CDM

Little Wekiva River

Watershed Management Plan

November 2005

Final Report

Executive Summary

The St. Johns River Water Management District (SJRWMD) in cooperation with Orange County, Seminole County, the City of Orlando and the City of Altamonte Springs (Participants) contracted with CDM in February 2002 to provide engineering services for Phase II of the Little Wekiva River Watershed Management Plan (WMP). The Little Wekiva River Watershed consists of approximately 42 square miles of land area tributary to the Little Wekiva River as shown in **Figure ES-1**.

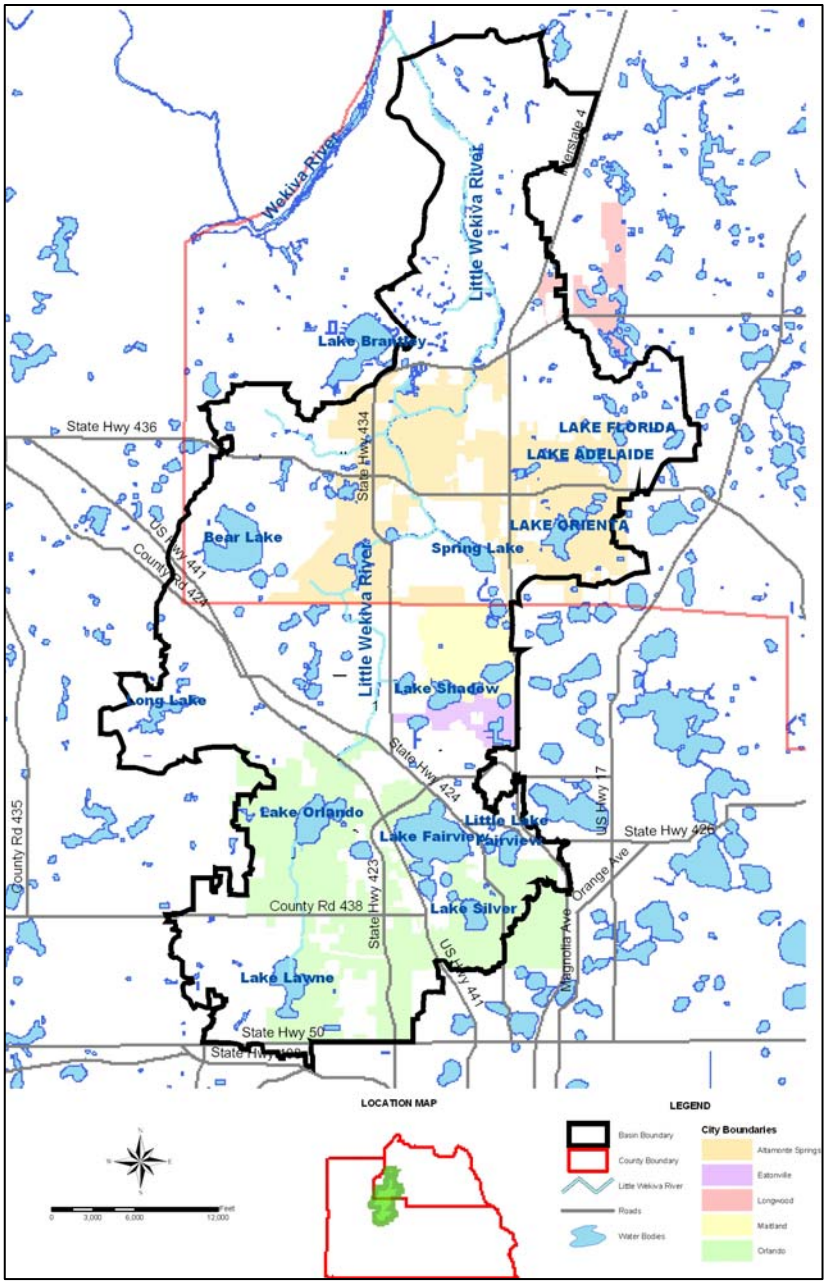

Figure ES-1 Study Area

Additionally, there are also 3 subbasins 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 in Orange County. Accounting for the closed subbasins, the total area contributing to the Little Wekiva River is approximately 54.5 square miles. The Little Wekiva River itself is approximately 15 miles long and is the predominant drainage feature in the basin. Its stream course consists of a combination of channelized ditches, lakes, incised channel reaches and meandering wetland flow until its confluence with the Wekiva River. 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 then eventually discharges through of the southern reaches of the Lower Wekiva River Preserve until it empties into the Wekiva River.

