacement of an existing structure;
3. Replacement of a single family residence with a single family residence;
4. Electrical, plumbing and mechanical activities;
5. Signage, fences and pools;
6. Screen patio and screen pool enclosures, and wooden (non-roofed) decks;
7. Improvements to an existing single family residence such as room additions and screened enclosures;
8. Accessory structures to a single family residence;
9. Temporary construction trailer placements;
10. Wells and septic tank placements;
11. Utilities such as telephone switching stations, and electrical power substations;
12. Radio and other communication towers; and,
13. Accessory facilities for agricultural uses.

Section 5.01.04 of the County's code of ordinances also identifies special exemptions for redevelopment after demolition or termination of existing use. This requirement states that "in the case of demolition of an existing structure or termination of an existing use in conjunction with plans for redevelopment, the concurrency management evaluation for future development shall be based upon the new or proposed land use as compared to the land use existing at the time of such demolition or termination. Credit shall only be given for the density/intensity of the site proposed for demolition/termination. Proposed redevelopment that increases the density/intensity of the site shall be reviewed based upon the net increase in density/intensity."

The Lake County Comprehensive Plan (as amended through 2002) was also reviewed for this element. One of the policies in the stormwater sub-element (Chapter VI-C) of the County's Comprehensive Plan addresses redevelopment and stormwater management. Policy 6C-2.7 (Provide Effective Stormwater Treatment) of the stormwater sub-element states that Lake County requires that plans for expansion, modifications, and replacement of existing development, excluding phased development, meet the adopted level of service, where such stormwater treatment is currently inadequate.

3.2.5 Current Water Resources Funding Mechanisms

Ordinance 1990-25 establishes a municipal service taxing unit (MSTU) for the unincorporated area of Lake County for the provision of stormwater management in addition to other various services provided by the County. Under this ordinance, the Board of County Commissioners is authorized to levy a millage (tax paid for each $1,000 of assessed value of property), up to five (5) mills on the dollar on the assessed value of the taxable real property and tangible personal property within the Lake County MSTU for unincorporated Lake County, in order to fund the provision of stormwater management and other essential facilities and municipal services.

3.3 City of Eustis

The City of Eustis has jurisdiction over approximately 3,327 acres or 5.2 square miles in the WSA. The City of Eustis is located along the northwestern edge of the WSA and portions of the City are within the Lake Eustis and Golden Triangle watersheds. Predominant land uses within the City of Eustis based on SJRWMD's 2000 Land Use and Land Cover data include medium density residential (39 percent), open land (14 percent), forest (8 percent) and commercial (8 percent).

3.3.1 Level of Service

Section 115-5 (Stormwater Management) of the City's Code of Ordinances defines the level of service for stormwater facilities as follows:

- Bridges – The hydraulic profile shall be below the top cord of the bridge for the 50-year, 24-hour storm event.

- Canals - Canals, ditches, or culverts external to the development, and stormwater detention or retention basins which are not part of a project that is contributory to land-locked areas with no positive outlet, shall be designed for the 25-year, 24-hour storm event.

- Roadway - Stormwater flooding for arterial and collector roadways shall not exceed one-half of the roadway width. For local roads, stormwater flooding shall not exceed the crown of the road for the 10-year, 24-hour storm event.

Additionally the design for drainage basins should be based on the following requirements:

- The 100-year 24-hour storm event shall be used for land locked (without positive drainage outfall) areas which are low-lying with a history of flooding problems, have a high water table, or contain impervious soils.

- The 50-year, 24-hour storm event for land locked areas which have a low ground water table or pervious soils.

- The 25-year, 24-hour storm event shall be used for areas having positive drainage outfall to an existing storm sewer or drainage ditch which leads to the surface waters of a lake or a canal. Drainage outfall onto adjacent property by sheet flow is prohibited.

3.3.2 NPDES MS4 Permit

The City of Eustis is regulated under the NPDES Phase II program which regulates small MS4s. The City was issued a generic permit for discharge of stormwater (Permit No. FLR04E100) from FDEP in February 2004. Under this permit, the City must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the City to comply with six (6) defined minimum control measures which include:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

Under each of these minimum control measures the City has committed to implement various BMPs throughout the life of the permit in order to achieve compliance.

3.3.3 Stormwater System Inspection and Maintenance

The City of Eustis currently has 5 staff members devoted to stormwater maintenance. Maintenance activities include mowing, debris removal, pipe and inlet cleaning and street sweeping. The frequency of maintenance is defined as follows:

- Mowing of pond areas and debris removal - weekly in the summer, less as season dictates;
- Inlet and pipe cleaning - as needed; and,
- Street sweeping – residential (monthly); commercial and main roads (monthly); industrial areas (bimonthly); downtown core (weekly).

The City collects approximately 1600 cubic yards of material from 1110 miles of sweeping. The City also has backhoes for larger work needs.

3.3.4 Redevelopment Control Measures

Section 106-2 of the City's Code of Ordinances requires that the level of service standards for stormwater (i.e., rate of discharge, volume of discharge and retention/detention) are met prior to the issuance of any final permit for land development activity issued by the City, with the following exceptions:

- Any addition to a single family dwelling;
- Any addition, expansion, or improvement to any other structure or use where such addition, expansion, or improvement can be shown to have no net increase in the demand for infrastructure;
- Any replacement of a structure or use by a similar structure or use where such replacement can be shown to have no net increase in the demand for infrastructure;
- Any change of use which reduces demand for all infrastructure facilities, even if the infrastructure serving the former use or activity was over capacity;
- Any low- or moderate-income housing development;
- Any public infrastructure or public facility; or
- Any vested project.

3.3.5 Current Water Resources Funding Mechanisms

Section 94-177 of the City's Code of Ordinances establishes a stormwater utility in order to "acquire, own, construct, equip, operate and maintain open drainage ways, underground storm drains, equipment and appurtenances necessary, useful or convenient for a complete stormwater control system; and also including maintenance, extension and reconstruction of the stormwater control system of the city; to minimize by suitable means the system's contribution to flooding; to minimize by suitable means the system's adverse effect on the water quality of streams and lakes; and to seek the cooperation of the state department of transportation, the county and other municipalities in minimizing the effects of all such systems and other sources of accelerated runoff to flooding and water quality, water conservation, replenishment and enhancement of groundwater." All stormwater drainage utility fees are collected by the City into a stormwater utility management fund. This fund is used for paying the costs of stormwater drainage facilities to be constructed in the various storm drainage basins and paying the cost of operation, administration and maintenance of the stormwater drainage facilities of the City. For residential units, the stormwater utility rate is currently $3.00, and for commercial units it is $6.00.

3.4 City of Mount Dora

The City of Mount Dora occupies approximately 3,150 acres or 4.9 square miles in the WSA. Located immediately to the southeast of the City of Eustis, it also lies along the northwestern edge of the WSA and portions of the City are also within the Lake Eustis and Golden Triangle watersheds. Predominant land uses within the city limits in the WSA include medium density residential (33 percent), water bodies (17 percent), high density residential (9 percent) and forest (8 percent).

3.4.1 Level of Service

Under Section 6.2.2 of the Land Development Code, the City's LOS is defined and requires that stormwater facilities be designed to accommodate the 25-year/24-hour storm design event for all new development and redevelopment, and meet the following water quality and quantity standards:

- Water quantity - Peak post-development runoff shall not exceed peak predevelopment runoff rates.

- Water quality - Treatment of stormwater runoff shall be required of all development and redevelopment areas. The stormwater treatment system or systems can be project specific, serve subareas within the city or be a system to serve the entire city. Regardless of the area served, the stormwater treatment systems must provide a level of treatment which meets the requirements of Chapter 40C-42, in particular Section 40C-42.025, Florida Administrative Code (FAC) to ensure that the receiving water quality standards of Chapter 62-302, FAC are met and to ensure that the receiving water bodies and their water quality are not degraded below the minimum conditions necessary to maintain their classification as established in Chapter 62-302, FAC.

Additionally, section 6.2.9 of the Land Development Code identifies the design criteria that must be met and are summarized in **Table 3-1**.

Table 3-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
City of Mount Dora LOS Stormwater Standards

Facility	Frequency (Year)	Duration (Hours)
Bridges	50	24
Principal arterial bridges and evacuation routes	100	24
Canals, ditches, swales or culverts for drainage external to the development	25	24
Canals, ditches, swales or culverts for drainage internal to the development	10	24
Detention and retention basins contributory to land-locked areas with no positive outlet	25	96
Major detention/retention structures with a positive outlet. The probable maximum precipitation (PMP) as required by the SJRWMD shall be evaluated PMP		24
Minor detention/retention structures with a positive outlet	25	24
Houses/buildings first floor elevation must be 18" or above the 100-year flood elevation	100	24

3.4.2 NPDES MS4 Permit

Like Lake County and the City of Eustis, the City of Mt. Dora is also regulated under the NPDES Phase II program which regulates small MS4s. The City was issued a generic permit for discharge of stormwater (Permit No. FLRD4E121) from FDEP in August 2004. Under this permit, the City must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the City to comply with six (6) defined minimum control measures. The City has committed to a number of various activities throughout the life of the permit to satisfy the 6 minimum control measures in order to achieve compliance. The 6 minimum control measures include:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

3.4.3 Stormwater System Inspection and Maintenance

The City of Mount Dora currently has 3 staff members dedicated to stormwater maintenance and inspections including a street-sweeper operator. For storm events, the City assigns 12 persons to cleaning ditches and inspecting damage, 3 assigned to each quadrant of the City.

All of the stormwater inspection and maintenance work is done internally. The only contracted services are for waste/trash disposal (litter like cans, debris) and tree-stump grinding, if the City needs to remove trees in the drainage paths. The City has a site for other miscellaneous debris stockpiling.

The City performs street sweeping daily. The street sweeper rotates around the entire city and visually inspects for major problems like collapsed inlets or for major system plugs. Maintenance activities are largely complaint driven and also driven by inspections. The City assigns repairs on a priority basis depending on the severity of the problem. Stormwater structures/outfalls are inspected approximately twice per year. The vac-truck issued to jet out severely plugged lines. Mowing is done on a weekly rotating schedule. Ditch cleaning is done approximately once per month, on a rotating basis. This includes about 2 to 3 miles of major ditches. Most of the minor ditch cleaning is complaint driven and the City also gets assistance from the homeowners as the problems are on private property much of the time.

The City owns riding mowers, a bush hog, a vac-truck, a one-ton flatbed truck, and minor equipment like weed-eaters, chain saws, hedge trimmers, etc.

The City maintains approximately 56 miles of paved roads, excluding privately owned subdivision roads. There are no public dirt roads within the City limits. The City Public Works department has a curbing and sidewalk program to add new and to replace damaged infrastructure.

The City is expanding rapidly and acquiring new subdivisions through annexation. The City's utility service district extends well beyond the current city limits. The City is considering the possibility of expanding the stormwater regulations and MS4 permit requirements to the entire utility service district area, which may help with future growth issues.

3.4.4 Redevelopment Control Measures

The City has a community redevelopment agency that was established under Chapter 38 of its Code of Ordinances. Section 6.2 of the City's Land Development Code requires all new development and redevelopment to adhere to the City's adopted level of service for drainage. This includes requirements for water quantity (i.e., peak post-development runoff should not exceed peak predevelopment runoff) and water quality (i.e., treatment of stormwater runoff is required and that treatment systems must provide a level of treatment which meets the requirements of Section 40C-42.025, F.A.C.). Some areas in the downtown exempt district are exempt from the SJRWMD permitting requirements.

3.4.5 Current Water Resources Funding Mechanisms

Part IV of Chapter 86 of the City's Code of Ordinances establishes a stormwater drainage utility in order to fund the operation and maintenance of stormwater conveyance systems. All stormwater drainage utility fees are collected by the City are paid into a stormwater utility management fund. This fund is used for paying the costs of stormwater drainage facilities to be constructed in the various storm drainage basins and paying the cost of operation, administration and maintenance of the stormwater drainage facilities of the City. For residential units, the stormwater utility rate is currently $3.00.

3.5 Orange County

Of all Stakeholders, Unincorporated Orange County occupies the largest land area in the WSA. Approximately 253 square miles or 39 percent of the WSA are within unincorporated Orange County. The County has jurisdiction within the Lake Apopka, Big Wekiva River, and Little Wekiva River watersheds. Dominating land uses in the County are water bodies (26 percent), wetlands (11 percent), forest (11 percent) and medium density residential (10 percent).

3.5.1 Level of Service

Orange County currently defines its LOS standard for stormwater in Chapter 30 (Planning and Development) of its Code of Ordinances. Section 30-520(5) (Performance Standards) states that the LOS standard for stormwater is based on the following stormwater quantity and quality criteria:

1. Stormwater facilities should accommodate the design storm events, based on a 24-hour minimum, shown below in **Table 3-2**.

2. Stormwater management systems are required to retain or detain with filtration the first one-half (1/2) inch of rainfall on the site, or the runoff generated from the first inch of rainfall on developed sites, whichever is greater.

3. Require a retention/detention system which limits peak discharge of a developed site, to the discharge from the site in an undeveloped condition during a 24-hour/25-year frequency storm event.

4. Prior to development approval, require projects to receive appropriate permits from state agencies to comply with the rules and regulations for stormwater facility design, performance and discharge.

5. Discharged stormwater runoff shall not degrade receiving surface water bodies below the minimum conditions established by state water quality standards (F.A.C. §§ 62-302 and 62-40.420).

Table 3-2
Wekiva Parkway & Protection Act Support
Master Stormwater Management Plan
Orange County LOS Stormwater Standards

Facility	Design Storm
Bridges	50-year
Canals, ditches, or culverts for drainage external to the development	25-year
Cross drains, storm sewers	10-year
Roadside swales for drainage internal to the development	10-year
Detention basins	25-year
Retention basins (no positive outfall)	100-year

Additionally, Orange County requires that the freeboard for open drainage ways and ponds should be a minimum of one (1) foot above the design high water elevation. Section 34-266 of the County's code also requires that a stormwater management system be designed and contain features to provide for:

(1) Pollution abatement- Pollution abatement will be accomplished by retention, or detention with filtration, of one-half (1/2) inch of runoff from the developed site or the runoff generated from the first one (1) inch of rainfall on the developed site, whichever is greater. The depth of runoff generated from the first inch of rainfall is estimated by multiplying the Rational Method Runoff Coefficient (C) for the developed site by one (1) inch of rainfall.

(2) Recharge where possible- Recharge in designated areas where the soils are compatible (Hydrologic Soil Group Type "A" soils as indicated on the soils survey map for the county prepared by the U.S.D.A. Soil Conservation Service) will be accomplished by providing for retention of the total runoff generated by a 25-year frequency, 24-hour duration storm event from the developed site. Where a positive outfall is not available, design the site to retain the 100-year frequency/24-hour duration storm on-site.

(3) Protection from flooding.

3.5.2 NPDES MS4 Permit

Orange County is currently regulated under the Phase I NPDES program for large MS4s. The County, along with its co-permittees (City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, Florida Department of Transportation (FDOT) District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4

Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the County and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the County to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the County is required to implement the specified stormwater management program (SWMP) specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to County requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Continuation of basin studies;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.5.3 Stormwater System Inspection and Maintenance

Stormwater maintenance and operation information was obtained from the *Overview of the Drainage Section Maintenance and Operation Program* (Orange County Roads and Drainage, 2002). The County has a Drainage Section of the Roads and Drainage Division whose primary responsibilities include the design, construction, maintenance and operation of stormwater control facilities. The County's stormwater management system consists of pump stations, open channels, canals, closed pipe systems, control structures, drainage wells, retention/detention ponds, and drainage ditches. The County performs the following in terms of maintenance and inspection:

- Primary Canals – Two canal crews perform routine maintenance activities on a 4- to 5-week cycle which include mowing, litter/debris removal, trimming and inspections. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures, and re-establishment of canal banks and slopes. Herbicides treatment is also performed bi-annually. Major repairs such as profiling or realignment are conducted as capital improvement projects (CIP).

- Non-MSTU Retention Ponds – A pond crew performs routine maintenance activities on a 4-to 5-week cycle which include mowing, litter/debris removal, trimming and inspections. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures, and re-establishment of flood bank and slope. Herbicides treatment is also performed bi-annually. The in-house crew maintains approximately 27 ponds and the remainder of the pond maintenance activities are outsourced.

- MSTU Ponds – The pond crew is divided into 4 geographic sectors with a total of 34 people. An inspection and mowing crew in each sector mows on a 4-week cycle and inspects control structures, fence conditions and berms for erosion. Necessary maintenance or repairs are ordered immediately, including removal of sediment, erosion repairs, replace/repair of erosion control and prevention measures, re-establishment of flood bank and slope, or use of heavy equipment. Heavy equipment is only used on an average of 8-12 years. Every two months 1 spray crew for sprays ponds in the entire county for aquatic vegetation.

- Pump Stations, Drainage Wells and Control Structures - Routine maintenance activities are conducted on a bi-weekly basis and include structural repair, litter/debris removal, trimming and inspections. Drainage wells are inspected daily during heavy rainfall periods. A two-person maintenance crew is assigned to routine maintenance of pump stations. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures (e.g., major cleaning of drainage wells). Herbicide treatments to control or remove brush and broadleaf weeds growing along and around the pump house, near control structures, curb inlets, inlet throats and gutters are performed on a bi-monthly basis.

The County also has a Heavy Equipment Section which is composed of two groups, Drainage and Roads. The section is comprised of a foreman, thirteen equipment operators and one MSTU equipment operator. These individuals operate a variety of machinery and equipment which ranges from ten wheel dump trucks, transport tractor/trailers, loaders, backhoes, trackhoes, bulldozers, draglines, long booms, snort booms and mobile cranes. The County has a contract for street sweeping which is performed once per month. Only those roads with curbs are swept which account for approximately 2,900 miles. The County requires a minimum of eight sweepers to be in operation.

3.5.4 Redevelopment Control Measures

Article XVII of Chapter 38 of the County's Code of Ordinances establishes zoning standards which are designed to facilitate the redevelopment of historic and/or established communities in the County. These communities fall under the designation of neighborhood center, neighborhood activity corridor, and neighborhood residential. The provisions of the article, including stormwater management, apply to all lands that have one of these designations. Section 38-1734 (4) addresses stormwater management for these areas. In general, it states the following:

- The design and construction of stormwater management systems within redevelopment areas should be in accordance with Chapter 34 of the Code of Ordinances (Subdivision Regulations). The stormwater management system should be consistent with applicable master plans or special area studies and designed as an amenity where feasible.

- The County encourages property owners to prepare stormwater master plans for multiple properties containing at least one acre and/or provide shared retention. In addition, individual property owners are encouraged to aggregate multiple properties into building sites containing a minimum of one acre for the purpose of providing stormwater management for the entire site.

- A minimum of one (1) tree and five (5) shrubs is required for each one hundred (100) linear feet of stormwater management area edge.

- A stormwater management system counts towards the overall amount of required open space if it is designed as an amenity with approved additional plantings over the minimum requirements specified above.

3.5.5 Current Water Resources Funding Mechanisms

The County's Stormwater Management Division and CIPs are financed through the general fund. This also includes some of the Orange County Environmental Protection Division's (EPD) programs as well. EPD programs include water quality sampling and monitoring, watershed management studies, data management, natural resources permitting, management of several MSTU/benefit unit (BU) lakes, lake water quality improvement projects, and citizen outreach and education. Projects and programs can also be supplemented through grants from the SJRWMD and the South Florida Water Management District (SFWMD). The Orange County Roads and Drainage Division receives funding sources from several sources including ad valorem taxes, local option gas tax and the constitutional gas tax.

3.6 City of Apopka

The City of Apopka is entirely within the WSA and is comprised of approximately 29.4 square miles or 6 percent of the WSA. The City has jurisdiction within the Lake Apopka and Big Wekiva River watersheds. Dominating land uses in the City are agriculture (22 percent), forest (21 percent) and open land (15 percent).

3.6.1 Level of Service

Section 6.05.00 in the City's Code of Ordinances established the guidelines for stormwater management within the City. Although the City does not define specific design storm events for various stormwater facilities (i.e., bridges, canals, etc.), it requires that all subdivisions, multifamily, and nonresidential projects must provide for retention and/or detention of stormwater runoff using the following guidelines:

- The post-development peak rate of discharge must not exceed the predevelopment peak rate of discharge for the 25-year, 24-hour storm.
- Pollution abatement volume should be in accordance with SJRWMD criteria.
- Construct finished floor slab elevations of all habitable structures at an elevation no less than 20 inches above the 100-year storm elevation, unless approved by the building division; in no instance, however, may the finished floor slab elevation be less than one foot above the 100-year storm elevation.
- Design all drainage discharge structures and bleed-down devices pursuant to SJRWMD criteria.
- All ponds should have a minimum one foot of freeboard to the design water resulting from the design storm.
- Approval of final engineering plans for any development will not be granted until the City is in receipt of a copy of the SJRWMD permit.
- The 24-hour rainfall amount of 8.6 inches should be used in runoff calculations.
- All retention ponds and detention ponds should be designed as dry bottom ponds unless otherwise approved by City Council.

Where a positive outfall is not available the following design criteria will apply:

- The on-site pond should be designed to retain the 100-year storm event. The pond should be designed to evacuate a daily volume equivalent to one inch of runoff from the total area contributing to the pond. The pond should be dry within 11 days following the storm event.
- When the project discharges to landlocked lakes that have no positive outfall which are adjacent to properties of one ownership, on-site detention ponds should be

designed to accommodate the pollution abatement volume as required by the SJRWMD from the developed site prior to discharge.

- When the project discharges to landlocked lakes that have no positive outfall which are adjacent to properties of more than one ownership, on-site detention ponds should be designed to accommodate the 25-year, 96-hour storm. Post-development runoff rate and runoff volume should not exceed predevelopment runoff rate and volume.

3.6.2 NPDES MS4 Permit

Similar to Orange County, the City of Apopka is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,

- Construction site runoff permitting, inspections, enforcements and operator training.

3.6.3 Stormwater System Inspection and Maintenance

Stormwater structures (i.e. storm sewer system, drainage wells, weirs, channel control structures, pump stations, inlets and catchbasins) within the City of Apopka are inspected and maintained twice a year. Storm sewer system maintenance includes TV inspections, vacuum truck operation, and repairs as needed. Stormwater treatment ponds (dry and wet detention, dry retention), ditches/swales, exfiltration trenches and wetlands have an inspection/maintenance schedule with an average of 18 times per year. Natural lakes are inspected/maintained once per week while roadways are on an ongoing schedule. Roadway maintenance includes street sweeping, resurfacing and repair, and curb edging. Ponds and ditches are scheduled to be mowed 8 times a year. Other maintenance activities include weed eating, litter and debris removal. The stormwater facilities are maintained by eight city employees and eight Orange County inmates. Inmate forces are used for maintaining the grass areas. For the majority of the year, the equipment used is lawn mowers (15) and other grass maintaining tools. However, in the event major work is required, the City has two backhoes which can be used for this task. Additional equipment owned by the City includes two street sweepers, two bush hogs, one vacuum truck, one dump truck, four transport trailers, 20 weed eaters, two pumps and numerous hand tools.

Chapter 12.02.00 (Procedure for Review of Development Plans) of the City's Code of Ordinances also has provisions for maintenance of private facilities. Section 12.02.07 specifically requires that "whenever a proposed development provides for the creation of facilities or improvements which are not proposed for dedication to the city a legal entity shall be created to be responsible for the ownership and maintenance of such facilities and/or improvements."

3.6.4 Redevelopment Control Measures

Section 11.06.00 of the City's Code of Ordinances establishes the City's Community Redevelopment Agency (CRA), which administers the redevelopment of the CRA district (one square mile area in downtown Apopka), through the use of local initiatives. Section 6.05.00 of the City's Code of Ordinances states that "no subdivision shall be platted nor shall construction commence for any multifamily, commercial, industrial or institutional project until the drainage design for such project has been approved by the city engineering division. The design shall equal or exceed design standards set forth hereinafter and the policies and procedures established by SJRWMD, and Department of Environmental Regulation [Protection], the Florida Department of Transportation and the design criteria contained therein." Additionally the code states that "all subdivisions, multifamily, and nonresidential projects must provide for retention and/or detention of stormwater runoff."

3.6.5 Current Water Resources Funding Mechanisms

Article III of Chapter 82 of the City's Code of Ordinances establishes a stormwater management utility. All stormwater management utility fees are collected by the City into a proprietary fund known as the Stormwater Management Fund. The fund is used exclusively to pay for the costs of the stormwater management program, including but not limited to, the costs to plan, construct, operate and maintain stormwater management facilities and to administer the stormwater management program as described in Article III. The stormwater management program is defined in the Code of Ordinances as the system by which the City manages and controls stormwater within its jurisdictional boundaries. The system includes management services such as designing, permitting, planning and reviewing stormwater-related infrastructure, and the operation, maintenance, repair and replacement and improvement of such infrastructure consistent with the capital improvement and stormwater management element of the City's comprehensive plan. The current annual fees are $15.00 for vacant lands with no building, $25 for single family residence property with building, and $46.25 for commercial property with building.

3.7 Town of Eatonville

The Town of Eatonville occupies approximately 0.7 square miles or 0.1 percent of the WSA. Located immediately to the southeast of the City of Maitland, it lies along the southwestern edge of the WSA and is in the Little Wekiva River watershed. Predominant land uses within the city limits within the WSA include water bodies (22 percent), commercial (14 percent) and forest (14 percent).

3.7.1 Level of Service

Although a defined LOS was not included in the Town's Land Development Code, Chapter 7, Article 3 of the Code establishes design standards and requires pre- and post-development or redevelopment peak flows to be similar but not exceed 10 percent for a 25-yr storm. In addition, the first inch of rainfall must be retained on-site, and natural vegetation should be used as a component of drainage design. Best management practices are required for stormwater runoff prior to discharge to natural or artificial drainage systems.

3.7.2 NPDES MS4 Permit

The Town of Eatonville is currently regulated under the Phase I NPDES program for large MS4s. The Town, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the Town and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the Town to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the Town is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Ensuring flood control projects consider water quality impacts;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage; and,
- Development of a construction inspection program, site runoff permitting, inspections, enforcements and operator training.

3.7.3 Stormwater System Inspection and Maintenance

Article 5 of the Town's Land Development Code outlines the inspection and maintenance requirements for stormwater in the Town of Eatonville. The Town maintains off-site systems that provide general public benefits. On-site retention and detention systems are required to be maintained by the owner; however the Town is permitted to conduct inspections and take corrective action at the cost to the owner.

The Town performs maintenance on a routine basis which includes mowing, street sweeping, cleaning retention ponds, and cleaning manholes. Monthly inspections of stormwater facilities are also performed and include inspections of weather outfall skimmers and using a televisions camera to inspect stormwater lines for leaks.

Resources used for maintenance includes, but is not limited to equipment, man-hours and contractual services. Equipment used includes a television camera (when needed), lawn mower, a front-end loader, and Vactron vacuum.

3.7.4 Redevelopment Control Measures

Redevelopment must meet the level of service as described in subsection 3.7.1, with the following exceptions: single-family and duplex residences and accessory structures, alterations or improvements to existing structures that do not change or affect the rate or volume of runoff; and construction that is on or parallel to the ground, less than or equal to 1,000 square ft of impervious area.

3.7.5 Current Water Resources Funding Mechanisms

The Town of Eatonville has established a separate stormwater utility fund for stormwater activities. This fund is generated by revenues from user fees of $4.95 charged on their monthly utility bill.

3.8 Town of Oakland

The Town of Oakland occupies approximately 1.7 square miles or 0.4 percent of the WSA. Located along the south shore of Lake Apopka, it is within the southwestern portion of the WSA in the Lake Apopka watershed. Predominant land uses within the town limits in the WSA include forest (28 percent), open land (16 percent), wetlands (14 percent) and medium density residential (12 percent).

3.8.1 Level of Service

The Town of Oakland has adopted the following stormwater LOS as shown in Infrastructure Policy 4.1.1:

a. Stormwater management of the mean annual (2.3 year), 10 year and 25 year frequency, 24-hour duration storm,

b. Require that discharge from the stormwater management facilities does not degrade receiving surface water bodies below the minimum conditions as established by the State water quality standards, and

c. That developments provide pollution abatement by requiring stormwater management systems to meet one of the following options:

   i. Retain off-line the first one-half inch of run-off from developed sites or 1.25 inches of run-off from the impervious area, whichever is greater; or on-line retention of an additional one-half inch of run-off over that volume previously specified;

   ii. Wet detention of the first inch of run-off or 2.5 inches of run-off from the impervious area, whichever is greater;

   iii. Dry detention of the first inch of run-off or 2.5 inches or run-off from the impervious area, whichever is greater;

   iv. Swale systems that percolate 80 percent of the run-off from the 3 year, 1 hour storm; or

   v. Wetland stormwater systems that meet the criteria of Section 40C-42.0265, F.A.C.; and that the stormwater management facility shall limit peak discharge of a developed site to the discharge from the site in an undeveloped condition during the mean annual (2.3 year), 10 year, and 25 year, 24-hour frequency storm events.

Under Article II (Wetlands) of Chapter 78 (Waterways), the Town "acknowledges and endorses the management and storage of surface waters permitting program established by F.S. ch. 373 and F.A.C. chs. 40C-4 (Management and Storage of Surface Waters), 40C-40 (General Surface Water Management Permits), 40C-41 (Surface Water Management Basin Criteria), 40C-42 (Regulation of Stormwater Management Systems), 40C-43 (General Silvicultural Surface Water Management Permits After Notice), and 40C-44 (Regulation of Agricultural Surface Water Management Systems); and jurisdictional wetlands shall be designated conservation areas."

Additionally, Section 34-110(d) (6) of the Town's Code provides design guidelines to encourage proper design, location, and use of open space. Stormwater management ponds can be used to obtain credits for open space if the performance standards are met.

3.8.2 NPDES MS4 Permit

As of the 2000 U.S. Census, the Town of Oakland had a population of 936 which is below the minimum population criteria of 1,000 residents which would require coverage under the NPDES MS4 Phase II program. The Town may be required to seek coverage after the next Census.

3.8.3 Stormwater System Inspection and Maintenance

The Town provides maintenance for the Tubb St. and Bailey St. areas as well as the old town plat. Residential area and subdivision ponds are privately maintained by homeowner's associations.

3.8.4 Redevelopment Control Measures

In 1994, the Town formally adopted the Orange County subdivision regulations for development and SJRWMD rules for stormwater management. Any development within the Town must also meet the LOS previously described. The threshold for redevelopment to meet all current standards is if the taxable value of the property increases by 25 percent or the constructed square footage increases by 20 percent. Redevelopment in the Town of Oakland thus far has been limited to a few older single family homes.

3.8.5 Current Water Resources Funding Mechanisms

Chapter 66, Article V of the Town's Code of Ordinances outlines the Special Assessment Improvement Fund which provides for the construction or repair of streets, sidewalks, storm sewers and sanitary sewers, or for any other construction, repairs or improvements. The property especially benefited by the improvement is assessed all or a portion of the cost of the improvement, which then becomes part of the fund. The Town also appropriates other revenues into the fund.

3.9 City of Ocoee

The City of Ocoee occupies approximately 13.3 square miles or 2.8 percent of the WSA. The City of Ocoee is located in the south central portion of the WSA to the east of Lake Apopka and has jurisdiction within the Lake Apopka and Big Wekiva River watersheds. Predominant land uses within the city limits in the WSA include medium density residential (21 percent), forest (17 percent), and roads (14 percent).

3.9.1 Level of Service

Section 6-7 of the City's Land Development Code defines the requirements for surface water management. The City's defined LOS is shown in **Table 3-3**.

Table 3-3
Wekiva Parkway & Protection Act Support
Master Stormwater Management Plan
City of Ocoee LOS Stormwater Standards

Facility	Design Storm
Bridges	50-year
Canals, ditches, or culverts for drainage external to the development	25-year
Cross drains, storm sewers	10-year
Roadside swales for drainage internal to the development	10-year
Detention basins	25-year
Retention basins (no positive outfall)	100-year

3.9.2 NPDES MS4 Permit

Similar to Orange County, the City of Ocoee is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.9.3 Stormwater System Inspection and Maintenance

The City follows the maintenance and inspection activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit, which is included in **Appendix C**. The City has 5 full-time staff members dedicated to stormwater operations and maintenance. For stormwater management purposes, the City currently owns one sweeping truck, one vacuum truck, one backhoe (for cleaning ditches), and one climbing excavator (for cleaning canals and ditches). Contracted services include mowing only.

3.9.4 Redevelopment Control Measures

Section 6-7 of the City's Land Development Code requires that a stormwater management system designed and installed for development contain features to provide for: (1) pollution abatement, (2) recharge where possible, and (3) protection from flooding. The code states that "all development will be required to pretreat the runoff generated from the first inch of rainfall from the developed site for pollution abatement purposes."

3.9.5 Current Water Resources Funding Mechanisms

The City of Ocoee currently has a stormwater utility which is responsible for funding the operation, construction and maintenance of stormwater management devices, for stormwater system planning, and lake management. A stormwater utility generates

its revenue through user fees and the current monthly fee is $5.00 per ERU. Residential properties are billed a flat fee based upon one ERU per individual dwelling unit. Non-residential properties are billed for the number of ERUs calculated based on impervious area.

3.10 City of Orlando

Approximately 9.2 square miles of the southeastern portion of the WSA are occupied by the City of Orlando which accounts for approximately 1.9 percent of the study area. The City is located within the Little Wekiva River Basin within the WSA. Urban land uses are dominant within the City and include medium density residential (23 percent), roads (14 percent) and industrial (11 percent).

3.10.1 Level of Service

The City of Orlando defines the LOS standards for stormwater in the Engineering Standards Manual (ESM) which was approved by the City Council in 2003, replacing the Orlando Urban Stormwater Management Manual (OUSWMM). Chapter 7 Stormwater Management outlines the criteria for the design, rehabilitation and review of existing and/or proposed stormwater management systems within the limits of the City as shown in **Table 3-4**. Other agencies and governmental entities also have jurisdiction within the City, and have established design criteria for stormwater management. Where overlapping jurisdictions occur, the most stringent regulations govern. The following entities have jurisdiction in the City of Orlando:

- South Florida Water Management District
- St. Johns River Water Management District
- Florida Department of Transportation
- Florida Department of Environmental Protection
- Orange County Environmental Protection Department
- Orange County Public Works Department
- U.S. Army Corps of Engineers

Table 3-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
City of Orlando LOS Stormwater Standards

Facility	LOS
City Primary	Design Storm: 25-year/24-hour. Max. Flood Stage: 100-year/3-day below flood elevation. Storm sewer system along roadway: Max. Hydraulic Grade Line (HGL): 25-year, 6-hour at gutter elevation.
City Secondary	Design Storm: 10-year/6-hour. Max. 10-year HGL: 1' below gutter elevation.
	Check Storm: 25-year/6-hour. Max. Hydraulic Grade Line (HGL): at gutter elevation.
City Tertiary	Design Storm: 10-year/6-hour. Max. 10-year HGL: 1' below gutter elevation.
	Check Storm: 25-year/6-hour. Max. HGL: at gutter elevation.
Arterial Streets	Roadway and Inlet Design: 10-year occurrence or 10-year/6-hour storm.
Collector Streets	Roadway and Inlet Design: 5-year occurrence or 5-year/6-hour storm.
Minor Streets	Roadway and Inlet Design: 3 year occurrence or 3-year/6-hour storm.
Travel Lane Spread	12 feet for all roads; roads with parking lane, width measured from face of curb to centerline of the outermost travel lane; clearance between design water surface and top of curb: 1".
Maximum Run Distance	400 Feet to first Inlet.
Retention Ponds	Retain the greater of: first 1/2 inch of runoff or the first 1 inch of rainfall; separate from detention system.
Detention Ponds	Design Storm: 25-year/6-hour. Detain the volume necessary to restrict post-development peak runoff to pre-development peak runoff.
Detention Ponds (landlocked basins)	Same as above plus volume storage on-site for the 100-year/24-hour storm.
Flood Prone Areas	Development allowed in 100-year floodplain with compensatory storage. Floor elevation at least 1' above 100-year/24-hour or max. stage for 100-year/ 3-day event.

Private stormwater systems are governed by the requirements of the water management districts in which they are located. The following exceptions apply:

St. Johns River Water Management District

- Flow attenuation for the 25-year, 24-hour storm will be required on projects for which SJRWMD requires a permit, but does not require this evaluation.
- For wet detention facilities, littoral zone requirements will not be waived in lieu of providing additional permanent pool volume.

South Florida Water Management District

- No exemption from pollution abatement requirements will be provided for rooftops, non-vehicular impervious surfaces, or water management areas or water features having permanent water surfaces.
- Dry detention is not allowed. Wet detention should be constructed in accordance with the requirements of SJRWMD, with the exception that littoral zone requirements will not be waived in lieu of providing additional permanent pool volume.

The following is a list of exemptions to the LOS for the City of Orlando for proposed projects:

1) Single lot for a single family dwelling unit which is not part of a multi-lot plat;

2) Single lot for a duplex family dwelling unit which is not part of a multi-lot plat;

3) Residential modifications to an existing single family dwelling which do not require a zoning change;

4) Lots, parcels, units, etc., which are part of a larger tract which has an approved drainage plan in conformity with this chapter;

5) Consists only of landscaping or resurfacing elements that do not alter surface drainage patterns.

Redevelopment Projects
Stormwater treatment by retrofitting to provide retention volume for pollution abatement will still be required where:

1) The increase in runoff volume (during a 25-year, 24-hour storm) caused by development is less than the volume required for pollution abatement; and

2) Project is not located in a natural water body, floodplain or any other area of critical environmental concern; and

3) Project consists entirely of redevelopment of existing impervious surfaces.

For redevelopment projects on all contiguous properties under a single ownership (to the extent that surface drainage is altered), stormwater management facilities for pollution abatement must be provided. Alterations of surface drainage (with the exception of resurfacing and landscaping elements only) is defined as: changing the flow patterns within the redevelopment area; changing the mode of transport from overland flow or open channel to a closed conduit, etc.; changing an impervious surface's character (from building to parking, wet bottom pond or a new building or vice versa); changing the character of a parking surface (from shell base to asphalt, etc.); or remodeling of an existing building which changes its footprint or number of floors.

3.10.2 NPDES MS4 Permit

The City of Orlando is currently regulated under the Phase I NPDES program for large MS4s. The City was issued an individual Phase I NPDES Municipal MS4 Permit (Permit No. FLS000014) on February 6, 2003. This is a 5-year permit that will expire in 2008. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Development planning procedures;
- Roadway maintenance, litter control and street sweeping;
- Flood management;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.10.3 Stormwater System Inspection and Maintenance

Section 7.03 Monitoring and Maintenance of the ESM states that: "All new stormwater retention/detention facilities will be evaluated by the City Engineer for the system's ability to prevent degradation of receiving waters. If deemed necessary by the City Engineer, a water quality monitoring program may be required." A monitoring program may be required for example, if drainage system pollution abatement practices are not functioning properly or there is evidence of water quality degradation in spite of the pollutant removal efficiency. The program will be in effect until the problem is alleviated.

If a monitoring program is required, the ESM states following regarding a sampling program: "Although specifics may vary from project to project, samples will normally be collected at discharge locations. A typical sampling schedule will consist of samples collected once per month during the wet season; however this may vary among projects. Some permittees may be required to collect samples during storm events in addition to monthly sampling. Rate of discharge at the time of sample collection and total monthly discharge each month for the duration of the permit may also be required. Parameters of interest will normally include those listed in Chapter 62-3, Florida Administrative Code, plus the nutrients nitrogen and phosphorus."

The City currently has 47 employees whose responsibilities include stormwater maintenance and/or inspection. For stormwater inspection and maintenance, the City follows the activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of their NPDES MS4 permit, as closely as possible. This table, provided in Appendix C**,** also identifies frequencies of inspection and maintenance of stormwater facilities. In addition to the items listed in the maintenance schedule, the City also performs street sweeping which is done on a 14-day cycle.

Major equipment owned and/or operated by the City include: 2 vactor trucks, 12 dump trucks, 8 street sweepers, 2 long reach track backhoes, a bulldozer, a mini excavator and skid loader, and 2 Gradall® excavators.

The City also has a maintenance contract for mowing, litter removal and inspection of open stormwater systems for an annual cost of $660,000.

3.10.4 Redevelopment Control Measures

Redevelopment requirements were discussed in Section 3.10.1. Additionally, the Stormwater and Aquifer Recharge Element of the City's Growth Management Plan, which was adopted in 1991 and subsequently amended in 2000, contains the goals, objectives and policies which will direct future development in Orlando. Policy 1.1.6 of the Stormwater and Aquifer Recharge Element specifically states that "the City shall meet State water quality standards in Chapters 62-302 and 62-520, F.A.C., as applied by FDEP and the Water Management Districts through compliance with OUSWMM [ESM] for all development and redevelopment without exception for size or type of development."

3.10.5 Current Water Resources Funding Mechanisms

The City of Orlando currently has a stormwater utility which is responsible for funding the operation, construction and maintenance of stormwater management devices for stormwater system planning and lake management. The stormwater utility generates its revenue through user fees. The fee is based on the amount of stormwater a particular parcel passes to the stormwater system. The more runoff a parcel contributes, the greater the fee. The City's stormwater utility Policies & Procedures Manual is specified in Chapter 31 of the City's code of ordinances.

A stormwater utility fee is imposed on each parcel of land within the City. Properties that have existing stormwater management facilities in accordance with the ESM, or those planning such facilities, may have their fee reduced or pro-rated as determined by the Utility Division Chief. The annual utility fee for developed property is based on the Equivalent Residential Unit (ERU). For a residential parcel of 1 ERU, the annual utility fee for the 2004 billing cycle was $82.56. The Utility maintains a database and assigns a billing class code to each parcel, for which each is charged a reasonable and equitable fee, according to assigned ERU equivalence and site mitigation factors.

Developed properties which meet ESM criteria will have their fee discounted. Those properties with on-site mitigation which does not fully meet ESM criteria may receive a partial discount as determined by the Division Chief. The stormwater utility fee is billed annually as a non-ad valorem charge.

3.11 City of Winter Garden

The City of Winter Garden is located entirely within the WSA and is comprised of 14 square miles or 3 percent of the WSA. It is situated directly to the southeast of Lake Apopka and located entirely within the Lake Apopka Basin. Dominant land uses in the City consist of agriculture (25 percent), wetlands (15 percent), open land (14 percent) and medium density residential (12 percent).

3.11.1 Level of Service

Chapter 86 (Concurrency Management System) of the City's Code of Ordinances defines the LOS for various public facilities within the City. Section 86-8(4) establishes the evaluation criteria for drainage where the impact of any proposed project is measured against the adopted LOS standards contained in the comprehensive plan. Policy 2.1 of the Capital Improvement Element of the City's Comprehensive Plan defines the drainage LOS as the following:

- For on-site retention, retain the first 0.5-inch of runoff for the 25-year/24-hour storm event.
- Post-development stormwater runoff flow rates, quantities, peaks and velocities should be equal or less than the pre-development runoff.
- State water quality standards as set forth in the State Water Policy Chapter 62-40, F.A.C. must be met.

3.11.2 NPDES MS4 Permit

The City of Winter Garden is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.11.3 Stormwater System Inspection and Maintenance

For stormwater inspections and maintenance, the City follows the maintenance and inspection schedule outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit, which is included in Appendix C. The City has 4 full-time staff members dedicated to stormwater operations and maintenance including a stormwater engineer and three operators. Major equipment owned and operated by the City includes one backhoe, two street sweepers, one dump truck, one Menzi Muck®, one 1-ton truck. The City currently contracts out storm sewer lining.

Section 106-9 of the City's Code of Ordinances states that prior to the issuance of a building permit, a written maintenance plan be submitted to the City which contains documentation to demonstrate that the maintenance agency is the legal entity empowered and obligated to perpetually maintain the stormwater management facilities. The document should define its authority and responsibility for maintenance of the stormwater management system, define how the maintenance is to be performed, and provide a legal mechanism ensuring the perpetuation of the maintenance. Maintenance of stormwater facilities include the performance of the system as originally designed and permitted by the City and if inspection reveals that the legal entity is not maintaining the system in accordance with the requirements, the City will give the legal entity written notice of the corrective actions required to be taken. If the legal entity fails to complete such corrective action within 30 days after notification, the City may enter upon the property and take the necessary corrective action and the owner will be liable to the City for any costs or expenses incurred by the City in taking the necessary corrective action plus 20 percent for an administrative fee.

3.11.4 Redevelopment Control Measures

Article V of Chapter 98 of the City's Code of Ordinances establishes the Community Redevelopment Agency and adopts the City's Community Redevelopment Plan (Draft Report, 2004) which provides recommendations for the sound development and redevelopment of properties in the redevelopment area.

Chapter 106 of the City's Code of Ordinances establishes the requirements for Stormwater Management. In this chapter, the definition of development or development activity includes "the modification or redevelopment of a site." New development or redevelopment shall adhere to the stormwater management requirements described in Section 106-7 of the Code of Ordinances which generally include the following:

- New development or redevelopment will be set to grades which will preclude flooding or any part or portion thereof due to excessive rainfall.
- All runoff be first diverted to retention/detention facilities which meet the requirements as prescribed by the SJRWMD.

- All retention/detention facilities incorporate designs which will provide for percolation, recovery, and other pertinent factors, as required by the SJRWMD.

- In addition to meeting the retention/detention requirements as required by the SJRWMD, the project should have detention capacity sufficient to ensure that post-development runoff flow rates, quantities, peaks, and velocities are equal to or less than predevelopment runoff for the 25-year, 24-hour storm event, and the quality of the runoff conforms to the minimum standards set forth in the State Water Policy, Chapter 62-40 F.A.C.

- In all cases, outfall from retention/detention facilities must be connected by approved means to the city storm drainage system.

- An exfiltration or porous pavement system may be designed in lieu of a retention/detention system.

- Final stormwater storage locations should not impound water against roadway or building structural sections.

- Floodways and floodplains, level of flood flows or velocities of adjacent streams, impoundments, or other watercourses must not be altered so as to adversely impact the off-site storage or conveyance capacities of the water resources.

- Use erosion and sediment control best management practices during construction to retain sediment on site.

- Water reuse and conservation should, to the maximum extent practicable, be achieved by incorporating the stormwater management system into irrigation systems serving the development.

3.11.5 Current Water Resources Funding Mechanisms

Article VI of Chapter 78 of the City's Code of Ordinances established the stormwater management utility. Section 78-208 establishes the stormwater management utility operating fund where all stormwater management utility fees and charges are collected by the City. This fund is used for the purpose of paying for stormwater management drainage facilities and the cost of operation, administration and maintenance of the stormwater system of the City. The charge per equivalent drainage unit (EDU) is $3.13 per month and consists of a base fee of $0.88 per EDU applicable to all properties, plus a contribution fee of $2.25 per EDU, applicable to all properties. All nonresidential property with site mitigation facilities may be entitled to a reduction in the contribution fee of up to 40 percent. Additionally, nonresidential property that does not directly or indirectly drain to any city-maintained or city-owned stormwater management system and that does not have frontage on a city-owned or city-maintained right-of-way, easement, or stormwater management system may be entitled to a reduction in the contribution fee of up to 100 percent.

3.12 Seminole County

Approximately 54 square miles of the western edge of Seminole County are within the WSA and account for approximately 11 percent of the study area. Seminole County has jurisdiction in the Big Wekiva, Little Wekiva, Monroe Basin, Soldiers Creek and Yankee Lake watersheds within the WSA. With the exception of the Wekiva Preserve, the portion of the County within the WSA is highly urbanized and is dominated by suburban and low density residential land uses.

3.12.1 Level of Service

For new development, design criteria for stormwater facilities have been adopted by Seminole County as described in its 2004 Vision 2020 Comprehensive Plan. These design criteria are presented in **Table 3-5**. In addition to these criteria, new development must meet all other applicable local, state, and federal design criteria (e.g., SJRWMD).

Table 3-5
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Seminole County Design Storm Criteria

Facility Type	Design Storm
Retention/Detention Basins (with positive outfall) ■ sites ■ subdivisions	25-year/24-hour 25-year/24-hour
Retention/Detention Basins (land locked)	100-year/24-hour Total Retention
Retention/Detention Basins (adjacent to public right-of-way with no positive outfall)	25-year/24-hour Total Retention
Closed Drainage System (internal to development)	10-year/3-hour
Roadside Swales	10-year/3-hour
Arterial and Collector Streets	10-year, hydraulic grade line 1.0 ft. below gutter line
Local Streets	10-year, hydraulic grade line 0.5 ft. below gutter line
Canals	25-year
Bridges	100-year

Source: 1991 Comprehensive Plan Update

In addition to design criteria, Seminole County adopted the following LOS definitions:

LOS A: Flow Contained within Systems

No flooding of major roadways, minor roadways, yards or buildings. The hydraulic grade line (free water surface) is generally at or below the inlet throats of storm sewer systems and/or within the top of bank in channels.

LOS B: Water Contained within Right-of-Way

Flooding of major roadways is limited to the outer lane but does not prevent travel. Flooding of minor street crowns is of limited duration. Flooding of yards is generally limited to the right-of-way but no flooding of buildings occurs. The hydraulic grade line is at or slightly above the inlet throat and/or encroaches on top of curb but does not breach the top of bank in channels.

LOS C: Water Contained within the Property

Flooding of major roadways precludes the use of the outer lanes and travel in inner lanes is possible but difficult. Prolonged flooding of minor streets precludes travel. Flooding of property up to the front face of building occurs, but no flooding of the building. The hydraulic grade line is significantly above the inlet, beyond road rights-of-way and beyond the normal channel in the floodplain.

LOS D: Structure Flooding

Extensive flooding of streets, yards and buildings for prolonged periods (24 hours or longer).

According to the drainage element of the County's Comprehensive Plan, the following facility based standards should be used as a guide for deficiency correction:

1. A 100-year/24-hour design storm standard will be assigned to bridges with spans greater than 20-feet and to any modeled stormwater structure intended to keep evacuation routes and emergency service buildings operational.

2. A 50-year/24-hour design storm standard will be assigned to all cross drains and bridges with spans less than 20-feet intended to keep operational evacuation routes and emergency services buildings operational.

3. A 25-year/24-hour design storm standard will be assigned to the primary stormwater management system and retention/detention facilities included in the stormwater model that are not subject to the criteria listed above.

4. A 10-year/24-hour design storm standard will be assigned to closed pipe conveyance systems and roadside swales included in the stormwater model that are not subject to the criteria listed above.

3.12.2 NPDES MS4 Permit

Seminole County along with its co-permittees (City of Altamonte Springs, City of Casselberry, City of Lake Mary, City of Longwood, City of Oviedo, City of Sanford, City of Winter Springs, FDOT District 5 and FDOT Turnpike District), was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. Phase I indicates that Seminole County is a large MS4. The County's permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the County will go through the renewal process.

This NPDES MS4 permit authorizes the County to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the County is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to County requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of CIPs;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.12.3 Stormwater System Inspection and Maintenance

According to the Vision 2020 Comprehensive Plan, Seminole County's maintenance of stormwater facilities has historically focused primarily on improvements associated with the development, expansion and maintenance of County roadways. With the correction of deficiencies and establishment of standards based upon a facility performance, the County developed an ongoing maintenance program to ensure that facility standards are maintained. Given the current growth rate and the continuing natural deterioration of existing drainage systems, ongoing maintenance and

structural improvements are issues of increasing importance. Seminole County should increase current stormwater facility maintenance practices and upgrade its maintenance program.

Privately Owned Systems

Issue DRG 5 outlines Seminole County's responsibilities for private facilities and retrofitting:

> "Seminole County is responsible for the development and operation of publicly owned stormwater facilities. There are a significant number of private systems that are inadequate and/or not maintained posing the potential for local flooding. Two general categories of private stormwater facilities need attention: (1) improperly maintained and deteriorating structures and (2) older systems, which are inadequate and not consistent with existing design regulations…
>
> Maintenance of systems associated with private developments is typically the responsibility of homeowner associations. Where improvements and facility replacement are necessary, Seminole County makes private property owners aware of alternative options for facility correction to include the establishment of Special Assessment Districts which permit the County to correct deficiencies and maintain facilities [The County has also initiated a program to acquire and/or secure legal access to drainage rights-of-way since improvements and maintenance of these ditches and canals is becoming a critical component to the overall stormwater program] …
>
> Today, there are many older developments that cannot adequately handle the volume of stormwater runoff generated onsite, and are without provisions for treatment to ensure water quality. Seminole County now regulates the expansion and/or redevelopment of all sites to require that stormwater facilities meet or exceed existing regulations."

Underdrains

Issue DRG 3 of the comprehensive plan addresses the use of underdrain facilities which the County plans to tackle in the future:

> "Underdrains are perforated pipe systems placed under or around ponds and roadways to aid in drawdown and recovery of stormwater. They are typically used in areas where natural storage retention systems do not provide sufficient percolation or used where there is insufficient land for retention ponds. Historically, these systems have required an extensive and expensive amount of maintenance to keep them free of debris and organic accumulation… Inadequate facility maintenance poses serious water quality impacts to local communities. Since the SJRWMD has revised its rules regarding underdrains, they are being used less often. Seminole County currently has plans to review the regulations and discontinue use of underdrains."

Current Maintenance & Inspection Program
For stormwater inspection and maintenance, the County follows the activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit (see Appendix C). This table defines frequencies of inspection and maintenance activities of various stormwater facilities.

The County's stormwater field operation consists of twenty (20) full time employees divided into four crews; one for pond maintenance, one for ditch and canal maintenance, one all-purpose crew which performs a variety of maintenance activities without heavy equipment, and a fourth crew to flush and clean pipes and structures. County-owned equipment for stormwater maintenance includes one long-reach tracked excavator and one skid-steer loader used for pond maintenance; one wheeled excavator and one crawling excavator used for canal and ditch maintenance; and two vacuum trucks for flushing and cleaning pipe structures.

Contracted services include monthly mowing of county-owned ponds, monthly mowing of flat-ground areas along county ditches and canals, and slope mowing of ditches and canals every three months.

3.12.4 Redevelopment Control Measures

In the County's Vision 2020 Comprehensive Plan, redevelopment is defined as the "substantial renovation, re-construction or demolition of an existing building or buildings. As shopping centers, apartment buildings, and warehouses become old, economically obsolete or structurally substandard, the property they occupy becomes more valuable than the building. The buildings are usually removed and the newly vacant property is redeveloped for a contemporary use. Redevelopment is the economic response to this growing situation. As development opportunities on vacant lands diminish, as viable commercial sites are rediscovered under marginal buildings, as land becomes more valuable, redevelopment opportunities will increase in Seminole County." Objective DRG5 of the County's Vision 2020 Comprehensive Plan Drainage Element, requires that: 1) all new development and redevelopment meet the design criteria set forth in the County's level of service standards; 2) all new development and redevelopment meet the stormwater quality and quantity criteria implemented within the Land Development Code; and 3) the County regulate development and redevelopment consistent with, and meeting the minimum requirements of the SJRWMD Rule 40C-42, F. A. C., Regulation of Stormwater Discharge and Rule 40C-4, F. A. C., Management and Storage of Surface Waters, and the Stormwater Discharge Rule; Ch. 62-25, Ch. 62-3, F. A.C.

Part 9 of Chapter 270 of the County's Code of Ordinances addresses storm sewer discharges. Section 270.394 prohibits stormwater discharges to the MS4 from new development or sites of significant redevelopment unless the appropriate local, state or federal permits are obtained prior to discharging to the MS4 or to waters of the United States within the County. Section 4 of Appendix B (Surface Water Management Standards) of the County's Land Development Code (2004) requires that

redevelopments which have no increase or a net decrease in impervious area yet lack evidence of a functioning retention/detention facility may be required to retrofit the site to current County standards.

3.12.5 Current Water Resources Funding Mechanisms

Overall funding for the County's stormwater program is currently provided mostly through the general fund, with additional monies from sales tax (for CIPs) and the rest from grants.

According to the County's Vision 2020 Comprehensive Plan, funding continues to be one of the most important issues of the County's current stormwater management program. The cost of correcting unfunded deficiencies has grown steadily in recent years. The County sees an effective Stormwater Program as a program that will ensure public safety, minimize flooding, ensure sufficient treatment of runoff and meet or exceed regulatory requirements, continue implementation of the specific basin master plans, correct existing deficiencies and ongoing system maintenance, and acquire rights-of-way. The magnitude of costs associated with meeting these needs is beyond the means of the County's currently applied revenue sources.

Seminole County will continue to pursue development of funding strategies, which generate the required funds while being equitable to County residents. In order to assess the magnitude of existing drainage deficiencies, Seminole County undertook a planning study of stormwater needs, entitled the Stormwater Management Study. As recommended in this study, the County is continuing to evaluate funding mechanisms to alleviate these deficiencies; possibilities are a stormwater utility fee or other financing alternatives to be used in conjunction with the utility included, bonding and special improvement assessment districts. These alternatives and others may be considered by Seminole County for funding of specific drainage improvement needs to supplement a stormwater utility or similar program.

3.13 City of Altamonte Springs

The City of Altamonte Springs occupies approximately 8.3 square miles or 1.8 percent of the WSA. The City is located on the eastern side of the WSA and is within the Little Wekiva River watershed. Predominant land uses within the city limits include medium density residential (21 percent), high density residential (21 percent), commercial (17 percent) and roads (16 percent).

3.13.1 Level of Service

The City of Altamonte Springs defines its LOS for stormwater facilities under Policy 6-4.1.3 in its Comprehensive Plan, adopted in 2002. The City establishes the following LOS standards for stormwater quantity and quality which apply to all development and redevelopment:

1. The lowest floor elevation of a habitable structure must be at least one foot above the 100-year base flood elevation (BFE) floodplain as set by the Federal Emergency Management Agency (FEMA).

2. Sites shall conform to the following design standards shown in **Table 3-6**.

3. Limit flooding of major arterial roadways to one half of the outer travel lane width using a peak intensity for the 10-year storm.

4. Limit flooding of local streets from exceeding one inch above the crown of the road.

5. Local streets shall not flood to such an extent that they become impassable to emergency vehicles.

6. Any existing structure with a first floor elevation below the 100-year floor elevation will be treated as a nonconforming use.

7. Any new development will be built in such a manner that the development will not exceed the downstream capacity for rate and volume of runoff for the storm events listed above.

8. Discharge to natural water bodies shall be consistent with state standards as stated in Rule 62.302.560, F.A.C., and the NPDES Stormwater Standards.

Table 3-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
City of Altamonte Springs Stormwater LOS

Development Type	Standard
Landlocked drainage basin-primary system design standard:	
New Development	Retain the difference in pre-development versus post-development run-off volume during the 100-year, 24-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size.
Redevelopment	Retain the difference in pre-development versus post-development run-off volume during the 100-year, 24-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size.
Infill Development	Retain the difference in pre-development versus post-development run-off volume during the 25-year, 6-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size.
Positive Outfall (Riverine) drainage basis-primary system design standard:	
New Development	Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size.
Redevelopment	Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size.
Infill Development	Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size.
For secondary system such as roads and storm sewer systems, the design storm will be the 10-year storm event, using the "Rational method."	

3.13.2 NPDES MS4 Permit

Similar to Seminole County, the City of Altamonte Springs (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.13.3 Stormwater System Inspection and Maintenance

Inspection and maintenance requirements as outlined in the Land Development Code and Chapter 26, Article VI: Stormwater Management of the Code of Ordinances require the property owner to maintain all primary and secondary drainage facilities on-site to ensure the integrity of the system and its proper functioning at design capacity. No owner or successor should remove, destroy, modify, subvert or render inoperable any part of a stormwater system unless approved by the City Engineer in writing in advance of any alteration. These facilities will be inspected for maintenance annually by City Inspectors and before the issuance of a certificate of occupancy.

3.13.4 Redevelopment Control Measures

Redevelopment requirements for stormwater management were previously defined in subsection 3.13.1.

3.13.5 Current Water Resources Funding Mechanisms

The City of Altamonte Springs established a Stormwater Management Fund described in Chapter 26, Article VI: Stormwater Management of the Code of Ordinances. The fund is used to pay the cost of construction, operation, administration and maintenance of stormwater management facilities. This fund is supplied by a Stormwater Utility Fee imposed on all property within the city, in order to minimize the system's adverse effect on the water quality of lakes, ponds and basins within the city, to seek and to maintain the levels of lakes, ponds and basins within the city, and to facilitate the maintenance of retention areas. Equivalent drainage units (EDU) are calculated for both residential and non-residential properties, and fees are based on $5.75/month/EDU effective April 1, 2005.

3.14 City of Lake Mary

The City of Lake Mary occupies less than 0.5 square miles of the WSA. This portion of the City is located along the eastern edge of the WSA within the Soldiers Creek watershed. Based on the SJRWMD's land use and land cover GIS layer, of the City's 290 acres in the WSA, 36 percent is commercial, 26 percent are roads and 20 percent is open land.

3.14.1 Level of Service

Chapter 155: Subdivision Regulations, Appendix C: Stormwater Management Regulations outlines the LOS for stormwater facilities required in the City of Lake Mary. The City follows SJRWMD criteria for pollution abatement, flood protection and recharge. **Table 3-7** details the LOS for structures.

Table 3-7
Wekiva Parkway & Protection Act Support
Master Stormwater Management Plan
City of Lake Mary LOS Stormwater Standards

Facility	Design Storm Critical Duration*
Bridges	50-year
Canals, ditches, or culverts for drainage external to the development	25-year
Cross drains, storm sewers	10-year
Roadside swales for drainage internal to the development	10-year
Detention basins	25-year, 24-hour
Retention basins (no positive outfall)	25-year, 24-hour or 100-year, 24-hour

*Note: Critical duration is that storm event which generates the peak discharge rate for the post-development conditions. Use the Florida Department of Transportation methods to determine this event.

Dry bottom retention/detention facilities must include infiltration and filtration respectively, and be dry 72 hours after a storm. Ponds not designed for the 25-year, 24-hour post-development volume or the 25-year, 96-hour or the 100-year, 24-hour storm events are required to have an outfall structure with an oil skimmer. These outfall structures must discharge to appropriate drainage facilities. Wet retention/detention facilities must be designed to meet the SJRWMD's criteria as a minimum.

3.14.2 NPDES MS4 Permit

The City of Lake Mary (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and
- Construction site runoff permitting, inspections, enforcements and operator training.

3.14.3 Stormwater System Inspection and Maintenance

There is one full-time staff member dedicated to stormwater in the City but there is an 8-person maintenance crew in the City's public works department that can be used for stormwater maintenance. The City's inspection and maintenance program is mostly complaint driven; however, the City does visit each system and inspect it monthly on average. Major systems tend to get more regular monthly inspections than some of the smaller ones. Street sweeping occurs twice per year, but the City currently participates in a lease program where they will purchase their own sweeper and can then sweep more frequently. The public works department has mowers, backhoes, a front end loader, pumps, and a vacuum machine. A Gradall® is contracted when needed.

3.14.4 Redevelopment Control Measures

Section 154.67 of the City's Code of Ordinances establishes a Downtown Centre Zoning District in order to identify and provide the geographic areas within the designated Downtown Area that are appropriate for development and maintenance of office, retail, and residential uses; and establish development standards for such development within the District. The Downtown Centre standards govern all development and redevelopment in the zoning district to the extent that the development standards for the Downtown Centre Zoning District expressly conflict with the existing land development regulations. These standards were reviewed and there were no provisions for stormwater management identified.

The stormwater management requirements in Appendix C of the City's Subdivision Regulations (Chapter 155 of the City's Code of Ordinances) apply to "the division of a parcel of land into two or more lots or parcels of land for the purpose, whether immediate or future, of transfer of ownership or building development…" . Stormwater management systems are to be designed and installed for all land development projects that will contain features to provide for pollution abatement, recharge where possible, and protection from flooding.

3.14.5 Current Water Resources Funding Mechanisms

In order to protect the water quality of its lakes and streams, and mitigate flooding, Section 7 of Appendix C of the City's Subdivision Regulations (Chapter 155 of the City's Code of Ordinances) establishes a stormwater management utility to provide capital for new stormwater projects and maintenance and operation of existing facilities. The stormwater utility fee is imposed on all lots within the city based on EDU. The charge per EDU is $3.00 per month and consists of a base fee of $1.45 per EDU, plus a contribution fee of $1.55 per EDU. Non-residential property with site mitigation facilities will not pay the contribution fee.

3.15 City of Longwood

The City of Longwood occupies a little less than 1 square mile of the WSA. Located immediately to the south of the City of Lake Mary, only the western portion of the City is located within the eastern edge of the WSA. Portions of the City are within the Soldiers Creek and Little Wekiva River watersheds. Predominant land uses within the city limits in the WSA include medium density residential (44 percent), water bodies (19 percent) and roads (15 percent).

3.15.1 Level of Service

In Chapter 7 (Stormwater Technical Requirements) of the *Manual of Standards for City Streets, Stormwater Systems and Subdivisions* outlines the LOS standards for stormwater facilities as shown in **Table 3-8**.

Table 3-8
Wekiva Parkway & Protection Act Support
Master Stormwater Management Plan
City of Longwood LOS Stormwater Standards

Facility Type	Design Storm
Cross drains, storm sewers	10-year/24-hour
Roadside swales for drainage internal to the development	10-year/24-hour
Detention Basins	25-year/24-hour
Retention Basins (no positive outfall)	100-year/24-hour

3.15.2 NPDES MS4 Permit

The City of Longwood (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;

- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

3.15.3 Stormwater System Inspection and Maintenance

Chapter 24: Stormwater Management, Article II: Regulation of Stormwater Management System of the City's Code of Ordinances outlines the inspection and maintenance procedures for the stormwater systems in the City of Longwood. Structural controls, BMPs, or other elements of the stormwater management system must be operated and maintained by the property owner in accordance with permitted design and performance criteria, and in compliance with federal, state and local permit conditions and regulations. City personnel inspect facilities discharging or suspected of discharging to the City's MS4 or waters of the United States in order to investigate potential violations.

The City's maintenance schedule complies with the requirements set forth in the NPDES permit (see Appendix C). There are 2 full-time staff members specifically dedicated to stormwater maintenance. The City had a consultant under contract for NPDES services. The City does not own/operate any major equipment. Regular maintenance (e.g. cleaning out drains, right-of-way mowing) is done in-house, but major maintenance (cleaning out retention areas, lining pipes) is contracted out. During periods of heavy rain there can be up to 10 people dedicated to stormwater activities.

3.15.4 Redevelopment Control Measures

Article III (Design Standards) of the City's Land Development Code addresses stormwater management. All new development and redevelopment, except single-family and duplex structures, must comply with the regulations for stormwater management in the City of Longwood. All stormwater management facilities must meet the level of service requirements of the Longwood Comprehensive Plan; comply with the Stormwater Technical Requirements of the City of Longwood, the Department of Public Works Design Standards and the water management district regulations. Retention/detention requirements outlined in the LOS must also be met.

3.15.5 Current Water Resources Funding Mechanisms

The City of Longwood has developed a stormwater utility fee to fund stormwater management projects and services. This fee applies to all property within the City and may be used to fund the following activities:

1. Preparation of plans for improvements and betterments to the stormwater management system.

2. Construction of improvements and betterments to the stormwater management system.

3. The promulgation of regulations for the use of the stormwater management system including provisions for the enforcement of said regulations.

4. Review and approval of all new development permits within the city for compliance with stormwater management regulations included in the present City Code or amendments later adopted.

5. Performance of routine maintenance and minor improvement to the stormwater management system.

6. Recommendation of charges for connection to and use of the stormwater management system.

7. Evaluation of water quality concerns for discharges to the stormwater management system.

8. Performance of all normal utility functions relating to construction, operation, and maintenance of the City's stormwater management system.

9. Stormwater management systems inspection fee. The City charges a fee of fifty dollars ($50.00) for each inspection of completed stormwater management systems which were approved for construction by the City.

Table 3-9 details the specific fees applied to each type of property in the City of Longwood.

Table 3-9
Wekiva Parkway & Protection Act Support
Master Stormwater Management Plan
City of Longwood Stormwater Utility Fees

Property Type	Stormwater utility fees
Single family property per month per unit	$3.00
Multifamily property per month per unit	$3.00
Nonresidential/commercial property: Per EDU per month (if property has mitigation) Minimum charge per month	 $1.00 $1.00
Nonresidential/commercial property: Per EDU month (if property has no mitigation) Minimum charge per month	 $3.29 $3.29
Vacant residential platted property	$1.05/month or $6.30 semiannually per lot
All other vacant property	$l.05/month or $6.30/ semiannually for every 8,500 sq. ft. or fraction thereof

Section 4
Existing Deficiencies & Prioritization

4.1 Introduction

As required by Section 369.319, F.S. of the WPPA, the MSMP must assess existing problems and deficiencies in the community as well as establish priorities to address existing deficiencies. This section describes the methodology used to identify, assess and prioritize existing deficiencies.

4.2 Existing Deficiencies

In order to identify existing deficiencies, CDM obtained existing stormwater master plans and drainage studies from the Stakeholders. Some problem areas were also identified through correspondence with Stakeholders as they were not part of an existing study. The available studies were then reviewed and the problems identified were tabulated and mapped using GIS ArcMap® Version 9.0, with a unique Id based on their major watershed location. Where evaluations of alternatives and recommendations for improvements were included in a study, these were noted as well. A large percentage of the WSA has already been studied in detail by the Stakeholders. Stakeholders who have performed detailed studies in the past within their jurisdictions include:

- City of Eustis
- City of Mount Dora
- Orange County
- City of Apopka
- City of Ocoee
- City of Orlando
- City of Winter Garden
- Seminole County
- City of Altamonte Springs

Table 4-1 lists an inventory of the available studies that were reviewed and summarizes the types of information that were included in each study. As a large number of studies have already been performed within the WSA, CDM attempted to limit the inventory to more recent studies as these would be more up-to-date in identifying existing problems. The areas that have been previously studied or are in the process of being studied are shown in **Figure 4-1**.

Table 4-1
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
Inventory of Stormwater Master Plan/Drainage Studies

Study	*Stormwater Structure Inventory*	*Water Quality Data Review*	*Pollutant Load Analysis*	*Water Quality Model*	*Subbasin Delineation*	*Hydrologic Unit Delineation*	*Model Schematic*	*Hydrologic Model*	*Hydraulic Surface Water Model*	*Long-Term Continuous Simulation Model*	*Model Attribute Data*	*Water Quantity Problems*	*Water Quality Problems*	*Other Problem Areas*	*Alternatives Evaluation*	*Estimated Capital Improvement Project Costs*	*Floodplain Mapping*
1. Lake Apopka Basin SWMMP (CDM, 2002) – Orange County	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	
2. Big Wekiva Basin SWMMP (PEC, 2001) – Orange County	✓	✓			✓	✓						✓	✓	✓	✓		
3. Little Wekiva River SWMMP (CDM, 2004) – Orange County, Seminole County, City of Orlando, City of Altamonte Springs	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
4. Big Wekiva Engineering Study and Drainage Inventory (DRMP, 2003) – Seminole County	✓	✓			✓	✓		✓	✓			✓	✓		✓	✓	
5. Lakes McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
6. Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996) – City of Ocoee	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
7. Lake Lotta Drainage Basin Study (PEC, 1998) – City of Ocoee	✓				✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
8. Lake Meadow and Prairie Lake Drainage Basin Study (PEC, 1998) – City of Ocoee	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
9. Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee	✓				✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
10. Spring Lake/Lake Johio - Drainage Basin Study (PEC, 1996) – City of Ocoee	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
11. Mt. Dora master Drainage Plan (Bowyer-Singleton, 1991) – City of Mount Dora	✓				✓				✓		✓	✓			✓		
12. Final Engineering Report on Hydrologic and Hydraulic Design Evaluation Proposed Lulu Creek Check Dams (Ardaman & Associates, 2002)– City of Winter Garden					✓			✓	✓		✓	✓					
13. Altamonte Springs Stormwater Management Master Plan (PEC, 1996) – City of Altamonte Springs												✓	✓		✓	✓	
14. Sawmill Pond/Crooked Lake Interconnection Study (SAI, 1999) – Orange County		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓		
15. Land Locked Drainage Basin Study for Orange County: Lakes Julia, Alpharetta, Long and Pleasant(DRMP, 1996) – Orange County	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
16. Johns Lake SWMP (Miller-Sellen, 2003)	✓	✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
17. Stormwater Outfall Master Drainage Plan for Jones Avenue (DRMP, 2002) – Orange County	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
18. City of Eustis SWMP (CPH, 2002)	✓	✓			✓	✓						✓	✓	✓	✓	✓	
19. Sweetwater Cove Tributary Surface Phase1A: Short Term Evaluation Water Restoration Project (ERD, 2002) – Seminole County	✓	✓										✓	✓		✓	✓	

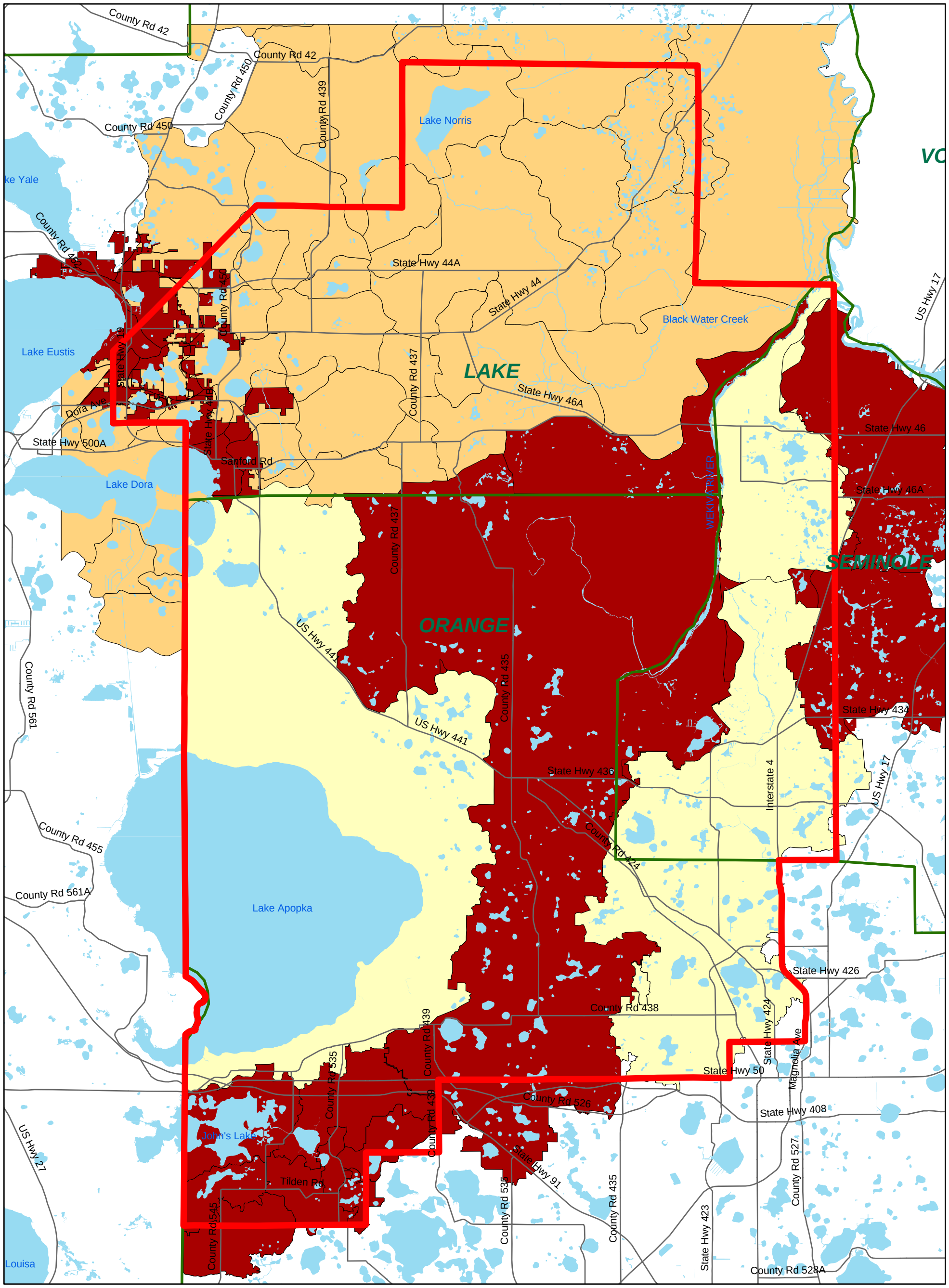
Table 4-1
Wekiva Parkway & Protection Act Master Stormwater Management Plan Support
Inventory of Stormwater Master Plan/Drainage Studies

Study	*Stormwater Structure Inventory*	*Water Quality Data Review*	*Pollutant Load Analysis*	*Water Quality Model*	*Subbasin Delineation*	*Hydrologic Unit Delineation*	*Model Schematic*	*Hydrologic Model*	*Hydraulic Surface Water Model*	*Long-Term Continuous Simulation Model*	*Model Attribute Data*	*Water Quantity Problems*	*Water Quality Problems*	*Other Problem Areas*	*Alternatives Evaluation*	*Estimated Capital Improvement Project Costs*	*Floodplain Mapping*
20. Sweetwater Cove Tributary Surface Water Restoration Project Phase 1B Hydrologic and Nutrient Budget (ERD, 2003)- Seminole County	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		✓		
21. West College Park Drainage Evaluation, City of Orlando (ERD, 2000)					✓	✓		✓	✓			✓			✓	✓	
22. Pleasant Oaks Drainage Basin, Orange County, Florida (BJM Associates, 1993)					✓		✓	✓	✓		✓	✓			✓	✓	✓
23. Bear Lake Drainage Basin Hydrology Study, Seminole County, Florida (T.E. Knowles & Associates, 1993)	✓	✓			✓	✓		✓			✓		✓		✓		
24. Little Wekiva River Basin Tributary C Flooding Investigation, Seminole County, Florida (DRMP, Inc., 1997)	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	✓
25. Little Wekiva River Drainage Basin Drainage Inventory Engineering Study, Tributary "C" Retrofit, Seminole County, Florida (DRMP, Inc., 1995)						✓	✓	✓	✓		✓	✓			✓		
26. Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)		✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
27. Orange County Stormwater Needs Assessment Update (Parsons Engineering Science, Inc. 2002)												✓	✓	✓	✓	✓	
28. Final Drainage Investigation Report Londonderry Hills Subdivision, Orange County, Florida (Parsons Engineering Science, Inc. 2001)	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	
29. Nob Hill Drainage Investigation, Orange County, Florida (PEC, 2001)					✓		✓	✓	✓		✓	✓			✓	✓	
30. Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	
31. Water Street Stormwater Outfall Master Drainage Plan (Gee & Jenson, September 1997)					✓	✓	✓	✓			✓	✓			✓	✓	
32. Stormwater Master Plan for the Beggs Road/Overland Road Area, Orange County, Florida (PEC, 1998)	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		✓	✓	✓
33. Engineering Study for the Retrofit and Restoration of Lulu Creek (Webb & Associates, Inc., 1999)		✓	✓		✓				✓		✓	✓	✓		✓	✓	
34. Draft Final Report Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration Plan (ERD, 2005)	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	
35. Monroe Basin Engineering Study and Drainage Inventory Update Final Report, Seminole County (CDM, October 2001)	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
36. Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County (Singhofen & Associates, Inc., December, 1996)	✓				✓	✓	✓	✓	✓		✓	✓			✓	✓	

honourdm

7/11/05

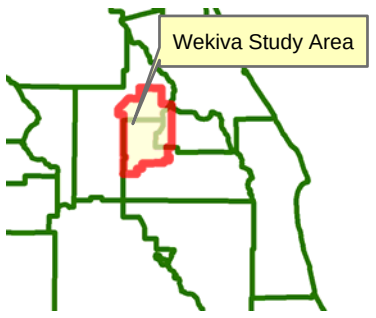
E:\Projects\9247\44812\GIS\Fig4-1.mxd



N
W E
S

0 7,000 14,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads
- Study Completed
- Study in Progress
- Study Not Completed

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 4-1
Areas Studied

Due to the large range of types of problems, CDM assigned them to the following categories:

- Aquifer Recharge
- Erosion/Sedimentation
- Finished Floor
- House/Structure Flooding
- Landlocked
- Maintenance
- Property Flooding
- Right-of-Way
- Street Flooding
- Water Quality

Once CDM had summarized, categorized and mapped these problems, they were submitted to the Stakeholders for review and comment. As some of the problems may have already been addressed or no longer exist, CDM took these comments and incorporated them into the master table. The resulting table of problem areas as well as maps showing their locations is provided in **Appendix D**.

4.3 Prioritization & Ranking

CDM developed a methodology to prioritize and rank the identified problems. As the final number of problem areas was in excess of 300, it was necessary to develop a methodology that would make prioritization of these problem areas more manageable. As this MSMP addresses surface water, a watershed approach was used to group and manage the problem areas. Section 2.6 of this MSMP identifies the major watershed boundaries within the WSA. In addition, the Stakeholders previously delineated the majority of these watersheds into sub-watersheds, more commonly referred to as subbasins. Based on the available delineations, 102 subbasins were identified (previously shown in Figure 2-11). Using ArcMap® Version 9.0, the problems were further divided by subbasin; the subbasin was then used as a unit of measure to rank and prioritize existing deficiencies.

CDM developed a list of criteria to evaluate and prioritize the subbasins with identified problem areas within the WSA. The problem areas were assigned scores, ranked, and prioritized according to the criteria proposed by CDM. These criteria were also submitted to the Stakeholders for review and comments, which were taken

into account in the final ranking matrix. A description of each of the criterions and how they were used to assess identified problems is provided below:

- Water Quality and Tributary to Impaired Water Body – Subbasins were evaluated based on the presence of water quality problems, and being tributary to an impaired water body, for which FDEP has determined a TMDL will be developed. More importance was placed on those subbasins that met both criteria.

- Landlocked Subbasin with no outfall – Section 2.6.1 (Subbasins) of this MSMP identified those subbasins that are either landlocked, have limited discharge capacity or have a free outfall to a surface water conveyance system. Since the majority of the problem areas in the WSA are flooding related, more importance was placed on landlocked subbasins as it relates to problem areas, as surface water can only be recharged to the aquifer. Most of these subbasins are located in high recharge areas especially along the Mount Dora Ridge through the central portion of the WSA. Subbasins that discharge intermittently or have drainage wells were categorized as limited discharge. Subbasins where surface water discharge can be readily lost (i.e., flow out of the system) were categorized as free outfall subbasins.

- Flooding Related Problems- All flooding problems (i.e. street, property, and house) were evaluated on the severity of impact based on duration, access, correlation with evacuation routes, and threat to structures. Flooding situations that impacted structures, blocked evacuation routes and were of lengthy duration were given more importance.

- Erosion/Sedimentation Problems- Areas with chronic erosion and sedimentation problems impacting the primary conveyance systems were given more priority over nuisance problems affecting secondary conveyance systems.

- Maintenance Problems- Subbasins were evaluated on the number of overall maintenance problems within their boundaries. More emphasis was given to those subbasins with more maintenance problems, which could indicate older stormwater systems or the need for a revised maintenance schedule.

- Number of Problems- The number of problem areas identified in each subbasin was also considered in prioritization. Subbasins with more problems were given more weight to assess the overall condition of that subbasin, and the possibility of combining projects and improvements to serve several areas.

An overall score for each subbasin was calculated, and the results of this process are summarized in a ranking matrix shown in **Table 4-2**. Based on the ranking, the top five subbasins are:

Table 4-2
Wekiva Parkway Protection Act Master
Stormwater Management Plan Support
Existing Deficiencies
Prioritzation and Ranking

Ranking Matrix				Tributary to Impaired Water Body	Landlocked Subbasin with no outfall	No. of Problems	Flooding Related	Erosion / Sedimentation	Maintenance Related	TOTALS	RANKING
Subbasin	Acres	# of Problems	Weight:	24.0%	10.0%	26.0%	20.0%	11.0%	9.0%	100.0%	#
AP-002	8237	43		10	0	10	5	10	10	8	1
AP-001	15876	34		5	5	8	7	5	2	6	2
LW-008	3980	13		10	5	3	5	10	0	6	2
LW-003	11113	24		10	0	6	5	8	2	6	2
BW-010	905	9		10	5	2	5	10	0	6	2
SOL-001	1286	4		10	10	1	5	0	0	5	3
BW-014	668	4		10	10	1	4	0	0	4	4
BW-011	460	9		5	5	2	5	10	2	4	4
LW-002	3549	18		10	0	4	4	0	1	4	4
LE-004	1277	1		10	10	0	4	0	0	4	4
LW-011	585	4		10	0	1	8	0	0	4	4
BW-002	1988	16		10	0	4	4	0	0	4	4
GT-006	1088	6		5	10	1	8	0	1	4	4
BW-007	742	7		10	5	2	3	0	2	4	4
BW-030	1155	17		5	0	4	6	0	7	4	4
BW-021	3683	5		5	0	1	6	10	0	4	4
BW-012	228	4		5	5	1	4	10	0	4	4
GT-001	1551	1		10	0	0	0	10	0	4	4
SOL-005	76	1		10	0	0	0	10	0	4	4
LW-010	1893	5		10	0	1	4	0	0	4	4
LW-012	629	3		10	0	1	5	0	1	4	4
LE-003	420	2		10	0	0	5	0	0	4	4
AP-006	1186	1		10	0	0	5	0	0	3	5
MON-002	655	1		10	0	0	5	0	0	3	5

Table 4-2
Wekiva Parkway Protection Act Master
Stormwater Management Plan Support
Existing Deficiencies
Prioritzation and Ranking

Ranking Matrix				Tributary to Impaired Water Body	Landlocked Subbasin with no outfall	No. of Problems	Flooding Related	Erosion / Sedimentation	Maintenance Related	TOTALS	RANKING
Subbasin	Acres	# of Problems	Weight:	24.0%	10.0%	26.0%	20.0%	11.0%	9.0%	100.0%	#
BW-013	1142	5		5	10	1	5	0	0	3	5
LW-001	2664	3		10	0	1	4	0	0	3	5
LE-002	1216	6		5	10	1	4	0	0	3	5
BW-009	433	2		5	10	0	5	0	0	3	5
LW-007	1279	2		10	0	0	4	0	0	3	5
MON-001	1697	2		10	0	0	4	0	0	3	5
LW-005	1784	3		10	0	1	4	0	0	3	5
LW-009	1717	3		10	0	1	3	0	0	3	5
GT-007	1272	4		5	10	1	0	7	0	3	5
AP-007	10494	2		10	0	0	3	0	0	3	5
LW-006	1160	2		10	0	0	0	0	0	3	5
BW-006	2892	4		0	10	1	6	0	0	2	6
GT-002	592	1		5	10	0	0	0	0	2	6
LE-006	1010	1		0	10	0	0	10	0	2	6
BW-022	15409	2		0	10	0	5	0	0	2	6
BW-025	190	1		5	0	0	4	0	0	2	6
BWC-007	1092	1		0	10	0	5	0	0	2	6
BW-018	7866	4		0	10	1	4	0	0	2	6
BW-017	2741	10		0	5	2	4	0	0	2	6
BW-032	185	2		0	5	0	7	0	0	2	6
BWC-021	3330	1		0	10	0	4	0	0	2	6
BW-008	1415	1		5	5	0	0	0	0	2	6
BW-028	512	2		0	5	0	5	0	1	2	6
BW-029	1021	2		0	5	0	4	0	0	1	7

Table 4-2
Wekiva Parkway Protection Act Master Stormwater Management Plan Support
Existing Deficiencies
Prioritzation and Ranking

Ranking Matrix				**Tributary to Impaired Water Body**	**Landlocked Subbasin with no outfall**	**No. of Problems**	**Flooding Related**	**Erosion / Sedimentation**	**Maintenance Related**	**TOTALS**	**RANKING**
Subbasin	Acres	# of Problems	Weight:	24.0%	10.0%	26.0%	20.0%	11.0%	9.0%	100.0%	#
BW-023	26783	1		5	0	0	0	0	0	1	7
BW-031	426	3		0	0	1	4	0	2	1	7
BW-033	412	1		0	0	0	5	0	0	1	7
BW-004	210	1		0	0	0	5	0	0	1	7
BWC-017	9526	1		0	0	0	4	0	0	1	7
YL-001	9861	1		0	0	0	4	0	0	1	7
BW-020	1774	1		0	5	0	0	0	0	1	7

Criteria Explanation:

1 Tributary to Impaired Water Body	10	within the subbasin associated with an impaired water body
	5	water quality problem have been identified but not related to TMDL
	0	no water quality problems have been identified
2 Landlocked Subbasin	10	landlocked subbasin with no outfall
	5	landlocked basin with limited discharge
	0	subbasin with a positive outfall
3 Number of Problems	10	Most # of problems
	0	No problem areas
4 Flood Severity	10	structure flooding (e.g., house)
	8	flooding of evacuation routes but no structure flooding
	5	impassable local road flooding but no structure or evacuation route flooding
	4	property flooding
	3	short-term local road flooding only
	0	no flooding
5 Erosion/Sedimentation	10	chronic erosion/sedimentation occurring in primary conveyance systems
	5	nuisance erosion/sedimentation associated with maintenance/secondary systems
	0	no erosion/sedimentation problems
6 Maintenance Related	10	the most number of problems related to maintenance
	0	no maintenance problems

1. Subbasin AP-002 – This approximately 8,200 acre subbasin is located in the Lake Apopka Basin adjacent to the southeastern shore of Lake Apopka, and encompasses portions of the Town of Oakland, the City of Ocoee, the City of Winter Garden and unincorporated Orange County. Important issues in this subbasin are the number of problem areas identified (43) and it is tributary to an impaired water body (i.e. Lake Apopka).

2. Subbasin AP-001- Located just south of subbasin AP-002, AP-001 is within the Town of Oakland, the City of Ocoee, the City of Winter Garden and unincorporated Orange County. This subbasin is a limited discharge basin, as Johns Lake intermittently discharges to Lake Apopka.

3. Subbasin LW-008 - This 3,980 acre subbasin within the Little Wekiva River Basin, is located on the eastern edge of the WSA and is within the City of Altamonte Springs and unincorporated Seminole County. It is a limited discharge subbasin with 13 problem areas, and is tributary to 4 impaired water bodies: Lake Florida, Lake Orienta, Lake Adelaide and the Little Wekiva River.

4. Subbasin LW-003- This subbasin, also located in the Little Wekiva River Basin, encompasses the main stem of the Little Wekiva River from its headwaters in Orange County to its confluence with the Wekiva River in Seminole County. There were 24 problem areas identified in this subbasin which is tributary to two impaired water bodies: the Little Wekiva Canal (Orange County) and the Little Wekiva River (Seminole County).

5. Subbasin BW-010- This is a limited discharge subbasin in the Big Wekiva Basin and is within the City of Ocoee and unincorporated Orange County. This is a limited discharge basin comprised of approximately 900 acres and is tributary to Starke Lake which is an impaired water body.

4.4 Recommendations

The intent of this section was to inventory and prioritize existing deficiencies within the WSA. These problems range widely in the type of problem as well as the severity. Problems associated with both primary and secondary systems were included in this analysis. It is important to re-emphasize that the subbasins listed in Table 4-2 have been identified because they already have detailed studies associated with them. The affected Stakeholders that have jurisdiction in areas shown in Figure 4-1 that have not been studied yet should consider performing detailed studies for these areas, especially as development continues and problems may be more prevalent in the future. Those Stakeholders who have completed a stormwater master plan, but it is somewhat dated (prior to the mid-1990s) should consider updating their existing plans to reflect existing conditions as well as the special needs of the WSA. The results of this matrix were also used to aid in developing management strategy prioritization and ranking, and project selection, furthered detailed in Section 5.

Section 5
Wekiva Study Area Management Strategies

5.1 Introduction

In addition to the other provisions that the MSMP must contain, as required by Section 369.319 F.S., the MSMP is also required to identify projects to meet long-term needs. The intent of this section of the MSMP is to address this specific objective of the WPPA. This section describes the methodology developed by CDM, with input from the Stakeholders, as well as the long-term management strategies for surface water resources and identified projects. Using this methodology, CDM applied these management strategies and identified 10 projects to address the problems, deficiencies, and long range needs in the WSA based upon the goals of the WPPA. A conceptual planning level capital cost estimate was developed, where practicable, for each of the ten projects and is presented in Section 5. 5. Although there was a limit of 10 projects identified as per the scope of services, the intent of this task is to provide a model on how the strategic planning process can be applied throughout the WSA for water resources management and water conservation.

5.2 Methodology

CDM developed a methodology with input from the Stakeholders in order to establish long-term management strategies within the WSA, as well as to identify important issues that are critical to the improvement and sustainability of surface water resources within the WSA.

5.2.1 Subbasin Prioritization & Ranking

In order to prioritize the subbasins within the WSA, CDM developed an approach to assess the WSA based on the characteristics of each watershed similar to the methodology described in Section 5. Within each watershed, subbasin boundaries had previously been delineated by the Stakeholders. CDM used the subbasin boundaries as the unit of measure for assessment and prioritization as these are smaller than the larger watersheds and are more manageable from a size standpoint. Subbasins within the same watershed can also vary greatly due to their individual characteristics. CDM developed a list of criteria important to the management of surface waters within the WSA. This list was also presented to the Stakeholders for review and comment. A description of each of the criterions and how they were used to assess each subbasin is provided below:

- Water Quality and Tributary to Impaired Water Body – Water quality problems were identified throughout the WSA as part of the effort described in Section 5 (Existing Deficiencies and Prioritization), as well as those subbasins that are tributary to an impaired water body and FDEP has determined a TMDL will be developed. More importance was placed on those subbasins tributary to the impaired water bodies.

