Lemon Bay

WATERSHED MANAGEMENT PLAN

Sarasota County

Southwest Florida Water Management District

Janicki Environmental, Inc.

JONES EDMUNDS
ENGINEERS | ARCHITECTS | SCIENTISTS

Appendix A

Existing Management Programs

August 2010

Sarasota County

Southwest Florida Water Management District

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Natural Systems					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Sarasota County Comprehensive Plan	2006	Sarasota County Planning Department	Protect, maintain and, where deemed necessary in the public interest, restore the barrier island, beach, and estuarine systems of Sarasota County. (Chapter 2, Environmental Goal 1)	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.
			Protect and enhance wherever possible, the quality of the estuarine environment throughout Sarasota County. (Chapter 2, Environmental Goal 2)		
			It shall be the goal of Sarasota County, as a member of the Sarasota Bay and Charlotte Harbor National Estuary Programs to support the implementation of their regional Comprehensive Conservation and Management Plans (CCMP) to restore and improve the natural estuarine systems and related coastal components. (Chapter 2, Environmental Goal 3)		
			Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)		
			Lessen the impact of a destructive storm on human life, public facilities, private structures, infrastructure, and coastal natural resources in Sarasota County. (Chapter 2, Environmental Goal 5)		
			Preserve, protect, and restore the integrity of the natural environment, historic and archeological resources, neighborhoods, and preserve agricultural uses consistent with resource protection (Chapter 9, FLU Goal 1)		
			Sarasota County shall provide programs which enhance, protect, and conserve the hydrologic and ecological functions of natural systems including estuaries, freshwater, and groundwater systems. (Chapter 4, Water Goal 2)		
Land Management Plan for the Alligator Creek Conservation Area	2005	Sarasota County Natural Resources	To manage the Conservation area's upland communities to improve habitat value for wildlife and habitat function.	Nuisance exotic species control.	Quarterly evaluation of nuisance exotic plant species populations should be conducted to assess the success of treatment as well as the need for additional control.
				Understory vegetation reduction.	Where deemed appropriate, areas of mesic flatwoods shall be managed by periodic rollerchopping, brown tree cutting, or other similar methods to reduce the height and density of understory vegetation.
				Community coordination.	The Conservation area boundaries will be clearly identified and signage will be positioned so that all interested parties can contact the County with inquiries related to the Conservation area.
					Adjacent land owners that are encroaching on the Conservation area shall be notified once boundaries are clearly identified and encroachment activities (e.g., discarding yard waste) are positively identified.
					Sarasota County staff will involve local homeowner's associations and nearby residents to solicit input on any major land management activities or recreational amenities proposed.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Natural Systems					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Southern Coastal Comprehensive Watershed Management Plan	2000	Southwest Florida Water Management District	To protect, preserve, and restore natural Florida ecosystems and to establish minimum water levels and flows necessary to maintain these natural systems.	Strategy: Continue ongoing efforts focused on protecting and restoring wetlands in the Southern Coastal Watershed.	Through the SWIM Trust Fund, and the District's Cooperative Funding Program, continue ongoing efforts to enhance, restore, and create wetlands throughout the Southern Coastal Watershed.
					Provide proactive, cooperative consultation to the private and public sectors on development proposals and regulatory issues that impact wetlands.
				Strategy: Protect natural systems within the Southern Coastal Watershed through land acquisition (fee simple) and other land conservation methods (e.g., conservation easements).	Identify and prioritize conservation lands within the watershed using the Florida Game and Freshwater Fish Commission's "Closing the Gaps" reports, as well as recent efforts by local governments and the District's SOR/P2000 Program.
					Coordinate land acquisition and other conservation efforts among federal, state, regional, and local governments.
					Educate land owners of significant undeveloped areas (e.g., ranchers in eastern Sarasota County) about protection and management of listed species habitats.
Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan	2000	Southwest Florida Water Management District	Improve the environmental integrity of the Charlotte Harbor study area.	Where practical, identify and remove areas of heavy invasive exotic vegetation from the Charlotte Harbor NEP study area.	Implement restoration master plan for Alligator Creek
					Restore Amberjack Slough.
					Restore Lemon Bay Park.
					Continue various other restoration projects.
				Enhance fish and wildlife habitat along shorelines, including canals, lakes, riverine systems, and artificial water bodies	Develop a water and nutrient budget for Lake Hancock for water quality improvement.
					Implement restoration Plan for Alligator Creek.
					Restore Amberjack Slough.
					Restore Lemon Bay Park.
					Continue various other restoration projects.
			Preserve, restore, and enhance seagrass beds, coastal wetlands, barrier beaches, and functionally related uplands.	Restore freshwater and estuarine wetland areas, especially those adversely impacted by ditching	Implement restoration Plan for Alligator Creek.
					Restore Amberjack Slough.
					Restore Lemon Bay Park.
					Continue various other restoration projects.
				Bring environmentally sensitive land under protection through ownership and/or management, and expand conservation areas, reserves, and preserves	Continue ongoing land acquisition/conservation easement activities.