The WMP builds upon Phase I of the Little Wekiva WMP which included detailed modeling, design and implementation of erosion control measures along the main stem of the Little Wekiva River as well as other stormwater master planning efforts completed independently by the individual Participants. The intent of the WMP is to develop a regional solution for the entire Little Wekiva River watershed to alleviate both water quantity and water quality problems that have plagued the basin in the past. This WMP is unique in the fact that the Participants cooperatively worked together to develop a WMP that takes a holistic approach to stormwater master planning in order to promote the development of a consistent plan rather than developing a piecemeal approach by individual governments. The remaining paragraphs summarize the efforts and findings of this WMP.

Little Wekiva River Basin History

The Little Wekiva River has had a history of stormwater quantity and quality problems including:

- An increase in rate of volume, flow and velocities due to the basin's urbanization;
- Minimal upstream storage and treatment due to much of the current development occurring before current stormwater regulations (pre-1983);
- Erosion and flooding, which has caused public safety concerns; and
- Adverse environmental and water quality impacts from the movement and deposition of sediments.

Stormwater runoff was identified back in 1980 (East Central Florida Regional Planning Council, 1980) as the major source of pollutants entering surface water bodies in the Little Wekiva River Basin. In 1977, approximately 40 percent of the total land area in the basin was developed as commercial and residential areas. The

majority of the development in the basin was built prior to statewide stormwater regulations being enacted and therefore did not have effective stormwater management systems for both water quality and quantity. However, since that time there has been progress made toward improving water quality in the Little Wekiva River over the past two decades. Historically, seven wastewater treatment plants and a citrus processing plant discharged into the river system. Currently, the Altamonte Springs Wastewater Treatment Plant is the only point source discharge into the river and only discharges intermittently due to reuse efforts.

The basin has also experienced chronic occurrences of sedimentation, primarily along the Little Wekiva River. The problem of sedimentation along the river appears to be a direct result of urbanization of the river's watershed that has overtaxed the conveyance and sediment transport capacity of the river (DRMP, 1988). The river changes in elevation by approximately 58 feet from its headwaters in Orange County to S.R. 434 in Seminole County. Over time, the combined effect of channelization of segments of the river, urbanization, and the loss of the river's natural floodplain aggravated sedimentation problems along the Little Wekiva River.

In 1988, the Florida Legislature passed the Wekiva River Protection Act, which requires the river's surrounding counties 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 basically provides long-term protection for the area. A small portion of the Little Wekiva River Basin is within this protection area, namely the area of the basin that is to the north of S.R. 434 and to the west of Markham Woods Road.

In 1995, a technical working group was formed to seek funding and to make basin-wide decisions to solve sedimentation and flooding problems. The Little Wekiva River Working Group is comprised of representatives of the Florida Department of Environmental Protection (FDEP), the Florida Department of Transportation (FDOT), SJRWMD, Orange and Seminole Counties, the City of Altamonte Springs, the Florida Audubon Society, Friends of the Wekiva and local area residents. The group has secured funding which has been put towards such achievements as:

- Stabilization of the riverbank and riverbed using manmade and natural materials;
- Removal of invasive vegetation (funded by FDEP and U.S. Army Corps of Engineers); and,
- Formulation of a basin-wide management plan with respect to sedimentation control (funded by the SJRWMD).

Wekiva Parkway & Protection Act

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. 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, and the recommendations included the following: 1) build the Wekiva Parkway; 2) protect the Wekiva River basin environment; 3) promote innovative planning and development; and 4) implementation.