- Magnitude of Estimated Pollutant Loads – This refers to the pollutant loadings resulting from the WMM analysis where both the presence of BMPs and the impact of septic tank failure are taken in to account. For the purpose of prioritization, the pollutant load per year per acre was calculated for each subbasin to determine where the pollutant loads are more concentrated. More importance, in terms of the ranking, was placed on those subbasins with a higher concentrated pollutant load. A detailed description of the pollutant load analysis methodology and results is provided in **Appendix E**.

- Spring Protection - The WAVA developed as part of FDEP's 2004 study, *A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area* and the *Report of Investigation No. 104, Wekiva Aquifer Vulnerability Assessment* (FGS, 2005), was used as a basis for this criterion. The More Vulnerable, Vulnerable and Less Vulnerable Zones identified from this study were used to identify which subbasins had more of a direct influence on the resulting water quality and quantity of the springs. As subbasins may encompass portions of different zones, a weighted average of the area for each zone was calculated to determine the ranking. More importance was given to those areas within the WAVA More Vulnerable Zone.

- Subbasins with a Free Outfall – Section 2.6.1 (Subbasins) of this MSMP identified those subbasins that are either landlocked, have limited discharge capacity or have a free outfall to a surface water conveyance system. As water conservation is an important issue within the WSA, more importance was placed on those subbasins with a free outfall as surface water discharge can be readily lost (i.e., flow out of the system) due to increased runoff and loss of pervious areas as a result of urbanization. This is not so much a factor in landlocked subbasins, as the majority of these are located in high recharge areas, especially along the Mount Dora Ridge through the central portion of the WSA. Subbasins that discharge intermittently or have drainage wells were categorized as limited discharge.

- Rate of Growth – This criterion was based on population changes identified from the 1990 and 2000 census data. As population projections are beyond the scope of this MSMP, population changes between 1990 and 2000 were used as an indicator for growth patterns within the WSA. Those subbasins with the greater percent increase in population were assigned a higher priority.

- Problems Identified – The methodology described in Section 5 (Existing Deficiencies and Prioritization) was used to prioritize and rank those subbasins with identified problems. The resulting score for each of those subbasins (which were assessed with a different set of criteria) was factored in to help with prioritizing subbasins from a long-term management standpoint. Subbasins with a higher total score from the problem matrix were given more importance under this category.

- Benefit Area - The size of the subbasin was also taken into consideration, as capital improvement projects and long-term management strategies that are implemented to serve larger areas have an overall greater benefit to surface water resources for both water quality and water quantity.

5.2.2 Management Strategies

CDM was required to develop two long-term management strategies that the Stakeholders can consider for future surface water resources planning as per the scope of services of the MSMP. These water resources strategies identify the types of basin management activities that can be pursued by local governments to mitigate existing problems (quality and quantity), promote groundwater protection and water conservation, and provide for long-term flood control and water quality benefits. A series of BMPs that would help meet the intent of each planning strategy were identified and defined. BMP definitions were mostly obtained from the *Stormwater Education Toolkit (SET), Volume II: Business/Industry & Government* (2003) available from the University of Central Florida's Stormwater Management Academy.

The intent of the WPPA legislation was revisited to help in identifying and developing the two management strategies. In general the goals of the WPPA legislation are as follows:

- Restore and protect springs from further impact (i.e., water quantity and quality)
- Protect surface water and groundwater resources
- Land use planning (to be addressed by comprehensive plan amendments, Section 369.321 of the WPPA, not part of this MSMP)

The development of the management strategies focused on the first two goals listed above and the resulting management strategies are:

1) Surface Water Conservation, Groundwater Protection and Reuse; and

2) Surface Water Treatment and Flood Control.

Each management strategy was then examined to determine which types of BMPs (structural and non-structural) would be appropriate to achieve the long-term goal of that strategy. The selected BMPs and their definitions under each strategy are described in the following sub-sections. As can be seen from this list for each strategy, there are some BMPs that if implemented, help meet the long-term goal under both management strategies, and are therefore repeated.

5.2.2.1 Strategy No. 1 – Surface Water Conservation, Groundwater Protection & Reuse

- Stormwater Reuse (Localized and System Network) - Small scale stormwater reuse for irrigation in communities and regional stormwater reuse facilities.
- Reservoirs/Ponds- Natural or constructed basin (e.g. abandoned borrow or gravel pit) or high flow/high level pond or lake where water is collected and stored for stormwater reuse and volume control.
- No Net Floodplain Loss- Create compensating storage so that there is no net loss of the 100-year floodplain.
- Stormwater Infiltration Basins (SIBs) - Water impoundment constructed over highly permeable soils to temporarily store surface runoff and allow it to infiltrate through the bottom and sides. Removes many pollutants, provides ground water recharge, reduces the volume of runoff and reduces peak discharges. These may not be appropriate for industrial sites or locations where spills may occur and some pre-treatment may be required if there are large sediment loads.
- Buffers- A BMP consisting of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.
- Green Development/Low Impact Development (LID) - Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. LID is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.
- Recharge Rule – Continuation of the SJRWMD recharge requirement for development.

5.2.2.2 Strategy No. 2 – Surface Water Treatment and Flood Control

- Source Controls- Infrastructure and treatment at problem site.
- No Net Floodplain Loss- Create compensating storage so that there is no net loss of the 100-year floodplain.
- Retention- Water impoundment constructed over permeable soils to temporarily store surface runoff and allow it to infiltrate through the bottom and sides of the basin. Removes many pollutants, provides groundwater recharge, reduces the volume of runoff and reduces peak discharges. These BMPs are very effective for removing fine sediment and pollutants such as trace metals, nutrients, bacteria, and oxygen-demanding substances.

- Detention - Temporary storage area for runoff to be held for short periods of time until it is gradually released to a watercourse at a rate no greater than pre-development peak discharge rate. Detention reduces downstream flooding problems, costs of stormwater conveyance facilities, pollution of receiving streams, and enhances aesthetics within a development area. A detention basin consists of a permanent water pool, an overlying zone (where runoff increases the depth while stored and then released at allowable discharge rate), and a shallow littoral zone where wetland plants biologically remove stormwater pollutants such as metals and nutrients. In this manner the water in the permanent pool is "treated" so when stormwater runoff displaces it, the clean water is discharged or, in the case of a severe storm, the polluted runoff will at least be diluted. A detention basin should have a maximum depth of six feet, which will minimize recycling of pollutants stored in the bottom mud.

- Buffers- A BMP consisting of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.

- Swales- A shallow vegetated area that is designed to convey stormwater, allow it to soak into the ground, and filter pollutants. Swales can be further classified as the following:

    - Landscape Swales- Landscape retention areas are landscaping features adapted to treat on-site stormwater runoff. Commonly they replace traditional "parking lot islands" with a depressed landscaped area specifically designed to receive runoff and filter it through the vegetation and soil matrix in the planted space. Treats first flush of runoff by reducing velocity, promoting settling, and removing pollutants.
    - Grassed swales- Broad shallow channels with dense stand of established vegetation. Uses low velocities and vegetative cover to settle pollutants and provide infiltration. Can also result in reduced volumes of runoff and peak discharges.

- End-of-Pipe Treatments (e.g., baffle boxes). A baffle box is simply a rectangular chamber connected to the storm drain with partitions dividing the box into sections. Stormwater flows into the first section of the box and allows pollutants to settle out of the water. As water rises above the next partition, it overflows into the second section to allow further reduction of pollutants. Later, as the cleaner water rises, it exits the baffle box to its final discharge point.

- Alum/ Chemical Treatment – An alternative form of stormwater treatment where the addition of alum or some other equivalent chemical promotes the precipitation of pollutants from the water column through adsorption. It is typically used for the removal of suspended solids, phosphorus, heavy metals, algae and bacteria. This technology is typically used where conditions do not allow for the construction of

traditional stormwater BMPs. The system is generally used in conjunction with existing stormwater pipes discharging into water bodies but may also be designed in conjunction with creating a new holding pond or with offline floc settling ponds and automatic floc disposal systems.

- Drainage Well/Recharge Well & Treatment System- Wells that are used to inject surface water directly into an aquifer, or shallow ground water directly into a deeper aquifer, primarily by gravity. Drainage wells in Central Florida are typically used for flood control purposes where stormwater runoff enters the well and recharges the aquifer.

- Agricultural Nonpoint Source Pollution Management – State water quality assessments have shown that agriculture is the most wide-spread source of pollution for assessed rivers and lakes, and the primary agricultural non-point source pollutants are nutrients, sediment, animal wastes, salts, and pesticides (USEPA, 2003). Detailed guidance on the appropriate types of BMPs to use for specific pollutants can be found in the technical guidance and reference document entitled *National Management Measures to Control Nonpoint Source Pollution from Agriculture* (USEPA, 2003). Additionally, the Office of Agricultural Water Policy (OAWP) was established in 1995 by the Florida Legislature to facilitate communications among federal, state, local agencies, and the agricultural industry on water quantity and water quality issues involving agriculture. The OAWP is directly involved with statewide programs to implement the Federal Clean Water Act's TMDL requirements for agriculture. An extensive listing of adopted BMPs and BMP manuals under development can be found on the OAWP's website (http://www.floridaagwaterpolicy.com/BestManagementPractices.html).

- Green Roofs- Attractive building additions which reduce energy use, stormwater runoff, and increase habitat conservation.

- Water Wise Landscaping and Reduced Turf Area- A systematic concept for saving water in landscaped areas, creative landscaping for water and energy efficiency and lower maintenance. The seven water wise landscaping principles are: good planning and design; practical lawn areas; efficient irrigation; soil improvement; use of mulches; low water demand plants; and good maintenance (www.qcwater.com/Glossary.asp).

- Pervious Pavement- Pervious pavement can be classified as the following:

    - Porous- Pavement specially formulated mixture of concrete with a high percentage of void space. Reduces runoff volume and peak flow rates via percolation of liquid through the pavement.

    - Concrete grid and modular - Pavement sections of strong enough materials to accommodate vehicles with regularly interspersed void areas filled with sod, gravel, sand, etc. Reduces runoff volume, peak flow rate and concentration of pollutants in low-volume traffic areas.

- Green Development/LID - Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. LID is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

- Public Outreach/Education for Proper Management and Use of Fertilizers– Most of the Stakeholders are currently required to do this under their NPDES MS4 permit, however, this is a global recommendation that all Stakeholders should continue to implement a public education program to emphasize to citizens the importance of proper fertilizer management and application. This can encourage the reduction of use of these products, which will help minimize runoff of nutrients into waterways and infiltration into the ground.

5.2.3 Overall Ranking

Since the two management strategies establish different objectives, it was necessary to rank the subbasins under each strategy (i.e. have two separate rankings for each strategy). The reason for this is that although the same ranking criteria (described in subsection 5.2.1) apply, some ranking criteria may be more critical when trying to achieve the objective of one management strategy versus achieving the objectives of the other. Therefore the weighting of the ranking criteria were adjusted to reflect the objectives to be achieved by each strategy. The following weighting was used for each management strategy:

Criteria	Management Strategy No. 1	Management Strategy No. 2
Water Quality and Tributary to Impaired Water Body	15%	19%
Magnitude of Estimated Pollutant Loads	7%	23%
Spring Protection	25%	17%
Subbasins with a Free Outfall	25%	10%
Rate of Growth	15%	10%
Problems Identified	7%	15%
Benefit Area	6%	6%

As an example, the spring protection ranking criteria would be somewhat of a more critical factor (i.e., those subbasins that are within the "More Vulnerable" and "Vulnerable" WAVA zones) when evaluating the subbasins under Management Strategy No. 1 (Surface Water Conservation, Groundwater Protection and Reuse) versus evaluating the same subbasins under Management Strategy No. 2 (Surface Water Treatment and Flood Control). Therefore, weighting for this criteria assigned under Management Strategy No. 1 (25 percent) was slightly higher than that assigned under Management Strategy No. 2 (17 percent). The resulting rankings under Management Strategy No. 1 and 2 are provided in **Tables 5-1** and **5-2**, respectively. The subbasins with their assigned rankings for each management strategy are also provided in **Figures 5-1** and **5-2**, which shows where the higher priority subbasins, according to the management strategies, are located throughout the WSA.

5.2.4 Applying Management Strategies

As mentioned previously, the number of projects (10) to be identified in the WSA was limited as per the scope of services. Therefore, the intent of this task is not only to identify 10 projects, but to also provide a model on how the strategic planning process can be applied throughout the WSA for water resources management and water conservation. In the following section, each management strategy was applied to five example subbasins, for a total of 10 projects. As a number of subbasins received the same ranking based on the results shown in Tables 5-1 and 5-2, an example from each (or as many as the limit of 10 projects would allow) was used to apply the management strategies. To aid the Stakeholders in this process, flowcharts of how to apply each of the management strategy for the remainder of the subbasins throughout the WSA were developed. These diagrams are provided in **Figures 5-3** and **5-4** and can be used as a tool to walk the user through the thought process of applying the management strategies to individual subbasins.

5.3 Identified Projects – Management Strategy No. 1 (Conservation, Groundwater Protection and Reuse)

Table 5-1 shows the ranking of the 102 subbasins according to the criteria previously described. As can be seen in the table, several subbasins may have received the same rank. Therefore, a candidate subbasin for the top five ranked subbasins was selected as an example to show how the management strategy can be applied. In most cases the top scoring subbasin (i.e., greatest number of points) within each rank was selected. However after reviewing these, there were some subbasins that were not feasible to apply management strategies to and make recommendations. An example would be subbasin AP-005. This subbasin is within the SJRWMD's jurisdiction for the restoration of Lake Apopka. As this land will be under the ownership and management of the SJRWMD, it was not selected as a candidate subbasin. Additionally, some of the selected candidate subbasins were chosen so that as much as possible, the majority of the Stakeholders were represented. Based on the prioritization shown in Table 5-1 and the reasons previously discussed, the following

Table 5-1
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Subbasin Ranking Matrix - Management Strategy # 1- Conservation, Groundwater Protection Reuse

Ranking Matrix			Benefit Area	Tributary to Impaired Water Body	Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr)	Spring Protection (WAVA Zones)	Subbasins with free outfall	Rate of Growth (based on change in population from 1990 - 2000)	Problems Identified	TOTALS	REVISED RANKING	Jurisdiction Affected													
Subbasin	Acres	Weight:	6.0%	15.0%	7.0%	25.0%	25.0%	15.0%	7.0%	100%	#	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
MON-003	25.7		0	10	5	10	10	9	0	8	1											√			
BW-002	1988.5		1	10	7	6	10	6	4	7	2				√				√		√				
LW-005	1783.7		1	10	7	6	10	5	4	7	2				√		√								
LW-009	1716.7		1	10	6	6	10	4	4	7	2				√	√						√	√		
LW-004	240.0		0	10	8	8	10	3	0	7	2				√					√					
LW-007	1279.0		0	10	7	6	10	4	4	7	2				√							√	√		
LW-003	11113.4		4	10	7	5	10	4	6	7	2				√					√		√	√	√	
LE-003	420.5		0	10	7	7	10	1	4	7	2	√	√												
LW-010	1893.1		1	10	7	6	10	2	4	7	2											√	√		
MON-001	1696.8		1	10	3	3	10	9	4	7	2											√			
SOL-005	75.5		0	10	6	8	10	0	4	7	2											√			
LW-001	2663.8		1	10	7	7	10	0	4	7	2				√					√					
LW-002	3549.3		1	10	8	5	10	1	4	6	3				√					√					
AP-007	10493.9		4	10	3	7	10	0	4	6	3	√		√	√										
MON-002	654.9		0	10	4	2	10	9	4	6	3											√			
LW-006	1159.7		0	10	7	5	10	1	3	6	3				√							√	√		
BW-010	905.0		0	10	6	6	5	6	6	6	3				√				√						
BW-021	3682.7		1	5	6	6	10	4	4	6	3				√	√									
AP-002	8237.2		3	10	4	4	10	0	8	6	3				√	√		√	√		√				
LW-011	585.0		0	10	8	4	10	0	4	6	3											√	√		
AP-003	25010.9		9	10	3	5	10	1	0	6	3	√			√	√		√	√		√				
LW-012	629.2		0	10	6	5	10	1	4	6	3											√			
SOL-004	122.6		0	0	8	9	10	4	0	6	3														√
AP-006	1185.9		0	10	4	6	10	0	4	6	3				√										
GT-001	1550.7		1	10	5	4	10	2	4	6	3	√		√	√										
BW-007	742.0		0	10	10	6	5	3	5	6	3				√					√					
LW-008	3980.0		1	10	9	6	5	1	6	6	3											√	√	√	
YL-001	9860.9		4	0	3	5	10	9	0	6	3	√			√							√			√
AP-001	15876.0		6	5	4	4	5	10	6	6	3				√			√	√		√				
AP-005	13107.1		5	10	2	4	10	0	0	5	4				√	√									
BW-011	460.2		0	5	6	7	5	4	5	5	4				√				√						
BW-014	667.8		0	10	4	9	0	4	5	5	4				√				√						
BW-023	26782.8		10	5	3	1	10	3	2	5	4	√			√							√			
BW-012	228.3		0	5	4	6	5	4	4	5	4				√				√						
BW-025	190.0		0	0	0	9	10	0	1	5	4												√		
SOL-001	1285.6		0	10	7	8	0	2	5	5	4											√		√	
BW-008	1415.3		1	5	5	6	5	5	2	5	4				√				√						
YL-002	1226.7		0	0	4	7	5	9	0	5	4											√			
BW-020	1774.0		1	0	7	7	5	7	1	5	4				√							√			
BW-033	411.6		0	0	0	8	10	0	1	5	4											√			
BW-031	425.5		0	5	0	4	10	1	1	4	5											√			
BW-030	1154.7		0	0	1	6	10	0	4	4	5											√			
BW-009	433.4		0	5	5	8	0	6	4	4	5				√				√						
BW-017	2740.7		1	0	8	6	5	5	2	4	5				√				√			√			
LE-004	1276.9		0	10	5	6	0	3	5	4	5	√	√												
BW-016	1012.2		0	0	7	7	5	2	0	4	5				√				√						
BW-013	1142.5		0	5	4	8	0	4	4	4	5				√				√						
LE-008	891.1		0	10	2	3	0	8	5	4	5	√	√												
LE-002	1215.7		0	5	4	6	0	7	4	4	5	√	√												
AP-004	9716.3		4	10	4	6	0	2	0	4	5				√	√			√						
SOL-003	681.5		0	0	6	8	0	9	0	4	5											√			√
BWC-016	7724.3		3	0	3	2	10	3	0	4	5	√													
BWC-019	4577.8		2	0	2	2	10	2	0	4	5	√													
BWC-015	1944.2		1	0	2	2	10	3	0	4	5	√													
BW-003	343.9		0	0	5	5	5	5	0	4	5				√				√						
BW-032	184.5		0	0	0	9	5	0	2	4	5											√			

Table 5-1
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Subbasin Ranking Matrix - Management Strategy # 1- Conservation, Groundwater Protection Reuse

Ranking Matrix			Benefit Area	Tributary to Impaired Water Body	Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr)	Spring Protection (WAVA Zones)	Subbasins with free outfall	Rate of Growth (based on change in population from 1990 - 2000)	Problems Identified	TOTALS	REVISED RANKING	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
Subbasin	Acres	Weight:	6.0%	15.0%	7.0%	25.0%	25.0%	15.0%	7.0%	100%	#															
BWC-013	6767.9		3	0	2	1	10	2	0	4	5	√													
BWC-010	5133.8		2	0	2	1	10	2	0	3	6	√													
BWC-018	2879.5		1	0	2	1	10	2	0	3	6	√													
BWC-017	9526.4		4	0	2	0	10	3	0	3	6	√										√			
BW-001	62.6		0	0	4	9	0	6	0	3	6				√			√							
AS-001	771.9		0	0	2	1	10	2	0	3	6	√										√			
GT-002	592.3		0	5	6	6	0	2	3	3	6	√		√	√										
BW-024	330.5		0	0	5	10	0	3	0	3	6				√	√									
GT-006	1088.3		0	5	7	6	0	1	4	3	6	√	√	√											
SOL-002	682.2		0	0	7	8	0	4	0	3	6											√		√	√
BW-022	15408.7		6	0	3	8	0	3	2	3	6	√			√	√									
BW-027	84.4		0	0	10	9	0	0	0	3	6											√			
LE-006	1009.7		0	0	2	6	0	8	3	3	6	√	√												
BW-028	511.7		0	0	0	6	5	1	2	3	6											√			
GT-007	1272.2		0	5	4	6	0	2	4	3	6	√	√												
BW-029	1020.5		0	0	1	6	5	0	1	3	6											√	√		
LE-005	777.6		0	0	3	5	0	8	2	3	6	√	√												
BW-004	210.4		0	0	5	5	0	6	2	3	4				√				√						
BW-006	2892.2		1	0	8	6	0	3	2	3	6				√										
LE-007	1254.6		0	0	2	6	0	7	2	3	6	√													
BW-018	7866.0		3	0	7	5	0	4	2	3	6				√	√			√						
LE-001	1232.1		0	0	1	5	0	8	0	3	6	√	√	√											
BW-026	913.2		0	0	2	10	0	0	0	3	6				√	√									
GT-004	1474.7		1	0	3	5	0	6	0	3	6	√		√											
BW-015	1588.7		1	0	5	6	0	4	0	3	6				√				√						
BWC-004	575.9		0	0	2	7	0	3	0	2	7	√		√											
BWC-001	2462.9		1	0	2	7	0	2	0	2	7	√			√										
BWC-007	1091.9		0	0	2	7	0	2	2	2	7	√													
GT-003	1450.6		1	0	4	7	0	2	0	2	7	√		√											
BWC-023	672.6		0	0	2	7	0	2	0	2	7	√													
BWC-022	755.3		0	0	3	6	0	2	0	2	7	√													
BWC-006	3838.8		1	0	2	6	0	3	0	2	7	√													
BWC-014	2397.2		1	0	2	7	0	2	0	2	7	√													
GT-005	1222.1		0	0	5	5	0	2	0	2	7	√		√											
BWC-003	3630.8		1	0	2	5	0	3	0	2	7	√													
BWC-009	1042.7		0	0	2	5	0	2	0	2	7	√													
BWC-021	3330.0		1	0	2	4	0	2	2	2	7	√													
BWC-008	1700.4		1	0	2	5	0	2	0	2	7	√													
BW-019	2939.4		1	0	3	5	0	1	2	2	7				√	√			√						
BWC-012	1075.1		0	0	2	6	0	0	0	2	7	√													
BWC-002	1415.7		1	0	3	3	0	3	0	1	8	√													
BWC-011	1646.9		1	0	2	2	0	4	0	1	8	√													
BWC-005	1458.6		1	0	1	3	0	3	0	1	8	√													
BWC-020	5536.6		2	0	2	2	0	2	0	1	8	√													
BWC-024	3241.5		1	0	3	2	0	2	0	1	8	√													
BWC-025	210.0		0	0	2	0	0	2	0	1	8	√													

Criteria Explanation:

1	Benefit Area	10	largest benefit area based on size
		0	least benefit area based on size
2	Tributary to Impaired Water B	10	within a subbasin associated with an impaired water body
		5	water quality problem have been identified but not related to TMDL
		0	no water quality problems have been identified
2	Magnitude of Pollutant Load	10	areas with the highest concentration of pollutant load (lbs/acre/yr)
		0	areas with the lowest concentration of pollutant load (lbs/acre/yr)
3	Spring Protection	10	within the primary protection WAVA zone
		5	within the secondary WAVA protection zone
		0	within the tertiary WAVA protection zone
4	Subbasin with free outfall	10	subbasin with a positive outfall
		5	landlocked basin with limited discharge
		0	landlocked subbasin with no outfall
5	Rate of Growth	10	highest rate of growth (in terms of population)
		0	little to no population growth
6	Problems Identified	10	problems identified in the subbasin with the highest score
		0	no identified problems

Table 5-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control

Ranking Matrix			Benefit Area	Tributary to Impaired Water Body	Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr)	Spring Protection (WAVA Zones)	Subbasins with free outfall	Rate of Growth (based on change in population from 1990 - 2000)	Problems Identified	TOTALS	REVISED RANKING	Jurisdiction Affected: Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
Subbasin	Acres	Weight:	6.0%	19.0%	23.0%	17.0%	10.0%	10.0%	15.0%	100%	#														
LW-003	11113.4		4	10	7	5	10	4	6	7	1				√				√		√	√	√	
LW-008	3980.0		1	10	9	6	5	1	6	7	1										√	√	√	
BW-002	1988.5		1	10	7	6	10	6	4	7	1				√			√		√				
MON-003	25.7		0	10	5	10	10	9	0	7	1										√			
LW-007	1279.0		0	10	7	6	10	4	3	7	1				√						√	√		
BW-007	742.0		0	10	10	6	5	3	4	6	2				√				√					
LW-002	3549.3		1	10	8	5	10	1	4	6	2				√				√					
LW-005	1783.7		1	10	7	6	10	5	3	6	2				√		√							
LE-003	420.5		0	10	7	7	10	1	4	6	2	√	√											
LW-010	1893.1		1	10	7	6	10	2	4	6	2										√	√		
BW-010	905.0		0	10	6	6	5	6	6	6	2				√				√					
LW-009	1716.7		1	10	6	6	10	4	3	6	2				√	√					√	√		
LW-004	240.0		0	10	8	8	10	3	0	6	2				√					√				
LW-001	2663.8		1	10	7	7	10	0	3	6	2				√					√				
LW-011	585.0		0	10	8	4	10	0	4	6	2										√	√		
SOL-005	75.5		0	10	6	8	10	0	4	6	2										√			
LW-006	1159.7		0	10	7	5	10	1	3	6	2				√						√	√		
AP-002	8237.2		3	10	4	4	10	0	8	6	2				√	√		√	√					
SOL-001	1285.6		0	10	7	8	0	2	5	6	2										√		√	
LW-012	629.2		0	10	6	5	10	1	4	6	2										√			
MON-001	1696.8		1	10	3	3	10	9	3	6	2										√			
MON-002	654.9		0	10	4	2	10	9	3	6	2										√			
AP-007	10493.9		4	10	3	7	10	0	3	5	3	√		√	√									
GT-001	1550.7		1	10	5	4	10	2	4	5	3	√		√	√									
BW-021	3682.7		1	5	6	6	10	4	4	5	3				√	√								
AP-001	15876.0		6	5	4	4	5	10	6	5	3				√			√	√		√			
BW-014	667.8		0	10	4	9	0	4	4	5	3				√				√					
AP-006	1185.9		0	10	4	6	10	0	3	5	3				√									
BW-011	460.2		0	5	6	7	5	4	4	5	3				√				√					
LE-004	1276.9		0	10	5	6	0	3	4	5	3	√	√											
AP-003*	25010.9		9	10	3	5	10	1	0	5	3	√			√	√		√	√		√			
SOL-004	122.6		0	0	8	9	10	4	0	5	3													√
BW-009	433.4		0	5	5	8	0	6	3	4	4				√				√					
BW-012	228.3		0	5	4	6	5	4	4	4	4				√				√					
GT-006	1088.3		0	5	7	6	0	1	4	4	4	√	√	√										
BW-008	1415.3		1	5	5	6	5	5	2	4	4				√				√					
AP-005	13107.1		5	10	2	4	10	0	0	4	4				√	√								
LE-008	891.1		0	10	2	3	0	8	3	4	4	√	√											
AP-004	9716.3		4	10	4	6	0	2	0	4	4				√	√			√					

Table 5-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control

Ranking Matrix			Benefit Area	Tributary to Impaired Water Body	Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr)	Spring Protection (WAVA Zones)	Subbasins with free outfall	Rate of Growth (based on change in population from 1990 - 2000)	Problems Identified	TOTALS	REVISED RANKING	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
Subbasin	Acres	Weight:	6.0%	19.0%	23.0%	17.0%	10.0%	10.0%	15.0%	100%	#														
BW-013	1142.5		0	5	4	8	0	4	3	4	4				√				√						
BW-020	1774.0		1	0	7	7	5	7	1	4	4				√							√			
BW-017	2740.7		1	0	8	6	5	5	2	4	4				√				√			√			
LE-002	1215.7		0	5	4	6	0	7	3	4	4	√	√												
GT-002	592.3		0	5	6	6	0	2	2	4	4	√		√	√										
BW-027	84.4		0	0	10	9	0	0	0	4	4											√			
YL-001	9860.9		4	0	3	5	10	9	1	4	4	√			√							√			√
BW-023	26782.8		10	5	3	1	10	3	1	4	4	√			√							√			
BW-016	1012.2		0	0	7	7	5	2	0	4	4				√				√						
BW-006	2892.2		1	0	8	6	0	3	2	4	4				√										
SOL-003	681.5		0	0	6	8	0	9	0	4	4											√			√
GT-007	1272.2		0	5	4	6	0	2	3	3	5	√	√												
YL-002	1226.7		0	0	4	7	5	9	0	3	5											√			
SOL-002	682.2		0	0	7	8	0	4	0	3	5											√		√	√
BW-018	7866.0		3	0	7	5	0	4	2	3	5				√	√			√						
BW-024	330.5		0	0	5	10	0	3	0	3	5				√	√									
BW-003	343.9		0	0	5	5	5	5	0	3	5				√				√						
BW-004	210.4		0	0	5	5	0	6	2	3	5				√				√						
BW-022	15408.7		6	0	3	8	0	3	2	3	5	√			√	√									
BW-031	425.5		0	5	0	4	10	1	1	3	5											√			
BW-001	62.6		0	0	4	9	0	6	0	3	5				√										
BW-025	190.0		0	0	0	9	10	0	2	3	5												√		
BW-030	1154.7		0	0	1	6	10	0	4	3	5											√			
LE-006	1009.7		0	0	2	6	0	8	2	3	5	√	√												
BW-015	1588.7		1	0	5	6	0	4	0	3	5				√				√						
BW-033	411.6		0	0	0	8	10	0	1	3	5											√			
LE-005	777.6		0	0	3	5	0	8	1	2	6	√	√												
LE-007	1254.6		0	0	2	6	0	7	1	2	6	√													
BWC-016	7724.3		3	0	3	2	10	3	0	2	6	√													
GT-003	1450.6		1	0	4	7	0	2	0	2	6	√		√											
BW-032	184.5		0	0	0	9	5	0	2	2	6											√			
GT-004	1474.7		1	0	3	5	0	6	0	2	6	√		√											
BWC-017	9526.4		4	0	2	0	10	3	1	2	6	√										√			
BWC-019	4577.8		2	0	2	2	10	2	0	2	6	√													
BWC-013	6767.9		3	0	2	1	10	2	0	2	6	√													
GT-005	1222.1		0	0	5	5	0	2	0	2	6	√		√											
BWC-015	1944.2		1	0	2	2	10	3	0	2	6	√													
BWC-022	755.3		0	0	3	6	0	2	0	2	6	√													
BWC-007	1091.9		0	0	2	7	0	2	2	2	6	√													

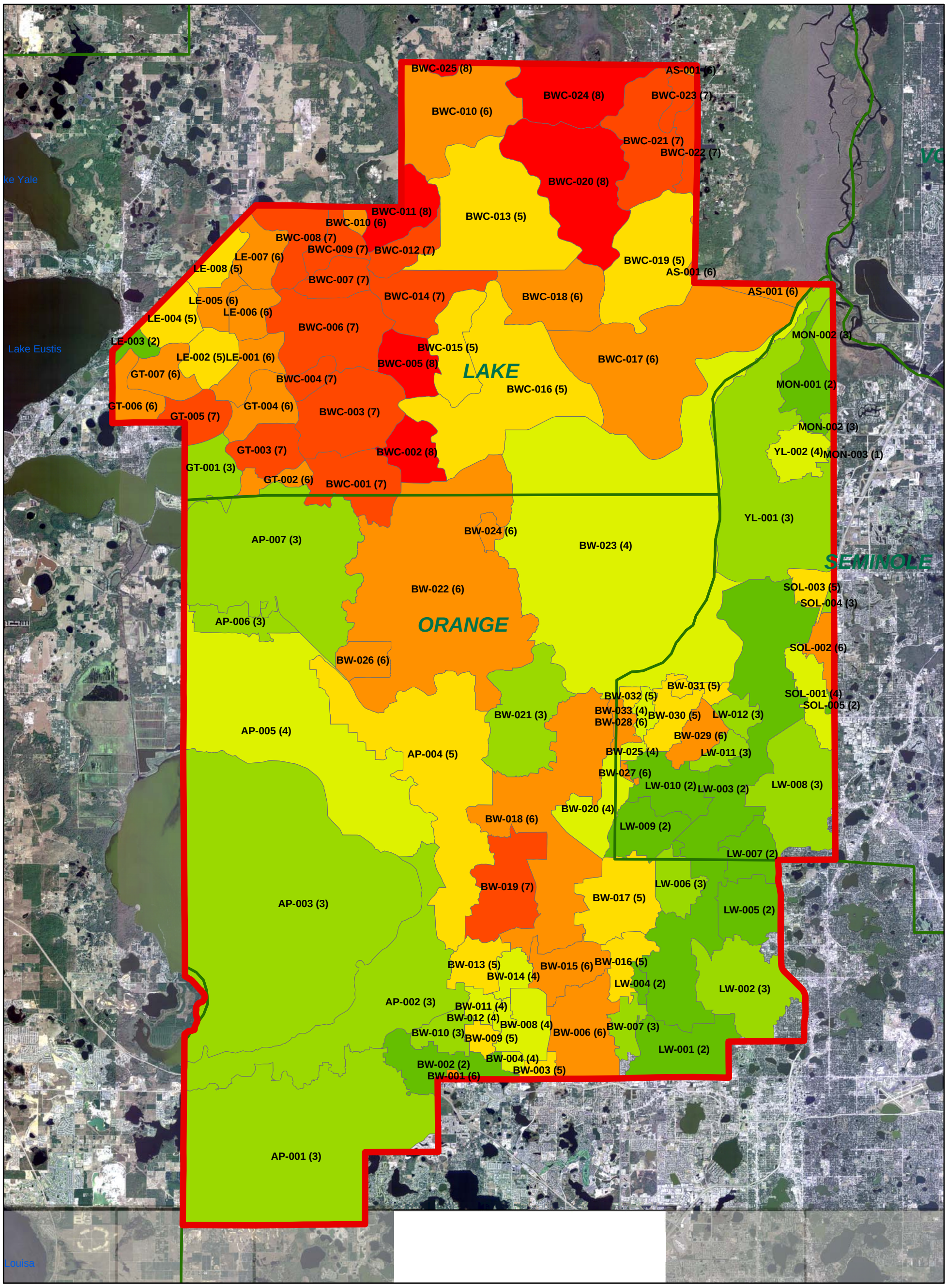
Table 5-2
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control

Ranking Matrix			Benefit Area	Tributary to Impaired Water Body	Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr)	Spring Protection (WAVA Zones)	Subbasins with free outfall	Rate of Growth (based on change in population from 1990 - 2000)	Problems Identified	TOTALS	REVISED RANKING	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
Subbasin	Acres	Weight:	6.0%	19.0%	23.0%	17.0%	10.0%	10.0%	15.0%	100%	#														
LE-001	1232.1		0	0	1	5	0	8	0	2	6	√	√	√											
BWC-010	5133.8		2	0	2	1	10	2	0	2	6	√													
BW-026	913.2		0	0	2	10	0	0	0	2	6				√	√									
BWC-001	2462.9		1	0	2	7	0	2	0	2	6	√			√										
BWC-018	2879.5		1	0	2	1	10	2	0	2	6	√													
BWC-023	672.6		0	0	2	7	0	2	0	2	6	√													
AS-001	771.9		0	0	2	1	10	2	0	2	6	√										√			
BW-028	511.7		0	0	0	6	5	1	2	2	6											√			
BW-029	1020.5		0	0	1	6	5	0	1	2	6											√	√		
BWC-004	575.9		0	0	2	7	0	3	0	2	6	√		√											
BW-019	2939.4		1	0	3	5	0	1	1	2	6				√	√			√						
BWC-014	2397.2		1	0	2	7	0	2	0	2	6	√													
BWC-021	3330.0		1	0	2	4	0	2	2	2	6	√													
BWC-006	3838.8		1	0	2	6	0	3	0	2	6	√													
BWC-003	3630.8		1	0	2	5	0	3	0	2	6	√													
BWC-009	1042.7		0	0	2	5	0	2	0	2	6	√													
BWC-008	1700.4		1	0	2	5	0	2	0	2	6	√													
BWC-002	1415.7		1	0	3	3	0	3	0	2	6	√													
BWC-012	1075.1		0	0	2	6	0	0	0	1	7	√													
BWC-011	1646.9		1	0	2	2	0	4	0	1	7	√													
BWC-020	5536.6		2	0	2	2	0	2	0	1	7	√													
BWC-024	3241.5		1	0	3	2	0	2	0	1	7	√													
BWC-005	1458.6		1	0	1	3	0	3	0	1	7	√													
BWC-025	210.0		0	0	2	0	0	2	0	1	7	√													

Criteria Explanation:

Benefit Area	10	largest benefit area based on size
	0	least benefit area based on size
Tributary to Impaired Water Bod	10	within a subbasin associated with an impaired water body
	5	water quality problem have been identified but not related to TMDL
	0	no water quality problems have been identified
Magnitude of Pollutant Load	10	areas with the highest concentration of pollutant load (lbs/acre/yr)
	0	areas with the lowest concentration of pollutant load (lbs/acre/yr)
Spring Protection	10	within the primary protection WAVA zone
	5	within the secondary WAVA protection zone
	0	within the tertiary WAVA protection zone
Subbasin with free outfall	10	subbasin with a positive outfall
	5	landlocked basin with limited discharge
	0	landlocked subbasin with no outfall
Rate of Growth	10	highest rate of growth (in terms of population)
	0	little to no population growth
Problems Identified	10	problems identified in the subbasin with the highest score
	0	no identified problems

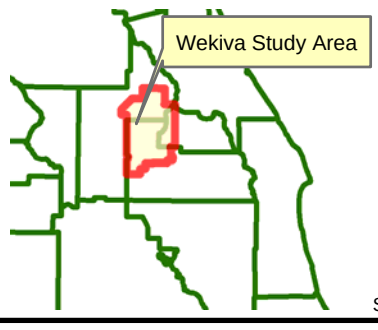
* The delineation for Subasin AP-003 includes just Lake Apopka itself. Therefore, jurisdictions affected should not be concerned with evaluating this particular subasin.



N
W E
S

0 3,400 6,800 13,600 20,400 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line

Subbasin Boundaries

Management Strategy No. 1 Ranking

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

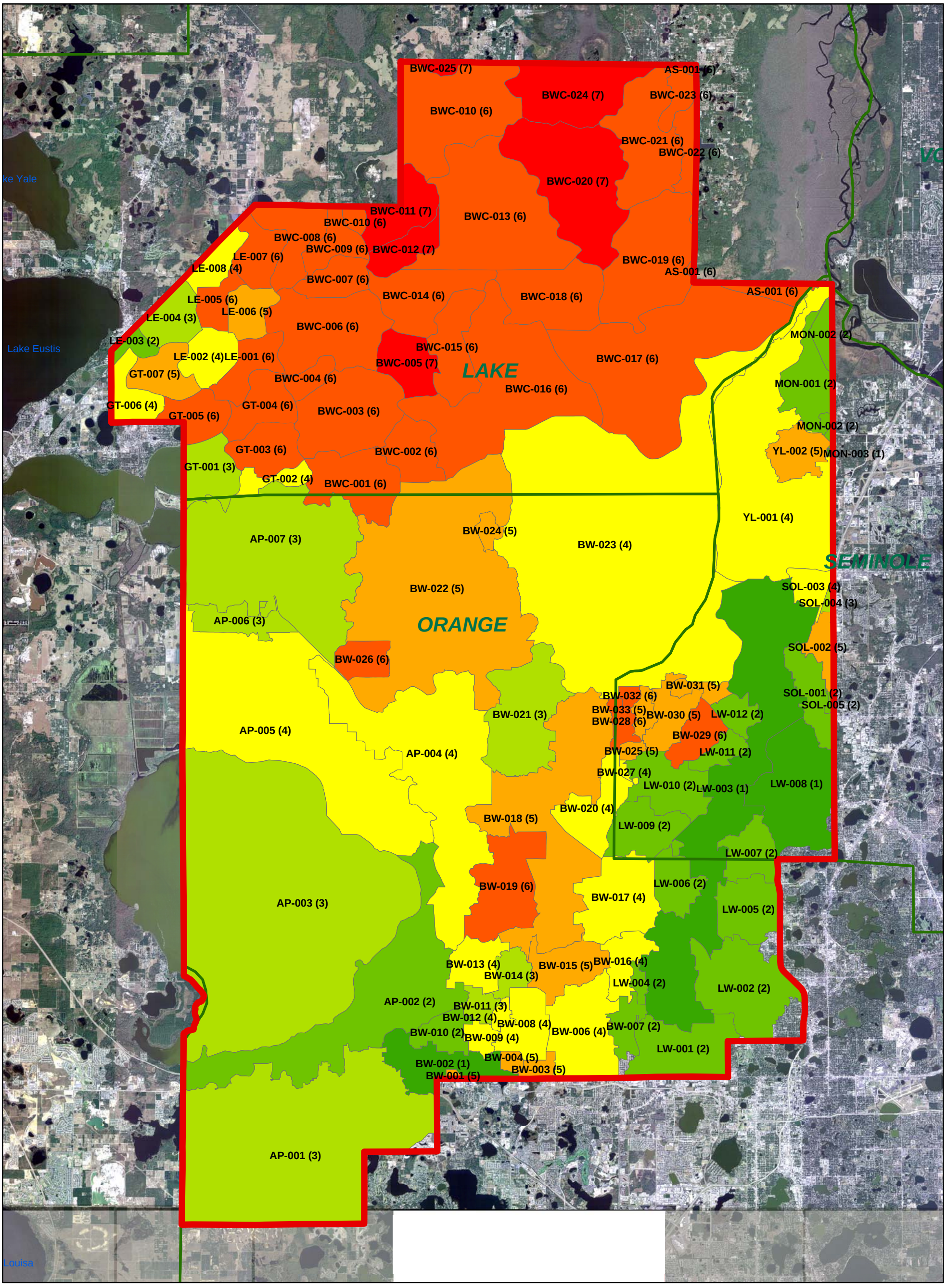
*This reflects the overall ranking for Management Strategy No.1. Subbasins highlighted in the draker green represent the highest priority subbasins.

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-1
Management Strategy No. 1 - Assigned Ranking

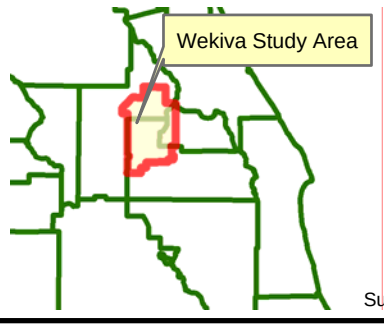
honourdm 10/17/05 E:\Projects\9247\44812\GIS\Fig5-1.mxd



N
W E
S

0 3,400 6,800 13,600 Feet

LOCATION MAP



LEGEND

Wekiva Study Area
County Line

Management Strategy No. 2 Ranking

7
6
5
4
3
2
1

*This reflects the overall ranking for Management Strategy No.2. Subbasins highlighted in the draker green represent the highest priority subbasins.

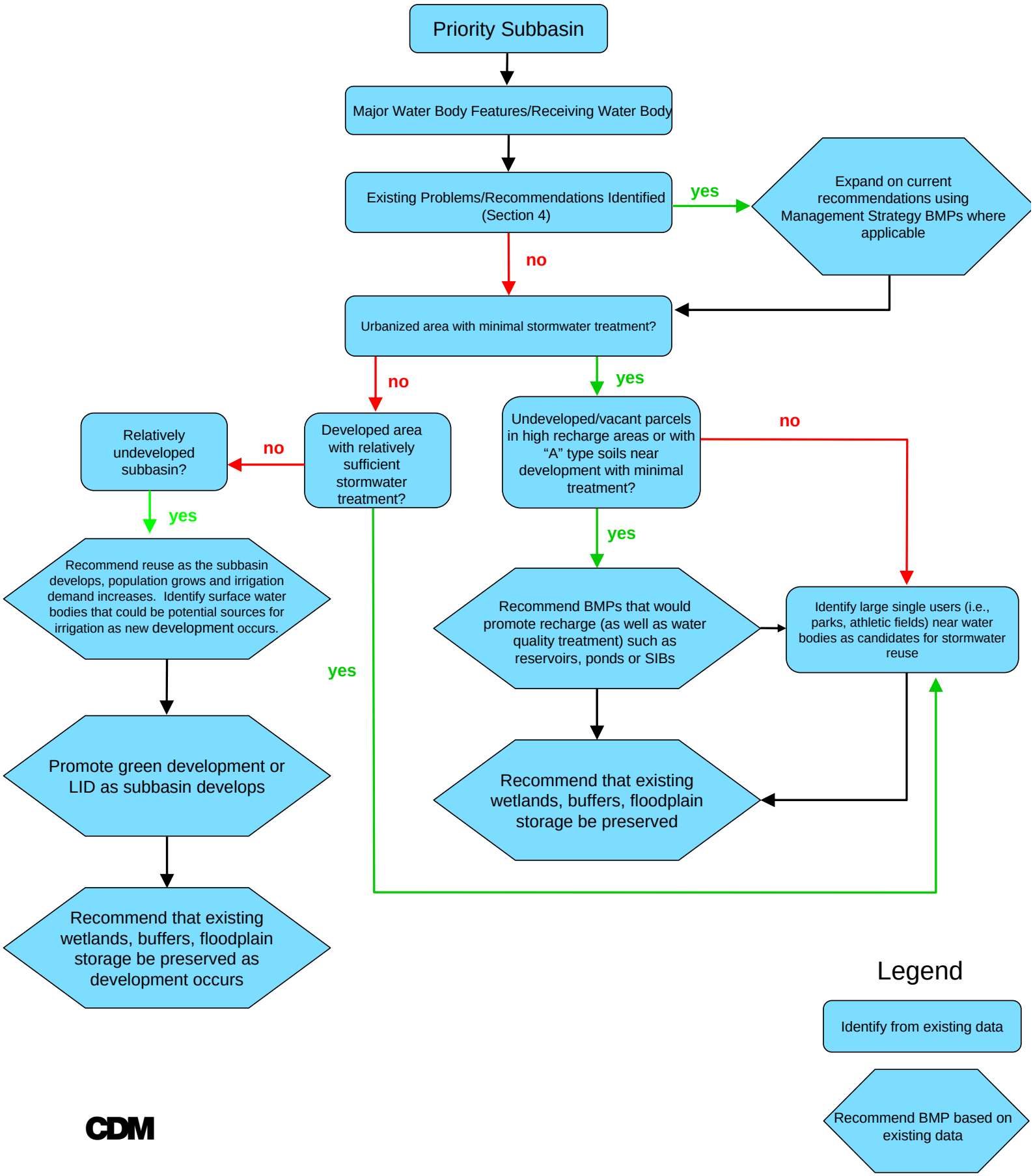
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-2
Management Strategy No. 2 - Assigned Ranking

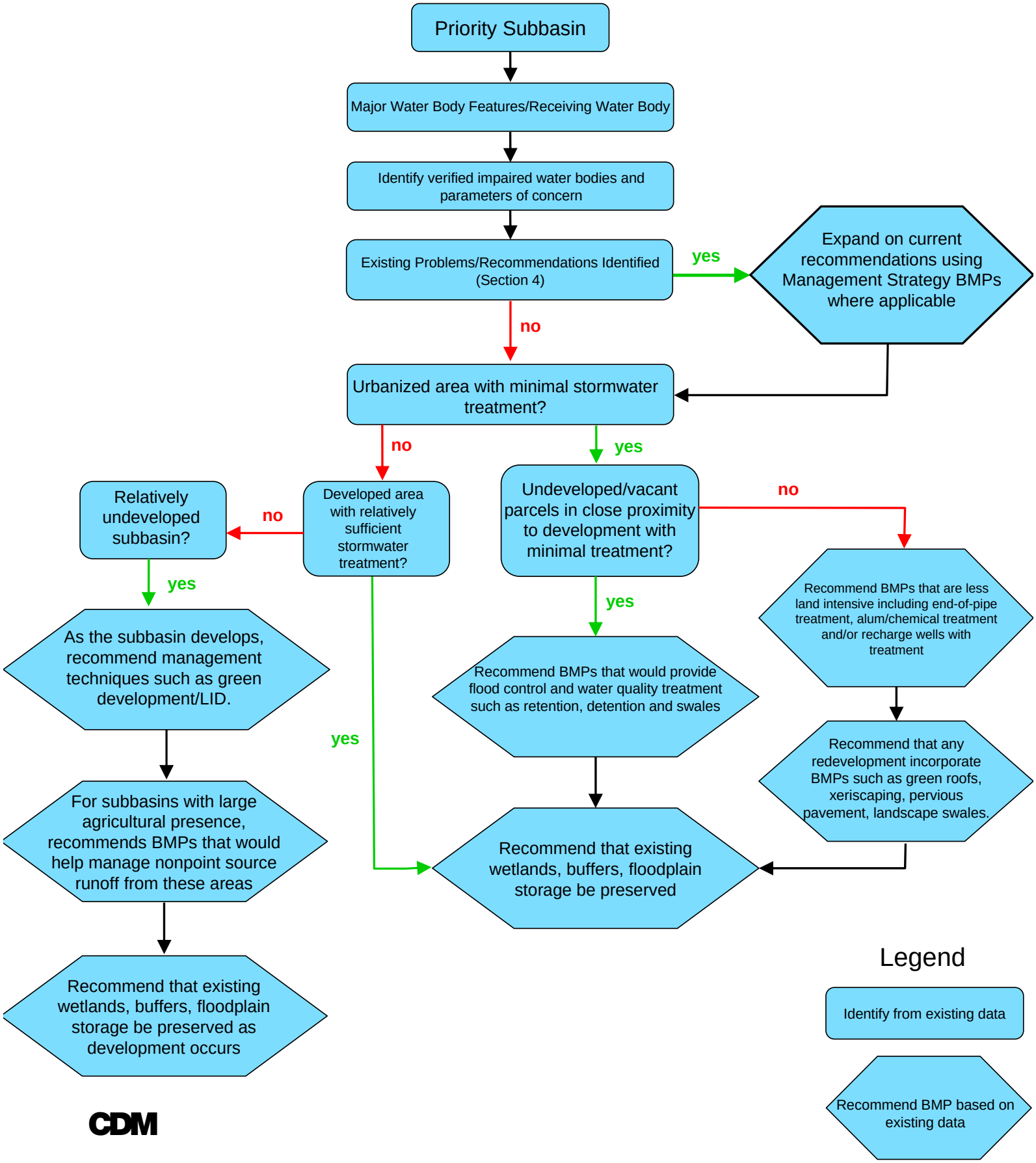
E:\Projects\92471\44812\GIS\Fig5-2.mxd
10/31/05
honourdm

Figure 5-3
Management Strategy No. 1
Conservation, Groundwater Protection and Reuse
Decision Making Flow Diagram



CDM

Figure 5-4
Management Strategy No. 2
Surface Water Treatment & Flood Control
Decision Making Flow Diagram



CDM

subbasins were selected as candidate subbasins to apply Management Strategy No. 1 (Surface Water Conservation, Groundwater Protection and Reuse):

- BW-002 (Rank 2; Subbasin MON-003 received a rank of "1" under this management strategy, however this subbasin is very small (26 acres) relative to the WSA, and it was thought the effort in identifying projects for Subbasin BW-002 would have more of an overall benefit to the WSA)
- LW-002 (Rank 3)
- BW-008 (Rank 4)
- BW-031 (Rank 5)
- BWC-010 (Rank 6)

The locations of these subbasins are shown in **Figure 5-5** along with the jurisdictional boundaries.

5.3.1 Subbasin BW-002

BW-002 received an overall rank of "2" under Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. Subbasin BW-002 is located in the Big Wekiva River Basin in the south central portion of the WSA and is approximately 1,989 acres. It is primarily located within the City of Ocoee (1,492 acres or 75 percent), but there are also small portions of unincorporated Orange County (313 acres of 16 percent) and the City of Winter Garden (181 acres or 9 percent) within the subbasin. Surface water in this subbasin is conveyed to the southeast to Lake Lotta where it eventually flows south out of the WSA. Lake Lotta is impaired for nutrients (TSI) and is scheduled to have a TMDL developed by 2008. Problems identified in Section 5 of this MSMP for this subbasin consist primarily of street and some property flooding and are shown in **Figure 5-6**. This subbasin was previously studied in detail by the City of Ocoee and is documented in a report entitled the *Lake Lotta Drainage Basin Study, Ocoee Florida* (PEC, 1998). For this particular subbasin, the PEC study emphasized that the depressional areas along the main conveyance system "attenuate peak flood flows from contributing drainage areas upstream…and reduces the amount of flood flows released to downstream drainage elements.'' The study recommends that "the City [of Ocoee] continue to strictly regulate development adjacent to flood hazard areas, such as this depressional area…and the regulation of development in such flood hazard areas will be in accordance with the policies established by the City's Comprehensive Plan."

In addition to the recommendations made in the Lake Lotta study, the affected jurisdictions should consider implementing the following BMPs under Management Strategy No. 1:

honourdm

8/16/05

E:\Projects\9247\44812\GIS\Fig5-5.mxd

BWC-010

BWC-010

GT-007

GT-001

AP-002

BW-008

BW-002

BW-020

LW-008

LW-002

LAKE

ORANGE

SEMINOLE

Lake Yale

Lake Eustis

Lake Apopka

John's Louisa

Black Water Creek

WEKIVA RIVER

County Rd 42

County Rd 19

State Hwy 44A

State Hwy 19

Sanford Ave

State Hwy 46

County Rd 437

State Hwy 441

Interstate 4

State Hwy 429

State Hwy 424

State Hwy 50

State Hwy 423

County Rd 439

County Rd 535

State Hwy 435

County Rd 528A

0 3,400 6,800 13,600 20,400 Feet

N W E S

LOCATION MAP

Wekiva Study Area

LEGEND

County Line

Wekiva Study Area

Candidate Subbasins

Water Bodies

Major Roads

Incorporated Areas

Altamonte Springs

Apopka

Eatonville

Eustis

Lake Mary

Longwood

Maitland

Mount Dora

Oakland

Ocoee

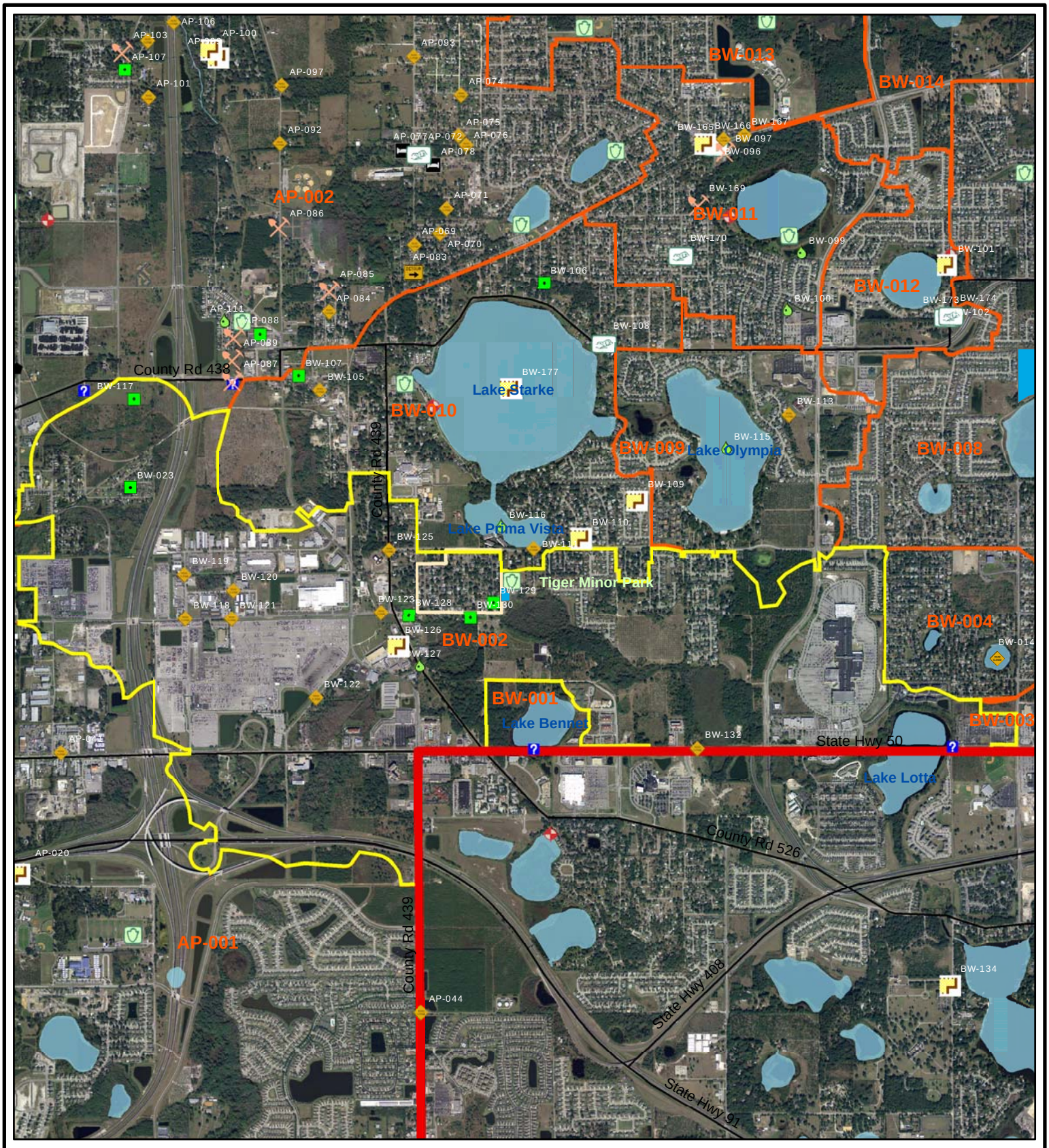
Orlando

Winter Garden

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-5
Example Subbasins for Applying Management Strategies





0 2,900 5,800 Feet

LOCATION MAP



LEGEND

- Potential Pond Site
- Problem Areas
  - Erosion/Sedimentation
  - House Flooding
  - Maintenance
  - Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Drainage Wells
  - Abandoned
  - Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Parks
- Wekiva Study Area
- Subbasin Boundary
- Major Roads
- Water Bodies
- Primavista Subdivision

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-6
Subbasin BW-002

honourdm
8/10/05
E:\Projects\92471\44812\GIS\Fig5-6.mxd

- The natural wetlands that act as floodplains through this area should be preserved, or if development near these areas is permitted, floodplain ordinances requiring compensating storage should be strictly enforced.

- Add retention/detention to retrofit untreated areas such as subdivisions, for water quality/quantity. A large majority of the subdivisions are equipped with stormwater treatment. An example of an untreated subdivision would be the Primavista Subdivision located to the south of East Orlando Avenue. This subdivision is currently within the City of Ocoee. Adjacent to the subdivision are lands owned by the City that are dominated by "A" type soils and may be suitable for a detention or retention facility. A facility located here would not only provide water quality treatment, flood control benefits, and promote aquifer recharge, but could also be used as a source of irrigation water for stormwater reuse.

- There may be some local opportunities for stormwater reuse for irrigation. One park, Tiger Minor Park, is owned by the City of Ocoee and may be a candidate for providing stormwater reuse from the above mention proposed pond or nearby Lake Primavista for irrigation purposes.

- Preserve and/or add buffers surrounding existing wetland floodplain areas. This would provide additional protection to the floodplain areas noted previously.

- Continue the SJRWMD 3-inch recharge rule for new development as this subbasin is predominately within the WAVA Vulnerable Zone.

- Provide aeration for Lake Lotta to improve water quality and sediment removal.

- A recharge well at Lake Lotta would provide treatment and promote recharge, although this will require discharge to the well to meet federal primary and state primary and secondary drinking water standards. This alternative would need further evaluation, most likely as part of the BMAP process after a TMDL has been developed and adopted for this water body.

- When implementing the recommendations proposed in the Lake Lotta Drainage Basin Study, the affected jurisdictions should also use site-specific water quality treatment options such as rehabilitation of existing swales and/or landscape swales where there are "A" type soils and where this type of retrofit would be deemed practicable.

5.3.2 Subbasin LW-002

Subbasin LW-002 received an overall rank of "3" in the decision matrix for Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. Subbasin LW-002 is located in the Little Wekiva River Basin in the southeast portion of the WSA and is approximately 3,549 acres in size. It is located within both the City of Orlando (1,684 acres or 47 percent) and unincorporated Orange County (1,845 acres or 52 percent). A very small portion, approximately 14 acres is within the City of Winter Park. The major water body features are Little Lake

Fairview and Lake Fairview. Overflow from Lake Fairview is discharged into the Little Wekiva River. This is a highly urbanized subbasin that is almost entirely built-out. Much of the development is older and was constructed prior to the SJRWMD's requirements for stormwater management and treatment.

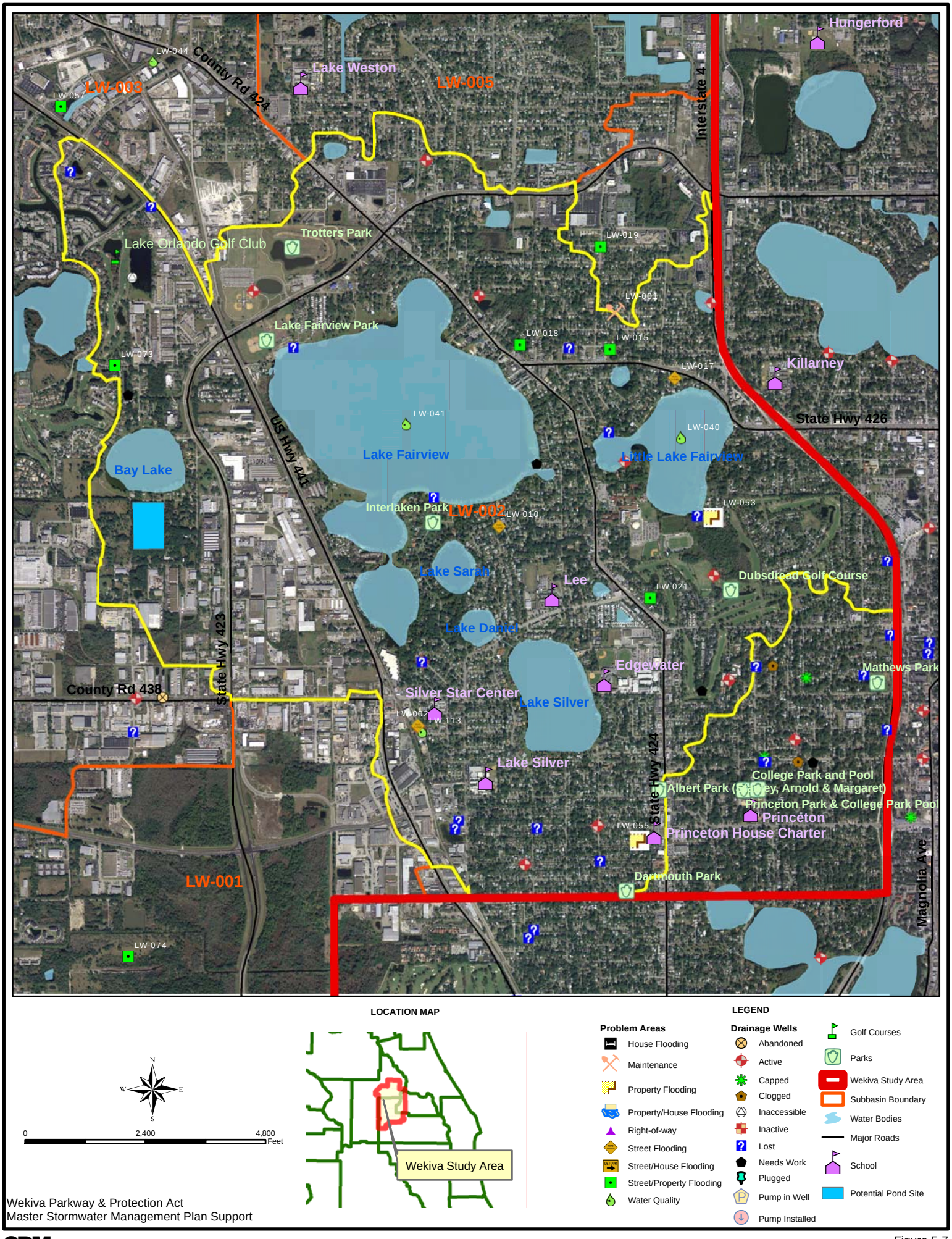
Existing problems identified for this subbasin consist of a combination of property flooding, street flooding and water quality. There are also three impaired water bodies in this subbasin: Lake Silver (nutrients (TSI)), Bay Lake (nutrients (TSI)) and the Little Wekiva Canal (BOD, DO, nutrients- chlorophyll a, and fecal coliform bacteria). The subbasin, along with the location of these problem areas, is shown in **Figure 5-7**. A detailed study of the Little Wekiva River watershed is currently underway as a separate effort by CDM. In this study, CDM identified existing problems, performed a pollutant load analysis, and updated the existing ICPR hydrologic and hydraulic model. The project is currently in its last and final phase where alternatives are being developed to address flooding problems within the primary surface water conveyance system and water quality issues in the watershed.

In addition to the recommendations that will be made in the final phase of the Little Wekiva River Watershed Management Plan, the affected jurisdictions should consider implementing the following BMPs to improve surface water conservation and groundwater protection:

- There are several parks within this subbasin and some are in the vicinity of surface water bodies. Some of these locations may be candidates for supplying stormwater reuse. These include Trotter's Park, Lake Fairview Park and Interlaken Park. Additionally, Edgewater High School, Lee Middle School and Lake Silver Elementary are also located within close proximity to Lake Silver, and have sports fields and recreational areas where there could be opportunities for stormwater reuse.

- The Little Lake Fairview Restoration project, which is a joint effort between Orange County, the City of Orlando and the SJRWMD, involves the design of a retrofit stormwater treatment facility to treat stormwater runoff that is currently conveyed in ditches bordering Minnesota Avenue and Edgewater Drive to Little Lake Fairview. The stormwater treatment facility will include a conveyance system and wet detention ponds to provide water quality benefits to the lake. Wetlands southeast of the lake will be restored and the existing adjacent borrow pond will be refurbished. Additionally, consideration is currently being given to providing the Dubsdread Golf Course with a stormwater reuse alternative for irrigation in an effort to minimize consumptive use of potable water.

- There is a large undeveloped area to the south of Bay Lake which is also an area of high recharge (i.e., 12-20 in/yr) and has "A" type soils. This site could possibly serve as a stormwater infiltration basin where overflow from Bay Lake or the Lake Fairview system could be routed to this area, as discharge from these systems go directly to the Little Wekiva River. This basin would temporarily store surface



LOCATION MAP

LEGEND

Problem Areas
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed

- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies
- Major Roads
- School
- Potential Pond Site

N W E S

0 2,400 4,800 Feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-7
Subbasin LW-002

honourdm
7/11/05
E:\Projects\92471\44812\GIS\Fig5-7.mxd

runoff and allow it to infiltrate through the bottom and sides. It would remove many pollutants, provide ground water recharge, and reduce the volume of runoff and peak discharges to the Little Wekiva River, which is a tributary to the Wekiva River.

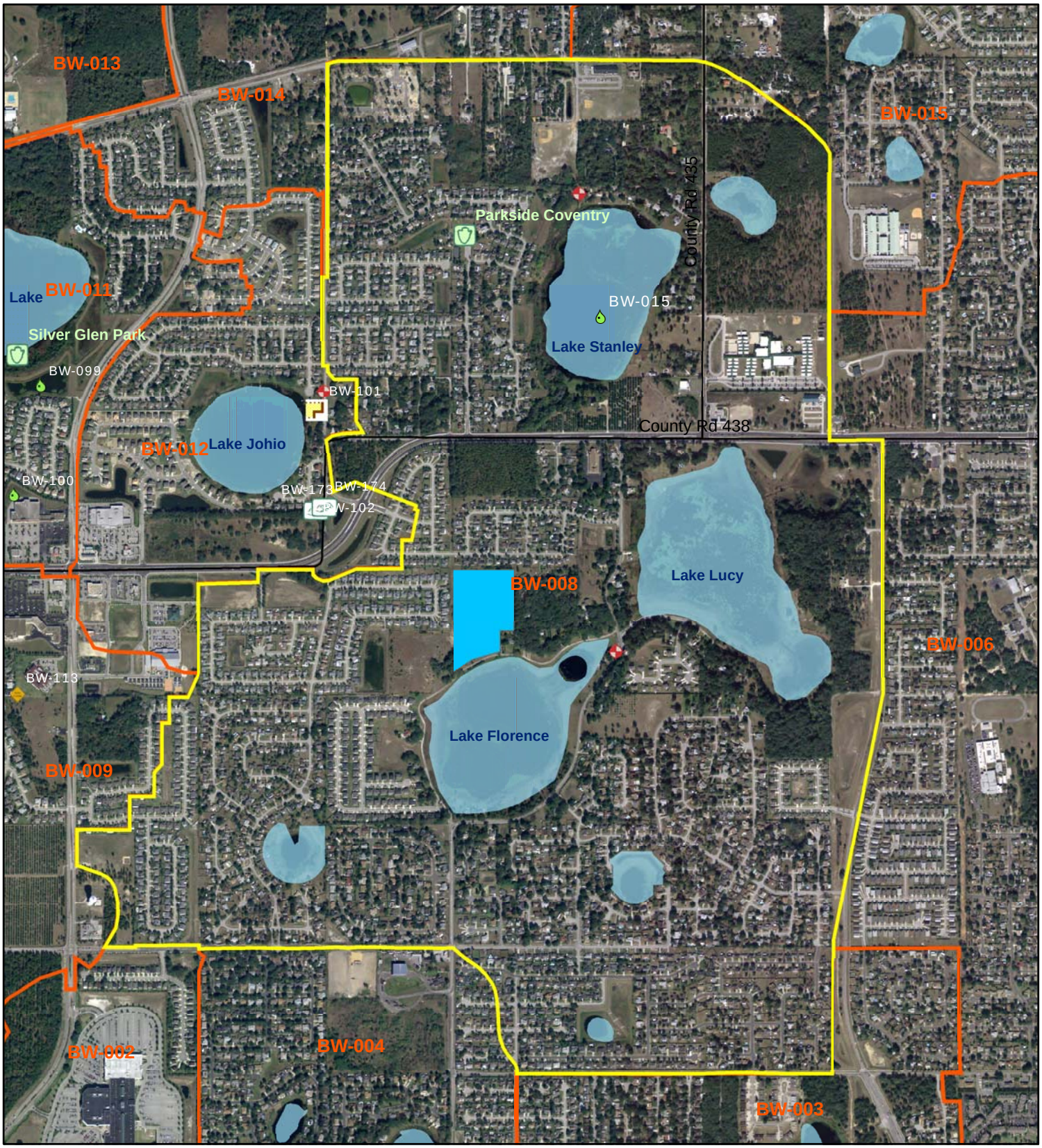
- The Lake Orlando Golf Club is northwest of Bay Lake. There could be an opportunity to provide irrigation to this golf course in the form of stormwater reuse, using Bay Lake as a source. This would promote aquifer recharge and reduce consumptive use as well. Recharge in the vicinity of the golf course is estimated to be 8 to 12 in/yr. The previously mentioned proposed facility could also serve as storage for reuse irrigation.

5.3.3 Subbasin BW-008

Subbasin BW-004 received a rank of "4" under Management Strategy No. 1. It is comprised of approximately 1,415 acres and is primarily located within unincorporated Orange County (1,094 acres or 77 percent), with some of its area within the City of Ocoee (321 acres or 22 percent). This subbasin is within the larger Big Wekiva River Basin and is located in the south central portion of the WSA (see **Figure 5-8**). The subbasin is highly urbanized but the majority of the development appears to have stormwater management systems in place. Its main water body features are Lake Stanley, Lake Lucy and Lake Florence. This is considered a limited discharge subbasin as it has drainage wells associated with Lake Stanley and Lake Florence that recharge the Floridan aquifer with surface water. According to the Central Florida Drainage Well Inventory (Hartman & Associates, Inc., 2003), both of these drainage wells are considered to be active. This lake system was previously studied by Orange County in the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001). There was one existing water quality problem identified associated with high bacteriological counts within Lake Stanley. The Orange County Environmental Protection Division (OCEPD) did some studies on the lake using DNA testing and determined the source of bacteria was due to animals.

Lake Stanley has an active drainage well but is also connected to Lake Lucy via a culvert crossing. Lake Lucy is connected to Lake Florence via a culvert under Good Homes Road that is obstructed and may in the long term reduce the amount of source water that could be recharged into the aquifer through the Lake Florence drainage well (PEC, 2001). The affected jurisdictions should consider implementing the following BMPs in this subbasin in order to meet the long-term goals of Management Strategy No. 1.

- The *Big Wekiva River Basin SWMMP* (PEC, 2001) stated that although no documented flooding problems have been identified, Lake Florence is vulnerable to flooding from extreme rainfall events because its lake level is controlled by a single drainage well. In addition to maintaining this drainage well, an emergency overflow surface water infiltration basin could be constructed in this subbasin, where surface water is collected and stored for volume control and infiltration.



honourdm

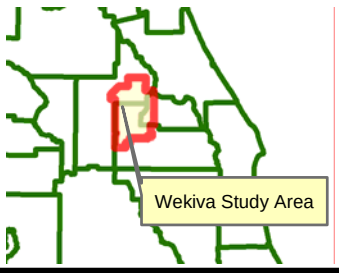
8/10/05

E:\Projects\924744812\GIS\Fig5-8.mxd

N
W
E
S

0 700 1,400 2,800 Feet

LOCATION MAP



LEGEND

Problem Areas
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance

- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed

- Golf Courses
- Parks
- Streets
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies
- Potential Pond Site

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-8
Subbasin BW-008

This facility would temporarily store surface runoff and allow it to infiltrate through the bottom and sides of the pond. Such a facility would remove pollutants, provide ground water recharge, and reduce peak stages in the lake. There are several large undeveloped parcels that have "A" soils and are in high recharge areas in this subbasin that would be good candidates for this type of facility.

- It would be important to maintain the natural floodplain areas around Lake Lucy and Lake Florence that have not yet been developed. If development were to occur, both the County and the City should strictly enforce their requirements to provide compensating storage.

- There are still some large undeveloped forested/wetland areas surrounding Lake Stanley and Lake Lucy. It is recommended that these be preserved as buffers, as these areas are dominated by "A" type soils and in high recharge areas. Additionally, these areas are predominately within the WAVA Vulnerable Zone.

- For any new development that occurs within this subbasin, the SJRWMD 3-inch recharge requirement should continue to be enforced, as there are high recharge areas within this subbasin.

5.3.4 Subbasin BW-031

Subbasin BW-031 received a rank of "5" under Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. This subbasin is located in the Big Wekiva Subbasin in Seminole County and is just south of the Wekiva Springs State Park. Subbasin BW-031 is approximately 426 acres in size and is located entirely within unincorporated Seminole County. There are no major water features in this subbasin and stormwater runoff is conveyed to the north to the Big Wekiva wetland. As can be seen in **Figure 5-9**, this subbasin is highly urbanized and problem types reported in this area are a combination of secondary system nuisance flooding, water quality and maintenance related issues. A detailed study was undertaken by Seminole County and is entitled the *Big Wekiva Basin Engineering Study and Drainage Inventory Phase II* (DRMP, 2003). In addition to the recommendations presented in the 2003 DRMP study, the County should consider implementation of the following to promote surface water conservation and aquifer recharge in the Subbasin BW-031:

- Approximately 50 percent of the subbasin is equipped with stormwater treatment. Due to the built-out nature of this subbasin there is limited opportunity to incorporate BMPs that promote conservation and aquifer recharge. Most of the neighborhoods in this area also have curb and gutter systems and would provide little opportunity for retrofitting with BMPs such as landscaped swales.

- Subbasins BW-030 and BW-033, which are adjacent to this area, also received approximately the same rank as subbasin BW-031. Lake Brantley which is within the vicinity of the subbasins, is a minimum flows and levels (MFL) water body and is monitored by the SJRWMD to ensure it is meeting its regulated lake levels.



honourdm

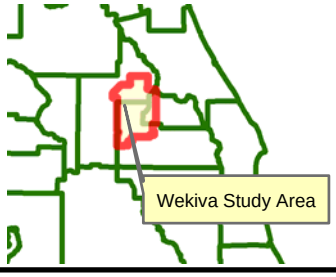
8/10/05

E:\Projects\92474\44812\GIS\Fig5-9.mxd

N
W
E
S

0 650 1,300 2,600 Feet

LOCATION MAP



LEGEND

WWTF Effluent Sites
Reuse Type
- Closed Stormwater Management System
- RIBs
- RIBs/Public Access Reuse Irrigation System
- RIBs/SPRAYFIELD
- Public Access Reuse Irrigation System

Problem Areas
- Erosion/Sedimentation
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Parks

- Streets
- Golf Courses
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-9
Subbasin BW-031

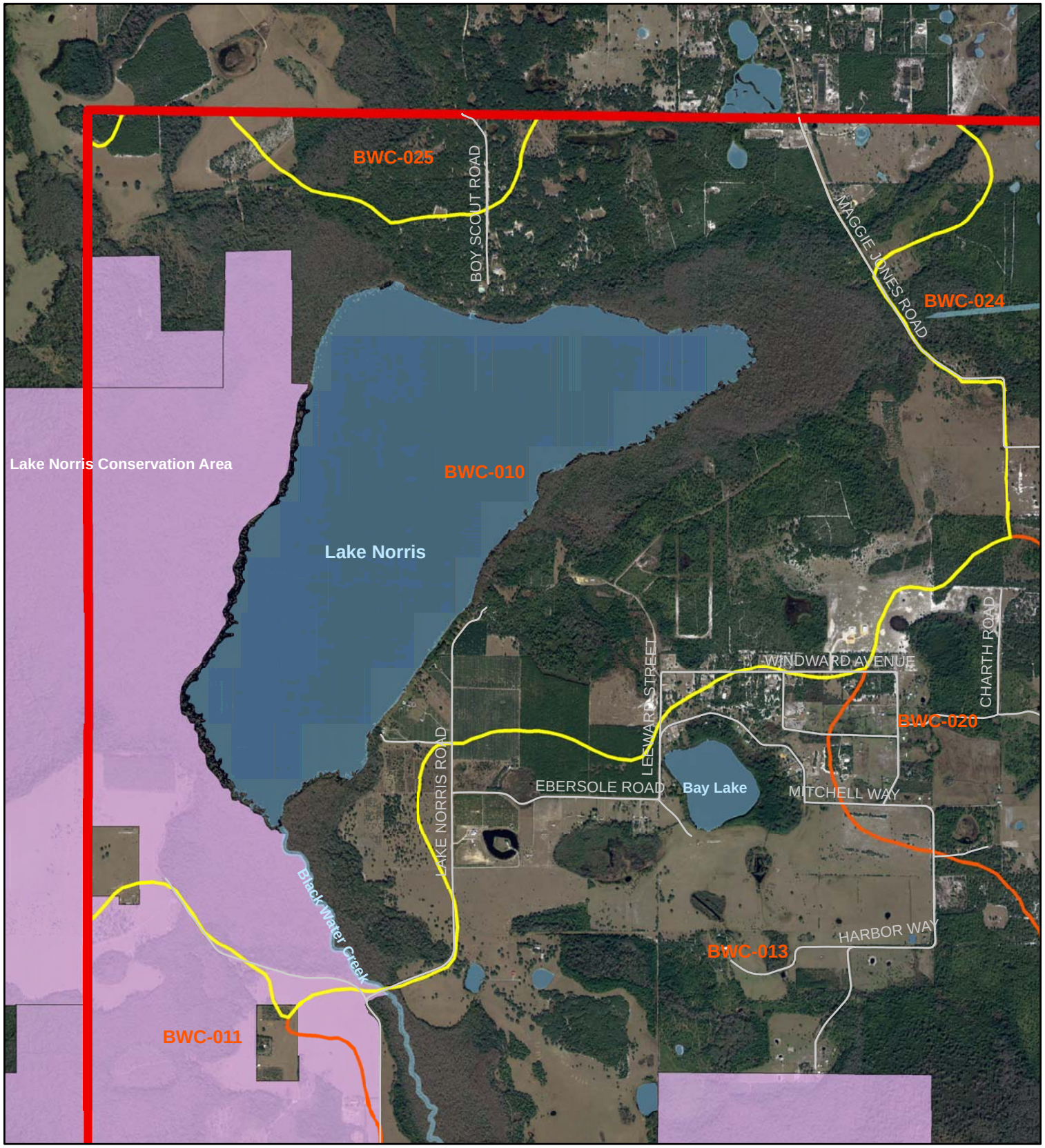
Therefore, surface water conservation in this area is important in helping to maintain these lake levels. DRMP's 2003 study cites that most of the subbasin tributary to Lake Brantley was developed prior to inclusion of rules for stormwater treatment. The Wekiva Hunt Club Wastewater Treatment Plant (WWTP) is located in this area and uses public access reuse irrigation system, rapid infiltration basins (RIBs) and surface water discharge as its disposal system. The public access system provides for public access irrigation of the Wekiva Hunt Club Community, two (2) golf courses (Trophy Club Golf Course [a.k.a. Sabal Point Golf Course] and Wekiva Golf Course), parks, playgrounds, landscaped areas, plant nursery (Lake Brantley Plant Corp.), road medians and right of ways. There may be some opportunity to augment the reclaimed water supply at the WWTP with excess surface water from Lake Brantley. A separate evaluation would need to be conducted to determine if there is a need for this additional supply as well as to determine the amount that could be withdrawn from Lake Brantley so that its MFLs are not violated. It is also important to mention that this WWTP is located in the WAVA Vulnerable Zone, and it will have new reclaimed water limits for existing RIBs (6 mg/l total nitrogen) and reuse irrigation systems (10 mg/l total nitrogen).

5.3.5 Subbasin BWC-010

Subbasin BWC-010, which is part of the Black Water Creek watershed, received a rank of "6" under Management Strategy No. 1. This 5,133 acre subbasin is located in the northwest corner of the WSA and is entirely within unincorporated Lake County. Lake Norris, which is the headwaters for Blackwater Creek, is the major water body feature in the subbasin. This water body is also regulated under the SJRWMD's MFL program. As can be seen in **Figure 5-10**, this subbasin is currently largely undeveloped and dominated by wetlands and open land. There are some agricultural and residential areas in the subbasin. There were no problem areas reported in this subbasin. The County should consider implementing the following BMPs to enhance surface water conservation and groundwater protection as this subbasin begins to develop over time:

- Reuse would be desirable in this subbasin as the population grows and along with it, irrigation demand increases. Surface water from Lake Norris, in addition to some of the local depressional lakes, could be potential sources for irrigation as new development occurs. Decreasing the projected consumptive use in this subbasin will also help Lake Norris maintain its regulated lake levels as dictated by the MFL program.

- As this subbasin is dominated by wetland areas both surrounding Lake Norris as well as Blackwater Creek, it is important to maintain these natural floodplains as development occurs over time. The County should strictly enforce their floodplain management requirements, and if development is allowed to occur in this area, compensating storage must be provided. It is important to note the area to the west of Lake Norris is a conservation area owned by the SJRWMD.



Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-10
Subbasin BWC-010

honourdm
8/10/05
E:\Projects\92471\44812\GIS\Fig5-10.mxd

- The County should also continue to enforce the use of buffers surrounding these wetland areas as stated in Chapter VI (Resource Protection Standards) of its Code of Ordinances. These buffers could consist of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.

- As this subbasin is largely undeveloped, it would be an ideal candidate for promoting green development or low impact development. Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. Low impact development is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality. Future land use for this subbasin indicates that it will be primarily low density residential (i.e., less than 1 dwelling unit/acre). This land use designation should be adhered to as development occurs in the subbasin.

- Subbasin BWC-010 is primarily within the WAVA Less Vulnerable Zone; however, there are some Vulnerable Zone areas to the east of Lake Norris. The SJRWMD 3-inch recharge rule should continue to be enforced, especially in the More Vulnerable and Vulnerable Zones.

5.4 Identified Projects – Management Strategy No. 2 (Surface Water Treatment and Flood Control)

Based on the prioritization shown in Table 5-2, the following subbasins were selected as candidate subbasins to apply Management Strategy No. 2 (Surface Water Treatment and Flood Control):

- LW-008 (Rank 1; although subbasin BW-002 was ranked the highest under this strategy, it was already evaluated under management strategy No. 1, therefore the next highest ranked subbasin was selected for evaluation)

- AP-002 (Rank 2)

- GT-001 (Rank 3)

- BW-020 (Rank 4)

- GT-007 (Rank 5)

The locations of these subbasins are shown in Figure 5-5 along with the jurisdictional boundaries.

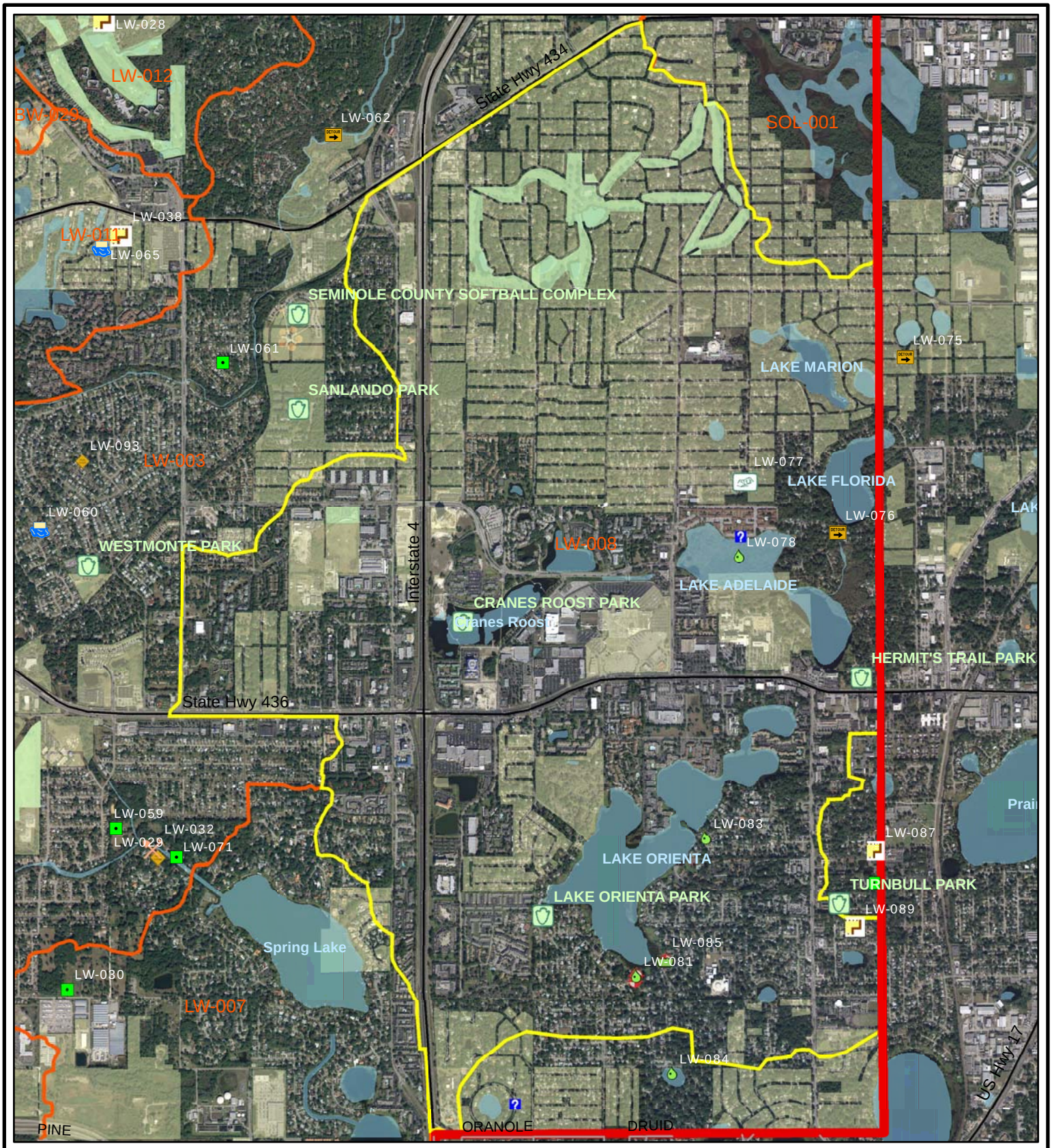
5.4.1 Subbasin LW-008

LW-008 was ranked the highest priority subbasin under Management Strategy No. 2. This 3,980 acre subbasin is within the Little Wekiva River Watershed and is partially located in the City of Altamonte Springs (2,335 acres or 59 percent) and unincorporated Seminole County (1,642 acres or 41 percent). Surface water in this subbasin is conveyed through a series of lakes, including Lake Marion, Lake Florida and Lake Adelaide. From Lake Adelaide, surface water can be discharged into Cranes Roost where it is intermittently pumped to the Little Wekiva River. Part of the reason subbasin LW-008 is a high priority subbasin is that it contains three impaired water bodies: Lake Adelaide, Lake Florida and Lake Orienta, all of which are impaired for nutrients (TSI). Lake Orienta is also a landlocked lake with drainage wells. As shown in **Figure 5-11**, this is another very highly urbanized subbasin where much of the development was built prior to the SJRWMD stormwater treatment requirements.

Problems identified in this subbasin consist of flooding, erosion and sedimentation, and water quality. Many of the problems in the subbasin have already been addressed by the City, or the recommendations associated with them have been found not feasible. A detailed study of the Little Wekiva River watershed is currently underway as a separate effort by CDM. In this study, CDM identified existing problems, performed a pollutant load analysis, and updated the existing ICPR hydrologic and hydraulic model. The project is currently in its last and final phase where alternatives are being developed to address flooding problems within the primary surface water conveyance system and water quality issues in the watershed.

In addition to the recommendations that will be made in the final phase of the Little Wekiva River Watershed Management Plan, the affected jurisdictions should consider implementing the following BMPs to provide surface water treatment and flood control:

- This subbasin has a high density of septic tanks, especially to the north of Lake Adelaide and to the south of Lake Orienta. The City of Altamonte Springs has noted that this may be contributing to water quality degradation. The Florida Department of Health (DOH) report entitled the *Wekiva Basin Onsite Sewage Treatment and Disposal System Study* (2004) recommends that the highest priority for sewering should be given to areas with high densities of systems within the WAVA More Vulnerable and Vulnerable Zones. For septic tanks, the Florida DOH recommends the following: 1) a discharge limit of 10 mg/l of total nitrogen for new systems, systems being modified, and for existing systems within the WAVA More Vulnerable and Vulnerable Zones; 2) state and local planning agencies evaluate the economic feasibility of sewering versus nutrient removal upgrades to existing onsite sewage treatment and disposal systems (OSTDSs) (areas with high densities of development will be better suited to central sewering, and lower density areas more suitable for nitrogen-removing OSTDSs); 3) failed or modified systems within the WSA be upgraded to meet new system standards; and 4) new regional



honourdm

8/10/05

E:\Projects\92471\44812\GIS\Fig5-11.mxd

N
W
E
S

0 600 1,200 2,400 3,600 Feet

LOCATION MAP



LEGEND

Problem Areas
- Erosion/Sedimentation
- Force Main Problem
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Parks
- Golf Courses
- Major Roads
- Parcels Served by Septic Tanks
- Water Bodies
- Subbasin Boundary
- Wekiva Study Area

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-11
Subbasin LW-008

wastewater management entities be established or that existing ones be modified to oversee the maintenance of all wastewater discharged from OSTDSs in the WSA. Subbasin LW-008 is an example of an area that is highly developed with a high density of septic tanks in the WAVA Vulnerable Zone.