				Acquire lands to increase wildlife habitat currently privately held within large, undeveloped, platted areas	Continue ongoing land acquisition/conservation easement activities.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Natural Systems					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Nonpoint Source Model Development and Basin Management Strategies for Lemon Bay	2004	Southwest Florida Water Management District	To reduce nonpoint source loadings from the Lemon Bay watershed to Lemon Bay.	Implement Hydrologic Restoration Program to restore freshwater systems that have been altered through manmade drainage activities to restore freshwater flows to estuary systems, enhance floodplain storage, and improve surface water quality through increased residence time in restored freshwater systems.	Alligator Creek Restoration. Forked Creek Western Branch Restoration Site. Forked Creek Eastern Branch Restoration Site. Manasota Key Restoration Site. Gottfried Creek Restoration Site. River Road Wetland Restoration Site. Ainger Creek Restoration.
Comprehensive Conservation and Management Plan (CCMP)	2007	Charlotte Harbor National Estuary Program	Improve the environmental integrity of the Charlotte Harbor study area.	FW-1: Meet the stated objectives for the target extent, location, and quality of the following habitats in the CHNEP study area: submerged aquatic vegetation (SAV), submerged and intertidal unvegetated habitats, mangroves, saltwater marsh, freshwater wetland systems, oyster bars, native upland communities, and water column.	FW-A: Develop methods to enhance seagrass recovery from prop scarring.
			Preserve, restore, and enhance sea grass beds, coastal wetlands, barrier beaches, and functionally related uplands.		FW-B: Ensure navigation programs protect the CHNEP study area habitat resources.
			Reduce the severity, extent, duration, and frequency of harmful algal blooms (HABs), including red tide.		FW-C: Restore freshwater and estuarine wetland areas, especially those adversely impacted by ditching, using the following methods: backfilling of ditches, removal of spoil piles, elimination of exotic vegetation and other techniques.
			Conserve and preserve sensitive lands to protect habitat.		FW-D: Enhance fish and wildlife habitat along shorelines, including canals, lakes, riverine systems, and artificial waterways.
			Stop new infestations of exotic pest plants and exotic nuisance animals and bring current infestations to manageable levels.		FW-E: Assess the impacts of canal/lake management activities on fish and wildlife.
					FW-F: Restore and protect a balance of native plant and animal communities.
					FW-G: Provide additional support for environmental compliance and enforcement on land and water. Ensure uniform compliance and enforcement of environmental regulations and permitting criteria.
					FW-O: Provide multifaceted environmentally responsible boater education programs.
					FW-P: Support public involvement programs in habitat and wildlife issues.
			Address fish and wildlife habitat loss, such as degradation and elimination of headwater streams and other habitats caused by development, conversion of natural shorelines, cumulative impacts of docks and boats, invasion of exotic species, and cumulative and future impacts.	FW-2: By 2025, achieve a 100 percent increase in conservation, preservation, and stewardship lands within the boundaries of the CHNEP study area. The increase will be based upon 1998 acreage of existing conservation, preservation, and stewardship lands.	FW-H: Bring environmentally sensitive land under protection through ownership and/or management and expand conservation areas, reserves and preserves, including undeveloped platted lots.
					FW-I: Advocate land acquisition and conservation easement programs.
					FW-J: Provide information on the economic, social, and environmental benefits of protected land.
					FW-K: Acquire as much of Babcock Ranch as possible for public stewardship and promote conservation management of the entire ranch.
					FW-P: Support public involvement programs in habitat and wildlife issues.
				FW-3: By 2020, on conservation, preservation, stewardship and other public lands achieve controllable levels of invasive exotic plants, as defined by the Florida Exotic Pest Plant Council, and exotic nuisance animals, as defined by the Florida Fish and Wildlife Conservation Commission.	FW-L: Where practical, identify and remove areas of heavy invasive exotic vegetation and exotic nuisance animals.
					FW-M: Promote local programs to research and eliminate nuisance exotic animal species.
					FW-N: Provide education programs on the impacts of invasive exotic plants and exotic nuisance animals.
			Address hydrologic alterations, which cause adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.	HA-1: By 2015, identify, establish, and maintain a more natural seasonal variation (annual hydrograph) in freshwater flows for Caloosahatchee River, Peace River and its tributaries, Myakka River with special attention to Flatford Swamp and Tatum Sawgrass, Estero Bay and its tributaries.	HA-A: Develop a historic and current estuarine mixing model, focusing on salinity, indicator species that are sensitive to salinity changes, and better evaluate proposed capital and operations projects.
					HA-C: Protect headwater tributaries from elimination and restore these tributary courses and their floodplains where opportunities exist.
					HA-D: Set and achieve minimum aquifer levels. Reduce the rate of saltwater intrusion of the Floridan aquifer.
					HA-E: Establish minimum flows and levels (MFLs).
					HA-F: Participate in Everglades restoration and the Southwest Florida Feasibility Study.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.
				HA-2: By 2020, restore, enhance, and improve, where practical, historic watershed boundaries and natural hydrology for watersheds within the CHNEP study area, with special attention to Outstanding Florida Waters and Class I water bodies.	HA-F: Participate in Everglades restoration and the Southwest Florida Feasibility Study.
					HA-G: Reestablish hydrologic watersheds to contribute flows to their historic receiving water bodies.
					HA-H: Identify natural, existing, and target water budgets for each watershed.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Natural Systems