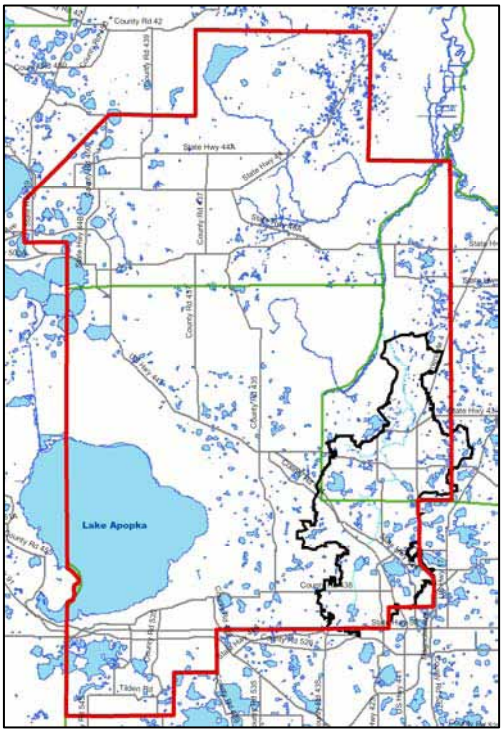

Figure ES-2 Wekiva Study Area

In addition to these recommendations, the Committee also delineated the WSA, shown in **Figure ES-2**, which includes the land area that contributes surface and groundwater to the Wekiva River and the various springs located in this area. The Little Wekiva River Basin is completely within the WSA as it is a major tributary to the Wekiva River. On June 29, 2004 Florida Governor Jeb Bush signed the 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. 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 within the WSA.

During the development of the Little Wekiva River WMP, an independent effort was concurrently undertaken to develop a master stormwater management plan (MSMP) for the WSA in order to satisfy the requirements of Section 369.319, F.S. of the WPPA. The WSA MSMP satisfies the requirements listed in the WPPA. Although the development of this WMP had been underway prior to the adoption of the legislation, the recommendations made in this plan are consistent with the goals of the WPPA.

Data Collection

CDM collected existing information describing the stormwater management system within the watershed. As part of this effort, CDM collected and summarized information related to existing studies and reports, construction drawings, subdivision plans, rainfall data, streamflow and stage data, drainage wells, septic tanks, stormwater pump stations, survey, survey and right-of way data, reported flooding problems, water quality, wetlands, existing and future land use data, parcel map data, soils data, and field reconnaissance.

Using these data, CDM updated the existing stormwater model representation of the basin, previously done by others, that was used to predict existing and future stormwater system deficiencies. The updated hydrologic portion of the stormwater model was used estimate the amount of stormwater runoff reaching the river and tributaries within the study area that convey stormwater runoff to the Little Wekiva River under both existing and future land use conditions. The hydraulic portion of the stormwater was used to predict deficiencies (flooding problems) of the primary stormwater management system (i.e., river, tributaries, culverts, etc.) based upon each Participant's defined level-of-service (LOS) criteria. The LOS adopted by each Participant is the foundation used to establish improvement goals. The primary focus of these goals is public safety by protecting against flooding of houses/buildings and maintaining emergency and evacuation route access.

Pollutant Load Analysis

The CDM Watershed Management Model (WMM) was used to conceptually evaluate the 12 USEPA indicator pollutants (BOD5, COD, TSS, TDS, TP, DP, TKN, NO3 and NO2, Pb, Cu, Zn, and Cd). 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. This conceptual screening allows the SJRWMD and the Participants to identify areas suitable for water quality retrofit in order to address TMDL issues as well as areas that currently do not receive any water quality treatment for stormwater runoff. In order to best address the needs identified in this basin, CDM estimated pollutant loadings for several scenarios. These included:

- The entire watershed (on a subbasin basis) for existing and future land use conditions;
- Identified points of interest along the Little Wekiva River; and
- Impaired water bodies identified on FDEP's verified list that require the development of a TMDL.

An earlier version of WMM (version 3.3) contains a module used to predict the chlorophyll-a and trophic state index (TSI) values for lakes based on nonpoint source pollutant loadings. This module was used separately from the WMM analysis

mentioned above used to predict loadings from nonpoint source pollution. Several lakes in the Little Wekiva River Basin are identified on the FDEP's verified list of impaired water bodies for nutrients and require the development of a TMDL. Those lakes analyzed using the WMM Lake module include Lake Lawne, Lake Silver, Bay Lake, Spring Lake, Lake Orienta, Lake Florida and Lake Adelaide. Using the individual lake characteristics and the estimated pollutant loads from the WMM analysis, the module was used to predict the chlorophyll-a, secchi disk depth and the Florida TSI. CDM compared the predicted TSI with historical sampling data to draw conclusions if any, of how the nutrient levels in the individual lakes are influenced, whether it be from stormwater inputs and/or other internal loadings. CDM also estimated the reduction in total phosphorus (TP) and total nitrogen (TN) needed to achieve a TSI value that meets the current water quality standard (i.e., less than 60). However, these reductions are based on stormwater inputs only and that the recommended strategy for lake restoration is to limit both external and stormwater inputs and the internal nutrient contribution from the sediments.