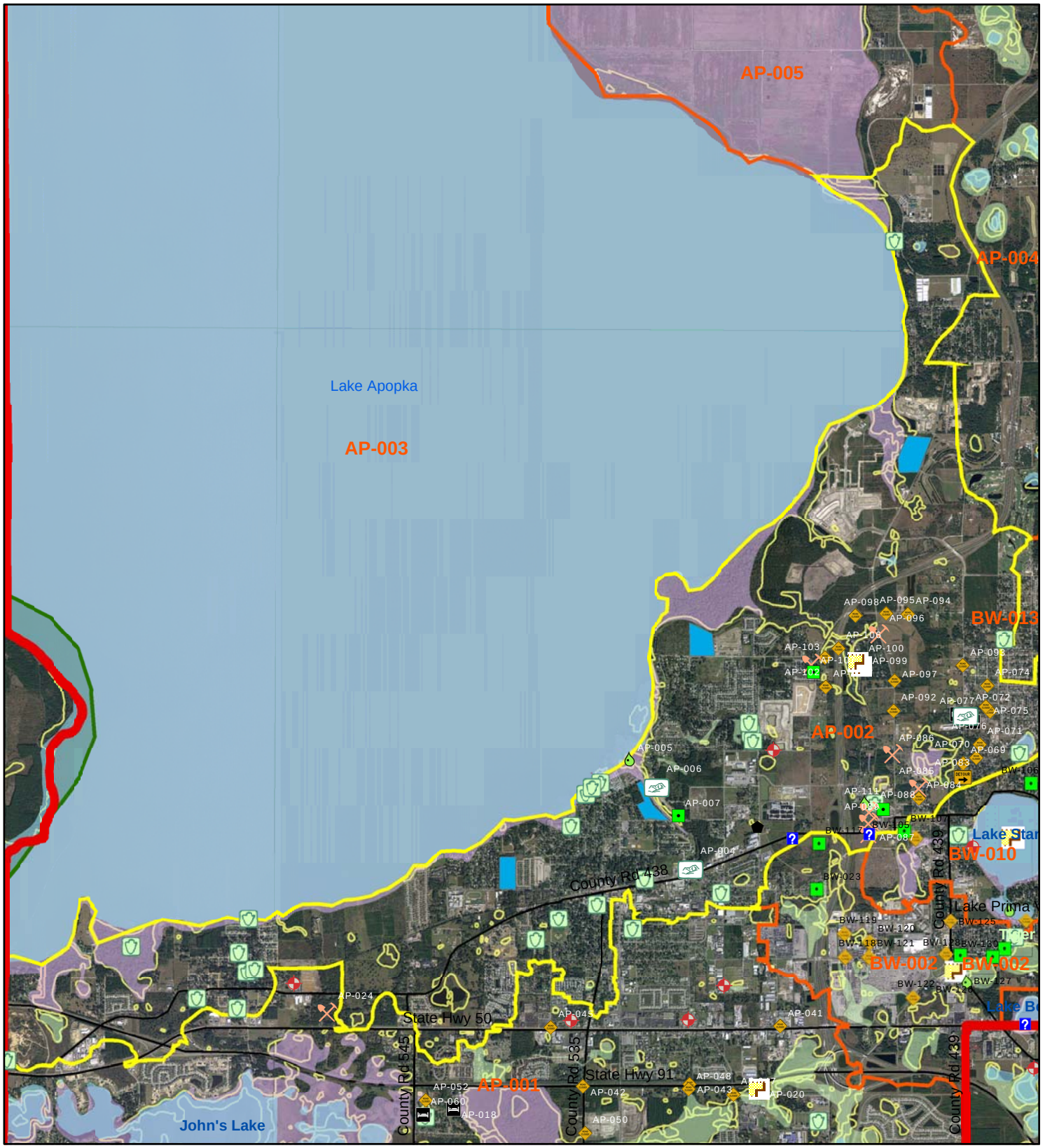
- Subbasin LW-008 was estimated to have some of the highest pollutant loads per acre from nonpoint source runoff based on the WMM results. There is little to no opportunity to construct large-scale regional stormwater treatment facilities due to the degree of urbanization that has taken place. Most of the neighborhoods in this area also have curb and gutter systems which would provide little opportunity for retrofitting with BMPs such as landscaped swales. Although the use of baffle boxes and alum treatment (or equivalent coagulant) has been recommended in this area before, it is an option that may want to be reconsidered to help improve water quality, especially for the impaired water bodies. As part of the NPDES MS4 program, the City feels that their street sweeping activities have been effective in removing solids and sediments that would otherwise be discharge to surface water bodies.

- As much of the development is older in subbasin LW-008, there may be areas that are desirable from a redevelopment standpoint. Therefore, strict enforcement of stormwater management treatment requirements for redevelopment in this subbasin is also very important. BMPs that can be incorporated into redevelopment include detention, retention, landscape swales, xeriscaping or water wise landscaping, green roofs and pervious pavement.

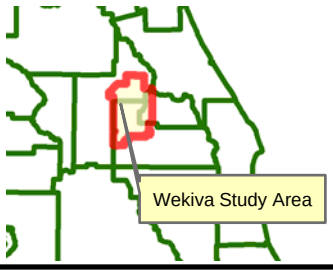
- As there is very limited opportunity in this subbasin for stormwater treatment retrofit and there are three impaired water bodies, the use of recharge wells with treatment would provide both flood control as well as water quality treatment. This BMP would provide a conduit where surface water is able to seep into the ground and refill surficial aquifers with a filter system surrounding the drain inlet. However, a modification to an existing drainage well or installation of a new well would require that surface water discharge to meet federal primary and state primary and secondary drinking water standards. The City of Altamonte Springs recently obtained a Consumptive Use Permit (CUP) from the SJRWMD to augment its reclaimed water supply with surface water from five water bodies, including Lake Orienta and Crane's Roost, which helps maintain the lake stages, reduces flows to the drainage wells and the Little Wekiva River.

5.4.2 Subbasin AP-002

Subbasin AP-002 received an overall rank of "2" under Management Strategy No. 2. This subbasin is comprised of approximately 8,237 acres and is located immediately to the east and south of Lake Apopka (see **Figure 5-12**). There are several jurisdictions within this subbasin including the City of Apopka (302 acres or 4 percent), the Town of Oakland (639 acres or 8 percent), the City of Ocoee (2,070 or 25 percent), the City of Winter Garden (2,995 acres or 36 percent) and unincorporated Orange County (2,215



LOCATION MAP



LEGEND

Problem Areas
- Potential Pond Site
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary

National Wetlands Inventory
- Lacustrine
- Palustrine
- Riverine
- Major Roads

FEMA Zone
- A
- AE
- AH
- ANI

N
W E
S

0 2,600 5,200 Feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-12
Subbasin AP-002

honourdm
8/10/05
E:\Projects\92471448\12\GIS\Fig5-12.mxd

acres or 27 percent). The major water body feature in this subbasin is Lake Apopka. There are several streams and tributaries throughout the subbasin that discharge into the lake.

Most of the problem areas within the subbasin have been identified in the Northwest drainage ditch as this is an area that has been studied in detail by the City of Ocoee (PEC, 1996). Additionally, a master stormwater management plan is currently being undertaken by Orange County for the Lake Apopka Basin for the unincorporated areas. Identified problems consist mainly of street and property flooding, water quality and maintenance issues. In addition to the recommendations made in the aforementioned studies, the affected jurisdictions should consider implementing the following BMPs.

- There are several large wetland areas surrounding the tributaries to Lake Apopka that are associated with the floodplain as shown by the Q3 flood data obtained from the SJRWMD, which is derived from the Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA). Parts of these areas are within the designated 100-year floodplain (i.e., Zone AE, an area inundated by 1 percent annual chance flooding, for which base flood elevations (BFEs) have been determined). These natural floodplains should be maintained and floodplain ordinances should be strictly adhered to in these areas if compensating storage needs to be provided as development occurs. Based on review of the 2004 DOQQs, development has already occurred right up to the edge of some of these wetland areas.

- All new development within the Lake Apopka Basin must meet phosphorus discharge limits pursuant to section 373.461(3)(a), F.S. Subbasin AP-002 is predominately within the WAVA Vulnerable Zone as well as in an area where recharge is estimated to be 4 to 8 inches per year. There are several large undeveloped parcels that may be suitable for a large-scale regional detention facility. The facility would provide water quality treatment and flood control benefits for developed areas that were constructed prior to the SJRWMD's requirements for stormwater treatment and limitations for phosphorus discharge. This type of facility could provide treatment for new development as well. The affected jurisdictions could create a municipal service taxing unit (MSTU) where in lieu of requiring on-site treatment for new development, a special district is established to fund a facility that is operated and maintained by the jurisdiction and benefits a larger area. Depending on the facility's construction, it could enhance aquifer recharge in addition to providing flood control benefits and water quality treatment.

- For the remaining areas along the shoreline of Lake Apopka, buffers should be incorporated to prevent development on the water's edge. Buffers should also be incorporated into development that is adjacent to the natural wetland areas surrounding the tributaries to Lake Apopka.

- For those remaining undeveloped areas in the subbasin, the affected jurisdictions should consider promoting green or LID, or providing incentives to those developers that incorporate resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

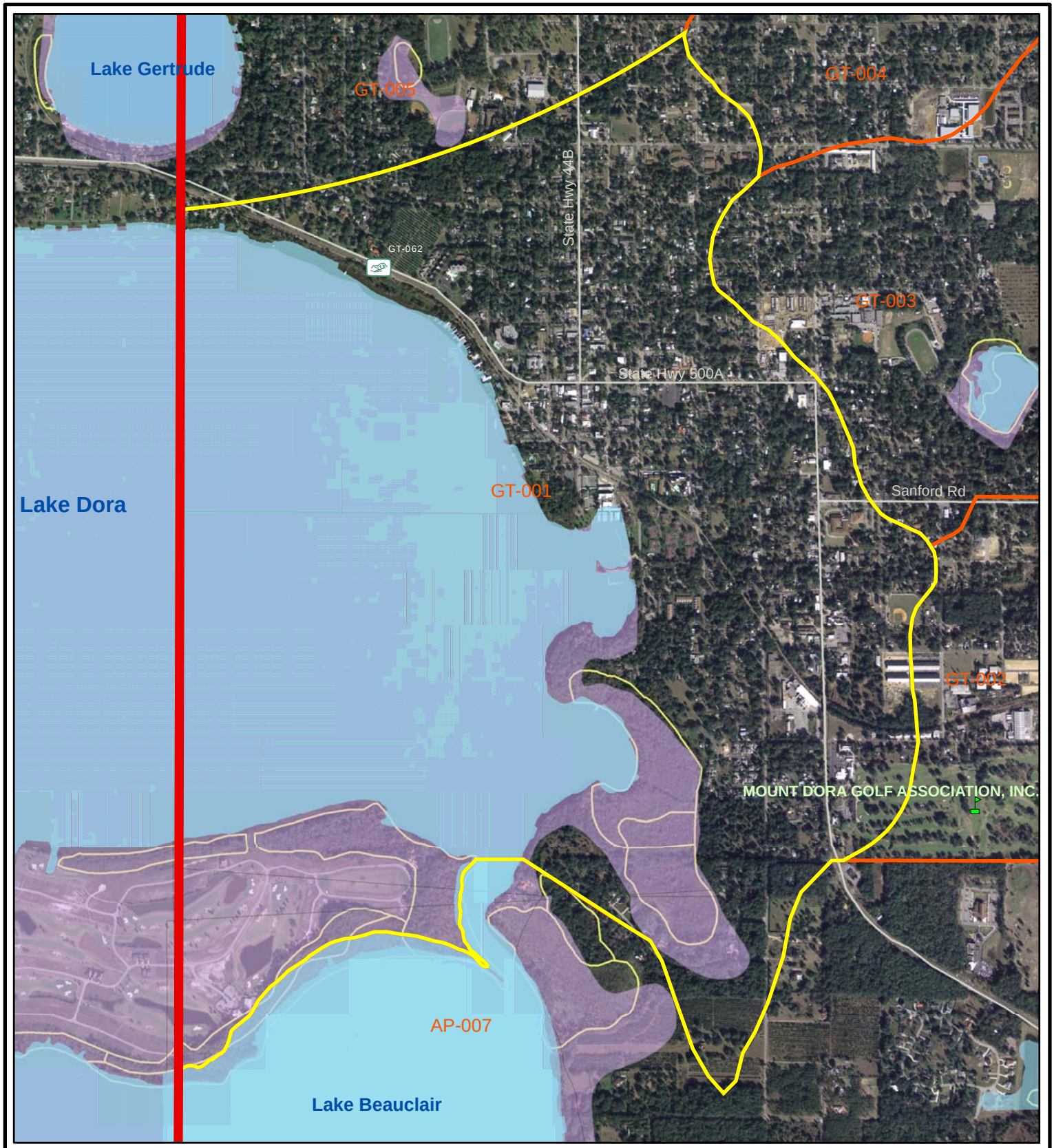
- When implementing the recommendations proposed in the *Northwest Ditch Drainage Basin Study* (PEC, 1996), the affected jurisdictions should also consider implementing site-specific water quality treatment options to coincide with the recommended culvert upgrades.

5.4.3 Subbasin GT-001

Subbasin GT-001 received a rank of "3" under Management Strategy No. 2. This subbasin, shown in **Figure 5-13**, is within the larger Golden Triangle Basin and is within the City of Mount Dora (1,152 acre or 74 percent), unincorporated Lake County (286 acres or 18 percent) and unincorporated Orange County (112 acres or 7 percent). Lake Dora is the receiving water body for this subbasin and the lake discharges through the Dora Canal into Lake Eustis. Lake Dora is also an impaired water body for which a TMDL for total phosphorus has already been developed, and FDEP is in the process of developing a BMAP for this water body. As part of the development of the phosphorus PLRG for Lake Dora, Fulton et al. (2003) found that the Lake Beauclair discharge represented more than 90 percent of both the phosphorus and nitrogen annual load to Lake Dora. Further personal communication with the SJRWMD revealed that the 90 percent was an average for 1991-2000. Estimated phosphorus contributions for more recent years are 2001 (54 percent P, 73 percent N), 2002 (55 percent P, 67 percent N), and 2003 (87 percent P, 91 percent N).

A master drainage plan for Mount Dora was completed in 1991 by Bowyer-Singleton & Associates. The master drainage plan states that stormwater conveyance in the City is characterized by pipe networks and ditch systems that discharge directly to Lake Dora, with little provision for stormwater treatment. The study also notes that the 100-year floodplain for Mount Dora is 66-ft NGVD and may exceed the banks of the lake and partially flood residential areas on the northern and eastern banks along Boathouse Road. Based on discussions with City staff, there are currently no deficiencies within the City and the recommendations made in the Bowyer-Singleton master drainage plan have been addressed. One problem due to erosion, was identified by Lake County in this subbasin at old US 441 and the railroad tracks. The affected jurisdictions should consider implementing the following BMPs under Management Strategy No. 2 in order to enhance long-term water quality treatment and flood control.

- Subbasin GT-001 is an urbanized basin, with development occurring up to most of the Lake Dora shoreline. Based on review of the 2004 DOQQs, there still appears to be some wetland areas along the southeast portion of the lake. It is important to maintain these areas in order to preserve what is left of the natural floodplain for



honourdm

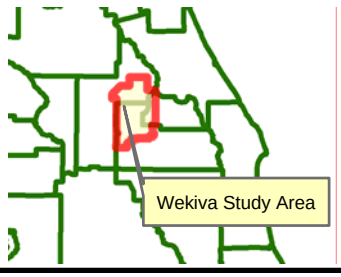
8/10/05

E:\Projects\92474481 2\GIS\Fig5-13.mxd

N
W
E
S

0 1,450 2,900 Feet

LOCATION MAP



LEGEND

Problem Areas
- Erosion/Sedimentation
- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary

National Wetlands Inventory
Type
- Lacustrine
- Palustrine
- Riverine
- Major Roads
- Water Bodies

FEMA Zone
- A
- AE
- ANI

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-13
Subbasin GT-001

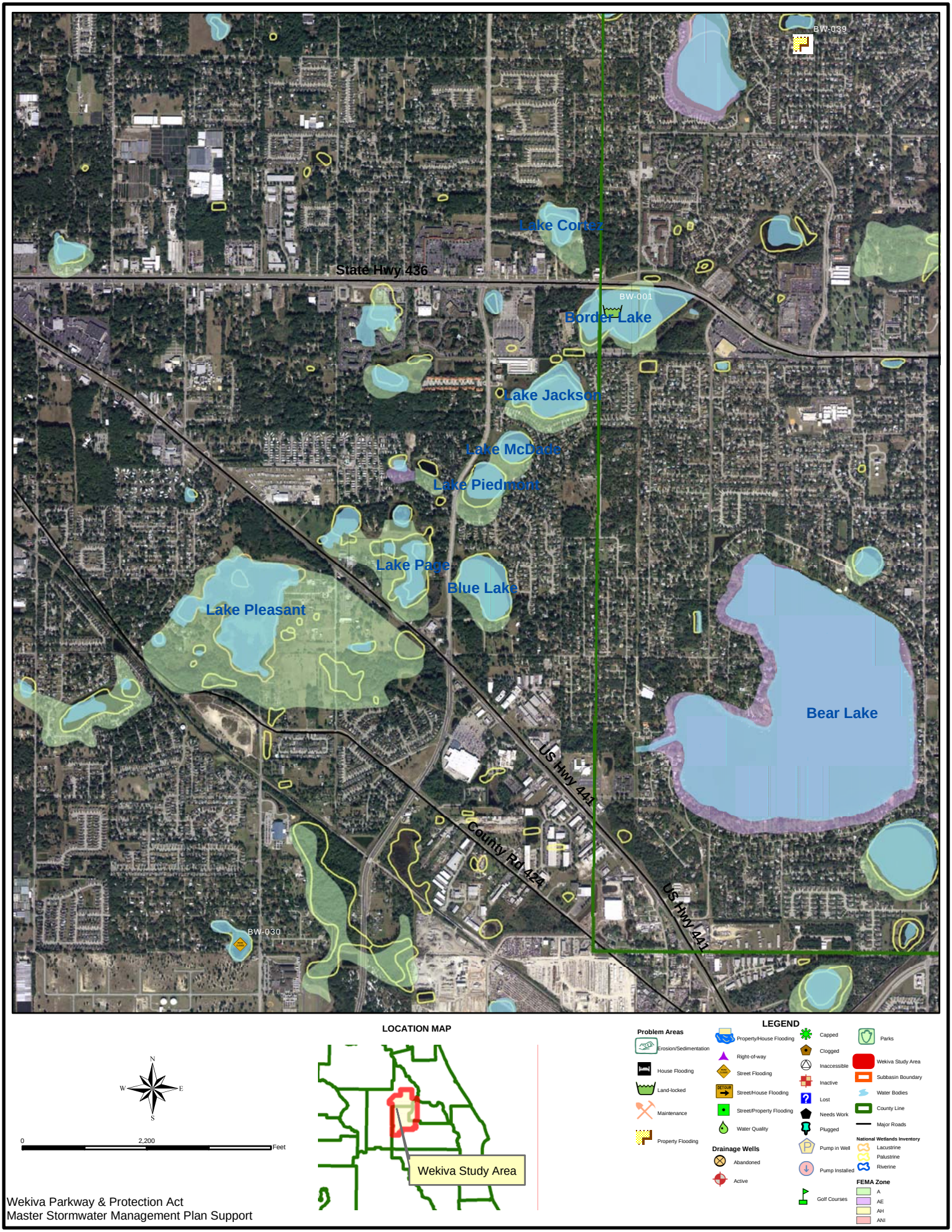
Lake Dora. The Q3 flood data obtained from the SJRWMD (derived from the FEMA FIRMs) has this area designated as part of the 100-year floodplain (i.e., Zone AE, an area inundated by 1 percent annual chance flooding, for which BFEs have been determined). If these areas are permitted to be developed, compensating storage requirements should be strictly enforced.

- As this subbasin is fairly built-out, there is little space available for large-scale regional stormwater treatment facilities. The City of Mount Dora has approximately 19 stormwater detention facilities that are currently within their maintenance jurisdiction. In addition to maintaining these ponds so that they effectively treat stormwater, the affected jurisdictions should install baffle boxes and end-of-pipe treatment devices, especially at the outfalls to the lake. For those areas that have no stormwater treatment capabilities, the affected jurisdictions should retrofit with landscaped or grass swales that are designed to convey stormwater, allow it to soak into the ground, and filter pollutants. These would be most effective in areas where there are "A" type soils or where this type of retrofit would be deemed practicable by the affected jurisdiction.

- The affected jurisdictions should also strictly enforce buffer requirements around the remaining wetlands to the southeast of Lake Dora. This will not only help with flood attenuation but also allow the wetlands to continue to provide natural water quality enhancement capabilities for surface runoff before it enters the lake.

5.4.4 Subbasin BW-020

BW-020 received an overall rank of "4" in the decision matrix for Management Strategy No. 2, Water Quality Treatment and Flood Control. Subbasin BW-020 is located in the Big Wekiva River Basin in the central portion of the WSA and is approximately 1,774 acres in size. It is located within the City of Apopka (908 acres or 51 percent), unincorporated Orange County (653 acres of 37 percent) and unincorporated Seminole County (213 acres or 12 percent). The major water body features include Border Lake, Lake Cortez, Lake Pleasant, Lake Jackson, Lake Piedmont, Blue Lake, Lake McDade and Lake Page. There are active drainage wells associated with Lake Page and Lake Pleasant that provide lake level control. This area has been previously studied both by Orange and Seminole Counties. Orange County has previously studied this lake system in the *Border Lake Master Plan, Phase I* (Miller-Sellen & Associates, Inc.) as well as the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001). Similarly, the Border Lake system was modeled as part of the *Big Wekiva Basin Engineering Study and Drainage Inventory Phase II* (DRMP, 2003). The existing problem identified in this subbasin is associated with flood control of Lake Cortez and Border Lake, of which a re-study is currently underway by Orange County to examine and identify potential alternatives for lake level control. The preferred alternative identified in the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001) entailed lowering existing drainage wells and pumping from or installing a new drainage well on Lake Cortez to help with flood control. The subbasin and the location of this problem area are shown in **Figure 5-14**.



Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-14
Subbasin BW-020

In addition to addressing existing deficiencies in the subbasin, the affected jurisdictions should consider implementing the following BMPs for long-term water quality treatment and flood control:

- Based on review of the 2004 DOQQs, there still remain some undeveloped/natural areas around several of the lakes including Lake Pleasant, Lake Page and Blue Lake. The Q3 flood data obtained from the SJRWMD that is derived from the FEMA FIRMs show some undeveloped areas within the 100-year floodplain (i.e., Zone A which is defined as an area inundated by 1 percent annual chance flooding, for which no BFEs have been determined). It is important to maintain these areas both for floodplain management as well as buffer systems as they provide water quality benefits. If any further development takes place in these areas, compensating storage must be strictly enforced so that no net loss of floodplain occurs.

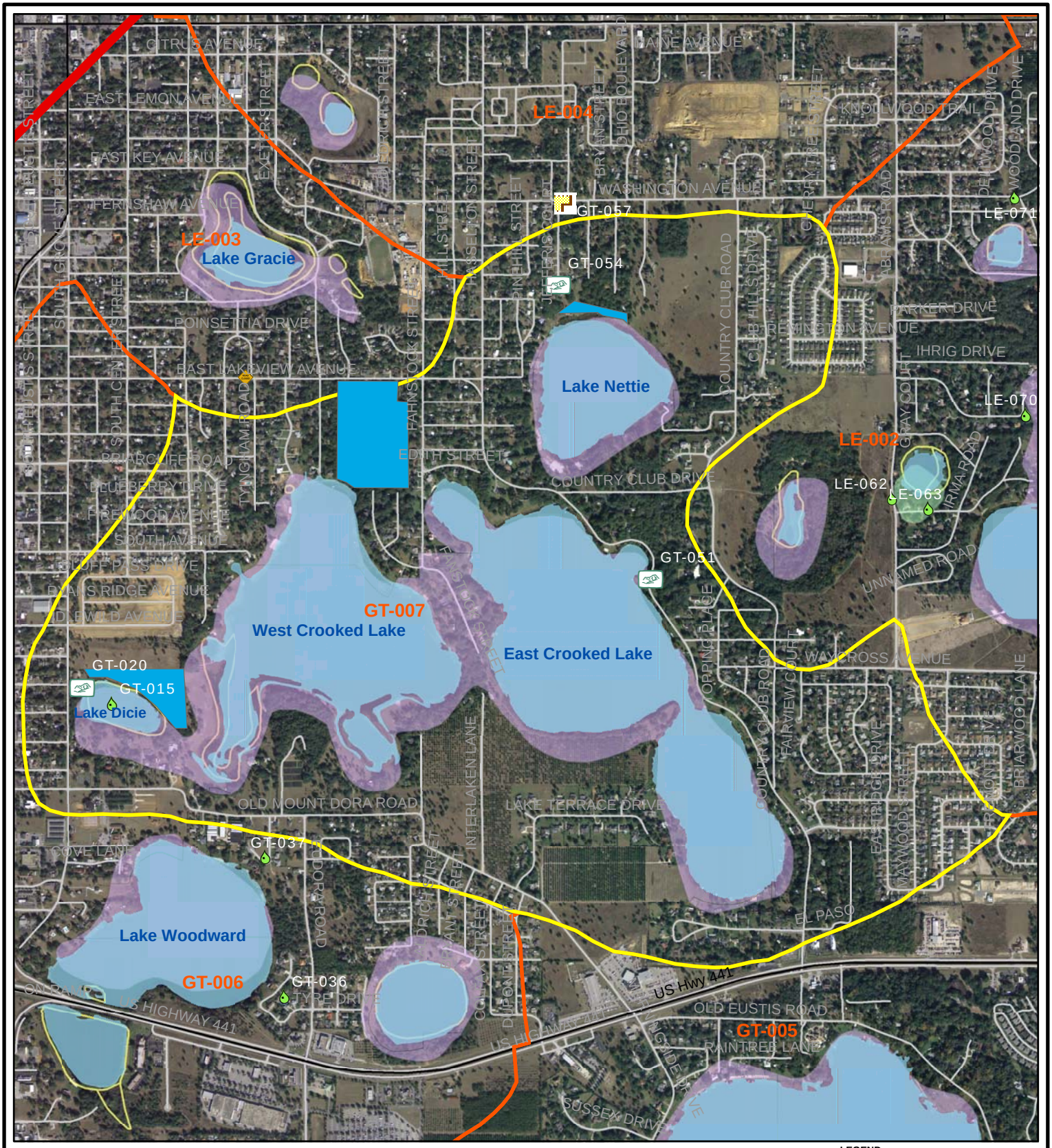
- As new development occurs, especially near the open water bodies within the subbasin, it will be important to incorporate buffers that will either preserve or create natural areas and wetlands between disturbed areas and a water body.

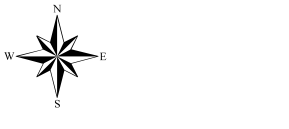
- Based on review of the 2004 DOQQs, a large majority of this subbasin appears to be equipped with stormwater treatment. For the few remaining areas constructed prior to the SJRWMD requirements for stormwater treatment, the affected jurisdictions should consider retrofitting with landscaped or grass swales where there are "A" type soils and where this type of retrofit would be deemed practicable. These BMPs would convey stormwater, allow it to soak into the ground, and filter pollutants.

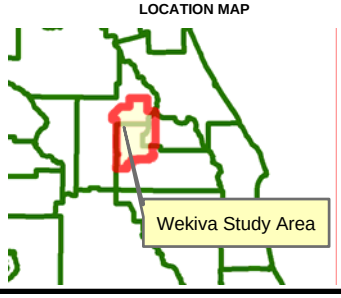
- For older, untreated areas that discharge directly to one of the lake systems, the affected jurisdictions should also consider providing end-of-pipe treatment at the outfalls to the lake.

5.4.5 Subbasin GT-007

Subbasin GT-007 received a rank of "5" under Management Strategy No. 2. This subbasin is 1,272 acres in size (shown in **Figure 5-15**) and is within the larger Golden Triangle Basin. It includes portions of the City of Eustis (526 acres or 41 percent) and unincorporated Lake County (746 acres or 59 percent). West Crooked Lake, East Crooked Lake, Lake Dicie and Lake Nettie are the main water body features in this subbasin. This area was previously studied as part of the *City of Eustis Master Stormwater Plan* prepared by CPH Engineers, Inc. in 2002. These are landlocked lake systems where the stormwater conveyance system is comprised of mostly closed secondary sewer systems which discharge directly to the lakes, as well as overland flow.







LEGEND

Problem Areas
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Maintenance
- Property Flooding

- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Golf Courses
- Parks

- Wekiva Study Area
- Subbasin Boundary

National Wetlands Inventory
- Lacustrine
- Palustrine
- Riverine
- Major Roads
- Streets
- Water Bodies

FEMA Zone
- A
- AE
- ANI
- Potential Pond Site

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 5-15
Subbasin GT-007

honourdm
8/10/05
E:\Projects\92474\44812\GIS\Fig5-15.mxd

The problem areas identified in this subbasin consist of erosion and sedimentation and water quality. In addition to the recommendations made in the master plan, the affected jurisdictions should implement the following BMPs under Management Strategy No. 2 in order to enhance long-term water quality treatment and flood control.

- Based on review of the 2004 DOQQs, there are some undeveloped areas around the perimeter of West Crooked Lake, East Crooked Lake, Lake Dicie and Lake Nettie. The Q3 flood data obtained from the SJRWMD (derived from the FEMA FIRMs) show large areas of undeveloped land within the 100-year floodplain (Zone AE, for which a BFE has been established). It is important to maintain these areas both for floodplain management purposes as well as buffer systems, as they provide water quality benefits. If any further development takes place in these areas, compensating storage must be strictly enforced so no net loss of floodplain area occurs.

- Some of the development in the *City of Eustis Master Stormwater Plan* was noted as having stormwater treatment either through detention/retention or swale systems. There still remain several large tracts of either undeveloped or agricultural lands which may be suitable for a regional stormwater treatment facility that could provide both attenuation and water quality benefits, for those areas that are untreated. This type of facility could also serve multiple purposes as it could provide treatment for older development as well as for new development. The affected jurisdictions could create an MSTU where in lieu of requiring on-site treatment for new development, a special district is established to fund a facility that is operated and maintained by the jurisdiction and benefits a larger area. Additionally, depending on where the facility is constructed, it could enhance aquifer recharge in addition to providing flood control benefits and water quality treatment. This type of facility can also have social value as it can be constructed as part of a park or public facility, and provide both educational and aesthetic value.

- For the remaining open spaces around the lakes not encroached by development, it is important to maintain buffers which will not only serve as filters for pollutants in stormwater runoff but also provide flood protection.

- If construction of a regional stormwater treatment facility is not feasible, the affected jurisdictions should consider retrofitting with landscaped or grass swales where there are "A" type soils and where this type of retrofit would be deemed practicable. These BMPs would convey stormwater, allow it to soak into the ground, and filter pollutants. Additionally, the affected jurisdictions should consider retrofit collection systems with end-of-pipe treatment such as baffle boxes to provide water quality treatment prior to surface water discharge.

- There are several large agricultural parcels that are immediately adjacent to West and East Crooked Lakes. The affected jurisdictions should work with the agricultural communities in this area to explore the feasibility of implementing

agricultural BMP practices. An extensive list of agricultural management practices can be found in the technical guidance and reference document entitled *National Management Measures to Control Nonpoint Source Pollution from Agriculture* (USEPA, 2003) as well as on the OAWP's website (http://www.floridaagwaterpolicy.com/BestManagementPractices.html).

- For those remaining undeveloped areas in the subbasin, the affected jurisdictions should consider promoting green or LID or providing incentives to those developers that incorporate resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

- For any new development that occurs within this subbasin, the SJRWMD 3-inch recharge requirement should continue to be enforced, as there are high recharge areas within this subbasin.

5.5 Conceptual Cost Estimates

Planning level conceptual cost estimates were prepared for each of the previously described alternatives where applicable. This included estimates for subbasins BW-002, LW-002, BW-008, LW-008, AP-002, GT-001, BW-020, and GT-007. As detailed hydrologic and hydraulic modeling was beyond the scope of this MSMP, the recommendations, and therefore the costs, are all conceptual in nature. Some of the recommendations made throughout the MSMP are more policy related and therefore a cost was not associated with those. When developing the conceptual cost estimates for those applicable alternatives, a number of assumptions were made including:

- Planning level costs do not include land acquisition or wetland mitigation costs;

- Unit costs and quantities may vary significantly based on actual site conditions.

- Costs do not include any potential hazardous material remediation or utility adjustment costs;

- The proposed project site has relatively level topography; and

- Gravity flow was assumed where applicable.

A more detailed list of assumptions and clarifications is included with the breakdown of the conceptual cost estimate for each alternative provided in **Appendix F**. The estimated planning level conceptual cost for each subbasin is shown in **Table 5-3**.

Table 5-3
Wekiva Parkway and Protection Act
Master Stormwater Management Support
Planning Level Conceptual Cost Estimates

Subbasin	Alternative Description	Conceptual Cost Estimate
BW-002	Detention Pond, Irrigation & Aeration	$464,000
LW-002	Surface Water Infiltration Basin & Irrigation	$3,365,000
BW-008	Surface Water Infiltration Basin	$2,188,000
LW-008	Baffle Boxes	$1,703,000
AP-002	Detention Pond(s)	Ranges from $2,747,000 to $5,526,000 depending on option
GT-001	Baffle Boxes	$425,000
BW-020	Baffle Boxes	$211,000
GT-007	Baffle Boxes	$318,000

Section 6
Feasibility of Stormwater Reuse

6.1 Introduction

Section 369.319 of the WPPA requires that the MSMP evaluates the feasibility of stormwater reuse. As the future of a sustainable water supply in Central Florida becomes more uncertain, water conservation practices and reuse become more attractive. The idea of stormwater reuse as an alternative water supply for irrigation has been suggested as a viable option that would help promote recharge and lower consumptive use of potable water supplies. Included in this section is an analysis of the feasibility of stormwater reuse as well as a summary of work done by others in this area.

6.2 Purpose & Methodology

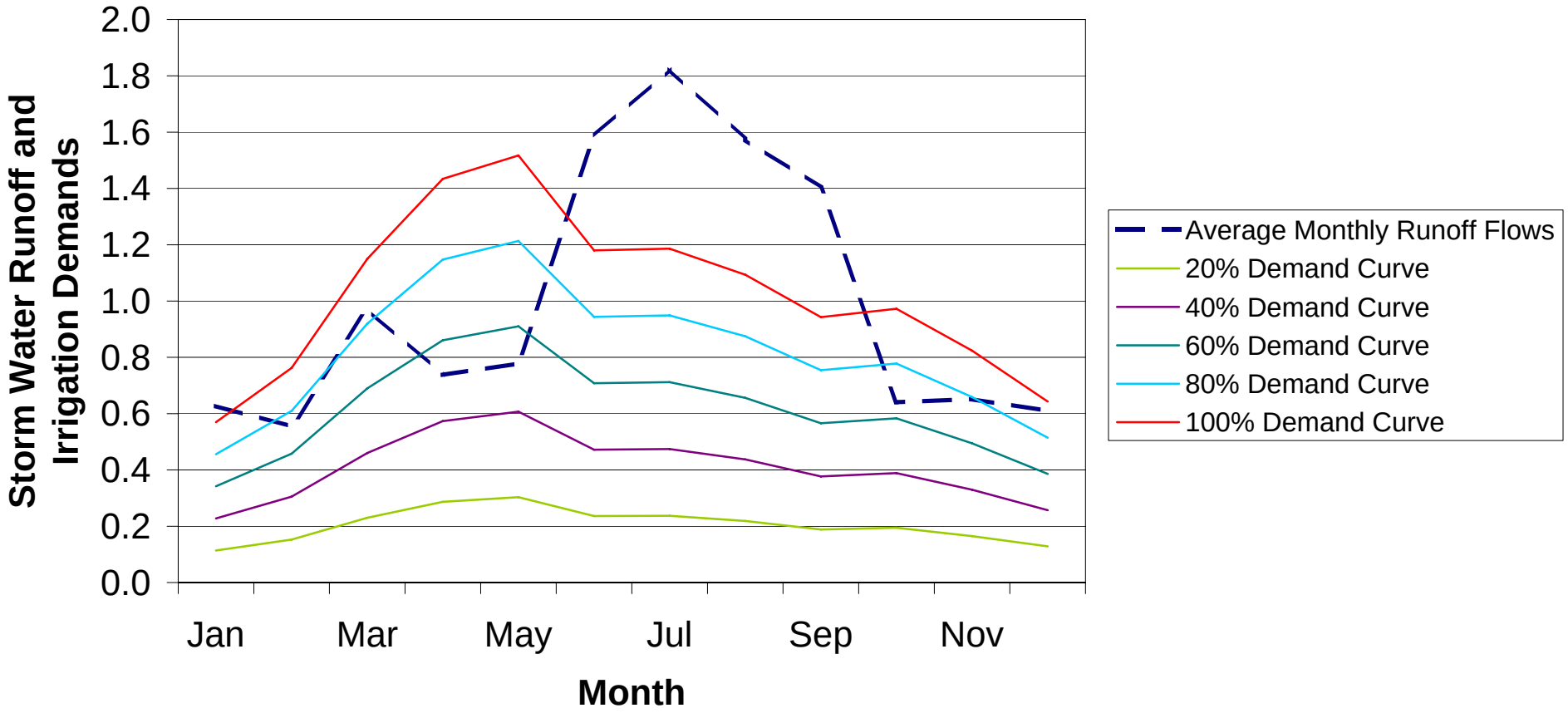
As part of the WPPA MSMP, CDM was tasked with evaluating the feasibility of using stormwater runoff as a source of irrigation water. Stormwater reuse can take several forms. One method is the direct reuse of stormwater runoff in landscape swales; another is to use the required retention basin as a source of irrigation water (the subject of this section). In order to accomplish this task, CDM used long term continuous simulation results for a representative 1-acre parcel in the Wekiva springshed along with long term meteorological records from the Orlando weather station (Station ID 6638). Using this information, the following calculations were developed:

- Stormwater Runoff – Daily runoff volumes were calculated for approximately 11 years (4,019 days) for a hypothetical one acre site using the above referenced weather station information. Stormwater calculations were based on A-type soils with 25 percent DCIA. The infiltration coefficient for type A soil was estimated to be 0.5. The model used to generate the runoff volumes was the Hydrologic Simulation Program Fortran® (HSPF).

- Irrigation Demand - An independent model developed by CDM for the analysis of water reclamation systems was then run to calculate the demand for irrigation expressed as inches of supplemental water required per day corresponding to the time period for the runoff calculations described above. The model uses the Thornthwaite equation (with correction factors for local conditions) to calculate potential evapotranspiration (PET) and includes soil moisture conditions in estimating irrigation demands. A more detailed explanation of calculating irrigation demands and the Thornthwaite equation is provided in **Appendix G**.

As one might expect, the available supply of stormwater runoff is inversely related to the demand for irrigation as shown in **Figure 6-1**. Using predicted demands and available supply (i.e., stormwater runoff) as input, this figure shows the dimensionless average monthly runoff curve for the Orlando area, with a range of irrigation demands expressed as a fraction of the average annual supply. This figure

Figure 6-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Average Monthly Runoff Versus Irrigation Demands



masks shortages and excesses that occur at less than a monthly (30 day) interval, but generally indicates that the average monthly demand for irrigation would be expected to be less than the available supply of runoff in all months, for commitments of less than approximately 50% of the available supply. This is of course, an over-simplification of the potential available moisture content in the root zone at any given time.

These predicted demand and available supply (i.e., stormwater runoff) datasets were then joined together in a water balance model spreadsheet based on the stormwater runoff represented as the only source of water available to satisfy supplemental irrigation requirements which represent a demand on the system. A more detailed description of the water balance model is also provided in Appendix G. Daily runoff and irrigation demands for approximately 11 years (4,019 days) were input into a water balance model. Variables in the daily water balance calculations were as follows:

- Percent of stormwater runoff committed to irrigation – The calculated daily runoff for the hypothetical one acre site was averaged over the period of record (4,019 days). This average value was used as the average volume of water available to meet the need for irrigation. The long term average demand for irrigation was then input into the water balance as a fraction of the total available supply varying from 0 to 100% of the expected supply. For example, the long term average daily runoff from the hypothetical one acre site was calculated to be 0.0012 cfs. If a long term irrigation demand equal to 50% of the available supply was used, the average daily demand for irrigation would be 0.0006 cfs.

- Available Storage – Irrigation commitments varying from 0 to 100% of the average long term supply (in 10%increments) were input into the water balance model spreadsheet. Storage was then varied until all shortages in irrigation demands could be eliminated (i.e., the fluctuations in supply and demand were completely equalized). Shortages occurring in the first year of the water balance calculation were neglected to allow the system to come to equilibrium. **Table 6-1** summarizes the result of the water balance calculations. This information is also presented graphically in **Figure 6-2**.

Table 6-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Storage Requirements as a Function of Irrigation Commitment

Irrigation Commitment (1)	Storage Required (Days) (Neglecting Year 1) (2)	Storage Required (ft^3/ac) (3) (Neglecting Year 1)
0%	0	-
10%	10.5	1,089
20%	25.3	2,623
30%	39.3	4,075
40%	53.2	5,516
50%	76.6	7,942
60%	102.5	10,627
70%	130.4	13,520
80%	207.8	21,545
90%	300.2	31,125
100%		

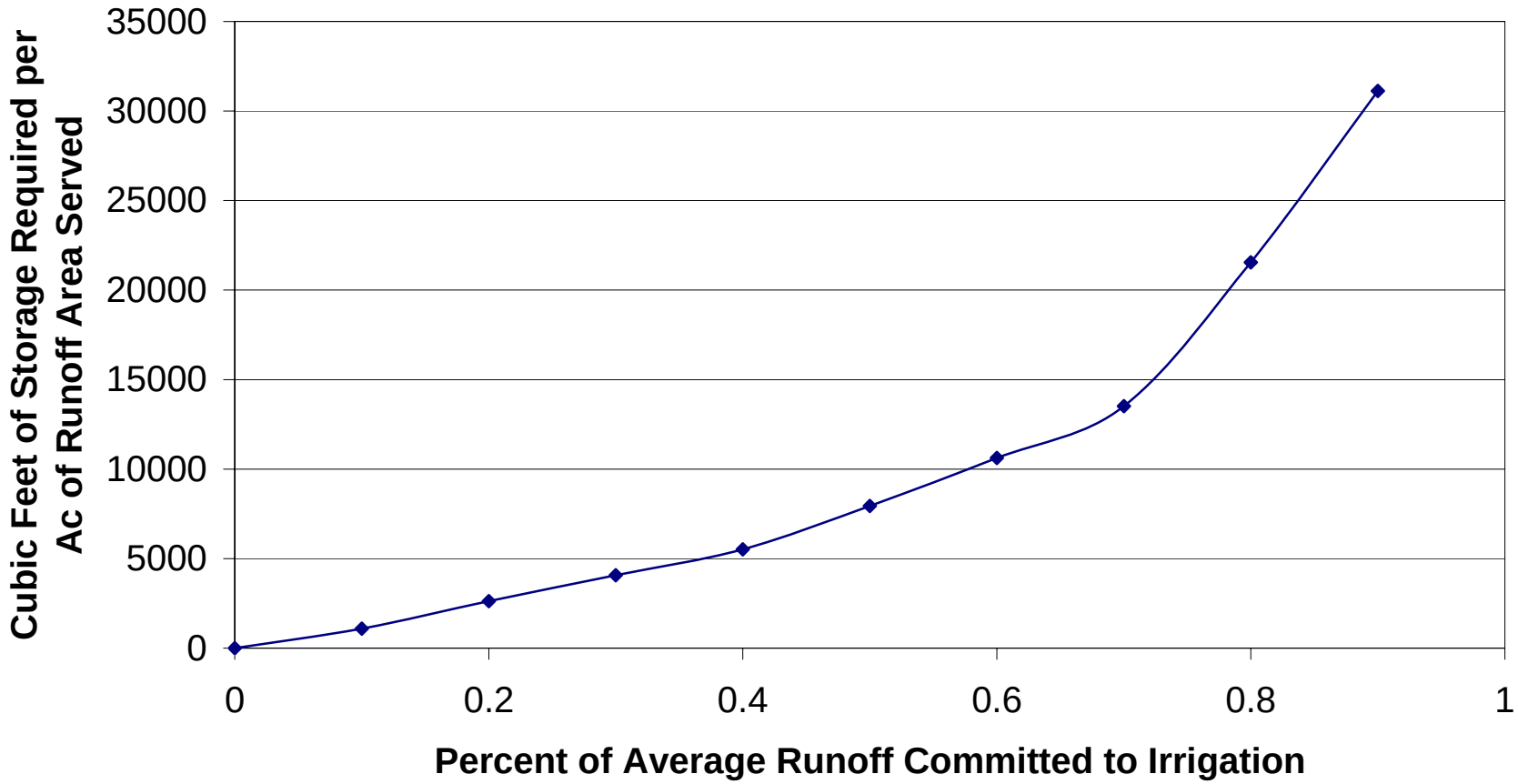
(1) Expressed as a fraction of the long term average runoff of a hypothetical one acre site.
(2) Expressed as days of the long term average runoff of a hypothetical one acre site.
(3) Expressed as cubic feet of storage required per acre of runoff area served given a long term average runoff of 0.0012 cfs

6.3 Results

The results of this analysis can be separated into two categories in order to assess or draw conclusions about the feasibility of stormwater reuse. The first category relates to demand and supply. As mentioned above, Figure 6-1 generally indicates that the average monthly demand for irrigation would be expected to be less than the available supply of runoff in all months, for commitments of less than approximately 50 percent of the available supply. Although it may be somewhat of an oversimplification, but from this comparison, it appears that stormwater reuse may be feasible on a continuous basis when demand is 50 percent or less of the available supply.

The second category for assessing the feasibility of stormwater reuse relates to storage. Based on the analysis performed, the volume of storage required to avoid a shortfall in irrigation increases as the fraction of runoff committed to beneficial use increases from 0 to 100 percent of the available supply. For the dataset used for the water balance calculations, it was not possible to provide sufficient storage to completely equalize supplies and demands, based on a desire to reuse 100% of the available runoff. It should be noted that the calculations of storage excluded losses

Figure 6-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Storage Required to Prevent a Shortage of Irrigation Water



and gains as a result of evaporation and rainfall respectively, as these values will be specific to the geometry of the storage pond. However, these parameters should be incorporated into the water balance calculations once the surface area of the storage pond is known.

The analysis given above suggests that stormwater reuse is feasible but the facilities required for a successful stormwater reuse system will depend on what fraction of the available supply is intended for beneficial use. From Figure 6-2, there is a linear relationship between storage volume required and percent of runoff reused as this percentage varies from 0 to approximately 70 percent of the long term average supply. At commitments beyond 70 percent, the slope of the curve increases and it is unlikely that reuse at these levels would be feasible due to the volume of storage required to equalize seasonal differences in supply (runoff) and demand (irrigation). From this, it can be concluded that stormwater reuse systems that attempt to reuse less than 70 percent of the long term average runoff may be feasible.

6.4 Advantages and Disadvantages

Several benefits of stormwater reuse have been identified. The most obvious benefit being increased pollutant removal and groundwater recharge. Reuse ponds are useful when the water table is close to the land surface, minimizing the losses due to groundwater infiltration, which will provide a more constant supply. It is also a relatively inexpensive source of irrigation water when compared to potable water supplies. Wanielista and Yousef (1993) calculated that irrigating a 100-acre 18-hole golf course (2 inches/week) would cost $300,000/year if potable water is used. The annual irrigation cost of pumping stormwater for irrigation was calculated to be $40,000/year for the same facility, seven times less than the cost of using potable water. A report entitled "Stormwater Reuse – A Balanced Assessment" (McAlister, 1999) also identified some additional benefits of stormwater reuse:

- Reduction in potable water usage;
- Reduction of peak flows;
- Reduce the magnitude of peak flows of potable water supplies, thus extending the life of existing water supply infrastructure; and
- Raises the awareness of stormwater management.

Some disadvantages of water reuse ponds are that they require a greater degree of operation than other stormwater practices and require the presence of a nearby customer for irrigation water. The impacts of continued pumping on downstream flows and aquatic life would have to be assessed as well. The report entitled "Stormwater Reuse – A Balanced Assessment" (McAlister, 1999) also identified some additional disadvantages for stormwater reuse:

- Widespread use may negatively impact environmentally sensitive areas;

- Public health;
- Relatively "new" approach;
- Source of supply not always available when needed;
- May require new standards and education practices; and
- Buyer and developer resistance.

An example of a large-scale stormwater reuse project currently underway in the WSA is the City of Apopka's Northwest Storage and Aquifer Recharge Stormwater and Reclaimed Water Project, which is currently under design and located at the City's Northwest Recreation Center (NWRC). The City is currently designing a system what will store stormwater to be used to augment their reclaimed water supply, which is another method of reusing stormwater. Boyle Engineering Corp. performed a feasibility study (2003) and cited the following reasons as to why this site was an ideal candidate for this type of project: 1) it is already under the City's ownership; 2) its topography provides natural depressions for temporary storage of reclaimed water as well as potential sites for concentrated recharge; and 3) the site is well situated relative to planned reclaimed water supply lines. The project includes construction of a storage/recharge pond and disinfection of the blend of reclaimed and stormwater that will be collected in the pond. FDEP is acquiring an additional 92 acres to implement Phases II and III of the project.

6.5 Conclusions

Other researchers (e.g., Wanielista) have developed stormwater reuse methodologies. Wanielista simulated a water reuse pond in Florida using 15 years of daily rainfall, runoff, reuse and pond discharge data. The model was then used to construct a series of rate-efficiency-volume (REV) curves which can aid in the design of water reuse ponds. An analysis of these curves suggest that water reuse ponds can provide a reliable source of irrigation water over the long term if a sizeable reuse is provided, which is often in excess of the water quality treatment volume used in designing stormwater treatment facilities.

As suggested by both CDM's analysis and Wanielista's research, stormwater reuse may be feasible up to a certain point, however additional study is needed to address the following concerns when considering this type of system in the WSA:

- The feasibility of stormwater reuse is site-specific and would need to be evaluated on a case by case basis as site conditions can vary greatly throughout the WSA (e.g., soils, recharge capacity, temporal and spatial distribution of rainfall, and local irrigation demand); and
- The relationship of stormwater reuse to the proposed pre-development/post-development match (Section 369.318 (4) of the WPPA) in the WSA would have to be assessed.

Section 7
Evaluation of Stormwater Management Programs

7.1 Introduction

Section 369.319, F.S. requires that the MSMP establishes measures to address redevelopment; includes requirements for inspection and maintenance of facilities; and identifies a funding source to fund implementation of the plan and maintenance program. Information presented in this section will address each of the aforementioned requirements in addition to establishing a schedule to complete needed improvements.

7.2 Redevelopment Measures

In addition to the economic and social benefits that successful redevelopment projects provide, they also afford an opportunity to local stakeholders and communities to incorporate stormwater management techniques and practices, that may have not previously existed or were substandard, which in the long term can provide better overall protection to the watershed. Many of the Stakeholders have established Community Redevelopment Agencies (CRA) through their local ordinances. A brief synopsis of each Stakeholders' policies for redevelopment as it relates to stormwater management and treatment is provided. In addition to this synopsis, this subsection provides examples of stormwater practices that can be used as guidance that when implemented at the local level, will help reduce pollutants in runoff, improve stormwater management and improve the environmental quality of development sites in highly urbanized watersheds.

7.2.1 Stakeholder Redevelopment Policies

Each of the Stakeholders' regulations were reviewed to identify current requirements for redevelopment as they relate to stormwater management for water quantity and quality. These were generally summarized in Section 3 - Stakeholder Stormwater Management Policies. In general, many of the Stakeholders already have language in either their code of ordinances, comprehensive plans and/or land development codes that specifically address stormwater management requirements for redevelopment. These Stakeholders include:

- Lake County
- City of Mount Dora
- Orange County
- City of Orlando
- City of Winter Garden

- Seminole County
- City of Longwood

Those Stakeholders where the language in their codes and/or comprehensive plans is somewhat vague and requirements apply to "land development activity", which could be interpreted as new development and/or redevelopment include:

- City of Eustis
- City of Apopka
- Town of Eatonville
- City of Ocoee
- City of Altamonte Springs
- City of Lake Mary

Those Stakeholders where language in their codes and/or comprehensive plans does not specifically or generally require stormwater management for redevelopment include:

- Town of Oakland

The Stakeholders with codes that are more broadly defined or do not have specific requirements for stormwater management and treatment for redevelopment should add to or strengthen the current language where applicable. Additionally, redevelopment practices related to stormwater management such as those described in the following subsection can be used as guidance by Stakeholders when promoting redevelopment in their communities.

7.2.1.1 Redevelopment Stormwater Practices

The Center for Watershed Protection (CWP) convened a Redevelopment Roundtable, which consisted of national and local stakeholders who participated in the process to develop "Smart Site Practices" specifically for redevelopment and infill sites. These practices are documented in the *Redevelopment Roundtable Consensus Agreement, Smart Site Practices for Redevelopment and Infill Projects* (CWP, 2001). When these practices are applied together, they provide benefits for all local stakeholders including developers, local government residents and others who are interested in designing redevelopment so that it better protects the local watershed features such as streams, lakes, wetlands and estuaries. Examples of redevelopment projects include historic preservation, waterfront development, Brownsfields, residential infill, adaptive reuse, downtown business district, multifamily, suburban commercial, mixed use development and roadway expansion. The "Smart Practices" were developed as a tool to be used by

developers, local government and planners and can be utilized to develop better criteria on which to gauge the potential impact of a development site. The practices are generally described below:

- Practice No. 1: Redevelopment and infill planning should include environmental site assessments that protect existing natural resources and identify opportunities for restoration where feasible.

- Practice No. 2: Sites should be designed to utilize impervious cover efficiently and to minimize stormwater runoff. Where possible, the amount of impervious cover should be reduced or kept the same. In situations where impervious cover does increase, sites should be designed to improve the quality of stormwater runoff at the site or in the local watershed.

- Practice No. 3: Plan and design sites to preserve naturally vegetated areas and to encourage revegetation, soil restoration and the utilization of native or non-invasive plants where feasible.

- Practice No. 4: Establish mechanisms to guarantee long-term management and maintenance of all vegetated areas.

- Practice No. 5: Manage rooftop runoff through storage, reuse, and/or redirection to pervious surfaces for stormwater management and other environmental benefits.

- Practice No. 6: Parking lots, especially surface lots, should be minimized and designed to reduce, store and treat stormwater runoff. Where site limitations or other constraints prevent full management of parking lot runoff, designers should target high use areas first.

- Practice No. 7: Utilize a combination of Better Site Design techniques with infill projects to minimize stormwater runoff and maximize vegetated areas. Many single lot or small multi-lot infill projects contribute to "impervious creep," which is defined as the increase in impervious cover seen over time in highly developed areas. On-site improvements, such as house additions, expanded driveways, new housing, and sidewalks all contribute to impervious creep. Better Site Design refers to a design approach that seeks to reduce the amount of impervious cover associated with development, increase the natural lands set aside for conservation, use pervious areas for more effective stormwater treatment, and achieve a marketable, cost-effective product. Better Site Design consists of a series of benchmarks that fall under three categories: parking lot and street design, lot development, and natural areas conservation.

- Practice No. 8: Utilize proper storage, handling and site design techniques to avoid the contact of pollutants with stormwater runoff.

- Practice No. 9: Design the streetscape to minimize, capture and reuse stormwater runoff. Where possible, provide planting spaces to promote the growth of healthy street trees while capturing and treating stormwater runoff. In arid climates, xeriscape or water wise landscaping should be used to achieve similar benefits.

- Practice No. 10: Design courtyards, plazas, and amenity open space to store, filter or treat rainfall.

- Practice No. 11: Design sites to maximize transportation choices in order to reduce pollution and improve air and water quality.

7.3 Stormwater Inspection and Maintenance

The benefit of stormwater operations and maintenance (O&M) to a community is realized in three general ways:

- The useful life of the stormwater infrastructure is extended through proper operation and routine maintenance of these assets resulting in a cost savings by delaying the need for major rehabilitation or replacement of these assets.

- Cleaning of catch basins, culverts, and stream channels maintains the hydraulic capacity of these items, thus lessening the likelihood of flooding in the vicinity of these structures as compared to a non-maintained state.

- Regular removal of trash, debris, sediment, and excess vegetation from the stormwater system improves water quality of streams and downstream waterways as well as the aesthetic value of these areas to the community. Regular street sweeping and greenway maintenance achieves similar results.

Information on the current stormwater inspection and maintenance practices was provided by each of the Stakeholders. This information was generally described in Section 3 of this MSMP (Stakeholder Stormwater Management Policies). Based on feedback from the Stakeholders, CDM summarized the maintenance operations, inspections, contracted services and equipment for each Stakeholder in **Tables 7-1** through **7-14**, located at the end of this section. Several of the Stakeholders regulated under the NPDES MS4 Phase I program use the suggested maintenance schedule (Table II.A.1.a in the NPDES permit) that is included in their NPDES permit to define their routine maintenance and inspections. These include the City of Orlando, City of Winter Garden, Seminole County, City of Altamonte Springs and City of Longwood. Other Stakeholders, although while still in compliance with their NPDES permit, have established and developed their own routine maintenance and inspection programs such as Orange County, City of Apopka, City of Ocoee and City of Lake Mary. Those Stakeholders regulated under the NPDES MS4 Phase II program, Lake County, Mount Dora and Eustis, do not have a suggested maintenance schedule. However, as part of the Phase II program, they will be required to establish certain inspection programs for illicit discharges and stormwater controls for construction throughout

the duration of their permit. Those NPDES Phase II permittees that already have established routine inspection and maintenance programs include the City of Eustis and the City of Mount Dora. Currently within Lake County, maintenance frequency and structure inspections are complaint driven. However, the County is moving toward scheduled maintenance and inspection activities with the mapping of their drainage infrastructure.

As O&M programs can vary greatly amongst Stakeholders based on individual needs and constraints (e.g., staffing, equipment, funding), it is recommended that each Stakeholder evaluate improvements to their maintenance programs based on the information presented in this MSMP and their own familiarity with their respective programs. The next sub-section provides some guidance on how individual Stakeholders can evaluate their maintenance programs.

7.3.1 Stormwater Operations and Maintenance Evaluation Guidance

The term "level-of-service" (LOS) describes the magnitude of the benefit provided as a result of a stormwater program. A higher LOS will result in more benefit to the community, but will also have a higher cost of implementation. The LOS concept is useful for assessing stormwater O&M programs.

For the purposes of this study, different LOS have been defined and assigned standard letter grades, with "A" being the highest and "D" being the lowest. These standard definitions facilitate the evaluation of the LOS currently being provided by the Stakeholders' stormwater programs and allows for consideration of alternative LOS, with their associated benefits and costs.

Definitions to assist in the understanding the different LOS as they relate to O&M are provided below

- LOS A - Fully Preventative/100% Routine
- LOS B - Mixture of Routine and Inspection Based
- LOS C - Inspection Based Only
- LOS D - Responsive Only

One of the lowest LOS associated with O&M activities is a responsive type of program (also known as complaint-based). Under a responsive program, O&M staff rely on private citizens or other outside sources to report O&M problems. Once a notice or complaint is received, O&M staff investigate the complaint and takes action if determined to be under its responsibility. Unfortunately, under this approach O&M problems are not reported until there is significant failure, which in some cases

causes damage to the infrastructure that may far exceed the cost of routine maintenance. This responsive type of program has been defined as a "D" LOS.

An enhanced LOS for O&M is an inspection based-program. Under this program, O&M staff perform periodic inspections of the existing stormwater system. This staff identify O&M problems before they result in complete failure of elements in the stormwater system. Information gathered during periodic inspections is processed and used to direct O&M activities, ideally before the situation results in a significant failure as under a responsive program. While an inspection-based program is an improvement over a responsive-only program, the approach still allows problems to develop in the system before they are corrected. This inspection-based type of program has been defined as a "C" LOS.

The most desired LOS for O&M is a preventative program. Under this approach, O&M is performed on a routine schedule, which is planned and conducted based upon known historical maintenance requirements of the system. This LOS also requires the owner to have a fairly complete inventory of the system and system components under its responsibility. In this type of program, O&M activities are performed before problems occur, thus providing the highest level of protection for system assets. This LOS can be more cost-effective that a response-based O&M approach once the initial phase of inventory, repairs, and backlog maintenance activities are completed. The challenge lies in transitioning from a responsive or inspection-based program to a fully preventive program. Even once the transition begins, it may be several years before the full benefits of routine maintenance are seen in terms of a reduction in O&M problems and failures. A fully preventive O&M program has been defined as an "A" LOS.

A LOS B is used to define a program that has characteristics of a preventive maintenance program, but also requires continued inspection-based (and possibly some responsive-based) activities. Usually, critical facilities receive routine maintenance and non-critical ones receive maintenance based on inspections.

7.4 Funding Mechanisms

Information on current funding mechanisms for the individual stormwater management programs was provided by each of the Stakeholders. This information was generally described in Section 3 of this MSMP (Stakeholder Stormwater Management Policies). A number of the Stakeholders currently have a stormwater utility to fund projects. These Stakeholders include the City of Altamonte Springs, the City of Apopka, the Town of Eatonville, the City of Eustis, the City of Lake Mary, the City of Longwood, the City of Mount Dora, the City of Ocoee, the City of Orlando and the City of Winter Garden.

Provided below is a discussion of funding alternatives for stormwater services. For the purposes of this discussion, stormwater services have been categorized into two elements: operations and capital improvements. Stormwater operations include

management, engineering, planning, enforcement, survey, maintenance, research, permitting, inspection, GIS, and drafting. Capital improvements include significant capital construction projects. The reason for this separation is that some funding alternatives provide revenues only for capital projects while others can provide funding for both components. The discussion that follows is divided into existing and new sources. Existing sources are those that have been historically used and new sources are those alternative funding mechanisms that are becoming increasingly more common.

7.4.1 Existing Funding Sources

Ad Valorem Taxes

Historically the typical source of funding for stormwater services, the general fund is an aggregation of several revenue sources from which many diverse governmental services are funded. As noted above, the major funding contributor to the general fund is ad valorem taxes. The maximum millage (tax paid for each $1,000 of assessed value of property) is by law 10.000 mills. This means that a house valued at $100,000 (after the $25,000 homestead exemption) would pay $100 for the annual ad valorem tax. Ad valorem taxes are unrestricted and can be used for any legitimate governmental program including operating and capital project stormwater costs.

Included in this general category is funding by municipal service taxing unit (MSTU) and benefit unit (MSBU). MSTU revenues can be used for any county service; however, MSBU funds are restricted to properties specifically benefiting from the municipal service. Use of the MSTU funding over multiple years such as to pay a debt service would require a referendum; this would not be required for a MSBU.

The advantage using of ad valorem revenues for stormwater services is that ad valorem tax is an existing source of revenue not requiring additional legislative action other than adoption of the millage rate. The public is currently paying such taxes and revenues are currently being used for stormwater services. The disadvantage is the competition for the use of ad valorem taxes usually means that stormwater services are not adequately funded.

Proprietary Sources

Proprietary sources identified in the budget are those funds collected for a particular service and ear-marked for such services. Some of these can be used for stormwater services such as Development Review Fees (used for review of site plans for stormwater). Others are for specific utility services such as water and sewer services; revenues from these utilities can be used only for the utility itself. Of course, many communities in Florida have adopted a utility fee for stormwater which will be described under subsection 7.4.2 New Funding Sources.

Special Assessments

Also referred to as a non-ad valorem assessment or uniform assessment method, special assessments for stormwater services are authorized in Chapter 403.0893, F.S. and the methodology to implement described in Chapter 197.3632 F.S. The basic rules for a legitimate special assessment are: (1) the services provided must be of special benefit to the individual properties; and (2) the assessment must be fairly and reasonably apportioned according to the benefits received. The Florida Supreme Court decision regarding the special assessment for Sarasota County (20 Fla. Law Weekly, S600-S603, January 1990) concludes that a stormwater special assessment can meet both of these criteria. However, the assessment must be set up specifically for stormwater as a new fee (see subsection 7.4.2 New Funding Sources).

½ Cent Sales Tax

The ½ Cent Sales Tax, identified as a state source, applies $0.005 to each dollar of sales of products within a county. The ½ Cent Sales Tax was imposed by the state legislature and shared with local governments.

Impact Fees

Impact fees are restricted in use and must be used for capital construction related to new growth in the area in which they are collected. The advantage of an impact fee is that they can generate funds for specific projects in a benefited area such as for development impacts. This is further described below under Other Funding Sources. The significant disadvantages are based upon the experience of other communities in the application of impact fees to stormwater services, they generally generate too small revenues to pay for the needed capital improvements and they can only be used for new growth. Many of the existing stormwater problem areas are related to existing developments, whereas new development is required to provide stormwater attenuation and treatment.

Local Option Gas Tax

The Local Option Gas Tax is one of many sources which are related to gas taxes and are placed in a specific fund to account for the construction, reconstruction, and major maintenance of County roads. Arterial and collector roads are funded through Gas Tax Bonds, the Constitutional Gas Tax, and the Six-Cent Local Option Gas Tax. The costs of local or "neighborhood" roads are assessed against the properties deemed to benefit from the improvements.

The advantage of this revenue is that it is an existing funding source which can resolve stormwater problems associated with roads. The disadvantage is that many problems are not associated with roads so this source is not available. Also, stormwater operating expenses can not be funded by this source.

7.4.2 New Funding Sources

Special Assessments or Non-ad Valorem Assessments

As discussed previously, a special or non-ad valorem assessment is a method to charge property owners in any county for services provided by that county. The two major criteria to judge the validity of a special assessment are that the property must receive special benefit from the service and the assessment must be reasonably apportioned according to the benefit. The assessment is billed through the Tax Collector's Office on the annual tax bill. However, to properly collect the assessment, a rigorous protocol must be followed as defined in Chapter 197.3232 F.S. which includes:

- Adoption of a resolution during the prior year stating that the non-ad valorem assessment may be billed in the following year;
- An agreement with the Property Appraiser and Tax Collector to implement the non-ad valorem assessment;
- Development of a non-ad valorem assessment roll, consistent with the Property Appraiser's data for the Tax Collector, and provided to the Tax Collector in September;
- During the first year of the assessment, a first-class mailing to property owners announcing the assessment; and,
- A public hearing in which the non-ad valorem assessment roll is adopted prior to September 15th of the year in which the assessment is billed.

It is clear that the schedule is stringent, the data requirements are specific, and implementation starts during the year prior to billing.

It is important to note that the non-ad valorem assessment is not a tax and is sent to taxed and non-taxed property alike. That is, tax-exempt property, such as homesteaded residential properties valued less than $25,000, governmental (local, state and federal, including schools) and institutional (churches and non-profit agencies) properties, must pay the assessment. As an example, the Sarasota Church of Christ took Sarasota County to the Florida Supreme Court in objection to the County's special assessment for stormwater services. While the details of the case and court decision are extensive, the results of the case were essentially that the property does indeed receive special benefit from stormwater services, especially related to stormwater quality, and that Sarasota County reasonably apportioned its assessment (their assessment was based upon an assessment for developed property only, a rate structure using impervious area alone, a uniform rate for residential properties, and an individual assessment for non-residential properties based upon actual impervious areas). This case was important in the understanding of special assessments in Florida. Since the case concluded, Sarasota County and others have modified their

rate structures to improve the apportionment by including undeveloped properties, pervious as well as impervious areas, and credits and adjustments.

The advantages of a special assessment include:

- Use in counties for lighting, paving and solid waste services;
- A billing mechanism is already in place with the Tax Collector;
- Revenues can pay for all components of the stormwater management program;
- Property owners are given an assessment which is equitably apportioned to them in relation to the benefits they receive;
- Tax-exempt properties pay for the assessment in recognition that they receive special benefits from the stormwater services provided by the County;
- Non-payment is minimal due to the ability to place a tax lien;
- The majority of property owners (residential) will pay the fee from an escrow account from which they normally pay property taxes; and,
- The method has been adjudicated up to the Florida Supreme Court where it was upheld.
- The disadvantages of a special assessment include:
- The public perception that it is a tax because it is on the tax bill;
- The cost of starting the assessment is moderate considering the one year advanced notice and stringent guidelines of Chapter 197 F.S.;
- Tax-exempt parcels have objected to the assessment based upon the experience of other municipalities who have adopted, or attempted to adopt, the assessment; and,
- A lien cannot be placed on governmental properties to require payment.

Stormwater Utility Fee

Governments can charge customers for services they provide for the following reasons: fees in exchange for a services or privilege (e.g., admission fees); fees to fund a regulatory responsibility (e.g., building fees, and inspection fees); and fees for a service for which the customer's own actions or property creates the need for the revenue (e.g., utility fees, impact fees, etc.). For the last two categories, there must be a reasonable connection (nexus) between cost of the service or regulatory activity and the fee charged. Fees such as these are usually charged on a utility bill which may include other fees (e.g., electric, water, sewer, solid waste fees, cable, etc.).

The use of a stormwater utility fee began in Florida in October of 1986 with the $1.00 per month per single family unit equivalent for the City of Tallahassee. In this case and many others in Florida, the user charge is assigned to the fee payer relative to the contribution to the stormwater problem or burden. For the majority of stormwater utilities, the contribution is related to stormwater runoff which, in turn, is related to impervious area (or a combination of pervious and impervious areas). Therefore, for most utilities, the fee is based upon the relative amount of impervious area. Since residential impervious area varies much less than does non-residential imperviousness, almost all stormwater utility fees in Florida are based on a residential equivalent. That is, residential fees are generally uniform equal to or a fraction of the single family unit rate, and non-residential fees depend on the relative amount of impervious area compared to either single family dwelling units or an average of all dwelling unit types. In this manner, the fees charged are connected or related to the service being provided.

The fee structure for a stormwater utility fee and a stormwater special assessment can be very similar. The Supreme Court case supported the apportionment of the special assessment for Sarasota which is very similar to many others in Florida. The biggest difference between the two is the billing method: a stormwater utility fee would be billed monthly with other utilities and the non-ad valorem assessment would be billed on the annual tax bill. It should be noted however, that the Supreme Count case showed that the legal requirements for the non-ad valorem assessment are greater than for the utility fee.

The advantages of a stormwater utility fee include:

- Revenues can pay for all components of the stormwater management program;
- Customers pay a fee which is equitably related to the benefits they receive;
- Tax-exempt properties pay the fee just as they pay for water and sewer services;
- A dedicated and stable funding source;
- Located on a utility bill, the stormwater fee is not perceived as a tax and is generally significantly less than the monthly water/garbage fees;
- Where bills are sent monthly, cash flow is improved over annual bills; and,
- Stormwater utility fees are consistent with and can be associated with other municipal utility fees such as water or sewer.

Disadvantages of the utility fee include:

- The cost of starting the assessment is moderate considering the data analysis necessary to assign each fee payer a correct fee;

- If it is not associated with other utilities, total collection of the stormwater utility fee is difficult; and,

- A stormwater utility fee is generally new to a municipality so there is additional political and public scrutiny and resistance to adopting the fee.

Local Government Infrastructure Sales Tax

Similar to the ½ Cent Sales Tax discussed above, the local government infrastructure sales tax allows the County to collect up to 1 percent on sales within the county. The revenues can be used for capital improvements for infrastructure, land acquisition, and landfill closures. This sales tax must be approved by voters in a referendum and has the ability to generate significant revenues. A local government infrastructure sales tax could be used for stormwater capital improvements.

An advantage of this method is that it will generate a significant amount of funding for a stormwater capital improvement program. Generally, the sales tax is used for all of the County's capital improvements (government buildings, sports arenas, entertainment halls, etc.) so that the stormwater program is only a part of the overall program. Another advantage is that because it is a sales tax applied to everyone who makes purchases in a county, both citizens and tourists alike pay for the capital improvements. That is, not just citizens pay for the improvements. A disadvantage of the sales tax include that a citizen vote is required: generally, voters are reluctant to vote for a additional tax. Also, the revenues can only be used for capital improvements where the overall stormwater program includes operational expenses as well.

Public Service Tax

Another major source of new funding would be a public service tax, which can be up to 10 percent of the purchases of electric, gas, water, garbage, telecommunications (only up to 7 percent) and fuel oil (up to 4 cents per gallon). It would be the County's choice as to which utility would be taxed. The tax would include all municipalities in a County. No referendum would be required to adopt a public service tax and the revenues could be used for any county service.

7.4.3 Other Funding Sources

Additional sources are available to local governments to pay for a portion of the stormwater management financial needs. These have been separated from the others because they generally do not generate sufficient funds for the entire stormwater program and in many cases are ear-marked to fund specific programs.

Impact Fees

Water, wastewater and solid waste utilities use impact fees as well as utility fees to support their programs. Impact fees are imposed on new construction because the development causes an impact on the utility service (e.g., increased water or sewer capacity, or increased collections). The concept is that a one-time fee is charged to the

new development to pay for the construction of new facilities which services the fee payer. Once the development has been connected to the utility service, normal monthly fees are imposed to pay for the actual service received. This discussion leads to the four major restrictions on the use of impact fees:

- Impact fees must be used for construction of facilities related to the utility;
- Impact fees must be defined based upon a clear connection between the fee and the construction required;
- Impact fees must be used for facilities, or incremental increases in facilities, required for new growth; and,
- Impact fees must be used in the area of the growth.

Impact fees can only be used for the design and construction of major CIP projects related to new growth. None of the other stormwater management functions can be funded by impact fees. For this reason, impact fees should be considered as a supplemental funding source.

Impact fees represent a method of capital cost recovery for growth-related construction. A new development will increase the runoff volume, timing and peak flow from the property. Stormwater regulations require that the post-development runoff peak flow must be no more than the pre-development runoff peak flow and the first half-inch or inch of runoff must be treated (detention). While the regulations help to maintain pre-development conditions, there are still increased services (in the form of construction of conveyances or storage) required by the municipality as a result of the new development. From this perspective, there are three possible methods to administer impact fees to recover capital costs.

Fixed Impact Fees
In this method, a uniform impact fee is imposed on a new development based upon a characteristic of the development. Possible characteristics include total land area, number of homes, etc. The impact fee would be used for the municipality to deal with the increased runoff and would be independent of any regulatory requirement imposed on the development.

Fee-In-Lieu-Of Charge
Another method of recovering capital costs is to require developments to pay an up-front charge for the capital improvements needed to service the development in lieu of a developer-built onsite stormwater facility. The charge would be representative of the runoff contribution of the development to the regional facility in the watershed. The concept is that regional stormwater facilities may be less costly than individual systems, and can be better maintained than onsite systems. The advantages for the municipality include capital cost recovery for the regional system and better maintenance. The advantage for the development is more land for development

(since none is required for the onsite stormwater facility). The fee-in-lieu-of charge is paid prior to the construction of the regional facility. The major issue with the fee-in-lieu-of charge is that the regional facility must be built prior to the completion of the development.

There are two general situations when a fee-in-lieu-of charge is appropriate. The first occurs when there is a large incremental cost to be incurred by the municipality to accommodate the new development. The second is when the addition of a sizable development precipitates the need for a new stormwater system, not just an expansion of the existing system.

Availability Charge

Similar to the fee-in-lieu-of charge, the availability charge is applied to a development to connect to an existing stormwater management facility. In this case, the regional stormwater facility must be constructed with excess capacity, the excess to be sold to developments based upon need. The original cost of the facility can be funded by whatever mechanism the municipality desires (bonds, pay-as-you-go sinking funds, etc.) and the capital cost to oversize the facility to accommodate growth is recovered through the availability charge. For this method to work, a master plan is required in order to define the amount of excess capacity needed for the future build-out.

Of the three options for capital cost recovery, the fee-in-lieu-of and availability charges are closely related to the particular benefits received. Implementation is on a project-by-project basis. In this way, each project can be categorized as construction for either existing problems, or for growth, so capital recovery charges can be negotiated depending on the development's requirements. These charges are fair, since the development pays only for what it needs (i.e., the charge is related to the service provided in the capital improvement).

Grants/Cost Sharing

Another method to provide funding for portions of the stormwater management program is through grants (external funding without significant cost to the municipality) and cost sharing (partial external funding). In neither of these cases is there no cost to the municipality. For grants, there are costs related to obtaining the grant (applications, environmental assessments, etc.) and these serve more for capital or regionally important projects. However, for either grants or cost sharing, governments may be able to accomplish the study, design and construction of capital projects for half or less of the total cost. It is important to note that cost sharing funds are not typically for maintenance and operation and local governments need to plan for their own funding of this. Sources of grants and cost sharing funds include the following:

Water Management District (WMD)

There are two sources of WMD funding, both of which require cost sharing: cooperative funds and Surface Water Improvement and Management Act (SWIM) funds. Cooperative funds uses SJRWMD ad valorem funds and projects are competitively selected. These funds provide generally 50 percent funding for projects which are mutually beneficial to the municipality and WMD. Cooperative funding can also provide the revenue for capital construction, generally for water quality and ecosystem enhancement projects as well as water supply improvements. SWIM funds refer to the Surface Water Improvement and Management Act which was developed to improve the quality of priority water bodies in Florida. Recently such funding has been limited although there are some funds available. As with cooperative funds, SWIM funds are for cost shared projects.

State of Florida

As with the water management district, there are a number of ways to fund projects with the state of Florida (usually through FDEP). First, periodically, the legislature provides FDEP with grant funding for stormwater purposes. The grants are generally small and currently there are no grants available. Second, the legislature allows low interest loan funds to be made available for stormwater management projects. These loans have interest rates less than the Prime Lending Rate. The stormwater loan program is relatively new and the process to obtain the loans can be tedious.

FDEP's Nonpoint Source (NPS) Management Section also administers grant money it receives from USEPA through Section 319(h) of the Federal Clean Water Act. These grant funds can be used to implement projects or programs that will help to reduce nonpoint sources of pollution. Projects or programs must be conducted within the state's NPS priority watersheds, which are the state's SWIM watersheds and National Estuary Program waters. All projects must include at least a 40% nonfederal match. Examples of fundable projects include: demonstration and evaluation of BMPs, nonpoint pollution reduction in priority watersheds, ground water protection from nonpoint sources, public education programs on nonpoint source management, etc.

In the 2005-06 legislative session, Senate Bill (SB) 444 authorized the Water Protection and Sustainability Program which defines funding for alternative water supplies, TMDL implementation and research, SWIM activities and small community grants. $100 million is to be available annually to FDEP for the implementation of an alternative water supply program of which 20 percent is for TMDL activities and 10 percent for SWIM activities. Grants will be distributed based on application and approval by each appropriate WMD. Even so, counties, cities, water management districts and special districts can apply for the grants.

Federal Government

In recent years, even though the USEPA has begun requiring stormwater management permits (NPDES MS4 permits), no new funding has been provided from the federal government to the states. Of course the low interest loan program for the

states is seeded by the federal government but direct grant or cost sharing money is not available. There are funds potentially available for water resources projects through the Army Corps of Engineers and sometimes as a direct consequence of federal legislative activity. As above, there are generally some costs to obtain these funds and the funds are usually restricted to capital projects which have significant public or statewide benefits.

7.4.4 Summary of Funding Sources

Most of the funding sources discussed above apply to cities and counties but are limited in their application to a multi-city and county program. Of course, all of the cities and county participants have revenues from ad valorem taxes collected within the three counties (Lake, Orange and Seminole). Many of the municipalities have stormwater utility fees; but none of the counties do. Thus, the use of an existing funding source to provide revenues for the entire WSA would be difficult to implement. Options to provide new sources are discussed below.

St. Johns River Water Management District

Currently (FY 04/05) the SJRWMD has set a millage rate of 0.462, of which 0.432 is for the baseline budget and 0.030 is for new projects and initiatives (e.g., local government water resource projects, district building repairs, water conservation media campaign, computer enhancements and restoration of the Apopka-Beauclair Canal). Total revenues are $216.5 million, of which $97.8 million are from ad valorem taxes. This translates to approximately $2.1 million for each 0.01 of millage, considering the entire WMD area. The subset of property values for the WSA would have to be determined before a millage could be considered.

WSA Special District

Florida law allows for the designation of special taxing districts for regional purposes. Chapter 298, F.S. allows for special taxing districts to be formed by special act of the Florida Legislature and provides for the collection of taxes for the funding of district programs. This chapter, however, envisions a water control district, much like the five water management districts and additional legal review would be necessary before this option is deemed able to be implemented.

Stormwater Utility Fee

The overall concept for this option is the collection of a stormwater user fee for the implementation of projects within the WSA. A number of challenges face this option:

- Not all of the jurisdictions have existing stormwater utility fee revenues. Lake County has a stormwater MSTU of 0.5 mills; but Orange and Seminole have no dedicated stormwater funding. Potentially, non-ad valorem assessments could be set up in all counties to collect stormwater assessment revenues to cover the WSA.

- The only method to collect the assessments would be the county tax collectors. Usually, such fees in cities are collected using other utility bills (e.g., water). The City of Altamonte Springs, the City of Apopka, the Town of Eatonville, the City of Eustis, the City of Lake Mary, the City of Longwood, the City of Mount Dora, the City of Ocoee, the City of Orlando and the City of Winter Garden have adopted stormwater utility fees, but the coverage of billing would not be sufficient for the entire basin, except through the tax collector's offices.

- Chapter 403.0893, F.S., authorizes cities and counties to create benefit areas in cooperation according to Chapter 163.01 (Interlocal Cooperation Act), which is defined in the text insert below. Subsection 3 of this statute provides for revenues to be based on a per-acre charge, rather than a classical stormwater utility fee based on impervious area.

403.0893 Stormwater funding; dedicated funds for stormwater management.--In addition to any other funding mechanism legally available to local government to construct, operate, or maintain stormwater systems, a county or municipality may:

(1) Create one or more stormwater utilities and adopt stormwater utility fees sufficient to plan, construct, operate, and maintain stormwater management systems set out in the local program required pursuant to s. 403.0891(3);

(2) Establish and set aside, as a continuing source of revenue, other funds sufficient to plan, construct, operate, and maintain stormwater management systems set out in the local program required pursuant to s. 403.0891(3); or

(3) Create, alone or in cooperation with counties, municipalities, and special districts pursuant to the Interlocal Cooperation Act, s. 163.01, one or more stormwater management system benefit areas. All property owners within said area may be assessed a per acreage fee to fund the planning, construction, operation, maintenance, and administration of a public stormwater management system for the benefited area. Any benefit area containing different land uses which receive substantially different levels of stormwater benefits shall include stormwater management system benefit subareas which shall be assessed different per acreage fees from subarea to subarea based upon a reasonable relationship to benefits received. The fees shall be calculated to generate sufficient funds to plan, construct, operate, and maintain stormwater management systems called for in the local program required pursuant to s. 403.0891(3). For fees assessed pursuant to this section, counties or municipalities may use the non-ad valorem levy, collection, and enforcement method as provided for in chapter 197.

7.4.5 Recommendations

In order to implement the recommendations made throughout this MSMP, a dedicated continuous funding source should be established for projects and programs in the WSA. Currently, 10 out of the 13 (not including the SJRWMD) local governments have established such a funding mechanism in the form of a stormwater utility. The overall concept of a joint stormwater utility as a method of funding projects within the WSA would be too difficult to implement and faces several challenges due to a number of factors mentioned in the previous sub-section. It is recommended that the affected Stakeholders that currently do not have a dedicated stormwater funding mechanism, such as a utility, consider developing one in order to fund the planning, implementation and O&M of projects within the WSA. The local governments would include Lake, Orange and Seminole Counties and the Town of Oakland. In addition to a dedicated stormwater fund it is recommended that the Stakeholders develop a joint planning agreement that would allow them to plan and implement regional projects in the WSA that are part of the CIP.

7.5 Summary of Recommendations

Recommendations made throughout the report are summarized in **Table 7-15,** located at the end of this section. This table identifies each recommendation, where it is referenced in the MSMP, as well as the identified Stakeholders that each recommendation applies to.

7.6 Schedule

Section 369.319, F.S. of the WPPA requires that the MSMP establishes a schedule to complete the needed improvements. A recommended schedule was developed with input from the Stakeholders in order to address the recommendations summarized in Table 7-15. The recommended schedule itself is shown in **Table 7-16,** located at the end of this section.

Governor Jeb Bush signed Senate Bill 360 into law in June 2005 which reforms the State's growth management laws. This bill appropriates $1.5 billon for 2005-2006 in new money for various transportation, water and school infrastructure programs. The bill requires a local government's comprehensive plan to be financially feasible and the capital improvements element in a local comprehensive plan to include a schedule of improvements that ensure the adopted level-of-service standards are achieved and maintained. It also requires an annual review of the capital improvements element to maintain a financially feasible 5-year schedule of capital improvements. Capital improvements element amendments must be adopted and transmitted no later than December 1, 2007. The bill provides for sanctions if the amendment and subsequent updates are not transmitted timely. Financial feasibility is defined in the bill as follows:

"...sufficient revenues are currently available or will be available from committed funding sources for the first 3 years, or will be available from committed or planned funding sources for years 4 and 5, of a 5-year capital improvement schedule for financing capital improvements, such as ad valorem taxes, bonds, state and federal funds, tax revenues, impact fees, and developer contributions, which are adequate to fund the projected costs of the capital improvements identified in the comprehensive plan necessary to ensure that adopted level-of-service standards are achieved and maintained within the period covered by the 5-year schedule of capital improvements."

The recommended schedule for this MSMP was developed keeping the 5-year schedule identified in Senate Bill 360 in mind, thus the schedule was developed using 5-year increments as shown in Table 7-16.

Table 7-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - Lake County

	Lake County	
Area within WSA	146 square miles	
Staff	71	
Maintenance	**Activity**	**Frequency**
Operations (Note 1)	Inspections	complaint driven
	Maintenance	complaint driven
Outsourced	Ditch Cleaning	
Operations	Pipe Cleaning	
Equipment	**Type**	**Number**
	Trucks	UNK
	Tractors	UNK
	Compactor/Rollers	UNK
	Loaders	UNK
	Backhoes	UNK
	Dump Trucks	UNK
	Flatbeds	UNK
	Water Trucks	UNK
	Irrigation Pumps	UNK
	Total	123

Notes:
1. The County is moving toward scheduled maintenance and inspection activities as the mapping of the drainage infrastructure continues.
UNK = unknown

Table 7-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Eustis

	Eustis		Maintenance/Inspection Items		
Area within WSA	5.2 square miles				
Staff	5				
Maintenance Operations	**Activity**	**Frequency**	Stormwater Treatment Ponds	Storm Sewer System	Roadways
	Maintenance				
	Mowing	Weekly (Note 1)	√		
	Debris Removal	Weekly (Note 1)	√		
	Pipe and Inlet Cleaning	As needed		√	
	Street Sweeping	Note 2			√
Outsourced Operations	None				
Equipment	**Type**	**Number**			
	Street Sweeper	UNK			
	Backhoes	UNK			

Notes:
1. Weekly in summer, less as season dictates.
2. Residential/commercial - monthly, industrial - bimonthly, downtown core - weekly.
UNK = unknown

Table 7-3
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Mount Dora

	Mount Dora		Maintenance/Inspection Items			
Area within WSA	4.9 square miles					
Staff	3 (12 Temps after storm events)					
Maintenance Operations	**Activity**	**Frequency**	Open Drainage (ditches)	Stormwater Treatment Ponds	Storm Sewer System	Roadways
	Inspections					
	Structures	Note 1			√	
	Maintenance	Note 2				
	Street Sweeping	Daily				√
	Structure Cleaning/Repair	As Needed			√	
	Mowing	Weekly rotation		√		
	Ditch Cleaning	Monthly rotation	√			
Outsourced Operations	Waste/Trash Disposal					
	Tree Stump Grinding					
Equipment	**Type**	**Number**				
	Street Sweeper	1				
	Vac-Truck	1				
	Riding Mowers	UNK				
	Bush Hog	1				
	1-ton Flatbed Truck	1				
	Weed Eaters	UNK				
	Chain Saws	UNK				
	Hedge Trimmers	UNK				

Notes:
1. Stormwater structures and oufalls inspected twice/yr.
2. Complaint driven and by inspections
UNK = unknown

Table 7-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - Orange County

	Orange County		Maintenance/Inspection Items					
Area within WSA	183.4 square miles							
Staff	60 (Note 1)							
Maintenance Operations	**Activity**	**Frequency**	Stormwater Treatment Retention Ponds	Weirs	Channel Control Structures	Drainage Wells	Pump Stations	Channels
	Inspections							
	Primary Canals	4 week cycle						√
	Non-MSTU Retention Ponds (Note 2)	4 week cycle	√					
	Drainage Wells	2 week cycle				√		
	Pump Stations	2 week cycle (Note 3)					√	
	Primary Control Structures	Continuous		√	√			
	Maintenance							
	Primary Canals (Note 4)	4 week cycle						√
	Non-MSTU Retention Ponds (Note 4)	4 week cycle	√					
	Drainage Wells (Note 5)	2 week cycle				√		
	Pump Stations (Note 6)	2 week cycle					√	
	Primary Control Structures (Note 5)	Continuous		√	√			
Outsourced Operations	Pond Maintenance Activities							
Equipment	**Type**	**Number**						
	Backhoe	1						
	Trackhoes	2						
	Bull Dozer	3						
	Dragline	1						
	Mobile Crane	1						
	Front End Loader	1						
	Dump Trucks	3						
	Transport Tractor	1						
	Transport Trailer	2						
	Heavy Eq. Crew Trucks	11						
	Spray Trucks	2						
	Air Boats	2						
	Marsh Masters	2						
	Spray Crew Trucks	2						
	Misc. Equipment	numerous						

Notes:
1. As of FY 2001/2002; information for inspections and maintenance obtained from *Overview of the Drainage Section Maintenance & Operation Program* (Orange County, 2002)
2. Municipal Services Taxing Unit (MSTU) ponds are funded and thus maintained separately.
3. Drainage wells are inspected daily during heavy rainfall periods.
4. Includes trash pickup, mowing/edging, chemical spray and general repairs.
5. Includes mowing, vegetative cover control, trash and debris removal,sediment removal and general repairs.
6. Includes cleaning intakes, checking mechanical equipment and control systems, checking for pipe leaks removal of sediment and general repairs.

Table 7-5
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Apopka

	Apopka		Maintenance/Inspection Items											
Area within WSA	29.4 square miles													
Staff	16 (Note 1)													
			Stormwater Treatment Ponds- Dry & Wet Detention, Dry Retention	Exfiltration Trench	Natural Lakes	Ditches/Swales	Roadways	Storm Sewer System	Drainage Wells	Wetlands	Weirs	Channel Control Structures	Pump Stations	Inlets and Catch Basins
Maintenance Operations	**Activity**	**Frequency**												
	Inspections													
	Roadway Structures	Ongoing					√							
	Lakes	1/week			√									
	Treatment Ponds	18/year	√	√		√				√				
	Structures	2/year						√	√		√	√	√	√
	Maintenance													
	Mowing, weed eating, litter and debris removal	8/year	√											
	Roadway Structures	Ongoing					√							
	Lakes	1/week			√									
	Treatment Ponds	18/year	√	√		√				√				
	Structures	2/year						√	√		√	√	√	√
Outsourced Operations	None													
Equipment	**Type**	**Number**												
	Lawn Mowers	15												
	Weed Eaters	20												
	Backhoes	2												
	Street Sweepers	2												
	Bush Hogs	2												
	Vacuum Truck	1												
	Dump Truck	1												
	Transport Trailer	4												
	Pumps	2												
	Hand Tools	Numerous												

Notes:
1. 8 employees and 8 Orange County inmates.

Table 7-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - Town of Eatonville

	Eatonville	
Area within WSA	0.7 square miles	
Staff	UNK	
Maintenance Operations	**Activity**	**Frequency**
	Maintenance (Note 1)	monthly
Outsourced Operations	Television Camera Inspections	
Equipment	**Type**	**Number**
	Lawn mower	UNK
	Front-end loader	UNK
	Vactron vacuum	UNK

Notes:
1. The Town performs monthly inspections of stormwater facilties. Maintenance activities include mowing, street sweeping, cleaning of retention ponds, and cleaning manholes within the Town limits.
UNK = Unknown

Table 7-7
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - Town of Oakland

	Oakland	
Area within WSA	1.7 square miles	
Staff	1	
Maintenance	**Activity**	**Frequency**
Operations	Maintenance (Note 1)	As Needed
Outsourced	Road Grading	
Operations	Swale Repair	
Equipment	**Type**	**Number**
	Backhoe	1
	Misc. equipment	UNK

Notes:
1. The Town is responsible for maintaining one detention pond and swales within the Town limits.

UNK = Unknown

Table 7-8
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Ocoee

	Ocoee		Maintenance/Inspection Items									
Area within WSA	13.3 square miles											
Staff	5											
Maintenance	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Exfiltration Trench	Weirs	Channel Control Structures	Pump Stations	Channels	Inlets and Catch Basins
Operations	Inspections (Note 1)											
	Detention Ponds (Notes 2 and 3)	Semi Annual	√	√	√	√						
	Structures (Note 4)	Semi Annual					√			√		√
	Structures (Note 5)	Quarterly						√	√		√	
	Channels	Annual									√	
	Maintenance (Note 1)											
	Repairs	Note 1	√	√	√	√				√		
	Scraping/Discing	Note 1	√									
	Mowing	Note 1	√	√	√	√					√	
	Litter/Debris Removal	Note 1	√	√	√	√	√	√	√	√	√	√
	Nutrient/Pest Control	Note 1	√	√	√	√						
	Invasive Plant Removal	Note 1			√	√					√	
	Sediment Removal	Note 1	√	√	√	√	√	√	√	√	√	√
Outsourced Operations	Mowing											
Equipment	**Type**	**Number**										
	Street Sweeper	1										
	Vacuum Truck	1										
	Backhoe	1										
	Climbing Excavator	1										

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000011 (see Appendix C).
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
3. Wet detention ponds are inspected annually.
4. Includes exfiltration trenches, pump stations, inlets and catch basins.
5. Includes weirs, channels and control structures.