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Comprehensive Conservation and Management Plan (CCMP)	2007	Charlotte Harbor National Estuary Program	Address hydrologic alterations, which cause adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.	HA-3: By 2020, enhance and improve to more natural hydrologic conditions water bodies affected by artificially created structures throughout the CHNEP study area. Reduce negative hydrologic effects of artificially created structures such as weirs, causeways, dams, clay settling areas, and new reservoirs.	HA-F: Participate in Everglades restoration and the Southwest Florida Feasibility Study. HA-I: Evaluate the impacts of man-made barriers to historic flows. HA-J: Build and restore water conveyances to have shallow, broad, vegetated and serpentine components that also restore floodplains. HA-K: Identify the hydrologic and environmental impacts of surface water reservoirs on estuaries within the watershed. HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation and water use.
				HA-4: By 2010, for each watershed, identify the linkages between local, water management district, state and federal government development permitting, and capital programs affecting water storage, flood control, and water quality. By 2012, identify and recommend reforms through tools such	HA-L: Encourage the use of low-impact techniques in new and old developments. HA-N: Implement watershed initiative projects to address hydrologic alterations, loss of water storage, changed hydroperiod and improve water quality. HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation and water use.
Tidal Creek Condition Index for Coastal Streams in Sarasota County, Florida	2006	Mote Marine Laboratory	Develop an index for use by county government in tracking the biological health of tidal creeks.		A refined index should be field tested in the 2007 dry season. The index should conserve all of the metrics tested in 2006, for both intertidal and subtidal settings. The density (O.D.) crustaceans and mollusks from coarsely sieved benthic samples should be added as a new metric. The effects of sample size and replication should be determined for metrics of interest. Improvements in site selection should be sought. While most sites are representative, some could be relocated to avoid problems encountered in 2006. A decision is needed regarding the use of bay sites for highly altered or unsafe creeks. The 2007 report will produce consistent, robust data set that should be thoroughly analyzed with respect to alternative methods of rectification, aggregation, and index normalization. Then, creek index scores should be compared to as many independent systems of watershed and creek conditions as may be available. A workshop should be held to address: (1) Whether, or how, the creek index can be incorporated into a watershed or stream "report card" by which the county can track overall environmental conditions along the coast, and (2) The question of other season sampling needs to be resolved. The behavior of the index during a wet season is presently unknown, and whether it should be evaluated in 2007 will depend on Sarasota County expectations for the index's future use. For example, an index based on periodic dry-season sampling may not be useful as an immediate response to a catastrophic pollution event during a wet season.
Lemon Bay Interagency Comprehensive Watershed Management Plan	2004	Lemon Bay League	To enhance, protect, and conserve the hydrologic and ecologic functions of natural systems including estuaries, freshwater, and groundwater systems.	Determine and restore more natural hydrologic regimes to our natural water systems.	Development of watershed budgets. Aquifer storage and recovery feasibility study. Hydrologic restoration program. Stormwater conservation and reuse program. Conversion of wastewater treatment plants to stormwater treatment plants.
				Protect and restore ecological habitat.	Hydrologic restoration program. Conservation of effluent ponds to stormwater management systems.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Quality