CDM then reviewed the pollutant load analysis results as well as the impairments for the listed verified water bodies to determine where the higher priority would be for water quality retrofit projects. Due to the highly urbanized nature of the basin, it was necessary to identify vacant or undeveloped lands that would be suitable for retrofit projects. Based on this investigation CDM identified 21 potential water quality retrofit project sites within the basin which are shown on **Figure ES-3**. CDM then developed a ranking matrix in order to prioritize the projects. The results of the ranking would then be used to identify the top ten water quality retrofit projects that would receive the highest priority for implementation. CDM then developed conceptual cost estimates for each water quality retrofit project which are shown in **Table ES-1**.

Table ES-1
Opinion of Probable Conceptual Project Cost Estimates for Prioritized Project Sites

No.	Project Site	Project Type	Water Body Affected	Conceptual Cost
5	Center of Commerce W.	Treatment Wetland	Little Wekiva Canal	$723,000
3	Dardanelle Drive/Seaboard Road South	Wet Detention	Little Wekiva Canal	$1,055,000
6	All American Blvd	Wet Detention	Little Wekiva Canal	$1,467,000
2	Princeton & Silver Star	Wet Detention	Little Wekiva Canal	$543,000
4	Mercy Star South	Wet Detention	Little Wekiva Canal	$1,329,000
7	West Lake Lawne	Treatment Wetland	Lake Lawne	$1,115,000
1	Lake Lawne Outfall	Wet Detention	Little Wekiva Canal	$5,679,000
14	Little Wekiva River	Wet Detention	Little Wekiva River	$759,000
11	South Bay Lake	Wet Detention	Bay Lake	$2,348,000
21	The Springs	Wet Detention	Little Wekiva River	$2,828,000
15	Newburyport Ave. West	Wet Detention	Lake Florida	$752,000
17	End of Pipe Treatment (Lake Florida)	End of Pipe Treatment	Lake Florida	$419,000