Table 7-9
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Orlando

	Orlando		Maintenance/Inspection Items									
Area within WSA	9.2 square miles											
Staff	47											
Maintenance	**Activity**	**Frequency**	Open Drainage (dry swales, canals, ditches)	Stormwater Treatment Ponds (Dry Retention)	Storm Water Treatment Pond (Wet Detention Facility)	Natural Lakes	Wetlands	Storm Sewer System	Roadways	Drainage Wells	Pump Stations	Sedimentation Devices
Operations	Inspections (Note 1)											
	Open Drainage (Note 2)	Monthly	√	√	√	√						
	Structures (Debris Collection Devices)	4/yr						√				√
	Structures (Note 3)	Ongoing Program						√				
	Structures (Flood Prone Areas)	Large Storm Events						√				
	Drainage Wells	Complaint Driven								√		
	Pump Stations	Monthly									√	
	Maintenance (Note 1)											
	Repairs	As needed	√	√	√	√		√		√		
	Scraping/Discing	As needed	√	√								
	Mowing	7/yr	√	√	√	√						
	Litter/Debris Removal	Monthly	√	√	√	√		√	√			
	Nutrient/Pest Control	As needed	√	√	√	√						
	Aquatic Plant Management & Harvesting	As needed					√					
	Invasive Plant Removal	Semi-Annually		√								
	Street Sweeping											
	Urban Core	Daily							√			
	Industrial Areas	Weekly							√			
	Residential/Interstate	Monthly							√			
Outsourced Operations	Mowing											
	Litter Removal											
	Open SW System Inspections											
Equipment	**Type**	**Number**										
	Vactor Trucks	2										
	Dump Trucks	12										
	Street Sweepers	8										
	Long-Reach Backhoes	2										
	Bull Dozer	1										
	Mini-Excavator	1										
	Skid Loader	1										
	Gradalls	2										

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000014 (see Appendix C)
2. Includes dry swales, canals and ditches, wet detention ponds and natural lakes.
3. Includes culverts, manholes, catch basins, inlets, outfalls and weirs.

Table 7-10
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Winter Garden

	Winter Garden		Maintenance/Inspection Items									
Area within WSA	14 square miles											
Staff	4 (Note 1)											
Maintenance	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Exfiltration Trench	Weirs	Channel Control Structures	Pump Stations	Channels	Inlets and Catch Basins
Operations	Inspections (Note 2)											
	Detention Ponds (Notes 3 and 4)	Semi Annual	√	√	√	√						
	Structures (Note 5)	Semi Annual					√			√		√
	Structures (Note 6)	Quarterly						√	√		√	
	Channels	Annual									√	
	Maintenance (Note 2)											
	Repairs	Note 2	√	√	√	√				√		
	Scraping/Discing	Note 2	√									
	Mowing	Note 2	√	√	√	√					√	
	Litter/Debris Removal	Note 2	√	√	√	√	√	√	√	√	√	√
	Nutrient/Pest Control	Note 2	√	√	√	√						
	Invasive Plant Removal	Note 2			√	√					√	
	Sediment Removal	Note 2	√	√	√	√	√	√	√	√	√	√
Outsourced Operations	Sewer Lining											
Equipment	**Type**	**Number**										
	Backhoe	1										
	Street Sweeper	2										
	Dump Truck	1										
	Menzei Muck	1										
	Crew Truck	1										

Notes:
1. Stormwater Engineer and 3 operators.
2. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000011 (see Appendix C).
3. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
4. Wet detention ponds are inspected annually.
5. Includes exfiltration trenches, pump stations, inlets and catch basins.
6. Includes weirs, channels and control structures.

Table 7-11
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - Seminole County

	Seminole County		Maintenance/Inspection Items								
Area within WSA	53.6 square miles										
Staff	20										
Maintenance Operations	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Canal Bank	Pump Stations	Grass Swales (Dry)	Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers)	Primary Stormwater Management System
	Inspections (Note 1)										
	Detention Ponds (Note 2)	Semi-Annual	√	√	√	√					
	Structures (Note 3)	Annual					√	√		√	
	Swales	Semi-Annual							√		
	Roadway Structures	Semi-Annual									√
	Maintenance (Note 1)										
	Repairs	As needed	√	√	√	√		√	√		√
	Scraping/Discing	As needed	√	√					√		
	Mowing (Note 4)	As needed	√	√	√	√					√
	Litter/Debris Removal	As needed	√	√	√	√	√	√	√	√	√
	Nutrient/Pest Control	As needed	√	√	√	√			√		
	Invasive Plant Removal	As needed			√	√					
	Sediment Removal	As needed	√	√	√	√	√	√	√	√	√
	Maintenance of Primary Stormwater Management System (Note 5)	Semi-Annual									√
Outsourced Operations	Mowing (Note 4)										
Equipment	**Type**	**Number**									
	Long-Reach Backhoes	1									
	Skid Loader	1									
	Wheeled Excavator	1									
	Track Excavator	1									
	Vacuum Trucks	2									

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (see Appendix C)
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
3. Includes pump stations, exfiltration trenches, channel control structures, pollution control boxes and swirl boxes.
4. Mowing of County-owned ponds and flat areas along ditches and canals is monthly, slope mowing of ditches and canals is every 3 months.
5. PSMS consists of inlets, catch basins, grates and ditches.

Table 7-12
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Altamonte Springs

	Altamonte Springs		Maintenance/Inspection Items								
Area within WSA	8.3 square miles										
Staff	7										
Maintenance	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Pump Stations	Grass Swales (Dry)	Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers)	Swirl Box	Inlets and Catch Basins
Operations	Inspections (Note 1)										
	Detention Ponds (Note 2)	Semi-Annual	√	√	√	√					
	Structures (Note 3)	Annual					√		√	√	
	Swales	Semi-Annual						√			
	Primary S/W Mgmt System (PSMS)	Semi-Annual									√
	Maintenance (Note 1)										
	Repairs	As needed	√	√	√	√	√	√			√
	Scraping/Discing	As needed	√	√				√			
	Mowing	As needed	√	√	√	√					
	Litter/Debris Removal	As needed	√	√	√	√	√	√	√		√
	Nutrient/Pest Control	As needed	√	√	√	√		√			
	Invasive Plant Removal	As needed			√	√					
	Sediment Removal	As needed	√	√	√	√	√	√	√	√	√
	Maintenance of PSMS	Semi-Annual									
Outsourced Operations	Concrete Pipe Lining Pipeline and Structure Cleaning Pond Demucking										
Equipment	**Type**	**Number**									
	Vacuum Pumps	2									
	Diaphragm Pump	1									
	Miscellaneous Pumps	3									
	Truck-Mounted Mini-Vac	1									
	Mowers	3									
	Hydro-Seeder	1									
	Dump Truck	1									
	Crew Truck	1									
	Bobcat	1									
	Generator	1									
	Concrete Mixer	1									
	Air compressor	1									
	Chopsaws	2									
	Chainsaws	3									
	Trimmers	4									
	Compactors	2									

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (See Appendix C)
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filration.
3. Includes pump stations, pollution control boxes and swirl boxes.

Table 7-13
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Lake Mary

	Lake Mary		Maintenance/Inspection Items										
Area within WSA	0.5 square miles												
Staff	1 - Full-time, 8 Part-time (Note 1)												
Maintenance	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Exfiltration Trench	Channel Control Structures	Pump Stations	Grass Swales (Dry)	Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers)	Swirl Box	Inlets and Catch Basins
Operations	Inspections	Note 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Maintenance	Note 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Outsourced Operations	Street Sweeping												
Equipment	**Type**	**Number**											
	Mowers (Note 1)												
	Backhoes (Note 1)												
	Front-End Loader (Note 1)												
	Pumps (Note 1)												
	Vacuum Machine (Note 1)												

Notes:
1. P/T staff and equipment is from Public Works, available to Stormwater Manager.
2. Complaint driven, otherwise inspect & maintain systems monthly.

Table 7-14
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Stormwater Inspection & Maintenance - City of Longwood

	Longwood		Maintenance/Inspection Items										
Area within WSA	0.97 square miles												
Staff	2 -Full-time, 10 Part-time (Note 1)												
Maintenance	**Activity**	**Frequency**	Stormwater Treatment Ponds (Dry Retention)	Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Storm Water Treatment Pond (Wet Detention Facility)	Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Exfiltration Trench	Channel Control Structures	Pump Stations	Grass Swales (Dry)	Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers)	Swirl Box	Primary Stormwater Management System
Operations	Inspections (Note 2)												
	Detention Ponds (Note 3)	Semi-Annual	√	√	√	√							
	Structures (Note 4)	Annual					√	√	√		√	√	
	Swales	Semi-Annual								√			
	Primary S/W Mgmt System (PSMS)	Semi-Annual											√
	Maintenance (Note 2)												
	Repairs	As needed	√	√	√	√			√	√			√
	Scraping/Discing	As needed	√	√						√			
	Mowing	As needed	√	√	√	√							
	Litter/Debris Removal	As needed	√	√	√	√		√	√	√	√		√
	Nutrient/Pest Control	As needed	√	√	√	√				√			
	Invasive Plant Removal	As needed			√	√							
	Sediment Removal	As needed	√	√	√	√	√	√	√	√	√	√	√
	Maintenance of PSMS (Note 5)	Semi-Annual											
Outsourced Operations	Mowing Aquatic Maintenance Pipe Lining Street Sweeping Major Maintenance Work												
Equipment	**Type**	**Number**											
	UNK												

Notes:
1. There are 2 full-time staff and up to 10 additional staff available as needed.
2. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (see Appendix C).
3. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
4. Includes pump stations, exfiltration trenches, channel control structures, pollution control boxes and swirl boxes.
5. PSMS consists of inlets, catch basins, grates and ditches.

UNK = Unknown

Table 7-15
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Summary of Recommendations

			Jurisdiction													
Recommendation No.	Recommendation Description	MSMP Reference	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
1	For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2.	Appendix E - Section E.4.2, Section E.5, Table E-17, Section 5.2.2	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP.	Section 4.3, Table 4-2, Appendix D	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements.	Figure 4-1, Section 4.4	√		√											
4	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied)	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied)	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions.	Section 6.4	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management.	Section 7.2.1		√			√	√	√	√				√		√
8	Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs.	Appendix C	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Develop a pro-active routine inspection and maintenance program of stormwater facilities.	Section 7.3	√													
10	Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program.	Section 7.3	√	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA.	Section 7.4.5	√			√			√				√			
12	Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects.	Section 7.4.5	√	√	√	√	√	√	√	√	√	√	√	√	√	√

* These are recommendations that the local governments should consider, however determining those recommendations that are feasible and affordable are the responsibility of the local governments.

Table 7-16
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Recommended Schedule

Recommendation No.	Recommendation Description	Comments	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2.	Dependent on planning horizons for build-out conditions for each Stakeholder.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
2	Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP.	Implement identified recommendations for 20 percent of the prioritized deficiencies every 5 years.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
3	Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements.	Evaluate 1 basin (i.e. watershed) every 5 years.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
4a	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
4b	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years						♦	♦	♦	♦	♦	♦	♦	♦	♦	♦										
4c	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years											♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
4d	Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "7" and "8", implementation of financially feasible projects the following 5 years																♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
5a	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
5b	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years						♦	♦	♦	♦	♦	♦	♦	♦	♦	♦										
5c	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years											♦	♦	♦	♦	♦	♦	♦	♦	♦	♦					
5d	Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible.	Evaluate and identify CIPs for subbasins receiving a rank of "7" implementation of financially feasible projects the following 5 years																♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
6	For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions.	Evaluate 1 basin (i.e. watershed) every 5 years, reference watershed list	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
7	Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management.	5 year duration or as directed by the Wekiva Parkway & Protection Act Legislation	♦	♦	♦	♦	♦																				
8	Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs.		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
9	Develop a pro-active routine inpection and maintenance program of stormwater facilities.	5 year duration	♦	♦	♦	♦	♦																				
10	Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program.	5 year duration	♦	♦	♦	♦	♦																				
11	Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA.	10 year duration or as directed by the Wekiva Parkway & Protection Act Legislation	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦															
12	Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects.	5 year duration	♦	♦	♦	♦	♦																				

*It is recommended the schedule should be updated every 5 years at a minimum

Section 8
References

Barraclough, J.T. 1962. Ground-water Resources of Seminole County, Florida: Florida Geological Survey Report of Investigations No. 27, 91 pp.

Birdie, T.R., and Blandford, T.N. 1994. Ground-water Flow and Solute Transport Modeling Study for Seminole County, Florida, and Adjoining Regions: St. Johns River Water Management District Special Publication SJ94-SP6, 65 pp.

Bush, P.W., and Johnston, R.H. 1988. Ground-water Hydraulics, Regional Flow, and Ground-water Development of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-C, 80 pp.

Camp, Dresser & McKee, Inc. 2005. Wekiva River Basin Engineering Assistance for Rulemaking.

Camp, Dresser & McKee, Inc. 1998. Rouge River National Wet Weather Demonstration Project, User's Manual: Watershed Management Model Version 4.1.

Center for Watershed Protection. 2001. Redevelopment Roundtable Consensus Agreement, Smart Site Practices for Redevelopment and Infill Projects.

Charlotte Harbor National Estuary Program. 2003. Assessing the Densities and Potential Water Quality Impacts of Septic Tank Systems in the Peace and Myakka River Basins.

Conklin, Porter & Holmes, Inc. 2002. City of Eustis Master Stormwater Plan.

Dyer, Riddle, Mills & Precourt, Inc. 2003. Big Wekiva Basin Engineering Study and Drainage Inventory Phase II.

Environmental Research & Design, Inc. 2005. Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration Plan.

Florida Department of Environmental Protection. Division of Water Resources. 2005. Florida's Total Maximum Daily Load Program: the First Five Years – A Report to the Legislature and Governor. 26 pp.

Florida Department of Environmental Protection. 2004. A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area.

Florida Department of Environmental Protection. 2004. Draft Nutrient Total Maximum Daily Load for Trout Lake, Lake County, Florida.

Florida Department of Environmental Protection. Division of Water Resources. 2003. Basin Status Report: Middle St. Johns. 345 pp.

Florida Department of Environmental Protection. Division of Water Resources. 2003. Water Quality Assessment Report: Ocklawaha. 437 pp.

Florida Department of Environmental Protection. Division of Water Resources. 2001. Basin Status Report: Ocklawaha. 315 pp.

Florida Department of Health. 2004. Wekiva Basin Onsite Sewage Treatment and Disposal System Study.

Cichon, J.R., et. al. 2005. Report of Investigation No. 104, Wekiva Aquifer Vulnerability Assessment Published for the Florida Geologic Survey.

Fulton et. al. 2003. Interim Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin. St. Johns River Water Management District. Draft.

German, E.R., and Adamski, J.C. 2005. Hydrology and Water Quality in Lakes and Streams in Orange County, Florida: USGS Scientific Investigations Report 2005-5052.

German, E.R., and Adamski, J.C. 2004. Hydrogeology and Quality of Groundwater in Orange County, Florida: USGS Water-Resources Investigations Report 03-4257, 113 pp.

Harper, H. 1999. Pollutant Removal Efficiencies for Typical Stormwater Management Systems in Florida.

Harper, H. 1994. Stormwater Loading Rate Parameters for Central and South Florida.

Hartman & Associates, Inc. 2003. The Central Florida Drainage Well Inventory.

Lichtler, W.F. 1972. Appraisal of Water Resources in the East-Central Florida Region: Florida Geological Survey Report of Investigations No. 61, 52 pp.

McAlister, T. 1999. Stormwater reuse: a balanced assessment. In Stormwater 2000: The Green with the Gold: Conference Proceedings 26-28 April 1999, ed. J.A. Wood. Stormwater Industry Association.

McGurk, B., and Presley, P. F. 2002. Simulation of the Effects of Groundwater Withdrawals on the Floridan Aquifer System in East-Central Florida: Model Expansion and Revision: St. Johns River Water Management District Technical Publication SJ2002-3, 196 pp.

McKenzie-Arenberg, M., and Szell G. 1990. Middle St. Johns Ground Water Basin Resource Availability Inventory: St. Johns River Water Management District Technical Publication SJ 90-11, 56 pp.

Miller, J.A. 1986. Hydrogeologic Framework of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-B, 91 pp.

Miller-Sellen & Associates, Inc. 1996. Border Lake Master Plan, Phase I

Murray, L.C., Jr., and Halford, K.J. 1999. Simulated Effects of Projected Ground-Water Withdrawals in the Floridan Aquifer System, Greater Orlando Metropolitan Area, East-Central Florida: U.S. Geological Survey Water-Resources Investigations Report 99-4058, 26 pp.

Murray, L.C., Jr., and Halford, K.J. 1996. Hydrogeologic conditions and simulation of ground-water flow in the Greater Orlando Metropolitan Area, East-Central Florida: U.S. Geological Survey Water-Resources Investigations Report 96-4181, 100 pp.

Post, Buckley, Schuh & Jernigan., Inc. 2002. Draft Orange County Utilities Master Plan.

Professional Engineering Consultants, Inc. 2001. Big Wekiva River Basin Stormwater Management Master Plan.

Schiffer, D.M. 1996. Hydrology of the Wolf Branch Sinkhole Basin, Lake County, East-Central Florida: U.S. Geological Survey Open-File Report 96-143, 29 pp.

Sheffield, C.W., et. al. 1995. "Drainage Wells – A Dual Purpose." Florida Water Resources Journal.

Southeastern Geological Society Ad Hoc Committee on Floridan Hydrostratigraphic Unit Definition. 1986. Hydrogeologic Units of Florida: Florida Geological Survey Special Publication No. 28, 8 pp.

Spechler, R.M., and Halford, K.J. 2001. Hydrogeology, Water Quality, and Simulated Effects of Ground-water Withdrawals from the Floridan Aquifer System, Seminole County and Vicinity, Florida. U.S. Geological Survey Water-Resources Investigations Report 01-4182, 116 pp.

St. Johns River Water Management District. 2004. Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin: Technical Publication SJ2004-5, 125 pp.

St. Johns River Water Management District. 2003. Draft Water Supply Assessment: Technical Publication SJ2003-XXX, 176 pp.

Tibbals, C.H. 1990. Hydrology of the Floridan Aquifer System in East-Central Florida: U.S. Geological Survey Professional Paper 1403-E, 98 pp.

Toth, D., Rohrer, K.P., and Munch, D.A. 1989. Water Quality Assessment of the Floridan Aquifer in the Wekiva River Basin of Orange, Lake, and Seminole Counties: St. Johns River Water Management District Technical Publication SJ89-5, 46 pp.

United States Environmental Protection Agency. 2003. National Management Measures to Control Nonpoint Source Pollution from Agriculture.

United States Environmental Protection Agency. 1986. Forecasting Onsite Soil Absorption System Failure Rates.

University of Central Florida Stormwater Management Academy. 2003. Stormwater Education Toolkit (SET), Volume II: Business/Industry & Government.

Wanielista, M., and Yousef, Y. 1993. Design and Analysis of an Irrigation Pond Using Urban Stormwater Runoff: Engineering Hydrology (C. Kuo, ed.), 7 pp.

Wekiva River Basin Coordinating Committee. 2004. Final Report.

Appendix A

Wekiva Parkway and Protection Act

CHAPTER 2004-384
Committee Substitute for Committee Substitute for
Committee Substitute for Senate Bill No. 1214

An act relating to the Wekiva Parkway and Protection Act; creating part III of ch. 369, F.S., consisting of ss. 369.314, 369.315, 369.316, 369.317, 369.318, 369.319, 369.320, 369.321, 369.322, 369.323, and 369.324, F.S.; providing legislative intent; providing a legal description of the Wekiva Study Area; defining the Wekiva Parkway; providing guiding principles for the Wekiva Parkway Design Features and Construction; limiting the number of interchanges along the Wekiva Parkway; granting the Department of Transportation certain eminent domain authority for the Wekiva Parkway construction; requiring that certain entities locate the precise corridor and interchanges for the Wekiva Parkway in Seminole County consistent with this act; providing that the Orlando-Orange County Expressway Authority is granted authority to act as a third-party acquisition agent on behalf of the Board of Trustees of the Internal Improvement Trust Fund or the St. Johns River Water Management District; providing that certain properties shall be acquired prior to the completion of the parkway; requiring certain entities and agencies to cooperate and establish funding responsibilities and partnerships; requiring certain studies by the Department of Environmental Protection, the Department of Health, the St. Johns River Water
Management District, and the Department of Agriculture and Consumer Services; providing for a master stormwater plan; providing for a wastewater facility plan; requiring certain local government comprehensive plan amendments; providing for the coordination of land use and water supply with the Wekiva Study Area; providing that comprehensive plans and comprehensive plan amendments be reviewed for compliance by the Department of Community Affairs; creating the Wekiva River Basin Commission; amending s. 163.3184, F.S.; amending the definition of “compliance”; creating s. 348.7546, F.S.; authorizing the construction and financing of the Wekiva Parkway; creating s. 348.7547, F.S.; authorizing the construction and financing of the Maitland Boulevard Extension and Northwest Beltway Part A; providing an effective date.

WHEREAS, the Wekiva River System and its associated springshed areas are of irreplaceable value to the quality of life and well-being of the people of the State of Florida, and

WHEREAS, protection of the surface and groundwater resources, including recharge within the springshed that provides for the Wekiva River System, is crucial to the long-term viability of the Wekiva River and springs and the central Florida Region’s water supply, and

WHEREAS, construction of the Wekiva Parkway and other roadway improvements to the west of the Wekiva River System will add to the pressures for growth and development already affecting the surface and groundwater resources within the recharge area,

NOW, THEREFORE, Be It Enacted by the Legislature of the State of Florida:

Section 1. Part III of chapter 369, Florida Statutes, consisting of sections 369.314, 369.315, 369.316, 369.317, 369.318, 369,319, 369.320, 369.321, 369.322, 369.323, and 369.324, is created to read:

PART III
Wekiva Parkway and Protection Act.

369.314 Short title.—This act may be cited as the “Wekiva Parkway Protection Act.”

369.315 Intent.—

(1) The Legislature finds that, in general, Florida springs whether found in urban or rural settings, public parks, or private lands, are threatened by actual and potential flow reductions and declining water quality. As a result of climate patterns and population changes, over the past 30 years, many of Florida’s springs have begun to exhibit signals of distress, including increasing nutrient loading and lowered water flow. The groundwater that feeds springs is recharged by seepage from the surface and through direct conduits such as sinkholes.

(2) The Legislature further finds that springs and groundwater once damaged by overuse can be restored through good stewardship, including effective planning strategies and best management practices to preserve and protect the spring and its springshed. Prudent land use planning decisions can protect and improve quality and quantity, as well as upland resources of a springshed. Managing land use types and their allowable densities and intensities of development, followed by specific site planning to further minimize impacts, rank as an important goal.

(3) It is the intent of the Legislature that the recommendations of the Wekiva River Basin Coordinating Committee as stated in its final report dated March 16, 2004, be taken and implemented as a whole to achieve the objective of improving and assuring protection of surface water and groundwater resources. Coordination of comprehensive plans and the Regional Water Supply Plan is important for protection of water resources and to promote the continuity of effective planning and development.

(4) It is not the intent of the Legislature to place an undue burden on local governments within the Wekiva Study Area. Any required Wekiva Study Area comprehensive plan amendments may be adopted in conjunction with other amendments not required by this part.

369.316 Wekiva Study Area.—

The Wekiva Study Area is defined to include the following land: Begin at the northwest corner of Section 6, Township 18 South, Range 28 East, Lake County, Florida, said corner lying on the north line of Township 18 South; thence Easterly along said north line of Township 18 South to the northeast corner of Section 5, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 5 to the northeast corner of Section 8, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 8 to the northeast corner of Section 17, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 17 to the northeast corner of Section 20, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 20 to the northeast corner of Section 29, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 29 to the northeast corner of Section 32, Township 18 South, Range 29 East; thence Southerly along the east line of said Section 32 to the southeast corner thereof, said corner lying on the south line of Township 18 South; thence Easterly along the south line of said Township 18 South to

an intersection with the east line of Range 29 East; thence Southerly along the east line of said Range 29 East to the southeast corner of Section 24, Township 21 South, Range 29 East; thence Westerly along the south line of said Section 24 to the southeast corner of Section 23, Township 21 South, Range 29 East; thence Westerly along the south line of said Section 23, to an intersection with the centerline of Interstate Highway No. 4; thence generally Southerly along the centerline of Interstate Highway No. 4 to an intersection with the south line of Section 13, Township 22 South, Range 29 East; thence Westerly along the south line of said Section 13 to the southeast corner of Section 14, Township 22 South, Range 29 East; thence Westerly along the south line of said Section 14 to the southeast corner of Section 15, Township 22 South, Range 29 East; thence Westerly along the south line of said Section 15 to the northeast corner of Section 21, Township 22 South, Range 29 East; thence Southerly along the east line of said Section 21 to an intersection with the centerline of State Road No. 50; thence Westerly along the centerline of said State Road No. 50 to the northeast corner of Section 30, Township 22 South, Range 28 East; thence Southerly along the east line of said Section 30 to the northeast corner of Section 31, Township 22 South, Range 28 East; thence Southerly along the east line of said Section 31 to the southeast corner thereof, said corner lying on the south line of Township 22 South; thence Westerly along said south line of Township 22 South to the northeast corner of Section 2, Township 23 South, Range 27 East; thence Southerly along the east line of said Section 2 to the northeast corner of Section 11, Township 23 South, Range 27 East; thence Southerly along the east line of said Section 11 to the southeast corner thereof; thence Westerly along the south line of said Section 11 to the southeast corner of Section 10, Township 23 South, Range 27 East; thence Westerly along the south line of said Section 10 to the southeast corner of Section 9, Township 23 South, Range 27 East; thence Westerly along the south line of said Section 9 to the Southeast corner of Section 8, Township 23 South, Range 27 East; thence Westerly along the south line of said Section 8 to the southeast corner of Section 7, Township 23 South, Range 27 East; thence Westerly along the south line of said Section 7 to the southwest corner thereof, said corner lying on the line of demarcation between Orange County and Lake County; thence generally Northerly and along said county line to the northeast corner of Section 12, Township 20 South, Range 26 East, said corner lying on the east line of Range 26 East; thence generally Northerly and along said east line of Range 26 East to the southeast corner of Section 24, Township 19 South, Range 26 East; thence Westerly along the south line of said Section 24 to the southeast corner of Section 23, Township 19 South, Range 26 East; thence Westerly along the south line of said Section 23 to the southwest corner thereof; thence Northerly along the west line of said Section 23 to the southwest corner of Section 14, Township 19 South, Range 26 East; thence Northerly along the west line of said Section 14 to the southwest corner of Section 11, Township 19 South, Range 26 East; thence generally Northeasterly to the southwest corner of Section 1, Township 19 South, Range 26 East; thence generally Northeasterly to the southwest corner of Section 31, Township 18 South, Range 27 East; thence generally Northeasterly to the southwest corner of Section 29, Township 18 South, Range 27 East; thence generally Northeasterly to the northwest corner of Section 28, Township 18 South, Range 27 East; thence Easterly along the north line of said Section 28 to the northwest corner of Section 27, Township 18 South, Range 27 East; thence Easterly along the north line of said Section 27 to the northwest corner of Section 26, Township 18 South, Range 27 East; thence Easterly along the north line of said Section 26 to the northwest corner of Section 25, Township 18 South, Range 27 East; thence Easterly along the north line of said Section 25 to an intersection with the west line of Range 28 East; thence Northerly along

the west line of said Range 28 East, to the northwest corner of Section 6, Township 18 South, Range 28 East, and the Point of Beginning.

316.317 Wekiva Parkway.—

(1) The “Wekiva Parkway” means any limited access highway or expressway constructed between State Road 429 and Interstate 4 specifically incorporating the corridor alignment recommended by Recommendation 2 of the Wekiva River Basin Area Task Force final report dated January 15, 2003, and the recommendations of the SR 429 Working Group that were adopted January 16, 2004.

(2) The Wekiva Parkway and related transportation facilities shall follow the design criteria contained in the recommendations of the Wekiva River Basin Area Task Force adopted by reference by the Wekiva River Basin Coordinating Committee in its final report of March 16, 2004 and the recommendations of the Wekiva Coordinating Committee contained in its final report of March 16, 2004, subject to reasonable environmental, economic and engineering considerations.

(3) With the exception of the road commonly referred to as the Apopka Bypass, the construction of any other limited-access highway or expressway that is identified by the Final Recommendations of the State Road 429 Working Group adopted January 16, 2004 within the Wekiva Study Area shall adhere to transportation and conservation principles identified within the Final Report of the Wekiva River Basin Coordinating Committee dated March 16, 2004. If any other limited-access highway or expressway is considered within the Wekiva Study Area, then such a project shall adhere to the extent practicable with transportation and conservation principles identified within the Final Report of the Wekiva River Basin Coordinating Committee dated March 16, 2004.

(4) Access to properties adjacent to SR 46 shall be maintained through appropriate neighborhood streets or frontage roads integrated into the parkway design.

(5) In Seminole County, the Seminole County Expressway Authority, the Department of Transportation, and the Florida Turnpike Enterprise shall locate the precise corridor and interchanges for the Wekiva Parkway consistent with the legislative intent expressed in this act and other provisions of this act.

(6) The Orlando-Orange County Expressway Authority is hereby granted the authority to act as a third-party acquisition agent, pursuant to s. 259.041 on behalf of the Board of Trustees or chapter 373 on behalf of the governing board of the St. Johns River Water Management District, for the acquisition of all necessary lands, property and all interests in property identified herein, including fee simple or less-than-fee simple interests. The lands subject to this authority are identified in paragraph 10.a., State of Florida, Office of the Governor, Executive Order 03-112 of July 1, 2003, and in Recommendation 16 of the Wekiva Basin Area Task Force created by Executive Order 2002-259, such lands otherwise known as neighborhood Lakes, a 1,587+/- acre parcel located in Orange and Lake Counties within Sections 27, 28, 33 and 34 of Township 19 South, Range 28 East, and Sections 3, 4, 5 and 9 of Township 20 South, Range 28 East; Seminole Woods/Swamp, a 5,353+/- acre parcel located in Lake County within Section 37, Township 19 South, Range 28 East; New Garden Coal; a 1,605+/- acre parcel in Lake County within Sections 23, 25, 26, 35 and 36, Township 19 South, Range 28 East; Pine Plantation, a 617+/- acre tract consisting of eight individual parcels within the Apopka

City limits. The Department of Transportation, the Department of Environmental Protection, the St. Johns River Water Management District, and other land acquisition entities shall participate and cooperate in providing information and support to the third-party acquisition agent. The land acquisition process authorized by this paragraph shall begin no later than December 31, 2004. Acquisition of the properties identified as Neighborhood Lakes, Pine Plantation, and New Garden Coal, or approval as a mitigation bank shall be concluded no later than December 31, 2010. Department of Transportation and Orlando-Orange County Expressway Authority funds expended to purchase an interest in those lands identified in this subsection shall be eligible as environmental mitigation for road construction related impacts in the Wekiva Study Area.

(a) Acquisition of the land described in this section is required to provide right of way for the Wekiva Parkway, a limited access roadway linking State Road 429 to Interstate 4, an essential component in meeting regional transportation needs to provide regional connectivity, improve safety, accommodate projected population and economic growth, and satisfy critical transportation requirements caused by increased traffic volume growth and travel demands.

(b) Acquisition of the lands described in this section is also required to protect the surface water and groundwater resources of Lake, Orange, and Seminole counties, otherwise known as the Wekiva Study Area, including recharge within the springshed that provides for the Wekiva River system. Protection of this area is crucial to the long term viability of the Wekiva River and springs and the central Florida region's water supply. Acquisition of the lands described in this section is also necessary to alleviate pressure from growth and development affecting the surface and groundwater resources within the recharge area.

(c) Lands acquired pursuant to this section that are needed for transportation facilities for the Wekiva Parkway shall be determined not necessary for conservation purposes pursuant to ss. 253.034(6) and 373.089(5) and shall be transferred to or retained by the Orlando-Orange County Expressway Authority or the Department of Transportation upon reimbursement of the full purchase price and acquisition costs.

(7) The Department of Transportation, the Department of Environmental Protection, the St. Johns River Water Management District, Orlando-Orange County Expressway Authority and other land acquisition entities shall cooperate and establish funding responsibilities and partnerships by agreement to the extent funds are available to the various entities. Properties acquired with Florida Forever funds shall be in accordance with s. 259.041 or chapter 373. The Orlando-Orange County Expressway Authority shall acquire land in accordance with this section of law to the extent funds are available from the various funding partners, but shall not be required nor assumed to fund the land acquisition beyond the agreement and funding provided by the various land acquisition entities.

(8) The Department of Environmental Protection and the St. Johns River Water Management District shall give the highest priority to the acquisition of the lands described and identified in subsection (6) for Florida Forever purchases.

369.318 Studies.—

(1) The Department of Environmental Protection shall study the efficacy and applicability of water quality and wastewater treatment standards needed to achieve nitrogen reductions protective of surface and groundwater quality within the Wekiva Study Area and report to the Governor and the Department of Community Affairs no later than December 1, 2004. Based on the December 2004 report, the Department of Environmental Protection shall, if appropriate, by March 1, 2005, initiate rulemaking to achieve nitrogen reductions protective of surface and groundwater quality or recommend any additional statutory authority needed to implement the report recommendations.

(2) The Department of Health, in coordination with the Department of Environmental Protection, shall study the efficacy and applicability of onsite disposal system standards needed to achieve nitrogen reductions protective of groundwater quality within the Wekiva Study Area including publicly owned lands and report to the Governor and the Department of Community Affairs no later than December 1, 2004. Based on the December 2004 report, the Department of Health shall, if appropriate, by March 1, 2005, initiate rulemaking to achieve nitrogen reductions protective of water quality or recommend legislation for any additional statutory authority needed to implement the report recommendations. The study shall consider:

(a) For new developments within the Wekiva Study Area and any existing development within the Wekiva River Protection Area using onsite disposal systems, a more stringent level of wastewater treatment, including, but not limited to, the use of multiple tanks to combine aerobic and anaerobic treatment to reduce the level of nitrates.

(b) The implementation of a septic tank maintenance and inspection program which includes upgrading certain onsite disposal systems permitted prior to 1982 to meet minimum Department of Health standards; replacement of failing systems and systems not meeting current standards; and providing funding mechanisms for supporting a septic tank inspection and maintenance program.

(3) The St. Johns River Water Management District shall initiate rulemaking to:

(a) Amend the recharge criteria in Rule 40C-41.063(3), Florida Administrative Code, to apply to all recharge lands within the Wekiva Study Area.

(b) Adopt a consolidated environmental resources permit/consumptive use permit for projects that require both an environmental resource permit and a consumptive use permit that involve irrigation of urban landscape, golf course or recreational areas.

(4) By March 1, 2005, the St. Johns River Water Management District in conjunction with the Department of Environmental Protection, shall initiate rulemaking to amend the recharge criteria in Rule 40C-41.063(3), Florida Administrative Code, to provide that the post-development recharge volume conditions within the Wekiva Study Area approximate predevelopment recharge volume conditions. The district shall study and undertake this rulemaking to accomplish this standard on a development-specific basis. The rule shall permit the utilization of existing permitted municipal master stormwater systems with adequate capacity to meet the new standards in lieu of onsite retention and shall provide applicants with the ability to submit appropriate geotechnical information

demonstrating that a specific site is not within a most effective recharge area of the Wekiva springshed.

(5) The St. Johns River Water Management District shall complete an assessment of the significance of water uses below the current consumptive use permit thresholds in the Wekiva Study Area to determine if rulemaking should be initiated to lower consumptive use permit thresholds.

(6) The St. Johns River Water Management District shall conduct an analysis of the impact of redevelopment projects in the Wekiva River basin upon aquifer recharge and shall consider whether to adopt a rule amendment to require those redevelopment projects exceeding a specified threshold to meet the Wekiva Basin recharge criteria. The effect of redevelopment upon aquifer recharge shall be analyzed and then the costs of regulation shall be analyzed.

(7) By December 1, 2007, the St. Johns River Water Management District shall update the minimum flows and levels standards for Rock Springs and Wekiva Springs. Further, the district shall revise the consumptive use permit thresholds in the Wekiva Study Area to address proposed water withdrawals above 50,000 gallons per day. Revisions to the consumptive use thresholds shall provide for a general permit, if possible, and include a transition period that allows continued access to water supply for users that were not previously subject to the permitting process.

(8) By December 1, 2005, the St. Johns River Water Management District shall establish pollution load reduction goals for the Wekiva Study Area to assist the Department of Environmental Protection in adopting total maximum daily loads for impaired waters within the Wekiva Study Area by December 1, 2006.

(9) The Department of Agriculture and Consumer Services shall be the lead agency in coordinating the reduction of agricultural nonpoint sources of pollution. The Department of Agriculture and Consumer Services shall study, and if necessary, initiate rulemaking to implement new or revised best management practices for improving and protecting water bodies, including those basins with impaired water bodies addressed by the Total Maximum Daily Loads Program.

369.319 Master stormwater management plan.—

Each local government within the Wekiva Study Area shall develop a master stormwater management plan that: assesses existing problems and deficiencies in the community; identifies projects to meet long-range needs; establishes priorities to address existing deficiencies; establishes measures to address redevelopment; establishes a schedule to complete needed improvements; evaluates the feasibility of stormwater reuse; and includes requirements for inspection and maintenance of facilities. The plan shall also identify a funding source, such as a stormwater utility fee, to fund implementation of the plan and maintenance program. In addition, the local government shall establish a water reuse and irrigation program that allows for reuse of stormwater on a site basis for development over a size threshold to be determined by the local government or on a jurisdiction-wide basis to minimize pumpage of groundwater for nonpotable usage.

369.320 Wastewater facility plan.—

(1) Local governments within the Wekiva Study Area shall develop a wastewater facility plan for joint planning areas and utility service areas where central wastewater systems are not readily available. The facility plan shall include: the delineation of areas within the utility service area that are to be served by central facilities within 5 years; a financially feasible schedule of improvements; an infrastructure work plan to build the facilities needed to implement the facility plan, including those needed to meet enhanced treatment standards adopted by the Department of Environmental Protection; and a phase-out of existing onsite septic tank systems where central facilities are available. The term available shall be interpreted consistent with the definition of s. 381.0065(2)(a). The facility plan shall also include a long-range component addressing service of the joint planning area or utility service area. In addition, local governments shall establish a water reuse program that allows for reuse of reclaimed water on a site-by-site basis for development over a size threshold to be determined by the local government or on a jurisdiction-wide basis to minimize pumpage of groundwater for nonpotable usage.

(2) Local governments shall update their wastewater facility plans required in subsection (1) where the Total Maximum Daily Loads Program requires reductions in point source pollutants for a basin or as required by legislation for enhanced treatment standards.

369.321 Comprehensive plan amendments.—

By January 1, 2006, each local government within the Wekiva Study Area shall amend its local government comprehensive plan to include the following:

(1) Local governments hosting an interchange on the Wekiva Parkway shall adopt an interchange land use plan into their comprehensive plans. Each interchange land use plan shall address: appropriate land uses and compatible development; secondary road access; access management; right of-way protection; vegetation protection and water conserving landscaping; and the height and appearance of structures and signage. Local governments within which the Wekiva Parkway is planned shall amend their local government comprehensive plan to include the Wekiva Parkway.

(2) Local governments shall amend the appropriate elements of the comprehensive plan, including the capital improvements element, to ensure implementation of the master stormwater management plan.

(3) Local governments shall amend their comprehensive plans to establish land use strategies that optimize open space and promote a pattern of development on a jurisdiction-wide basis that protects the most effective recharge areas, karst features, and sensitive natural habitats including Longleaf Pine, Sand Hill, Sand Pine, and Xeric Oak Scrub. Such strategies shall recognize property rights and the varying circumstances within the Wekiva Study Area, including rural and urban land use patterns. Local comprehensive plans shall map, using best available data from the St. Johns River Water Management District and the Fish and Wildlife Conservation Commission, recharge areas and sensitive upland habitats for this purpose. Local governments shall have flexibility to achieve this objective through comprehensive plan strategies that may include, but are not limited to:

(a) Coordinated greenway plans;
(b) Dedication of conservation easements;
(c) Land acquisition;
(d) Clustering of development;
(e) Density credits and density incentives which result in permanent protection of open space; and
(f) Low to very low density development.

(4) An up-to-date 10-year water supply facility work plan for building potable water facilities necessary to serve existing and new development and for which the local government is responsible as required by paragraph 163.3177(6)(c).

(5) Comprehensive plans and comprehensive plan amendments adopted by the local governments to implement this section shall be reviewed by the Department of Community Affairs pursuant to s. 163.3184, and shall be exempt from the provisions of s. 163.3187(1).

(6) Implementing land development regulations shall be adopted no later than January 1, 2007.

(7) During the period prior to the adoption of the comprehensive plan amendments required by this act, any local comprehensive plan amendment adopted by a city or county that applies to land located within the Wekiva Study Area shall protect surface and groundwater resources and be reviewed by the Department of Community Affairs, pursuant to chapter 9J-5, Florida Administrative Code, using best available data, including the information presented to the Wekiva River Basin Coordinating Committee.

369.322 Coordination of land use and water supply within the Wekiva Study Area.—

(1) In their review of local government comprehensive plan amendments for property located within the Wekiva Study Area pursuant to s. 163.3184, the Department of Community Affairs and the St. Johns River Water Management District shall assure that amendments that increase development potential demonstrate that adequate potable water consumptive use permit capacity is available.

(2) Local governments located within the Wekiva Study Area shall coordinate with the St. Johns River Water Management District and other public and private utilities, on a countywide or multicounty basis, to implement cooperative solutions for development of alternative water sources necessary to supplement groundwater supplies consistent with the St. Johns River Water Management District Regional Water Supply Plan.

(3) In recognition of the need to balance resource protection, existing infrastructure and improvements planned or committed as part of approved development, consistent with existing municipal or county comprehensive plans and economic development opportunities, planned community development initiatives that assure protection of surface and groundwater resources while promoting compact, ecologically and economically sustainable growth should be encouraged. Small area studies, sector plans, or similar planning tools should support these community development initiatives. In addition, the Department of Community Affairs may make available best practice guides that demonstrate how to balance resource protection and economic development opportunities.

369.323 Compliance.—

Comprehensive plans and plan amendments adopted by the local governments within the Wekiva Study Area to implement this act shall be reviewed for compliance by the Department of Community Affairs.

369.324 Wekiva River Basin Commission.—

(1) The Wekiva River Basin Commission is created to monitor and ensure the implementation of the recommendations of the Wekiva River Basin Coordinating Committee for the Wekiva Study Area. The East Central Florida Regional Planning Council shall provide staff support to the commission with funding assistance from the Department of Community Affairs. The commission shall be comprised of a total of 19 members appointed by the Governor, 9 of whom shall be voting members and 10 shall be ad hoc nonvoting members. The voting members shall include:

(a) One member of each of the Boards of County Commissioners for Lake, Orange, and Seminole Counties.
(b) One municipal elected official to serve as a representative of the municipalities located within the Wekiva Study Area of Lake County.
(c) One municipal elected official to serve as a representative of the municipalities located within the Wekiva Study Area of Orange County.
(d) One municipal elected official to serve as a representative of the municipalities located within the Wekiva Study Area of Seminole County.
(e) One citizen representing an environmental or conservation organization, one citizen representing a local property owner, a land developer, or an agricultural entity, and one at-large citizen who shall serve as chairman of the council.
(f) The ad hoc nonvoting members shall include one representative from each of the following entities:

1. St. Johns River Management District.
2. Department of Community Affairs.
3. Department of Environmental Protection.
4. Department of Health.
5. Department of Agriculture and Consumer Services.
6. Fish and Wildlife Conservation Commission.
7. Department of Transportation.
8. MetroPlan Orlando.
9. Orlando-Orange County Expressway Authority.
10. Seminole County Expressway Authority.

(2) Voting members shall serve 3-year, staggered terms, and shall serve without compensation but shall serve at the expense of the entity they represent.

(3) Meetings of the commission shall be held in Lake, Orange, or Seminole county at the call of the chairman, but shall meet at least twice a year.

(4) To assist the commission in its mission, the East Coast Regional Planning Council, in coordination with the applicable regional and state agencies, shall serve as a clearinghouse of baseline or specialized studies through modeling and simulation,

including collecting and disseminating data on the demographics, economics, and the environment of the Wekiva Study Area including the changing conditions of the Wekiva River surface and groundwater basin and associated influence on the Wekiva River and the Wekiva Springs.

(5) The commission shall report annually, no later than December 31 of each year, to the Governor, the President of the Senate, the Speaker of the House of Representatives, and the Department of Community Affairs on implementation progress.

Section 2. Paragraph (b) of subsection (1) of section 163.3184, Florida Statutes, is amended to read:

163.3184 Process for adoption of comprehensive plan or plan amendment.—

(1) DEFINITIONS.—As used in this section, the term:

(b) “In compliance” means consistent with the requirements of ss. 163.3177, 163.31776, when a local government adopts an educational facilities element, 163.3178, 163.3180, 163.3191, and 163.3245, with the state comprehensive plan, with the appropriate strategic regional policy plan, and with chapter 9J-5, Florida Administrative Code, where such rule is not inconsistent with this part and with the principles for guiding development in designated areas of critical state concern and with part III of chapter 369, where applicable.

Section 3. Section 348.7546, Florida Statutes, is created to read:

348.7546 Wekiva Parkway, construction authorized; financing.—

Notwithstanding s. 338.2275, the Orlando-Orange County Expressway Authority is hereby authorized to exercise its condemnation powers, construct, finance, operate, own, and maintain the Wekiva Parkway as part of the authority’s long-range capital improvement plan. The “Wekiva Parkway” means any limited access highway or expressway constructed between State Road 429 and Interstate 4 specifically incorporating the corridor alignment recommended by Recommendation 2 of the Wekiva River Basin Area Task Force final report dated January 15, 2003, and the recommendations of the SR 429 Working Group that were adopted January 16, 2004. This project may be financed with any funds available to the authority for such purpose or revenue bonds issued by the authority under s. 11, Article VII of the State Constitution and s. 348.755(1)(b).

Section 4. Section 348.7547, Florida Statutes, is created to read:

348.7547 Maitland Boulevard Extension and Northwest Beltway Part A Realignment construction authorized; financing.—

Notwithstanding s. 338.2275, the Orlando-Orange County Expressway Authority is hereby authorized to exercise its condemnation powers, construct, finance, operate, own, and maintain the portion of State Road 414 know as the Maitland Boulevard Extension and the realigned portion of the Northwest Beltway Part A as part of the authority’s long-range capital improvement plan. The Maitland Boulevard Extension will extend from the current terminus of State Road 414 at U.S. 441 west to State Road 429

in west Orange County. The realigned portion of the Northwest Beltway Part A will run from the point at or near where the Maitland Boulevard Extension will connect with State Road 429 and will proceed to the west and then north resulting in the northern terminus of State Road 429 moving farther west before reconnecting with U.S. 441. However, under no circumstances shall the realignment of the Northwest Beltway Part A conflict or contradict with the alignment of the Wekiva Parkway as defined in s. 348.7546. This project may be financed with any funds available to the authority for such purpose or revenue bonds issued by the authority under s. 11, Article VII of the State Constitution and s. 348.755(1)(b).

Section 5. This act shall take effect July 1, 2004.

Approved by the Governor June 29, 2004.

Filed in Office Secretary of State June 29, 2004.

Appendix B

Land Use

Table B-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Existing Land Use Description

FLUCCS Code	Reassigned Land Use
1000:Urban	
1100: Residential, low density - less than 2 dwelling units/acre	Low Density Residential
1180: Rural residential	Very Low Density Residential
1190: Low density under construction	Low Density Residential
1200: Residential, medium density - 2-5 dwelling units/acre	Medium Density Residential
1290: Medium density under construction	Medium Density Residential
1300: Residential, high density - 6 or more dwelling units/acre	High Density Residential
1390: High density under construction	High Density Residential
1400: Commercial and services	Commercial
1480: Cemeteries	Cemetery
1490: Commercial & services under construction	Commercial
1500: Industrial	
1510: Food processing	Industrial
1520: Timber processing	Industrial
1550: Other light industrial	Industrial
1560: Other heavy industrial	Industrial
1562: Pre-stressed concrete plants (includes 1564)	Industrial
1590: Industrial under construction	Industrial
1600: Extractive	
1610: Strip mines	Extractive
1611: Clays	Extractive
1620: Sand & gravel pits (must be active)	Extractive
1650: Reclaimed lands	Extractive
1660: Holding ponds	Extractive
1670: Abandoned mining lands	Extractive
1700: Institutional	Institutional
1800: Recreational	
1810: Swimming beach	Recreational
1820: Golf courses	Golf Course
1830: Race tracks	Recreational
1840: Marinas & fish camps	Recreational
1850: Parks and zoos	Recreational
1860: Community recreational facilities	Recreational
1900: Open land	Open Land
1920: Inactive land with street pattern but no structures	Open Land
2000: Agriculture	
2100: Cropland and pastureland	Agriculture - Pasture
2110: Improved pastures (monocult, planted forage crops)	Agriculture - Pasture
2120: Unimproved pastures	Agriculture - Pasture
2130: Woodland pastures	Agriculture - Pasture
2140: Row crops	Agriculture - Row Crops
2150: Field crops	Agriculture - Field Crops
2200: Tree crops	Agriculture - Tree Crops
2210: Citrus groves	Agriculture - Tree Crops
2240: Abandoned tree crops	Agriculture - Tree Crops
2300: Feeding operations	Agriculture - Feeding Operations
2310: Cattle feeding operations	Agriculture - Feeding Operations
2320: Poultry feeding operations	Agriculture - Feeding Operations
2400: Nurseries and vineyards	Agriculture - Nurseries
2410: Tree nurseries	Agriculture - Nurseries
2420: Sod farms	Agriculture - Nurseries
2430: Ornamentals	Agriculture - Nurseries
2431: shade ferns	Agriculture - Nurseries
2432: hammock ferns	Agriculture - Nurseries
2450: Floriculture	Agriculture - Nurseries
2500: Specialty farms	Agriculture - Specialty Farms
2510: Horse farms	Agriculture - Specialty Farms
2610: Fallow cropland	Open Land

Table B-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Existing Land Use Description

FLUCCS Code	Reassigned Land Use
3000: Upland Nonforested	
3100: Herbaceous upland nonforested	Open Land
3200: Shrub and brushland (wax myrtle or saw palmetto, occasionally scru	Open Land
3300: Mixed upland nonforested	Open Land
4000: Upland Forests (25% forested cover)	
4110: Pine flatwoods	Forest
4120: Longleaf pine - xeric oak	Forest
4130: Sand pine	Forest
4200: Upland hardwood forests	Forest
4210: Xeric oak	Forest
4300: Upland mixed forest	Forest
4340: Upland mixed coniferous/hardwood	Forest
4410: Coniferous pine	Forest
4430: Forest regeneration	Forest
5000: Water	
5100: Streams and waterways	Water Body
5200: Lakes	Water Body
5250: Open water within a freshwater marsh / Marshy Lakes	Water Body
5300: Reservoirs - pits, retention ponds, dams	Water Body
5500: Major springs	Water Body
6000: Wetlands	
6100: Wetland hardwood forests	Wetlands
6110: Bay swamp (if distinct)	Wetlands
6170: Mixed wetland hardwoods	Wetlands
6181: Cabbage palm hammock	Wetlands
6210: Cypress	Wetlands
6220: Pond pine	Wetlands
6250: Hydric pine flatwoods	Wetlands
6300: Wetland forested mixed	Wetlands
6410: Freshwater marshes	Wetlands
6430: Wet prairies	Wetlands
6440: Emergent aquatic vegetation	Wetlands
6460: Mixed scrub-shrub wetland	Wetlands
7400: Disturbed land	Barren Land
7410: Rural land in transition without positive indicators of intended a	Barren Land
7420: Borrow areas	Barren Land
7430: Spoil areas	Barren Land
8000: Transportation, Communication, and Utilities	
8100: Transportation	Transportation
8110: Airports	Transportation
8120: Railroads	Transportation
8140: Roads and highways (divided 4-lanes with medians)	Roads
8180: Auto parking facilities	Transportation
8200: Communications	Communication & Utilities
8300: Utilities	Communication & Utilities
8310: Electrical power facilities	Communication & Utilities
8320: Electrical power transmission lines	Communication & Utilities
8330: Water supply plants	Communication & Utilities
8340: Sewage treatment	Communication & Utilities
8360: Treatment ponds (non-sewage)	Communication & Utilities

Table B-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future Land Use Description

Jurisdiction	Jurisdiction Future Land Use	ECFRPC Generalized Land Use	ECFRPC Definition	CDM Reassigned Land Use
MOUNT DORA	Active Recreation	REC	Recreation / Open Space	Recreation
MOUNT DORA	Commercial	COM	Commercial	Commercial
MOUNT DORA	Conservation	CONS	Conservation - Includes any Wetlands categories	Wetlands
MOUNT DORA	High Density Residential (12 DU/AC or Less)	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
MOUNT DORA	Industrial	IND	Industrial	Industrial
MOUNT DORA	Low Density Residential (2.5 DU/AC or Less)	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
MOUNT DORA	Medium Density Residential (6 DU/AC or Less)	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
MOUNT DORA	Office	OFF	Office	Commercial
MOUNT DORA	Passive Recreation	REC	Recreation / Open Space	Recreation
MOUNT DORA	Public Lands	INST	Institutional	Institutional
MOUNT DORA	Urban Expansion	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
MOUNT DORA	Water	WAT	Water Body	Water Body
LAKE COUNTY	Commercial Area	COM	Commercial	Commercial
LAKE COUNTY	Employment Center	IND	Industrial	Industrial
LAKE COUNTY	Institutional	INST	Institutional	Institutional
LAKE COUNTY	Lake	WAT		Water Body
LAKE COUNTY	Public Resource	CONS	Conservation - Includes any Wetlands categories	Wetlands
LAKE COUNTY	Receiving_Area_A120	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Rural	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Rural Village	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	Sending_Area_120	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Sending_Area_140	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Sending_Area_A120	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Sending_Area_A140	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
LAKE COUNTY	Suburban	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	UCN_Non_Wekiva	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	UCN_Wekiva	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	Urban	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	Urban Expansion	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE COUNTY	Water	WAT	Water Body	Water Body
EUSTIS	GC - General 459 Acres	COM	Commercial	Commercial
EUSTIS	GI - General Industrial 199 Acres	IND	Industrial	Industrial
EUSTIS	MCR - Mixed Commercial Residential 382 Acres	MU	Mixed Use	Commercial
EUSTIS	PI - Public / Institutional 826 Acres	INST	Institutional	Institutional
EUSTIS	RR - Rural 1 D.U. or Less/Acre	RVL	Very Low Density Residential(less than two units per acre, but greater than that allowed in the Rural Residential category)	Very Low Density Residential
EUSTIS	RT - Residential / Office Transitional 325 Acres	MU	Mixed Use	Commercial
EUSTIS	SR - Surburban 1-5 D.U./Acre	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
EUSTIS	UR - Urban 6 or More D.U./Acre - 362 Acres	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
WINTER GARDEN	AG	AG	Agricultural	Agriculture
WINTER GARDEN	COM	COM	Commercial	Commercial
WINTER GARDEN	DT	MU	Mixed Use	Commercial
WINTER GARDEN	I	IND	Industrial	Industrial
WINTER GARDEN	LD	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
WINTER GARDEN	LR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
WINTER GARDEN	MR	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential

*This table represents generalized informtion, which may not correspond to the existing and future landuse designations depicted in local government comprehensive plan maps.

Table B-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future Land Use Description

Jurisdiction	Jurisdiction Future Land Use	ECFRPC Generalized Land Use	ECFRPC Definition	CDM Reassigned Land Use
WINTER GARDEN	NC	MU	Mixed Use	Commercial
WINTER GARDEN	OC	UNK		Commercial
WINTER GARDEN	PF	INST	Institutional	Institutional
WINTER GARDEN	REC	REC	Recreation / Open Space	Recreation
WINTER GARDEN	SUB	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
WINTER GARDEN	U	INST	Institutional	Institutional
ORLANDO	COMM-AC	COM	Commercial	Commercial
ORLANDO	CONSERV	CONS	Conservation - Includes any Wetlands categories	Wetlands
ORLANDO	INDUST	IND	Industrial	Industrial
ORLANDO	INDUST/RES-PRO	IND	Industrial	Industrial
ORLANDO	MUC-MED	MU	Mixed Use	Commercial
ORLANDO	NEIGH-AC	MU	Mixed Use	Commercial
ORLANDO	OFFICE-LOW	OFF	Office	Commercial
ORLANDO	OFFICE-MED	OFF	Office	Commercial
ORLANDO	PUB-REC-INST	INST	Institutional	Institutional
ORLANDO	PUB-REC-INST/RES-PRO	INST	Institutional	Institutional
ORLANDO	RES-LOW	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
ORLANDO	RES-LOW/RES-PRO	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
ORLANDO	RES-MED	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
ORLANDO	RES-MED/RES-PRO	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
ORLANDO	UR-AC	MU	Mixed Use	Commercial
ORANGE COUNTY	1/1	RVL	Very Low Density Residential(less than two units per acre, but greater than that allowed in the Rural Residential category)	Very Low Density Residential
ORANGE COUNTY	1/2	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
ORANGE COUNTY	1/5	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
ORANGE COUNTY	C	COM	Commercial	Commercial
ORANGE COUNTY	C/PD	COM	Commercial	Commercial
ORANGE COUNTY	HD	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
ORANGE COUNTY	I	IND	Industrial	Industrial
ORANGE COUNTY	IN	INST	Institutional	Institutional
ORANGE COUNTY	LD	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
ORANGE COUNTY	LM	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
ORANGE COUNTY	MD	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
ORANGE COUNTY	NO DATA	UNK		
ORANGE COUNTY	O	OFF	Office	Commercial
ORANGE COUNTY	P/R	REC	Recreation / Open Space	Recreation
ORANGE COUNTY	PD	PD	Planned Development	Medium Density Residential
ORANGE COUNTY	R	AG	Agricultural	Agriculture
ORANGE COUNTY	R	AG	Agricultural	Agriculture
ORANGE COUNTY	RL	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
ORANGE COUNTY	V	MU	Mixed Use	Commercial
ORANGE COUNTY	WB	WAT	Water Body	Water Body
OCOEE	COMM	COM	Commercial	Commercial
OCOEE	CONS	CONS	Conservation - Includes any Wetlands categories	Wetlands
OCOEE	HDR	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
OCOEE	HI	IND	Industrial	Industrial
OCOEE	INST	INST	Institutional	Institutional
OCOEE	LAKE	WAT	Water Body	Water Body
OCOEE	LDR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
OCOEE	LI	IND	Industrial	Industrial

*This table represents generalized informtion, which may not correspond to the existing and future landuse designations depicted in local government comprehensive plan maps.

Table B-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future Land Use Description

Jurisdiction	Jurisdiction Future Land Use	ECFRPC Generalized Land Use	ECFRPC Definition	CDM Reassigned Land Use
OCOEE	MDR	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
OCOEE	PS	MU	Mixed Use	Commercial
OCOEE	REC	REC	Recreation / Open Space	Recreation
OAKLAND	AGR	AG	Agricultural	Agriculture
OAKLAND	COM	COM	Commercial	Commercial
OAKLAND	COM	COM	Commercial	Commercial
OAKLAND	CSV	CONS	Conservation - Includes any Wetlands categories	Wetlands
OAKLAND	IND	IND	Industrial	Industrial
OAKLAND	IST	INST	Institutional	Institutional
OAKLAND	LDR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
OAKLAND	REC	REC	Recreation / Open Space	Recreation
MAITLAND	CONS	CONS	Conservation - Includes any Wetlands categories	Wetlands
MAITLAND	H	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
MAITLAND	LM	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
MAITLAND	MD	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
MAITLAND	MORC	MU	Mixed Use	Commercial
MAITLAND	O	OFF	Office	Commercial
MAITLAND	PARK	REC	Recreation / Open Space	Recreation
MAITLAND	SF	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
MAITLAND	WB	WAT	Water Body	Water Body
EATONVILLE	C	COM	Commercial	Commercial
EATONVILLE	EC	CONS	Conservation - Includes any Wetlands categories	Wetlands
EATONVILLE	HD	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
EATONVILLE	I	IND	Industrial	Industrial
EATONVILLE	LD	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
APOPKA	1/5	RR	Rural Residential (not to exceed one unit for every two acres)	Very Low Density Residential
APOPKA	AG	AG	Agricultural	Agriculture
APOPKA	AG-E	AG	Agricultural	Agriculture
APOPKA	COMM	COM	Commercial	Commercial
APOPKA	IN	INST	Institutional	Institutional
APOPKA	IND	IND	Industrial	Industrial
APOPKA	INST-PU	INST	Institutional	Institutional
APOPKA	LD	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
APOPKA	LM	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
APOPKA	MU	MU	Mixed Use	Commercial
APOPKA	OFF	OFF	Office	Commercial
APOPKA	PR	REC	Recreation / Open Space	Recreation
APOPKA	R	AG	Agricultural	Agriculture
APOPKA	RE	RVL	Very Low Density Residential(less than two units per acre, but greater than that allowed in the Rural Residential category)	Very Low Density Residential
APOPKA	RH	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
APOPKA	RL	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
APOPKA	RLS	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
APOPKA	RM	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
APOPKA	RML	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
APOPKA	RVLS	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
APOPKA	WB	WAT	Water Body	Water Body

*This table represents generalized informtion, which may not correspond to the existing and future landuse designations depicted in local government comprehensive plan maps.

Table B-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future Land Use Description

Jurisdiction	Jurisdiction Future Land Use	ECFRPC Generalized Land Use	ECFRPC Definition	CDM Reassigned Land Use
SEMINOLE COUNTY	COM	COM	Commercial	Commercial
SEMINOLE COUNTY	CONS	CONS	Conservation - Includes any Wetlands and/or flood prone categories	Wetlands
SEMINOLE COUNTY	HDR	RH	High Density Residential (maximum allowable density exceeds approximately 10 units per net buildable acre)	High Density Residential
SEMINOLE COUNTY	HIPTR	MU	Mixed Use	Commercial
SEMINOLE COUNTY	IND	IND	Industrial	Industrial
SEMINOLE COUNTY	LDR	RL	Low Density Residential (up to 4 units per net buildable acre)	Low Density Residential
SEMINOLE COUNTY	MDR	RM	Medium Density Residential (up to approximately 10 units per net buildable acre)	Medium Density Residential
SEMINOLE COUNTY	OFF	OFF	Office	Commercial
SEMINOLE COUNTY	PD	PD	Planned Development	Medium Density Residential
SEMINOLE COUNTY	PUBC	INST	Institutional	Institutional
SEMINOLE COUNTY	PUBG	INST	Institutional	Institutional
SEMINOLE COUNTY	PUBR	INST	Institutional	Institutional
SEMINOLE COUNTY	PUBS	INST	Institutional	Institutional
SEMINOLE COUNTY	PUBU	INST	Institutional	Institutional
SEMINOLE COUNTY	REC	REC	Recreation / Open Space	Recreational
SEMINOLE COUNTY	SE	RVL	Very Low Density Residential(greater than one unit per net buildable acre)	Very Low Density Residential
SEMINOLE COUNTY	WATER	WAT	Water Body	Water Body
LONGWOOD	CON	CONS	Conservation - Includes any Wetlands categories	Wetlands
LONGWOOD	GC	COM	Commercial	Commercial
LONGWOOD	LDR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LONGWOOD	MDR	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
LONGWOOD	P/I	INST	Institutional	Institutional
LONGWOOD	WATER	WAT	Water Body	Water Body
LAKE MARY	COM	COM	Commercial	Commercial
LAKE MARY	IND	IND	Industrial	Industrial
LAKE MARY	LMDR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
LAKE MARY	PUB	INST	Institutional	Institutional
ALTAMONTE SPRINGS	COMM	COM	Commercial	Commercial
ALTAMONTE SPRINGS	CONS	CONS	Conservation - Includes any Wetlands categories	Wetlands
ALTAMONTE SPRINGS	GOFF	OFF	Office	Commercial
ALTAMONTE SPRINGS	HDR	RH	High Density Residential (maximum allowable density exceeds approximately 12 units per acre)	High Density Residential
ALTAMONTE SPRINGS	IND	IND	Industrial	Industrial
ALTAMONTE SPRINGS	INST	INST	Institutional	Institutional
ALTAMONTE SPRINGS	IOCH	COM	Commercial	Commercial
ALTAMONTE SPRINGS	IOCM	COM	Commercial	Commercial
ALTAMONTE SPRINGS	IOIM	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	IORH	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	IORM	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	LDR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
ALTAMONTE SPRINGS	MDR	RM	Medium Density Residential (up to approximately 12 units per acre)	Medium Density Residential
ALTAMONTE SPRINGS	MUD	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	OCL	COM	Commercial	Commercial
ALTAMONTE SPRINGS	OIL	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	ORL	MU	Mixed Use	Commercial
ALTAMONTE SPRINGS	PARK	REC	Recreation / Open Space	Recreational
ALTAMONTE SPRINGS	PUDM	PD	Planned Development	Medium Density Residential
ALTAMONTE SPRINGS	PUDR	PD	Planned Development	Medium Density Residential
ALTAMONTE SPRINGS	SFR	RL	Low Density Residential (up to approximately 5 units per acre)	Low Density Residential
ALTAMONTE SPRINGS	WATER	WAT	Water Body	Water Body

*This table represents generalized informtion, which may not correspond to the existing and future landuse designations depicted in local government comprehensive plan maps.

Appendix C

NPDES MS4 Permit Maintenance Schedules

NPDES MS4 Permit No. FLS000011
Maintenance Schedule

STATE OF FLORIDA
MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT

PERMIT NUMBER: FLS000011 - Major Facility

ISSUANCE DATE: July 29, 2002

EXPIRATION DATE: July 28, 2007

Orange County – Municipal Separate Storm Sewer System Permittee(s):

CO-PERMITTEE(S):

Orange County
Environmental Protection Division
800 Mercy Drive, Suite 4
Orlando, FL 32808

City of Apopka
P.O. Box 1229
Apopka, FL 32704-1229

City of Belle Isle
1600 Nela Ave.
Belle Isle, FL 32809

Town of Eatonville
307 E. Kennedy Blvd.
Eatonville, FL 32751

City of Edgewood
405 Larue Ave.
Edgewood, FL 32809-340

FDOT-District 5
719 S. Woodland Blvd.
Deland, FL 32809

City of Maitland
1776 Independence Lane
Maitland, FL 32751

City of Ocoee
370 Enterprise St.
Ocoee, FL 34761

Valencia Water Control Dist.
10365 Orangewood Blvd.
Orlando, FL 32821

City of Winter Garden
City Hall
251 W. Plant Street
Winter Garden, FL 34787

City of Winter Park
147 E. Lyman Ave.
Winter Park, FL 32789-4386

This permit is issued pursuant to Section 403.0885, Florida Statutes (F.S.), and rules promulgated thereunder. The Department of Environmental Protection (DEP) implements the stormwater element of the federal National Pollutant Discharge Elimination System (NPDES) as part of the Department's Wastewater Facility and Activities Permitting program. The stormwater element of the federal NPDES program is mandated by Section 402(p) of the Clean Water Act which is set out in the federal statutes at 33 U.S.C. Section 1342(p) and implemented through federal regulations including 40 Code of Federal Regulations (CFR) 122.26.

Authorized by Section 403.0885, F.S., the Department's federally approved NPDES stormwater program is set out in various provisions within Chapters 62-4, 62-620, 62-621 and 62-624 of the Florida Administrative Code (F.A.C.). Chapter 62-624, F.A.C., specifically addresses Municipal Separate Storm Sewer Systems (MS4s).

The above named permittees are hereby authorized to discharge to waters of the state, in accordance with the approved Stormwater Management Program(s), effluent limitations, monitoring requirements, and other provisions as set forth in this permit, the application and other documents attached hereto or on file with the Department and made a part hereof, from all portions of the Municipal Separate Storm Sewer System owned or operated by any permittee listed above.

PART I. DISCHARGES AUTHORIZED UNDER THIS PERMIT

A. **Permit Area.** This permit covers all areas located within the political boundary of Orange County that is served by the municipal separate storm sewer system owned or operated by the Permittee(s) identified above.

B. **Authorized Discharges.** Except for discharges prohibited under Part I.D., this permit authorizes all existing or new stormwater point source discharges to waters of the state from those portions of the Municipal Separate Storm Sewer System (MS4) owned or operated by the Permittee(s).

C. **Permittee(s) Responsibility.**

1. Permittees are individually responsible for:

   a. Compliance with permit conditions relating to discharges from portions of the MS4 where they are the operator;

   b. Stormwater management program implementation on portions of the MS4 where they are the operator;

   c. Where permit conditions are established for specific portions of the MS4, the permittee(s) need only comply with the permit conditions relating to those portions of the MS4 for which they are the operator; and

   d. A plan of action to assume responsibility for implementation of stormwater management and monitoring programs on their portions of the MS4 should inter-jurisdictional agreements allocating responsibility between permittee(s) be dissolved or in default. (See Part II.G.3., of this permit also.)

2. Each permittee is jointly responsible for:

   a. Submission of annual reporting requirements as specified in Part V.C. (ANNUAL REPORT);

   b. Collection of monitoring data as required by Part V.B.,

   c. Insuring implementation of system-wide management program elements, including any system-wide public education efforts.

D. **Limitations on Coverage.** Pursuant to Section 403.0885, and rules promulgated thereunder, and consistent with Section 402(p)(3)(B)(ii) of the Clean Water Act, this permit must include a requirement to effectively prohibit non-stormwater discharges into the storm sewers within the permittee's MS4. Consequently, the following discharges are not authorized by this permit:

1. *Non-stormwater:* discharges of non-stormwater, except where such discharges are:

   a. authorized under the provisions of Chapter 373 or 403, F.S., or rules promulgated thereunder; or

   b. identified by and in compliance with Part II.A.7.a.

2. *Spills*: discharges of material resulting from a spill, except where such discharges are:

a. the result of an Act of God where reasonable and prudent measures have been taken to minimize the impact of the discharge; or

b. an emergency discharge required to prevent imminent threat to human health or prevent severe property damage, where reasonable and prudent measures have been taken to minimize the impact of the discharge.

PART II. STORMWATER POLLUTION PREVENTION & MANAGEMENT PROGRAMS

As required by Rule 62-624.440(2), F.A.C., which adopts 40 CFR 122.26(d)(2)(iv), the permittee(s) shall implement a comprehensive Stormwater Management Program (SWMP) that shall include pollution prevention measures, treatment or removal techniques, stormwater monitoring, use of legal authority, and other appropriate means to control the quality of stormwater discharged from the MS4.

Controls and activities in the SWMP shall identify areas of permittee jurisdiction. The SWMP shall include controls necessary to effectively prohibit the discharge of non-stormwater into municipal separate storm sewers and reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable (MEP). Compliance with this SWMP shall be reported annually in the ANNUAL REPORT discussed in Part V.C. of this permit.

Implementation of the SWMP may be achieved through participation with other permit holders, public agencies, or private entities in cooperative efforts to satisfy the requirements of Part II and Part III of the permit in lieu of creating duplicate program elements for each individual permittee. The SWMP, taken as a whole, shall achieve the "effective prohibition" requirements and "MEP" standards from Section 402(p)(3)(B) of the Clean Water Act, as implemented pursuant to Section 403.0885, F.S., and rules promulgated thereunder.

The SWMP covers the term of the permit and shall be updated as necessary, or as required by the Department, to ensure that it complies with Section 403.0885, F.S., and rules promulgated thereunder, and is consistent with Section 402(p)(3)(B) of the Clean Water Act. Modifications to the SWMP shall be made in accordance with Part II.G. of this permit. Compliance with the SWMP and the compliance schedules in Part III shall be deemed in compliance with Parts II.A. and II.B. of the permit. The Stormwater Management Program submitted by the permittee(s) in the September 30, 1993, (Winter Park, June 17, 1994), Part 2 Application, and all approved updates, are hereby incorporated into this permit by reference. FDOT's Statewide Stormwater Management Program for MS4 Permits, dated 1997 and all approved updates, are hereby incorporated into this permit by reference and thus are enforceable elements of the permit. Specific components of these Stormwater Management Programs are identified in Parts II and III to serve as measurable and enforceable elements of this permit.

A. Stormwater Management Program (SWMP) Requirements.

1. *Structural Controls and Stormwater Collection System Operation:* The MS4 and any stormwater structural control shall be operated in a manner to reduce the discharge of pollutants to the *Maximum Extent Practicable* (*MEP*).

    a. The permittee(s) shall operate and maintenance their respective structural controls and stormwater collection system. The maintenance activities and inspection frequencies identified for the structural controls in Table II.A.1.a. of this permit represent suggested maintenance practices and inspection frequencies that may be implemented on an as needed basis. In addition, the permittee(s) shall maintain an internal record keeping system to track inspections and maintenance activities performed during the permit term. If these activities are performed by others under a contractual agreement, then the permittee(s) shall retain copies of the contractual agreement which specifies the maintenance activities to be performed and the schedule of frequency. Inspection and maintenance records shall be retained by the permittee(s) in accordance with Part V.G. of this permit. Annual evaluations shall be made to assess the appropriateness of the inspection and maintenance schedule and to ensure the optimization of equipment use. A summary of the annual evaluation shall be included within each ANNUAL REPORT required under Part V.C. of this permit.

TABLE II.A.1.a.
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Ponds (Dry Retention)	Semi-Annually	Semi-Annual Inspection Items	° Inspect facility for signs of prolonged wetness and damage to structures including diversion devices and inflow and outflow structures and pipes. ° Note any critically eroded areas on banks and pond bottom. ° Schedule for stabilization. ° Undercutting at the point of discharge and signs of piping in the vicinity of the control structure or inlets, flumes, diversion structures or pipes should be noted and scheduled for immediate repair. ° Dead or dying grass on the pond bottom are indications of potential clogging and reduced infiltration capacity. When observed the facility should be checked to insure that it percolates completely within 2-3 days following storms. Scrapping, discing or otherwise aerating pond bottom may be required to restore the infiltration capacity of the soil. ° Note any signs of excessive petroleum hydrocarbon contamination and handle appropriately (2).
		As needed	° Mowing and litter and debris removal. ° Stabilization of eroded banks. ° Repair undercut or eroded areas at inflow and diversion structures or conveyances. ° Nutrient and pesticide use management (1). ° Dethatch pond bottom and remove thatching. Dispose via composting and land application. As an alternative, remove grass clippings following mowing.
		Annually	° Disc or otherwise aerate pond bottom.
		5 year Revolving Schedule	° Scrape pond bottom and remove sediment with proper sediment disposal. Restore original cross-section and infiltration rate. (2,3) ° Seed or sod to restore ground cover.

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Pond (Dry Detention with Sand Filter System)	Semi-Annually	Semi-Annual Inspection Items	° Inspect facility for evidence of damage and short circuiting of the filter. Close attention should be given to the filter box, bed, trench or mound and appurtenant works. Signs of piping (erosion of filter sand) into underdrain pipes or holes next to junction box and/or discharge control structures or exposure of coarse aggregate or geotextile surrounding the underdrain pipe should be noted and scheduled for immediate repair. ° Note any critically eroded areas on banks, pond bottom, or filter. Schedule for stabilization. ° Any undercutting at the point of discharge and erosion in the vicinity of inflow pipes, flumes and diversion structures should be noted and scheduled for immediate repair. ° Dead or dying grass on the pond bottom and/or standing water following 3 or more days of dry weather are indicative of filter "blinding". When observed, the facility should be scheduled for major maintenance. Standing water may need to be pumped from the facility or be otherwise drained to effect restoration of the filter. The owner or owner's representative should contact FDEP or the appropriate WMD to advise the permitting authority of the need to perform the drawdown. ° Note signs of excessive petroleum contamination and handle appropriately (2). ° If so equipped check "clean out" ports at the end of each underdrain and the junction box or underdrain outlet for evidence of blockage. (i.e. standing water in UD lateral accompanied by little or no outflow.) ° Schedule cleaning of UD pipes via mechanical means or high pressure water jet as appropriate. Also inspect for damage to caps from mowing accidents or any breaks in seals to prevent short circuiting of the filter.
		Semi-annually or as needed (open sand or sod covered filter beds, trenches, or mounds).	° Minor corrective maintenance of filtration components should be scheduled any time drawdown does not occur within 48 hours after a storm. This activity usually involves simple light discing raking or aeration of sod cover or the surface of the filter. Confined unit "vault or box" type systems may be backflushed (i.e. fluidized) if these capabilities are available.

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Pond (Dry Detention with Sand Filter System) {cont.}	Semi-annually	18 months or as needed to maintain 72 hour drawdown capacity.	° Major maintenance of filtration components is required any time that nuisance conditions (standing water) persist for more than 3 days following storms. This activity involves removal and replacement of ballast gravel and geotextile covers when used. Any sod cover or the top 2-3 inches of sand must be removed in cases involving vegetated or open sand filter beds. All discolored sediment contaminated sand must be removed and replaced with clean sand of a type equivalent to the original grade. ° Sediment and contaminated sand must be disposed of properly, (2,3) ° Seed or sod to restore any dead or severely damaged ground cover. ° At select locations, excavate down to and check UD pipe for clogging of the orifices, slots and/or fabric sock surrounding the pipe if used. Clean or otherwise replace pipe as needed to restore drainage capacity.
		Annually or as needed to maintain 72 hour drawdown limit (Confined Unit Box Type Filter).	° Major maintenance of filtration components associated with "confined unit" type filters is usually more frequent than with other filtration devices. The activities required are facilitated, however, by the unit's compact nature. Complete removal and replacement of geotextile, filter sand, and the ballast stone or gravel when used is normally required. ° Restore damaged ground cover on the pond bottom. ° Fabric wrapped UD pipe should be closely inspected and replaced if clogged. Perforated or slotted pipe should be checked for damage or restricted openings. Replace or clean UDs as needed to restore drainage capacity.
		As Needed	° Mowing and removal of grass clipping. ° Litter and debris removal from banks. ° Stabilization of eroded banks. ° Repair undercut and eroded areas in the vicinity of the discharge point or other structures such as inlet flumes, inflow pipes and energy dissipaters. ° Nutrient and pesticide use management (1).
		Bi-monthly	° Litter and debris removal from control structure and screens and remove sediment buildup at inflows.

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Pond (Wet Detention Facility)	Annual	Annual Inspection Items	° Inspect facility for damage. Close attention should be given to the control structure and the point of discharge (POD). ° Undercutting at the POD and evidence of piping (erosion of soil into pipe junctions) and/or erosion in the vicinity of inflow pipes, the outlet control structure, or flumes should be noted and scheduled for immediate repair. ° Note signs of excessive total petroleum hydrocarbon contamination and handle appropriately (2). ° Monitor sediment accumulations and remove when ¼ of storage volume is filled (3). ° Check for apparent signs of hypereutrophic conditions and note areas which require invasive aquatic plant control. ° Bleeder devices such as orifices as well as weirs, stand pipes, box drop inlets, grates, and screens should clean, free of debris and ready for service. ° All control gates should be checked for operational capacity by briefly opening and closing valve. ° Forebays/sediment sumps should be monitored for sediment accumulation. The "Cleanout Level" should be calculated for each facility and the sump should be scheduled for sediment removal based on the limit established for the facility and the sediment accumulation rate.
	Semi-annually		° Detention facilities that include constructed wetlands (littoral shelf) components should be monitored carefully to avoid invasive aquatic plant problems. Schedule removal of invasive species or chemical control when necessary to prevent excessive competition with beneficial or desired plants (1). ° Note those areas within the littoral zone where the spread or overcrowding of beneficial plants necessitates management and harvesting.
		As needed	° Repair and stabilize undercut and eroded areas near structures and banks. ° Stabilize eroded banks. ° Mowing side slopes with litter and debris removal from banks. ° Nutrient and pesticide use management (1).

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Pond (Wet Detention Facility) {cont.}	Semi-annually	As needed	° Clean and remove debris from orifices, weirs, stand pipes, drop inlets and screens.
		Semi-annually	° Invasive aquatic plant control (1).
		5 year revolving schedule or as needed.	° Removal of sediment from forebays or sediment sumps and dispose of properly (2,3). Sediment "cleanout level" should not be higher than 1 foot below the invert elevation of the bay or sump nor should the storage volume be reduced by more than 60 percent of original design, (i.e. Cleanout Level = .2 in/acre drainage area remaining storage volume in most cases.)
		As needed to maintain adequate storage volume and treatment.	° Monitor sediment accumulations and remove when ¼ storage volume is filled or when hypereutrophic conditions become apparent. Sediment must be disposed of or used properly (2)(3).
		Annually or as needed.	° Aquatic plant management and harvesting. Manage constructed wetland components to prevent overcrowding of beneficial plants and to maintain adequate open water area for aesthetics, light penetration and oxygenation. It is also important to avoid excessive cover for insect (mosquito) larvae which enhances production and inhibits predation. Not more than a 50 percent reduction in open water area is recommended prior to mechanical harvesting and reduction of macrophytes cover to its original level (i.e. 30-35 percent in most instances). ° Constructed wetland management (regular selective harvesting) to encourage sites for active growth and enhanced pollutant assimilation is recommended.

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Storm Water Treatment Pond (Wet Detention with Sand Filtration)	Annually	Annual Inspection Items	° Inspect filtration component in accordance with type of system as per "Dry Detention with Sand filter" guidelines. ° Inspect detention pond component as described in "Wet Detention" guidelines. ° Close attention should be given to the filtration component particularly evidence of short circuiting associated with piping in the vicinity of underdrain junctions and the control structure.
		As needed	° Maintain bank filter bed, trench, or box as described in Dry Detention with Sand Filter guidelines to maintain 72 hour drawdown limit. ° Flood control components (weirs, risers, drop boxes and discharge pipes) should be clean and ready for service. ° Mowing banks and grass clipping removal. ° Litter and debris removal from banks. ° Stabilization of eroded banks and repair of undercutting or piping in the vicinity of inlets, outlet control structure and point of discharge. ° Nutrient and pesticide use management (1).
		Monthly	° Litter and debris removal from control structure and screens.
		Annually	° Invasive plant species removal (1).
		As needed to ensure that the depth of sediments does not exceed ¼ of the design cross-sectional area to the pond.	° Sediment removal with proper sediment disposal (2,3).

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Exfiltration Trench	Semi-annually	Semi-annual Inspection Items	° Monitor facility for sediment accumulation in the pipe (when used) and storage volume recovery (i.e. drawdown, capacity). Observation wells and inspection ports should be checked following 3 days minimum dry weather. Failure to percolate stored runoff to the design treatment volume level within 72 hours indicates blinding of soil in the trench walls and/or clogging of geotextile liner with fine solids. Reductions in storage volume due to sediment in the distribution pipe also reduces efficiency. Minor maintenance measures can restore exfiltration rates to acceptable levels short term. Major maintenance (total rehabilitation) is required to remove accumulated sediment in most cases or to restore recovery rate when minor measures are no longer effective or can not be performed due to design configuration. ° Inspect appurtenances such as sedimentation and oil and grit separation chambers of catch basin as well as diversion devices and over flow weirs when used. Diversion facilities and over flow weirs should be free of debris and ready for service. Sedimentation and oil/grit separators should be scheduled for cleaning when sediment depth approaches cleanout level. Cleanout levels should be established not less than 1 foot below control elevation of the chamber.
		As needed	° Remove sediment from sediment/oil and grease chamber of catch basin inlets and dispose of properly (2,3). ° Remove debris from the outfall or "smart box" (diversion device) in the case of off-line facilities.
		As needed to maintain storage capacity within 2/3 of the design treatment volume and 72 hour exfiltration rate limit.	° Total rehabilitation of trench. Excavate and remove perforated or slotted pipe, surrounding coarse aggregate envelop (bedding) and geotextile fabric (wrap). In most cases renovation will require replacement with new material of equivalent grade and quality. Trench walls should be excavated to expose clean soil. Sediment contaminated soil, coarse aggregate and filter cloth should be disposed of properly (2,3).

TABLE II.A.1.a. (continued)
SUGGESTED MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	MAINTENANCE ACTIVITIES
Exfiltration Trench	Semi-annually	5 Years or as needed to prolong service.	° When bypass capability is available minor maintenance measures such as extended dry periods may be used to provide short term recovery of exfiltration rate. ° Remove accumulated sediment from facilities constructed with manholes or other appurtenant structures to facilitate cleanout. Sediment should be disposed of properly (2,3). This process normally involves facilities with large pipes. Cleanout may be performed by suction hose and tank truck and/or by high pressure jet washing.
Weirs	Quarterly	Quarterly	°Litter and debris removal
		As Needed	°Sediment removal with proper sediment disposal
Channel Control Structures	Quarterly	As Needed	°Litter and debris removal °Sediment removal with proper sediment disposal
Storm Water Pump Stations	Semi-Annually	As Needed	°Sediment removal with proper sediment disposal °Mechanical repairs °Litter and debris removal
Inlets and Catch Basins	Semi-Annually	As Needed	°Sediment removal with proper sediment disposal
		5 Yr. Revolving Schedule	°Litter and debris removal
Channels	Annually - to determine priority	As Needed	°Litter and debris removal °Mowing and invasive plant species removal °Stabilization of eroded bank areas
		As necessary to ensure that the depth of sediments does not exceed _ of the design storage volume area of the pond.	°Sediment removal with proper sediment disposal provided the original cross-section is not exceeded

Notes for Table II.A.1.a:

(1) Use only pesticides approved by US EPA and FDACS for aquatic sites to control weed pests in and around treatment facilities. Use of pesticides and chemicals for the control of invasive species and common undesirable aquatic plants should be minimized. Careful herbicide selection and application is essential to minimize harm to desirable plants and animals. If done on a routine basis, mechanical removal can help control unwanted aquatics and minimize the use of chemicals. However, experienced trained applicators can selectively control many undesirable plants with minimum harm to desirable vegetation and possible downstream contamination. DEP regional biologist with the Bureau of Aquatic Plant Management and/or County Cooperative Extension Service should be contacted for assistance.

Soil amendments (fertilizer) should be used, as needed, to establish and maintain healthy and vigorous cover on the banks of treatment facilities. However, normal rates of fertilization should be lowered in the immediate vicinity of treatment facilities to avoid overenrichment of the soil and adjacent waters. Apply soil amendments only when grass shows signs of distress once ground cover is well established. Clippings should be removed periodically to prevent the buildup of nutrients in vegetation subject to periodic or frequent inundation.

Problem areas susceptible to chronic erosion require more intense measures for protection and establishment of permanent vegetative cover. These special considerations may include the use of sod in lieu of seeding and/or the use of higher rates of soil amendments and supplemental moisture during dry weather conditions to insure more rapid establishment or vigorous growth in bank vegetation. Experts in soil conservation are available for assistance by contacting the Natural Resources Conservation Service with USDA.

(2) Excessive petroleum hydrocarbon contamination can present severe sediment disposal/cleanup problems. Evidence of such pollution includes very dark oily stains particularly at inlet and outlet structures and strong odors of gasoline, etc. The source of such inputs should be determined and removed if possible. Otherwise, pretreatment practices should be used, as necessary, to insure that influent runoff water is not contaminated beyond levels normally observed in runoff from highways and parking lots.

(3) Sediments associated with storm water treatment devices should be regarded as contaminated well beyond the levels in runoff itself. As such, if disposed of haphazardly, this material may become a source of pollution for substances like heavy metals, petroleum hydrocarbons, other organic compounds and pesticides, as well as infectious organisms, nutrients and oxygen demanding substances. However, absent the regular addition of refuse, paints, solvents cleaning agents, pesticide and fuel spills, etc., there is little probability that these materials would be concentrated to the extent so as to be considered "hazardous waste". In most cases sediment removed from basins may be land spread on-site in areas of restricted access, provided proper practices are used to limit wind and water erosion such that off-site discharge is minimized. Off-site disposal must be either to an approved landfill (landfill cover) or an approved sludge application site. Sediment from facilities serving major urban highways or industrial, commercial and fuel transfer facilities should be tested to determine the proper level of precaution for disposal. Contact FDEP Storm Water and NPS Management Section for more information regarding appropriate testing and disposal methods.

NPDES MS4 Permit No. FLS000014
Maintenance Schedule

STATE OF FLORIDA
MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT

PERMIT NUMBER: FLS000014 - Major Facility

ISSUANCE DATE: February 6, 2003

EXPIRATION DATE: February 5, 2008

City of Orlando - Municipal Separate Storm Sewer System Permittee

PERMITTEE:

City of Orlando
Public Works Department
400 South Orange Avenue
Orlando, FL 32801-3302

This permit is issued pursuant to Section 403.0885, Florida Statutes (F.S.), and rules promulgated thereunder. The Department of Environmental Protection (DEP) implements the stormwater element of the federal National Pollutant Discharge Elimination System (NPDES) as part of the Department's Wastewater Facility and Activities Permitting program. The stormwater element of the federal NPDES program is mandated by Section 402(p) of the Clean Water Act which is set out in the federal statutes at 33 U.S.C. Section 1342(p) and implemented through federal regulations including 40 Code of Federal Regulations (CFR) 122.26.

Authorized by Section 403.0885, F.S., the Department's federally approved NPDES stormwater program is set out in various provisions within Chapters 62-4, 62-620, 62-621 and 62-624 of the Florida Administrative Code (F.A.C.). Chapter 62-624, F.A.C., specifically addresses Municipal Separate Storm Sewer Systems (MS4s).

The above named permittee is hereby authorized to discharge to waters of the state, in accordance with the approved Stormwater Management Program, effluent limitations, monitoring requirements, and other provisions as set forth in this permit, the application and other documents attached hereto or on file with the Department and made a part hereof, from all portions of the Municipal Separate Storm Sewer System owned or operated by the permittee listed above.

PART I. DISCHARGES AUTHORIZED UNDER THIS PERMIT

A. **Permit Area.** This permit covers all areas located within the political boundary of the City of Orlando that is served by the municipal separate storm sewer system owned or operated by the City of Orlando.

B. **Authorized Discharges.** Except for discharges prohibited under Part I.D., this permit authorizes all existing or new stormwater point source discharges to waters of the state from those portions of the Municipal Separate Storm Sewer System (MS4) owned or operated by the City of Orlando.

C. **Permittee Responsibility.**

1. The permittee is responsible for:

   a. Compliance with permit conditions relating to discharges from portions of the MS4 where they are the operator;

   b. Stormwater management program implementation on portions of the MS4 where they are the operator;

c. Submission of annual reporting requirements as specified in Part V.C. (ANNUAL REPORT);

d. Collection of monitoring data as required by Part V.B.;

e. Insuring implementation of system-wide management program elements, including any system-wide public education efforts;

f. Where permit conditions are established for specific portions of the MS4, the permittee need only comply with the permit conditions relating to those portions of the MS4 for which they are the operator; and

g. A plan of action to assume responsibility for implementation of stormwater management and monitoring programs on their portions of the MS4 should inter-jurisdictional agreements allocating responsibility between parties be dissolved or in default. (See Part II.G.3., of this permit also.)

D. **Limitations on Coverage.** Pursuant to Section 403.0885, and rules promulgated thereunder, and consistent with Section 402(p)(3)(B)(ii) of the Clean Water Act, this permit must include a requirement to effectively prohibit non-stormwater discharges into the storm sewers within the permittee's MS4. Consequently, the following discharges are not authorized by this permit:

1. *Non-stormwater:* discharges of non-stormwater, except where such discharges are:

   a. authorized under the provisions of Chapter 373 or 403, F.S., or rules promulgated thereunder; or

   b. identified by and in compliance with Part II.A.7.a.

2. *Spills*: discharges of material resulting from a spill, except where such discharges are:

   a. the result of an Act of God where reasonable and prudent measures have been taken to minimize the impact of the discharge; or

   b. an emergency discharge required to prevent imminent threat to human health or prevent severe property damage, where reasonable and prudent measures have been taken to minimize the impact of the discharge.

PART II. STORMWATER POLLUTION PREVENTION & MANAGEMENT PROGRAM

As required by Rule 62-624.440(2), F.A.C., which adopts 40 CFR 122.26(d)(2)(iv), the permittee shall implement a comprehensive Stormwater Management Program (SWMP) that shall include pollution prevention measures, treatment or removal techniques, stormwater monitoring, use of legal authority, and other appropriate means to control the quality of stormwater discharged from the MS4.

Controls and activities in the SWMP shall identify areas of permittee jurisdiction. The SWMP shall include controls necessary to effectively prohibit the discharge of non-stormwater into the MS4 and reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable (MEP). Compliance with this SWMP shall be reported annually in the ANNUAL REPORT discussed in Part V.C. of this permit.

Implementation of the SWMP may be achieved through participation with other permit holders, public agencies, or private entities in cooperative efforts to satisfy the requirements of Part II and Part III of the permit in lieu of creating duplicate program elements for each individual permittee. The SWMP, taken as a whole, shall achieve the

"effective prohibition" requirements and "MEP" standards from Section 402(p)(3)(B) of the Clean Water Act, as implemented pursuant to Section 403.0885, F.S., and rules promulgated thereunder.

The SWMP covers the term of the permit and shall be updated as necessary, or as required by the Department, to ensure that it complies with Section 403.0885, F.S., and rules promulgated thereunder, and is consistent with Section 402(p)(3)(B) of the Clean Water Act. Modifications to the SWMP shall be made in accordance with Part II.G. of this permit. Compliance with the SWMP and the compliance schedules in Part III shall be deemed in compliance with Parts II.A. and II.B. of this permit. Specific components of the Stormwater Management Program are identified in Parts II and III to serve as measurable and enforceable elements of this permit.

A. Stormwater Management Program (SWMP) Requirements.

1. *Structural Controls and Stormwater Collection System Operation:* The MS4 and any stormwater structural control shall be operated in a manner to reduce the discharge of pollutants to the *Maximum Extent Practicable* (*MEP*).

    a. The permittee shall implement maintenance activities, including an inspection and maintenance schedule, for the MS4 and structural controls to reduce pollutants (including floatables) to the maximum extent practicable. Suggested inspection and maintenance schedules and activities are provided in Table II.A.1.a. In addition, the permittee shall maintain an internal record keeping system to track inspections and maintenance activities performed during the permit term. If these activities are performed by others under a contractual agreement, then the permittee shall retain copies of the contractual agreement that specifies the maintenance activities to be performed and the schedule of frequency. Inspection and maintenance records shall be retained by the permittee in accordance with Part V.G. of this permit. Annual evaluations shall be made to assess the appropriateness of the inspection and maintenance schedule and to ensure the optimization of equipment use. A summary of the annual evaluation shall be included within each ANNUAL REPORT required under Part V.C. of this permit.