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Sarasota County Comprehensive Plan	2006	Sarasota County Planning Department	Sanitary sewer service shall be provided to Sarasota County residents through the continual evolution of a centralized regional wastewater collection and treatment system, and shall be provided in a safe, clean, efficient, economical, and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 1) Sarasota County shall provide programs which enhance water quality where appropriate (Chapter 4, Water Goal 2)	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.
Forked Creek Basin Master Plan	1996	Sarasota County Stormwater Environmental Utility	Meet water quality goals as stated in the Sarasota County Comprehensive Plan.	Implement projects to address both the flood control and water quality LOS.	F-2: Construct an approximately 400 ft channel, 12 ft wide with 3:1 side slopes along 5th Street to connect the existing wetland systems F-6: Improve channel and clear and snag 1,200 ft long creek segment from Manasota Beach Road to existing driveway. Design improvements as a longitudinal wetland/slough with 3:1 side slopes to obtain water quality benefits. F-7: Acquire and improve existing 3 acre wetland. F-8: Clear and snag about 700 ft of channel from previous location to an existing 0.25 acre adjacent wetland area downstream. F-10: Reconstruct about 300 ft of creek channel upstream from a private driveway located approximately 500 ft upstream from SR 776 crossing. Design the system as a longitudinal wetland/slough with 3:1 side slopes to obtain water quality benefits. Provide for erosion control at selected locations along the creek. Sides with slopes steeper than 3:1 should be protected with erosion control materials. F-13: Improve about 1,500 ft of creek channel in the Whispering Pines area by reshaping the creek banks to a 3:1 slope or a 2:1 slope with protected side slopes. Stabilize creek banks in areas where existing structures are located. Design project as a longitudinal wetland/slough to obtain water quality benefits. Implement a Regional Stormwater Management Facility (RSMF) in the Forked Creek basin with its outfall located approximately 1,300 ft north of Keyway Road crossing on the creek's eastern branch.
Ainger Creek Comprehensive Basin Master Plan	1997	Sarasota County Stormwater Environmental Utility	To identify existing and future Level of Service deficiencies with respect to water quality.	Implement alternatives to address water quality LOS deficiencies.	Coordinate with landowner and Sarasota County's Environmentally Sensitive Lands Program to protect the Ainger Creek floodplain. Restore water level control structure located just within North Port city limits on SWFWMD property. Construct a minimum 50 acre regional stormwater facility. Maintain existing systems.
Gottfried Creek Basin Master Plan	1996	Sarasota County Stormwater Environmental Utility	To evaluate the existing and future water quality LOS and identify the best management practices required to control stormwater pollution.	Implement projects to address water quality LOS deficiencies.	G-7: Regional water quality facility. Clear, snag, and remove existing spoil berms along the creek banks between the confluence of the main branch with the Englewood lateral and the Park Forest bridge. Place diversion structures to route flows through adjacent wetlands for water quality treatment. (Englewood Lateral Improvement) G-9: Proposed future regional detention facility: It will cover about 60 acres of currently undeveloped land north of an existing Englewood lateral weir structure. (Englewood Lateral Improvement) G-12: Construct stormwater detention facility approximately 1,300 ft downstream from the existing WENG Radio culvert in the Ainger Creek basin. (South River Road Improvement)