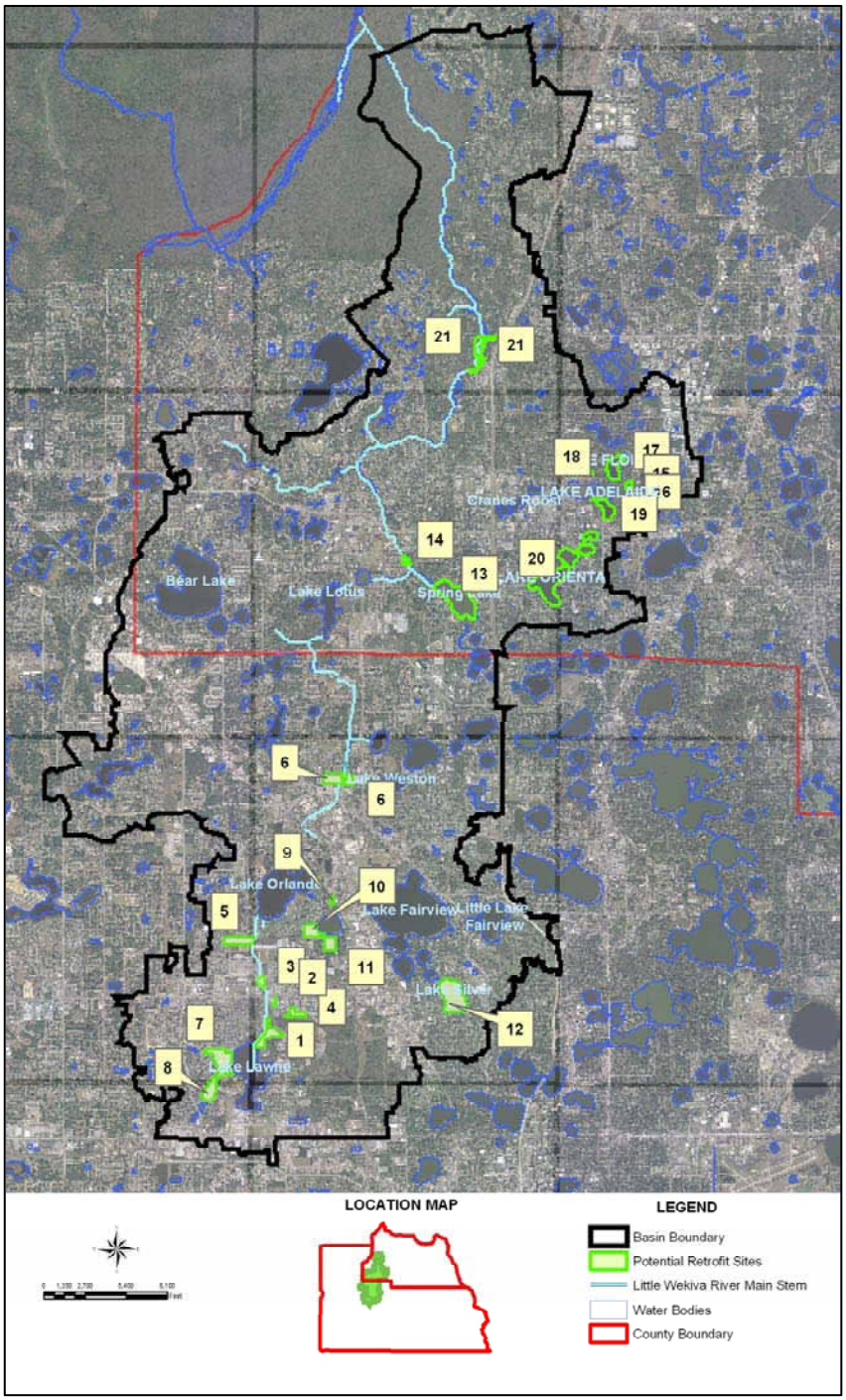

Figure ES-3 Proposed Water Quality Retrofit Sites

Engineering Analysis and Alternative Improvements

As part of the engineering analysis of the primary stormwater management system (i.e., streams, canals, culverts, etc.), CDM identified flooding problems and developed recommended improvements for the identified problems. The Interconnected Pond Routing (ICPR®) for Windows, Version 3.02 was the stormwater model used to

predict flooding under both existing and future land use and hydraulic conditions under the mean annual, 10-year, 25-year, 50-year and 100-year frequency 24-hour design storm events using the Orange County, SCS Type II (Florida Modified) and 10-year/3-hour rainfall distributions. Based on the model results and the Participant's LOS goals, 21 problem areas within the basin were identified. Each problem area is a grouping of several deficient structures (i.e., channel bank overtopping, culvert overtopping, etc.) within a localized area. The general locations of the problem areas are described in **Table ES-2** and presented on **Figure ES-4**.

Table ES-2
Problem Area General Location Descriptions

Problem Area No.	Subbasin	Description
1	LWR	Little Wekiva Canal – Industrial Park
2	LWR	Lake Orlando Outfall
3	LWR	Kathleen Drive to Lake Lotus
4	LWR	Horselover's Lane
5	LWR	Spring Oaks Subdivision
6	LWR	River Run Subdivision
7	LWR	The Springs
8	LWR	Springs Landing and the Wekiva Preserve
9	TRIBA	Sabal Point/Willow Run Subdivision
10	TRIBB	Mobile Manor Subdivision
11	TRIBB	Timberlake Property & Hidden Springs Condominiums
12	TRIBC	Forest Lake Academy
13	TRIBC	Forest Slopes Subdivision/Lake Harriet Estates
14	TRIBD	Country Creek Outfall
15	TRIBE	Beggs Road/Overland Road Area
16	TRIBF	Spring Lake Outfall
17	TRIBG	Lake Lovely Outfall
18	TRIBH	Lake Fairview Outfall Channel
19	TRIBI	Lake Lawne Canal
20	CR	Sanlando Springs Outfall
21	CR	Lake Florida Outfall