Table II.A.1.a. — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Grass Swales (Dry)	Semi-annual inspection items	• Inspect swales for signs of prolonged wetness and damage to structures including diversion devices, inflow pipes, driveway culverts and swale blocks. • Note any critically eroded areas on banks and front or back slope and swale bottom. Schedule for stabilization. • Undercutting at the point of discharge and paved flumes or pipes and culverts should be noted and scheduled for immediate repair. • Dead or dying grass and saturation of the swale bottom are indications of potential clogging and reduced infiltration capacity. When observed, the facility should be checked to insure that it percolates completely within 3 days following storms to comply with state regulations. Scraping, discing or otherwise aerating the bottom may be required to restore the infiltration capacity of the soil. For best performance, swales should percolate within one day following storms. • Note any signs of excessive petroleum hydrocarbon contamination and handle appropriately. (2)
	As needed	• Mowing and litter and debris removal. • Stabilization of eroded side slopes and bottom. • Repair undercut or eroded areas at culverts, flumes or swale blocks. • Nutrient and pesticide use management. (1) • Dethatch swale bottom and remove thatching. Dispose via composting and land application. As an alternative, remove grass clippings following mowing.
	Annual maintenance or as needed	• Disc or otherwise aerate swale bottom.
	Five-year revolving schedule	• Scrape swale bottom and remove sediment with proper sediment disposal. Restore original cross-section and infiltration rate. (2,3) • Seed or sod to restore ground cover. • Violation of water quality standards for turbidity will often result following initial construction as well as during major maintenance and restoration activities, unless water can be temporarily diverted while seeding and subsequent germination take place. In lieu of diversion, it is advisable to stabilize both the swale bottom and side slopes as quickly as possible by resodding and staking all areas disturbed during swale clean out and restoration operations. Use of netting or geotextile matting in conjunction with seeding operations have also been shown to reduce the potential for erosion and subsequent turbidity problems from roadside swale maintenance.

Table II.A.1.a. — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Ponds (Dry Retention)	Semi-annual inspection items	• Inspect facility for signs of prolonged wetness and damage to structures including diversion devices and inflow and outflow structures and pipes. • Note any critically eroded areas on banks and pond bottom. Schedule for stabilization. • Undercutting at the point of discharge and signs of piping in the vicinity of the control structure or inlets, flumes, diversion structures or pipes should be noted and scheduled for immediate repair. • Dead or dying grass on the pond bottom are indications of potential clogging and reduced infiltration capacity. When observed, the facility should be checked to insure that it percolates completely within 2-3 days following storms. Scraping, discing or otherwise aerating pond bottom may be required to restore the infiltration capacity of the soil. Standing water may need to be pumped from the facility or be otherwise drained to effect restoration of the infiltration basin. The owner or owner's representative should contact FDEP or the appropriate WMD to advise the permitting authority of the need to perform the drawdown. • Note any signs of excessive petroleum hydrocarbon contamination and handle appropriately. (2)
	As needed	• Mowing and litter and debris removal. • Stabilization of eroded banks. • Repair undercut or eroded areas at inflow and diversion structures or conveyances. • Nutrient and pesticide use management. (1) • Dethatch pond bottom and remove thatching. Dispose via composting and land application. As an alternative, remove grass clippings following mowing.
	Annual maintenance or as needed	• Disc or otherwise aerate pond bottom.
	Five-year revolving schedule	• Scrape pond bottom and remove sediment with proper sediment disposal. Restore original cross-section and infiltration rate. (2,3) • Seed or sod to restore ground cover or allow for rapid natural seed germination/vegetation propagation. Use netting, staked in place, in conjunction with dry organic mulch (hay or straw) or other suitable techniques to protect from erosion and promote more rapid ground cover.

Table II.A.1.a. — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Pond (Dry Detention with Sand Filter System)	Semi-annual inspection items	• Inspect facility for evidence of damage and short-circuiting of the filter. Close attention should be given to the filter box, bed, trench or mound and appurtenant works. Signs of piping (erosion of filter sand) into underdrain pipes or holes next to junction box and/or discharge control structures or exposure of coarse aggregate or geotextile surrounding the underdrain pipe should be noted and scheduled for immediate repair. • Note any critically eroded areas on banks, pond bottom or filter. Schedule for stabilization. • Any undercutting at the point of discharge and erosion in the vicinity of inflow pipes, flumes and diversion structures should be noted and scheduled for immediate repair. • Dead or dying grass on the pond bottom and/or standing water following 3 days or more of dry weather are indicative of filter "blinding." When observed, the facility should be scheduled for major maintenance. Standing water may need to be pumped from the facility or be otherwise drained to effect restoration of the filter. The owner or owner's representative should contact FDEP or the appropriate Water Management District to advise the permitting authority of the need to perform the drawdown. • Note signs of excessive petroleum contamination and handle appropriately. (2) • If so equipped check "clean out" ports at the end of each underdrain and the junction box or underdrain outlet for evidence of blockage (i.e., standing water in underdrain lateral accompanied by little or no outflow). • Schedule cleaning of underdrain pipes via mechanical means or high-pressure water jet as appropriate. Also inspect for damage to caps from mowing accidents or any breaks in seals to prevent short-circuiting of the filter.
	As needed	• Mowing and removal of grass clippings. • Litter and debris removal from banks and control structure or screens. Remove sediment buildup obstructing inflows. • Stabilization of eroded banks. • Repair undercut and eroded areas in the vicinity of the discharge point or other structures such as inlet flumes, inflow pipes and energy dissipators. • Nutrient and pesticide use management. (1)
	Semi-annual or as needed maintenance	• Minor corrective maintenance of filtration components should be scheduled any time drawdown does not occur within 48 hours after a storm. This activity usually involves simple light discing, raking, or aeration of sod cover or the surface of the filter. Confined unit "vault or box" type systems may be backflushed (i.e., fluidized) if these capabilities are available.

Table II.A.1.a. — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Pond (Dry Detention with Sand Filter System) [cont.]	18 months or as needed to maintain 72 hour drawdown capacity	• Major maintenance of filtration components is required any time that nuisance conditions (standing water) persist for more than 3 days following storms. This activity involves removal and replacement of ballast gravel and geotextile covers when used. Any sod cover or the top 2-3 inches of sand must be removed in cases involving vegetated or open sand filter beds. All discolored, sediment contaminated sand must be removed and replaced with clean sand of a type equivalent to the original grade. • Sediment and contaminated sand must be disposed of properly. (2,3) • Seed or sod to restore any dead or severely damaged ground cover. Use netting, staked in place, in conjunction with dry organic mulch (hay or straw) or other suitable techniques to protect from erosion and promote more rapid ground cover. • At select locations, excavate down to and check underdrain pipe for clogging of the orifices, slots and/or fabric sock surrounding the pipe if used. Clean or otherwise replace pipe as needed to restore drainage capacity.
	Annual or as needed to maintain 72 hour drawdown limit. (Confined Unit or Box Type Filter)	• Major maintenance of filtration components associated with "confined unit" type filters is usually more frequent than with other filtration devices. The activities required are facilitated, however, by the unit's compact nature. Complete removal and replacement of geotextile, filter sand, and the ballast stone or gravel when used is normally required. • Restore damaged ground cover on the pond bottom and protect from erosion. • Fabric wrapped underdrain pipe should be closely inspected and replaced if clogged. Perforated or slotted pipe should be checked for damage or restricted openings. Replace or clean underdrains as needed to restore drainage capacity.

Table II.A.1.a — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Pond (Wet Detention Facility)	Semi-annual inspection items	• Detention facilities that include constructed wetlands (littoral shelf) components should be monitored carefully to avoid invasive aquatic plant problems. Schedule removal of invasive species or chemical control when necessary to prevent excessive competition with beneficial or desired plants. (1) • Note those areas within the littoral zone where the spread or overcrowding of beneficial plants necessitates management and harvesting.
	Annual inspection items	• Inspect facility for damage. Close attention should be given to the control structure and the point of discharge (POD). • Undercutting at the POD and evidence of piping (erosion of soil into pipe junctions) and/or erosion in the vicinity of inflow pipes, the outlet control structure or flumes should be noted and scheduled for immediate repair. • Note signs of excessive total petroleum hydrocarbon contamination and handle appropriately. (2) • Monitor sediment accumulations and remove when ¼ of storage volume is filled. (3) • Check for apparent signs of hypereutrophic conditions and note areas that require invasive aquatic plant control. • Bleeder devices such as orifices as well as weirs, stand pipes, box drop inlets, grates and screens should clean, free of debris and ready for service. • All control gates should be checked for operational capacity by briefly opening and closing valve. • Forebays/sediment sumps should be monitored for sediment accumulation. The "Cleanout Level" should be calculated for each facility and the sump should be scheduled for sediment removal based on the limit established for the facility and the sediment accumulation rate.
	As needed	• Repair and stabilize undercut and eroded areas near structures and banks. • Mowing side slopes with litter and debris removal from banks. • Nutrient and pesticide use management. (1)
	Monthly maintenance or as needed	• Clean and remove debris from orifices, weirs, stand pipes, drop inlets and screens.
	Semi-annual maintenance	• Invasive aquatic plant control. (1)

Table II.A.1.a — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Pond (Wet Detention Facility) [cont.]	Annual or as needed maintenance	• Aquatic plant management and harvesting. Manage constructed wetland components to prevent overcrowding of beneficial plants and to maintain adequate open water area for aesthetics, light penetration and oxygenation. It is also important to avoid excessive cover for insect (mosquito) larvae that enhances production and inhibits predation. Not more than a 50 percent reduction in open water area is recommended prior to mechanical harvesting and reduction of macrophytes cover to its original level (i.e., 30-35 percent in most instances). • Constructed wetland management (regular selective harvesting) to encourage sites for active growth and enhanced pollutant assimilation is recommended.
	Five-year revolving schedule or as needed.	• Removal of sediment from forebays or sediment sumps and dispose of properly. (2,3) Sediment "cleanout level" should not be higher than 1 foot below the control elevation of the bay or sump nor should the storage volume be reduced by more than 60 percent of original design (i.e., Cleanout Level = .2 in./acre drainage area remaining storage volume in cases where the original design calls for .5 inches of runoff volume below the control elevation in the forebay or sediment sump.).
	As needed to maintain adequate storage volume and treatment.	• Monitor sediment accumulations and remove when ¼ storage volume is filled or when hypereutrophic conditions become apparent. Sediment must be disposed of or used properly. (2,3)
Stormwater Treatment Pond (Wet Detention w/Sand Filtration)	Annual inspection items	• Inspect filtration component in accordance with type of system as per "Dry Detention w/Sand Filter" guidelines. • Inspect detention pond component as described in "Wet Detention" guidelines. • Close attention should be given to the filtration component particularly evidence of short-circuiting associated with piping in the vicinity of underdrain junctions and the control structure.
	As needed	• Maintain bank filter bed, trench or box as described in Dry Detention w/Sand Filter guidelines to maintain 72-hour drawdown limit. • Flood control components (weirs, risers, drop boxes and discharge pipes) should be clean and ready for service. • Mowing banks and grass clipping removal. • Litter and debris removal from banks. • Stabilization of eroded banks and repair of undercutting or piping in the vicinity of inlets, outlet control structures, and point of discharge. Nutrient and pesticide use management. (1)

Table II.A.1.a — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Stormwater Treatment Pond (Wet Detention w/Sand Filtration) [cont.]	Monthly maintenance or as needed	• Litter and debris removal from control structure and screens.
	Annual maintenance or as needed	• Invasive plant species removal. (1)
	As needed	• Sediment removal with proper sediment disposal to ensure that the depth of sediments does not exceed ¼ of the design cross-sectional area of the pond. (2,3)
Pump Station	Semi-annual inspection items	• Inspect pump for proper operation and schedule any necessary repairs or replacement of worn parts. • Inspect sump in the vicinity of pump intake for excessive sediment, litter and debris accumulation. • A "Cleanout Level" should be established for sediment sumps and the sump should be scheduled for sediment removal based on the limit established for the facility and the sediment accumulation rate. Cleanout levels should be established not less than 1 foot below the intake elevation of the pump or as otherwise needed to prevent re-suspension of particulates and excessive turbidity in discharge water.
	As needed	• Where bar screens are used to protect the pump, remove screens and clean. Properly dispose of litter and debris collected. • Remove any accumulated sediment collected from near pump intake point and/or sediment sump and provide proper disposal. (2,3)
Pollution Control Boxes (Catch Basins w/Oil Grease & Grit Separation Chambers)	Semi-annual inspection items	• Monitor facility for sediment accumulation. • Inspect appurtenances such as grates, oil and grit separation chambers, over flow weirs, and discharge pipes. Over flow weirs and grated inlets should be free of debris and ready for service. Sedimentation and oil/grit separators should be scheduled for cleaning when sediment depth approaches cleanout level. Cleanout levels should be established not less than 1 foot below the control elevation of the chamber.
	As needed	• Remove leaves, litter, and debris from the outfall pipe and grated inlets or screens. • Remove sediment from oil and grit chamber of catch basin and dispose of properly. (2,3) Cleanout may be facilitated by suction hose and vactor truck.

Table II.A.1.a — SUGGESTED INSPECTION AND MAINTENANCE SCHEDULES AND ACTIVITIES

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION AND MAINTENANCE	INSPECTION AND MAINTENANCE ACTIVITIES
Exfiltration Trench	Semi-annual inspection items	• Monitor facility for sediment accumulation in the pipe (when used) and storage volume recovery (i.e., drawdown, capacity). Observation wells and inspection ports should be checked following 3 days minimum dry weather. Failure to percolate stored runoff to the design treatment volume level within 72 hours indicates blinding of soil in the trench walls and/or clogging of geotextile liner with fine solids. Reductions in storage volume due to sediment in the distribution pipe also reduces efficiency. Minor maintenance measures can restore exfiltration rates to acceptable levels short term. Major maintenance (total rehabilitation) is required when accumulated sediment has reduced the effective treatment volume to an unacceptable level or to restore recovery rate when minor measures are no longer effective or cannot be performed due to design configuration. • Inspect appurtenances such as sedimentation and oil and grit separation chambers of catch basins as well as diversion devices and over flow weirs when used. Diversion facilities and over flow weirs should be free of debris and ready for service. Sedimentation and oil/grit separators should be scheduled for cleaning when sediment depth approaches cleanout level. Cleanout levels should be established not less than 1 foot below the control elevation of the chamber.
	As needed	• Remove sediment from sediment/oil and grease chamber of catch basin inlets and dispose of properly. (2,3) • Remove debris from the outfall or "smart box" (diversion device) in the case of off-line facilities.
	Five-years or as needed to prolong service.	• When bypass capability is available minor maintenance measures such as extended dry periods may be used to provide short-term recovery of exfiltration rate. • Remove accumulated sediment from facilities constructed with manholes or other appurtenant structures to facilitate cleanout. Sediment should be disposed of properly. (2,3) This process normally involves facilities with large pipes. Cleanout may be performed by suction hose and vactor truck and/or by high-pressure jet washing.
	10-15 years or as needed.	• Total rehabilitation of trench to maintain storage capacity within 2/3 of the design treatment volume and 72-hour exfiltration rate limit. Excavate and remove perforated or slotted pipe, surrounding coarse aggregate envelope (bedding) and geotextile fabric (wrap). In most cases renovation will require replacement with new material of equivalent grade and quality. Trench walls should be excavated to expose clean soil. Sediment contaminated soil, coarse aggregate and filter cloth should be disposed of properly. (2,3)

Notes:

1. As a rule, pesticides should not be used in association with the maintenance of stormwater management systems. When mechanical control or other options prove to be impractical, use only pesticides approved by U.S. EPA and FDACS for aquatic sites. Violation of water quality standards in receiving waters resulting from the use of chemicals within the treatment facility may be punishable under state law. Careful herbicide selection and application are important to avoid harm to desirable plants and animals. Applicators must be experienced and well trained in plant identification to selectively control undesirable plants while avoiding detrimental effects on desirable vegetation and possible downstream contamination. For assistance, contact the Florida Department of Environmental Protection, Bureau of Aquatic Plant Management, regional biologist, the local County Cooperative Extension Service agent or University of Florida IFAS Center for Aquatic Plants in Gainesville.

   To maintain the permitted or required treatment efficiency associated with a wet detention pond, the littoral vegetation should never be entirely removed or eradicated with chemicals. At least 30% of the surface area of the pond must remain vegetated with appropriate vegetation. A good management plan that provides for periodic removal of aquatic vegetation at select locations on a rotational basis is strongly encouraged. This practice helps to remove accumulated nutrients that otherwise promote over enrichment and reduced aesthetic value. Regular maintenance of this nature slows the rate of accumulation of organic matter and the loss in treatment capacity from these processes. A good management program will prolong the useful life of the facility and decrease the frequency and costs incurred for major maintenance like dredging. When done regularly, mechanical removal can help control unwanted aquatics such as cattails. As a secondary benefit, more active growth of desired plants such as pickerelweed and arrowhead is also encouraged. Harvesting the vegetation increases the rate of assimilation of nutrients by increasing plant growth and can balance the loss of treatment associated with the reduction in plants.

   Soil amendments (fertilizer) should be used, as needed, to establish and maintain a healthy and vigorous cover on the banks of treatment facilities. Once ground cover is well established, normal rates of fertilization should be lowered near stormwater ponds to avoid over enrichment of the soil and adjacent waters. Following construction or reconstruction, do not apply soil amendments within 15 to 20 feet of the edge of the pond unless fertility problems are evident. When mowing the grass, be careful not to divert clippings into the pond. Remove clippings to prevent the buildup of nutrients in those areas subject to periodic or frequent inundation.

   Problem areas susceptible to chronic erosion require more intense measures for protection and establishment of permanent vegetative cover. These special considerations may include the use of sod instead of seeding. Also, higher fertilization rates and provisions to provide temporary irrigation during dry weather conditions help insure more rapid establishment and vigorous growth in bank vegetation. Experts in soil conservation are available for assistance by contacting the local office of the Natural Resources Conservation Service with USDA.

2. Excessive petroleum hydrocarbon contamination can present severe sediment disposal problems. Evidence may include very dark oily stains particularly at inlet and outlet structures and strong odors of gasoline. The source of such inputs should be found and removed if possible. Pretreatment practices should be used whenever practical and as necessary, to insure that influent runoff water is not contaminated so as to produce objectionable odors or a noticeable oil sheen over a significant portion of the pond surface.

3. Sediments associated with stormwater treatment devices should be regarded as contaminated well beyond the levels in runoff itself. When disposed of haphazardly, this material may become a source of pollution. Pollutants associated with stormwater sediment include high nutrients and oxygen demanding substances, heavy metals, petroleum hydrocarbons and other volatile and semi-volatile organic compounds, pesticides and infectious organisms. However, absent the regular addition of refuse, paints, solvents, cleaning agents, pesticides and spilled fuels, etc. there is little probability that the sediment would be a

NPDES MS4 Permit No. FLS000038
Maintenance Schedule

STATE OF FLORIDA
MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT

PERMIT NUMBER: FLS000038 – MAJOR Facility

ISSUANCE DATE:

EXPIRATION DATE:

Seminole County – Municipal Separate Storm Sewer System Permittees:

PERMITTEES:

Seminole County
520 West Lake Mary Blvd., Suite 200
Sanford, Florida 32773

City of Altamonte Springs
225 Newburyport Avenue
Altamonte Springs, Florida 32701

City of Casselberry
95 Lake Triplet Drive
Casselberry, Florida 32707

City of Lake Mary
100 North County Club Road
Post Office Box 958445
Lake Mary, Florida 32795-8445

City of Longwood
175 West Warren Avenue
Longwood, Florida 32750

City of Oviedo
400 Alexandria Boulevard
Oviedo, Florida 32765

City of Sanford
300 North Park Avenue
Post Office Box 1788
Sanford, Florida 32772-1788

City of Winter Springs
1126 East State Road 434
Winter Springs, Florida 32708

Florida Department of Transportation, District Five
719 South Woodland Boulevard
Deland, Florida 32720-6800

This permit is issued pursuant to Section 403.0885, Florida Statutes (F.S.), and rules promulgated thereunder. The Department of Environmental Protection (the Department) implements the stormwater element of the federal National Pollutant Discharge Elimination System (NPDES) as part of the Department's Wastewater Facility and Activities Permitting program. The stormwater element of the federal NPDES program is mandated by Section 402(p) of the Clean Water Act (CWA), which is set out in the federal statutes at 33 U.S.C. Section 1342(p) and implemented through federal regulations including 40 Code of Federal Regulations (CFR) 122.26.

Authorized by Section 403.0885, F.S., the Department's federally approved NPDES stormwater program is set out in various provisions within Chapters 62-4, 62-620, 62-621 and 62-624 of the Florida Administrative Code (F.A.C.). Chapter 62-624, F.A.C., specifically addresses Municipal Separate Storm Sewer Systems (MS4s).

The above named permittees are hereby authorized to discharge to waters of the state, in accordance with the approved Stormwater Management Programs (SWMPs) elements, effluent limitations, monitoring requirements, and other provisions as set forth in this permit, the application and other documents attached hereto or on file with the Department and made a part hereof, from all portions of the MS4 owned or operated by any permittee listed above.

PART I. DISCHARGES AUTHORIZED UNDER THIS PERMIT

A. **Permit Area.** This permit covers all areas located within the political boundary of Seminole County that is served by the MS4 owned or operated by the permittees identified above.

B. **Authorized Discharges.** Except for discharges prohibited under Part I.D, this permit authorizes all existing or new stormwater point source discharges to waters of the state from those portions of the MS4 owned or operated by the permittees.

C. **Permittee's Responsibility.**

1. Permittees are individually responsible for:

   a. Compliance with permit conditions relating to discharges from portions of the MS4 where they are the operator;

   b. SWMP implementation on portions of the MS4 where they are the operator;

   c. Where permit conditions are established for specific portions of the MS4, the permittees need only comply with the permit conditions relating to those portions of the MS4 for which they are the operator;

   d. A plan of action to assume responsibility for implementation of stormwater management and monitoring programs on their portions of the MS4 should inter-jurisdictional agreements allocating responsibility between permittees be dissolved or in default. (See Part II.G.3 of this permit also.);

   e. Submission of annual reporting requirements as specified in Part V.C (ANNUAL REPORT).

2. Permittees are jointly responsible for:

   a. Collection of monitoring data as required by Part V.B; and

   b. Ensure implementation of system-wide management program elements, including any system-wide public education efforts.

D. **Limitations on Coverage.** Pursuant to Section 403.0885, F.S., and rules promulgated thereunder, and consistent with Section 402(p)(3)(B)(ii) of the CWA, this permit must include a requirement to effectively prohibit non-stormwater discharges into the storm sewers within each permittee's MS4. Consequently, this permit does not authorize the following discharges:

1. *Non-stormwater:* discharges of non-stormwater, except where such discharges are:

   a. Authorized under the provisions of Chapter 373 or 403, F.S., or rules promulgated thereunder; or

   b. Identified by and in compliance with Part II.A.7.a.

2. *Spills*: discharges of material resulting from a spill, except where such discharges are:

   a. The result of an Act of God where reasonable and prudent measures have been taken to minimize the impact of the discharge; or

   b. An emergency discharge required to prevent imminent threat to human health or prevent severe property damage, where reasonable and prudent measures have been taken to minimize the impact of the discharge.

PART II. STORMWATER POLLUTION PREVENTION AND MANAGEMENT PROGRAMS

As required by Rule 62-624.440(2), F.A.C., which adopts 40 CFR 122.26(d)(2)(iv), each permittee shall implement a comprehensive SWMP that shall include pollution prevention measures, treatment or removal techniques, stormwater monitoring, use of legal authority, and other appropriate means to control the quality of stormwater discharged from the MS4.

Controls and activities in the SWMPs shall identify areas of permittee jurisdiction. The SWMPs shall include controls necessary to effectively prohibit the discharge of non-stormwater into the MS4 and reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable. Compliance with the SWMPs shall be reported annually in the ANNUAL REPORT discussed in Part V.C of this permit.

Implementation of the SWMPs may be achieved through participation with other permit holders, public agencies, or private entities in cooperative efforts to satisfy the requirements of Part II and Part III of the permit in lieu of creating duplicate program elements for each individual permittee. However, each permittee remains responsible for annually reporting on the program elements conducted by the other entity within their jurisdictional area. Each SWMP, taken as a whole, shall achieve the "effective prohibition" requirements and "Maximum Extent Practicable" standards from Section 402(p)(3)(B) of the CWA, as implemented pursuant to Section 403.0885, F.S., and rules promulgated thereunder.

Each SWMP covers the term of the permit and shall be updated as necessary, or as required by the Department, to ensure that it complies with Section 403.0885, F.S., and rules promulgated thereunder, and is consistent with Section 402(p)(3)(B) of the CWA. Modifications to SWMPs shall be made in accordance with Part II.G of this permit. Compliance with the SWMPs and the compliance schedules in Part III shall be deemed in compliance with Parts II.A and II.B of the permit. The latest approved version of the Florida Department of Transportation's Statewide Stormwater Management Plan for MS4 Permits is hereby incorporated into this permit by reference and thus its contents are enforceable elements of the permit. Specific components of the SWMPs are identified in Parts II and III to serve as measurable and enforceable elements of this permit.

A. Stormwater Management Program (SWMP) Requirements.

1. *Structural Controls and Stormwater Collection System Operation:* The MS4 and any stormwater structural control shall be operated in a manner to reduce the discharge of pollutants to the Maximum Extent Practicable.

    a. Each permittee, except FDOT District Five, shall comply with the inspection and maintenance requirements in Table II.A.1.a for these controls. FDOT District Five shall comply with the inspection and maintenance schedule included in the FDOT Statewide Stormwater Management Plan. In addition, the permittees shall maintain an internal record keeping system to track inspections and maintenance activities performed during the permit term. If these activities are performed by others under a contractual agreement, then the permittees shall retain copies of the contractual agreement that specifies the maintenance activities to be performed and the schedule of frequency. Inspection and maintenance records shall be retained by the permittees in accordance with Part V.G of this permit. Annual evaluations shall be made to assess the appropriateness of the inspection and maintenance schedule. A summary of the annual evaluation shall be included within each ANNUAL REPORT required under Part V.C of this permit.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Ponds (Dry Retention)	Biennially	Biennial Inspection Items	• Inspect facility for signs of prolonged wetness and damage to structures including diversion devices and inflow and outflow structures and pipes. • Note any critically eroded areas on banks and pond bottom, and schedule for stabilization immediately. • Undercutting at the point of discharge and signs of piping in the vicinity of the control structure or inlets, flumes, diversion structures or pipes should be noted and scheduled for immediate repair. • Dead or dying grass on the pond bottom are indications of potential clogging and reduced infiltration capacity. Scrapping, discing or otherwise aerating pond bottom may be required to restore the infiltration capacity of the soil. • Note any signs of excessive petroleum hydrocarbon contamination and handle appropriately. (1)
		As Needed	• Mow side slope; remove litter and debris from banks. • Stabilization of eroded banks. • Repair undercut or eroded areas at inflow and diversion structures or conveyances. • Nutrient and pesticide use management. (2) • Disk or otherwise aerate pond bottom.
		As Needed To Maintain Performance As Per Original Pond Design	• Scrape pond bottom and remove sediment with proper sediment disposal. Restore original cross-section and infiltration rate. (1,3) • Seed or sod to restore ground cover.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Pond (Dry Detention with Sand Filtration System)	Biennially	Biennial Inspection Items	• Inspect facility for evidence of damage and short-circuiting of the filter. Close attention should be given to the filter box, bed, trench or mound and appurtenant works. Signs of piping (erosion of filter sand) into underdrain pipes or holes next to junction box and/or discharge control structures or exposure of coarse aggregate or geotextile surrounding the underdrain pipe should be noted and scheduled for repair. • Note any critically eroded areas on banks, pond bottom or filter, and schedule for stabilization immediately. • Any undercutting at the point of discharge and erosion in the vicinity of inflow pipes, flumes and diversion structures should be noted and scheduled for repair. • Dead or dying grass on the pond bottom and/or standing water following 3 days or more of dry weather are indicative of filter "blinding." When observed, the facility should be scheduled for major maintenance. • Note signs of excessive petroleum contamination and handle appropriately. (1) • If so equipped, check "clean out" ports at the end of each underdrain and the junction box or underdrain outlet for evidence of blockage (i.e., standing water in underdrain lateral accompanied by little or no outflow). • Inspect underdrain and schedule cleaning of underdrain pipes via mechanical means or high pressure water jet as appropriate. • Inspect for damage to caps from mowing accidents or any breaks in seals to prevent short-circuiting of the filter.
		As Needed	• Mowing and removal of grass clippings. • Litter and debris removal from banks and control structure or screens. Remove sediment buildup obstructing inflows. • Stabilization of eroded banks. • Repair undercut and eroded areas in the vicinity of the discharge point or other structures such as inlet flumes, inflow pipes and energy dissipators. • Nutrient and pesticide use management. (2)

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Pond (Dry Detention with Sand Filtration System) [cont.]	Biennially	As Needed	• Minor corrective maintenance of filtration components should be scheduled to maintain drawdown performance as per original pond design. This activity usually involves simple light discing, raking or aeration of sod cover or the surface of the filter. Confined unit "vault or box" type systems may be backflushed (i.e., fluidized) if these capabilities are available.
		As Needed To Maintain Performance As Per Original Pond Design	• Maintenance of filtration components is required any time that nuisance conditions (i.e., standing water) persist for more than 3 days following storms. This may involve removal and replacement of ballast gravel and geotextile covers when used. Any sod cover or the top 2-3 inches of sand must be removed in cases involving vegetated or open sand filter beds. All discolored, sediment contaminated sand must be removed and replaced with clean sand of a type equivalent to the original grade. • Sediment and contaminated sand must be disposed of or used properly. (1,3) • Seed or sod to restore any dead or severely damaged ground cover. Use suitable techniques to protect pond from erosion and promote more rapid ground cover. • At select locations, excavate down to and check underdrain pipe for clogging of the orifices, slots and/or fabric sock surrounding the pipe if used. Clean or otherwise replace pipe as needed to restore drainage capacity.
		As Needed To Maintain Performance As Per Original Pond Design (Confined Unit or Box Type Filter)	• Maintenance of filtration components associated with "confined unit" type filters is usually more frequent than with other filtration devices. The activities required are facilitated, however, by the unit's compact nature. Complete removal and replacement of geotextile, filter sand, and the ballast stone or gravel when used is normally required. • Restore damaged ground cover on the pond bottom and protect from erosion. • Fabric wrapped underdrain pipe should be closely inspected and replaced if clogged. Perforated or slotted pipe should be checked for damage or restricted openings. Replace or clean underdrains as needed to restore drainage capacity.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Pond (Wet Detention)	Biennially	Biennial Inspection Items	• Inspect facility for damage. Close attention should be given to the control structure and the point of discharge (POD). • Undercutting at the POD and evidence of piping (erosion of soil into the pipe junctions) and/or erosion in the vicinity of inflow pipes, the outlet control structure, or flumes should be noted and scheduled for repair. • Note signs of excessive total petroleum hydrocarbon contamination and handle appropriately. (1) • Monitor sediment accumulations and remove when ¼ of storage volume is filled. (3) • Check for apparent signs of hypereutrophic conditions and note areas that require invasive aquatic plant control. • Bleeder devices such as orifices as well as weirs, stand pipes, box drop inlets, grates, and screens should clean, free of debris and ready for service. • All control gates should be checked for operational capacity by briefly opening and closing valve. • Forebays/sediment sumps should be monitored for sediment accumulation. The "Cleanout Level" should be calculated for each facility and the sump should be scheduled for sediment removal based on the limit established for the facility and the sediment accumulation rate. • Detention facilities that include constructed wetlands (littoral shelf) components should be monitored carefully to avoid invasive aquatic plant problems. Schedule removal of invasive species or chemical control when necessary to prevent excessive competition with beneficial or desired plants. (2) • Note those areas within the littoral zone where the spread or overcrowding of beneficial plants necessitates management and harvesting.
		As Needed	• Repair and stabilize undercut and eroded areas near structures and banks. Stabilize eroded banks. • Mow side slope; remove litter and debris from banks. • Nutrient and pesticide management. (2) • Clean and remove debris from orifices, weirs, stand pipes, drop inlets and screens. • Invasive aquatic plant control. (2)

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Pond (Wet Detention) [cont.]	Biennially	As Needed	• Aquatic plant management and harvesting. Manage constructed wetland components to prevent overcrowding of beneficial plants to maintain adequate open water area for aesthetics, light penetration and oxygenation. It is also important to avoid excessive cover for insect (mosquito) larvae, which enhances production and inhibits predation. Not more than a 50 percent reduction in open water area is recommended prior to mechanical harvesting and reduction of macrophyte cover to its original level (i.e., 30-35 percent in most instances). • Constructed wetland management (regular selective harvesting) to encourage sites for active growth and enhanced pollution assimilation is recommended. • Removal of sediment from forebays or sediment sumps and dispose of properly. (1, 3) Sediment "clean out" should not be higher than 1 foot below the invert elevation of the bay or sump nor should the storage volume be reduced by more than 60 percent of original design, (i.e., Cleanout Level = .2 in/acre drainage area remaining storage volume in most cases.)
		As Needed to Maintain Adequate Storage Volume and Treatment	• Monitor sediment accumulations and remove when ¼ storage volume is filled or when hypereutrophic conditions become apparent. Sediment must be disposed of or used properly. (1, 3)
Stormwater Treatment Pond (Wet Detention with Sand Filtration)	Biennially	Biennial Inspection Items	• Inspect filtration component in accordance with type of system as described in "Dry Detention with Sand Filtration" guidelines. • Inspect detention component as described in "Wet Detention" guidelines. • Close attention should be given to the filtration component particularly evidence of short-circuiting associated with piping in the vicinity of underdrain junctions and the control structure.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Stormwater Treatment Pond (Wet Detention with Sand Filtration) [cont.]	Biennially	As Needed	• Maintain bank filter bed, trench or box as described in "Dry Detention with Sand Filtration" guidelines to maintain performance as per pond design. • Flood control components (weirs, risers, drop boxes and discharge pipes) should be clean and ready for service. • Mowing banks. • Litter and debris removal from banks. • Stabilization of eroded banks and repair of undercutting or piping in the vicinity of inlets, outlets control structures and point of discharge. • Nutrient and pesticide use management. (2) • Litter and debris removal from control structure and screens. • Invasive plant species removal (2). • Sediment removal with proper sediment disposal to ensure that the depth of sediments does not exceed ¼ of the design cross-section area of the pond. (1,3)
Pump Stations	Annually	Annual Inspection Items	• Inspect pump for proper operation and schedule any necessary repairs or replacement of worn parts. • Inspect sump in the vicinity of pump intake for excessive sediment, litter and debris accumulation. • A "Cleanout Level" should be established for sediment sumps and the sump should be scheduled for sediment removal based on the limit established for the facility and the sediment accumulation rate. Cleanout levels should be established not less than 1 foot below the intake elevation of the pump or as otherwise needed to prevent resuspension of particulates and excessive turbidity in discharge water.
		As Needed	• Where bar screens are used to protect the pump, clean the screens. Properly dispose of litter and debris collected. • Remove any sediment collected and provide proper disposal. (1,3)

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Exfiltration Trench	Annually	Annual Inspection Items	• Monitor facility for sediment accumulation in the pipe (when used) and storage volume recovery (i.e., drawdown capacity). Observation wells and inspection ports should be checked following 3 days minimum dry weather. Failure to percolate stored runoff to the design treatment volume level within 72 hours indicates binding of soil in the trench walls and/or clogging of geotextile liner with fine solids. Reductions in storage volume due to sediment in the distribution pipe, also reduces efficiency. Minor maintenance measures can restore infiltration rates to acceptable levels short term. Major maintenance (total rehabilitation) is required to remove accumulated sediment in most cases or to restore recovery rate when minor measures are no longer effective or cannot be performed due to design configuration. • Inspect appurtenances such as sedimentation and oil and grit separation chambers of catch basins as well as diversion devices and overflow weirs when used. Diversion facilities and overflow weirs should be free of debris and ready for service. Sedimentation and oil/grit separators should be scheduled for cleaning when sediment depth approaches cleanout level. Cleanout levels should be established not less than 1 foot below control elevation of the chamber.
		As Needed	• Remove sediment from sediment/oil and grease chamber of each catch basin inlet, and dispose of properly. (1,3) • Remove debris from the outfall or “Smart Box” (diversion device in the case of off-line facilities).
		As Needed To Maintain Storage Capacity Within 2/3 Of The Design Treatment Volume And 72-Hour Exfiltration Rate Limit	• Total rehabilitation of trench. Excavate and remove perforated or slotted pipe, surrounding coarse aggregate envelope (bedding) and geotextile fabric (wrap). In most cases renovation will require replacement with new material of equivalent grade and quality. Trench walls should be excavated to expose clean soil. Sediment, contaminated soil, coarse aggregate, and filter cloth shall be disposed of properly. (1,3)

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Exfiltration Trench [cont.]	Annually	As Needed To Prolong Service	• When bypass capability is available, minor maintenance measures such as extended dry periods may be used to provide short-term recovery of exfiltration rate. • Remove accumulated sediment from facilities constructed with manholes or other appurtenant structures to facilitate cleanout. Sediment shall be disposed of properly. (1,3) This process normally involves facilities with large pipes. Cleanout may be performed by suction hose and tank truck and/or by high-pressure jet washing.
Channel Control Structures	Annually	As Needed	• Litter and debris removal. • Sediment removal with proper sediment disposal. (1,3)
Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers)	Annually	Annual Inspection Items	• Monitor facility for sediment accumulation. • Inspect appurtenances such as grates, oil and grit separation chambers, overflow weirs, and discharge pipes. Overflow weirs and grated inlets should be free of debris and ready for service. Sedimentation and oil/grit separators should be scheduled for cleaning when sediment depth approaches cleanout level. Cleanout levels should be established not less than 1 foot below the control elevation of the chamber.
		As Needed	• Remove leaves, litter and debris from the outfall pipe and grated inlets or screens. • Remove sediment from oil and grit chamber of catch basin and dispose of properly. (1,3) Cleanout may be facilitated by suction hose and vactor truck.
Grass Swales (Dry)	Biennially	Biennial Inspection Items	• Inspect swales for signs of prolonged wetness and damage to structures including diversion devices, inflow pipes, driveway culverts, and swale blocks. • Note any critically eroded areas on banks and front or back slope and swale bottom, and schedule for stabilization immediately. • Undercutting at the point of discharge and paved flumes or pipes and culverts should be noted and scheduled for repair.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Grass Swales (Dry) [cont.]	Biennially	Biennial Inspection Items	• Dead or dying grass and saturation of the swale bottom are indications of potential clogging and reduced infiltration capacity. When observed the facility should be checked to insure that it percolates completely within 3 days following storms. Scraping, discing or otherwise aerating the bottom may be required to restore the infiltration capacity of the soil. For best performance swales should percolate within one day following storms. • Note any signs of excessive petroleum hydrocarbon contamination and handle appropriately. (1)
		As Needed	• Mow and remove litter and debris. • Stabilization of eroded side slopes and bottom. • Repair undercut or eroded areas at culverts, flumes, or swale blocks. • Nutrient and pesticide use management. (2) • Disc or otherwise aerate swale bottom.
		As Necessary to Maintain Adequate Storage Volume and Treatment	• Scrape swale bottom and remove sediment with proper sediment disposal. Restore original cross-section and infiltration rate. (1,3) • Seed or sod to restore ground cover. • Violation of water quality standards for turbidity will often result following initial construction as well as during major maintenance and restoration activities, unless water can be temporarily diverted while seeding and subsequent germination take place. In lieu of diversion it is advisable to stabilize both the swale bottom and side slopes as quickly as possible by resodding and staking all areas disturbed during swale clean out and restoration operations. Use of netting or geotextile matting in conjunction with seeding operations also reduce the potential for erosion and subsequent turbidity problems from roadside swale maintenance.
Swirl Box	Annually	As Needed	• Remove accumulated sediment from structures to facilitate box cleanout. Sediment shall be disposed of properly. (1,3) Cleanout may be performed by suction hose and tank truck and/or by high-pressure jet washing.

TABLE II.A.1.a — INSPECTION AND MAINTENANCE SCHEDULE FOR STRUCTURAL CONTROLS

STRUCTURAL CONTROL	FREQUENCY OF INSPECTION	FREQUENCY OF MAINTENANCE	INSPECTION/MAINTENANCE ACTIVITY
Primary Stormwater Management System	Biennially	Biennially	• Inspect for proper operation and perform necessary structural repairs. • Remove litter and debris (including prior to mowing). • Mow. • Remove accumulated sediment from structures to facilitate box or structure cleanout. Cleanout may be performed by suction hose and tank truck and/or by high-pressure jet washing. Sediment shall be disposed of properly. (1,3)

Notes: (1) Excessive petroleum hydrocarbon contamination can present severe sediment disposal/cleanup problems. Evidence of such pollution includes very dark oily stains, particularly at inlet and outlet structures and strong odors of gasoline, etc. The source of such pollutant discharges to the MS4 should be determined and removed if possible. Otherwise, pretreatment practices should be used as necessary to insure stormwater runoff is not contaminated beyond levels normally observed in runoff from highways and parking lots.

(2) Use only pesticides approved by USEPA and FDACS for aquatic sites to control weed pests in and around treatment facilities. Use of pesticides and chemicals for the control of invasive species and common undesirable aquatic plants should be minimized. Careful herbicide selection and application is essential to minimize harm to desirable plants and animals. If done on a routine basis, mechanical removal can help control unwanted aquatics and minimize the use of chemicals. However, experienced trained applicators can selectively control many undesirable plants with minimum harm to desirable vegetation and possible downstream contamination. The DEP regional biologist, with the Bureau of Aquatic Plant Management and/or County Cooperative Extension Service, should be contacted for assistance.

Soil amendments (fertilizer) should be used, as needed, to establish and maintain healthy and vigorous cover on the banks of treatment facilities. However, normal rates of fertilization should be lowered in the immediate vicinity of treatment facilities to avoid over-enrichment of the soil and adjacent waters. Apply soil amendments only when grass shows signs of distress once ground cover is well established. Clippings should be removed periodically to prevent the buildup of nutrients in vegetation subject to periodic or frequent inundation.

Problem areas susceptible to chronic erosion require more intense measures for protection and establishment of permanent vegetative cover. These special considerations may include the use of sod in lieu of seeding and/or the use of higher rates of soil amendments and supplemental moisture during dry weather conditions to insure more rapid establishment or vigorous growth in bank vegetation. Experts in soil conservation are available for assistance by contacting the Natural Resources Conservation Service with the USDA.

(3) Sediments associated with stormwater treatment devices may be regarded as contaminated. As such, if disposed of haphazardly, this material may become a source of pollution for substances like heavy metals, petroleum hydrocarbons, other organic compounds and pesticides, as well as infectious organisms, nutrient and oxygen demanding substances. However, absent the regular addition of refuse, paints, solvents cleaning agents, pesticide and fuel spills, etc., there is little probability that these materials would be concentrated to the extent so as to be considered "hazardous waste." Off-site disposal of sediments shall be pursuant to Department rules.

Appendix D

Existing Deficiencies

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-001	AP-008	Lake Roberts	Property Flooding	Lake Roberts outfall improvements- construct replacement drainwell. Orange County Stormwater Management Division observing what effects Western Beltway drainage systems have on Lake Roberts before additional measures implemented	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-013	Lake Tilden	Water Quality	Expanded nuisance plant management program, public education./ Being addressed by the Lakes Management Section	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-014	Black Lake	Right-of-way	Obtain drainage easements for lake outfall to ensure legal access for continued maintenance.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-015	Black Lake- East end of Ellerbee Rd. and Silpin Rd.	House Flooding	Purchase lots located in 100 yr floodplain, remove structures and develop a park facility with lake access.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-016	Black Lake	Water Quality	Purchase lots located in 100 yr floodplain, remove structures and develop a park facility with lake access./ This is not proposed to be in EPD's budget.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-017	Black Lake- Ellerbee Rd	Property Flooding	Restoration of wetland flow-way	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-018	Tilden Estates subdivision north of Black Lake	House Flooding	Purchase lots located in 100 yr floodplain, remove structures and develop a park facility with lake access.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-020	Black Lake- Marshall Farms Rd.	Property Flooding	Purchase lots located in 100 yr floodplain, and develop a park facility with lake access.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-021	Black Lake- South of Reaves Rd. and Gillard Rd.	House Flooding	Purchase lots located in 100 yr floodplain, remove structures and develop a park facility with lake access.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-023	Black Lake	Water Quality	Expanded nuisance plant management program including physical removal of plant material and replanting with beneficial vegetation. Public education./ Being addressed by the Lakes Management Section	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-024	Johns Lake- Oakland	Maintenance	Acquire drainage easements for lake outfall	Town of Oakland	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-031	Johns Lake	Water Quality	Phosphorus discharge limitations/lake management plan; Expanded nuisance plant management program; Grass carp management	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-032	Johns Lake- Stucki Property	Water Quality	Purchase property and convert pasture area into natural wetland system, regrade canal, multi-use path, environmental center/welcome station. /Proposed for 2005-2006 EPD Cip budget to try to implement the recommendations in the 2003 Miller-Sellen report of converting pasture into wetlands treatment system.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-033	Avalon Lake- Hartwood Marsh Rd. close to County line.	Erosion/Sedimentation	Install roadside swales with check dams and cross drains	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-036	Lake Avalon	Aquifer Recharge	Protection of recharge capacity within basin	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-040	Lake Tilden-CR 535- South of Daniels Rd.	Street Flooding	Construct additional outfall to ensure adequate flood protection	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-041	Black Lake-SR 50 east of Carter Street	Street Flooding	Detailed analysis of the conveyance capacity of the existing culvert and detailed study of area due to lack of available information for primary drainage facilities north of SR 50	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-001	AP-042	Black Lake-Turnpike- CR 535 Overpass	Street Flooding	Detailed study of area due to lack of available information for primary drainage facilities.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-043	Black Lake-Turnpike- 9th St. Canal	Street Flooding	Agencies responsible for maintenance of roads make improvements. Solution in conjunction with improvements to culverts on Beard Rd.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-044	Black Lake-Maguire Rd. (Ocoee)	Street Flooding	Agencies responsible for maintenance of roads make improvements.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-045	Black Lake-Park Ave. and SR 50 (Winter Garden)	Street Flooding	Detailed study of area due to lack of available information for primary drainage facilities.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-047	Black Lake-Beulah Rd.	Street Flooding	Agencies responsible for maintenance of roads make improvements. Solution in conjunction with improvements to culverts on CR 535.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-048	Black Lake-Beard Rd. at 9th St. Ditch box culverts	Street Flooding	Improve conveyance capacity of box culverts. Solution in conjunction with improvements to culverts on CR 535.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-050	Black Lake-CR 535 at multiple culverts 2300 ft south of Turnpike	Street Flooding	Increase hydraulic capacity of culverts.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-051	Black Lake-CR 545	Street Flooding	Culvert upgrades, raise the minimum road grades.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-052	Johns Lake -Cocester Rd.	Street/House Flooding	Further detail analysis of the secondary system in conjunction with primary system.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-054	Lake Avalon- private drive south of Williams Rd. and Seidner Rd.	House Flooding	Investigate finished floor elevations.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-055	Lake Avalon- southwest shore of lake on Davenport Rd.	House Flooding	Investigate finished floor elevations.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-056	Lake Avalon- southerly shore of lake on Rex Rd.	House Flooding	Investigate finished floor elevations.	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-060	Johns Lake- CR 545 and Cocester Rd	House Flooding	Further detailed analysis to accurately predict flood levels	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-001	AP-061	Tract C-1 stormwater pond and adjacent roadway	Property Flooding	Lower weir elevation of stormwater pond.	Unincorporated Orange County	Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)
AP-001	AP-062	Open space south of Pond X	Property Flooding	Construct bypass storm sewer system from Tract A-5 ditch bottom inlet directly to Lake Roper.	Unincorporated Orange County	Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)
AP-001	AP-063	Shadow Pine (Pond) Terrace-Lot 82	House Flooding	Sunset Lakes Cir. curb inlets directly to Pond X	Unincorporated Orange County	Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)
AP-001	AP-064	Pond X	Property Flooding	Remove and replace Pond X high level overflow structure with a new structure which has a notch elevation of 105.8ft and weir elevation of 106.4ft	Unincorporated Orange County	Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)
AP-001	AP-065	Backyards of houses adjacent to Lake Luntz (lots 13-17)	Property Flooding	Redirect Lake Luntz high level overflow structure outfall pipe directly to Pond X. Remove and replace Lake Luntz high level overflow structure with a new structure which has a weir elevation of 106.4	Unincorporated Orange County	Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-001	AP-110	Johns Lake	Aquifer Recharge	Protection of recharge capacity within basin	Unincorporated Orange County	Johns Lake SWMP (Miller-Sellen) 2003
AP-002	AP-004	Southern end of creek below stormwater transmission facility	Erosion/Sedimentation	Re-shape side slopes, line bank and creek bottom with geotextile material, plant ground cover from transmission system to headwall of Division St. culvert. Energy dissipaters at transmission system discharge./ Owner refuses to sell property.	Privately owned	Engineering Study for the Retrofit and Restoration of Lulu Creek Webb & Assoc. Inc. 1999
AP-002	AP-005	Lulu Creek	Water Quality	Wetland treatment facility South of E. Crest St. and east of the creek for treatment of stormwater, sediment settling; Catch basins	City of Winter Garden	Engineering Study for the Retrofit and Restoration of Lulu Creek Webb & Assoc. Inc. 1999
AP-002	AP-006	Lulu Creek area surrounding proposed check dam installations	Erosion/Sedimentation	Routine maintenance program of check dam system: inspection of weirs, energy dissipaters and erosion protection system; bank repair, stabilization and re-vegetation; and, removal and disposal of accumulated sediments; Bank repair, stabilization and re-vegetation, as part of an overall maintenance program, and routing sheetflow from adjacent land areas to a point of controlled discharge into Lulu Creek. Structural modification to reduce channel velocities resulting in reduced bed and bank erosion and allowing removal of sediments from suspension.	City of Winter Garden	Final Engineering Report on Hydrologic and Hydraulic Design Evaluation Proposed Lulu Creek Check Dams Winter Garden, Florida
AP-002	AP-007	Lulu Creek downstream of Division St.	Street/Property Flooding	Bank repair, stabilization and re-vegetation, as part of an overall maintenance program, and routing sheetflow from adjacent land areas to a point of controlled discharge into Lulu Creek. Structural modification to reduce channel velocities resulting in reduced bed and bank erosion and allowing removal of sediments from suspension.	City of Winter Garden	Final Engineering Report on Hydrologic and Hydraulic Design Evaluation Proposed Lulu Creek Check Dams Winter Garden, Florida
AP-002	AP-067	South of Twin Lake Woods Subdivision, east of Adair St, north of Flewelling St, and west of Wurst Rd.	Maintenance	Routine or regular maintenance required	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-068	South of Wurst Rd., east of Little Spring Hill cul-de-sacs, north of Flewelling St and west of Lakes Moxie and Peach Basin divide.	Maintenance	Re-establishment of roadside swales	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-069	Lakewood Ave	Street Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-070	Burnt Tree Subdivision, east of Lakewood Ave.	Street Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-071	North of Burnt Tree Subdivision, east of Lakewood Ave, south of Anderson St.	Street Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-002	AP-072	Roadside ditch parallel to and on south side of 17th St	Erosion/Sedimentation	Re-design to limit erosion	Unincorporated Orange County	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-074	Wurst Rd.	Street Flooding	Upgrade cross culverts under 17th St.	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-075	Ditch section between 16th & 17th St	Street Flooding	Upgrade cross culverts under 17th St.	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-076	17th St	Street Flooding	Upgrade cross culverts under 17th St.	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-077	Lakewood Ave vicinity	House Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-078	Southeast of Lakewood Ave and 17th St	House Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-079	South of 17th St, east of Lakewood Ave, north of Anderson St, west of Little Spring Hill Dr.	Maintenance	Regular maintenance	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-080	South of 12th St, north of Wurst Rd, west of Little Spring Hill Dr cul-de-sacs, east of Greenwood Ave.	Maintenance	Regular maintenance	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-081	South of Wurst Rd., north of 17th St, east of Greenwood Ave, west of Little Spring Hill Dr cul-de-sacs.	Maintenance	Regular maintenance	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-082	South of 13th St, west of Lakewood Ave, west of Greenwood Ave, north of 17th St	Maintenance	Regular maintenance	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-083	Lakewood Ave and west	Street/House Flooding	Upgrade 12-in cross culvert under 17th St.	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-084	Pioneer Key 1 mobile park, north of Silver Star Rd.	Street Flooding	Upgrade existing storm sewer collection system, construct stormwater pond north of Pioneer Key I, additional catch basins/ Design underway	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-085	Pioneer Key 1 mobile park, north of Silver Star Rd.	Maintenance	Maintenance of drainage facilities	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-086	East- west ditch and cross culvert under Ocoee-Apopka Rd	Maintenance	Maintenance of drainage facilities and right-of-way	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-087	Cross culvert under Silver Star Rd.	Maintenance	Maintenance	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-088	North-South ditch east of Pioneer Key II	Maintenance	Remove excess vegetative growth	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-002	AP-089	East-West ditch west of Silver Star Rd. Extension	Maintenance	Remove excess vegetative growth	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-091	Shopping center south of Palm Dr, north of Silver Star Rd. Extension	Street/Property Flooding	Upgrade drainage facilities	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-092	Cross culvert under Ocoee-Apopka Rd.	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-093	Cross culvert under Lakewood Ave	Street Flooding	Upgrade culvert and maintenance of the inlet and outlet conditions	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-094	18-in cross culvert under Fullers Cross Rd.	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-095	24- in cross culvert under Fullers Cross Rd.	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-096	Cross culvert under Ocoee-Apopka Rd.	Maintenance	Routine maintenance of culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-097	36-in cross culvert under Ocoee-Apopka Rd.	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-098	12- in cross culvert under Fullers Cross Rd.	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-099	Stormwater pond in Crown Point Woods Subdivision	Property Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-100	Stormwater pond in Crown Point Woods Subdivision	Property Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-101	Cross culvert under dirt road at northern boundary o f basin	Street Flooding	Upgrade culvert and maintenance of the inlet and outlet conditions	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-102	Cross culvert under private driveway at the northern boundary of basin	Street Flooding	Upgrade culvert	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-103	West of Crown Point Rd, south of Fullers Cross Rd	Maintenance	Routine maintenance	Unincorporated Orange County	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-106	Cross culverts under Fullers Cross Rd	Street Flooding	Upgrade culverts and maintenance	Unincorporated Orange County	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-107	Stormwater pond in Corsino Subdivision	Street/Property Flooding		City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-108	Dirt and clay roadways east of Lakewood Ave	Water Quality	Coordinate with OC to pave roads./ Not in EPD's budget.	Unincorporated Orange County	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee
AP-002	AP-111	Pioneer Key II	Water Quality	Build a Regional Stormwater Facility/ Desing of the Regional Facility is currently underway	City of Ocoee	Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
AP-006	AP-003	Jones Avenue	Street Flooding	Subject of an independent study and design by DRMP. Fill existing ditches along road to maintainable depth and cross-section for maintenance mowers to depth of 2.5 ft below shoulder or 2ft below existing outside top of bank; construct 4 cross drain groups ranging from 36 to 48 in diameter to move flow from the north to south side of roadway; construct a 10 ac wet detention stormwater pond and mass grade a wetland restoration area at intersection of Jones Ave and Canal Rd to provide borrow source and meet water quantity and quality objectives; construct additional side drain modification so convey flow through the ditches and toward pond; purchase easement to construct and maintain ditches and to accommodate any areas that are to flood.	Unincorporated Orange County	Lake Apopka Basin Stormwater Management Plan, Phase I Draft Report (CDM, 2002)
AP-007	AP-001	Lake Maggiore	Street Flooding	Currently in Phase II of the Lake Apopka Basin Stormwater Management Master Plan	Unincorporated Orange County	Lake Apopka Basin Stormwater Management Plan, Phase I Draft Report (CDM, 2002)
AP-007	AP-002	Tangerine - north shore of Lake Ola	Street Flooding	Currently in Phase II of the Lake Apopka Basin Stormwater Management Master Plan	Unincorporated Orange County	Lake Apopka Basin Stormwater Management Plan, Phase I Draft Report (CDM, 2002)
BW-002	BW-023	Joe Louis/Ficquette Thornal Subdivision	Street/Property Flooding	Since the Western Beltway (SR429) was constructed after the completion of the Joe Louis/Ficquette Thornal Subdivision Stormwater Master Drainage Plan (Stottler Starmer & Associates, 1996), the net flood protection benefits cannot be assessed unless the study is updated to reflect those alterations to the drainage system affecting the subdivision. The County is currently proceeding with evaluating possible solutions to the identified drainage problems within the 2 subdivisions; The Orange County Stormwater Management Department initiated a study of the sub-basin to assess the severity of the existing drainage conditions and to develop alternatives to provide relief. The preliminary findings of the County's study indicate that the swales are fairly well maintained, but a majority of the driveway culverts are either undersized and/or are at the end of their structural life.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-002	BW-117	Joe Louis Park Subdivision	Street/Property Flooding	The Orange County Stormwater Management Department initiated a study of the sub-basin to assess the severity of the existing drainage conditions and to develop alternatives to provide relief.	Unincorporated Orange County	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-118	Intersection of Roper Parkway and Story Road	Street Flooding	Two inlets draining the intersection of Roper Parkway and Story Road are in poor structural condition and need to be replaced to alleviate the localized flooding.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-002	BW-119	West Orange Industrial Park	Street Flooding	Recommend the 24-inch culvert at Roper Parkway be replaced with a box culvert and that appropriate end treatments be provided to minimize the potential for erosion behind the back of curb line at Roper Parkway. It is also recommended that the City investigate the need to acquire appropriate drainage easements to encompass the drainage ditches within these sub-basins.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-120	Capitol Court	Street Flooding	Recommended replacing the 42-inch RCP at Capitol Ct. with a larger pipe that would reduce the backwater effects upstream of the culvert. It is also recommended that the City investigate the need to acquire appropriate drainage easements to encompass the drainage ditches within these sub-basins.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-121	Story Road	Street Flooding	Recommended replacing the 42-inch RCP at Story Rd. with a larger pipe that would reduce the backwater effects upstream of the culvert. It is also recommended that the City investigate the need to acquire appropriate drainage easements to encompass the drainage ditches within these sub-basins.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-122	Marshall Farms Rd.	Street Flooding	Recommended replacing the 42-inch culvert at Marshall Farms Road to reduce the backwater effects upstream of the culvert.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-123	Geneva Street	Street Flooding	Recommended that the culvert at Geneva Street be replaced with a 34-inch by 53-inch elliptical culvert with sufficient length to accommodate the future widening of Geneva Street. In addition, the downstream invert of the culvert would connect to the existing pipe on the south side of Geneva Street that was recently constructed. Also regrade the ditch north of Geneva Street. to a trapezoidal channel section.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-125	Intersection of Bluford Ave and Orlando Ave	Street Flooding	The City of Ocoee has initiated the preparation of final design and construction plans for the drainage improvements to the intersection./ Utility conflicts	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-126	Oakwood Plaza Development	Property Flooding	Replace the existing culvert at Columbus Street to prevent flooding.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-127	Main channel of Lake Lotta Drainage System	Water Quality	Standing water in ditch results in algal blooms in the water column.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-128	Private Driveway south of Geneva St, east of Bluford Ave.	Street/Property Flooding	Replace existing culverts with a box culvert to prevent overtopping of driveway and washing out of driveway. City should secure a drainage easement to encompass the main channel of the Lake Lotta drainage system including the private driveway.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-129	Prima Vista Subdivision-Intersection of Sbinal Court and Gallego Avenue	Street/Property Flooding	Installation of a curb inlet at an existing manhole; replace concrete junction box, upsize a pipe, and install a leaf trap.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-130	Private Driveway between Butternut Ave and the Ocoee Cemetery	Street/Property Flooding	The City will need to acquire drainage easements for the section of the main channel of the Lake Lotta drainage system over the existing private driveway. Install a reinforced box culvert at the private driveway.	City of Ocoee	Lake Lotta Drainage Basin Study (PEC, 1998)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-002	BW-132	SR-50	Street Flooding	The PEC study indicated that SR-50 may flood due to a sag area where a berm prevents the water from entering the depressional area and then floods SR-50	FDOT	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-002	BW-134	Woodlawn Memorial Cemetery	Property Flooding	The minimum roadway elevation is below the 100-year flood elevation of Lake Rose. The sub-basin is located in unincorporated Orange County so no further study was completed as part of the report.	Unincorporated Orange County	Lake Lotta Drainage Basin Study (PEC, 1998)
BW-004	BW-014	Lake Rose Hill	Street Flooding	Lake Rose Hill/Good Homes Stormwater Outfall Master Drainage Plan (MSA, 1996) identified 4 alternatives. The preferred alternative was creating an emergency outfall to Lake Lotta. The County has reevaluated the priority of providing recharge to the Florida Aquifer and may want to consider the alternative that entails constructing a pumped outfall to Lake Sherwood.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-006	BW-026	Powers Drive & Jennings Road	Street Flooding	The Orange County Stormwater Management Department has initiated the design of a collection and conveyance system to connect the areas of flooding to an existing storm sewer system that traverses Powers Drive and extends through the Lonesome Pines and Robinswood Heights subdivisions.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-006	BW-028	Bolling Drive	Street/Property Flooding	The Orange County Stormwater Management Department has initiated the design of a collection and conveyance system.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-006	LW-096	Vacant parcel of land south of Nob Hill subdivision	Street/House Flooding	Purchase parcel and construct dry retention pond with 2:1 side slopes. Type “D” ditch bottom inlet and 18-in RCP installed on east side of parcel to capture runoff and convey to proposed pond. Construct concrete flume with rip-rap south of existing open flume on Buena Vista Court to convey stormwater runoff into proposed pond without erosion concerns. Install control structure to provide high level overflow for the proposed pond. Connect proposed pond to existing inlets along Hart Blvd. via 18-in RCP. Acquire a 20ft. easement along proposed pipe alignment form the west edge of the parcel to Hart Blvd.	Unincorporated Orange County	Nob Hill Drainage Investigation, Orange County, Florida (PEC, 2001)
BW-006	LW-101	Westwood Subdivision	Street Flooding	“Small Area Studies”- review documented flooding complaints to focus on specific drainage improvements.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-099	Evans High School on east, Pioneer Rd and Robinswood Heights on west, Villas o Pine Hills on north, Balboa Drive on south.	Street Flooding	“Small Area Studies”- detailed survey, combined with hydrologic and hydraulic analysis, of gravity outfall system from pumping station.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-007	LW-100	SR 438	Water Quality	Roads and Drainage coordinate with Environmental Protection Division to initiate a water quality sampling program. “Small Area Studies”- Pollutant load analysis capable of targeting outfalls contributing to significant annual loads, thus justifying installation of various treatment and pollutant removal systems./ Commercial area built before requirement for on-site stormwater treatment. Recent upgrades and improvements to "Woodsmere Lake" a holding pond for the pumping station were implemented by Roads and Drainage. The discharge for the Little Wekiva River form the pump station should be monitored.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-102	Forest Lake Subdivision	Street Flooding	“Small Area Studies”- review documented flooding complaints to focus on specific drainage improvements.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-103	SR 438 stormwater collection system	Maintenance	Pipeline inspection of the system downstream of the high-point weir junction box at Kingsland Ave. to initiate necessary repairs.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-105	Homes that lie in limits of 100-ry flood plain near Pine Hills Golf Course area	Finished Floor	Conduct a finished floor survey.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-107	Winn Dixie Plaza	Water Quality	Roads and Drainage coordinate with Environmental Protection Division to initiate a water quality sampling program. “Small Area Studies”- Pollutant load analysis capable of targeting outfalls contributing to significant annual loads, thus justifying installation of various treatment and pollutant removal systems./ Commercial area built before requirement for on-site stormwater treatment. Recent upgrades and improvements to "Woodsmere Lake" a holding pond for the pumping station were implemented by Roads and Drainage. The discharge for the Little Wekiva River form the pump station should be monitored.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-007	LW-108	Silver Pines Village Square	Water Quality	Roads and Drainage coordinate with Environmental Protection Division to initiate a water quality sampling program. “Small Area Studies”- Pollutant load analysis capable of targeting outfalls contributing to significant annual loads, thus justifying installation of various treatment and pollutant removal systems./ Commercial area built before requirement for on-site stormwater treatment. Recent upgrades and improvements to "Woodsmere Lake" a holding pond for the pumping station were implemented by Roads and Drainage. The discharge for the Little Wekiva River form the pump station should be monitored.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
BW-008	BW-015	Lake Stanley	Water Quality	No alternative identified./ High in coliform bacteria. EPD did studies on surface water discharges to the lake using DNA testing and determined the source was animals. No further action was contemplated.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-009	BW-113	Lake Olympia-Clarke Road/Lake Olympia Square	Street Flooding	Outfall Improvements	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-009	BW-115	Lake Olympia	Water Quality	Street sweeping to improve water quality. Coordinate with Orange County to have dirt/clay roads paved.	City of Ocoee/Orange County	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-105	Starke Lake-Taylor Avenue and Oakland Street	Street Flooding	Recommend Taylor Ave be improved to accommodate either an open drainage system or a closed drainage system.	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-106	Starke Lake-Center Street Roadway and Drainage Improvements	Street/Property Flooding	Recommend street improvements to provide curb and gutters on both sides of the Center Street and Orange Avenue, curb inlets at various locations to collect the stormwater runoff, and stormwater pipes to transport the runoff to an existing culvert on the north side of Silver Star Road./ Design is currently underway.	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-107	Starke Lake-Franklin Street Driveway	Street/Property Flooding	Recommend City acquire the necessary drainage easement to improve the channel/culvert near the private driveway.	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-108	Starke Lake-Culvert near Woodson Avenue	Erosion/Sediment ation	Coordination with Orange County and FDOT to improve sediment accumulation due to unpaved streets on Woodson Avenue.	Orange County/FDOT	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-109	Starke Lake-Veronica Place Stormwater Pond	Property Flooding	Increase cross-culvert size	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-110	Starke Lake-Hamlin Drive/White Rd.	Property Flooding	Provide drainage relief by using yard drains to collect the stormwater runoff and connect these yard drains to an existing curb inlet on Hamlin Dr.	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-111	Starke Lake-White Rd.	Street Flooding	The recommended improvements to this drainage structure system is to replace the existing pipe with larger pipe.	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-116	Lake Prima Vista	Water Quality	Use of Aerator Systems with stone diffusers should be investigated to lower T.S.I./ Status unknown, not in EPD's budget.	City of Ocoee/Orange County	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-010	BW-177	Starke Lake	Property Flooding	Construct a regional stormwater pond to address flooding and water quality issues./Construction Plans are completed and project is currently out-to-bid	City of Ocoee	Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996)
BW-011	BW-096	Spring Lake-Sandy Cove	Erosion/Sediment ation	Road stabilization.	Orange County/Property Owner	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-097	Spring Lake-Victory Baptist Church Stormwater Pond	Maintenance	Modify or replace the existing outfall structure for the pond.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-099	Spring Lake-Stormwater Ponds west of Clarke Rd and southeast of Spring Lake	Water Quality	Convert the 3 ponds into 1 large wet detention pond system.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-100	Spring Lake-Stormwater Pond in Ocoee Plaza Development	Water Quality	Recommended the City of Ocoee initiate enforcement action.	Privately owned	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-011	BW-165	Stormwater pond at Jiffy Food Store south of Wurst Rd.	Property Flooding	**No Action**. No damage to residential dwellings.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-166	Paved roadside ditch along north right-of-way of A.D. Mims Rd.	Street Flooding	**No Action**. Orange County and Ocoee resolve cost and maintenance jurisdiction issues.	Unincorporated Orange County	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-167	A.D. Mims Rd	Street Flooding	No Action. Orange County and Ocoee resolve cost and maintenance jurisdiction issues.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-169	Vicinity of 709 Lakeview Dr.	Maintenance	City investigate to find cause of problem.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-011	BW-170	Ocoee Hills Rd and Pinewood Ln	Erosion/Sedimentation	Remove and replace existing exfiltration system with an exfiltration system sized to accept the contributing drainage area.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-012	BW-101	Lake Johio-Stormwater Pond in Candlewood Shores-East	Property Flooding	Excavate pond bottom and backfill with clean fill sand to promote infiltration and modify and/or replace existing outfall structure.	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-012	BW-102	Lake Johio-Stormwater Pond in Johio Bay Subdivision	Water Quality	Recommended the City of Ocoee initiate enforcement action.	Privately owned	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-012	BW-173	Stormwater pond in Johio Bay Subdivision	Erosion/Sedimentation	Install erosion control blanket within the southern pond bank in order to stabilize the existing pond bank and prevent further erosion	Privately owned	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-012	BW-174	East right-of-way of Johio Shores Rd, immediately northeast of Azalea Ranch Ln.	Erosion/Sedimentation	Maintenance improvements at inlet	City of Ocoee	Spring Lake/Lake Johio Drainage Basin Study (PEC, 1996)
BW-013	BW-136	Nicole Blvd.	Water Quality	Recommended using the street sweeper regularly and to construct a sedimentation baffle box at the end of Nicole Blvd./ Street sweeping program has been implemented. Sedimentation baffle box has not been constructed.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-013	BW-137	Culvert under Ocoee-Clarcona Rd, just north of the Amber Ridge Subdivision	Street Flooding	Culvert is undersized; however the Forest Lake Golf Club may be expanded. If so, the runoff to the culvert would be reduced, because the golf course is an effluent disposal site and all runoff is retained. If the road is expanded then the culvert could be replaced.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-013	BW-138	Amber Ridge Subdivision	Street Flooding	The existing stormwater pond was designed as a dry pond, but remains wet. It is recommended that the pond be modified to a wet detention system. However, the City does not own the pond.	Privately owned	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-013	BW-139	Lauren Beth Avenue	Street Flooding	Lauren Beth Avenue floods between Nicole Blvd and Clarcona-Ocoee Rd, due to a small culvert at a driveway crossing and the road needs to be paved and raised.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-013	BW-140	Intersection of Clarcona-Ocoee Rd and Lauren Beth Avenue and Clarcona-Ocoee Rd 300 ft east of Ingram Rd.	Street Flooding	Orange County has initiated a study to realign Clarcona-Ocoee Rd. As part of the realignment, Orange County will evaluate the drainage.	Unincorporated Orange County	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-014	BW-141	Sawmill Subdivision	Property Flooding	Recommend an emergency overflow be constructed to protect properties. The study concluded a gravity outfall system was the most viable./ Recommended improvements are currently being considered as the City of Ocoee's next CIP project.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-014	BW-142	Forest Oaks Subdivision	Property Flooding	It is recommended that a storm sewer system be constructed to convey runoff from Subbasins 3-03 and 3-04 to Prairie Lake to eliminate the flooding in the Forest Oaks Subdivision.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-014	BW-143	Forest Oaks Subdivision	Water Quality	Recommended using the street sweeper regularly and to construct 3 sediment control devices within the pond./Street sweeping program has been implemented. Sedimentation baffle box has not been constructed.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-014	BW-144	Florida Central Railroad	Street Flooding	Recommended that runoff in the Florida Central Railroad right of way be intercepted and piped to Prairie Lake via the Forest Oaks bypass system./ Construction plans were completed but construction is on hold due to lack of easements.	City of Ocoee	Lake Meadow/Prairie Lake Drainage Basin Study (PEC, 1998)
BW-015	BW-004	Crooked Lake	Aquifer Recharge	CDM is currently under contract with Orange County to develop a conceptual feasibility study of modifying the existing gravity outfall system from Lake Orlando to Horseshoe Lake in order to increase the recharge volume to the Floridan Aquifer..	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-017	BW-013	Whispering Hills	Property Flooding	The Orange County Stormwater Needs Assessment Report (1996) recommended that a control structure be constructed in the pond to allow for high water level overflow./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-017	BW-147	Upstream of Apopka Blvd near McEwen Lumber	Street/Property Flooding	Remove existing culverts and replace with 36-in RCP culverts./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-148	Upstream of the railroad near McEwen Lumber	Property Flooding	Remove existing culvert and replace with double 42-in RCP culverts./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-149	Upstream of Internal Access Rd (Florida Potting Soils)	Street Flooding	Remove existing culverts under eastern internal road and replace with single 8-foot wide by 4-foot high rectangular box culvert./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-150	Upstream of Internal Access Rd (Florida Potting Soils)	Street Flooding	Remove existing culverts under western internal road and replace with single 8-foot wide by 4-foot high rectangular box culvert./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-155	Upstream of Overland Rd (southwest of Keystone Heights)	Street Flooding	Remove existing culvert and replace with single 45-in wide by 29-inc high elliptical RCP culvert./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-017	BW-156	Downstream of Overland Rd (southwest of Keystone Heights)	Property Flooding	Remove existing outfall pipe east of Overland Rd and replace with a 45-in wide by 29-in high elliptical RCP culvert./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-157	Upstream of Privacy Wall (southeast of Keystone Heights)	Property Flooding	Remove existing culvert downstream of the Overland Rd. outfall system and replace with 45-in wide by 29-in high elliptical RCP culvert./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-160	Upstream of Overland Rd	Street Flooding	Remove existing culvert and replace with double 7-foot wide by 6-foot high rectangular box culverts. This improvement at Overland Rd. will also require the vertical relocation of the existing water and sewer utilities./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-017	BW-161	McEwen Lumber/Florida Potting Soils conveyance system	Street Flooding	Remove and replace existing triple 48-in CMP culverts under Beggs Rd. with double 7 ft wide by 6ft high rectangular box culverts./ The County has completed final engineering plans for these improvements and will soon be implementing the recommendations.	Unincorporated Orange County	Stormwater Master Plan for the Beggs Road/Overland Road Area, Engineering Report, PEC, 1998
BW-018	BW-009	Lake Alpharetta	Landlocked	Land Locked Drainage Basin Study for Orange County: Lakes Julia, Alpharetta, Long and Pleasant (DRMP, 1996) identified an existing outfall from the lake that discharges to Long Lake. Lake Alpharetta has excellent recharge capacity and further evaluation in the form of a continuous simulation model may be warranted to take into account potential recharge water sources from Oak Lake and Lake Julia.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-018	BW-016	Lakeville Road	Street Flooding	Condition of roadside swales are insufficient to adequately drain Lakeville Road; no plan of improvement is proposed or has been initiated by the County	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-018	BW-030	Oak Lake	Street Flooding	The preferred alternative from the Oak Lake Preliminary Engineering Study (DRMP, 1999) is a bleed down line from Oak Lake to a proposed percolation pond. The ability of Lake Alpharetta to recharge water into the Floridan aquifer may be an alternative to the recommended improvement in the Oak Lake Preliminary Engineering Study. Inwood Consulting Engineers has completed a draft report.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-018	LW-070	Tributary E (Lake Julia)	Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
BW-020	BW-001	Border Lake Chain	Landlocked	CDM is currently under contract with Orange County to develop the Lake Cortez-Border Lake Outfall Improvement Study for which a feasibility study for alternative flood control improvements will be recommended.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-021	BW-021	Carpenter Branch	Water Quality	No water quality-related action has been initiated by the County for Carpenter Branch	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-021	BW-061	South Lake McCoy	Street Flooding	The normal high water level should be based upon the culvert outfall under Votaw Road.	City of Apopka	Lake McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County
BW-021	BW-063	Existing stormwater pond in vicinity of east Myrtle St.	Property Flooding	**No Action**. Overflow will bypass outfall structure and discharge to Lake McCoy South via outfall channel along Votaw Rd. No structures endangered.	City of Apopka	Lake McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County
BW-021	BW-072	Dream Lake discharge stream.	Erosion/Sedimentation	Reconstruct last segment of Dream Lake outfall to include a drop manhole, a pipe outfall at the existing stream bed, and an energy dissipating end treatment for the pipe.	Unincorporated Orange County	Lake McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County
BW-021	BW-090	Brook Forest Court	House Flooding	Finished floor elevations of homes adjacent to stream, compared to 100-yr flood anticipated upstream of the triple culverts, replacement of culverts if lower.	City of Apopka	Lake McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County
BW-022	BW-018	Plymouth Sorrento Road	Street/Property Flooding	DRMP prepared a stormwater management plan for these areas and recommended construction of retention ponds for Plymouth Sorrento Road North and South.	Unincorporated Orange County	Big Wekiva SWMMP (PEC,2001)
BW-022	BW-176	Rainey Rd	Street Flooding		Unincorporated Lake County	Lake County
BW-023	BW-060	Sweetwater Island	Water Quality	Sediment catch basin and a skimmer/trash wall	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-025	BW-039	205 W. Berkshire Cir	Property Flooding	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-028	BW-048	Canterclub Trail	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-028	BW-058	Majestic Oak Drive	Street Flooding	Construct a 200-foot retaining wall	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-029	BW-032	3286 Hickory Lane	Property Flooding	Modify the secondary system to add inlets or increase pipe capacity to address Street Flooding. Include water quality treatment.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-029	BW-051	2040 Terrace Blvd	Property Flooding	Modify the secondary system to add inlets or increase pipe capacity to address Street Flooding. Include water quality treatment.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-034	261 Cambridge	Street Flooding	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-035	2160 Triangle Drive	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-036	Westwood & Clay	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-037	Azalea Drive	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-038	108 Holderness Drive	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-043	113 Wheatland Ct	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-044	115 W. York Ct	Property Flooding	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-045	East Wekiva Trail	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
BW-030	BW-046	108 Creekwood Ct	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-047	106 Colyer Road	Property Flooding	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-049	103 Bay Hammock Lane	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-050	103 Thistlewood Dr	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-052	2650/2670 Azalea Drive	House Flooding	Increase capacity under Azalea Drive (addition of one 72" pipe); construct water quality pond and wetland enhancement.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-053	Smokerise Blvd.	Street Flooding	No Action	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-054	900/902 Riverbend Blvd.	House Flooding	Replace existing arch CMP cross drains; construct a 225-foot spillway ; raise the minimum berm overtopping elevation.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-055	Wekiva Springs Road	Street Flooding	Culvert improvements; proposed weir upstream of problem area; and raise roadway profile of Wekiva Springs Road.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-030	BW-175	Sweetwater Creek	Water Quality	Forested wetland and sedimentation basin treatment systems, and periodic whole-lake surface chemical treatments. Seminole County has implemented the Sedimentation Basin, Forested Wetland Treatment elements of the recommended improvements. The remaining recommendations include the dredging and revegetation of the Sweetwater Cove Lake.	Unincorporated Seminole County	Draft Final Report Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration Plan (ERD, 2005)
BW-031	BW-033	508 Woodview Drive	Property Flooding	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-031	BW-040	203 E. Hornbeam Dr	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-031	BW-041	207 E. Hornbeam Dr	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-032	BW-057	Sweetwater Club Blvd.	Street Flooding	No Action	Privately owned	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-032	BW-059	Sweetwater Club Drive	House Flooding	Excavation of depressional areas behind homes.	Privately owned	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BW-033	BW-056	W. Wekiva Springs Road	Street Flooding	Construction of water quality pond designed by CPH and upgrading culvert crossing.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
BWC-007	BC-002	Dairy Rd.	Street Flooding		Unincorporated Lake County	Lake County
BWC-017	BC-001	Wekiva Pines Estates	Street/Property Flooding		Unincorporated Lake County	Lake County
BWC-021	BC-003	Royal Trails Subdivision-main entrance	Street/Property Flooding		Unincorporated Lake County	Lake County
GT-001	GT-062	Old US 441 at Railroad tracks	Erosion/Sedimentation		Unincorporated Lake County	Lake County
GT-002	GT-063	Wolf Branch Sink	Water Quality		Unincorporated Lake County	

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
GT-006	GT-011	Basin 23- South side of Charlotte Ave, lots 2 & 3 from Bay Ave and lots 22&23 on north side of Seminole Rd.	House Flooding	Small area between commercial property on Seminole and Bay and first residential lot where an easement obtain between Lots 22&23 for small retention pond. Request emergency tie-in, or purchase large area for total retention.	Unincorporated Lake County	
GT-006	GT-012	Basin 23- West of SR 19, north of SR 441, south of Lakeview Ave, west to Lake Eustis	Water Quality	Provide swale section or improve existing swales for pollution abatement./ DOT project in progress, to be completed in 2006.	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-006	GT-013	Basin 23-Kurt and Ardice	Street Flooding	If recent improvements have not solved, enlarge size of holding ditch on southwest corner in combination with regarding swale to allow drainage from the valley gutter to enter system./Intersection to be rebuilt by Lake County in 2008.	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-006	GT-036	Basin 34- Subdivision at Lake Woodward Dr.	Water Quality	Pollution abatement pond at discharge point of Monte Carlo Ct	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-006	GT-037	Basin 34- Subdivision at Monte Carlo Ct	Water Quality	Pollution abatement pond at discharge point of Lake Woodward Dr.	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-006	GT-049	Basin 35A- US 441	Maintenance	Check and maintain swales and storm sewers regularly	FDOT	City of Eustis SWMP (CPH, 2002)
GT-007	GT-015	Basin 24- Lake Dicie	Water Quality		Unincorporated Lake County	City of Eustis SWMP (CPH, 2002)
GT-007	GT-020	Basin 24- East of SR 19, west of West Crooked Lake, north of Ardice Ave, South of Lakeview Ave	Erosion/Sediment ation	Pollution abatement at discharge point at Dicie Ave to Lake Dicie. /Enlarge system on Bay St. South of Chesley Ave.	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-007	GT-051	Basin 36- East Crooked Lake Dr.	Erosion/Sediment ation	Each system would require analyzing to determine if sufficient capacity and legal access is available to provide adequate improvements for pollution abatement- ponds/swales	City of Eustis	City of Eustis SWMP (CPH, 2002)
GT-007	GT-054	Basin 37- Jeffries Court	Erosion/Sediment ation	Extend existing storm sewers at Jefferies Ct. cul-de-sac to collect discharge at low point.	City of Eustis	City of Eustis SWMP (CPH, 2002)
LE-002	LE-062	Basin 40- Abrams Rd	Water Quality	Improve swale sections with swale checks to provide pollution abatement prior to entering Lake Irma or Lake Alfred.	Unincorporated Lake County	City of Eustis SWMP (CPH, 2002)
LE-002	LE-063	Basin 40- Joanna Dr.	Water Quality	Improve swale sections with swale checks to provide pollution abatement prior to entering Lake Irma or Lake Alfred.	Unincorporated Lake County	City of Eustis SWMP (CPH, 2002)
LE-002	LE-070	Basin 41- West side of Lake Joanna near Windham Dr	Water Quality	Retention basin adjacent to Windham Dr. to provide pollution abatement for street drainage.	Unincorporated Lake County	City of Eustis SWMP (CPH, 2002)
LE-002	LE-071	Basin 41- Washington Ave in Lake Joanna Shores subdivision	Water Quality	Construct swales along street and direct stormwater to a pollution abatement area that could be constructed east of the existing park area.	City of Eustis	City of Eustis SWMP (CPH, 2002)
LE-002	LE-073	Basin 41- North of US 441, south SR 44, east of Abrams Rd, west of CR 44B	Water Quality	Construct swales with swale checks along existing paved roads to provide pollution abatement prior to entering lake	City of Eustis/Unincorporated Lake County	City of Eustis SWMP (CPH, 2002)
LE-002	LE-113	Briarwood Ln.	Street/Property Flooding		Unincorporated Lake County	Lake County

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LE-003	GT-004	Basin 23- Subdivision west of Atwater St.	Water Quality	Reversed berm section just west of the end of Atwater St. serve as pollution abatement for discharge from existing subdivision prior to the discharge entering the swampy wetland area to the north.	City of Eustis	City of Eustis SWMP (CPH, 2002)
LE-003	LE-056	Basin 25-Lakeview Ave between Tyringham Rd and St. Andrews Ct.	Street Flooding	Investigate further and televised to determine exact cause of flooding	City of Eustis	City of Eustis SWMP (CPH, 2002)
LE-004	GT-057	Basin 37-Property at southeast corner of Washington and Jefferies	Property Flooding	Extend existing storm sewers at Jefferies Ct. cul-de-sac to collect discharge at low point.	City of Eustis	City of Eustis SWMP (CPH, 2002)
LE-006	LE-112	Marshall Rd.	Erosion/Sedimentation		Unincorporated Lake County	Lake County
LW-001	LW-039	Lake Lawne	Water Quality	For chlorophyll a, habitat restoration through invasive plant removal and replacement by more environmentally friendly plants./ High nutrients, a TMDL impaired water body. Funds to identify and implement specific BMPs are in the 2005 and 2006 CIP budget for EPD.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-001	LW-074	Tributary I	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Orange County/City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-001	LW-109	Pine Hills Rd.	Water Quality	Roads and Drainage coordinate with Environmental Protection Division to initiate a water quality sampling program. “Small Area Studies”- Pollutant load analysis capable of targeting outfalls contributing to significant annual loads, thus justifying installation of various treatment and pollutant removal systems./ Commercial area built before requirement for on-site stormwater treatment. Recent upgrades and improvements to "Woodsmere Lake" a holding pond for the pumping station were implemented by Roads and Drainage. The discharge for the Little Wekiva River form the pump station should be monitored.	Unincorporated Orange County	Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999)
LW-002	LW-001	Canovia, Carew, and Naples	Maintenance	Under study by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-002	LW-002	Fairvilla Park Subdivision	Street Flooding	Drainwell receives direct runoff from roadside drainage systems with no pre-treatment and provides the only source of relief to the stormwater management system. The drainwell should be abandoned and replaced with a new well and inlet.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-002	LW-010	Interlaken/Lakeview Park/Palomar/ University Heights Subdivisions	Street Flooding	A small area study is recommended that would include evaluation of the existing secondary drainage system deficiencies and make recommendations for corrective measures. Under maintenance by Orange County Roads & Drainage.	Orange County/City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-002	LW-015	Sunshine Gardens Subdivision	Street/Property Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-017	Shells Terrace Subdivision	Street Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-018	Fairview Court Subdivision	Street/Property Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-019	Sunshine Gardens Subdivision	Street/Property Flooding	Under study by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-002	LW-021	Golfview Subdivision	Street/Property Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-040	Little Lake Fairview	Water Quality	Little Lake Fairview, Minnesota ditch and Edgewater ditch are the subject of a restoration/retrofit project with the City of Orlando, Orange County and the SJRWMD; clean up of groundwater petroleum plume entering the storm system is planned by state funding source./ High nutrients and contaminated groundwater. The City of Orlando, OC and FDOT are building new retention ponds and overseeing clean up to address the issues. Ponds will be constructed within two years and groundwater contamination is being monitored.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-002	LW-041	Lake Fairview	Water Quality	Bird scaring project to reduce bacterial coliforms was performed and fecal coliform counts have returned to normal. Orange County continues to monitor these levels. Habitat restoration through invasive plant removal and replacement by more environmentally friendly plants (chlorophyll a). /In 1994 the TSI was 53, in 2004 the TSI was 38. The seagull "scaring" project increased aquatic plant maintenance and genera improvements to the watershed have dramatically improved the water quality of Lake Fairview.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-002	LW-053	Dubsdread Heights	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-055	Anderson Park, Bay Run Gardens, Bonita Park, Briarwood, Bryn Mawr, Edgewater Park, Golfview, Greens Phase 2 and 3, Neva Court, Palomar Townhouses, Phelps Replat, Pinewood Plat 1, Villa Farms	Property Flooding	City is currently investigating this; survey has been completed.	City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-073	Tributary H	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Orange County/City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-002	LW-112	Rio Grande to RR, Silver Star Rd. to Tulane Ave.	Street Flooding	Place inlets every 400 ft along City-owned streets, extend proposed storm sewers to the existing drainage well located at the northwest corner of Cumbie Ave and Taft Ave.	City of Orlando and FDOT	West College Park Drainage Evaluation Final Report, 2002, ERD
LW-002	LW-113	Taft Ave north of Cumbie Ave	Water Quality	Installation of liquid/solid separation structures on each of the stormwater systems which discharge into existing drainage well, to reduce loads to drainage well	City of Orlando and FDOT	West College Park Drainage Evaluation Final Report, 2002, ERD

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-002	LW-114	Ardsley to Rio Grande, Manchester to Fairview	Street Flooding	Place inlets every 400 ft along City-owned streets, extend proposed storm sewers east into the three existing storm sewer outfalls. The City should confirm these outfalls are clean and in good condition.	City of Orlando and FDOT	West College Park Drainage Evaluation Final Report, 2002, ERD
LW-002	LW-115	Ardsley to Rio Grande, Fairview to Quailey Ave	Street Flooding	Place inlets every 400 ft along City-owned streets, extend proposed storm sewers east into the three existing storm sewer outfalls. The City should confirm these outfalls are clean and in good condition.	City of Orlando and FDOT	West College Park Drainage Evaluation Final Report, 2002, ERD
LW-002	LW-116	Ardsley to Rio Grande, Quailey to Bryn Mawr	Street Flooding	Place inlets every 400 ft along City-owned streets, extend proposed storm sewers east into the three existing storm sewer outfalls. The City should confirm these outfalls are clean and in good condition.	City of Orlando and FDOT	West College Park Drainage Evaluation Final Report, 2002, ERD
LW-003	LW-006	Londonderry Subdivision	Street Flooding	The existing ditch requires a positive outfall with the nearest discharge point being the FDOT secondary drainage system for Pine Hills Road. The ditch serving Danny Bor Cir. should be redesigned to recover via an underdrain system based on the high water table conditions. Under construction by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-003	LW-013	Little Wekiva River	Erosion/Sedimentation	Under study by Orange County Stormwater Management	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-022	Ramir/Magnolia Terrace Subdivision	Street Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-023	Monroe Manor Subdivision	Street Flooding	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-024	Shady Grove Subdivision	Maintenance	Under maintenance by Orange County Roads & Drainage	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-003	LW-025	Spring Run Patio Homes Subdivision	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	City of Altamonte Springs/Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-027	Altamonte Landings Subdivision	Landlocked	Stormwater pump constructed in 2001 and pumps stormwater to Altamonte Springs Reclaimed Water Reclamation Facility. City has obtained CUP to utilize basin for reclamation augmentation which could increase available flood storage.	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-029	Spring Valley Farms Subdivision	Street Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-032	Spring Valley Subdivision	Maintenance	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-044	Little Wekiva River	Water Quality	Little Wekiva River Watershed Management Plan in third and final phase of study./ EpD has not implemented any BMPs.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-003	LW-047	Weathersfield Ave. Area; direct discharge to river without treatment	Water Quality	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-048	Northwestern Avenue; direct discharge to river without treatment	Water Quality	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-051	Country Creek	Erosion/Sedimentation	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-003	LW-056	Little Wekiva Canal	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-057	Little Wekiva Canal	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Orange County/City of Orlando	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-058	Little Wekiva Canal	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-059	Little Wekiva River	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-060	Little Wekiva River	Property/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-061	Little Wekiva River	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-062	Little Wekiva River	Street/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-063	Little Wekiva River	Property/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-069	Tributary D (Bear Lake system)	Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-071	Tributary F (Spring Lake Outfall system)	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-003	LW-093	Spring Oaks Subdivision along Little Wekiva Rd. and Greenbriar Blvd.	Street Flooding	**No Action.** Reconstruction of road to provide additional drainage inlets would hasten flow of runoff to river possibly resulting in flooded homes on Little Wekiva Rd./ This area is part of the SJRWMD Little Wekiva Watershed Master Plan, and is in the process of being addressed. In addition, a baffle box was installed in this area to improve water quality.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-005	LW-004	Twin Lakes Estates	Street Flooding	Retrofitting the subdivision with stormwater management facilities, provision of adequate secondary drainage systems to alleviate flooding as well as to direct flows to the stormwater pond for treatment and eliminate the maintenance intensive ditch system.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-005	LW-042	Lake Weston	Water Quality	Nothing planned at this time./ Lake continues to be sampled and monitored for aquatic plant maintenance. It was included on the Final Impaired Waters list for Grp 2.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-005	LW-072	Tributary G (Lake Lovely Outfall)	Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-006	LW-043	Lake Gandy	Water Quality	Nothing planned at this time./ Nothing implemented or planned by EPD.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-006	LW-045	Lake Hill	Water Quality	Nothing planned at this time./ Lake is routinely monitored but nothing has been implemented or is planned. It is not impaired by IWR.	Unincorporated Orange County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004); Orange County Stormwater Needs Assessment Update 2002
LW-007	LW-030	Hillview Drive	Street/Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-007	LW-049	Spring Lake; direct discharge to river without treatment	Water Quality	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-008	LW-026	Franklin & Central Parkway	Street Flooding	City has not reported any problems since Tropical Storm Gordon	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-008	LW-052	Sanlando, The Altamonte Section	Street Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-008	LW-075	Unnamed Lake - Cranes Roost Subbasin	Street/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-008	LW-076	Lake Florida	Street/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan/ Based on water testing in recent years, a major source of lake quality problem is from septic tanks up gradient of lake.	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-008	LW-077	North of Villa del Mar, at end of paved portion of Orange St.	Erosion/Sedimentation	Exfiltration treatment system within existing Center Street right-of-way directly north of Villa del Mar./No work has been performed on this project. The outfall for the City portion of Orange St. is located in unincorporated Seminole County.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-078	Lake Adelaide	Water Quality	Environmental assessment, aquatic planting and lake restoration program./ During reviews of lake water quality, observed that lake serving invaluable service in improving water quality in Cranes Roost Basin that extends north and east of Lake Florida. The current lake vegetation results in an exponential improvement in nutrient and biological loading in the water from Lake Florida flowing down gradient to Cranes Roost. City fears any alteration to the vegetation in lake will have a negative affect on water quality.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-008	LW-081	South of Lake Orienta and Barclay Woods Subdivision, within the Spring Lake Rd. right-of-way (south of Broadway Ave, and north of Oak Hill Dr.) west of Mt. Vernon Pkwy	Water Quality	Exfiltration system within the Spring Lake Rd. right-of-way./ Due to the large number of utilities within the right of way, project deemed not feasible. City has implemented an aggressive street sweeping program that has resulted in improved water quality in Lake Orienta.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-083	Lake Orienta	Water Quality	10 sediment baffle boxes to reduce sediment load. 1 alum injection treatment system for 1 of the largest storm sewer inflows to Lake Orienta./ After completing other baffle boxes in other parts of the City, they determined that the cost to benefit basis for acquiring additional land and installing baffle boxes were poor at best. After monitoring water quality with the street sweeping program, they believe they are achieving many of the same positive impacts anticipated with baffle boxes.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-084	Lake Ruby	Water Quality	Alum treatment system to improve water quality within the lake. 2 sediment baffle boxes to reduce sediment load./ the City elected not to pursue this project due to mixed reactions from adjoining property owners.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-085	Lake Orienta	Landlocked	Construct stormwater pumping station to discharge to force main downstream of Lake Maltbie pumping station. Institute a navigational safety program including dredging “high points” in lake bottom or warning signs./ This project was viewed as stormwater diversion and would not be a permit able project. Recognizing a need, the City recently obtained a CUP from SJRWMD to allow the used of water in Lake Orienta of reclaimed augmentation. This CUP assists the City to better maintain a better pond elevation. In addition, the City discovered and opened a third drainwell that had been disconnected during the construction of a residence.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-086	Ballard St.	Street/Property Flooding	Curb and/or gutter improvements, small amount of re-grading behind selected homes north of Ballard St./ The City completed the drainage and curb work on Ballard St. to reduce street and property flooding. Additional work is needed on City owned property north of this location.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-087	Pair of interconnected stormwater ponds in Windsong Apartments	Property Flooding	Pipe cleaning.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-008	LW-089	Swale behind homes on Pennsylvania Ave.	Property Flooding	Install a French drain with perforated pipe in aggregate material, properly connected to the existing storm manhole./ City is currently working on this project which may be modified to overcome problems with the current hydraulic gradeline.	City of Altamonte Springs	Altamonte Springs Stormwater Management Master Plan, PEC 1996
LW-009	LW-033	McNeil Woods Subdivision	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
LW-009	LW-036	Bear Lake Heights Subdivision	Street Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-009	LW-037	Bear Lake Forest Subdivision-Linneal Beach	Street Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-010	LW-034	Bear Lake Hills Subdivision-Bonnie/Anna Dr.	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-010	LW-035	Beverly Terrace Dedicated Subdivision-Mirror Lake Dr.	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-010	LW-050	Mirror Lake; direct discharge to river without treatment	Water Quality	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-010	LW-067	Tributary C	Street/Property Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-010	LW-068	Tributary C	Street Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-011	LW-038	Mobile Manor	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-011	LW-046	Spring Oaks Subdivision	Water Quality	The City of Altamonte Springs will be installing sediment control structures at this location as resources become available.	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-011	LW-065	Mobile Manor Lake	Property/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Seminole County/City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-011	LW-066	Tributary B	Property/House Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	City of Altamonte Springs	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-012	BW-042	510 Windingcreek Pl	Maintenance	Maintenance and/or analysis of secondary system should be conducted.	Unincorporated Seminole County	Big Wekiva Basin Engineering Study & Drainage Inventory Phase II (DRMP, 2003)
LW-012	LW-028	Sabal Point Subdivision	Property Flooding	Little Wekiva River Watershed Management Plan in third and final phase of study.	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
LW-012	LW-064	Tributary A	Street Flooding	Alternatives Analysis is currently underway under Phase III of the Little Wekiva River Watershed Management Plan	Unincorporated Seminole County	Little Wekiva Watershed Master Plan, Phase 2, Part II Engineering Analysis (CDM, 2004)
MON-001	MO-001	Main channel northeast of Ohio Ave. and Astor Farms Subdivision	Property Flooding	Regrade channel sections	Unincorporated Seminole County	Monroe Basin Engineering Study and Drainage Inventory Update Final Report, Seminole County, (CDM, 2001)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

Appendix D
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Identified Problem Areas from Existing Studies

Subbasin	WSA Problem ID	Problem Area	Problem Description	Recommendation/Status	Jurisdiction	Source
MON-001	MO-002	Channel east of Mallard Dr.	Property Flooding	Regrade channel sections	Unincorporated Seminole County	Monroe Basin Engineering Study and Drainage Inventory Update Final Report, Seminole County, (CDM, 2001)
MON-002	MO-003	FPC powerline crossing	Street Flooding	Replace culverts with two 42-in circular RCPs	Unincorporated Seminole County	Monroe Basin Engineering Study and Drainage Inventory Update Final Report, Seminole County, (CDM, 2001)
SOL-001	SC-002	Hickory Tree Rd	Street Flooding	Replace existing structures at E.E. Williamson and Penelope Rds. With equivalent structures to that at Hickory Tree Rd. Reconstruct a section of Penelope Rd, approximately 400 to 500 linear ft, to a minimum crown elevation of 76 ft.	Unincorporated Seminole County	Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County, (Singhofen & Associates, Inc,)
SOL-001	SC-003	Penelope Rd	Street Flooding	Replace existing structures at E.E. Williamson and Penelope Rds. With equivalent structures to that at Hickory Tree Rd. Reconstruct a section of Penelope Rd, approximately 400 to 500 linear ft, to a minimum crown elevation of 76 ft.	Unincorporated Seminole County	Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County, (Singhofen & Associates, Inc,)
SOL-001	SC-004	Twin Lake-Cedarwood Cir. And Sweet Briar Branch	Street Flooding	Replace existing structures at E.E. Williamson and Penelope Rds. With equivalent structures to that at Hickory Tree Rd. Reconstruct a section of Penelope Rd, approximately 400 to 500 linear ft, to a minimum crown elevation of 76 ft.	Unincorporated Seminole County	Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County, (Singhofen & Associates, Inc,)
SOL-001	SC-005	Area between Woodlands II Pond and E.E. Williamson Rd	Street/Property Flooding	Replace existing structures at E.E. Williamson and Penelope Rds. With equivalent structures to that at Hickory Tree Rd. Reconstruct a section of Penelope Rd, approximately 400 to 500 linear ft, to a minimum crown elevation of 76 ft.	Unincorporated Seminole County	Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County, (Singhofen & Associates, Inc,)
SOL-005	SC-001	Rangeline Rd	Erosion/Sedimentation	Clean out stormwater conveyance system	City of Longwood	Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County, (Singhofen & Associates, Inc,)
YL-002	YL-001	Lake Sylvan	Property Flooding	Under study	Unincorporated Seminole County	Yankee lake Engineering Study and Drainage Inventory, (CDM, current)

AP - Apopka Basin
BC- Black Water Creek Basin
BW - Big Wekiva Basin
GT - Golden Triangle Basin
LE - Lake Eustis Basin
LW - Little Wekiva River Basin
MO - Monroe Basin
SC - Soldiers Creek Basin
YL - Yankee Lake

8/31/05

HonourDM

E:\Projects\92477\44812\GIS\FigD-1.mdx

Legend

- Wekiva Study Area
- Major Roads
- Roads

Incorporated Areas

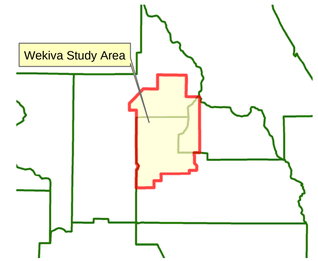
- Altamonte Springs
- Apopka
- Eatonville
- Eustis
- Lake Mary
- Longwood
- Maitland
- Mount Dora
- Oakland
- Ocoee
- Orlando
- Winter Garden

- County Line
- Water Bodies

Problem Areas

- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

LOCATION MAP



N
W E
S

4,500 0 4,500 9,000 Feet

1 inch equals 4,500 feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure D-1
Locations of Existing Deficiencies

8/31/05

HonourDM

E:\Projects\92477448\2\GIS\FigD-2.mdx

Legend

- Wekiva Study Area
- Major Roads
- Roads

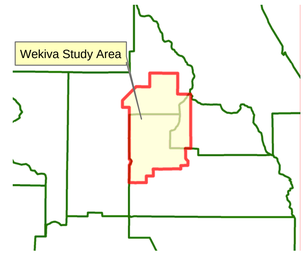
Incorporated Areas

- Altamonte Springs
- Apopka
- Eatonville
- Eustis
- Lake Mary
- Longwood
- Maitland
- Mount Dora
- Oakland
- Ocoee
- Orlando
- Winter Garden
- County Line
- Water Bodies

Problem Areas

- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

LOCATION MAP



N
W E
S

4,500 0 4,500 9,000 Feet

1 inch equals 4,500 feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure D-2
Locations of Existing Deficiencies

Appendix E

Pollutant Load Analysis

Appendix E
Pollutant Load Analysis

E.1 Introduction

As part of the MSMP, CDM estimated the relative annual pollutant loads for the WSA for existing and future conditions. Nonpoint source pollutant loads were estimated using the CDM Watershed Management Model (WMM), Version 4.21. The WMM was used to conceptually evaluate the 12 USEPA stormwater indicator pollutants (BOD_5, COD, TSS, TDS, TP, DP, TKN, NO_3 and NO_2, Pb, Cu, Zn, and Cd) for each of the subbasins identified in the WSA (see Section 2.6.1). The purpose of the evaluation was to identify relative changes in nonpoint source pollutant loadings due to changes in land use, areas served by septic tank, point sources and existing BMPs. The model provides a basis for planning-level evaluations of the long-term (annual or seasonal) basin pollutant loads and the relative benefits of pollution management strategies to reduce these loads. This conceptual screening allows the Stakeholders to identify areas where water quality retrofit may be a higher priority to address TMDL and water quality issues as well as to focus on those areas where future loads are predicted to be relatively high.