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Quality					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Nonpoint Source Model Development and Basin Management Strategies for Lemon Bay	2004	Southwest Florida Water Management District	To reduce nonpoint source loadings from the Lemon Bay watershed to Lemon Bay.	Implement Hydrologic Restoration Program to restore freshwater systems that have been altered through manmade drainage activities to restore freshwater flows to estuary systems, enhance floodplain storage, and improve surface water quality through increased residence time in restored freshwater systems.	Alligator Creek Restoration.
					Forked Creek Western Branch Restoration Site
					Forked Creek Eastern Branch Restoration Site
					Manasota Key Restoration Site
					Gottfried Creek Restoration Site
					River Road Wetland Restoration Site
					Ainger Creek Restoration
				Conversion of effluent ponds to stormwater management systems to eliminate wastewater discharge and improve stormwater quality.	Florida Pines MHP
					Japanese Gardens MHP
					Polynesian Village MHP
					Englewood Utility
				Conversion of wastewater treatment plants to stormwater treatment plants to reduce stormwater pollutant loads and excess volumes to bays and also to provide beneficial irrigation uses.	Venice Gardens WRF
					Plantation
Southern Coastal Comprehensive Watershed Management Plan	2000	Southwest Florida Water Management District	To protect water quality by preventing further degradation of the water resource and enhancing water quality where appropriate.	Strategy: Continue ongoing monitoring and data management activities in Sarasota and Manatee Counties.	Through the District's cooperative funding program, determine those water quality monitoring programs in need of support and/or enhancement though the use of District staff and/or funding.
					Through the District's cooperative funding program, continue to support efforts focused on determining the status and trends (if any) in water quality.
				Strategy: Expand ongoing monitoring and data management activities into Charlotte County.	Through the District's cooperative funding program, and in coordination with the Charlotte Harbor NEP, develop a coordinated water quality monitoring program for Lemon Bay and Gasparilla Sound.
				Strategy: Determine the potential ecological consequences associated with further development of the Lemon Bay watershed.	In coordination with the Charlotte Harbor NEP and the SWIM Program, develop a detailed pollutant loading model for Lemon Bay, with special attention paid to generating potential scenarios associated with increased nitrogen loads into Lemon Bay.
				Strategy: Better understand the ecological impacts of present-day flood control practices in Cow Pen Slough, and determine the potential for utilizing high flows as a supplement to potable and/or non-potable water supplies in Sarasota County.	Through the District's cooperative funding program, and in coordination with the Charlotte Harbor NEP and the SWIM Program, develop a detailed hydrologic model of Cow Pen Slough, Shakett Creek, and Dona and Roberts Bays to better understand the ecological impacts of present-day flood control practices.
				Strategy: Reduce wastewater-related point and non-point source pollutant loads to the freshwater and estuarine waters of the Southern Coastal Watershed.	Support local governments in their efforts to require wastewater treatment policies consistent with either nutrient removal technology, or advanced secondary treatment with effective reuse.
					Develop a multi-county wastewater reclamation program to minimize the discharge of treated wastewater to the freshwater and estuarine waters of the Southern Coastal Watershed.
				Strategy: Reduce stormwater-related non-point source pollutant loads to the freshwater and estuarine waters of the Southern Coastal Watershed.	Promote pollution prevention through improved landscape design and maintenance of residential areas.
					Continue ongoing efforts to implement the Sarasota Bay NEP's "Florida Yards and Neighborhoods Program."
					Develop and implement stormwater management master plans for tributaries identified as "hot spots" for toxic and/or sediment loadings.
					Continue ongoing efforts to maintain stormwater management and treatment systems for maximum efficiency in reducing pollutant loads.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Quality