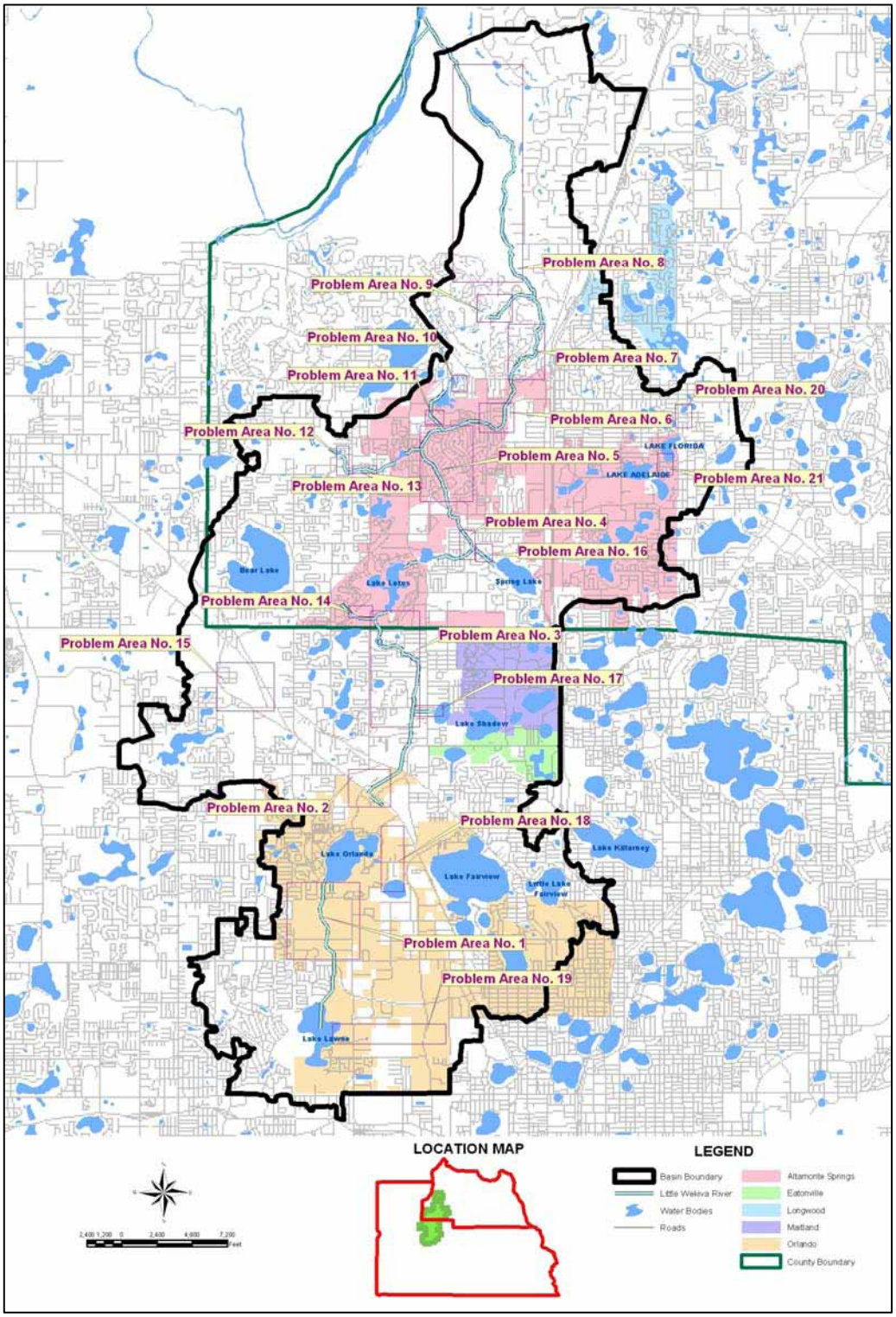

Figure ES-4 Problem Areas

Once identified, CDM developed alternative improvements to the identified flooding problems. Regional solutions that incorporated the proposed water quality retrofit sites were considered where practicable. Improvements for the 21 identified flooding deficiencies included culvert improvements, stormwater detention facilities, stormwater reuse, grade control structures and survey. The estimated capital cost of the recommended improvements is approximately $24 million.