E.2 Watershed Management Model (WMM) Background

WMM uses a database platform to estimate annual or seasonal pollutant nonpoint surface loads within a basin. Data required for the WMM include stormwater event mean concentrations (EMCs) for each pollutant type, land use, and average annual precipitation. In addition, impacts due to failing septic systems, annual baseflow and average baseflow concentrations, point source flows and pollutant concentrations, and average number of combined sewer overflows (CSOs) and concentrations can also be taken into account in the WMM if applicable. The model is a "stand alone" application that runs in Microsoft Windows 95® or greater. The following summarizes some of the features of the WMM:

- Estimates annual stormwater runoff pollution loads and concentrations for nutrients (total phosphorus, dissolved phosphorus, total nitrogen, ammonia plus organic nitrogen), heavy metals (lead, copper, zinc, cadmium), and oxygen demand (BOD_5, COD) and sediment (total suspended solids, total dissolved solids) based upon EMCs, land use, percent impervious, and annual rainfall;
- Estimates stormwater runoff pollution load reduction due to partial or full-scale implementation of onsite or regional BMPs;
- Estimates annual pollution loads from stream baseflow;
- Estimates point source loads for comparison with relative magnitude of other basin pollution loads;
- Estimates pollution loads from failing septic tanks;

- Applies a delivery ratio to account for reduction in runoff pollution load due to settling of particulate matter in stream courses; and,

- Imports data sets from land use data files from the spreadsheet version of WMM 3.30 into the data base version of WMM for Windows, Version 1.0.

Pollution control strategies that may be identified and evaluated using WMM include nonstructural controls (e.g., land use controls, buffer zones, etc.), and structural controls (e.g., onsite and regional detention basins, grassed swales, dry detention ponds, CSO basins, sewer separation, etc.).

The WMM can also evaluate alternative management strategies (combinations of source and treatment stormwater controls) to develop a proposed municipal NPDES stormwater management plan or other basin management plan.

Within a given watershed, multiple subbasins can be evaluated. Subbasins are typically subdivided by tributary areas, outfalls, or other receiving water body within a basin. However, subbasins can be delineated based on non-hydrologic boundaries such as jurisdictional limits. This provides decision makers with information regarding the relative contribution of pollution loadings from various areas within a basin which can be used for targeting control measures to those areas which are responsible for generating the majority of the pollutant load.

The WMM consists of three major computational modules, the import utility, and numerous related database records. WMM was developed using Visual Basic® and Microsoft Access®.

E.2.1 Basins and Pollution Sources

A "basin" is the land area which supplies all of the water that eventually flows into a downstream "receiving water" such as a river, lake, or reservoir. The major sources of water in a basin typically include rainfall runoff from the basin surface and seepage into streams from groundwater sources.

The major sources of pollutants in a basin are typically stormwater runoff pollution from urban and agricultural areas and discharges from wastewater treatment plants (WWTPs) or industrial facilities. Stormwater runoff, traditionally referred to a nonpoint source (NPS), discharges into streams at many dispersed points. A WWTP discharge or industrial process wastewater discharge, typically referred to as a point source releases pollution into streams at discrete points.

E.2.2 Rainfall/Runoff Relationships

NPS pollution loading factors (lbs/acre/year) for different land use categories are based upon annual runoff volumes and event mean concentrations (EMCs) for different pollutants. The EMC is defined as the average of individual measurements of storm pollutant mass loading divided by the storm runoff volume. One of the keys

to effective transfer of literature values for nonpoint pollution loading factors to a particular study area is to make adjustments for actual runoff volumes in the basin under study. In order to calculate annual runoff volumes for each subbasin, the pervious and impervious fractions of each land use category are used as the basis for determining rainfall/runoff relationships. For rural/agricultural (nonurban) land uses, the pervious fraction represents the major source of runoff or stream flow, while impervious areas are the predominant contributors for most urban land uses.

Annual Runoff Volume

WMM calculates annual runoff volumes for the pervious/impervious areas in each land use category by multiplying the average annual rainfall volume by a runoff coefficient. A runoff coefficient of 0.95 is typically used for impervious areas (i.e., 95% of the rainfall is assumed to be converted to runoff from the impervious fraction of each land use). A pervious area runoff coefficient of 0.20 is typically used. The total average annual surface runoff from land use "L" is calculated by weighting the impervious and pervious area runoff factors for each land use category as follows:

$$R_L = [C_P + (C_I - C_P)\, IMP_L] * I; \qquad \textit{(Equation E-1)}$$

where:

R_L = total average annual surface runoff from land use L (in/yr);

IMP_L = fractional imperviousness of land use L;

I = long-term average annual precipitation (in/yr);

C_P = pervious area runoff coefficient; and

C_I = impervious area runoff coefficient.

Total runoff in a basin is the area-weighted sum of R_L for all land uses.

E.2.3 Nonpoint Pollution Event Mean Concentrations

The WMM estimates loads from pollutants which are most frequently associated with nonpoint pollution sources, including,

- Oxygen Demand
  - Biochemical Oxygen Demand (BOD_5)
  - Chemical Oxygen Demand (COD)
- Sediment
  - Total Suspended Solids (TSS)

- Total Dissolved Solids (TDS)

- Nutrients
  - Total Phosphorus (TP)
  - Dissolved Phosphorus (DP)
  - Total Kjeldahl Nitrogen (TKN)
  - Nitrate + Nitrite Nitrogen (NO_3 +NO_2)
- Heavy Metals
  - Lead (Pb)
  - Copper (Cu)
  - Zinc (Zn)
  - Cadmium (Cd)

Estimates of the annual load of most of these pollutants were also specified as part of the Phase I National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. These pollutants and their impacts on water quality and aquatic habitat are described below.

Oxygen Demand: Biochemical Oxygen Demand (BOD_5) is caused by the decomposition of organic material in stormwater which depletes dissolved oxygen (DO) levels in slower moving receiving waters such as lakes and estuaries. Low dissolved oxygen can be the cause of fish kills in streams and reservoirs. The degree of DO depletion is measured by the BOD_5 test that expresses the amount of easily oxidized organic matter present in water.

Sediment: Sediment from nonpoint sources is the most common pollutant of surface waters. Many other toxic contaminants adsorb to sediment particles or solids suspended in the water column. Excessive sediment can lead to the destruction of habitat for fish and aquatic life. Total suspended solids (TSS) is a laboratory measurement of the amount of sediment particles suspended in the water column. Excessive sediment pollution is primarily associated with poor sedimentation controls at construction sites in developing areas or unstable channels throughout river systems.

Nutrients: Nutrients, usually phosphorus and nitrogen, are essential for plant growth. Within a lake, impoundment, or other slow moving receiving water, high concentrations of nutrients, particularly phosphorus, can result in overproduction of algae and other aquatic vegetation. Excessive levels of algae present in a receiving

water is called an algal bloom. Algal blooms typically occur during the summer when sunlight and water temperature are ideal for algal growth. Water quality problems associated with algal blooms range from simple nuisance or unaesthetic conditions, to noxious taste and odor problems, oxygen depletion in the water column, and fish kills. Collectively, the problems associated with excessive levels of nutrients in a receiving water are referred to as eutrophication impacts. Control of nutrients discharged to streams can severely limit algal productivity and minimize the water quality problems associated with eutrophication.

Heavy Metals: Heavy metals are toxic to humans above certain levels and are subject to State and Federal drinking water quality standards. Heavy metals are also toxic to aquatic life and may bioaccumulate in fish. Lead, copper, zinc and cadmium are heavy metals which typically exhibit higher nonpoint pollutant loadings than other metals found in urban runoff. The presence of these heavy metals in streams and reservoirs in the basin may also be indicative of problems with a wide range of other toxic chemicals, like synthetic organics, that have been identified in previous field monitoring studies of urban runoff pollution (USEPA, 1983b).

Event Mean Concentrations

Over the past 20 years, nonpoint pollution monitoring studies throughout the U.S. have shown that annual "per acre" discharges of urban stormwater pollution (e.g., nutrients, metals, BOD_5) are positively related to the amount of imperviousness in the land use (i.e., the more imperviousness the greater the nonpoint pollution load) and that the EMC is fairly consistent for a given land use. The EMC is a flow-weighted average concentration for a storm event and is defined as the sum of individual measurements of stormwater pollution loads divided by the storm runoff volume. The EMC is widely used as the primary statistic for evaluations of stormwater quality data and as the stormwater pollutant loading factor in analyses of pollutant loadings to receiving waters.

Nonpoint pollution loading analyses typically consist of applying land use specific stormwater pollution loading factors to land use scenarios in the basin under study. Runoff volumes are computed for each land use category based on the percent impervious of the land use and the annual rainfall. These runoff volumes are multiplied by land use specific mean EMC load factors (mg/L) to obtain nonpoint pollution loads by land use category. This analysis can be performed on a subarea or basin-wide basis, and the results can be used for performing load allocations or analyzing pollution control alternatives, or for input into a riverine water quality model.

Selection of nonpoint pollution loading factors depends upon the availability and accuracy of local monitoring data as well as the effective transfer of literature values for nonpoint pollution loading factors to a particular study area.

EMC monitoring data collected by the USEPA's Nationwide Urban Runoff Program (NURP) and the Federal Highway Administration (FHWA) were determined to be log normally (base e) distributed. The log normal distribution allows the EMC data to be described by two parameters, the mean or median which is a measure of central tendency, and the standard deviation or coefficient of variation (standard deviation divided by the mean) which is a measure of the dispersion or spread of the data. The median value should be used for comparisons between EMCs for individual sites or groups of sites because it is less influenced by a small number of large values which is typical of lognormally distributed data.

To estimate annual pollutant loads discharged to receiving waters from a municipality, median EMCs are converted to mean values (USEPA, 1983b; Novotny, 1992) by the following relationship:

$$M = T * ((1 + CV^2))^{1/2}; \qquad \textit{(Equation E-2)}$$

where:

M = arithmetic mean;

T = median; and

CV= coefficient of variation = standard deviation/mean.

E.2.4 Nonpoint Pollution Loading Factors

WMM estimates pollutant loadings based upon nonpoint pollution loading factors (expressed as lbs/ac/yr) that vary by land use and the percent imperviousness associated with each land use. The pollution loading factor M_L is computed for each land use L by the following equation:

$$M_L = EMC_L * R_L * K; \qquad \textit{(Equation E-3)}$$

where:

M_L = loading factor for land use L (lbs/ac/yr);

EMC_L = event mean concentration of runoff from land use L (mg/l); EMC_L varies by land use and by pollutant;

R_L = total average annual surface runoff from land use L computed from Equation E-1 (in/yr); and

K = 0.2266, a unit conversion constant.

By multiplying the pollutant loading factor by the acreage in each land use and summing for all land uses, the total annual pollution load from a subbasin can be

computed. The EMC coverage is typically not changed for various land use scenarios within a given study basin, but any number of land use data sets can be created to examine and compare different land use scenarios (e.g., existing versus future) or land use management scenarios.

BMP Pollutant Removal Efficiencies

The WMM applies a constant removal efficiency for each pollutant to all land use types to simulate treatment BMPs. The range of typical pollutant removal efficiencies for swales, extended dry and wet detention ponds, baffle boxes and retention ponds are shown in **Table E-1**.

Calculation of Pollutant Loading Reduction from BMPs

The effectiveness of BMPs in reducing nonpoint source loads is computed for each land use in each subbasin. Up to five BMPs per land use can be specified. The percent reduction in nonpoint pollution per pollutant type in each subbasin of the basin is calculated as:

$$P_{L,SB} = (AC_{1,SB}(REM_1) + (AC_{2,SB}(REM_2) + (AC_{3,SB}(REM_3) + (AC_{4,SB}(REM_4) + (AC_{5,SB}(REM_5) \quad \text{(Equation E-4)}$$

where:

$P_{L,SB}$ = percent of annual nonpoint pollution load captured in subbasin SB by application of the five BMP types on land use L;

$AC_{1,SB}$; $AC_{2,SB}$; $AC_{3,SB}$; $AC_{4,SB}$; $AC_{5,SB}$ = fractional area coverage of BMP types 1 through 5 on subbasin SB;

REM_1; REM_2; REM_3; REM_4; REM_5 = removal efficiency of BMP types 1 through 5 respectively; REM; varies by pollutant type but not by land use or subbasin.

Equation E-4 enables the user to examine the effectiveness of various BMPs and the degree of BMP coverage within a basin. Coverage might vary depending upon whether the BMP is applied to new development only, existing plus new development, etc. Also, topography may limit the areal coverage of some BMPs.

The nonpoint pollution load from a basin is thus computed by combining Equations E-3 and E-4 and summing over all land uses and all subbasins; i.e.,

$$MASS = \sum_{SB=1}^{N} \sum_{L=1}^{15} M_{L,SB}(1 - P_{L,SB}); \quad \text{(Equation E-5)}$$

Table E-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Ranges of BMP Removal Efficiencies (%)

Parameter	Dry Detention [1]	Wet Detention [1]	Retention [1]	Swale [1]	Baffle Boxes[2]
BOD_5	20 - 30	20 - 40	80-99	20 - 40	0
COD	20 - 30	20 - 40	80-99	20 - 40	0
TSS	80-90	80 - 90	80-99	70 - 90	80
TDS	0	30 - 40	80-99	0 - 10	0
Total -P	20 - 30	40-50	80-99	30 - 50	35
Dissolved P	0	60 - 70	80-99	0 - 20	0
TKN	10 - 20	20 - 30	80-99	30 - 50	5
NO_2+NO_3	0	30 - 40	80-99	30 - 50	0
Lead	70 - 80	70 - 80	80-99	60 - 90	75
Copper	50 - 60	60 - 70	80-99	40 - 60	50
Zinc	40 - 50	40 - 50	80-99	40- 50	35
Cadmium	70 - 80	70 - 80	80-99	50 - 80	60

(1) Watershed Management Model Version 4.0 User's Manual. CDM, 1998.
(2) Big Creek Watershed Study, Fulton County, GA. CDM, 2001.

where:

MASS = annual nonpoint pollution load washed off the basin in lbs/yr with BMPs taken into account.

N = number of subbasins

The resultant model is a very versatile yet simple algorithm for examining and comparing nonpoint pollution management alternatives for effectiveness in reducing nonpoint pollution.

E.2.5 Failing Septic Tank Impacts

Many of the residential developments within the U.S. rely on household septic tanks and soil absorption fields for wastewater treatment and disposal. The nonpoint pollution loading factors for low density residential areas, which are typically served by septic tank systems, are based on test basin conditions where the septic systems were in good working order and made no significant contribution to the monitored nonpoint pollution loads. In fact, septic tank systems typically have a limited useful life expectancy and failures are known to occur, causing localized water quality impacts. This section describes the method used for estimating average annual septic tank failure rates and the additional nonpoint pollution loadings from failing septic systems.

To estimate an average annual failure rate, the time series approach proposed in the report entitled *Forecasting Onsite Soil Absorption System Failure Rates* (USEPA, 1986) was used. This approach considers an annual failure rate (percent per year of operation), future population growth estimates, and system replacement rate to forecast future overall failure rates. Annual septic tank failure rates reported for areas across the U.S. range from about 1% to 3%. For average annual conditions, it is conservative to expect that septic tank system failures would be unnoticed or ignored for five years before repair or replacement occurred. Therefore, during an average year, 5% to 15% of the septic tanks system in the basin are estimated to be failing.

This is consistent with the results of a survey conducted in Jacksonville, Florida, by the Department of Health and Rehabilitative Services. Of more than 800 site inspections, about 90 violations (11%) had been detected. Types of violations detected were typically: (1) drain field located below groundwater table, (2) direct connections between the tile field and a stream, and (3) structural failures. The violation rate of 11% is consistent with the average year septic tank failure rate and period of failure before discovery/remediation. The "impact zone" or the "zone of influence" for failing septic tanks can be estimated to be all residential areas that are not served by public sewer.

Pollutant loading rates for failing septic systems were developed from a review of septic tank leachate monitoring studies. The range of concentrations of total-P and total-N based upon literature values are as follows:

	Total-P	Total-N
Low	1.0 mg/L	7.5 mg/L
Medium	2.0 mg/L	15.0 mg/L
High	4.0 mg/L	30.0 mg/L

Annual "per acre" loading rates for septic tank failures from low density residential land uses were then estimated using 50 gallons per capita per day wastewater flows. The loading rates can be applied to the percentage of all non-sewered residential land uses with failing septic tanks. The septic tank loading factors are included in the runoff pollution loading factors. The range of percent increases in annual per acre loadings attributed to failing septic tanks is:

	Total-P	Total-N
Low	130%-180%	120%-150%
Medium	160%-250%	140%-200%
High	220%-400%	180%-310%

To assess the increase in surface runoff load due to failing septic tanks, WMM considers a multiplication factor. This multiplication factor is applied to the phosphorus (dissolved P, total P) and nitrogen (TKN, NO_2+NO_3-N) parameters.

Consequently, the load from a residential area with failing septic tanks is:

(surface runoff load without failing septic tanks) x

((multiplication factor) x (% of area with failing septic tanks/100%) + (1 - (% of area with failing septic tanks)/100%))

Despite the large increase in annual loading rates, septic tank failures typically have only a limited impact on overall nonpoint pollution discharges. This is because the increased annual loading rates are applied only to the fraction of non-sewered residential development that are predicted to have a failing septic tank system during an average year. Based upon this methodology, failing septic tank systems typically would contribute less than 10% of total nonpoint loadings.

However, it should be noted that septic tanks often exist along lakes, streams, and wetlands, therefore a public information program may be beneficial to curtail localized water quality impacts. For example, a pilot septic tank inspection program can be initiated which would include a mail- out questionnaire to each resident in the pilot area, a stream walk to observe for potential septic tank failure, stream sampling for fecal coliform, and onsite inspections to verify the continued use of septic tanks and their maintenance condition. The information can be complied into a database to develop a systematic inspection and maintenance program based on the findings of the pilot program. The program could require inspections every five years for those homes that lie around wetlands and water bodies.

E.2.6 Point Source Loadings

Pollutant loadings from point source discharges such as package wastewater treatment plants (WWTP), regional WWTPs, and industrial sources can also be estimated to determine the relative contributions of point versus other watershed pollution loadings. An inventory of package plants and industrial discharges within each subbasin are typically developed from utility location maps and discharge permit data. Package plants and industrial dischargers are usually assumed to be discharging effluent at their permit limits where compliance monitoring data are not available. Where data on permit limits are not readily available, package plant discharges can be represented by following effluent concentrations which are based on typical effluent limits for secondary WWTPs:

- Total-P 6.0 mg/L
- Total-N 12.0 mg/L
- Lead 0.0 mg/L
- Zinc 0.0 mg/L

If permit data on industrial discharges are not available, then pollutant loads for each point source discharge are estimated for each subbasin by multiplying the discharge flow rate by the effluent concentration.

E.2.7 Model Limitations

The WMM was developed to estimate the relative changes in nonpoint source pollutant loads (average annual or seasonal) due to changes in land use or from the cumulative effects of alternative basin management decisions (e.g. treatment BMPs). The models should be applied to appropriate spatial (basin-wide) and temporal (average annual or seasonal) scales. It is not appropriate to use these input/output models for analysis of short-term (i.e., daily, weekly) water quality impacts. It is also not appropriate to use WMM to estimate absolute loads for a given outfall system without specific monitoring data for that system.

E.3 WMM Data Analysis

The WSA is made up of 10 major watersheds (previously shown in Figure 2-10). Based on existing delineations available from the Stakeholders, the major watersheds are divided up into 102 subbasins within the WSA (previously shown in Figure 2-11). These subbasins range in size from 85 to 26,783 acres in total area. The following sections describe how each of the input parameters for the WMM (i.e., land use, EMCs, BMPs, septic tank, point source) was obtained and processed to perform the pollutant load analysis for the WSA.

E.3.1 Land Use

The acquisition and modification of existing and future land use data were described in detail in Section 2.4 of the MSMP. Due to the number of land use classifications within the WSA, the categories were consolidated into twenty major categories for the purpose of developing the WMM, as shown in **Table E-2**. Another reason for consolidation was to correlate the twenty land use categories with the land use categories with available EMC data. The percent impervious used for each of the land use categories is also shown in Table E-2. Studies conducted at the University of Florida have indicated that wetlands export about 25% of the annual rainfall to other wetlands or water bodies, due to internal storage within the wetlands. Lakes export a slightly higher value (approximately 30%). For this study, an average of the two was used for the water and wetlands land use category.

E.3.2 BMP Identification and Pollution Removal Efficiencies

The existing BMPs were identified using information provided by some of the Stakeholders, parcel maps, available GIS stormwater structure inventory data, GIS subdivision coverages and inspection of the 2004 DOQQs. The BMP treatment areas identified from these data sources were then digitized as polygon features using ArcMap Version 9.0. Approximately 40,000 acres or 62 square miles within the WSA are served by BMPs as shown in **Figure E-1**. The SJRWMD was also consulted regarding the restoration effort at Lake Apopka. Values of approximate removal efficiencies for phosphorus for the alum treatment system the SJRWMD operates were provided.

In order to account for BMPs that will be incorporated as part of future development it was expected that all future development (i.e., those lands considered developable based on land use) will have treatment by BMPs based on current regulations (the most likely scenario). Therefore, all lands with agricultural and forest/open land use categories under existing conditions that were shown to be developed under future land use conditions (i.e., residential, commercial, industrial, etc.) were estimated as served by wet detention. At this point, it is unknown exactly which types of stormwater treatment BMPs will be incorporated as part of new development as there are various types. Therefore, for the purpose of this analysis, wet detention was used to represent this unknown. This basis is also made to show the pollution reduction benefits of mandating BMPs for all future development. The BMP tributary areas

Table E-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
WMM Land Use Categories

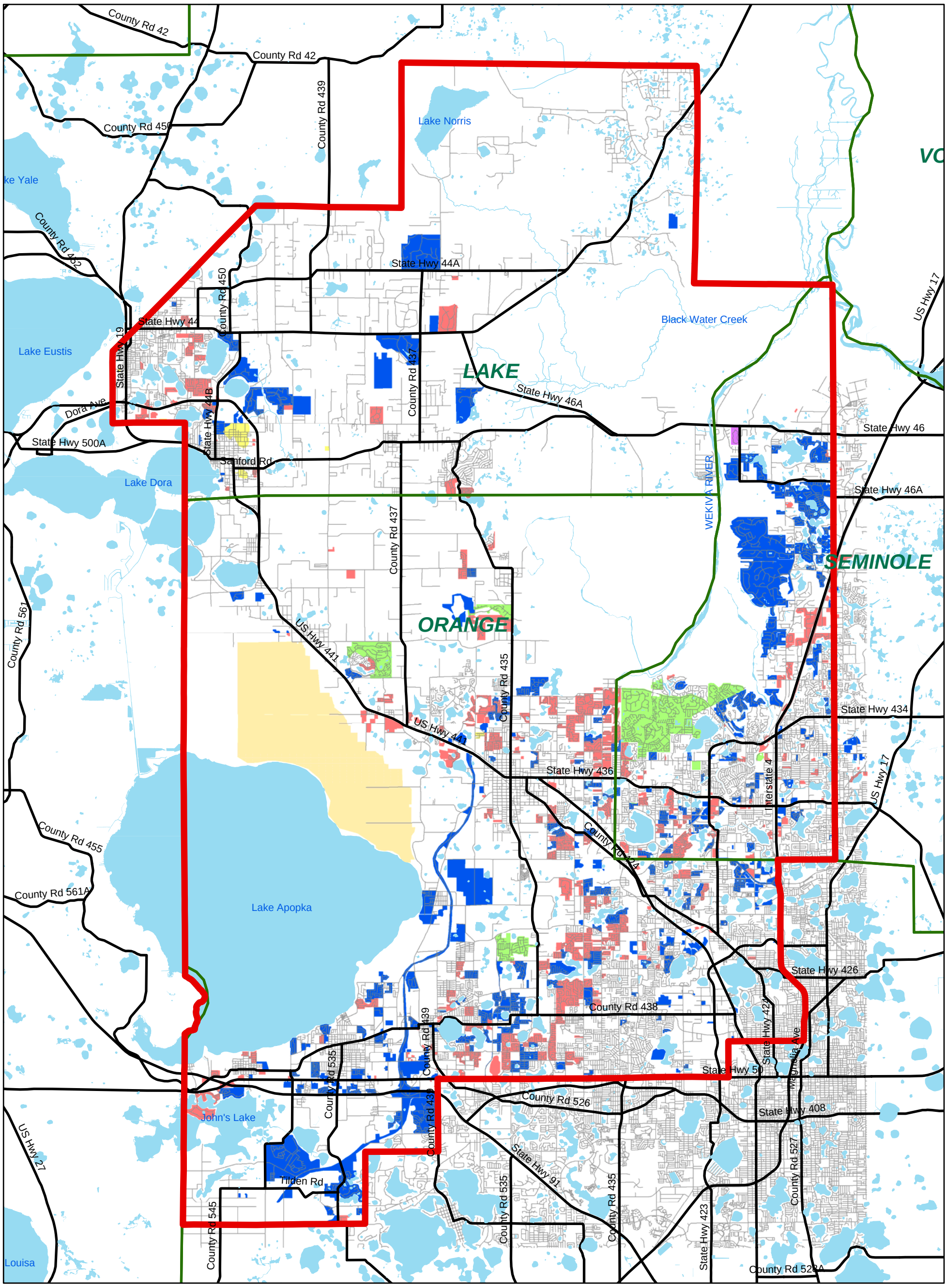
FLUCCS Land Use Category	WMM Land Use	% Impervious
Agriculture - Feeding Operations	Agriculture - Feeding Operations	1.0%
Agriculture - Field Crops	Agriculture - Field Crops	1.0%
Agriculture - Nurseries	Agriculture - Nurseries	1.0%
Agriculture - Pasture	Agriculture - Pasture	1.0%
Agriculture - Row Crops	Agriculture - Row Crops	1.0%
Agriculture - Specialty Farms	Agriculture - Specialty Farms	1.0%
Agriculture - Tree Crops	Agriculture - Tree Crops	1.0%
Commercial	Commercial	85.0%
Barren Land	Forest/Open	0.5%
Forest	Forest/Open	0.5%
Transportation*	Forest/Open	0.5%
Open Land	Forest/Open	0.5%
Cemetery	Forest/Open	0.5%
Recreational	Forest/Open	0.5%
Agriculture	General Agriculture	1.0%
Golf Course	Golf Course	17.0%
High Density Residential	High Density Residential	71.0%
Communication & Utilities	Industrial/utility	85.0%
Industrial	Industrial/utility	85.0%
Extractive	Industrial/utility	85.0%
Institutional	Institutional	65.0%
Low Density Residential	Low Density Residential	30.0%
Roads	Major Roads	100.0%
Medium Density Residential	Medium Density Residential	37.0%
Very Low Density Residential	Very Low Density Residential	16.0%
Rural Residential	Very Low Density Residential	16.0%
Water Body	Water Body	27.5%
Wetlands	Wetlands	27.5%

*Inspection of the 2004 DOQQs revealed that the actual land cover for the designated transportation areas were primarily grassed airstrips and therefore were assigned Forest/Open.

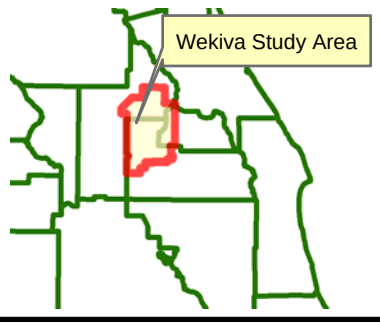
honourdm

8/25/05

E:\Projects\92471\44812\GIS\FigE-1.mxd



LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Roads
- Major Roads

BMP Tributary Area

BMP Type

- Combination (Swale/Dry Pond)
- Retention/Detention (Dual Pond)
- alum treatment
- dry detention
- dry retention
- swale
- wet detention

N W E S

0 3,500 7,000 14,000 21,000 Feet

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure E-1
BMP Tributary Areas - Existing Conditions

under the future land use scenario are shown in **Figure E-2**. **Tables E-3** and **E-4** provide the BMP type, the acreage and percent land use served by each type of BMP under existing and future conditions, respectively.

Five types of BMPs were identified in the WSA: alum treatment (SJRWMD Lake Apopka Restoration), combination of swale and dry detention (treatment train), retention, wet and retention/detention (dual ponds), and wet detention. Dr. Harvey Harper performed a literature search to document the removal efficiencies for various stormwater treatment systems from selected studies throughout the state of Florida. This paper, *Pollutant Removal Efficiencies for Typical Stormwater Management Systems in Florida* (1999) summarizes removal efficiencies for dry retention, wet retention, off-line retention/detention systems (dual pond), wet detention and dry detention. Where available, values for treatment efficiencies documented in Harper's work for the parameters evaluated in the WMM analysis were used. Where values were not available from Harper's work for certain BMPs as well as certain constituents, the literature values shown in Table E-1 were used (i.e., WMM User's Manual, 1998). The BMP removal efficiencies used in the WSA WMM analysis are shown in **Table E-5**. As mentioned previously, the SJRWMD provided approximate removal efficiencies for phosphorus related to the restoration effort at Lake Apopka.

Since some combination BMPs (e.g., swale/dry detention) are not standard default BMPs included in the WMM, it was necessary to create a new BMP type for these treatment trains from their individual treatment efficiencies. These efficiencies are estimated by calculating the "minimum" and "maximum" efficiency of the two BMPs in question. The minimum efficiency would be the maximum of the two BMPs. The equation for "maximum efficiency" is based on that each BMP in series has the same efficiency it would have if it was the only BMP.

For example, a wet detention BMP was expected to have a efficiency of 30 percent for BOD_5, and a swale was expected to have 30 percent removal efficiency for copper. The "minimum efficiency" would be 30 percent. Under the "maximum efficiency" calculation, wet detention would remove 30 percent (e.g., of a 100-pound load, 30 lb would be removed and 70 lb would be discharged) and the second BMP (swale) would remove 30 percent of the BOD_5 discharged by the first BMP (in the example, 70 lb is discharged by the first BMP into the second BMP and of that 70 lb, 21 lb (30%) is removed and 49 lb (70%) is discharged). The maximum efficiency would be 51 percent (100 lb into the BMP series, 51 lb removed and 49 lb discharged).

The equation below performs the calculations described above:

$$\text{Maximum Efficiency} = 100 - \frac{[(100 - \text{BMP1 efficiency})(100 - \text{BMP2 efficiency})]}{100}$$

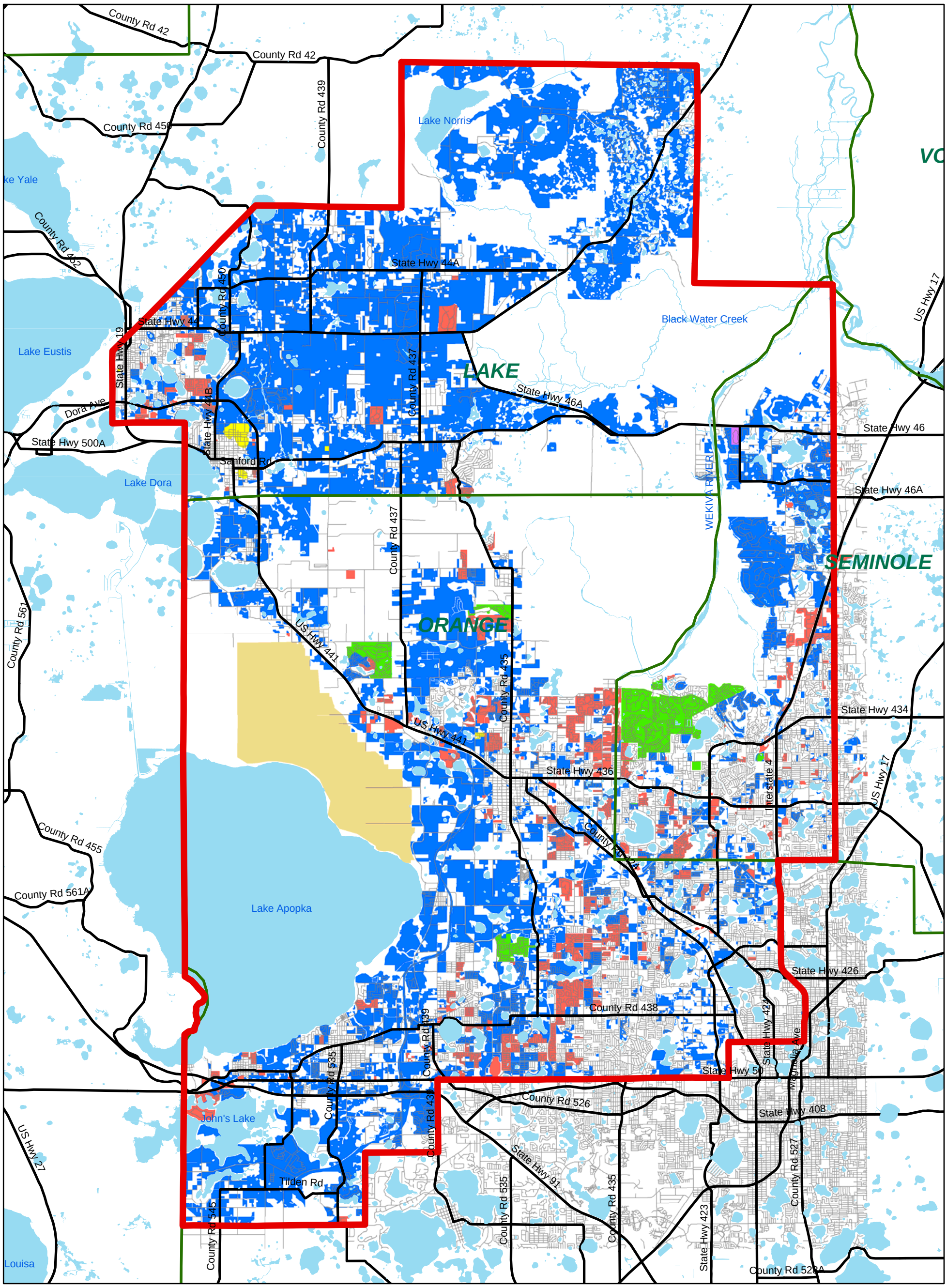
where:

The BMP efficiencies are in percent removal (e.g., use "50" in the equation for 50% removal). The final removal efficiency of the two BMPs in series is an average of the minimum and maximum efficiencies. For the example of BOD_5, the resulting efficiency would be approximately 40 percent.

honourdm

8/25/05

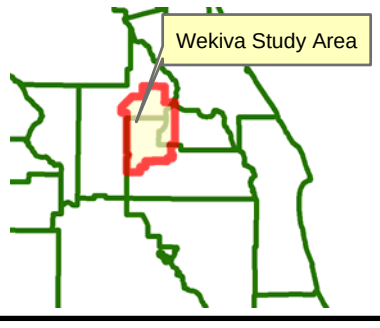
E:\Projects\92471\44812\GIS\FigE-2.mxd



N
W
E
S

0 3,500 7,000 14,000 21,000
Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Water Bodies
- Roads
- Major Roads

BMP Tributary Area

BMP Type

- Combination (Swale/Dry Pond)
- Retention/Detention (Dual Pond)
- Dry Detention
- Dry Retention
- Swale
- Wet Detention

Alum Treatment

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure E-2
BMP Tributary Area - Future Conditions

Table E-3
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Existing BMP Tributary Areas

Land Use	BMP Type	Acres Served	% of Land Use
Agriculture - Nurseries	alum treatment	376.43	6.72%
Agriculture - Pasture	alum treatment	5.63	0.03%
Agriculture - Tree Crops	alum treatment	0.03	0.00%
Forest/Open	alum treatment	8,463.36	10.00%
Industrial/utility	alum treatment	33.62	0.69%
Low Density Residential	alum treatment	1.77	0.01%
Major Roads	alum treatment	0.38	0.00%
Water Body	alum treatment	51.50	0.13%
Wetlands	alum treatment	145.57	0.29%
Agriculture - Pasture	Combination (Swale/Dry Pond)	1.23	0.01%
Forest/Open	Combination (Swale/Dry Pond)	1.78	0.00%
Major Roads	Combination (Swale/Dry Pond)	18.25	0.12%
Medium Density Residential	Combination (Swale/Dry Pond)	59.84	0.18%
Agriculture - Field Crops	dry detention	0.26	0.01%
Agriculture - Nurseries	dry detention	164.61	2.94%
Agriculture - Pasture	dry detention	12.93	0.07%
Agriculture - Row Crops	dry detention	6.94	1.06%
Agriculture - Specialty Farms	dry detention	8.84	0.97%
Agriculture - Tree Crops	dry detention	110.99	1.25%
Commercial	dry detention	539.50	8.37%
Forest/Open	dry detention	772.04	0.91%
General Agriculture	dry detention	0.00	0.00%
Golf Course	dry detention	72.28	2.67%
High Density Residential	dry detention	1,146.55	17.93%
Industrial/utility	dry detention	92.81	1.91%
Institutional	dry detention	148.38	5.99%
Low Density Residential	dry detention	724.19	4.55%
Major Roads	dry detention	1,426.06	9.06%
Medium Density Residential	dry detention	3,782.94	11.31%
Very Low Density Residential	dry detention	4.59	0.14%
Water Body	dry detention	42.34	0.11%
Wetlands	dry detention	65.79	0.13%
Agriculture - Tree Crops	retention	35.31	0.40%
Forest/Open	retention	61.98	0.07%
High Density Residential	retention	6.44	0.10%
Industrial/utility	retention	1.19	0.02%
Institutional	retention	19.58	0.79%
Low Density Residential	retention	8.77	0.06%
Major Roads	retention	5.30	0.03%
Medium Density Residential	retention	162.00	0.48%
Water Body	retention	2.61	0.01%
Wetlands	retention	1.13	0.00%

Table E-3
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Existing BMP Tributary Areas

Land Use	BMP Type	Acres Served	% of Land Use
Agriculture - Nurseries	Retention/Detention (Dual Pond)	0.02	0.00%
Agriculture - Specialty Farms	Retention/Detention (Dual Pond)	1.92	0.21%
Agriculture - Tree Crops	Retention/Detention (Dual Pond)	0.14	0.00%
Commercial	Retention/Detention (Dual Pond)	10.87	0.17%
Forest/Open	Retention/Detention (Dual Pond)	256.95	0.30%
Golf Course	Retention/Detention (Dual Pond)	294.87	10.89%
High Density Residential	Retention/Detention (Dual Pond)	49.22	0.77%
Industrial/utility	Retention/Detention (Dual Pond)	37.85	0.78%
Institutional	Retention/Detention (Dual Pond)	64.12	2.59%
Low Density Residential	Retention/Detention (Dual Pond)	362.19	2.28%
Major Roads	Retention/Detention (Dual Pond)	562.05	3.57%
Medium Density Residential	Retention/Detention (Dual Pond)	1,571.79	4.70%
Water Body	Retention/Detention (Dual Pond)	48.77	0.12%
Wetlands	Retention/Detention (Dual Pond)	102.67	0.20%
Agriculture - Tree Crops	swale	0.17	0.00%
Commercial	swale	1.98	0.03%
Forest/Open	swale	1.08	0.00%
High Density Residential	swale	0.44	0.01%
Industrial/utility	swale	0.05	0.00%
Institutional	swale	0.23	0.01%
Low Density Residential	swale	0.77	0.00%
Major Roads	swale	266.08	1.69%
Agriculture - Feeding Operations	wet detention	0.31	0.18%
Agriculture - Field Crops	wet detention	311.34	8.06%
Agriculture - Nurseries	wet detention	287.80	5.14%
Agriculture - Pasture	wet detention	1,071.56	5.44%
Agriculture - Tree Crops	wet detention	854.94	9.66%
Commercial	wet detention	736.33	11.42%
Forest/Open	wet detention	2,107.97	2.49%
General Agriculture	wet detention	21.19	26.91%
Golf Course	wet detention	885.35	32.68%
High Density Residential	wet detention	1,673.67	26.17%
Industrial/utility	wet detention	486.07	10.01%
Institutional	wet detention	148.40	5.99%
Low Density Residential	wet detention	537.41	3.38%
Major Roads	wet detention	2,306.15	14.66%
Medium Density Residential	wet detention	4,945.93	14.78%
Very Low Density Residential	wet detention	53.17	1.68%
Water Body	wet detention	465.52	1.19%
Wetlands	wet detention	793.23	1.58%

Table E-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future BMP Tributary Areas

Land Use	BMP Type	Acres Served	% of Land Use
Agriculture - Nurseries	alum treatment	372.03	17.32%
Agriculture - Pasture	alum treatment	5.63	0.19%
Agriculture - Tree Crops	alum treatment	0.03	0.00%
Commercial	alum treatment	1.27	0.01%
General Agriculture	alum treatment	8422.66	43.39%
Industrial/utility	alum treatment	33.03	0.50%
Institutional	alum treatment	0.44	0.01%
Low Density Residential	alum treatment	1.77	0.00%
Major Roads	alum treatment	0.38	0.00%
Very Low Density Residential	alum treatment	0.05	0.00%
Water Body	alum treatment	43.83	0.10%
Wetlands	alum treatment	197.17	0.45%
Forest/Open	Combination (Swale/Dry Pond)	0.01	0.00%
Major Roads	Combination (Swale/Dry Pond)	18.23	0.11%
Medium Density Residential	Combination (Swale/Dry Pond)	59.80	0.17%
Very Low Density Residential	Combination (Swale/Dry Pond)	2.99	0.01%
Agriculture - Nurseries	dry detention	47.71	2.22%
Agriculture - Pasture	dry detention	0.09	0.00%
Agriculture - Tree Crops	dry detention	0.02	0.00%
Commercial	dry detention	608.76	4.68%
Forest/Open	dry detention	9.73	0.05%
General Agriculture	dry detention	55.83	0.29%
Golf Course	dry detention	72.23	2.67%
High Density Residential	dry detention	1148.34	16.15%
Industrial/utility	dry detention	156.76	2.38%
Institutional	dry detention	156.94	3.00%
Low Density Residential	dry detention	1325.30	3.26%
Major Roads	dry detention	1398.13	8.72%
Medium Density Residential	dry detention	3864.82	10.82%
Very Low Density Residential	dry detention	208.33	0.45%
Water Body	dry detention	40.32	0.09%
Wetlands	dry detention	16.32	0.04%
Commercial	retention	0.14	0.00%
Forest/Open	retention	5.48	0.03%
High Density Residential	retention	6.44	0.09%
Industrial/utility	retention	1.19	0.02%
Institutional	retention	39.74	0.76%
Low Density Residential	retention	81.57	0.20%
Major Roads	retention	5.29	0.03%
Medium Density Residential	retention	161.97	0.45%
Water Body	retention	1.84	0.00%
Wetlands	retention	0.44	0.00%

Table E-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Future BMP Tributary Areas

Land Use	BMP Type	Acres Served	% of Land Use
Agriculture - Tree Crops	Retention/Detention (Dual Pond)	0.14	0.01%
Commercial	Retention/Detention (Dual Pond)	10.87	0.08%
Forest/Open	Retention/Detention (Dual Pond)	28.46	0.15%
General Agriculture	Retention/Detention (Dual Pond)	0.00	0.00%
Golf Course	Retention/Detention (Dual Pond)	294.67	10.88%
High Density Residential	Retention/Detention (Dual Pond)	49.18	0.69%
Industrial/utility	Retention/Detention (Dual Pond)	37.68	0.57%
Institutional	Retention/Detention (Dual Pond)	89.41	1.71%
Low Density Residential	Retention/Detention (Dual Pond)	509.71	1.26%
Major Roads	Retention/Detention (Dual Pond)	561.67	3.50%
Medium Density Residential	Retention/Detention (Dual Pond)	1592.42	4.46%
Very Low Density Residential	Retention/Detention (Dual Pond)	46.31	0.10%
Water Body	Retention/Detention (Dual Pond)	29.82	0.07%
Wetlands	Retention/Detention (Dual Pond)	110.78	0.25%
Commercial	swale	2.41	0.02%
Forest/Open	swale	0.00	0.00%
General Agriculture	swale	0.34	0.00%
High Density Residential	swale	0.47	0.01%
Industrial/utility	swale	0.06	0.00%
Institutional	swale	0.33	0.01%
Low Density Residential	swale	1.05	0.00%
Major Roads	swale	265.90	1.66%
Medium Density Residential	swale	0.01	0.00%
Water Body	swale	0.02	0.00%
Agriculture - Field Crops	wet detention	1.14	0.31%
Agriculture - Nurseries	wet detention	0.76	0.04%
Agriculture - Pasture	wet detention	2.01	0.07%
Agriculture - Tree Crops	wet detention	0.63	0.06%
Commercial	wet detention	6656.86	51.21%
Forest/Open	wet detention	93.89	0.49%
General Agriculture	wet detention	62.32	0.32%
Golf Course	wet detention	884.75	32.66%
High Density Residential	wet detention	2247.25	31.60%
Industrial/utility	wet detention	2685.10	40.84%
Institutional	wet detention	2585.14	49.38%
Low Density Residential	wet detention	22985.08	56.60%
Major Roads	wet detention	2471.53	15.42%
Medium Density Residential	wet detention	6878.63	19.26%
Very Low Density Residential	wet detention	40291.52	87.89%
Water Body	wet detention	229.96	0.54%
Wetlands	wet detention	650.55	1.49%

Table E-5
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
BMP Removal Efficiencies (%) Used In WMM

Parameter	Dry Detention	Wet Detention	Retention [4]	Dual Pond (Off-line Retention/Detention) [5]	Swale	Swale/Dry Detention [6]	Alum Treatment
BOD (1)	30	30	90	90	**30**	**45**	N/A
BOD (2)	**40**	**55**	**90**	**80**	N/A	N/A	**75**
COD (1)	**30**	**30**	**90**	**90**	**30**	**40**	N/A
COD (2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TSS (1)	90	90	90	95	**80**	**85**	N/A
TSS (2)	**70**	**85**	**90**	**90**	N/A	N/A	**90**
TDS (1)	**0**	**40**	**90**	**90**	**10**	**10**	N/A
TDS (2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total -P (1)	30	50	90	90	**40**	**40**	N/A
Total -P (2)	**25**	**65**	**90**	**85**	N/A	N/A	N/A
Total -P (3)	N/A	N/A	N/A	N/A	N/A	N/A	**60**
Dissolved P (1)	**0**	**70**	**90**	**95**	**10**	**10**	N/A
Dissolved P (2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dissolved P (3)	N/A	N/A	N/A	N/A	N/A	N/A	**88**
TKN (1)	20	30	90	90	**40**	**45**	N/A
TKN (2)	N/A	**37**	**90**	**80**	N/A	N/A	N/A
NO2+NO3 (1)	**0**	30	90	90	**40**	**40**	N/A
NO2+NO3 (2)	N/A	**80**	**90**	**90**	N/A	N/A	N/A
Total N (1)	N/A	N/A	N/A	90	**40***	**30**	N/A
Total N (2)	**15**	**25**	**90**	**60**	N/A	N/A	**50**
Lead (1)	80	80	90	95	**75**	**80**	N/A
Lead (2)	**60**	**75**	**90**	**75**	N/A	N/A	N/A
Copper (1)	60	70	90	90	**50**	**60**	N/A
Copper (2)	**35**	**60**	**90**	**65**	N/A	N/A	**80**
Zinc (1)	50	50	90	90	**50**	**70**	N/A
Zinc (2)	**70**	**85**	**90**	**85**	N/A	N/A	**90**
Cadmium (1)	**80**	**80**	**90**	**95**	**65**	**85**	N/A
Cadmium (2)	N/A	N/A	N/A	N/A	N/A	N/A	**80**

N/A - Not Available
(1) Average of values from Table E-1
(2)Literature Values from "Pollutant Removal Efficiencies for Typical Stormwater Management Systems in Florida", Harper, 1999
(3) SJRWMD measured values for P removal associated with Lake Apopka Restoration
(4) Values cited for retention removal in Harper's 1999 study were for 0.25-in., 0.5-in, 0.75-in, 1.0-in and 1.25-in retention; values shown in table are for 0.75-in retention.
(5) Estimated from efficiencies for a combination of wet detention and retention
(6) Estimated from efficiencies for a combination of swale and dry detention

E.3.3 Event Mean Concentration Values

Due to the large number of local governments included within the WSA, it was necessary to gain consensus on an acceptable set of EMCs for the study area. Additionally, the WPPA (Section 369.318, F.S.) requires the SJRWMD to develop a pollution load reduction goal (PLRG) for the WSA and the information regarding EMCs in this subsection may be useful to the SJRWMD for that effort. CDM performed an extensive literature review and compiled EMC values for the Central Florida area. Studies and reports that were consulted as part of this effort include:

- *Stormwater Loading Rate Parameters for Central and South Florida* (Harper, 1994);
- *Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin* (Technical Publication SJ2004-5);
- *Draft Nutrient Total Maximum Daily Load For Trout Lake, Lake County, Florida* (FDEP, 2004);
- Pollutant Load Spreadsheet Model Expanded Land Use Parameters, Indian River Lagoon and Lower St. Johns (SJRWMD, date unknown);
- SJRWMD Lake Jesup HSPF Modeling (SJRWMD, date unknown);
- EMC values from the Orange County's NPDES MS4 Part 2 Permit Application (PBS&J, 1993);
- Seminole County EMC values; and
- Southeastern United States Regional EMC database (CDM, 2001).

CDM developed a spreadsheet that shows the land uses where EMC data were available for the 12 USEPA indicator pollutants. As there is variance in reported EMC values depending on the study, CDM worked with the Stakeholders to develop a methodology to assign a set of EMCs for the WSA. The resulting EMC table is provided in **Table E-6**. This table shows the values identified from various studies as well as the selected values used in the WMM analysis based on feedback from the Stakeholders and the methodology described below. A large majority of the EMCs used came from Harper's *Stormwater Loading Rate Parameters for Central and South Florida* (1994). Based on communication with the SJRWMD, it is understood that additional work is on-going and may provide more refined EMCs for this specific application in the future.

Table E-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Event Mean Concentrations

		BOD mg/l	COD mg/l	TSS mg/l	TDS mg/l	TP mg/l	DP mg/l	TKN mg/l	NO2/NO3 mg/l	TN mg/l	Pb mg/l	Cu mg/l	Zn mg/l	Cd mg/l
General Agriculture	**Study Land Use**													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	N/A													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Agricultural/Golf Course	3.80	51.00	55.30	100.00	0.34	0.23	1.74	0.58	2.32	0.00	0.00	0.00	0.00
Harvey Harper, 1994	General Agriculture	3.80		55.30		0.34				2.32	0.00		0.00	
Other Local Studies (Average)	Agriculture					0.34				2.74				
Southeast	Agriculture/Pasture*	13.20	70.00	50.00	113.00	0.14	0.12	0.87	0.28	1.15	0.01	0.00	0.02	0.00
	Choice	**3.80**	**51.00**	**55.30**	**100.00**	**0.34**	**0.23**	**1.74**	**0.58**	**2.32**	**0.01**	**0.00**	**0.02**	**0.00**
Feeding Operations														
UORB PLRG (SJ 2004-5)	Feeding Operations					6.53				78.23				
Indian River Lagoon PLRGs (SJRWMD)	Feed Lots			59.40		1.13				3.74				
	Choice	**3.80**	**51.00**	**59.40**	**100.00**	**6.53**	**0.23**	**1.74**	**0.58**	**78.23**	**0.01**	**0.00**	**0.02**	**0.00**
Nurseries														
Indian River Lagoon PLRGs (SJRWMD)	Nurseries			22.00		0.57				2.30				
	Choice	**3.80**	**51.00**	**22.00**	**100.00**	**0.57**	**0.23**	**1.74**	**0.58**	**2.30**	**0.01**	**0.00**	**0.02**	**0.00**
Pasture														
UORB PLRG (SJ 2004-5)	Pasture					0.39				2.48				
Harvey Harper, 1994	Pasture	5.10		94.30		0.48				2.48				
Indian River Lagoon PLRGs (SJRWMD)	Improved Pasture			30.10		0.58				2.70				
	Choice	**5.10**	**51.00**	**94.30**	**100.00**	**0.48**	**0.23**	**1.74**	**0.58**	**2.48**	**0.01**	**0.00**	**0.02**	**0.00**
Field Crops														
UORB PLRG (SJ 2004-5)	Cropland					0.67				4.56				
Harvey Harper, 1994	N/A													
Indian River Lagoon PLRGs (SJRWMD)	Field Crops			15.70		0.27				2.52				
	Choice	**3.80**	**51.00**	**15.70**	**100.00**	**0.27**	**0.23**	**1.74**	**0.58**	**2.52**	**0.01**	**0.00**	**0.02**	**0.00**
Row Crops														
UORB PLRG (SJ 2004-5)	Cropland					0.67				4.56				
Harvey Harper, 1994	Row Crops					0.56				2.68				
Indian River Lagoon PLRGs (SJRWMD)	Field Crops			15.70		0.27				2.52				
Indian River Lagoon PLRGs (SJRWMD)	Row Crops			55.30		1.00				4.56				
	Choice	**3.80**	**51.00**	**55.30**	**100.00**	**0.56**	**0.23**	**1.74**	**0.58**	**2.68**	**0.01**	**0.00**	**0.02**	**0.00**
Specialty Farms														
Indian River Lagoon PLRGs (SJRWMD)	Stables/Dairy/Aquaculture			40.63		0.49				2.34				
	Choice	**3.80**	**51.00**	**40.63**	**100.00**	**0.49**	**0.23**	**1.74**	**0.58**	**2.34**	**0.01**	**0.00**	**0.02**	**0.00**
Tree Crops														
UORB PLRG (SJ 2004-5)	Tree Crops					0.14				2.05				
Harvey Harper, 1994	Citrus	2.55		16.30		0.14				2.05				
Indian River Lagoon PLRGs (SJRWMD)	Citrus			30.50		0.51				1.92				
	Choice	**2.55**	**51.00**	**16.30**	**100.00**	**0.14**	**0.23**	**1.74**	**0.58**	**2.05**	**0.01**	**0.00**	**0.02**	**0.00**
Commercial														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	Commercial/Office	12.70	55.00	87.65	174.00	0.29	0.18	1.14		0.20	0.18	0.11	0.14	0.03
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	Commercial/Office	2.33	19.67	3.33	93.33	0.05	0.04	0.49		0.06	0.05	0.03	0.04	0.01
Seminole County	Commercial	7.80	53.00	42.50	141.00	0.20	0.09	1.03	0.67	1.70	0.01	0.02	0.07	0.00
Harvey Harper, 1994	Low Intensity Commercial	8.20		81.00		0.15				1.18	0.14		0.11	
Harvey Harper, 1995	High Intensity Commercial	17.20		94.30		0.43				2.83	0.21		0.17	
Other Local Studies (Average)	Commercial					0.24				1.80				
Southeast	Commercial	6.60	45.00	54.00	57.50	0.14	0.06	0.83	0.41	1.24	0.01	0.01	0.05	0.00
	Choice	**12.70**	**54.00**	**87.65**	**157.50**	**0.29**	**0.14**	**1.08**	**0.67**	**2.01**	**0.18**	**0.06**	**0.14**	**0.02**

Table E-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Event Mean Concentrations

		BOD mg/l	COD mg/l	TSS mg/l	TDS mg/l	TP mg/l	DP mg/l	TKN mg/l	NO2/NO3 mg/l	TN mg/l	Pb mg/l	Cu mg/l	Zn mg/l	Cd mg/l
Industrial	**Study Land Use**													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	Industrial	9.60	55.00	93.90	174.00	0.31	0.13	1.79		0.27	0.20	0.12	0.12	0.04
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Industrial/utility	14.00	83.00	77.00	130.00	0.28	0.20	1.47	0.40	1.87	0.02	0.02	0.13	0.00
Harvey Harper, 1994	Industrial	9.60		93.90		0.31				1.79	0.20		0.12	
Other Local Studies (Average)	Industrial					0.28				1.85				
Southeast	Heavy Industrial	6.50	39.20	60.00	66.50	0.15	0.05	1.00	0.49	1.49	0.01	0.01	0.04	0.00
	Choice	**9.60**	**69.00**	**93.90**	**152.00**	**0.31**	**0.17**	**1.63**	**0.40**	**1.79**	**0.20**	**0.07**	**0.12**	**0.02**
Institutional														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	N/A													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Institutional	7.30	49.90	41.20	114.10	0.15	0.08	1.24	1.05	2.29	0.01	0.02	0.08	0.00
Other Local Studies (Average)	Institutional					0.48				1.80				
Southeast	N/A													
	Choice	**7.30**	**49.90**	**41.20**	**114.10**	**0.15**	**0.08**	**1.24**	**1.05**	**2.29**	**0.01**	**0.02**	**0.08**	**0.00**
Forest/Open														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	Undeveloped	1.45	55.00	11.10	174.00	0.53	0.00	1.25		0.19	0.03	0.02	0.01	0.01
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	Undeveloped	3.00	50.00	3.33	95.33	0.07	0.07	1.39		0.11	0.05	0.02	0.01	0.01
Seminole County	Open	1.50	51.00	11.00	100.00	0.05	0.00	0.94	0.31	1.25	0.00	0.00	0.00	0.00
Harvey Harper, 1994	Open	1.45		11.10		0.05				1.25	0.03		0.01	
Other Local Studies (Average)	Open					0.08				0.98				
Southeast	Forest /Open	10.30	70.00	25.00	216.00	0.28	0.15	0.87	0.17	1.04	0.01	0.01	0.01	0.00
	Choice	**1.45**	**53.00**	**11.10**	**137.00**	**0.05**	**0.00**	**1.10**	**0.31**	**1.25**	**0.03**	**0.01**	**0.01**	**0.00**
Very Low Density Residential														
Harvey Harper, 1994	Low Density Residential*	4.40		19.10		0.18				1.77	0.04		0.03	
	Choice	**4.40**	**54.51**	**19.10**	**136.75**	**0.18**	**0.15**	**1.22**	**0.47**	**1.77**	**0.04**	**0.02**	**0.03**	**0.00**
*Lot sizes are generally defined as greater than 1 acre or less than 1 DU/acre														
Low Density Residential														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	Low Density Residential	5.60	41.25	29.27	136.50	0.64	0.30	1.33		0.24	0.06	0.04	0.04	0.01
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	Low Density Residential	4.00	31.67	22.67	92.33	0.33	0.33	1.07		0.26	0.05	0.03	0.04	0.01
Seminole County	Low Density Residential	15.10	70.80	26.60	286.00	0.44	0.33	1.34	0.63	1.97	0.00	0.01	0.05	0.00
Harvey Harper, 1994	Single Family Residential	7.40		27.00		0.30				2.29	0.05		0.06	
Other Local Studies (Average)	Low Density Residential					0.14				1.40				
Southeast	Low Density Residential	13.20	70.00	50.00	74.00	0.14	0.03	0.87	0.28	1.15	0.01	0.00	0.02	0.00
	Choice	**7.40**	**56.03**	**27.00**	**136.50**	**0.30**	**0.30**	**1.34**	**0.63**	**2.29**	**0.05**	**0.02**	**0.04**	**0.01**
Medium Density Residential														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	N/A													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Medium Density Residential	9.20	64.60	58.80	58.80	0.45	0.27	1.77	0.27	2.04	0.01	0.01	0.06	0.00
Harvey Harper, 1994	N/A													
Other Local Studies (Average)	Medium Density Residential					0.26				1.85				
Southeast	Medium Density Residential	9.40	50.00	48.00	70.00	0.27	0.10	1.22	0.46	1.68	0.01	0.01	0.03	0.00
	Choice	**9.20**	**58.45**	**49.35**	**157.88**	**0.40**	**0.40**	**1.48**	**0.65**	**2.36**	**0.07**	**0.03**	**0.05**	**0.01**

Table E-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Event Mean Concentrations

		BOD mg/l	COD mg/l	TSS mg/l	TDS mg/l	TP mg/l	DP mg/l	TKN mg/l	NO2/NO3 mg/l	TN mg/l	Pb mg/l	Cu mg/l	Zn mg/l	Cd mg/l
High Density Residential	**Study Land Use**													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	High Density Residential	9.30	68.75	48.80	217.50	1.05	0.50	2.22		0.39	0.10	0.06	0.06	0.02
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	High Density Residential	3.33	24.00	3.67	92.33	0.19	0.34	0.60		0.33	0.05	0.03	0.02	0.01
Seminole County	High Density Residential	7.80	53.00	42.50	141.00	0.49	0.09	1.03	0.67	1.70	0.01	0.02	0.07	0.00
Harvey Harper, 1994	Multi-Family Residential	11.00		71.70		0.49				2.42	0.09		0.06	
Other Local Studies (Average)	High Density Residential					0.38				2.15				
Southeast	High Density Residential	9.60	53.50	38.00	49.50	0.19	0.17	1.01	0.40	1.41	0.01	0.01	0.08	0.00
	Choice	**11.00**	**60.88**	**71.70**	**179.25**	**0.49**	**0.50**	**1.63**	**0.67**	**2.42**	**0.09**	**0.04**	**0.06**	**0.01**
Highways														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	Major Roads	9.04	55.00	79.13	174.00	0.49	0.18	1.75		0.30	0.15	0.09	0.10	0.03
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	Major Roads	3.17	47.67	18.55	179.50	0.48	0.44	1.80		0.14	0.05	0.03	0.02	0.01
Seminole County	Major Roads	14.00	83.00	77.00	130.00	0.28	0.20	1.47	0.40	1.87	0.02	0.02	0.13	0.00
Harvey Harper, 1994	Transportation	5.60		50.30		0.34				2.08	0.19		0.13	
Other Local Studies (Average)	Transportation					0.45				2.01				
Southeast	Major Highways	14.00	114.00	287.00	57.50	0.44	0.40	1.83	0.76	2.59	0.40	0.05	0.33	0.00
	Choice	**5.60**	**69.00**	**50.30**	**152.00**	**0.34**	**0.19**	**1.61**	**0.40**	**2.08**	**0.19**	**0.06**	**0.13**	**0.01**
Water														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	N/A													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Water/Wetlands	3.20	16.80	6.20	100.00	0.17	0.09	0.60	0.19	0.79	0.01	0.05	0.15	0.00
Harvey Harper, 1994	Water	1.60		3.10		0.11				1.25	0.03		0.03	
Other Local Studies (Average)	Water					0.07				0.66				
Southeast	Water	3.10	22.00	5.00	100.00	0.09	0.02	1.10	0.20	1.30	0.01	0.00	0.01	0.00
	Choice	**1.60**	**16.80**	**3.10**	**100.00**	**0.11**	**0.02**	**0.60**	**0.19**	**1.25**	**0.01**	**0.05**	**0.03**	**0.00**
Wetlands														
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - NPSLAM (1993)	N/A													
Orange County, Florida Part 2 Joint MS4 Permit Application Regional Data - Sampling Event Data (1993)	N/A													
Seminole County	Water/Wetlands	3.20	16.80	6.20	100.00	0.17	0.09	0.60	0.19	0.79	0.01	0.05	0.15	0.00
Harvey Harper, 1994	Wetlands	4.63		10.20		0.19				1.60	0.03		0.01	
Other Local Studies (Average)	Wetlands					0.24				1.27				
Southeast	Wetlands	5.00	51.00	5.00	100.00	0.10	0.02	1.10	0.40	1.50	0.01	0.00	0.01	0.00
	Choice	**4.63**	**51.00**	**10.20**	**100.00**	**0.19**	**0.09**	**1.10**	**0.40**	**1.60**	**0.03**	**0.05**	**0.01**	**0.00**

N/A - Not Available

Harper, 1994

The average of Orange (regional values identified in the NPDES Part 2 Permit Application) and Seminole County's EMCs

The values from the southeast regional database were used as the other values reported were 0.000

The choice for General Agriculture

Indian River Lagoon PLRGs (SJRWMD)

Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin (Technical Publication SJ2004-5)

Average of Harper's values for Low and High Intensity Commercial land uses.

Average of the Open and Low Density Residential choices

Orange County regional values

Average of Orange County (regional) and Seminole County values were used instead of Harper's values

Average of Low Density and High Density Residential choices

Seminole County value was used

The southeast U.S. regional value was used

The methodology for the EMC selection criteria is presented as follows:

1) Where values from the *Stormwater Loading Rate Parameters for Central and South Florida* (Harper, 1994) were available, those were used as the recommended choice (highlighted as Light Yellow in Table E-6).

2) If Harper's numbers were not available, the average of Orange County's (regional values identified in the NPDES Part 2 Permit Application) and Seminole County's EMCs were used.(highlighted as Light Green in Table E-6).

3) In very few cases Harper's numbers were outside the range of all the other reported values, so the average of Orange County (regional) and Seminole County values were used (i.e., Low Density Residential for Zn) (highlighted as Light Blue in Table E-6).

4) In some cases where Harper's data were not available and some of the Seminole County EMCs had high variability from Low Density Residential to High Density Residential, then the Orange County values were used (i.e., Low Density Residential for TDS & DP; High Density Residential for DP) (highlighted as Orange in Table E-6).

5) For Medium Density Residential, there was only 1 complete dataset available (Seminole County). Therefore, the average of Low Density and High Density Residential choices was used to obtain a value for Medium Density Residential EMCs (highlighted as Pink in Table E-6).

6) For metals under General Agriculture, the values from the Southeastern United States Regional EMC database (CDM, 2001) were used as the other values reported were 0.000 (highlighted as Purple in Table E-6).

7) For the Water land use for Pb, Harper's values note that the same value used for Wetlands was also applied to the Open Water land use. Therefore, the Seminole County value was used for this constituent (highlighted as Grey in Table E-6).

8) For some cases for the Wetlands and Water land uses, where only a value for Seminole County is reported and it is identical for both land uses, the Southeastern United States Regional EMC database (CDM, 2001) value was used (highlighted as Green in Table E-6).

9) For Commercial land use, Harper reports values for both Low and High Intensity Commercial land uses. Low Intensity Commercial land uses are defined as "…areas that receive only a moderate amount of traffic volume and areas where cars may be parked during the day.

High Intensity Commercial is defined in Harper's study as "commercial areas with constant traffic moving in and out of area…and are assumed to be represented by typical downtown areas which contain commercial sites, office buildings and associated parking lots." Therefore, since there seems to be a mixture of these two types of commercial land use throughout the study area, the average of the two were used (highlighted as Turquoise in Table E-6).

10) A new land use was added for Very Low Density Residential. Very Low Density Residential is generally defined as lot sizes greater than 1-acre or less than one dwelling unit/acre. Based on review of the land use coverages for the study area, large acreages of this type of land use are prevalent, more so in Lake County under future land use conditions. Harper also included this type of land use in his analysis. Since no site specific data were available for this land use, he averaged the values for Open and Low Density Residential land uses to arrive at these values. Where Harper's values were available, these were used as the choice in the accompanying table. Where values were not available, the same methodology of averaging the Open and Low Density Residential choices shown in the table was applied (highlighted as Fuchsia in Table E-6).

11) The comment was raised by the Stakeholders that the choice selected for TN should equal the sum of the choices for TKN and NO2+NO3. In almost all cases, there was a more complete set of values available for TN versus TKN and NO2+NO3. Where Harper's values were available for TN, these were used. There are two cases where Harper's values were not available (Institutional & Medium Density Residential). In the case of Institutional, the TN choice is already equal to the sum of the TKN and NO2+NO3 choices. For Medium Density Residential land use criteria 5 above applies.

12) Due to the variability in EMCs for different types of agriculture operations, agriculture land uses in addition to "General Agriculture" were taken into consideration. This is especially important in Lake County, as much of the land area is devoted to agriculture. The land use coverages were revisited and the Lake County FLUCCS codes were used to determine each type of agricultural operation (i.e., Feeding Operations, Nurseries, Pasture, Row Crops, Specialty Farms and Tree Crops). As before, Harper's values were used where available. When Harper's values were not available, the EMCs from the *Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin* (Technical Publication SJ2004-5) were used as this study was specific to the Lake County area (highlighted as Light Orange in Table E-6). When neither of those two was available, the SJRWMD values from the

Indian River Lagoon PLRG work were used (highlighted as Red in Table E-6). These values are largely based on the results of a literature search of studies performed mostly throughout the State of Florida. Where no values were available, the choices for General Agriculture were used (highlighted as Dark Pink in Table E-6).

E.3.4 Rainfall Data

Annual rainfall data for the WSA was discussed in Section 2.7 of the MSMP. CDM summarized historical rainfall data obtained from the National Oceanic & Atmospheric Administration (NOAA) rainfall stations. CDM obtained and reviewed a listing of these stations along with their associated data. This list was then narrowed down to those stations with a long-term period of record (i.e., 15 years and greater) and complete data sets. This list of NOAA stations along with their period of record and long-term monthly average rainfall data was provided in Table 2-3. Based on the values shown in this table, an annual rainfall of 50.3 inches was used in the WMM analysis. As seasonal EMCs were not available for this analysis, CDM estimated the seasonal rainfall to approximate loadings during the wet and dry seasons. From Table 2-3, the average annual rainfall for the wet season (June through September) is 27.9 inches and for the dry season (October through May) it is 22.4 inches.

E.3.5 Septic Tank Usage

Septic tanks are still used in many areas of the WSA for sewage disposal, primarily in older residential areas and rural areas where sanitary sewer services are not readily available. To identify those areas where septic tanks are used, a variety of sources were consulted. Seminole County and the City of Orlando provided a septic tank coverage in GIS format. The majority of the City of Altamonte Springs is served by sanitary sewer based on a wastewater GIS coverage provided by the City. Septic tank information for Orange County was obtained from the Orange County Utility Master Plan (PBS&J, 2001). In this study, it was presumed that all areas currently not served by sanitary sewer are served by septic tanks. The GIS coverage reflecting this was obtained and used as part of the WMM analysis. Additionally, Lake County provided a point coverage of those parcels served by septic tanks within the WSA.

Upon inspection of the GIS data obtained, specifically for Seminole County, there were many subdivisions in the County where only some parcels within the subdivision were shown to be on septic systems. However, these subdivisions were also not served by sanitary sewer based on the GIS coverage provided by the County. CDM reviewed these areas along with the 1990 census data and evaluated the entire subdivision as served by septic systems if no sanitary sewer lines were shown servicing the area. The 1990 census data were used because this type of information was not surveyed for the 2000 census. The 1990 census long form inquired if homes were served by septic tanks or sanitary sewer systems. These data are available by census tract and block group at the U.S. Census web page. By making the

determinations previously described, the resulting changes reflected something closer to the values reported in the census data. Using the data sources previously mentioned, CDM estimated that approximately 51,400 identified parcels within the WSA are served by septic systems. The resulting septic tank coverage with the assumptions incorporated is shown in **Figure E-3**.

E.3.5.1 Septic Tank Failure

The WMM assesses the impact of failing septic tanks by applying a multiplication factor to the surface runoff load. This multiplication factor was applied only to the phosphorus (dissolved P, total P) and nitrogen (TKN, NO_2+NO_3) parameters. The factor used for the phosphorus and nitrogen parameters was 2.1 and 2.0, respectively (i.e., nitrogen load for a residential area with failing septic tanks is estimated to be 2.0 times the load from a residential area without failing septic tanks).

To assess the increase in surface runoff load due to failing septic tanks, the WMM considers the multiplication factor (discussed above), the percent septic tank coverage, and the percent failure rate. Although the definition of "failure" varies, national failure rates average 19 percent (EPA, 2002) and range from a high of 50-70 percent (Minnesota) to low of 0.4 percent (Wyoming), with Florida reported as 1-2 percent. The Florida Department of Health (DOH) had provided some feedback on failure rates and reported that for Florida it is typically less than the 1-3 percent reported in the *Forecasting Onsite Soil Absorption System Failure Rates* (USEPA, 1986).

Assessing the Densities and Potential Water Quality Impacts Of Septic Tank Systems in the Peace and Myakka River Basins (Charlotte Harbor National Estuary Program, 2003) states that it is unclear if this number represents the total number of failures at any time, or the annual number of repair permits issued. The EPA's 1986 guidance manual (*Forecasting Onsite Soil Absorption System Failure Rates*) acknowledged that many failures go unreported. Modeling guidelines developed for EPA's Rouge River demonstration project (CDM, 1998) suggest homeowners ignore signs of failure for 5 years before completing repairs, resulting in a range of 5-10 percent failures for Florida. This value is consistent with a Department of Health study conducted in Jacksonville where site inspections were conducted at 800 facilities and found an 11 percent failure rate.

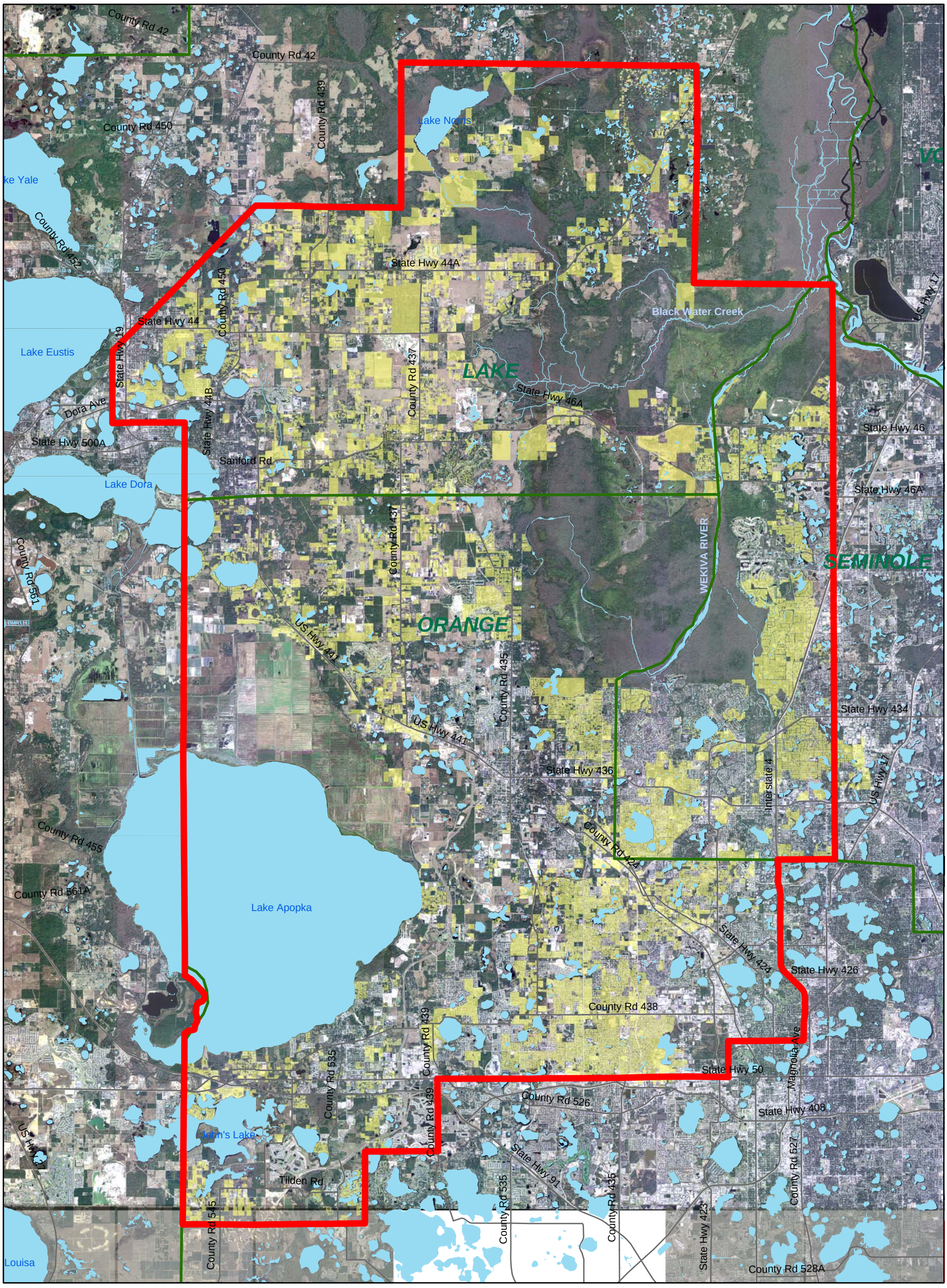
Based on the information found for failure rates in Florida and feedback from the DOH, a failure rate of 1 percent was used in the WMM analysis. As a wide variation of failure rates have been reported, CDM also did a limited sensitivity analysis to show the impact of varying the failure on the overall pollutant load.

Using a failure rate of 1 percent, the maximum increase in nitrogen loading from a residential area with 100 percent septic tank coverage and a 1 percent failure rate, is 1 percent over the base load:

honourdm

8/26/05

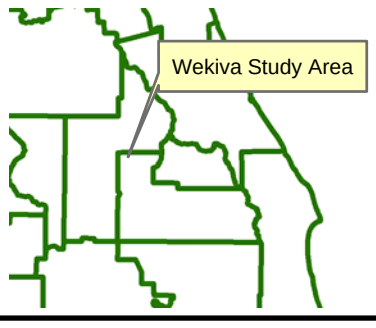
E:\Projects\9247\44812\GIS\FigE-3.mxd



N
W E
S

0 7,000 14,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- County Line
- Major Roads
- Water Bodies
- Parcels Served by Septic Tanks

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure E-3
Parcels Served by Septic Tanks

(2.0 x 1%/100%) + (1 - 1%/100%) = 0.2 + 0.9 = 1.01, or 1% increase over the case without septic tanks)

It is important to emphasize that although the WMM includes a septic routine, it does not address all aspects of septic loading, such as loading estimates from "working" systems.

Based on the septic tank data obtained from the Stakeholders, there was a percentage of the WSA served by septic tanks that was identified as non-residential (i.e., commercial, industrial and institutional). Typically the septic tank routine in WMM has been used to assess the impacts from residential areas. Little to no data were available regarding the use of septic tanks for non-residential areas. It was assumed that these land uses typically have greater disposal rates than those of residential, due to the higher volume of occupants in the facilities associated with these land uses. Therefore, the higher end of the range of percent increases in annual per acre loadings presented in Section 4.2.5 was used for these types of land uses.

The recent study prepared by the Florida DOH for the WSA entitled the *Wekiva Basin Onsite Sewage Treatment and Disposal System Study* (2004) recommended that the highest priority for sewering should be given to areas with high densities of systems within the WAVA Primary and Secondary Protection Zones. For septic tanks, the study recommends the following: 1) a discharge limit of 10 mg/l of total nitrogen for new systems, systems being modified, and for existing systems within the WAVA Primary and Secondary Protection Zones; 2) state and local planning agencies evaluate the economic feasibility of sewering versus nutrient removal upgrades to existing onsite sewage treatment and disposal systems (OSTDSs) (areas with high densities of development will be better suited to central sewering and lower density areas more suitable for nitrogen-removing OSTDSs); 3) failed or modified systems within the WSA be upgraded to meet new system standards; and 4) new regional wastewater management entities be established or that existing ones be modified to oversee the maintenance of all wastewater discharged from OSTDSs in the WSA.

E.3.6 Point Source Discharges

Three point source discharges associated with wastewater treatment plants (WWTPs), were identified in the WSA. One point source exists along the main stem of the Little Wekiva River and is associated with the Swofford WWTP and water reclamation facility operated by the City of Altamonte Springs. The outfall from this plant is located just upstream of this confluence of the Little Wekiva River and tributary from Spring Lake. Monthly discharge monitoring reports (DMRs) from February, 1997 through December, 2003 were obtained from the WWTP. Discharge data were available for flow and concentrations of BOD, TP and TSS. Overall, the average values for the period of record are included below in **Table E-7**. The City of Altamonte Springs is currently pursuing a regional project to remove discharges to the Little Wekiva River in favor of providing reclaimed water to the City of Apopka.

Table E-7
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Average Discharge Monitoring Data from the Swofford WWTP

	Flow (mgd)	CBOD5 (mg/L)	TSS (mg/L)	Phosphorus, Total as P (mg/L as P)
Annual Flow	0.85	1.25	0.58	1.38

The Wekiva Hunt Club WWTP in Seminole County was also identified as a point source discharge. This facility discharges to Sweetwater Creek which eventually discharges to the Wekiva River. Point source loadings from this facility were documented in the *Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration* Plan (ERD, 2005). Chemical characteristics of discharges from the Wekiva Hunt Club WWTP that were used in the WMM analysis are provided in **Table E-8**.

Table E-8
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Monitoring Data from the Wekiva Hunt Club WWTP

	Flow (mgd)	NO_3 (mg/L)	TN (mg/L)	TP (mg/l)	TSS (mg/l)	BOD (mg/l)
Annual Flow	1.7	8.7	10.9	0.15	0.98	1.96

Lastly, the City of Winter Garden's WWTP discharges from the underdrain system of and land application system (i.e., percolation pond site) to an unnamed ditch, then through approximately one (1) mile of wetlands and swamp to Lake Apopka. Chemical characteristics of the treated effluent (i.e., annual average of selected constituents) discharged from the percolation pond were obtained from FDEP's Domestic Wastewater Facility Permit issued to the City and are summarized in **Table E-9**.

Table E-9
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Discharge Effluent Levels from the City of Winter Garden WWTP

	Flow (mgd)	TN (mg/L)	TP (mg/l)	DO (mg/l)
Annual Flow	1.05	2.45	0.17	5.81

E.4 WMM Results

The WMM was used to evaluate the major subbasins identified in sub-section 2.6.1 under existing and future land use conditions to estimate both annual and seasonal pollutant loads. The summary of the scenarios evaluated for the 102 major subbasins are listed as follows:

- Existing Land Use – Annual
- Existing Land Use – Dry Season
- Existing Land Use – Wet Season
- Future Land Use – Annual
- Future Land Use – Dry Season
- Future Land Use – Wet Season

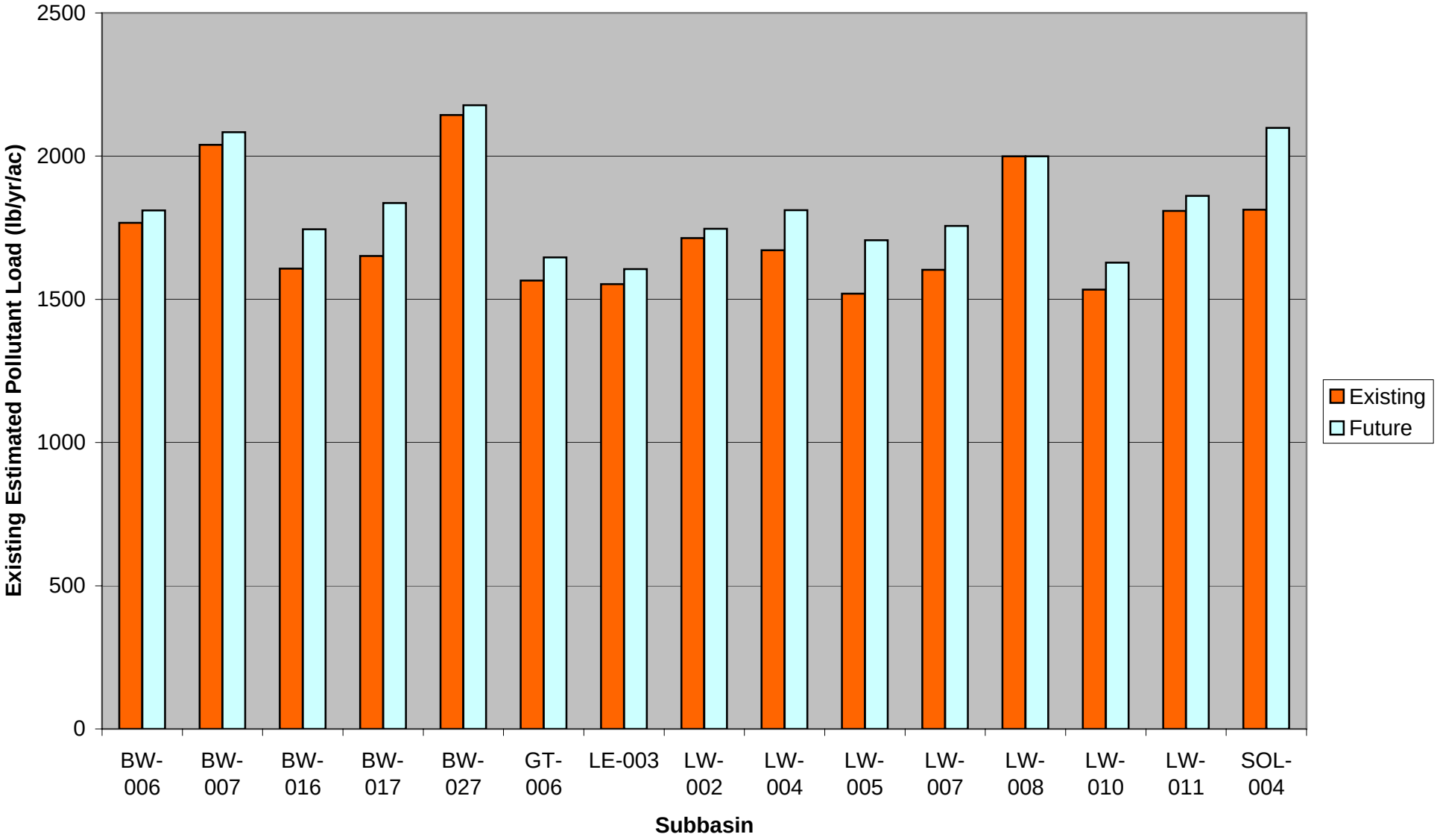
The results of the WMM analysis for both existing and future land use conditions with BMPs considered and a septic tank failure rate of 1 percent under annual rainfall are included in **Tables E-10** through **E-15**, which is located at the end of this section. Pollutant loading estimates are calculated in units of lbs/yr. However, when comparing subbasins using these units, the size of the subbasin has a large effect on the estimated load (i.e., one will typically see larger pollutant loads associated with larger subbasins). Therefore, in an effort to normalize the estimates, the loading rate was calculated using the subbasin tributary area (i.e., lb/ac/yr). This provides a better basis for comparison to determine where the generated loads are more concentrated. A discussion of the results is provided in the following subsections.

E.4.1 Existing Land Use

Due to the number of subbasins evaluated, the discussion has been narrowed to the top 15 that are estimated to generate the highest pollutant loads. As mentioned earlier, existing land use conditions with BMPs and a 1 percent failure rate assumed for septic systems was simulated using the WMM. The top 15 estimated annual pollutant loading rates (lb/yr/ac) are shown in **Figure E-4.** For comparison purposes, the estimated loading rate under future conditions is also shown. The watersheds that encompass these subbasins include:

- Big Wekiva River Basin – Subbasins BW-006, BW-007, BW-016, BW-017 and BW-027;
- Golden Triangle Basin – Subbasin GT-006;
- Lake Eustis Basin – Subbasin LE-003;
- Little Wekiva River Basin – Subbasins LW-002, LW-004, LW-005, LW-007, LW-008, LW-010 and LW-011; and,
- Soldiers Creek Basin – Subbasin SOL-004.

Figure E-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Subbasins with Largest Estimated Annual Pollutant Load - Existing Conditions



The locations of these subbasins are shown on **Figure E-5.** As can be seen from this figure and Figures E-4, 2-5 and 2-7, most of these subbasins are very close to build-out conditions (i.e., little change between existing and future land use) based on the comparison to future conditions. A complete listing of the subbasins and the resulting annual pollutant loading rate is provided in **Table E-16** located at the end of this section.

E.4.2 Future Land Use

Under future conditions, a comparison was done to show the percent increase from existing to future conditions for each subbasin. Under this scenario, the top 15 estimated percent increases between existing and future conditions are shown in **Figure E-6** and occur in the following subbasins:

- Big Wekiva River Basin – Subbasins BW-001;
- Blackwater Creek Basin – Subbasin BWC-001, BWC-002, BWC-003, BWC-005, BWC-008, BWC-011, BWC-012, BWC-014, BWC-015, and BWC-018; and,
- Lake Eustis Basin – Subbasin LE-001, LE-005, LE-006 and LE-008.

A complete listing of the subbasins and their estimated increase in annual pollutant loading is provided in **Table E-17** located at the end of this section. Based on this table, a total of 28 subbasins had a predicted increase in future loadings by greater than 20 percent. The locations of the 28 subbasins are shown in **Figure E-7.** These subbasins are primarily in areas that are relatively undeveloped or are dominated by agriculture and the future land use map indicates they will be developed over time. Please note that the future loading estimates assumed that all new development was treated by wet detention BMPs (as some type of treatment would be required by permitting agencies). Subbasins BWC-005, LE-001 and BW-001 exhibited the highest estimated increases with 59.7, 45.9 and 39.7 percent, respectively. There are 26 subbasins whose pollutant loading rates are predicted to increase by greater than 10 percent, but less than 20 percent. The pollutant loading rates for 16 subbasins are predicted to increase by greater than 5 percent but less than 10 percent. The pollutant loading for the remaining 32 subbasins is predicted to increase by less than 5 percent between existing and future land use conditions.

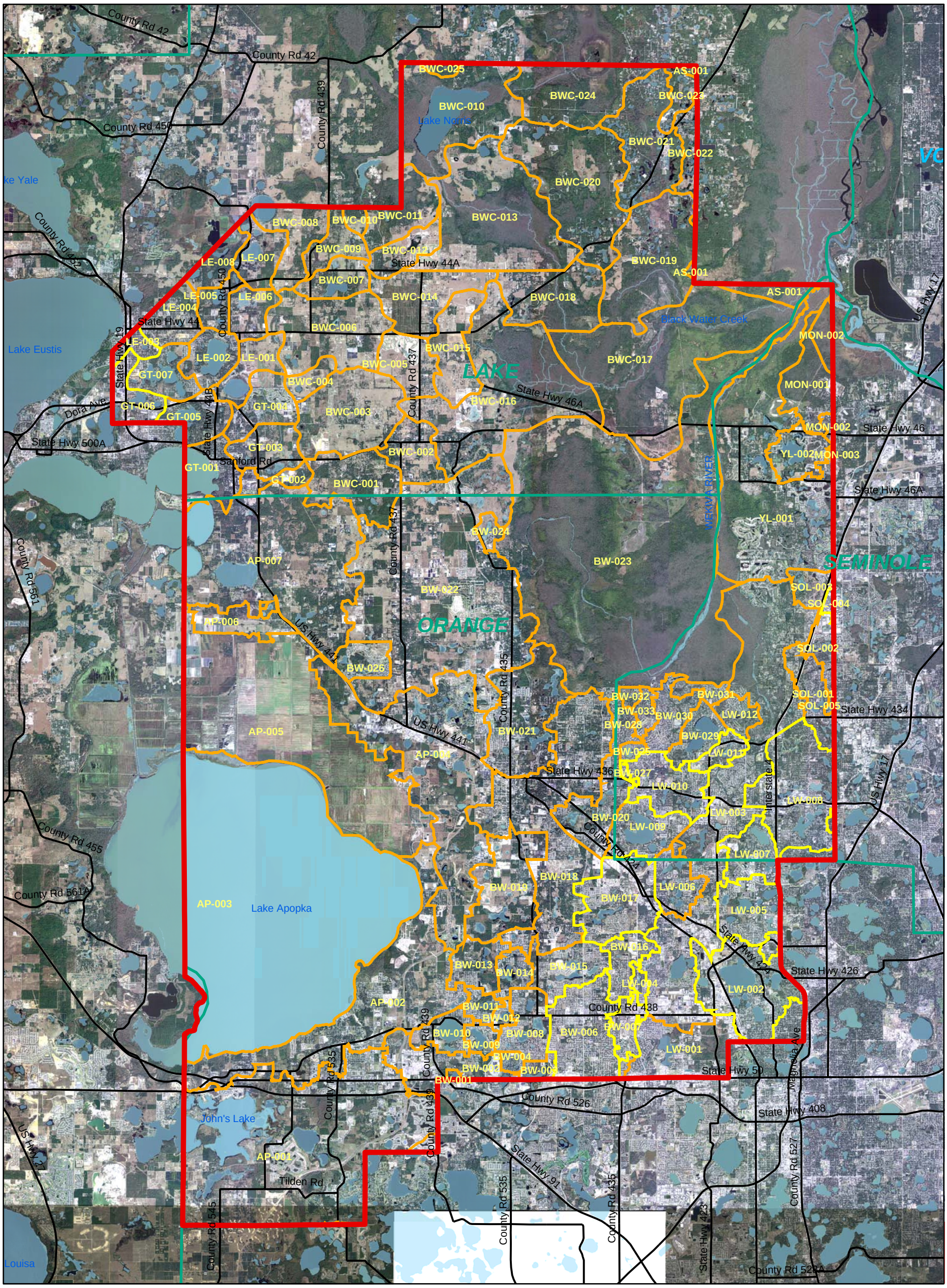
E.5 Recommendations

The subbasins identified above in subsection E.4.1 that have the highest estimated pollutant loading rates should consider being given the highest priority for water quality retrofits, as the majority of these subbasins are nearing build-out conditions. The majority of development that has occurred in these subbasins was prior to the SJRWMD regulations for stormwater treatment. The affected jurisdictions should implement water quality retrofit BMPs in the subbasins where practicable, which will help in decreasing existing pollutant loadings. Estimated pollutant loading rates were factored into the ranking methodology described in Section 5.2 used to prioritize

honourdm

10/21/05

E:\Projects\92471\44812\GIS\FigE-5.mxd

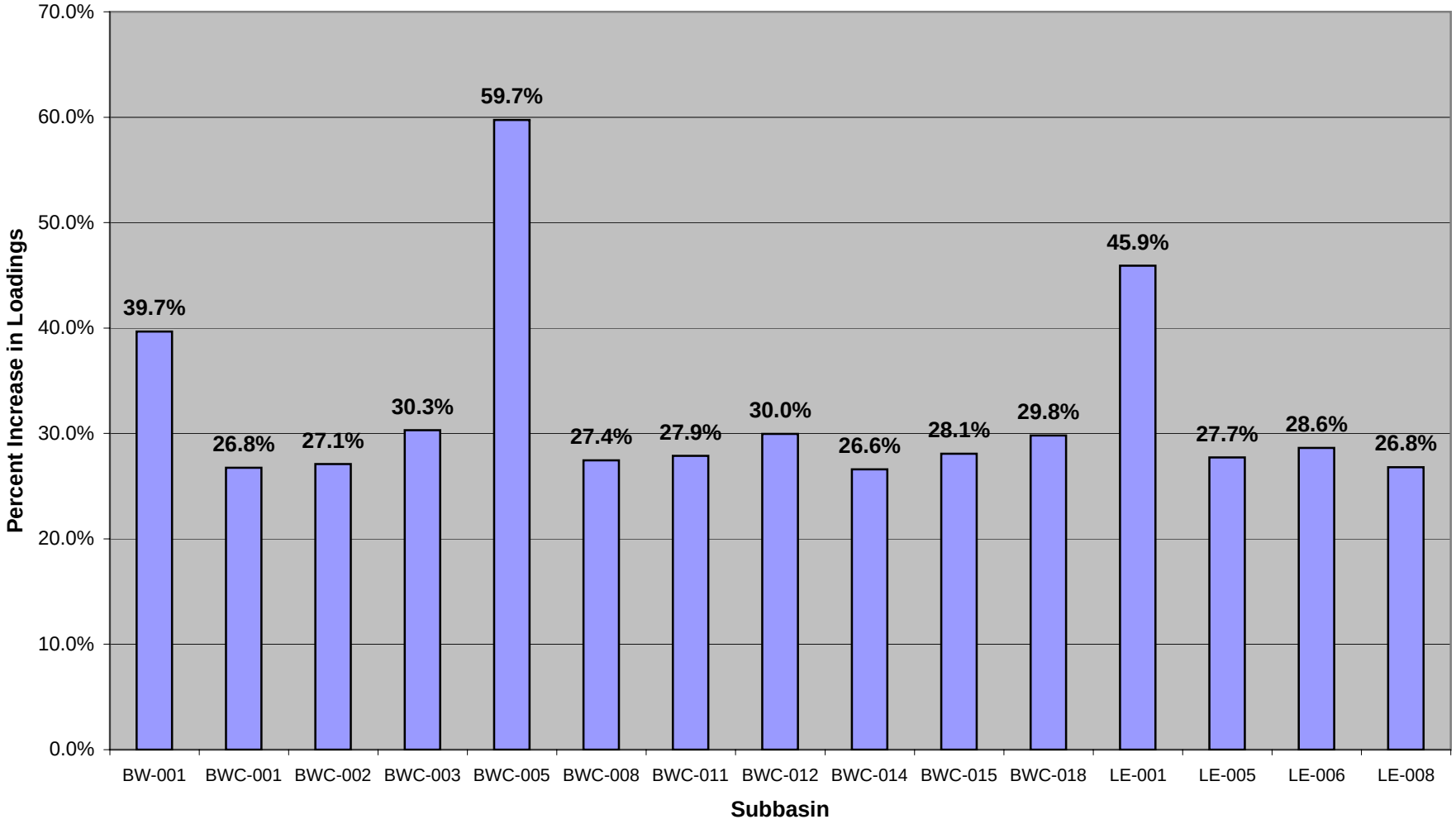


Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure E-5
Subbasins with Highest Estimated Annual Pollutant Loading Rates

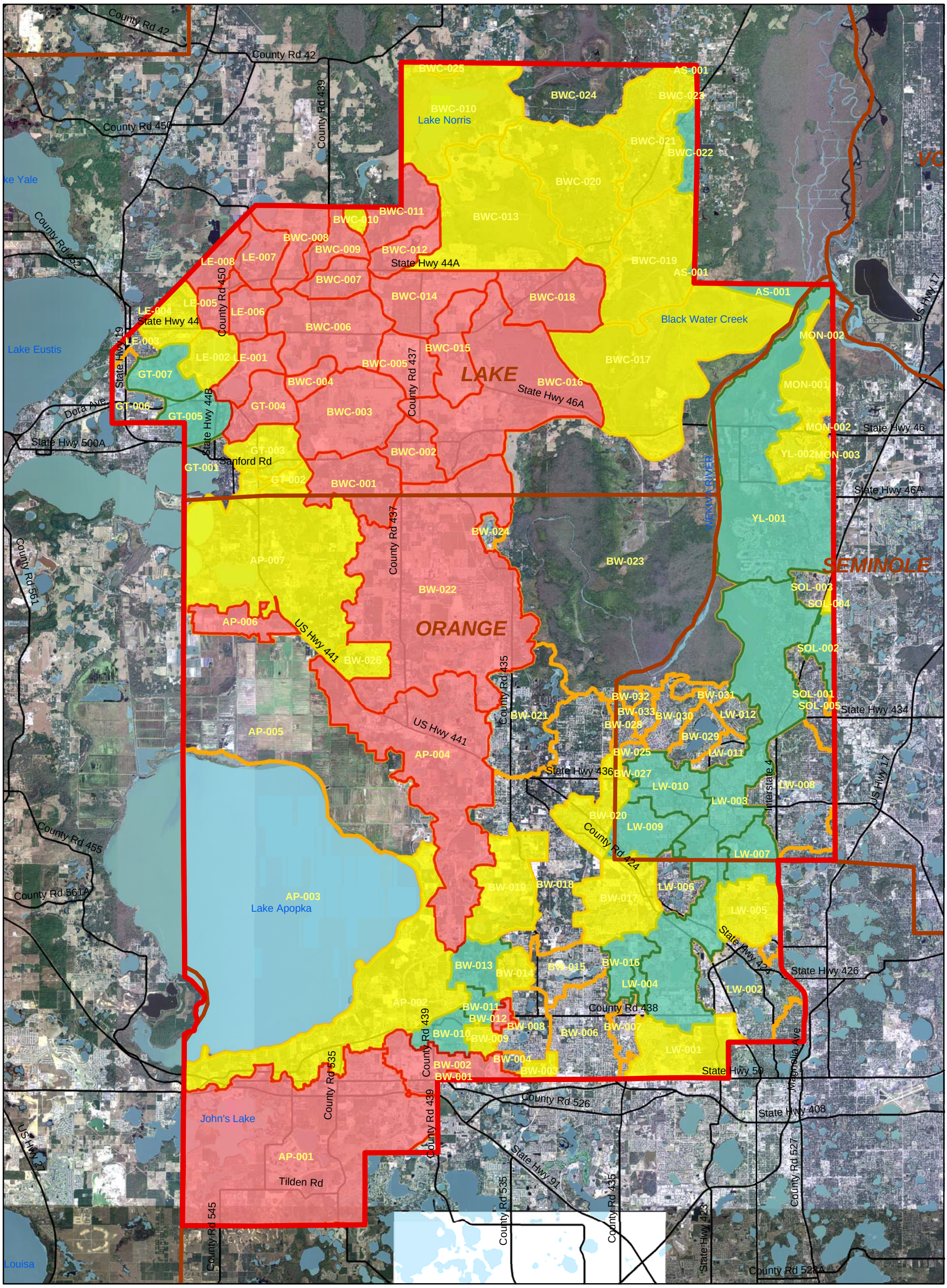
Figure E-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Subbasins with Largest Estimated Increase in Pollutant Loadings Between Existing & Future Conditions



honourdm

10/21/05

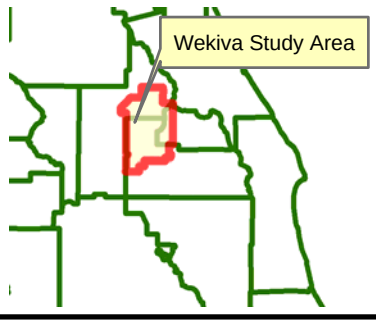
E:\Projects\9247\44812\GIS\FigE-7.mxd



N
W
E
S

0 3,500 7,000 14,000 Feet

LOCATION MAP



LEGEND

- Wekiva Study Area
- Water Bodies
- Predicted Pollutant Load Increase >20%
- 10%<Predicted Pollutant Load Increase <20%
- 5%<Predicted Pollutant Load Increase <10%
- Major Roads
- Subbasins
- County Line

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure E-7
Subbasins with Predicted Increase in Pollutant Loads
Existing vs. Future Conditions

subbasins in order to apply long term management strategies. Therefore this is already addressed in the recommendations made in Section 5. Section 5 also includes a detailed list of BMPs for water quality treatment that when implemented will help reduce pollutant loads.

For those subbasins with predicted percent increases in pollutant loads between existing and future land use conditions, the affected jurisdictions should consider requiring controls in addition to what is already required for stormwater treatment by local governments and permitting agencies. Twenty-eight subbasins were identified with estimated percent increase in loads greater than 20 percent are primarily undeveloped or dominated by agriculture. These subbasins should therefore receive a higher priority for evaluation as development takes place. These additional controls will help offset some of the large percent increases in pollutant loads which are forecasted for these subbasins within the WSA. The remaining subbasins should also be evaluated but are somewhat of a less priority than the 28 subbasins previously mentioned. Section 5 also includes a detailed list of BMPs for water quality treatment that when implemented will help reduce pollutant loads.

Table E-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Annual Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15879	4,583	29	25,352.0	330,000.0	357.0	3,200,000.0	2,359.0	8,552.0	26,366.0	4,142.0	8,100,000.0	77,193.0	120,000.0	13,585.0	1,800,000.0	3,308.0
AP-002	8237	2,528	31	14,832.0	210,000.0	260.0	2,000,000.0	1,275.0	6,789.0	15,546.0	3,002.0	4,800,000.0	48,568.0	77,505.0	9,764.0	1,300,000.0	2,091.0
AP-003	25030	6,871	27	38,778.0	170,000.0	84.0	1,800,000.0	4,740.0	2,185.0	20,254.0	651.0	11,000,000.0	63,806.0	130,000.0	11,679.0	340,000.0	2,930.0
AP-004	9708	2,344	24	13,966.0	180,000.0	211.0	2,000,000.0	1,134.0	5,838.0	14,781.0	2,482.0	4,800,000.0	47,657.0	68,563.0	8,745.0	1,100,000.0	1,780.0
AP-005	13107	482	4	9,859.0	46,938.0	51.0	1,400,000.0	263.0	926.0	9,106.0	518.0	3,600,000.0	31,464.0	29,322.0	2,536.0	320,000.0	371.0
AP-006	1186	230	19	1,517.0	20,941.0	27.0	220,000.0	134.0	706.0	1,652.0	315.0	500,000.0	5,362.0	7,180.0	1,124.0	150,000.0	230.0
AP-007	10494	1,619	15	12,028.0	140,000.0	156.0	1,500,000.0	900.0	4,525.0	12,816.0	1,626.0	4,000,000.0	37,490.0	53,580.0	6,502.0	820,000.0	1,361.0
AS-001	772	89	12	784.0	6,935.0	1.0	100,000.0	59.0	128.0	735.0	32.0	230,000.0	2,185.0	3,009.0	290.0	21,767.0	14.0
BW-001	65	15	24	93.0	821.0	1.0	11,107.0	10.0	26.0	87.0	17.0	30,927.0	288.0	414.0	48.0	5,550.0	14.0
BW-002	1989	1,008	51	4,632.0	74,839.0	91.0	640,000.0	491.0	1,710.0	4,801.0	1,141.0	1,600,000.0	14,471.0	22,185.0	2,741.0	420,000.0	754.0
BW-003	344	124	36	631.0	8,737.0	12.0	88,207.0	64.0	349.0	713.0	145.0	240,000.0	2,207.0	3,236.0	458.0	53,875.0	108.0
BW-004	210	92	44	441.0	5,267.0	3.0	54,529.0	29.0	234.0	480.0	52.0	150,000.0	1,364.0	2,194.0	253.0	19,854.0	36.0
BW-006	2892	1,551	54	7,019.0	140,000.0	164.0	1,100,000.0	746.0	5,345.0	10,822.0	1,839.0	2,900,000.0	26,319.0	40,057.0	6,205.0	870,000.0	1,354.0
BW-007	742	445	60	1,960.0	44,581.0	59.0	320,000.0	242.0	1,445.0	3,002.0	639.0	810,000.0	7,846.0	11,460.0	1,845.0	310,000.0	468.0
BW-008	1416	531	38	2,670.0	33,788.0	33.0	350,000.0	207.0	1,336.0	2,769.0	411.0	930,000.0	8,494.0	13,308.0	1,624.0	160,000.0	298.0
BW-009	434	155	36	794.0	9,923.0	10.0	95,552.0	72.0	352.0	767.0	125.0	270,000.0	2,414.0	3,800.0	464.0	49,224.0	94.0
BW-010	907	387	43	1,868.0	30,177.0	38.0	260,000.0	210.0	1,028.0	2,335.0	432.0	690,000.0	6,506.0	9,761.0	1,380.0	190,000.0	339.0
BW-011	460	214	46	1,006.0	15,531.0	18.0	140,000.0	94.0	557.0	1,163.0	208.0	360,000.0	3,389.0	5,289.0	711.0	84,289.0	154.0
BW-012	237	79	33	414.0	4,862.0	7.0	51,166.0	34.0	136.0	295.0	79.0	120,000.0	1,213.0	1,894.0	209.0	26,689.0	57.0
BW-013	1143	338	30	1,852.0	23,507.0	27.0	250,000.0	164.0	801.0	1,908.0	331.0	610,000.0	5,988.0	8,769.0	1,144.0	130,000.0	228.0
BW-014	668	225	34	1,175.0	12,026.0	13.0	130,000.0	83.0	379.0	824.0	158.0	320,000.0	3,116.0	5,082.0	552.0	55,892.0	110.0
BW-015	1589	585	37	2,961.0	39,901.0	33.0	380,000.0	234.0	1,764.0	3,619.0	417.0	1,100,000.0	9,592.0	15,042.0	1,989.0	180,000.0	306.0
BW-016	1012	478	47	2,238.0	44,835.0	57.0	350,000.0	245.0	1,586.0	3,327.0	626.0	910,000.0	8,599.0	12,687.0	1,948.0	290,000.0	460.0
BW-017	2740	1,412	52	6,458.0	120,000.0	173.0	980,000.0	781.0	3,659.0	8,123.0	1,961.0	2,500,000.0	23,575.0	33,899.0	4,990.0	840,000.0	1,343.0
BW-018	7866	3,356	43	16,201.0	300,000.0	359.0	2,400,000.0	1,626.0	10,836.0	22,479.0	4,009.0	6,300,000.0	58,346.0	89,077.0	13,168.0	1,800,000.0	2,845.0
BW-019	2940	509	17	3,555.0	49,389.0	62.0	500,000.0	294.0	1,462.0	3,994.0	662.0	1,200,000.0	12,054.0	16,477.0	2,178.0	340,000.0	494.0
BW-020	1774	817	46	3,853.0	76,328.0	96.0	560,000.0	450.0	2,205.0	5,294.0	1,061.0	1,500,000.0	13,196.0	20,658.0	3,004.0	470,000.0	797.0
BW-021	3681	1,409	38	7,038.0	120,000.0	127.0	1,000,000.0	660.0	4,454.0	9,614.0	1,383.0	2,700,000.0	24,666.0	37,769.0	5,423.0	700,000.0	1,039.0
BW-022	15208	2,052	13	16,441.0	200,000.0	205.0	2,200,000.0	977.0	7,184.0	18,694.0	2,130.0	5,400,000.0	52,973.0	74,832.0	9,792.0	1,200,000.0	1,621.0
BW-023	26770	4,496	17	31,909.0	340,000.0	88.0	4,300,000.0	2,981.0	7,329.0	33,108.0	1,864.0	9,300,000.0	94,536.0	130,000.0	14,512.0	1,000,000.0	772.0
BW-024	330	91	28	513.0	8,293.0	9.0	74,307.0	46.0	360.0	666.0	96.0	210,000.0	1,868.0	2,630.0	409.0	51,975.0	66.0
BW-025	3949	1,807	46	10,447.0	93,565.0	76.0	590,000.0	562.0	2,726.0	50,726.0	1,115.0	1,600,000.0	16,843.0	88,178.0	4,508.0	430,000.0	735.0
BW-026	913	186	20	1,198.0	7,925.0	4.0	76,361.0	47.0	249.0	685.0	67.0	210,000.0	2,195.0	4,050.0	351.0	33,258.0	51.0
BW-027	84	56	66	240.0	4,990.0	5.0	33,036.0	26.0	213.0	396.0	60.0	110,000.0	864.0	1,325.0	218.0	28,647.0	41.0
BWC-001	2463	211	9	2,256.0	25,955.0	24.0	310,000.0	99.0	851.0	2,600.0	205.0	780,000.0	7,321.0	10,026.0	1,085.0	140,000.0	162.0
BWC-002	1416	220	16	1,628.0	27,744.0	30.0	230,000.0	117.0	874.0	2,191.0	277.0	560,000.0	5,526.0	8,048.0	1,133.0	170,000.0	214.0
BWC-003	3636	355	10	3,477.0	40,653.0	38.0	410,000.0	165.0	1,538.0	3,810.0	341.0	1,000,000.0	10,153.0	14,698.0	1,753.0	220,000.0	269.0
BWC-004	576	15	3	412.0	2,128.0	1.0	47,478.0	7.0	60.0	331.0	6.0	120,000.0	1,120.0	1,428.0	103.0	12,346.0	8.0
BWC-005	1466	69	5	1,152.0	8,482.0	7.0	80,633.0	31.0	339.0	733.0	63.0	200,000.0	2,049.0	5,072.0	555.0	45,398.0	50.0
BWC-006	3839	136	4	2,870.0	19,474.0	12.0	360,000.0	62.0	590.0	2,690.0	99.0	890,000.0	8,266.0	10,667.0	992.0	110,000.0	100.0
BWC-007	1092	99	9	1,019.0	8,898.0	7.0	110,000.0	52.0	299.0	979.0	53.0	290,000.0	2,694.0	3,968.0	425.0	38,538.0	58.0
BWC-008	1700	207	12	1,764.0	18,942.0	14.0	200,000.0	107.0	631.0	1,851.0	121.0	510,000.0	4,849.0	7,311.0	812.0	76,666.0	109.0

Table E-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Annual Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-009	1043	117	11	1,046.0	12,760.0	9.0	130,000.0	58.0	457.0	1,131.0	81.0	310,000.0	2,930.0	4,309.0	548.0	59,359.0	58.0
BWC-010	5134	840	16	6,044.0	49,150.0	14.0	630,000.0	564.0	945.0	5,065.0	238.0	1,700,000.0	14,822.0	22,580.0	2,226.0	130,000.0	212.0
BWC-011	1647	181	11	1,642.0	15,269.0	5.0	200,000.0	110.0	349.0	1,543.0	78.0	450,000.0	4,346.0	6,117.0	625.0	48,530.0	39.0
BWC-012	1075	106	10	1,031.0	7,709.0	5.0	98,237.0	26.0	273.0	665.0	39.0	230,000.0	2,372.0	3,760.0	322.0	28,451.0	34.0
BWC-013	6768	1,069	16	7,838.0	85,052.0	32.0	980,000.0	629.0	2,143.0	7,906.0	452.0	2,100,000.0	21,867.0	37,921.0	4,011.0	250,000.0	237.0
BWC-014	2397	125	5	1,927.0	16,949.0	12.0	240,000.0	50.0	568.0	1,984.0	96.0	600,000.0	5,568.0	11,258.0	1,132.0	86,191.0	91.0
BWC-015	1945	136	7	1,677.0	14,897.0	9.0	190,000.0	52.0	552.0	1,794.0	78.0	500,000.0	4,556.0	6,460.0	702.0	74,940.0	74.0
BWC-016	7725	1,209	16	8,912.0	110,000.0	54.0	1,100,000.0	713.0	3,031.0	9,633.0	658.0	2,600,000.0	25,295.0	37,754.0	4,547.0	430,000.0	426.0
BWC-017	9563	1,170	12	9,937.0	94,326.0	19.0	1,300,000.0	775.0	1,854.0	9,842.0	447.0	2,900,000.0	28,871.0	39,751.0	3,911.0	280,000.0	167.0
BWC-018	2788	286	10	2,712.0	25,930.0	9.0	340,000.0	173.0	656.0	2,676.0	131.0	750,000.0	7,507.0	12,151.0	1,245.0	87,677.0	70.0
BWC-019	4578	379	8	4,148.0	32,566.0	10.0	500,000.0	232.0	677.0	3,676.0	144.0	1,200,000.0	11,006.0	15,088.0	1,385.0	120,000.0	88.0
BWC-020	5540	632	11	5,602.0	54,349.0	18.0	720,000.0	391.0	1,323.0	5,741.0	265.0	1,700,000.0	16,348.0	24,277.0	2,467.0	180,000.0	160.0
BWC-021	3331	380	11	3,368.0	28,463.0	12.0	410,000.0	230.0	622.0	3,177.0	133.0	1,100,000.0	9,299.0	13,372.0	1,216.0	100,000.0	117.0
BWC-022	755	146	19	963.0	14,896.0	12.0	120,000.0	73.0	561.0	1,232.0	100.0	340,000.0	3,041.0	4,771.0	661.0	70,475.0	82.0
BWC-023	673	74	11	672.0	7,241.0	5.0	79,513.0	38.0	245.0	709.0	41.0	210,000.0	1,900.0	2,831.0	334.0	32,194.0	38.0
BWC-024	3242	448	14	3,540.0	34,948.0	7.0	480,000.0	298.0	647.0	3,548.0	168.0	1,100,000.0	10,374.0	14,319.0	1,421.0	100,000.0	57.0
BWC-025	210	17	8	188.0	1,479.0	0.0	25,146.0	11.0	23.0	172.0	6.0	57,214.0	532.0	690.0	58.0	5,149.0	1.0
GT-001	1551	548	35	2,814.0	48,114.0	47.0	320,000.0	315.0	1,371.0	3,504.0	460.0	990,000.0	8,240.0	13,828.0	1,888.0	270,000.0	409.0
GT-002	593	186	31	997.0	19,488.0	28.0	160,000.0	113.0	547.0	1,236.0	296.0	390,000.0	3,883.0	4,931.0	754.0	160,000.0	196.0
GT-003	1451	342	24	2,058.0	32,973.0	37.0	280,000.0	180.0	1,045.0	2,547.0	383.0	720,000.0	6,736.0	9,714.0	1,336.0	210,000.0	285.0
GT-004	1476	331	22	2,037.0	20,938.0	14.0	200,000.0	80.0	727.0	1,294.0	134.0	510,000.0	5,012.0	7,928.0	875.0	86,168.0	95.0
GT-005	1223	360	29	1,976.0	33,079.0	26.0	250,000.0	166.0	1,090.0	2,694.0	271.0	710,000.0	6,175.0	10,034.0	1,272.0	170,000.0	254.0
GT-006	1090	516	47	2,416.0	54,232.0	58.0	330,000.0	286.0	1,360.0	3,873.0	626.0	960,000.0	7,923.0	12,957.0	1,841.0	330,000.0	512.0
GT-007	1274	323	25	1,885.0	29,972.0	23.0	220,000.0	157.0	1,306.0	2,568.0	201.0	700,000.0	5,992.0	9,758.0	1,389.0	140,000.0	180.0
LE-001	1233	126	10	1,198.0	7,872.0	5.0	86,112.0	68.0	229.0	745.0	54.0	260,000.0	2,249.0	5,175.0	473.0	32,162.0	66.0
LE-002	1216	304	25	1,783.0	23,964.0	16.0	200,000.0	140.0	1,049.0	2,083.0	147.0	630,000.0	5,282.0	8,699.0	1,126.0	100,000.0	137.0
LE-003	422	186	44	889.0	22,520.0	21.0	130,000.0	93.0	677.0	1,636.0	203.0	360,000.0	3,225.0	5,336.0	794.0	130,000.0	174.0
LE-004	1278	319	25	1,873.0	37,147.0	30.0	270,000.0	144.0	1,389.0	2,952.0	283.0	720,000.0	6,577.0	10,258.0	1,493.0	200,000.0	226.0
LE-005	778	107	14	847.0	9,784.0	6.0	99,498.0	56.0	275.0	1,075.0	60.0	260,000.0	2,529.0	3,880.0	381.0	48,591.0	78.0
LE-006	1010	113	11	1,013.0	11,756.0	11.0	120,000.0	61.0	396.0	1,111.0	103.0	300,000.0	3,057.0	4,364.0	495.0	62,691.0	86.0
LE-007	1255	141	11	1,261.0	12,297.0	8.0	150,000.0	72.0	457.0	1,384.0	64.0	400,000.0	3,726.0	5,629.0	556.0	51,103.0	83.0
LE-008	891	132	15	1,003.0	10,245.0	4.0	120,000.0	85.0	299.0	1,050.0	53.0	290,000.0	2,948.0	4,319.0	463.0	34,646.0	41.0
LW-001	2664	1,152	43	5,537.0	110,000.0	155.0	870,000.0	712.0	2,872.0	7,293.0	1,735.0	2,100,000.0	20,232.0	29,091.0	4,328.0	760,000.0	1,238.0
LW-002	3550	1,822	51	8,342.0	170,000.0	237.0	1,300,000.0	1,065.0	4,804.0	11,227.0	2,588.0	3,300,000.0	30,850.0	45,202.0	6,844.0	1,200,000.0	1,939.0
LW-003	11154	5,430	49	26,175.0	470,000.0	547.0	3,700,000.0	2,786.0	15,296.0	31,198.0	6,154.0	9,400,000.0	90,319.0	130,000.0	23,371.0	2,800,000.0	4,173.0
LW-004	240	120	50	552.0	11,636.0	14.0	89,160.0	58.0	400.0	926.0	149.0	220,000.0	2,167.0	3,316.0	496.0	72,164.0	123.0
LW-005	1784	885	50	4,089.0	79,258.0	102.0	590,000.0	480.0	2,068.0	5,012.0	1,122.0	1,500,000.0	13,687.0	21,361.0	3,005.0	490,000.0	828.0
LW-006	1160	540	47	2,540.0	44,821.0	52.0	370,000.0	255.0	1,706.0	3,329.0	583.0	990,000.0	9,061.0	13,913.0	2,043.0	250,000.0	429.0
LW-007	1323	731	55	3,282.0	60,434.0	74.0	470,000.0	362.0	1,754.0	3,708.0	828.0	1,200,000.0	10,992.0	17,012.0	2,401.0	350,000.0	573.0
LW-008	4047	2,413	60	10,636.0	240,000.0	315.0	1,700,000.0	1,330.0	7,582.0	15,722.0	3,424.0	4,400,000.0	39,796.0	60,901.0	9,807.0	1,600,000.0	2,517.0
LW-009	1758	783	45	3,730.0	62,181.0	73.0	500,000.0	386.0	2,302.0	4,778.0	815.0	1,400,000.0	12,630.0	19,823.0	2,844.0	350,000.0	623.0
LW-010	1930	945	49	4,383.0	81,986.0	92.0	640,000.0	442.0	2,806.0	6,210.0	1,028.0	1,700,000.0	15,650.0	24,068.0	3,474.0	480,000.0	788.0

Table E-10
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Annual Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
LW-011	589	374	64	1,626.0	34,635.0	41.0	220,000.0	186.0	824.0	2,170.0	449.0	580,000.0	5,199.0	8,560.0	1,188.0	210,000.0	345.0
LW-012	629	317	50	1,460.0	23,680.0	21.0	200,000.0	114.0	853.0	1,411.0	235.0	490,000.0	4,980.0	7,780.0	1,049.0	130,000.0	156.0
MON-001	1697	347	20	2,229.0	28,403.0	17.0	320,000.0	220.0	686.0	2,513.0	224.0	700,000.0	7,115.0	10,004.0	1,190.0	110,000.0	120.0
MON-002	655	182	28	1,023.0	14,040.0	8.0	150,000.0	119.0	348.0	1,180.0	115.0	310,000.0	3,292.0	4,745.0	604.0	48,751.0	57.0
MON-003	26	7	28	41.0	620.0	1.0	5,849.0	3.0	29.0	58.0	7.0	15,719.0	147.0	219.0	31.0	3,051.0	5.0
SOL-001	1301	598	46	2,822.0	52,310.0	64.0	430,000.0	301.0	1,948.0	3,882.0	712.0	1,100,000.0	10,528.0	15,912.0	2,416.0	310,000.0	527.0
SOL-002	682	308	45	1,461.0	23,878.0	29.0	200,000.0	151.0	810.0	1,761.0	346.0	570,000.0	4,992.0	7,459.0	1,054.0	140,000.0	234.0
SOL-003	682	272	40	1,342.0	21,028.0	29.0	200,000.0	136.0	802.0	1,572.0	337.0	520,000.0	4,986.0	7,220.0	1,049.0	130,000.0	241.0
SOL-004	122	72	59	319.0	6,600.0	8.0	42,640.0	40.0	110.0	437.0	99.0	130,000.0	931.0	1,545.0	202.0	38,170.0	69.0
SOL-005	76	34	45	160.0	2,584.0	3.0	22,290.0	17.0	97.0	180.0	37.0	59,089.0	553.0	859.0	126.0	15,203.0	28.0
YL-001	9854	2,310	23	13,941.0	160,000.0	121.0	1,800,000.0	975.0	4,516.0	11,689.0	1,409.0	4,200,000.0	40,876.0	63,038.0	6,649.0	670,000.0	960.0
YL-002	1229	325	26	1,861.0	21,165.0	22.0	220,000.0	155.0	641.0	1,655.0	240.0	570,000.0	5,358.0	8,475.0	955.0	97,318.0	192.0

Table E-11
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15879	4,583	29	14,062.0	180,000.0	198.0	1,800,000.0	1,309.0	4,743.0	14,625.0	2,298.0	4,500,000.0	42,817.0	65,845.0	7,535.0	1,000,000.0	1,835.0
AP-002	8237	2,528	31	8,751.0	120,000.0	144.0	1,100,000.0	707.0	3,765.0	8,623.0	1,665.0	2,700,000.0	26,939.0	46,481.0	5,658.0	700,000.0	1,160.0
AP-003	25030	6,871	27	21,509.0	95,201.0	47.0	1,000,000.0	2,629.0	1,212.0	11,234.0	361.0	5,900,000.0	35,392.0	73,301.0	6,478.0	190,000.0	1,625.0
AP-004	9708	2,344	24	7,746.0	97,893.0	117.0	1,100,000.0	629.0	3,238.0	8,199.0	1,377.0	2,600,000.0	26,434.0	38,030.0	4,850.0	610,000.0	987.0
AP-005	13107	482	4	5,468.0	26,035.0	28.0	790,000.0	146.0	514.0	5,051.0	287.0	2,000,000.0	17,452.0	16,264.0	1,407.0	180,000.0	206.0
AP-006	1186	230	19	841.0	11,615.0	15.0	120,000.0	75.0	392.0	916.0	175.0	280,000.0	2,974.0	3,983.0	623.0	81,041.0	128.0
AP-007	10494	1,619	15	6,671.0	77,741.0	86.0	850,000.0	499.0	2,510.0	7,109.0	902.0	2,200,000.0	20,795.0	29,719.0	3,606.0	460,000.0	755.0
AS-001	772	89	12	435.0	3,846.0	1.0	55,590.0	33.0	71.0	408.0	18.0	130,000.0	1,212.0	1,669.0	161.0	12,074.0	8.0
BW-001	65	15	24	51.0	455.0	1.0	6,161.0	5.0	14.0	48.0	9.0	17,154.0	159.0	229.0	27.0	3,079.0	8.0
BW-002	1989	1,008	51	2,569.0	41,511.0	51.0	360,000.0	272.0	949.0	2,663.0	633.0	900,000.0	8,027.0	12,305.0	1,520.0	230,000.0	418.0
BW-003	344	124	36	350.0	4,846.0	7.0	48,926.0	36.0	194.0	395.0	80.0	130,000.0	1,224.0	1,795.0	254.0	29,883.0	60.0
BW-004	210	92	44	244.0	2,921.0	2.0	30,246.0	16.0	130.0	266.0	29.0	84,682.0	757.0	1,217.0	140.0	11,012.0	20.0
BW-006	2892	1,551	54	3,893.0	80,118.0	91.0	590,000.0	414.0	2,965.0	6,003.0	1,020.0	1,600,000.0	14,598.0	22,219.0	3,442.0	480,000.0	751.0
BW-007	742	445	60	1,087.0	24,728.0	33.0	180,000.0	134.0	802.0	1,665.0	354.0	450,000.0	4,352.0	6,357.0	1,024.0	170,000.0	260.0
BW-008	1416	531	38	1,481.0	18,741.0	18.0	190,000.0	115.0	741.0	1,536.0	228.0	510,000.0	4,711.0	7,381.0	901.0	86,821.0	165.0
BW-009	434	155	36	440.0	5,504.0	6.0	53,000.0	40.0	195.0	425.0	69.0	150,000.0	1,339.0	2,108.0	257.0	27,303.0	52.0
BW-010	907	387	43	1,036.0	16,738.0	21.0	140,000.0	117.0	570.0	1,295.0	239.0	380,000.0	3,609.0	5,414.0	766.0	110,000.0	188.0
BW-011	460	214	46	558.0	8,614.0	10.0	77,248.0	52.0	309.0	645.0	115.0	200,000.0	1,880.0	2,934.0	395.0	46,753.0	85.0
BW-012	237	79	33	230.0	2,697.0	4.0	28,380.0	19.0	75.0	164.0	44.0	67,757.0	673.0	1,051.0	116.0	14,804.0	31.0
BW-013	1143	338	30	1,027.0	13,039.0	15.0	140,000.0	91.0	444.0	1,058.0	184.0	340,000.0	3,321.0	4,864.0	634.0	74,010.0	126.0
BW-014	668	225	34	651.0	6,671.0	7.0	70,609.0	46.0	210.0	457.0	88.0	170,000.0	1,728.0	2,819.0	306.0	31,002.0	61.0
BW-015	1589	585	37	1,642.0	22,132.0	18.0	210,000.0	130.0	979.0	2,007.0	231.0	600,000.0	5,320.0	8,343.0	1,103.0	99,397.0	170.0
BW-016	1012	478	47	1,241.0	24,869.0	32.0	200,000.0	136.0	880.0	1,845.0	347.0	500,000.0	4,770.0	7,037.0	1,080.0	160,000.0	255.0
BW-017	2740	1,412	52	3,582.0	68,816.0	96.0	540,000.0	433.0	2,029.0	4,505.0	1,088.0	1,400,000.0	13,076.0	18,803.0	2,768.0	470,000.0	745.0
BW-018	7866	3,356	43	8,986.0	170,000.0	199.0	1,300,000.0	902.0	6,010.0	12,469.0	2,223.0	3,500,000.0	32,363.0	49,409.0	7,304.0	980,000.0	1,578.0
BW-019	2940	509	17	1,972.0	27,394.0	34.0	280,000.0	163.0	811.0	2,215.0	367.0	680,000.0	6,686.0	9,139.0	1,208.0	190,000.0	274.0
BW-020	1774	817	46	2,137.0	42,337.0	53.0	310,000.0	250.0	1,223.0	2,936.0	589.0	830,000.0	7,319.0	11,458.0	1,666.0	260,000.0	442.0
BW-021	3681	1,409	38	3,904.0	69,184.0	70.0	560,000.0	366.0	2,470.0	5,332.0	767.0	1,500,000.0	13,682.0	20,949.0	3,008.0	390,000.0	576.0
BW-022	15208	2,052	13	9,119.0	110,000.0	113.0	1,200,000.0	542.0	3,985.0	10,369.0	1,181.0	3,000,000.0	29,383.0	41,507.0	5,431.0	640,000.0	899.0
BW-023	26770	4,496	17	17,699.0	190,000.0	49.0	2,400,000.0	1,653.0	4,065.0	18,364.0	1,034.0	5,200,000.0	52,437.0	74,586.0	8,049.0	560,000.0	428.0
BW-024	330	91	28	285.0	4,600.0	5.0	41,216.0	26.0	199.0	369.0	53.0	120,000.0	1,036.0	1,459.0	227.0	28,829.0	37.0
BW-025	3949	1,807	46	6,643.0	56,428.0	42.0	320,000.0	312.0	1,512.0	48,206.0	618.0	890,000.0	9,342.0	74,055.0	2,846.0	240,000.0	407.0
BW-026	913	186	20	664.0	4,396.0	2.0	42,355.0	26.0	138.0	380.0	37.0	120,000.0	1,218.0	2,246.0	194.0	18,447.0	28.0
BW-027	84	56	66	133.0	2,768.0	3.0	18,324.0	14.0	118.0	220.0	33.0	58,591.0	479.0	735.0	121.0	15,890.0	23.0
BWC-001	2463	211	9	1,251.0	14,396.0	13.0	170,000.0	55.0	472.0	1,442.0	114.0	430,000.0	4,061.0	5,561.0	602.0	79,265.0	90.0
BWC-002	1416	220	16	903.0	15,389.0	16.0	130,000.0	65.0	485.0	1,215.0	154.0	310,000.0	3,065.0	4,464.0	628.0	95,557.0	119.0
BWC-003	3636	355	10	1,929.0	22,549.0	21.0	230,000.0	92.0	853.0	2,114.0	189.0	560,000.0	5,632.0	8,153.0	972.0	120,000.0	149.0
BWC-004	576	15	3	229.0	1,181.0	0.0	26,335.0	4.0	33.0	183.0	3.0	67,695.0	621.0	792.0	57.0	6,848.0	5.0
BWC-005	1466	69	5	639.0	4,705.0	4.0	44,725.0	17.0	188.0	407.0	35.0	110,000.0	1,136.0	2,813.0	308.0	25,181.0	28.0
BWC-006	3839	136	4	1,592.0	10,802.0	7.0	200,000.0	34.0	327.0	1,492.0	55.0	490,000.0	4,585.0	5,917.0	550.0	60,993.0	56.0
BWC-007	1092	99	9	565.0	4,935.0	4.0	60,436.0	29.0	166.0	543.0	30.0	160,000.0	1,494.0	2,201.0	236.0	21,376.0	32.0
BWC-008	1700	207	12	978.0	10,507.0	8.0	110,000.0	60.0	350.0	1,027.0	67.0	280,000.0	2,690.0	4,055.0	450.0	42,524.0	61.0

Table E-11
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-009	1043	117	11	580.0	7,077.0	5.0	69,454.0	32.0	253.0	627.0	45.0	170,000.0	1,625.0	2,390.0	304.0	32,925.0	32.0
BWC-010	5134	840	16	3,353.0	27,262.0	8.0	350,000.0	313.0	524.0	2,810.0	132.0	930,000.0	8,221.0	12,525.0	1,235.0	74,522.0	118.0
BWC-011	1647	181	11	911.0	8,469.0	3.0	110,000.0	61.0	194.0	856.0	43.0	250,000.0	2,411.0	3,393.0	346.0	26,918.0	22.0
BWC-012	1075	106	10	572.0	4,276.0	3.0	54,489.0	15.0	151.0	369.0	21.0	130,000.0	1,316.0	2,085.0	178.0	15,781.0	19.0
BWC-013	6768	1,069	16	4,348.0	47,176.0	18.0	540,000.0	349.0	1,189.0	4,385.0	251.0	1,200,000.0	12,129.0	21,034.0	2,225.0	140,000.0	132.0
BWC-014	2397	125	5	1,069.0	9,401.0	7.0	130,000.0	27.0	315.0	1,100.0	53.0	330,000.0	3,088.0	6,245.0	628.0	47,808.0	50.0
BWC-015	1945	136	7	930.0	8,263.0	5.0	110,000.0	29.0	306.0	995.0	44.0	280,000.0	2,527.0	3,583.0	389.0	41,567.0	41.0
BWC-016	7725	1,209	16	4,943.0	59,301.0	30.0	610,000.0	396.0	1,681.0	5,343.0	365.0	1,400,000.0	14,030.0	20,941.0	2,522.0	240,000.0	237.0
BWC-017	9563	1,170	12	5,512.0	52,320.0	11.0	730,000.0	430.0	1,028.0	5,459.0	248.0	1,600,000.0	16,014.0	22,049.0	2,169.0	160,000.0	93.0
BWC-018	2788	286	10	1,504.0	14,383.0	5.0	190,000.0	96.0	364.0	1,484.0	73.0	410,000.0	4,164.0	6,740.0	691.0	48,632.0	39.0
BWC-019	4578	379	8	2,301.0	18,063.0	5.0	280,000.0	129.0	376.0	2,039.0	80.0	670,000.0	6,105.0	8,369.0	768.0	64,479.0	49.0
BWC-020	5540	632	11	3,107.0	30,146.0	10.0	400,000.0	217.0	734.0	3,184.0	147.0	920,000.0	9,068.0	13,466.0	1,369.0	100,000.0	89.0
BWC-021	3331	380	11	1,868.0	15,788.0	6.0	230,000.0	127.0	345.0	1,762.0	74.0	590,000.0	5,158.0	7,417.0	674.0	56,169.0	65.0
BWC-022	755	146	19	534.0	8,262.0	6.0	68,494.0	40.0	311.0	683.0	55.0	190,000.0	1,687.0	2,646.0	366.0	39,090.0	46.0
BWC-023	673	74	11	373.0	4,016.0	3.0	44,104.0	21.0	136.0	393.0	23.0	120,000.0	1,054.0	1,570.0	185.0	17,857.0	21.0
BWC-024	3242	448	14	1,964.0	19,384.0	4.0	270,000.0	165.0	359.0	1,968.0	93.0	590,000.0	5,754.0	7,942.0	788.0	56,286.0	32.0
BWC-025	210	17	8	104.0	820.0	0.0	13,948.0	6.0	13.0	95.0	3.0	31,735.0	295.0	383.0	32.0	2,856.0	1.0
GT-001	1551	548	35	1,561.0	26,687.0	26.0	180,000.0	175.0	760.0	1,944.0	255.0	550,000.0	4,570.0	7,670.0	1,047.0	150,000.0	227.0
GT-002	593	186	31	553.0	10,809.0	16.0	87,922.0	63.0	303.0	686.0	164.0	210,000.0	2,154.0	2,735.0	418.0	89,871.0	109.0
GT-003	1451	342	24	1,141.0	18,289.0	21.0	150,000.0	100.0	580.0	1,412.0	212.0	400,000.0	3,736.0	5,388.0	741.0	120,000.0	158.0
GT-004	1476	331	22	1,130.0	11,614.0	8.0	110,000.0	45.0	403.0	718.0	74.0	280,000.0	2,780.0	4,397.0	485.0	47,795.0	53.0
GT-005	1223	360	29	1,096.0	18,348.0	15.0	140,000.0	92.0	605.0	1,494.0	150.0	400,000.0	3,425.0	5,566.0	705.0	94,535.0	141.0
GT-006	1090	516	47	1,340.0	30,081.0	32.0	180,000.0	159.0	754.0	2,148.0	347.0	530,000.0	4,395.0	7,187.0	1,021.0	190,000.0	284.0
GT-007	1274	323	25	1,045.0	16,625.0	13.0	120,000.0	87.0	725.0	1,424.0	111.0	390,000.0	3,324.0	5,413.0	770.0	79,066.0	100.0
LE-001	1233	126	10	665.0	4,367.0	3.0	47,764.0	38.0	127.0	413.0	30.0	140,000.0	1,248.0	2,871.0	262.0	17,839.0	37.0
LE-002	1216	304	25	989.0	13,292.0	9.0	110,000.0	78.0	582.0	1,155.0	82.0	350,000.0	2,930.0	4,825.0	624.0	57,517.0	76.0
LE-003	422	186	44	493.0	12,491.0	12.0	74,238.0	52.0	376.0	907.0	113.0	200,000.0	1,789.0	2,960.0	440.0	73,794.0	96.0
LE-004	1278	319	25	1,039.0	20,605.0	17.0	150,000.0	80.0	770.0	1,637.0	157.0	400,000.0	3,648.0	5,690.0	828.0	110,000.0	125.0
LE-005	778	107	14	470.0	5,427.0	3.0	55,189.0	31.0	153.0	596.0	33.0	150,000.0	1,403.0	2,152.0	212.0	26,952.0	43.0
LE-006	1010	113	11	562.0	6,521.0	6.0	68,173.0	34.0	220.0	616.0	57.0	170,000.0	1,696.0	2,421.0	275.0	34,773.0	48.0
LE-007	1255	141	11	699.0	6,821.0	5.0	80,610.0	40.0	253.0	767.0	35.0	220,000.0	2,067.0	3,122.0	308.0	28,346.0	46.0
LE-008	891	132	15	556.0	5,682.0	2.0	66,934.0	47.0	166.0	583.0	29.0	160,000.0	1,635.0	2,395.0	257.0	19,217.0	23.0
LW-001	2664	1,152	43	3,071.0	60,880.0	86.0	480,000.0	395.0	1,593.0	4,045.0	962.0	1,200,000.0	11,222.0	16,136.0	2,401.0	420,000.0	686.0
LW-002	3550	1,822	51	4,627.0	91,961.0	131.0	700,000.0	591.0	2,665.0	6,227.0	1,435.0	1,800,000.0	17,112.0	25,073.0	3,796.0	650,000.0	1,075.0
LW-003	11154	5,430	49	14,943.0	260,000.0	304.0	2,100,000.0	1,545.0	8,484.0	17,305.0	3,413.0	5,200,000.0	50,098.0	74,152.0	14,555.0	1,600,000.0	2,315.0
LW-004	240	120	50	306.0	6,454.0	8.0	49,455.0	32.0	222.0	514.0	83.0	120,000.0	1,202.0	1,839.0	275.0	40,027.0	68.0
LW-005	1784	885	50	2,268.0	43,962.0	57.0	330,000.0	266.0	1,147.0	2,780.0	623.0	850,000.0	7,592.0	11,848.0	1,667.0	270,000.0	459.0
LW-006	1160	540	47	1,409.0	24,861.0	29.0	200,000.0	142.0	947.0	1,846.0	323.0	550,000.0	5,026.0	7,717.0	1,133.0	140,000.0	238.0
LW-007	1323	731	55	1,821.0	33,521.0	41.0	260,000.0	201.0	973.0	2,057.0	459.0	670,000.0	6,097.0	9,436.0	1,332.0	200,000.0	318.0
LW-008	4047	2,413	60	5,900.0	130,000.0	175.0	920,000.0	738.0	4,205.0	8,720.0	1,899.0	2,400,000.0	22,074.0	33,780.0	5,440.0	880,000.0	1,396.0
LW-009	1758	783	45	2,069.0	34,490.0	41.0	280,000.0	214.0	1,277.0	2,650.0	452.0	780,000.0	7,006.0	10,995.0	1,578.0	190,000.0	345.0
LW-010	1930	945	49	2,431.0	45,475.0	51.0	360,000.0	245.0	1,556.0	3,444.0	570.0	930,000.0	8,680.0	13,350.0	1,927.0	270,000.0	437.0

Table E-11
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
LW-011	589	374	64	902.0	19,211.0	23.0	120,000.0	103.0	457.0	1,204.0	249.0	320,000.0	2,884.0	4,748.0	659.0	120,000.0	191.0
LW-012	629	317	50	810.0	13,135.0	12.0	110,000.0	63.0	473.0	783.0	131.0	270,000.0	2,762.0	4,316.0	582.0	71,318.0	87.0
MON-001	1697	347	20	1,236.0	15,754.0	9.0	180,000.0	122.0	381.0	1,394.0	124.0	390,000.0	3,946.0	5,549.0	660.0	63,709.0	66.0
MON-002	655	182	28	567.0	7,787.0	4.0	82,084.0	66.0	193.0	655.0	64.0	170,000.0	1,826.0	2,632.0	335.0	27,041.0	32.0
MON-003	26	7	28	23.0	344.0	0.0	3,244.0	2.0	16.0	32.0	4.0	8,719.0	81.0	121.0	17.0	1,692.0	3.0
SOL-001	1301	598	46	1,566.0	29,015.0	36.0	240,000.0	167.0	1,080.0	2,153.0	395.0	610,000.0	5,840.0	8,826.0	1,340.0	170,000.0	292.0
SOL-002	682	308	45	810.0	13,244.0	16.0	110,000.0	84.0	449.0	977.0	192.0	310,000.0	2,769.0	4,137.0	585.0	78,006.0	130.0
SOL-003	682	272	40	744.0	11,664.0	16.0	110,000.0	75.0	445.0	872.0	187.0	290,000.0	2,766.0	4,005.0	582.0	71,952.0	134.0
SOL-004	122	72	59	177.0	3,661.0	4.0	23,651.0	22.0	61.0	242.0	55.0	70,017.0	516.0	857.0	112.0	21,172.0	38.0
SOL-005	76	34	45	89.0	1,433.0	2.0	12,363.0	9.0	54.0	100.0	21.0	32,775.0	307.0	477.0	70.0	8,433.0	16.0
YL-001	9854	2,310	23	7,733.0	87,685.0	67.0	980,000.0	541.0	2,505.0	6,483.0	782.0	2,300,000.0	22,673.0	34,966.0	3,688.0	370,000.0	533.0
YL-002	1229	325	26	1,032.0	11,740.0	12.0	120,000.0	86.0	356.0	918.0	133.0	310,000.0	2,972.0	4,701.0	530.0	53,980.0	106.0

Table E-12
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15879	4,583	29	11,290.0	150,000.0	159.0	1,400,000.0	1,051.0	3,808.0	11,742.0	1,845.0	3,600,000.0	34,376.0	52,865.0	6,050.0	800,000.0	1,473.0
AP-002	8237	2,528	31	7,258.0	92,507.0	116.0	910,000.0	568.0	3,023.0	6,923.0	1,337.0	2,200,000.0	21,628.0	38,863.0	4,650.0	560,000.0	931.0
AP-003	25030	6,871	27	17,269.0	76,434.0	38.0	800,000.0	2,111.0	973.0	9,020.0	290.0	4,700,000.0	28,415.0	58,851.0	5,201.0	150,000.0	1,305.0
AP-004	9708	2,344	24	6,219.0	78,595.0	94.0	870,000.0	505.0	2,600.0	6,582.0	1,105.0	2,100,000.0	21,223.0	30,533.0	3,894.0	490,000.0	793.0
AP-005	13107	482	4	4,390.0	20,903.0	23.0	630,000.0	117.0	412.0	4,055.0	231.0	1,600,000.0	14,012.0	13,058.0	1,129.0	140,000.0	165.0
AP-006	1186	230	19	676.0	9,325.0	12.0	97,227.0	60.0	314.0	735.0	140.0	220,000.0	2,388.0	3,198.0	500.0	65,065.0	103.0
AP-007	10494	1,619	15	5,356.0	62,416.0	69.0	680,000.0	401.0	2,015.0	5,707.0	724.0	1,800,000.0	16,695.0	23,861.0	2,895.0	370,000.0	606.0
AS-001	772	89	12	349.0	3,088.0	1.0	44,632.0	26.0	57.0	327.0	14.0	100,000.0	973.0	1,340.0	129.0	9,693.0	6.0
BW-001	65	15	24	41.0	366.0	1.0	4,946.0	4.0	11.0	39.0	7.0	13,773.0	128.0	184.0	21.0	2,472.0	6.0
BW-002	1989	1,008	51	2,063.0	33,328.0	41.0	290,000.0	219.0	762.0	2,138.0	508.0	720,000.0	6,444.0	9,880.0	1,221.0	190,000.0	336.0
BW-003	344	124	36	281.0	3,891.0	5.0	39,281.0	29.0	156.0	317.0	64.0	110,000.0	983.0	1,441.0	204.0	23,992.0	48.0
BW-004	210	92	44	196.0	2,345.0	2.0	24,283.0	13.0	104.0	214.0	23.0	67,988.0	607.0	977.0	113.0	8,841.0	16.0
BW-006	2892	1,551	54	3,126.0	64,324.0	73.0	470,000.0	332.0	2,380.0	4,819.0	819.0	1,300,000.0	11,720.0	17,839.0	2,763.0	390,000.0	603.0
BW-007	742	445	60	873.0	19,853.0	26.0	140,000.0	108.0	644.0	1,337.0	284.0	360,000.0	3,494.0	5,104.0	822.0	140,000.0	209.0
BW-008	1416	531	38	1,189.0	15,047.0	15.0	150,000.0	92.0	595.0	1,233.0	183.0	410,000.0	3,783.0	5,926.0	723.0	69,706.0	133.0
BW-009	434	155	36	353.0	4,419.0	5.0	42,552.0	32.0	157.0	341.0	56.0	120,000.0	1,075.0	1,692.0	206.0	21,921.0	42.0
BW-010	907	387	43	832.0	13,438.0	17.0	110,000.0	94.0	458.0	1,040.0	192.0	310,000.0	2,897.0	4,347.0	615.0	84,438.0	151.0
BW-011	460	214	46	448.0	6,916.0	8.0	62,020.0	42.0	248.0	518.0	93.0	160,000.0	1,509.0	2,355.0	317.0	37,536.0	68.0
BW-012	237	79	33	184.0	2,165.0	3.0	22,786.0	15.0	61.0	132.0	35.0	54,400.0	540.0	844.0	93.0	11,885.0	25.0
BW-013	1143	338	30	825.0	10,468.0	12.0	110,000.0	73.0	357.0	850.0	147.0	270,000.0	2,667.0	3,905.0	509.0	59,420.0	101.0
BW-014	668	225	34	523.0	5,356.0	6.0	56,690.0	37.0	169.0	367.0	70.0	140,000.0	1,388.0	2,263.0	246.0	24,890.0	49.0
BW-015	1589	585	37	1,319.0	17,769.0	15.0	170,000.0	104.0	786.0	1,612.0	186.0	480,000.0	4,271.0	6,699.0	886.0	79,803.0	136.0
BW-016	1012	478	47	997.0	19,966.0	25.0	160,000.0	109.0	706.0	1,481.0	279.0	400,000.0	3,829.0	5,650.0	867.0	130,000.0	205.0
BW-017	2740	1,412	52	2,876.0	55,250.0	77.0	440,000.0	348.0	1,629.0	3,617.0	873.0	1,100,000.0	10,499.0	15,096.0	2,222.0	370,000.0	598.0
BW-018	7866	3,356	43	7,215.0	130,000.0	160.0	1,100,000.0	724.0	4,826.0	10,011.0	1,785.0	2,800,000.0	25,983.0	39,669.0	5,864.0	790,000.0	1,267.0
BW-019	2940	509	17	1,583.0	21,994.0	28.0	220,000.0	131.0	651.0	1,779.0	295.0	550,000.0	5,368.0	7,337.0	970.0	150,000.0	220.0
BW-020	1774	817	46	1,716.0	33,991.0	43.0	250,000.0	200.0	982.0	2,357.0	473.0	670,000.0	5,876.0	9,200.0	1,338.0	210,000.0	355.0
BW-021	3681	1,409	38	3,134.0	55,545.0	56.0	450,000.0	294.0	1,983.0	4,281.0	616.0	1,200,000.0	10,985.0	16,819.0	2,415.0	310,000.0	463.0
BW-022	15208	2,052	13	7,322.0	88,510.0	91.0	960,000.0	435.0	3,199.0	8,325.0	948.0	2,400,000.0	23,590.0	33,325.0	4,361.0	510,000.0	722.0
BW-023	26770	4,496	17	14,210.0	150,000.0	39.0	1,900,000.0	1,327.0	3,264.0	14,744.0	830.0	4,200,000.0	42,100.0	59,883.0	6,463.0	450,000.0	344.0
BW-024	330	91	28	228.0	3,693.0	4.0	33,091.0	21.0	160.0	296.0	43.0	94,396.0	832.0	1,171.0	182.0	23,146.0	30.0
BW-025	3949	1,807	46	5,709.0	47,310.0	34.0	260,000.0	250.0	1,214.0	47,587.0	496.0	710,000.0	7,501.0	70,587.0	2,438.0	200,000.0	327.0
BW-026	913	186	20	533.0	3,529.0	2.0	34,006.0	21.0	111.0	305.0	30.0	93,642.0	978.0	1,804.0	156.0	14,811.0	23.0
BW-027	84	56	66	107.0	2,222.0	2.0	14,712.0	12.0	95.0	176.0	27.0	47,040.0	385.0	590.0	97.0	12,757.0	18.0
BWC-001	2463	211	9	1,005.0	11,558.0	10.0	140,000.0	44.0	379.0	1,158.0	91.0	350,000.0	3,260.0	4,465.0	483.0	63,640.0	72.0
BWC-002	1416	220	16	725.0	12,355.0	13.0	100,000.0	52.0	389.0	976.0	124.0	250,000.0	2,461.0	3,584.0	504.0	76,720.0	95.0
BWC-003	3636	355	10	1,549.0	18,104.0	17.0	180,000.0	73.0	685.0	1,697.0	152.0	450,000.0	4,521.0	6,545.0	780.0	95,833.0	120.0
BWC-004	576	15	3	184.0	948.0	0.0	21,143.0	3.0	27.0	147.0	2.0	54,350.0	499.0	636.0	46.0	5,498.0	4.0
BWC-005	1466	69	5	513.0	3,777.0	3.0	35,908.0	14.0	151.0	326.0	28.0	87,946.0	912.0	2,259.0	247.0	20,217.0	22.0
BWC-006	3839	136	4	1,278.0	8,672.0	5.0	160,000.0	27.0	263.0	1,198.0	44.0	390,000.0	3,681.0	4,750.0	442.0	48,969.0	45.0
BWC-007	1092	99	9	454.0	3,962.0	3.0	48,522.0	23.0	133.0	436.0	24.0	130,000.0	1,200.0	1,767.0	189.0	17,162.0	26.0
BWC-008	1700	207	12	785.0	8,435.0	6.0	89,667.0	48.0	281.0	824.0	54.0	230,000.0	2,159.0	3,256.0	362.0	34,141.0	49.0

Table E-12
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-009	1043	117	11	466.0	5,682.0	4.0	55,762.0	26.0	203.0	504.0	36.0	140,000.0	1,305.0	1,919.0	244.0	26,434.0	26.0
BWC-010	5134	840	16	2,692.0	21,888.0	6.0	280,000.0	251.0	421.0	2,256.0	106.0	740,000.0	6,601.0	10,056.0	991.0	59,831.0	94.0
BWC-011	1647	181	11	731.0	6,800.0	2.0	88,609.0	49.0	155.0	687.0	35.0	200,000.0	1,935.0	2,724.0	278.0	21,612.0	17.0
BWC-012	1075	106	10	459.0	3,433.0	2.0	43,748.0	12.0	122.0	296.0	17.0	100,000.0	1,056.0	1,674.0	143.0	12,670.0	15.0
BWC-013	6768	1,069	16	3,491.0	37,876.0	14.0	440,000.0	280.0	954.0	3,521.0	201.0	950,000.0	9,738.0	16,887.0	1,786.0	110,000.0	106.0
BWC-014	2397	125	5	858.0	7,548.0	5.0	110,000.0	22.0	253.0	883.0	43.0	270,000.0	2,479.0	5,014.0	504.0	38,383.0	40.0
BWC-015	1945	136	7	747.0	6,634.0	4.0	85,251.0	23.0	246.0	799.0	35.0	220,000.0	2,029.0	2,877.0	312.0	33,373.0	33.0
BWC-016	7725	1,209	16	3,969.0	47,611.0	24.0	490,000.0	318.0	1,350.0	4,290.0	293.0	1,100,000.0	11,264.0	16,813.0	2,025.0	190,000.0	190.0
BWC-017	9563	1,170	12	4,425.0	42,006.0	9.0	590,000.0	345.0	826.0	4,383.0	199.0	1,300,000.0	12,857.0	17,702.0	1,742.0	130,000.0	74.0
BWC-018	2788	286	10	1,208.0	11,547.0	4.0	150,000.0	77.0	292.0	1,192.0	58.0	330,000.0	3,343.0	5,411.0	555.0	39,045.0	31.0
BWC-019	4578	379	8	1,847.0	14,502.0	4.0	220,000.0	104.0	302.0	1,637.0	64.0	530,000.0	4,901.0	6,719.0	617.0	51,768.0	39.0
BWC-020	5540	632	11	2,495.0	24,203.0	8.0	320,000.0	174.0	589.0	2,556.0	118.0	740,000.0	7,280.0	10,811.0	1,099.0	81,114.0	71.0
BWC-021	3331	380	11	1,500.0	12,675.0	5.0	180,000.0	102.0	277.0	1,415.0	59.0	480,000.0	4,141.0	5,955.0	541.0	45,096.0	52.0
BWC-022	755	146	19	429.0	6,633.0	5.0	54,992.0	32.0	250.0	548.0	44.0	150,000.0	1,354.0	2,124.0	294.0	31,384.0	37.0
BWC-023	673	74	11	299.0	3,224.0	2.0	35,410.0	17.0	109.0	316.0	18.0	94,538.0	846.0	1,261.0	149.0	14,337.0	17.0
BWC-024	3242	448	14	1,577.0	15,563.0	3.0	210,000.0	133.0	288.0	1,580.0	75.0	470,000.0	4,620.0	6,377.0	633.0	45,190.0	25.0
BWC-025	210	17	8	84.0	659.0	0.0	11,198.0	5.0	10.0	77.0	3.0	25,479.0	237.0	307.0	26.0	2,293.0	1.0
GT-001	1551	548	35	1,253.0	21,426.0	21.0	140,000.0	140.0	610.0	1,561.0	205.0	440,000.0	3,669.0	6,158.0	841.0	120,000.0	182.0
GT-002	593	186	31	444.0	8,678.0	13.0	70,589.0	50.0	244.0	551.0	132.0	170,000.0	1,729.0	2,196.0	336.0	72,154.0	87.0
GT-003	1451	342	24	916.0	14,684.0	17.0	120,000.0	80.0	465.0	1,134.0	170.0	320,000.0	3,000.0	4,326.0	595.0	92,894.0	127.0
GT-004	1476	331	22	907.0	9,324.0	6.0	91,179.0	36.0	324.0	576.0	60.0	230,000.0	2,232.0	3,530.0	390.0	38,373.0	42.0
GT-005	1223	360	29	880.0	14,731.0	12.0	110,000.0	74.0	486.0	1,200.0	121.0	320,000.0	2,750.0	4,469.0	566.0	75,899.0	113.0
GT-006	1090	516	47	1,076.0	24,151.0	26.0	150,000.0	127.0	606.0	1,725.0	279.0	430,000.0	3,528.0	5,770.0	820.0	150,000.0	228.0
GT-007	1274	323	25	839.0	13,347.0	10.0	100,000.0	70.0	582.0	1,143.0	89.0	310,000.0	2,668.0	4,346.0	618.0	63,479.0	80.0
LE-001	1233	126	10	534.0	3,506.0	2.0	38,348.0	30.0	102.0	332.0	24.0	110,000.0	1,002.0	2,305.0	210.0	14,323.0	30.0
LE-002	1216	304	25	794.0	10,672.0	7.0	87,965.0	62.0	467.0	927.0	65.0	280,000.0	2,352.0	3,874.0	501.0	46,179.0	61.0
LE-003	422	186	44	396.0	10,029.0	9.0	59,603.0	41.0	302.0	729.0	91.0	160,000.0	1,436.0	2,376.0	353.0	59,247.0	77.0
LE-004	1278	319	25	834.0	16,543.0	14.0	120,000.0	64.0	619.0	1,315.0	126.0	320,000.0	2,929.0	4,568.0	665.0	89,633.0	101.0
LE-005	778	107	14	377.0	4,357.0	3.0	44,309.0	25.0	123.0	479.0	27.0	120,000.0	1,126.0	1,728.0	170.0	21,639.0	35.0
LE-006	1010	113	11	451.0	5,235.0	5.0	54,734.0	27.0	176.0	495.0	46.0	140,000.0	1,361.0	1,944.0	221.0	27,918.0	38.0
LE-007	1255	141	11	561.0	5,476.0	4.0	64,719.0	32.0	203.0	616.0	28.0	180,000.0	1,659.0	2,507.0	248.0	22,758.0	37.0
LE-008	891	132	15	447.0	4,562.0	2.0	53,739.0	38.0	133.0	468.0	24.0	130,000.0	1,313.0	1,923.0	206.0	15,429.0	18.0
LW-001	2664	1,152	43	2,466.0	48,878.0	69.0	390,000.0	317.0	1,279.0	3,248.0	772.0	960,000.0	9,010.0	12,955.0	1,928.0	340,000.0	551.0
LW-002	3550	1,822	51	3,715.0	73,832.0	105.0	570,000.0	474.0	2,139.0	5,000.0	1,152.0	1,500,000.0	13,738.0	20,130.0	3,048.0	520,000.0	863.0
LW-003	11154	5,430	49	12,185.0	210,000.0	244.0	1,700,000.0	1,241.0	6,812.0	13,893.0	2,740.0	4,200,000.0	40,222.0	59,534.0	12,390.0	1,200,000.0	1,858.0
LW-004	240	120	50	246.0	5,182.0	6.0	39,705.0	26.0	178.0	412.0	67.0	98,946.0	965.0	1,477.0	221.0	32,137.0	55.0
LW-005	1784	885	50	1,821.0	35,296.0	45.0	260,000.0	214.0	921.0	2,232.0	500.0	680,000.0	6,095.0	9,513.0	1,338.0	220,000.0	369.0
LW-006	1160	540	47	1,131.0	19,960.0	23.0	160,000.0	114.0	760.0	1,482.0	259.0	440,000.0	4,035.0	6,196.0	910.0	110,000.0	191.0
LW-007	1323	731	55	1,462.0	26,913.0	33.0	210,000.0	161.0	781.0	1,651.0	369.0	540,000.0	4,895.0	7,576.0	1,069.0	160,000.0	255.0
LW-008	4047	2,413	60	4,737.0	110,000.0	140.0	740,000.0	592.0	3,376.0	7,001.0	1,525.0	2,000,000.0	17,722.0	27,121.0	4,367.0	700,000.0	1,121.0
LW-009	1758	783	45	1,661.0	27,691.0	33.0	220,000.0	172.0	1,025.0	2,128.0	363.0	630,000.0	5,625.0	8,828.0	1,267.0	150,000.0	277.0
LW-010	1930	945	49	1,952.0	36,511.0	41.0	290,000.0	197.0	1,250.0	2,765.0	458.0	750,000.0	6,969.0	10,718.0	1,547.0	210,000.0	351.0

Table E-12
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Existing Land Use with 1% Septic Tank Failure Rate and Existing BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
LW-011	589	374	64	724.0	15,424.0	18.0	99,972.0	83.0	367.0	967.0	200.0	260,000.0	2,315.0	3,812.0	529.0	95,240.0	153.0
LW-012	629	317	50	650.0	10,545.0	10.0	89,174.0	51.0	380.0	628.0	105.0	220,000.0	2,218.0	3,465.0	467.0	57,259.0	70.0
MON-001	1697	347	20	993.0	12,649.0	8.0	140,000.0	98.0	306.0	1,119.0	100.0	310,000.0	3,168.0	4,455.0	530.0	51,150.0	53.0
MON-002	655	182	28	456.0	6,252.0	3.0	65,903.0	53.0	155.0	526.0	51.0	140,000.0	1,466.0	2,113.0	269.0	21,710.0	26.0
MON-003	26	7	28	18.0	276.0	0.0	2,605.0	2.0	13.0	26.0	3.0	7,000.0	65.0	97.0	14.0	1,359.0	2.0
SOL-001	1301	598	46	1,257.0	23,295.0	29.0	190,000.0	134.0	867.0	1,729.0	317.0	490,000.0	4,688.0	7,086.0	1,076.0	140,000.0	235.0
SOL-002	682	308	45	651.0	10,634.0	13.0	91,059.0	67.0	361.0	784.0	154.0	250,000.0	2,223.0	3,322.0	469.0	62,629.0	104.0
SOL-003	682	272	40	598.0	9,364.0	13.0	90,454.0	60.0	357.0	700.0	150.0	230,000.0	2,221.0	3,215.0	467.0	57,768.0	107.0
SOL-004	122	72	59	142.0	2,939.0	3.0	18,989.0	18.0	49.0	195.0	44.0	56,214.0	415.0	688.0	90.0	16,998.0	31.0
SOL-005	76	34	45	71.0	1,151.0	2.0	9,926.0	8.0	43.0	80.0	17.0	26,314.0	246.0	383.0	56.0	6,770.0	13.0
YL-001	9854	2,310	23	6,208.0	70,399.0	54.0	780,000.0	434.0	2,011.0	5,205.0	628.0	1,900,000.0	18,203.0	28,073.0	2,961.0	300,000.0	428.0
YL-002	1229	325	26	829.0	9,426.0	10.0	99,311.0	69.0	285.0	737.0	107.0	250,000.0	2,386.0	3,774.0	425.0	43,338.0	85.0

Table E-13
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Annual Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15878	7,634	48	35,584.0	510,000.0	497.0	4,300,000.0	3,150.0	10,524.0	30,730.0	5,809.0	11,000,000.0	97,090.0	170,000.0	17,343.0	2,300,000.0	4,210.0
AP-002	8237	3,848	47	19,259.0	270,000.0	292.0	2,500,000.0	1,508.0	7,723.0	16,699.0	3,371.0	5,800,000.0	56,767.0	98,820.0	11,217.0	1,400,000.0	2,274.0
AP-003	25011	6,873	27	38,774.0	170,000.0	85.0	1,800,000.0	4,741.0	2,189.0	20,261.0	653.0	11,000,000.0	63,813.0	130,000.0	11,685.0	340,000.0	2,930.0
AP-004	9708	4,518	47	21,255.0	290,000.0	295.0	2,800,000.0	1,714.0	7,647.0	17,413.0	3,518.0	6,400,000.0	64,441.0	100,000.0	11,303.0	1,500,000.0	2,299.0
AP-005	13107	721	6	10,660.0	83,247.0	59.0	1,500,000.0	344.0	2,413.0	14,431.0	658.0	3,000,000.0	44,337.0	45,623.0	5,688.0	620,000.0	604.0
AP-006	1186	272	23	1,658.0	25,714.0	35.0	260,000.0	152.0	853.0	3,176.0	394.0	680,000.0	6,713.0	8,227.0	1,412.0	240,000.0	281.0
AP-007	10494	2,265	22	14,192.0	170,000.0	162.0	1,800,000.0	991.0	5,780.0	19,796.0	1,682.0	4,800,000.0	45,068.0	66,518.0	8,455.0	1,100,000.0	1,435.0
AS-001	772	103	13	831.0	7,258.0	2.0	110,000.0	59.0	137.0	722.0	34.0	250,000.0	2,310.0	3,287.0	292.0	21,351.0	15.0
BW-001	63	38	60	167.0	2,223.0	2.0	18,470.0	17.0	36.0	121.0	29.0	50,898.0	407.0	724.0	75.0	8,687.0	20.0
BW-002	1989	1,447	73	6,101.0	110,000.0	119.0	810,000.0	637.0	2,058.0	5,584.0	1,470.0	2,000,000.0	17,685.0	28,997.0	3,395.0	540,000.0	942.0
BW-003	344	188	55	846.0	12,677.0	15.0	110,000.0	78.0	456.0	791.0	168.0	300,000.0	2,755.0	4,374.0	579.0	63,137.0	117.0
BW-004	212	109	51	498.0	6,054.0	4.0	59,715.0	31.0	248.0	509.0	56.0	160,000.0	1,484.0	2,495.0	271.0	21,674.0	40.0
BW-006	2892	1,706	59	7,540.0	150,000.0	166.0	1,100,000.0	763.0	5,642.0	11,119.0	1,854.0	3,000,000.0	27,547.0	43,087.0	6,475.0	880,000.0	1,371.0
BW-007	742	467	63	2,032.0	46,001.0	60.0	330,000.0	246.0	1,487.0	3,036.0	648.0	830,000.0	8,030.0	11,870.0	1,888.0	310,000.0	474.0
BW-008	1418	617	44	2,962.0	37,792.0	36.0	370,000.0	222.0	1,471.0	2,846.0	437.0	980,000.0	9,076.0	14,898.0	1,753.0	160,000.0	316.0
BW-009	433	203	47	953.0	12,576.0	12.0	110,000.0	81.0	386.0	806.0	143.0	300,000.0	2,688.0	4,579.0	520.0	53,998.0	102.0
BW-010	907	455	50	2,095.0	33,877.0	44.0	290,000.0	235.0	1,070.0	2,369.0	490.0	750,000.0	7,106.0	10,672.0	1,480.0	210,000.0	367.0
BW-011	460	233	51	1,070.0	16,758.0	18.0	150,000.0	98.0	599.0	1,205.0	215.0	380,000.0	3,582.0	5,667.0	756.0	87,176.0	157.0
BW-012	228	127	56	570.0	6,812.0	7.0	68,018.0	41.0	150.0	307.0	83.0	160,000.0	1,497.0	2,645.0	242.0	25,036.0	54.0
BW-013	1143	430	38	2,161.0	28,372.0	28.0	280,000.0	182.0	953.0	2,107.0	351.0	660,000.0	6,817.0	10,636.0	1,322.0	150,000.0	245.0
BW-014	668	289	43	1,390.0	15,939.0	15.0	160,000.0	99.0	469.0	949.0	183.0	370,000.0	3,686.0	6,231.0	662.0	64,622.0	118.0
BW-015	1589	673	42	3,254.0	43,967.0	38.0	410,000.0	247.0	1,914.0	3,728.0	457.0	1,100,000.0	10,227.0	16,693.0	2,100.0	190,000.0	335.0
BW-016	1012	578	57	2,576.0	50,570.0	60.0	390,000.0	266.0	1,736.0	3,489.0	659.0	990,000.0	9,445.0	14,490.0	2,117.0	300,000.0	477.0
BW-017	2741	1,679	61	7,353.0	140,000.0	189.0	1,100,000.0	868.0	3,950.0	8,385.0	2,140.0	2,800,000.0	25,973.0	37,889.0	5,411.0	900,000.0	1,439.0
BW-018	7867	3,861	49	17,894.0	320,000.0	370.0	2,500,000.0	1,708.0	11,296.0	22,742.0	4,114.0	6,600,000.0	61,569.0	96,138.0	13,488.0	1,800,000.0	2,895.0
BW-019	2939	913	31	4,908.0	59,978.0	46.0	600,000.0	288.0	1,700.0	4,638.0	494.0	1,400,000.0	14,159.0	23,969.0	2,366.0	280,000.0	454.0
BW-020	1774	978	55	4,396.0	88,322.0	109.0	630,000.0	497.0	2,437.0	5,630.0	1,198.0	1,700,000.0	14,547.0	23,431.0	3,291.0	520,000.0	880.0
BW-021	3681	1,587	43	7,636.0	130,000.0	134.0	1,100,000.0	687.0	4,710.0	10,004.0	1,445.0	2,800,000.0	25,991.0	41,014.0	5,596.0	720,000.0	1,086.0
BW-022	15410	3,325	22	20,840.0	260,000.0	212.0	2,700,000.0	1,145.0	9,786.0	30,464.0	2,224.0	7,000,000.0	68,367.0	100,000.0	13,065.0	1,600,000.0	1,790.0
BW-023	26770	4,451	17	31,757.0	340,000.0	104.0	4,300,000.0	2,844.0	7,387.0	33,286.0	1,875.0	9,600,000.0	95,001.0	130,000.0	14,235.0	1,100,000.0	840.0
BW-024	330	88	27	503.0	8,759.0	8.0	71,704.0	46.0	424.0	737.0	92.0	200,000.0	2,017.0	2,907.0	489.0	63,087.0	70.0
BW-025	3949	1,833	46	10,535.0	94,917.0	77.0	600,000.0	564.0	2,760.0	50,772.0	1,124.0	1,600,000.0	17,023.0	88,591.0	4,523.0	430,000.0	735.0
BW-026	913	260	28	1,445.0	11,029.0	5.0	93,101.0	61.0	324.0	749.0	85.0	240,000.0	2,618.0	5,261.0	458.0	39,483.0	61.0
BW-027	84	60	71	254.0	5,281.0	5.0	34,718.0	27.0	229.0	420.0	62.0	110,000.0	904.0	1,403.0	228.0	29,388.0	42.0
BWC-001	2463	651	26	3,732.0	47,274.0	35.0	470,000.0	174.0	1,561.0	3,134.0	310.0	1,000,000.0	11,083.0	18,874.0	1,873.0	190,000.0	227.0
BWC-002	1416	543	38	2,710.0	42,535.0	37.0	340,000.0	173.0	1,138.0	2,331.0	352.0	800,000.0	7,614.0	13,716.0	1,390.0	170,000.0	244.0
BWC-003	3631	958	26	5,496.0	62,882.0	42.0	660,000.0	224.0	2,121.0	4,101.0	349.0	1,500,000.0	14,705.0	26,505.0	2,335.0	170,000.0	250.0
BWC-004	576	98	17	691.0	4,225.0	2.0	71,949.0	20.0	107.0	228.0	21.0	160,000.0	1,491.0	2,571.0	146.0	8,318.0	14.0
BWC-005	1466	348	24	2,090.0	20,233.0	14.0	230,000.0	76.0	582.0	1,066.0	121.0	530,000.0	5,044.0	9,063.0	692.0	56,838.0	77.0
BWC-006	3839	682	18	4,701.0	33,606.0	22.0	510,000.0	150.0	862.0	2,070.0	190.0	1,200,000.0	10,706.0	18,253.0	1,148.0	75,368.0	128.0
BWC-007	1092	216	20	1,412.0	11,925.0	8.0	150,000.0	68.0	344.0	874.0	69.0	370,000.0	3,371.0	5,793.0	458.0	31,481.0	61.0
BWC-008	1701	448	26	2,570.0	28,715.0	20.0	300,000.0	143.0	865.0	1,938.0	170.0	700,000.0	6,740.0	11,965.0	1,082.0	80,288.0	132.0
BWC-009	1043	223	21	1,402.0	16,334.0	12.0	170,000.0	75.0	551.0	1,155.0	105.0	410,000.0	3,871.0	6,323.0	647.0	60,083.0	70.0
BWC-010	5134	1,183	23	7,196.0	63,192.0	25.0	770,000.0	658.0	1,348.0	5,479.0	344.0	1,900,000.0	17,691.0	28,710.0	2,724.0	150,000.0	272.0
BWC-011	1647	339	21	2,172.0	23,029.0	14.0	280,000.0	153.0	619.0	1,968.0	143.0	620,000.0	6,095.0	9,452.0	914.0	65,485.0	88.0
BWC-012	1075	206	19	1,367.0	11,016.0	7.0	150,000.0	42.0	340.0	700.0	57.0	330,000.0	3,364.0	5,775.0	419.0	29,245.0	42.0
BWC-013	6768	1,532	23	9,393.0	100,000.0	50.0	1,200,000.0	733.0	2,706.0	8,567.0	599.0	2,600,000.0	26,349.0	41,308.0	4,157.0	270,000.0	332.0
BWC-014	2397	483	20	3,128.0	28,479.0	21.0	360,000.0	116.0	759.0	1,782.0	185.0	820,000.0	7,495.0	12,852.0	949.0	79,768.0	126.0
BWC-015	1944	366	19	2,449.0	22,401.0	15.0	290,000.0	95.0	768.0	1,923.0	133.0	700,000.0	6,351.0	10,442.0	866.0	70,765.0	101.0