Improvement Ranking and Prioritization

CDM prioritized the stormwater improvements for the 21 problem areas using criteria that included flood severity, recharge potential, ease of maintenance, public benefit, permittability, estimated construction cost, and water quality retrofit need. Each of these criteria was weighted based upon input from the Participants. The results of the improvement ranking are presented in **Table ES-3.**

Summary

As this basin is highly urbanized and much of the development occurred prior to stormwater management treatment regulations, it was difficult to achieve the desired LOS for flooding for each of the deficiencies due to the issues of potential downstream flooding, erosion and wetland impacts along with lack of available space for storage. Traditional methods of improving culvert crossings and open channel segments are difficult to implement in this basin due to the lack of open space for water quality treatment and flood attenuation. Additionally, the method of allowing more water to flow through the system without attenuation, thus leaving the basin (i.e., into the Wekiva River) contradicts the long-term management goals of the WPPA, which are to not only to address existing deficiencies and improve water quality, but to also conserve surface water resources through recharge and reuse. In summary, the recommended improvements will assist the Participants in helping to meet the LOS goals for flooding, improve water quality and promoting recharge within a highly urbanized watershed setting.

Table ES-3
Problem Area Prioritization

Problem No.	Problem Area	Subbasin	Project Summary	Purpose of Proposed Detention Pond (i.e., water quality and/or water quantity)	Candidate for Regional Stormwater Park?	Score	Rank
18	Lake Fairview Outfall Channel	TRIBH	Detention pond (2.7 acres); culvert replacement	both	yes	64.5	1
10	Mobile Manor Subdivision	TRIBB	Detention pond (3 acres), finished floor survey	both	yes	64.5	1
7	The Springs	LWR	Detention ponds (16 acres)	both	yes	63.5	2
3	Kathleen Drive to Lake Lotus	LWR	Detention pond (11.4 acres)	both	yes	62.5	3
4	Horselover's Lane	LWR	Detention pond (5 acres)	both	yes	62.5	3
1	Little Wekiva Canal - Industrial Park	LWR	Detention ponds (25 acres)	both	yes	61.5	4
2	Lake Orlando Outfall	LWR	Detention pond (16.4 acres)	both	yes	59.5	5
5	Spring Oaks Subdivision	LWR	Grade control structure	N/A	no	59.0	6
19	Lake Lawne Canal	TRIBI	Detention ponds (62 acres)	both	yes	54.5	7
6	River Run Subdivision	LWR	Stormwater reuse	both	no	54.5	7
8	Springs Landing and the Wekiva Preserve	LWR	Finished Floor Survey	N/A	no	53.0	8
20	Sanlando Springs Outfall	CR	Survey, raise top of road	N/A	no	53.0	8
11	Timberlake Property & Hidden Springs Condominiums	TRIBB	Survey	N/A	no	51.0	9
17	Lake Lovely Outfall	TRIBG	Finished Floor Survey	N/A	no	51.0	9
6	River Run Subdivision	LWR	Grade control structure	N/A	no	49.0	10
9	Sabal Point/Willow Run Subdivision	TRIBA	Culvert replacements, raise top of road, finished floor survey	N/A	no	49.0	10
21	Lake Florida Outfall	CR	Raise top of road	N/A	no	49.0	10
8	The Springs	LWR	Woodbridge Road bridge replacement	N/A	no	44.0	11
2	Lake Orlando Outfall	LWR	Stormwater reuse	both	no	43.5	12
13	Forest Slopes Subdivision/Lake Harriet Estates	TRIBC	Culvert replacement; raise top of road	N/A	no	42.0	13
12	Forest Lake Academy	TRIBC	N/A	N/A	no	N/A	
14	Country Creek Outfall	TRIBD	N/A	N/A	no	N/A	
15	Beggs Road/Overland Road Area (Problem No. 15)	TRIBE	Floodproofing; structural improvements	N/A	no	N/A	
16	Spring Lake Outfall	TRIBF	Detention pond downstream (5 acres)	both	yes	N/A	

N/A - Not Applicable