Table E-13
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Annual Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-016	7724	1,939	25	11,360.0	140,000.0	85.0	1,500,000.0	899.0	4,095.0	11,428.0	919.0	3,400,000.0	33,135.0	52,630.0	5,734.0	500,000.0	603.0
BWC-017	9527	1,462	15	10,891.0	110,000.0	46.0	1,500,000.0	841.0	2,467.0	10,972.0	622.0	3,300,000.0	32,206.0	45,817.0	4,485.0	340,000.0	318.0
BWC-018	2880	546	19	3,642.0	37,490.0	21.0	470,000.0	254.0	981.0	3,302.0	224.0	1,100,000.0	10,201.0	15,657.0	1,496.0	110,000.0	141.0
BWC-019	4578	625	14	4,974.0	40,715.0	18.0	610,000.0	265.0	934.0	3,787.0	207.0	1,400,000.0	13,203.0	19,800.0	1,591.0	120,000.0	131.0
BWC-020	5537	1,106	20	7,190.0	67,865.0	39.0	870,000.0	439.0	1,798.0	5,408.0	403.0	1,900,000.0	18,793.0	30,085.0	2,646.0	180,000.0	258.0
BWC-021	3330	726	22	4,528.0	40,701.0	21.0	500,000.0	302.0	966.0	3,019.0	234.0	1,200,000.0	10,996.0	18,354.0	1,566.0	99,425.0	166.0
BWC-022	755	197	26	1,136.0	16,635.0	13.0	140,000.0	85.0	605.0	1,236.0	112.0	370,000.0	3,401.0	5,605.0	700.0	69,758.0	86.0
BWC-023	673	143	21	902.0	9,229.0	6.0	100,000.0	50.0	299.0	670.0	55.0	250,000.0	2,324.0	3,910.0	372.0	30,061.0	43.0
BWC-024	3242	678	21	4,311.0	40,469.0	15.0	530,000.0	315.0	909.0	3,205.0	224.0	1,100,000.0	11,237.0	17,590.0	1,582.0	92,312.0	103.0
BWC-025	210	40	19	265.0	2,056.0	1.0	30,624.0	14.0	44.0	142.0	11.0	64,146.0	635.0	1,025.0	76.0	3,997.0	4.0
GT-001	1551	591	38	2,957.0	50,335.0	48.0	340,000.0	323.0	1,429.0	3,552.0	476.0	1,000,000.0	8,537.0	14,561.0	1,952.0	280,000.0	419.0
GT-002	592	292	49	1,352.0	25,944.0	35.0	200,000.0	144.0	737.0	1,467.0	355.0	470,000.0	4,848.0	6,840.0	971.0	180,000.0	231.0
GT-003	1451	570	39	2,824.0	42,508.0	38.0	350,000.0	201.0	1,311.0	2,726.0	379.0	870,000.0	8,220.0	14,043.0	1,590.0	200,000.0	286.0
GT-004	1475	528	36	2,697.0	29,495.0	20.0	280,000.0	115.0	949.0	1,495.0	196.0	660,000.0	6,606.0	11,684.0	1,115.0	98,645.0	129.0
GT-005	1223	482	39	2,385.0	38,322.0	29.0	280,000.0	183.0	1,214.0	2,740.0	297.0	790,000.0	6,807.0	12,004.0	1,420.0	170,000.0	264.0
GT-006	1089	594	55	2,677.0	58,596.0	61.0	360,000.0	304.0	1,419.0	3,929.0	659.0	1,000,000.0	8,350.0	14,178.0	1,930.0	340,000.0	528.0
GT-007	1274	419	33	2,207.0	34,408.0	25.0	260,000.0	171.0	1,439.0	2,658.0	224.0	760,000.0	6,628.0	11,536.0	1,519.0	150,000.0	191.0
LE-001	1232	318	26	1,841.0	16,141.0	10.0	190,000.0	97.0	420.0	961.0	97.0	470,000.0	4,241.0	7,879.0	599.0	40,468.0	85.0
LE-002	1216	405	33	2,122.0	30,753.0	22.0	240,000.0	162.0	1,306.0	2,430.0	188.0	720,000.0	6,187.0	10,845.0	1,375.0	120,000.0	166.0
LE-003	421	192	46	908.0	22,803.0	21.0	140,000.0	94.0	687.0	1,642.0	205.0	370,000.0	3,262.0	5,444.0	803.0	130,000.0	175.0
LE-004	1278	504	39	2,495.0	46,798.0	35.0	340,000.0	171.0	1,661.0	3,392.0	323.0	860,000.0	8,138.0	14,040.0	1,770.0	220,000.0	268.0
LE-005	778	261	34	1,364.0	16,402.0	10.0	150,000.0	76.0	414.0	1,105.0	90.0	360,000.0	3,457.0	6,595.0	546.0	50,643.0	92.0
LE-006	1010	290	29	1,607.0	18,610.0	14.0	190,000.0	80.0	553.0	1,133.0	116.0	430,000.0	4,177.0	7,648.0	666.0	52,951.0	88.0
LE-007	1255	372	30	2,036.0	21,878.0	14.0	220,000.0	103.0	688.0	1,363.0	106.0	540,000.0	5,077.0	9,742.0	830.0	50,721.0	98.0
LE-008	891	261	29	1,435.0	17,117.0	9.0	170,000.0	101.0	502.0	1,203.0	89.0	390,000.0	3,876.0	6,836.0	671.0	43,624.0	64.0
LW-001	2664	1,605	60	7,056.0	140,000.0	189.0	1,100,000.0	858.0	3,409.0	8,199.0	2,104.0	2,600,000.0	24,286.0	36,537.0	5,103.0	910,000.0	1,471.0
LW-002	3550	1,999	56	8,935.0	180,000.0	243.0	1,300,000.0	1,102.0	4,976.0	11,580.0	2,660.0	3,400,000.0	32,404.0	48,204.0	7,075.0	1,200,000.0	1,987.0
LW-003	11154	5,890	53	27,715.0	500,000.0	584.0	4,000,000.0	2,943.0	16,013.0	32,096.0	6,552.0	9,900,000.0	95,090.0	140,000.0	24,306.0	3,000,000.0	4,398.0
LW-004	240	129	54	583.0	12,758.0	15.0	93,903.0	63.0	425.0	1,003.0	161.0	240,000.0	2,282.0	3,528.0	529.0	79,391.0	133.0
LW-005	1774	1,052	59	4,642.0	90,174.0	111.0	650,000.0	533.0	2,219.0	5,236.0	1,233.0	1,700,000.0	14,939.0	23,911.0	3,249.0	530,000.0	887.0
LW-006	1160	592	51	2,714.0	47,603.0	54.0	380,000.0	265.0	1,786.0	3,378.0	601.0	1,000,000.0	9,449.0	14,835.0	2,129.0	260,000.0	439.0
LW-007	1323	830	63	3,616.0	69,043.0	83.0	510,000.0	399.0	1,874.0	4,023.0	925.0	1,300,000.0	11,811.0	18,739.0	2,590.0	400,000.0	640.0
LW-008	4047	2,512	62	10,969.0	240,000.0	315.0	1,700,000.0	1,342.0	7,409.0	15,492.0	3,442.0	4,400,000.0	40,072.0	62,123.0	9,719.0	1,600,000.0	2,513.0
LW-009	1758	864	49	4,002.0	66,539.0	78.0	540,000.0	413.0	2,366.0	4,841.0	870.0	1,500,000.0	13,381.0	20,955.0	2,947.0	360,000.0	646.0
LW-010	1930	1,054	55	4,749.0	88,694.0	95.0	690,000.0	474.0	2,952.0	6,562.0	1,071.0	1,800,000.0	16,629.0	26,144.0	3,670.0	500,000.0	821.0
LW-011	589	378	64	1,638.0	35,437.0	42.0	230,000.0	188.0	842.0	2,211.0	461.0	590,000.0	5,255.0	8,669.0	1,208.0	220,000.0	354.0
LW-012	629	318	51	1,461.0	23,910.0	21.0	200,000.0	114.0	862.0	1,425.0	237.0	490,000.0	5,013.0	7,816.0	1,057.0	130,000.0	156.0
MON-001	1697	546	32	2,898.0	36,735.0	18.0	380,000.0	246.0	774.0	3,041.0	239.0	810,000.0	8,469.0	13,441.0	1,308.0	130,000.0	168.0
MON-002	655	197	30	1,071.0	14,724.0	8.0	150,000.0	123.0	351.0	1,179.0	121.0	320,000.0	3,348.0	4,918.0	610.0	49,624.0	60.0
MON-003	26	8	33	44.0	652.0	1.0	6,122.0	4.0	29.0	56.0	7.0	16,185.0	148.0	231.0	31.0	2,991.0	5.0
SOL-001	1302	629	48	2,928.0	53,966.0	65.0	440,000.0	311.0	1,981.0	3,949.0	721.0	1,100,000.0	10,769.0	16,456.0	2,464.0	320,000.0	532.0
SOL-002	683	381	56	1,707.0	27,596.0	31.0	230,000.0	177.0	894.0	1,913.0	379.0	620,000.0	5,676.0	8,581.0	1,171.0	150,000.0	250.0
SOL-003	681	320	47	1,502.0	23,113.0	30.0	220,000.0	149.0	842.0	1,578.0	350.0	540,000.0	5,253.0	7,901.0	1,111.0	130,000.0	243.0
SOL-004	123	101	82	415.0	8,153.0	9.0	52,761.0	50.0	131.0	478.0	115.0	150,000.0	1,149.0	1,939.0	240.0	42,589.0	77.0
SOL-005	75	34	45	161.0	2,600.0	3.0	22,441.0	17.0	98.0	181.0	37.0	59,143.0	556.0	862.0	126.0	15,244.0	28.0
YL-001	9854	2,879	29	15,851.0	180,000.0	133.0	2,000,000.0	1,109.0	5,048.0	12,655.0	1,563.0	4,600,000.0	45,521.0	73,025.0	7,391.0	720,000.0	1,047.0
YL-002	1228	413	34	2,158.0	25,461.0	24.0	260,000.0	176.0	750.0	1,745.0	262.0	640,000.0	6,137.0	10,121.0	1,085.0	100,000.0	199.0

Table E-14
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15878	7,634	48	19,738.0	290,000.0	276.0	2,400,000.0	1,747.0	5,837.0	17,045.0	3,222.0	6,000,000.0	53,853.0	92,484.0	9,620.0	1,300,000.0	2,335.0
AP-002	8237	3,848	47	11,206.0	150,000.0	162.0	1,400,000.0	836.0	4,284.0	9,262.0	1,870.0	3,200,000.0	31,487.0	58,303.0	6,464.0	760,000.0	1,261.0
AP-003	25011	6,873	27	21,507.0	95,284.0	47.0	1,000,000.0	2,630.0	1,214.0	11,238.0	362.0	5,800,000.0	35,396.0	73,303.0	6,481.0	190,000.0	1,625.0
AP-004	9708	4,518	47	11,790.0	160,000.0	164.0	1,500,000.0	951.0	4,242.0	9,659.0	1,951.0	3,600,000.0	35,743.0	55,797.0	6,270.0	800,000.0	1,275.0
AP-005	13107	721	6	5,913.0	46,175.0	33.0	810,000.0	191.0	1,338.0	8,005.0	365.0	1,700,000.0	24,593.0	25,306.0	3,155.0	350,000.0	335.0
AP-006	1186	272	23	920.0	14,263.0	19.0	140,000.0	85.0	473.0	1,762.0	219.0	380,000.0	3,724.0	4,563.0	783.0	130,000.0	156.0
AP-007	10494	2,265	22	7,872.0	95,171.0	90.0	980,000.0	550.0	3,206.0	10,980.0	933.0	2,700,000.0	24,998.0	36,896.0	4,690.0	630,000.0	796.0
AS-001	772	103	13	461.0	4,026.0	1.0	59,428.0	33.0	76.0	401.0	19.0	140,000.0	1,281.0	1,823.0	162.0	11,843.0	8.0
BW-001	63	38	60	92.0	1,233.0	1.0	10,245.0	10.0	20.0	67.0	16.0	28,231.0	226.0	402.0	42.0	4,819.0	11.0
BW-002	1989	1,447	73	3,384.0	58,449.0	66.0	450,000.0	353.0	1,141.0	3,097.0	815.0	1,100,000.0	9,809.0	16,084.0	1,883.0	300,000.0	523.0
BW-003	344	188	55	469.0	7,032.0	8.0	62,883.0	43.0	253.0	439.0	93.0	160,000.0	1,528.0	2,426.0	321.0	35,020.0	65.0
BW-004	212	109	51	276.0	3,358.0	2.0	33,122.0	17.0	137.0	282.0	31.0	90,236.0	823.0	1,384.0	150.0	12,022.0	22.0
BW-006	2892	1,706	59	4,182.0	84,838.0	92.0	620,000.0	423.0	3,129.0	6,168.0	1,029.0	1,700,000.0	15,280.0	23,899.0	3,591.0	490,000.0	760.0
BW-007	742	467	63	1,127.0	25,515.0	33.0	180,000.0	136.0	825.0	1,684.0	359.0	460,000.0	4,454.0	6,584.0	1,047.0	170,000.0	263.0
BW-008	1418	617	44	1,643.0	20,962.0	20.0	210,000.0	123.0	816.0	1,579.0	242.0	540,000.0	5,034.0	8,264.0	972.0	89,028.0	175.0
BW-009	433	203	47	528.0	6,976.0	7.0	62,405.0	45.0	214.0	447.0	79.0	170,000.0	1,491.0	2,540.0	288.0	29,951.0	57.0
BW-010	907	455	50	1,162.0	18,790.0	24.0	160,000.0	130.0	593.0	1,314.0	272.0	420,000.0	3,941.0	5,919.0	821.0	120,000.0	204.0
BW-011	460	233	51	594.0	9,295.0	10.0	81,725.0	55.0	332.0	668.0	119.0	210,000.0	1,987.0	3,143.0	419.0	48,354.0	87.0
BW-012	228	127	56	316.0	3,778.0	4.0	37,727.0	23.0	83.0	170.0	46.0	87,929.0	830.0	1,467.0	134.0	13,887.0	30.0
BW-013	1143	430	38	1,199.0	15,737.0	16.0	150,000.0	101.0	528.0	1,169.0	195.0	360,000.0	3,781.0	5,899.0	733.0	83,041.0	136.0
BW-014	668	289	43	771.0	8,841.0	8.0	86,745.0	55.0	260.0	527.0	102.0	200,000.0	2,045.0	3,456.0	367.0	35,844.0	65.0
BW-015	1589	673	42	1,805.0	24,387.0	21.0	230,000.0	137.0	1,062.0	2,068.0	253.0	630,000.0	5,673.0	9,259.0	1,165.0	100,000.0	186.0
BW-016	1012	578	57	1,429.0	28,050.0	33.0	220,000.0	148.0	963.0	1,935.0	365.0	550,000.0	5,239.0	8,037.0	1,174.0	170,000.0	265.0
BW-017	2741	1,679	61	4,079.0	76,966.0	105.0	600,000.0	482.0	2,191.0	4,651.0	1,187.0	1,500,000.0	14,406.0	21,016.0	3,002.0	500,000.0	798.0
BW-018	7867	3,861	49	9,925.0	180,000.0	205.0	1,400,000.0	947.0	6,266.0	12,615.0	2,282.0	3,700,000.0	34,151.0	53,325.0	7,481.0	980,000.0	1,606.0
BW-019	2939	913	31	2,723.0	33,268.0	26.0	330,000.0	160.0	943.0	2,573.0	274.0	770,000.0	7,854.0	13,295.0	1,312.0	150,000.0	252.0
BW-020	1774	978	55	2,438.0	48,990.0	61.0	350,000.0	276.0	1,352.0	3,123.0	665.0	920,000.0	8,069.0	12,997.0	1,826.0	290,000.0	488.0
BW-021	3681	1,587	43	4,236.0	74,308.0	74.0	590,000.0	381.0	2,613.0	5,549.0	802.0	1,600,000.0	14,417.0	22,749.0	3,104.0	400,000.0	602.0
BW-022	15410	3,325	22	11,559.0	150,000.0	117.0	1,500,000.0	635.0	5,428.0	16,898.0	1,234.0	3,900,000.0	37,921.0	57,183.0	7,247.0	890,000.0	993.0
BW-023	26770	4,451	17	17,615.0	190,000.0	58.0	2,400,000.0	1,578.0	4,097.0	18,463.0	1,040.0	5,300,000.0	52,694.0	74,606.0	7,896.0	590,000.0	466.0
BW-024	330	88	27	279.0	4,858.0	5.0	39,772.0	25.0	235.0	409.0	51.0	110,000.0	1,119.0	1,612.0	271.0	34,993.0	39.0
BW-025	3949	1,833	46	6,692.0	57,169.0	43.0	330,000.0	313.0	1,531.0	48,232.0	623.0	890,000.0	9,442.0	74,284.0	2,855.0	240,000.0	408.0
BW-026	913	260	28	802.0	6,118.0	3.0	51,641.0	34.0	180.0	415.0	47.0	130,000.0	1,452.0	2,918.0	254.0	21,900.0	34.0
BW-027	84	60	71	141.0	2,929.0	3.0	19,257.0	15.0	127.0	233.0	34.0	62,208.0	501.0	778.0	126.0	16,301.0	23.0
BWC-001	2463	651	26	2,070.0	26,222.0	19.0	260,000.0	97.0	866.0	1,738.0	172.0	580,000.0	6,147.0	10,469.0	1,039.0	110,000.0	126.0
BWC-002	1416	543	38	1,503.0	23,593.0	21.0	190,000.0	96.0	631.0	1,293.0	196.0	440,000.0	4,223.0	7,608.0	771.0	96,155.0	135.0
BWC-003	3631	958	26	3,049.0	34,879.0	23.0	360,000.0	124.0	1,177.0	2,275.0	193.0	830,000.0	8,157.0	14,702.0	1,295.0	95,489.0	139.0

Table E-14
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-004	576	98	17	383.0	2,343.0	1.0	39,908.0	11.0	59.0	127.0	12.0	89,481.0	827.0	1,426.0	81.0	4,614.0	8.0
BWC-005	1466	348	24	1,159.0	11,223.0	7.0	130,000.0	42.0	323.0	591.0	67.0	290,000.0	2,798.0	5,027.0	384.0	31,527.0	43.0
BWC-006	3839	682	18	2,607.0	18,640.0	12.0	290,000.0	83.0	478.0	1,148.0	105.0	640,000.0	5,938.0	10,124.0	637.0	41,805.0	71.0
BWC-007	1092	216	20	783.0	6,615.0	5.0	84,779.0	38.0	191.0	485.0	38.0	210,000.0	1,870.0	3,213.0	254.0	17,461.0	34.0
BWC-008	1701	448	26	1,426.0	15,927.0	11.0	170,000.0	79.0	480.0	1,075.0	94.0	390,000.0	3,738.0	6,637.0	600.0	44,534.0	73.0
BWC-009	1043	223	21	778.0	9,060.0	6.0	96,775.0	42.0	306.0	641.0	58.0	230,000.0	2,147.0	3,507.0	359.0	33,327.0	39.0
BWC-010	5134	1,183	23	3,991.0	35,051.0	14.0	430,000.0	365.0	748.0	3,039.0	191.0	1,100,000.0	9,813.0	15,925.0	1,511.0	81,668.0	151.0
BWC-011	1647	339	21	1,205.0	12,774.0	8.0	160,000.0	85.0	343.0	1,092.0	79.0	350,000.0	3,381.0	5,243.0	507.0	36,323.0	49.0
BWC-012	1075	206	19	758.0	6,110.0	4.0	84,250.0	23.0	188.0	388.0	32.0	190,000.0	1,866.0	3,204.0	233.0	16,221.0	23.0
BWC-013	6768	1,532	23	5,210.0	57,651.0	28.0	670,000.0	407.0	1,501.0	4,752.0	332.0	1,400,000.0	14,615.0	22,912.0	2,306.0	150,000.0	184.0
BWC-014	2397	483	20	1,735.0	15,797.0	12.0	200,000.0	65.0	421.0	988.0	103.0	460,000.0	4,157.0	7,129.0	527.0	44,245.0	70.0
BWC-015	1944	366	19	1,358.0	12,425.0	8.0	160,000.0	53.0	426.0	1,067.0	74.0	390,000.0	3,522.0	5,792.0	481.0	39,251.0	56.0
BWC-016	7724	1,939	25	6,301.0	79,994.0	47.0	820,000.0	499.0	2,271.0	6,339.0	510.0	1,900,000.0	18,379.0	29,192.0	3,180.0	280,000.0	334.0
BWC-017	9527	1,462	15	6,041.0	61,548.0	25.0	820,000.0	467.0	1,368.0	6,086.0	345.0	1,900,000.0	17,864.0	25,413.0	2,488.0	190,000.0	176.0
BWC-018	2880	546	19	2,020.0	20,795.0	12.0	260,000.0	141.0	544.0	1,832.0	124.0	590,000.0	5,658.0	8,685.0	830.0	60,355.0	78.0
BWC-019	4578	625	14	2,759.0	22,584.0	10.0	340,000.0	147.0	518.0	2,101.0	115.0	800,000.0	7,323.0	10,983.0	882.0	67,536.0	73.0
BWC-020	5537	1,106	20	3,988.0	37,643.0	22.0	480,000.0	244.0	998.0	3,000.0	223.0	1,100,000.0	10,424.0	16,687.0	1,468.0	99,593.0	143.0
BWC-021	3330	726	22	2,512.0	22,576.0	12.0	280,000.0	168.0	536.0	1,674.0	130.0	660,000.0	6,099.0	10,181.0	868.0	55,149.0	92.0
BWC-022	755	197	26	630.0	9,227.0	7.0	79,451.0	47.0	336.0	686.0	62.0	200,000.0	1,886.0	3,109.0	388.0	38,693.0	48.0
BWC-023	673	143	21	500.0	5,119.0	4.0	57,315.0	28.0	166.0	372.0	31.0	140,000.0	1,289.0	2,169.0	206.0	16,674.0	24.0
BWC-024	3242	678	21	2,391.0	22,447.0	9.0	290,000.0	175.0	504.0	1,778.0	124.0	620,000.0	6,233.0	9,757.0	878.0	51,203.0	57.0
BWC-025	210	40	19	147.0	1,140.0	0.0	16,986.0	8.0	25.0	79.0	6.0	35,580.0	352.0	568.0	42.0	2,217.0	2.0
GT-001	1551	591	38	1,640.0	27,920.0	27.0	190,000.0	179.0	792.0	1,970.0	264.0	570,000.0	4,735.0	8,077.0	1,083.0	150,000.0	232.0
GT-002	592	292	49	750.0	14,391.0	19.0	110,000.0	80.0	409.0	813.0	197.0	260,000.0	2,689.0	3,794.0	538.0	100,000.0	128.0
GT-003	1451	570	39	1,567.0	23,578.0	21.0	190,000.0	112.0	727.0	1,512.0	210.0	480,000.0	4,560.0	7,789.0	882.0	110,000.0	159.0
GT-004	1475	528	36	1,496.0	16,360.0	11.0	160,000.0	64.0	526.0	829.0	109.0	370,000.0	3,664.0	6,481.0	619.0	54,716.0	71.0
GT-005	1223	482	39	1,323.0	21,256.0	16.0	160,000.0	101.0	674.0	1,520.0	165.0	440,000.0	3,776.0	6,659.0	788.0	95,992.0	146.0
GT-006	1089	594	55	1,485.0	32,501.0	34.0	200,000.0	169.0	787.0	2,179.0	366.0	560,000.0	4,631.0	7,864.0	1,071.0	190,000.0	293.0
GT-007	1274	419	33	1,224.0	19,085.0	14.0	140,000.0	95.0	798.0	1,474.0	124.0	420,000.0	3,676.0	6,399.0	842.0	80,887.0	106.0
LE-001	1232	318	26	1,021.0	8,953.0	6.0	100,000.0	54.0	233.0	533.0	54.0	260,000.0	2,352.0	4,370.0	332.0	22,447.0	47.0
LE-002	1216	405	33	1,177.0	17,058.0	12.0	130,000.0	90.0	725.0	1,348.0	104.0	400,000.0	3,432.0	6,015.0	763.0	65,287.0	92.0
LE-003	421	192	46	503.0	12,648.0	12.0	75,146.0	52.0	381.0	911.0	114.0	200,000.0	1,809.0	3,020.0	445.0	73,936.0	97.0
LE-004	1278	504	39	1,384.0	25,958.0	19.0	190,000.0	95.0	921.0	1,881.0	179.0	480,000.0	4,514.0	7,788.0	982.0	120,000.0	149.0
LE-005	778	261	34	757.0	9,098.0	5.0	83,302.0	42.0	230.0	613.0	50.0	200,000.0	1,917.0	3,658.0	303.0	28,090.0	51.0
LE-006	1010	290	29	892.0	10,322.0	8.0	100,000.0	44.0	307.0	629.0	64.0	240,000.0	2,317.0	4,242.0	370.0	29,371.0	49.0
LE-007	1255	372	30	1,129.0	12,135.0	8.0	120,000.0	57.0	381.0	756.0	59.0	300,000.0	2,816.0	5,404.0	460.0	28,134.0	55.0
LE-008	891	261	29	796.0	9,494.0	5.0	94,120.0	56.0	279.0	667.0	50.0	220,000.0	2,150.0	3,792.0	372.0	24,197.0	35.0

Table E-14
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Wet Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
LW-001	2664	1,605	60	3,914.0	78,250.0	105.0	580,000.0	476.0	1,891.0	4,548.0	1,167.0	1,400,000.0	13,471.0	20,266.0	2,831.0	510,000.0	816.0
LW-002	3550	1,999	56	4,956.0	97,293.0	135.0	740,000.0	611.0	2,760.0	6,423.0	1,476.0	1,900,000.0	17,974.0	26,737.0	3,924.0	670,000.0	1,102.0
LW-003	11154	5,890	53	15,797.0	280,000.0	324.0	2,200,000.0	1,632.0	8,882.0	17,803.0	3,634.0	5,500,000.0	52,744.0	78,487.0	15,073.0	1,600,000.0	2,440.0
LW-004	240	129	54	323.0	7,077.0	8.0	52,085.0	35.0	236.0	556.0	89.0	130,000.0	1,266.0	1,957.0	293.0	44,036.0	74.0
LW-005	1774	1,052	59	2,575.0	50,017.0	62.0	360,000.0	296.0	1,231.0	2,904.0	684.0	930,000.0	8,286.0	13,263.0	1,802.0	290,000.0	492.0
LW-006	1160	592	51	1,505.0	26,404.0	30.0	210,000.0	147.0	991.0	1,874.0	333.0	570,000.0	5,241.0	8,228.0	1,181.0	140,000.0	243.0
LW-007	1323	830	63	2,006.0	38,296.0	46.0	280,000.0	221.0	1,039.0	2,231.0	513.0	730,000.0	6,551.0	10,394.0	1,437.0	220,000.0	355.0
LW-008	4047	2,512	62	6,084.0	130,000.0	174.0	930,000.0	745.0	4,110.0	8,593.0	1,909.0	2,500,000.0	22,227.0	34,458.0	5,391.0	860,000.0	1,394.0
LW-009	1758	864	49	2,220.0	36,907.0	43.0	300,000.0	229.0	1,312.0	2,685.0	483.0	820,000.0	7,422.0	11,623.0	1,634.0	200,000.0	358.0
LW-010	1930	1,054	55	2,634.0	49,196.0	53.0	380,000.0	263.0	1,637.0	3,640.0	594.0	970,000.0	9,224.0	14,501.0	2,036.0	280,000.0	455.0
LW-011	589	378	64	909.0	19,656.0	23.0	130,000.0	105.0	467.0	1,227.0	256.0	330,000.0	2,915.0	4,808.0	670.0	120,000.0	196.0
LW-012	629	318	51	811.0	13,262.0	12.0	110,000.0	63.0	478.0	791.0	131.0	270,000.0	2,780.0	4,335.0	586.0	71,848.0	87.0
MON-001	1697	546	32	1,607.0	20,376.0	10.0	210,000.0	136.0	430.0	1,687.0	133.0	450,000.0	4,698.0	7,455.0	725.0	72,394.0	93.0
MON-002	655	197	30	594.0	8,167.0	4.0	84,433.0	68.0	195.0	654.0	67.0	180,000.0	1,857.0	2,728.0	339.0	27,525.0	33.0
MON-003	26	8	33	25.0	362.0	0.0	3,396.0	2.0	16.0	31.0	4.0	8,978.0	82.0	128.0	17.0	1,659.0	3.0
SOL-001	1302	629	48	1,624.0	29,933.0	36.0	250,000.0	172.0	1,099.0	2,190.0	400.0	620,000.0	5,973.0	9,127.0	1,367.0	180,000.0	295.0
SOL-002	683	381	56	947.0	15,307.0	17.0	130,000.0	98.0	496.0	1,061.0	210.0	350,000.0	3,148.0	4,760.0	649.0	83,601.0	139.0
SOL-003	681	320	47	833.0	12,820.0	17.0	120,000.0	83.0	467.0	875.0	194.0	300,000.0	2,914.0	4,383.0	616.0	72,295.0	135.0
SOL-004	123	101	82	230.0	4,522.0	5.0	29,265.0	28.0	72.0	265.0	64.0	84,079.0	637.0	1,075.0	133.0	23,623.0	43.0
SOL-005	75	34	45	89.0	1,442.0	2.0	12,448.0	9.0	54.0	100.0	21.0	32,805.0	308.0	478.0	70.0	8,455.0	16.0
YL-001	9854	2,879	29	8,792.0	100,000.0	74.0	1,100,000.0	615.0	2,800.0	7,019.0	867.0	2,500,000.0	25,249.0	40,505.0	4,100.0	400,000.0	581.0
YL-002	1228	413	34	1,197.0	14,123.0	13.0	140,000.0	97.0	416.0	968.0	145.0	360,000.0	3,404.0	5,614.0	602.0	56,562.0	110.0

Table E-15
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
AP-001	15878	7,634	48	15,847.0	230,000.0	222.0	1,900,000.0	1,403.0	4,687.0	13,685.0	2,587.0	4,800,000.0	43,237.0	74,253.0	7,723.0	1,000,000.0	1,875.0
AP-002	8237	3,848	47	9,229.0	120,000.0	130.0	1,100,000.0	671.0	3,439.0	7,437.0	1,501.0	2,600,000.0	25,280.0	48,355.0	5,297.0	610,000.0	1,013.0
AP-003	25011	6,873	27	17,267.0	76,500.0	38.0	800,000.0	2,111.0	975.0	9,023.0	291.0	4,700,000.0	28,418.0	58,853.0	5,204.0	150,000.0	1,305.0
AP-004	9708	4,518	47	9,466.0	130,000.0	132.0	1,200,000.0	763.0	3,405.0	7,755.0	1,567.0	2,900,000.0	28,697.0	44,797.0	5,034.0	650,000.0	1,024.0
AP-005	13107	721	6	4,747.0	37,072.0	26.0	650,000.0	153.0	1,074.0	6,427.0	293.0	1,300,000.0	19,745.0	20,317.0	2,533.0	280,000.0	269.0
AP-006	1186	272	23	738.0	11,451.0	15.0	120,000.0	68.0	380.0	1,414.0	176.0	300,000.0	2,990.0	3,664.0	629.0	110,000.0	125.0
AP-007	10494	2,265	22	6,320.0	76,409.0	72.0	790,000.0	441.0	2,574.0	8,816.0	749.0	2,200,000.0	20,070.0	29,622.0	3,765.0	510,000.0	639.0
AS-001	772	103	13	370.0	3,232.0	1.0	47,713.0	26.0	61.0	322.0	15.0	110,000.0	1,029.0	1,464.0	130.0	9,508.0	7.0
BW-001	63	38	60	74.0	990.0	1.0	8,225.0	8.0	16.0	54.0	13.0	22,666.0	181.0	322.0	33.0	3,869.0	9.0
BW-002	1989	1,447	73	2,717.0	46,927.0	53.0	360,000.0	284.0	916.0	2,487.0	654.0	900,000.0	7,876.0	12,913.0	1,512.0	240,000.0	420.0
BW-003	344	188	55	377.0	5,645.0	6.0	50,487.0	35.0	203.0	352.0	75.0	130,000.0	1,227.0	1,948.0	258.0	28,117.0	52.0
BW-004	212	109	51	222.0	2,696.0	2.0	26,593.0	14.0	110.0	227.0	25.0	72,447.0	661.0	1,111.0	121.0	9,652.0	18.0
BW-006	2892	1,706	59	3,358.0	68,114.0	74.0	500,000.0	340.0	2,512.0	4,952.0	826.0	1,300,000.0	12,268.0	19,188.0	2,883.0	390,000.0	610.0
BW-007	742	467	63	905.0	20,486.0	27.0	150,000.0	110.0	662.0	1,352.0	289.0	370,000.0	3,576.0	5,286.0	841.0	140,000.0	211.0
BW-008	1418	617	44	1,319.0	16,830.0	16.0	170,000.0	99.0	655.0	1,267.0	194.0	430,000.0	4,042.0	6,635.0	780.0	71,478.0	141.0
BW-009	433	203	47	424.0	5,600.0	5.0	50,103.0	36.0	172.0	359.0	64.0	140,000.0	1,197.0	2,039.0	232.0	24,047.0	45.0
BW-010	907	455	50	933.0	15,086.0	19.0	130,000.0	104.0	476.0	1,055.0	218.0	330,000.0	3,164.0	4,753.0	659.0	92,611.0	164.0
BW-011	460	233	51	477.0	7,463.0	8.0	65,614.0	44.0	267.0	537.0	96.0	170,000.0	1,595.0	2,524.0	336.0	38,822.0	70.0
BW-012	228	127	56	254.0	3,033.0	3.0	30,290.0	18.0	67.0	137.0	37.0	70,595.0	667.0	1,178.0	108.0	11,149.0	24.0
BW-013	1143	430	38	962.0	12,635.0	13.0	120,000.0	81.0	424.0	938.0	156.0	290,000.0	3,036.0	4,736.0	589.0	66,671.0	109.0
BW-014	668	289	43	619.0	7,098.0	7.0	69,645.0	44.0	209.0	423.0	82.0	160,000.0	1,642.0	2,775.0	295.0	28,778.0	52.0
BW-015	1589	673	42	1,449.0	19,580.0	17.0	180,000.0	110.0	853.0	1,660.0	203.0	500,000.0	4,554.0	7,434.0	935.0	82,511.0	149.0
BW-016	1012	578	57	1,147.0	22,520.0	27.0	170,000.0	118.0	773.0	1,554.0	293.0	440,000.0	4,206.0	6,453.0	943.0	130,000.0	213.0
BW-017	2741	1,679	61	3,275.0	61,793.0	84.0	490,000.0	387.0	1,759.0	3,734.0	953.0	1,200,000.0	11,566.0	16,873.0	2,410.0	400,000.0	641.0
BW-018	7867	3,861	49	7,969.0	140,000.0	165.0	1,100,000.0	761.0	5,031.0	10,128.0	1,832.0	3,000,000.0	27,419.0	42,813.0	6,006.0	790,000.0	1,289.0
BW-019	2939	913	31	2,186.0	26,710.0	21.0	270,000.0	128.0	757.0	2,066.0	220.0	620,000.0	6,306.0	10,674.0	1,054.0	120,000.0	202.0
BW-020	1774	978	55	1,958.0	39,332.0	49.0	280,000.0	221.0	1,085.0	2,507.0	534.0	740,000.0	6,478.0	10,435.0	1,466.0	230,000.0	392.0
BW-021	3681	1,587	43	3,401.0	59,660.0	60.0	480,000.0	306.0	2,098.0	4,455.0	644.0	1,300,000.0	11,575.0	18,265.0	2,492.0	320,000.0	484.0
BW-022	15410	3,325	22	9,281.0	120,000.0	94.0	1,200,000.0	510.0	4,358.0	13,567.0	990.0	3,100,000.0	30,446.0	45,910.0	5,818.0	710,000.0	797.0
BW-023	26770	4,451	17	14,142.0	150,000.0	46.0	1,900,000.0	1,267.0	3,289.0	14,823.0	835.0	4,300,000.0	42,307.0	59,898.0	6,339.0	470,000.0	374.0
BW-024	330	88	27	224.0	3,900.0	4.0	31,932.0	20.0	189.0	328.0	41.0	87,504.0	898.0	1,295.0	218.0	28,094.0	31.0
BW-025	3949	1,833	46	5,748.0	47,901.0	34.0	270,000.0	251.0	1,229.0	47,608.0	501.0	720,000.0	7,581.0	70,771.0	2,445.0	200,000.0	327.0
BW-026	913	260	28	644.0	4,912.0	2.0	41,461.0	27.0	144.0	333.0	38.0	110,000.0	1,166.0	2,343.0	204.0	17,583.0	27.0
BW-027	84	60	71	113.0	2,352.0	2.0	15,461.0	12.0	102.0	187.0	27.0	49,945.0	403.0	625.0	101.0	13,087.0	19.0
BWC-001	2463	651	26	1,662.0	21,053.0	15.0	210,000.0	78.0	695.0	1,396.0	138.0	460,000.0	4,936.0	8,405.0	834.0	86,072.0	101.0

Table E-15
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
BWC-002	1416	543	38	1,207.0	18,942.0	16.0	150,000.0	77.0	507.0	1,038.0	157.0	360,000.0	3,391.0	6,108.0	619.0	77,199.0	108.0
BWC-003	3631	958	26	2,448.0	28,003.0	19.0	290,000.0	100.0	945.0	1,826.0	155.0	670,000.0	6,549.0	11,803.0	1,040.0	76,665.0	112.0
BWC-004	576	98	17	308.0	1,882.0	1.0	32,041.0	9.0	47.0	102.0	9.0	71,841.0	664.0	1,145.0	65.0	3,704.0	6.0
BWC-005	1466	348	24	931.0	9,010.0	6.0	100,000.0	34.0	259.0	475.0	54.0	230,000.0	2,246.0	4,036.0	308.0	25,312.0	34.0
BWC-006	3839	682	18	2,093.0	14,966.0	10.0	230,000.0	67.0	384.0	922.0	85.0	510,000.0	4,768.0	8,129.0	511.0	33,563.0	57.0
BWC-007	1092	216	20	629.0	5,311.0	4.0	68,066.0	30.0	153.0	389.0	31.0	170,000.0	1,501.0	2,580.0	204.0	14,019.0	27.0
BWC-008	1701	448	26	1,145.0	12,788.0	9.0	130,000.0	64.0	385.0	863.0	76.0	310,000.0	3,001.0	5,328.0	482.0	35,755.0	59.0
BWC-009	1043	223	21	624.0	7,274.0	5.0	77,697.0	33.0	245.0	514.0	47.0	180,000.0	1,724.0	2,816.0	288.0	26,757.0	31.0
BWC-010	5134	1,183	23	3,205.0	28,141.0	11.0	340,000.0	293.0	600.0	2,440.0	153.0	860,000.0	7,878.0	12,785.0	1,213.0	65,569.0	121.0
BWC-011	1647	339	21	967.0	10,256.0	6.0	120,000.0	68.0	276.0	876.0	64.0	280,000.0	2,714.0	4,209.0	407.0	29,162.0	39.0
BWC-012	1075	206	19	609.0	4,906.0	3.0	67,641.0	19.0	151.0	312.0	26.0	150,000.0	1,498.0	2,572.0	187.0	13,023.0	19.0
BWC-013	6768	1,532	23	4,183.0	46,286.0	22.0	540,000.0	327.0	1,205.0	3,815.0	267.0	1,200,000.0	11,734.0	18,396.0	1,851.0	120,000.0	148.0
BWC-014	2397	483	20	1,393.0	12,683.0	9.0	160,000.0	52.0	338.0	793.0	82.0	370,000.0	3,338.0	5,723.0	423.0	35,523.0	56.0
BWC-015	1944	366	19	1,091.0	9,976.0	7.0	130,000.0	42.0	342.0	856.0	59.0	310,000.0	2,828.0	4,650.0	386.0	31,514.0	45.0
BWC-016	7724	1,939	25	5,059.0	64,225.0	38.0	660,000.0	400.0	1,824.0	5,089.0	409.0	1,500,000.0	14,756.0	23,437.0	2,553.0	220,000.0	268.0
BWC-017	9527	1,462	15	4,850.0	49,415.0	20.0	660,000.0	375.0	1,099.0	4,886.0	277.0	1,500,000.0	14,342.0	20,403.0	1,997.0	150,000.0	142.0
BWC-018	2880	546	19	1,622.0	16,695.0	9.0	210,000.0	113.0	437.0	1,470.0	100.0	470,000.0	4,543.0	6,973.0	666.0	48,457.0	63.0
BWC-019	4578	625	14	2,215.0	18,132.0	8.0	270,000.0	118.0	416.0	1,686.0	92.0	640,000.0	5,880.0	8,817.0	709.0	54,223.0	58.0
BWC-020	5537	1,106	20	3,202.0	30,222.0	17.0	390,000.0	196.0	801.0	2,409.0	179.0	870,000.0	8,369.0	13,398.0	1,178.0	79,960.0	115.0
BWC-021	3330	726	22	2,017.0	18,125.0	9.0	220,000.0	134.0	430.0	1,344.0	104.0	530,000.0	4,897.0	8,174.0	697.0	44,277.0	74.0
BWC-022	755	197	26	506.0	7,408.0	6.0	63,789.0	38.0	269.0	551.0	50.0	160,000.0	1,515.0	2,496.0	312.0	31,065.0	38.0
BWC-023	673	143	21	401.0	4,110.0	3.0	46,016.0	22.0	133.0	299.0	25.0	110,000.0	1,035.0	1,741.0	166.0	13,387.0	19.0
BWC-024	3242	678	21	1,920.0	18,022.0	7.0	230,000.0	140.0	405.0	1,427.0	100.0	500,000.0	5,004.0	7,833.0	705.0	41,109.0	46.0
BWC-025	210	40	19	118.0	915.0	0.0	13,638.0	6.0	20.0	63.0	5.0	28,566.0	283.0	456.0	34.0	1,780.0	2.0
GT-001	1551	591	38	1,317.0	22,416.0	22.0	150,000.0	144.0	636.0	1,582.0	212.0	460,000.0	3,802.0	6,485.0	869.0	120,000.0	187.0
GT-002	592	292	49	602.0	11,554.0	15.0	89,591.0	64.0	328.0	653.0	158.0	210,000.0	2,159.0	3,046.0	432.0	81,114.0	103.0
GT-003	1451	570	39	1,258.0	18,930.0	17.0	160,000.0	90.0	584.0	1,214.0	169.0	390,000.0	3,661.0	6,254.0	708.0	86,847.0	127.0
GT-004	1475	528	36	1,201.0	13,135.0	9.0	130,000.0	51.0	423.0	666.0	87.0	300,000.0	2,942.0	5,203.0	497.0	43,929.0	57.0
GT-005	1223	482	39	1,062.0	17,066.0	13.0	130,000.0	81.0	541.0	1,220.0	132.0	350,000.0	3,031.0	5,346.0	632.0	77,069.0	118.0
GT-006	1089	594	55	1,192.0	26,094.0	27.0	160,000.0	136.0	632.0	1,750.0	294.0	450,000.0	3,718.0	6,314.0	860.0	150,000.0	235.0
GT-007	1274	419	33	983.0	15,323.0	11.0	110,000.0	76.0	641.0	1,184.0	100.0	340,000.0	2,952.0	5,137.0	676.0	64,941.0	85.0
LE-001	1232	318	26	820.0	7,188.0	5.0	83,117.0	43.0	187.0	428.0	43.0	210,000.0	1,889.0	3,509.0	267.0	18,022.0	38.0
LE-002	1216	405	33	945.0	13,695.0	10.0	110,000.0	72.0	582.0	1,082.0	84.0	320,000.0	2,755.0	4,830.0	612.0	52,417.0	74.0
LE-003	421	192	46	404.0	10,155.0	9.0	60,332.0	42.0	306.0	731.0	91.0	160,000.0	1,453.0	2,424.0	358.0	59,361.0	78.0
LE-004	1278	504	39	1,111.0	20,841.0	16.0	150,000.0	76.0	740.0	1,510.0	144.0	380,000.0	3,624.0	6,252.0	788.0	97,601.0	119.0

Table E-15
Wekiva Parkway Protection Act
Master Stormwater Management Plan Support
Dry Season Pollutant Load Estimates - Future Land Use with 1% Septic Tank Failure Rate and Future BMPs

Name	Tributary Area (acres)	DCIA (acres)	DCIA (%)	Flow	BOD	Cd	COD	Cu	DP	NO23	Pb	TDS	TKN	TN	TP	TSS	Zn
LE-005	778	261	34	608.0	7,304.0	4.0	66,880.0	34.0	184.0	492.0	40.0	160,000.0	1,539.0	2,937.0	243.0	22,553.0	41.0
LE-006	1010	290	29	716.0	8,287.0	6.0	82,689.0	36.0	246.0	505.0	51.0	190,000.0	1,860.0	3,406.0	297.0	23,581.0	39.0
LE-007	1255	372	30	907.0	9,743.0	6.0	97,089.0	46.0	306.0	607.0	47.0	240,000.0	2,261.0	4,338.0	369.0	22,588.0	44.0
LE-008	891	261	29	639.0	7,622.0	4.0	75,566.0	45.0	224.0	536.0	40.0	170,000.0	1,726.0	3,044.0	299.0	19,427.0	28.0
LW-001	2664	1,605	60	3,142.0	62,824.0	84.0	470,000.0	382.0	1,518.0	3,651.0	937.0	1,100,000.0	10,815.0	16,271.0	2,273.0	410,000.0	655.0
LW-002	3550	1,999	56	3,979.0	78,114.0	108.0	600,000.0	491.0	2,216.0	5,157.0	1,185.0	1,500,000.0	14,430.0	21,466.0	3,151.0	540,000.0	885.0
LW-003	11154	5,890	53	12,870.0	220,000.0	260.0	1,800,000.0	1,310.0	7,131.0	14,293.0	2,918.0	4,400,000.0	42,346.0	63,015.0	12,807.0	1,300,000.0	1,959.0
LW-004	240	129	54	260.0	5,682.0	7.0	41,817.0	28.0	189.0	447.0	72.0	100,000.0	1,016.0	1,571.0	235.0	35,355.0	59.0
LW-005	1774	1,052	59	2,067.0	40,157.0	50.0	290,000.0	237.0	988.0	2,332.0	549.0	750,000.0	6,653.0	10,648.0	1,447.0	240,000.0	395.0
LW-006	1160	592	51	1,209.0	21,199.0	24.0	170,000.0	118.0	795.0	1,504.0	268.0	460,000.0	4,208.0	6,606.0	948.0	120,000.0	195.0
LW-007	1323	830	63	1,611.0	30,747.0	37.0	230,000.0	178.0	834.0	1,791.0	412.0	590,000.0	5,260.0	8,345.0	1,153.0	180,000.0	285.0
LW-008	4047	2,512	62	4,885.0	110,000.0	140.0	750,000.0	598.0	3,300.0	6,899.0	1,533.0	2,000,000.0	17,845.0	27,665.0	4,328.0	690,000.0	1,119.0
LW-009	1758	864	49	1,782.0	29,632.0	35.0	240,000.0	184.0	1,053.0	2,156.0	387.0	660,000.0	5,959.0	9,332.0	1,312.0	160,000.0	288.0
LW-010	1930	1,054	55	2,115.0	39,498.0	42.0	310,000.0	211.0	1,314.0	2,922.0	477.0	780,000.0	7,405.0	11,643.0	1,634.0	220,000.0	365.0
LW-011	589	378	64	730.0	15,781.0	19.0	100,000.0	84.0	375.0	985.0	205.0	260,000.0	2,340.0	3,861.0	538.0	98,024.0	158.0
LW-012	629	318	51	651.0	10,648.0	10.0	90,026.0	51.0	384.0	635.0	106.0	220,000.0	2,232.0	3,481.0	471.0	57,684.0	69.0
MON-001	1697	546	32	1,290.0	16,359.0	8.0	170,000.0	110.0	345.0	1,354.0	107.0	360,000.0	3,772.0	5,986.0	582.0	58,123.0	75.0
MON-002	655	197	30	477.0	6,557.0	4.0	67,789.0	55.0	156.0	525.0	54.0	140,000.0	1,491.0	2,190.0	272.0	22,099.0	27.0
MON-003	26	8	33	20.0	290.0	0.0	2,726.0	2.0	13.0	25.0	3.0	7,208.0	66.0	103.0	14.0	1,332.0	2.0
SOL-001	1302	629	48	1,304.0	24,032.0	29.0	200,000.0	138.0	882.0	1,759.0	321.0	500,000.0	4,796.0	7,328.0	1,098.0	140,000.0	237.0
SOL-002	683	381	56	760.0	12,289.0	14.0	100,000.0	79.0	398.0	852.0	169.0	280,000.0	2,528.0	3,822.0	521.0	67,120.0	111.0
SOL-003	681	320	47	669.0	10,293.0	13.0	97,611.0	66.0	375.0	703.0	156.0	240,000.0	2,339.0	3,519.0	495.0	58,043.0	108.0
SOL-004	123	101	82	185.0	3,631.0	4.0	23,496.0	22.0	58.0	213.0	51.0	67,504.0	512.0	863.0	107.0	18,966.0	34.0
SOL-005	75	34	45	72.0	1,158.0	2.0	9,994.0	8.0	43.0	80.0	17.0	26,338.0	248.0	384.0	56.0	6,788.0	13.0
YL-001	9854	2,879	29	7,059.0	82,181.0	59.0	890,000.0	494.0	2,248.0	5,636.0	696.0	2,000,000.0	20,272.0	32,520.0	3,291.0	320,000.0	466.0
YL-002	1228	413	34	961.0	11,339.0	11.0	120,000.0	78.0	334.0	777.0	117.0	290,000.0	2,733.0	4,507.0	483.0	45,412.0	88.0

Table E-16
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Annual Pollutant Loading Rates

Name	Tributary Area (acres)	Total Pollutant Load (lbs/yr)	Loading Rate (lbs/yr/ac)
BW-027	84	180,061	2143.6
BW-007	742	1,513,547	2039.8
LW-008	4,047	8,092,030	1999.5
SOL-004	122	221,170	1812.9
LW-011	589	1,065,223	1808.5
BW-006	2,892	5,109,870	1766.9
LW-002	3,550	6,083,098	1713.5
LW-004	240	401,161	1671.5
BW-017	2,740	4,524,962	1651.4
BW-016	1,012	1,626,608	1607.3
LW-007	1,323	2,121,420	1603.5
GT-006	1,090	1,706,084	1565.2
LE-003	422	655,568	1553.5
LW-010	1,930	2,960,927	1534.2
LW-005	1,784	2,711,012	1519.6
BW-020	1,774	2,656,942	1497.7
LW-003	11,154	16,700,019	1497.2
SOL-001	1,301	1,931,422	1484.6
LW-001	2,664	3,913,193	1468.9
LW-006	1,160	1,688,732	1455.8
BW-002	1,989	2,787,856	1401.6
BW-018	7,866	11,018,946	1400.8
SOL-002	682	952,175	1396.2
LW-012	629	861,739	1370.0
LW-009	1,758	2,360,185	1342.5
SOL-005	76	101,226	1331.9
BW-011	460	612,409	1331.3
BW-010	907	1,194,074	1316.5
SOL-003	682	888,742	1303.1
BW-021	3,681	4,612,173	1253.0
GT-002	593	742,469	1252.1
BW-003	344	398,742	1159.1
BW-004	210	234,736	1117.8
BW-015	1,589	1,735,858	1092.4
GT-001	1,551	1,660,990	1070.9
BW-024	330	351,238	1064.4
BW-008	1,416	1,504,938	1062.8
AP-002	8,237	8,489,632	1030.7
BW-009	434	433,591	999.1
MON-003	26	25,780	991.5
LE-004	1,278	1,252,372	979.9
GT-005	1,223	1,187,037	970.6
BW-013	1,143	1,034,719	905.3
GT-007	1,274	1,113,431	874.0

Table E-16
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Annual Pollutant Loading Rates

Name	Tributary Area (acres)	Total Pollutant Load (lbs/yr)	Loading Rate (lbs/yr/ac)
BW-012	237	207,055	873.6
GT-003	1,451	1,267,294	873.4
AP-001	15,879	13,711,214	863.5
AP-004	9,708	8,245,157	849.3
MON-002	655	534,282	815.7
LE-002	1,216	974,426	801.3
BW-014	668	529,410	792.5
AP-006	1,186	909,188	766.6
BW-001	65	49,403	760.0
YL-002	1,229	928,037	755.1
BW-025	190	140,824	741.2
BW-033	412	305,069	741.2
BW-028	512	379,261	741.2
BW-029	1,021	756,372	741.2
BW-030	1,155	855,838	741.2
BW-031	426	315,371	741.2
BW-032	185	136,747	741.2
BWC-022	755	556,867	737.6
BW-019	2,940	2,130,621	724.7
BWC-002	1,416	1,007,782	711.7
YL-001	9,854	6,974,174	707.8
MON-001	1,697	1,182,721	696.9
AP-007	10,494	6,590,984	628.1
BW-022	15,208	9,184,849	603.9
BW-023	26,770	15,257,099	569.9
GT-004	1,476	835,302	565.9
BWC-016	7,725	4,331,023	560.7
LE-005	778	427,060	548.9
AP-003	25,030	13,585,107	542.8
BWC-024	3,242	1,749,327	539.6
LE-008	891	465,156	522.1
BWC-001	2,463	1,280,584	519.9
BWC-013	6,768	3,498,088	516.9
BWC-021	3,331	1,670,009	501.4
BWC-009	1,043	522,746	501.2
LE-006	1,010	505,144	500.1
LE-007	1,255	626,640	499.3
BWC-010	5,134	2,561,860	499.0
BWC-023	673	335,761	498.9
BWC-020	5,540	2,710,941	489.3
BWC-017	9,563	4,669,900	488.3
BWC-008	1,700	823,177	484.2
AS-001	772	365,939	474.0
BWC-003	3,636	1,706,895	469.4

Table E-16
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Annual Pollutant Loading Rates

Name	Tributary Area (acres)	Total Pollutant Load (lbs/yr)	Loading Rate (lbs/yr/ac)
BWC-011	1,647	728,653	442.4
BWC-018	2,788	1,230,937	441.5
BWC-025	210	90,669	431.8
BWC-007	1,092	456,990	418.5
AP-005	13,107	5,451,354	415.9
BWC-019	4,578	1,889,020	412.6
BWC-015	1,945	795,791	409.1
BWC-014	2,397	965,826	402.9
BW-026	913	336,441	368.5
BWC-006	3,839	1,405,822	366.2
BWC-012	1,075	372,924	346.9
BWC-004	576	185,428	321.9
LE-001	1,233	396,408	321.5
BWC-005	1,466	344,564	235.0

Table E-17
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Percent Increase in Pollutant Loads

Name	Tributary Area (acres)	Existing Pollutant Loading Rate (lbs/yr/ac)	Future Pollutant Loading Rate (lbs/yr/ac)	Estimated Percent Increase in Pollutant Load	Jurisdiction Affected													
					Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
BWC-005	1,466	235	584	59.7%	√													
LE-001	1,233	321	594	45.9%	√	√	√											
BW-001	65	760	1,260	39.7%				√			√							
BWC-003	3,636	469	674	30.3%	√													
BWC-012	1,075	347	495	30.0%	√													
BWC-018	2,788	442	629	29.8%	√													
LE-006	1,010	500	701	28.6%	√	√												
BWC-015	1,945	409	569	28.1%	√													
BWC-011	1,647	442	613	27.9%	√													
LE-005	778	549	759	27.7%	√	√												
BWC-008	1,700	484	667	27.4%	√													
BWC-002	1,416	712	976	27.1%	√													
LE-008	891	522	713	26.8%	√	√												
BWC-001	2,463	520	710	26.8%	√			√										
BWC-014	2,397	403	549	26.6%	√													
AP-004	9,708	849	1,156	26.5%				√	√			√						
LE-007	1,255	499	679	26.5%	√													
AP-006	1,186	767	1,036	26.0%				√										
AP-001	15,879	863	1,164	25.8%				√			√	√		√				
BWC-004	576	322	434	25.8%	√		√											
BWC-006	3,839	366	484	24.3%	√													
GT-004	1,476	566	741	23.6%	√		√											
BWC-016	7,725	561	733	23.5%	√													
BW-022	15,208	604	776	22.2%	√			√	√									
BWC-009	1,043	501	643	22.1%	√													
BW-012	237	874	1,120	22.0%				√				√						
BW-002	1,989	1,402	1,773	21.0%				√				√		√				
BWC-007	1,092	418	527	20.6%	√													
BW-003	344	1,159	1,442	19.6%				√				√						
LW-001	2,664	1,469	1,817	19.1%				√					√					
BWC-013	6,768	517	630	18.0%	√													
AP-007	10,494	628	766	18.0%	√		√	√										
GT-002	593	1,252	1,506	16.8%	√		√	√										
AP-002	8,237	1,031	1,237	16.7%				√	√		√	√		√				
LE-004	1,278	980	1,173	16.5%	√	√												
BWC-023	673	499	591	15.6%	√													
BW-014	668	793	935	15.2%				√				√						
GT-003	1,451	873	1,030	15.2%	√		√											
BW-026	913	369	432	14.8%				√	√									
MON-001	1,697	697	818	14.7%											√			
BWC-019	4,578	413	484	14.7%	√													
SOL-004	122	1,813	2,116	14.3%														√
LE-002	1,216	801	934	14.2%	√	√												

Table E-17
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Percent Increase in Pollutant Loads

					Jurisdiction Affected													
Name	Tributary Area (acres)	Existing Pollutant Loading Rate (lbs/yr/ac)	Future Pollutant Loading Rate (lbs/yr/ac)	Estimated Percent Increase in Pollutant Load	Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
BWC-010	5,134	499	574	13.1%	√													
BWC-017	9,563	488	560	12.9%	√										√			
BWC-020	5,540	489	557	12.1%	√													
BWC-025	210	432	491	12.0%	√													
YL-002	1,229	755	853	11.5%											√			
BW-020	1,774	1,498	1,688	11.3%				√							√			
BWC-021	3,331	501	564	11.2%	√													
BW-019	2,940	725	814	11.0%				√	√			√						
BW-009	434	999	1,122	10.9%				√				√						
LW-005	1,784	1,520	1,697	10.4%				√		√								
BW-017	2,740	1,651	1,837	10.1%				√				√			√			
GT-007	1,274	874	966	9.6%	√	√												
BW-013	1,143	905	1,000	9.5%				√				√						
SOL-002	682	1,396	1,537	9.2%											√		√	√
GT-005	1,223	971	1,068	9.1%	√		√											
YL-001	9,854	708	778	9.0%	√			√							√			√
BW-010	907	1,317	1,444	8.8%				√				√						
LW-007	1,323	1,603	1,756	8.7%				√							√	√		
BWC-022	755	738	807	8.6%	√													
BW-016	1,012	1,607	1,745	7.9%				√				√						
LW-004	240	1,672	1,812	7.7%				√					√					
AS-001	772	474	513	7.7%	√										√			
BW-004	210	1,118	1,205	7.2%				√				√						
LW-009	1,758	1,343	1,432	6.2%				√	√						√	√		
LW-003	11,154	1,497	1,591	5.9%				√					√		√	√	√	
LW-010	1,930	1,534	1,628	5.8%											√	√		
BW-011	460	1,331	1,407	5.4%				√				√						
BW-021	3,681	1,253	1,317	4.9%				√	√									
BW-008	1,416	1,063	1,117	4.9%				√				√						
GT-006	1,090	1,565	1,645	4.8%	√	√	√											
SOL-003	682	1,303	1,367	4.6%											√			√
BW-018	7,866	1,401	1,456	3.8%				√	√			√						
LE-003	422	1,553	1,602	3.0%	√	√												
BWC-024	3,242	540	556	2.9%	√													
LW-011	589	1,809	1,861	2.8%											√	√		
MON-003	26	992	1,019	2.7%											√			
BW-015	1,589	1,092	1,122	2.6%				√				√						
GT-001	1,551	1,071	1,099	2.6%	√		√	√										
BW-023	26,770	570	585	2.6%	√			√							√			
BW-006	2,892	1,767	1,810	2.4%				√										
MON-002	655	816	834	2.2%											√			
BW-007	742	2,040	2,083	2.1%				√					√					

Table E-17
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Estimated Percent Increase in Pollutant Loads

Name	Tributary Area (acres)	Existing Pollutant Loading Rate (lbs/yr/ac)	Future Pollutant Loading Rate (lbs/yr/ac)	Estimated Percent Increase in Pollutant Load	Jurisdiction Affected													
					Lake County	Eustis	Mount Dora	Orange County	Apopka	Eatonville	Oakland	Ocoee	Orlando	Winter Garden	Seminole County	Altamonte Springs	Longwood	Lake Mary
LW-006	1,160	1,456	1,486	2.0%				√							√	√		
LW-002	3,550	1,714	1,746	1.9%				√					√					
BW-027	84	2,144	2,178	1.6%											√			
SOL-001	1,301	1,485	1,502	1.2%											√		√	
BW-029	1,021	741	744	0.4%											√	√		
BW-028	512	741	744	0.4%											√			
BW-030	1,155	741	744	0.4%											√			
BW-031	426	741	744	0.4%											√			
BW-032	185	741	744	0.4%											√			
BW-033	412	741	744	0.4%											√			
BW-025	190	741	744	0.4%												√		
SOL-005	76	1,332	1,335	0.3%											√			
LW-012	629	1,370	1,371	0.0%											√			
LW-008	4,047	2,000	2,000	0.0%											√	√	√	
AP-003	25,030	543	543	0.0%	√			√	√		√	√		√				
BW-024	330	1,064	1,063	-0.1%				√	√									
AP-005	13,107	416	407	-2.3%				√	√									

Appendix F

Conceptual Cost Estimates

Table F-1
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin BW-002

No.	*Brief Description of Improvement*	*Unit*	*Estimated Quantity*	*Unit Price*	*Cost*
	Prima Vista Subdivision Pond				
1	Mobilization	LS	1	$50,000	$50,000
2	Maintenance of Traffic	LS	1	$20,000	$20,000
3	Erosion Control	LF	800	$2	$1,600
4	Clearing and Grubbing	AC	0.9	$7,200	$6,480
5	Demolition	LS	0	$10,000	$0
6	Excavation	CY	12000	$5	$60,000
7	Embankment	CY	0	$7	$0
8	Cast-in-Place Concrete	LS	1	$10,000	$10,000
9	Inlet Structures	EA	1	$7,000	$7,000
10	Outlet Structures	EA	1	$5,000	$5,000
11	48" RCP	LF	100	$100	$10,000
12	Riprap	LS	1	$10,000	$10,000
13	Fencing	LF	800	$9	$7,200
14	Sod, Seed and Mulch	AC	0.6	$6,700	$4,020
15	Signage	LS	1	$2,000	$2,000
	Tiger Manor Park				
16	Irrigation System	AC	4.4	$2,500	$11,000
	Lake Lotta				
17	Pond Aeration System	LS	1	$50,000	$50,000
	Subtotal				**$254,000**
	Contractor's OH&P (15%)				**$38,000**
	Subtotal				**$292,000**
	Construction Contingencies (25%)				**$73,000**
	Total Construction Cost				**$365,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$387,000**
	Engineering and Implementation (20%)				**$77,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$464,000**

Assumptions and clarifications:
1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. Only 0.9 acre is available for use.
5. The site has a relatively level topography.
6. The entire site will consist of an excavated 12' deep wet detention pond system with 3:1 side slopes. No embankment has been considered at this time. No credit has been included for sale of excess excavated material.
7. Gravity flow has been assumed. No pumping facilities have been included.
8. One inlet structure and one outlet structure have been assumed.
9. No replanting will be necessary.
10. Entire site will be fenced with a standard 6' high galvanized chain link fence.
11. Site has approximate perimeter of 800'.
12. Entire site will be cleared and grubbed.
13. Sod, seed and mulch assumed for a 50' wide portion of site around perimeter.

Table F-2
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin LW-002

No.	Brief Description of Improvement	Unit	Estimated Quantity	Unit Price	Cost
	Bay Lake Stormwater Infiltration Basin				
1	Mobilization	LS	1	$50,000	$50,000
2	Maintenance of Traffic	LS	1	$20,000	$20,000
3	Erosion Control	LF	3300	$2	$6,600
4	Clearing and Grubbing	AC	14	$7,200	$100,800
5	Demolition	LS	0	$10,000	$0
6	Excavation	CY	255000	$5	$1,275,000
7	Embankment	CY	0	$7	$0
8	Cast-in-Place Concrete	LS	1	$10,000	$10,000
9	Inlet Structures	EA	1	$7,000	$7,000
10	Outlet Structures	EA	1	$5,000	$5,000
11	48" RCP	LF	100	$90	$9,000
12	Riprap	LS	1	$10,000	$10,000
13	Fencing	LF	3300	$9	$29,700
14	Sod, Seed and Mulch	AC	3.8	$6,700	$25,460
15	Signage	LS	1	$2,000	$2,000
	Trotter's Park				
16	Irrigation System	AC	68.2	$2,500	$170,500
	Lake Fairview Park				
17	Irrigation System	AC	22.6	$2,500	$56,500
	Interlaken Park				
18	Irrigation System	AC	0.36	$2,500	$900
	Edgewater High School				
19	Irrigation System	AC	15	$2,500	$37,500
	Lee Middle School				
20	Irrigation System	AC	6	$2,500	$15,000
	Lake Silver Elementary School				
21	Irrigation System	AC	3	$2,500	$7,500
	Subtotal				**$1,838,000**
	Contractor's OH&P (15%)				**$276,000**
	Subtotal				**$2,114,000**
	Construction Contingencies (25%)				**$529,000**
	Total Construction Cost				**$2,643,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$2,804,000**
	Engineering and Implementation (20%)				**$561,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$3,365,000**

Assumptions and clarifications:
1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. The site consists of 14.4 acres.
5. The site has a relatively level topography.
6. The entire site will consist of an excavated 12' deep wet detention pond system with 3:1 side slopes. No embankment has been considered at this time. No credit has been included for sale of excess excavated material.
7. Gravity flow has been assumed. No pumping facilities have been included.
8. One inlet structure and one outlet structure have been assumed.
9. No replanting will be necessary.
10. Entire site will be fenced with a standard 6' high galvanized chain link fence.
11. Site has approximate perimeter of 3300'.
12. Entire site will be cleared and grubbed.
13. Sod, seed and mulch assumed for a 50' wide portion of site around perimeter.

Table F-3
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin BW-008

No.	*Brief Description of Improvement*	*Unit*	*Estimated Quantity*	*Unit Price*	*Cost*
1	Mobilization	LS	1	$50,000	$50,000
2	Maintenance of Traffic	LS	1	$20,000	$20,000
3	Erosion Control	LF	2800	$2	$5,600
4	Clearing and Grubbing	AC	11	$7,200	$79,200
5	Demolition	LS	0	$10,000	$0
6	Excavation	CY	190000	$5	$950,000
7	Embankment	CY	0	$7	$0
8	Cast-in-Place Concrete	LS	1	$10,000	$10,000
9	Inlet Structures	EA	1	$7,000	$7,000
10	Outlet Structures	EA	1	$5,000	$5,000
11	48" RCP	LF	100	$100	$10,000
12	Riprap	LS	1	$10,000	$10,000
13	Fencing	LF	2800	$9	$25,200
14	Sod, Seed and Mulch	AC	3.2	$6,700	$21,440
15	Signage	LS	1	$2,000	$2,000
	Subtotal				**$1,195,000**
	Contractor's OH&P (15%)				**$179,000**
	Subtotal				**$1,374,000**
	Construction Contingencies (25%)				**$344,000**
	Total Construction Cost				**$1,718,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$1,823,000**
	Engineering and Implementation (20%)				**$365,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$2,188,000**

Assumptions and clarifications:

1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. The site is approximately 12.9 acres. The pond size is assumed to be 11 acres.
5. The site has a relatively level topography.
6. The entire site will consist of an excavated 12' deep wet detention pond system with 3:1 side slopes. No embankment has been considered at this time. No credit has been included for sale of excess excavated material.
7. Gravity flow has been assumed. No pumping facilities have been included.
8. One inlet structure and one outlet structure have been assumed.
9. No replanting will be necessary.
10. Entire site will be fenced with a standard 6' high galvanized chain link fence.
11. Pond site has approximate dimensions of 600' x 800'.
12. Entire site will be cleared and grubbed.
13. Sod, seed and mulch assumed for a 50' wide portion of site around perimeter.

Table F-4
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin LW-008

No.	Brief Description of Improvement	Unit	Estimated Quantity	Unit Price	Cost
	Lake Orienta Baffle Boxes				
1	Mobilization	LS	10	$10,000	$100,000
2	Maintenance of Traffic	LS	10	$10,000	$100,000
3	Site Prep	EA	10	$5,000	$50,000
4	Baffle Box	EA	10	$30,000	$300,000
5	Fencing	LF	1000	$9	$9,000
6	Sod, Seed and Mulch	SY	1000	$2	$2,000
7	Signage	LS	10	$2,000	$20,000
	Lake Florida Baffle Boxes				
1	Mobilization	LS	2	$10,000	$20,000
2	Maintenance of Traffic	LS	2	$10,000	$20,000
3	Site Prep	EA	2	$5,000	$10,000
4	Baffle Box	EA	2	$30,000	$60,000
5	Fencing	LF	200	$9	$1,800
6	Sod, Seed and Mulch	SY	200	$2	$400
7	Signage	LS	2	$2,000	$4,000
	Lake Adelaide Baffle Boxes				
1	Mobilization	LS	4	$10,000	$40,000
2	Maintenance of Traffic	LS	4	$10,000	$40,000
3	Site Prep	EA	4	$5,000	$20,000
4	Baffle Box	EA	4	$30,000	$120,000
5	Fencing	LF	400	$9	$3,600
6	Sod, Seed and Mulch	SY	400	$2	$800
7	Signage	LS	4	$2,000	$8,000
	Subtotal				**$930,000**
	Contractor's OH&P (15%)				**$140,000**
	Subtotal				**$1,070,000**
	Construction Contingencies (25%)				**$268,000**
	Total Construction Cost				**$1,338,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$1,419,000**
	Engineering and Implementation (20%)				**$284,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$1,703,000**

Assumptions and clarifications:

1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. It was assumed that 10 outfalls for Lake Orienta, 2 outfalls for Lake Florida and 4 outfalls for Lake Adelaide would be retrofitted
3. Unit costs and quantities may vary significantly based on actual site conditions.
4. Costs do not include any potential hazardous material remediation or utility adjustment costs.
5. Gravity flow has been assumed. No pumping facilities have been included.
6. Each site will be fenced with a standard 6' high galvanized chain link fence.
7. Each site has approximate perimeter of 100'.
8. All disturbed areas will be sodded.
9. Each baffle box is assumed to be 10' x 20' and the estimated cost includes installation.
10. Recharge/Drainage wells costs have not been included at this time.

Table F-5
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin AP-002

No.	Brief Description of Improvement	Unit	Unit Price	Estimated Quantity	Cost	Estimated Quantity	Cost	Estimated Quantity	Cost	Estimated Quantity	Cost
				Option 1 - 16 Ac Pond		Option 2 - 14 Ac Pond		Option 3 - 29 Ac Pond		Option 4 - 20 Ac Pond	
1	Mobilization	LS	$50,000	1	$50,000	1	$50,000	1	$50,000	1	$50,000
2	Maintenance of Traffic	LS	$20,000	1	$20,000	1	$20,000	1	$20,000	1	$20,000
3	Erosion Control	LF	$2	3400	$6,800	3250	$6,500	4500	$9,000	3800	$7,600
4	Clearing and Grubbing	AC	$7,200	16	$115,200	14	$100,800	29	$208,800	20	$144,000
5	Demolition	LS	$10,000	0	$0	0	$0	0	$0	0	$0
6	Excavation	CY	$5	285000	$1,425,000	246700	$1,233,500	524500	$2,622,500	358000	$1,790,000
7	Embankment	CY	$7	0	$0	0	$0	0	$0	0	$0
8	Cast-in-Place Concrete	LS	$10,000	1	$10,000	1	$10,000	1	$10,000	1	$10,000
9	Inlet Structures	EA	$7,000	1	$7,000	1	$7,000	1	$7,000	1	$7,000
10	Outlet Structures	EA	$5,000	1	$5,000	1	$5,000	1	$5,000	1	$5,000
11	48" RCP	LF	$90	100	$9,000	100	$9,000	100	$9,000	100	$9,000
12	Riprap	LS	$10,000	1	$10,000	1	$10,000	1	$10,000	1	$10,000
13	Fencing	LF	$7	3400	$23,800	3250	$22,750	4500	$31,500	3800	$26,600
14	Sod, Seed and Mulch	AC	$6,700	3.9	$26,130	3.7	$24,790	5.2	$34,840	4.4	$29,480
15	Signage	LS	$2,000	1	$2,000	1	$2,000	1	$2,000	1	$2,000
	Subtotal				**$1,710,000**		**$1,501,000**		**$3,020,000**		**$2,111,000**
	Contractor's OH&P (15%)				**$257,000**		**$225,000**		**$453,000**		**$317,000**
	Subtotal				**$1,967,000**		**$1,726,000**		**$3,473,000**		**$2,428,000**
	Construction Contingencies (25%)				**$492,000**		**$432,000**		**$868,000**		**$607,000**
	Total Construction Cost				**$2,459,000**		**$2,158,000**		**$4,341,000**		**$3,035,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$2,609,000**		**$2,289,000**		**$4,605,000**		**$3,220,000**
	Engineering and Implementation (20%)				**$522,000**		**$458,000**		**$921,000**		**$644,000**
	Land Acquisition				**$0**		**$0**		**$0**		**$0**
	Opinion of Probable Project Costs				**$3,131,000**		**$2,747,000**		**$5,526,000**		**$3,864,000**

Assumptions and clarifications:
1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. The sites consist of 4 options as described.
5. The sites have relatively level topography.
6. The pond sites will consist of an excavated 12' deep wet detention pond system with 3:1 side slopes. No embankment has been considered at this time. No credit has been included for sale of excess excavated material.
7. Gravity flow has been assumed. No pumping facilities have been included.
8. One inlet and one outlet structure have been assumed for each site.
9. No replanting will be necessary.
10. Sites will be fenced with a standard 6' high galvanized chain link fence.
11. Sites have approximate perimeters as described.
12. Sites will be cleared and grubbed.
13. Sod, seed and mulch assumed for a 50' wide portion of site around perimeter of each site.

Table F-6
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin GT-001

No.	*Brief Description of Improvement*	*Unit*	*Estimated Quantity*	*Unit Price*	*Cost*
	Baffle Boxes				
1	Mobilization	LS	4	$10,000	$40,000
2	Maintenance of Traffic	LS	4	$10,000	$40,000
3	Site Prep	EA	4	$5,000	$20,000
4	Baffle Box	EA	4	$30,000	$120,000
5	Fencing	LF	400	$9	$3,600
6	Sod, Seed and Mulch	SY	400	$2	$800
7	Signage	LS	4	$2,000	$8,000
	Subtotal				**$232,000**
	Contractor's OH&P (15%)				**$35,000**
	Subtotal				**$267,000**
	Construction Contingencies (25%)				**$67,000**
	Total Construction Cost				**$334,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$354,000**
	Engineering and Implementation (20%)				**$71,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$425,000**

Assumptions and clarifications:
1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. Gravity flow has been assumed. No pumping facilities have been included.
5. Each site will be fenced with a standard 6' high galvanized chain link fence.
6. Each site has approximate perimeter of 100'.
7. All disturbed areas will be sodded.
8. Each baffle box is assumed to be 10' x 20' and the estimated cost includes installation.
9. Assumed 4 outfalls to be retrofitted.

Table F-7
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin BW-020

No.	*Brief Description of Improvement*	*Unit*	*Estimated Quantity*	*Unit Price*	*Cost*
	Baffle Boxes				
1	Mobilization	LS	2	$10,000	$20,000
2	Maintenance of Traffic	LS	2	$10,000	$20,000
3	Site Prep	EA	2	$5,000	$10,000
4	Baffle Box	EA	2	$30,000	$60,000
5	Fencing	LF	200	$9	$1,800
6	Sod, Seed and Mulch	SY	200	$2	$400
7	Signage	LS	2	$2,000	$4,000
	Subtotal				**$116,000**
	Contractor's OH&P (15%)				**$17,000**
	Subtotal				**$133,000**
	Construction Contingencies (25%)				**$33,000**
	Total Construction Cost				**$166,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$176,000**
	Engineering and Implementation (20%)				**$35,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$211,000**

Assumptions and clarifications:
1.The above planning level costs do not include land acquisition or wetland mitigation costs.
2.Unit costs and quantities may vary significantly based on actual site conditions.
3.Costs do not include any potential hazardous material remediation or utility adjustment costs.
4.Gravity flow has been assumed. No pumping facilities have been included.
5. Each site will be fenced with a standard 6' high galvanized chain link fence.
6. Each site has approximate perimeter of 100'.
7. Each baffle box is assumed to be 10' x 20' and the estimated cost includes installation.
8. Assumed 2 outfalls to be retrofitted, one on Lake Pleasant and one on Lake Cortez.

Table F-8
Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support
Draft Opinion of Probable Conceptual Project Costs
Subbasin GT-007

No.	Brief Description of Improvement	Unit	Unit Price	Estimated Quantity	Cost	Estimated Quantity	Cost	Estimated Quantity	Cost
				Option 1 - 19 Ac Pond		Option 2 - 1 Ac Pond		Option 3 - 7 Ac Pond	
1	Mobilization	LS	$50,000	1	$50,000	1	$50,000	1	$50,000
2	Maintenance of Traffic	LS	$20,000	1	$20,000	1	$20,000	1	$20,000
3	Erosion Control	LF	$2	3760	$7,520	1020	$2,040	2640	$5,280
4	Clearing and Grubbing	AC	$7,200	19	$136,800	1	$7,200	7	$50,400
5	Demolition	LS	$10,000	0	$0	0	$0	0	$0
6	Excavation	CY	$5	337600	$1,688,000	12000	$60,000	115500	$577,500
7	Embankment	CY	$7	0	$0	0	$0	0	$0
8	Cast-in-Place Concrete	LS	$10,000	1	$10,000	1	$10,000	1	$10,000
9	Inlet Structures	EA	$7,000	1	$7,000	1	$7,000	1	$7,000
10	Outlet Structures	EA	$5,000	1	$5,000	1	$5,000	1	$5,000
11	48" RCP	LF	$100	100	$10,000	100	$10,000	100	$10,000
12	Riprap	LS	$10,000	1	$10,000	1	$10,000	1	$10,000
13	Fencing	LF	$7	3760	$26,320	1020	$7,140	2640	$18,480
14	Sod, Seed and Mulch	AC	$6,700	4.3	$28,810	1	$6,700	3	$20,100
15	Signage	LS	$2,000	1	$2,000	1	$2,000	1	$2,000
	Subtotal				**$2,001,000**		**$197,000**		**$786,000**
	Contractor's OH&P (15%)				**$300,000**		**$30,000**		**$118,000**
	Subtotal				**$2,301,000**		**$227,000**		**$904,000**
	Construction Contingencies (25%)				**$575,000**		**$57,000**		**$226,000**
	Total Construction Cost				**$2,876,000**		**$284,000**		**$1,130,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$3,051,000**		**$301,000**		**$1,199,000**
	Engineering and Implementation (20%)				**$610,000**		**$60,000**		**$240,000**
	Land Acquisition				**$0**		**$0**		**$0**
	Opinion of Probable Project Costs				**$3,661,000**		**$361,000**		**$1,439,000**

Assumptions and clarifications:
1. The above planning level costs do not include land acquisition or wetland mitigation costs.
2. Unit costs and quantities may vary significantly based on actual site conditions.
3. Costs do not include any potential hazardous material remediation or utility adjustment costs.
4. The sites consist of 4 options as described.
5. The sites have relatively level topography.
6. The pond sites will consist of an excavated 12' deep wet detention pond system with 3:1 side slopes. No embankment has been considered at this time. No credit has been included for sale of excess excavated material.
7. Gravity flow has been assumed. No pumping facilities have been included.
8. One inlet structure and one outlet structure have been assumed for each site.
9. No replanting will be necessary.
10. Sites will be fenced with a standard 6' high galvanized chain link fence.
11. Sites have approximate perimeters as described.
12. Site will be cleared and grubbed.
13. Sod, seed and mulch assumed for a 50' wide portion of site around perimeter of each site at $7500/acre.

No.	Brief Description of Improvement	Unit	Estimated Quantity	Unit Price	Cost
	Baffle Boxes				
1	Mobilization	LS	3	$10,000	$30,000
2	Maintenance of Traffic	LS	3	$10,000	$30,000
3	Site Prep	EA	3	$5,000	$15,000
4	Baffle Box	EA	3	$30,000	$90,000
5	Fencing	LF	300	$9	$2,700
6	Sod, Seed and Mulch	SY	300	$2	$600
7	Signage	LS	3	$2,000	$6,000
	Subtotal				**$174,000**
	Contractor's OH&P (15%)				**$26,000**
	Subtotal				**$200,000**
	Construction Contingencies (25%)				**$50,000**
	Total Construction Cost				**$250,000**
	Construction Cost Escalation (2yrs@3%/yr)				**$265,000**
	Engineering and Implementation (20%)				**$53,000**
	Land Acquisition				**$0**
	Opinion of Probable Project Costs				**$318,000**

Assumptions and clarifications:
1.The above planning level costs do not include land acquisition or wetland mitigation costs.
2.Unit costs and quantities may vary significantly based on actual site conditions.
3.Costs do not include any potential hazardous material remediation or utility adjustment costs.
4.Gravity flow has been assumed. No pumping facilities have been included.
5. Each site will be fenced with a standard 6' high galvanized chain link fence.
6. Each site has approximate perimeter of 100'.
7. Each baffle box is assumed to be 10' x 20' and the estimated cost includes installation.
8. Assumed 3 outfalls to be retrofitted, one each at West Crooked Lake, East Crooked Lake and Lake Nettie.

Appendix G

Water Balance Model Description

Appendix G

G.1 Irrigation Requirements

Understanding supplemental irrigation water requirements (irrigation) is fundamental to the design of a water supply system. Supplemental irrigation requirements vary with climatic and hydrogeologic conditions, and therefore, the need for irrigation will vary with site location, the season of the year, and other factors. Primary factors controlling the need for supplemental landscape irrigation are evapotranspiration, rainfall, and soil properties of the root zone.

Evapotranspiration from a crop-soil unit is defined as water that is evaporated from the soil surface and transpiration by the plant through the leaves. If the crop, in this case, turf, completely covers the ground surface, evapotranspiration occurs completely through the plants, and if sufficient water is available for absorption by the roots, the evapotranspiration is controlled by climate. This rate of use is referred to as potential evapotranspiration (PET). The actual evapotranspiration can be less than the PET when the ground is not completely covered with vegetation or with low moisture soil conditions that restrict absorption by the plant roots. Evapotranspiration and PET are strongly influenced by temperature and will be lowest in the winter months, highest in mid-summer. The magnitude of the PET will vary according to local conditions (based on temperature and humidity), but a bell-shaped curve peaking in the summer months is typical of the project area.

G.1.2 Calculation of Irrigation Demands

In addition to rainfall and PET, other factors affecting irrigation requirements include the soil/aquifer properties, vegetative cover (in this case turfgrass), stage of plant growth, and the type of irrigation system employed. The soil/aquifer properties and drainage features of that site control percolation and thus affect irrigation demand.

A model was developed to characterize the response of the irrigation demand to climatic (rain and temperature), soil, and plant factors using a Microsoft Visual Basic program. In the model, water balance calculations are conducted on an elementary soil unit using the historical weather data, soil properties, and plant characteristics as inputs. The model simulates the conditions in the field for a plant-soil unit under the influence of a supplemental irrigation regime. The program calculates inflows to the soil unit (rain, irrigation) and losses from the soil unit (evapotranspiration, percolation, & runoff) as the program steps through the period of historic weather data on a daily basis. The vaporization of water from the soil is assumed to be equal to the PET (if there is sufficient moisture of the root zone), which is calculated using the Thornthwaite equation defined as:

$$E = 16.0\left(\frac{10T}{I}\right)^{a} \text{ mm/month}$$

where: T = mean monthly temperature °C

I = 'heat index' for the 12 months in a year where

$$I = \sum i = \sum \left(\frac{T}{5} \right)^{1.514} \quad \text{for each month in the year}$$

Figure G-1 provides a conceptual overview of the operation of the soil-plant level water balance model.

Generally, in a uniform soil, greater root development takes place in the upper layers of the soil profile than elsewhere. This influences the pattern of moisture extraction from the soil profile by the plant. In evaluating water actually available to a given crop, the model partitions the root zone into four layers assuming 40 percent of the PET may be satisfied from the first layer, 30 percent from the second layer, 20 percent from the third layer, and 10 percent from the deepest layer as shown in Figure G-1. This approximates the expected water extraction pattern of most crops.

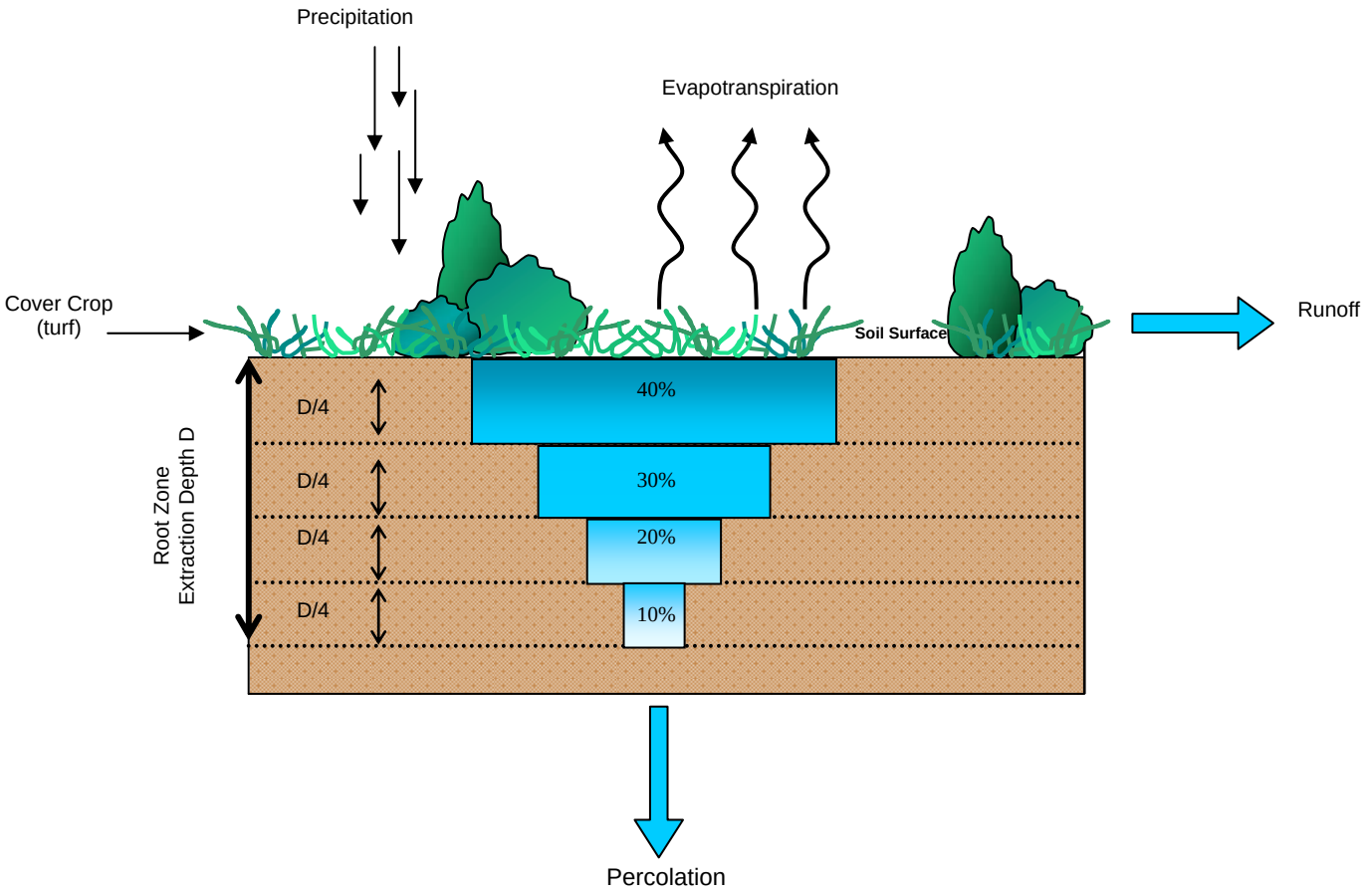
The model also allows the user to input the allowable moisture deficit prior to irrigation. In performing daily calculations, the first step is to determine if PET exceeds daily rainfall. When PET exceeds rainfall, the following calculations are carried out:

- The crop will attempt to satisfy the water demand by using water available in the four layers of the root zone.
- PET demand is set to zero if there is sufficient moisture in the root zone.
- If there is an insufficient amount of moisture in the root zone to satisfy PET, a daily deficit is recorded.
- If this deficit exceeds the user defined allowable moisture depletion, irrigation occurs. This irrigation will equal the daily unsatisfied PET, and brings the root zone to full available water content.

Total irrigation is increased by a user-specified irrigation efficiency rate.

If rainfall exceeds PET, the following calculations are conducted:

- A runoff volume is calculated based on available soil storage capacity in the root zone.
- After deducting runoff from rainfall, the model attempts to bring each soil layer to field capacity.
- Water in excess of field capacity is assumed to leave the root zone as percolation.



CDM

S:\9247\44812\Report\Fig G-1.doc

Figure G-1
Root Zone Water Extraction Pattern
Water Balance

The model calculates the irrigation demand in this manner for the entire period of historic weather record. The results allow statistical characterization of the magnitude and variation of the irrigation demands with the season of the year (seasonality) and from year to year.

G.2 Water Balance Model

A water balance model was developed to determine the relationship between reclaimed water supply, reclaimed water demand, and discharge to the existing and proposed alternate disposal systems. The model was used to determine the ability of the expected reclaimed water supply to meet the expected demands for nonpotable water. For the purpose of the water balance calculations this ability will be defined as the "reliability" of the reuse system. Some level of reliability in reuse systems must be provided to reclaimed water customers. Peak season demands should be met or there will be little incentive for potential users to switch from current sources of water to reclaimed water.

The calculation of reliability and alternative effluent disposal rates are based on a monthly water balance, which requires the following inputs:

- Expected reclaimed water supplies are input as an average annual flow. This annual average flow is converted to expected monthly flows using the calculated monthly supply factors.

- The daily results of the irrigation demand calculations are summed by month. Demands for each month of a period of record are converted into dimensionless demand factors. Each month's demand factor is unique and based on the historical rainfall and temperature of that month. The expected annual average reclaimed water demand is input and distributed according to the monthly demand factors for each month of the period of record.

Using the inputs described above, a Microsoft Excel® spreadsheet is used to track the ability of the modeled system to meet expected reclaimed water demands for each month for the period of record. This includes calculation of the magnitude and frequency of shortage as well as the magnitude and frequency of discharge events. For the purposes of the model, a discharge event is defined as any month in which reclaimed water supplies exceed reclaimed water demands and available storage capacity. An overview of the operation of the system-level water balance scenarios model is presented on **Figure G-2**.

Using predicted demands and available supply as input, reliability is measured as the inverse of the frequency of expected shortage. Design for 50% reliability means that customers could be expected to run short of reclaimed water 5 years out of 10. A reliability of 80% would reduce the occurrence of shortage to 2 years out of 10. There are no guidelines for the establishment of the reliability of water reclamation systems in Florida or elsewhere, and most communities have not made a concerted effort to define target reliability and plan facilities accordingly. Reclaimed water is a

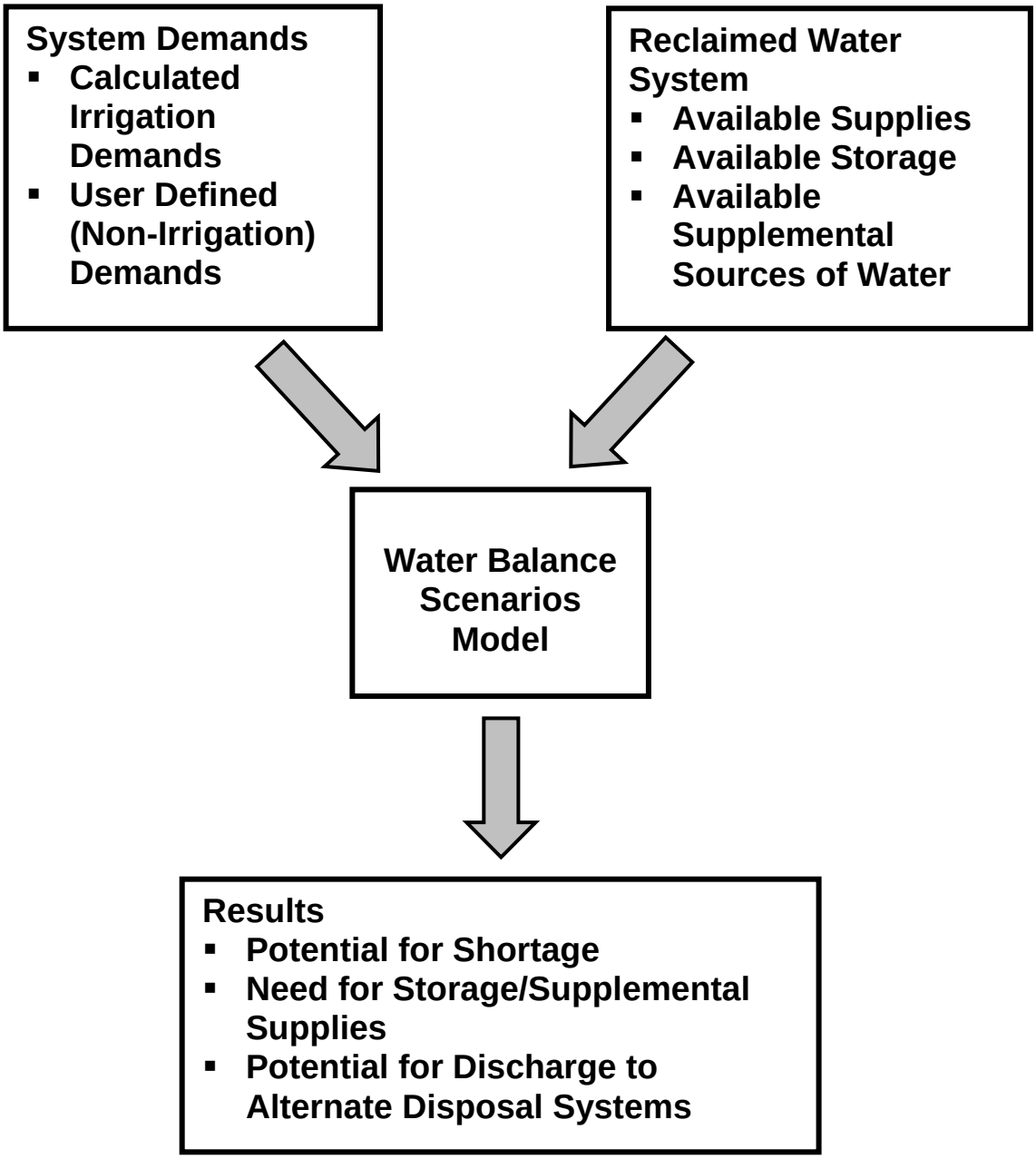


Figure G-2
Overview of Water Balance Scenarios Model

commodity and should be afforded a reasonable level of reliability in order to be accepted by customers. However, reclaimed water is not an essential service and so does not require the same level of reliability provided in the potable water distribution system or the wastewater collection system. Establishing a target reclaimed water system reliability is therefore a matter of policy for each supplier. The Water Management Districts typically permit irrigation supplies with a reliability of 80% (i.e., the user is not expected to experience a shortage of water 8 out of 10 years).

It should be noted that the reliability discussed here refers to system-wide reclaimed water demands and available supplies only. This discussion does not include independent consideration of the reliability of the pumping, transmission and distribution systems.

The water balance model is used to examine the effects of reuse commitment on both system reliability and discharge. The results can be used to evaluate the existing level of reuse system demand and determine the optimal levels of reuse commitment for future expanded systems when more reclaimed water becomes available.

Reuse commitment is defined as the reclaimed water that is distributed to customers. Although the Florida Department of Environmental Protection (FDEP) considers reclaimed flow to wetlands systems and RIBs as reuse, for the purpose of this analysis, discharge of reclaimed water to such systems and to other non-irrigation uses is defined as alternative disposal. The reuse commitment does not include reclaimed water routed to wetlands, RIBs, or deep wells.

Reuse commitment can be expressed as a dimensionless percentage of the reclaimed water supply. The percent reuse commitment is defined as the average annual reuse commitment divided by the annual average daily flow of the reclaimed water supply. With most reclaimed water systems, reuse commitment is a function of the user agreements that have been executed. The sum of the reclaimed water contracts may or may not equal actual reclaimed water use.