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Charlotte Harbor Surface Water Improvement and Management (SWIM) Plan	2000	Southwest Florida Water Management District	Reduce point and non-point sources of pollution to attain desired use of the estuary.	Identify gaps in water quality data needed to calibrate the appropriate models used to determine Total Maximum Daily Load (TMDL) limits; coordinate monitoring programs; and implement programs to fill data gaps for TMDLs.	Develop a linked nutrient budget and water quality model for Lemon Bay.
					Develop a resource-based pollutant load reduction goal for Charlotte Harbor "Proper."
					Continue the existing short-term water quality monitoring program.
					Implement the long-term water quality monitoring program.
					Continue seagrass mapping efforts.
				Install or retrofit best management practices (BMPs) to maintain or improve water quality.	Develop a linked nutrient budget and water quality model for Lemon Bay.
					Develop a resource-based pollutant load reduction goal for Charlotte Harbor "Proper."
					Implement the Canal Water Quality Enhancement Project.
					Develop and implement water quality improvement projects, as appropriate.
			Provide the proper fresh water inflow to the estuary to ensure a balanced and productive ecosystem.	Establish and implement minimum flows for tributaries as detailed within the draft CCMP. Determine maximum cumulative withdrawals.	Establish minimum flows for the Upper Peace River by 2001.
					Establish minimum flows for the Middle and Lower Peace River (including Shell, Horse, and Joshua Creeks) between 2002 and 2005.
					Establish minimum flows for the Myakka River between 2011 and 2015.
					Continue efforts to reduce excessive dry season flows in the Upper Myakka River.
					Assess the potential for hydrologic restoration of Cow Pen Slough.
				Reestablish, where practical, surface flows from sub-basins that do not currently contribute to their historic hydrologic connections.	Assess the potential for hydrologic restoration of identified sub-basins.
				Where possible, and practical, restore groundwater levels to historic seasonal mean levels.	Establish minimum flows for the Upper Peace River by 2001.
					Establish minimum flows for the Middle and Lower Peace River (including Shell, Horse and, Joshua Creeks) between 2002 and 2005.
				Evaluate potential alternatives to modification and/or removal of the structure at the southern end of Lake Hancock.	Establish minimum flows for the Upper Peace River by 2001.
					Develop a water and nutrient budget for Lake Hancock for water quality improvement.
Comprehensive Conservation and Management Plan (CCMP)	2007	Charlotte Harbor National Estuary Program	Reduce point and non-point sources of pollution to attain desired uses of the estuary.	WQ-1: Maintain or improve water quality from year 2000 levels. By 2011, bring all impaired water bodies into a watershed management program such as Reasonable Assurance or Basin Management Action Plan. Remove at least two water bodies from the impaired list by improving water quality by 2015.	WQ-A: Participate in 303(d) Total Maximum Daily Load (TMDL), Reasonable Assurance and Basin Management Action Plan (BMAP) development and implementation.
					WQ-B: Identify gaps in water quality data needed to calibrate the appropriate models used to assess impairments, determine total maximum daily load (TMDL) limits and develop basin management action plans (BMAP). Coordinate monitoring programs and implement programs to fill data gaps for impairment assessments, TMDLs, and BMAPs.
			Address water quality degradation, including but not limited to pollution from agricultural and urban runoff, point source discharges, septic tank system loadings, atmospheric deposition, and groundwater.		WQ-C: Develop integrated ground and surface water quality and pollutant loading models.
					WQ-D: Reduce nonpoint-source pollutants associated with stormwater runoff. Install or retrofit best management practices (BMP) to maintain or improve water quality and flows.
					WQ-E: Implement projects to restore or protect water quality to offset anthropogenic impacts.
					WQ-F: Promote conservation, stormwater and intergovernmental coordination within local comprehensive plans to prevent the impacts of increasing levels of impervious surface and fill to achieve either a neutral impact on water quality and loss of groundwater and surface water storage, or achieve restoration, based upon the condition of the receiving waters.
					WQ-K: Implement the Florida Yards and Neighborhoods program and similar Florida-friendly plant programs throughout the CHNEP study area.
					WQ-L: Increase the use of personal and home best management practices by consumers throughout the watershed to reduce nonpoint-source pollution.
					WQ-M: Support public involvement programs addressing water quality issues.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Quality

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Comprehensive Conservation and Management Plan (CCMP)	2007	Charlotte Harbor National Estuary Program	Address water quality degradation, including but not limited to pollution from agricultural and urban runoff, point source discharges, septic tank system loadings, atmospheric deposition, and groundwater.	WQ-2: By 2015, develop and meet site-specific alternative criteria that are protective of living resources for dissolved oxygen, chlorophyll a, turbidity/total suspended solids, salinity and pesticides.	WQ-G: Develop site-specific criteria for dissolved oxygen, chlorophyll a, turbidity/total suspended solids, salinity and pesticides as applicable.
					WQ-H: Assess the bacteria, nutrient load, and base flow impacts of septic tank systems, wastewater treatment plants, and reuse water. Recommend effective corrective action.
					WQ-M: Support public involvement programs addressing water quality issues.
				WQ-3: By 2025, reduce severity, extent, duration, and frequency of harmful algal blooms (HABs), including macro-algae, phytoplankton, and periphyton, through the identification and reduction of anthropogenic influences.	WQ-I: Determine the relationship between macro and micronutrients and phytoplankton/algal blooms.
					WQ-M: Support public involvement programs addressing water quality issues.
				WQ-4: By 2025, meet shellfish harvesting standards year round for the Myakka River conditionally restricted area and the conditionally approved areas of Lemon Bay, Gasparilla Sound, Myakka River, Pine Island Sound Western Section, and Pine Island Sound eastern section.	WQ-J: Provide central sanitary sewers to developed areas within 900 feet of waters such as estuarine shorelines, rivers, creeks, canals, and lakes.
					WQ-H: Assess the bacteria, nutrient load and base flow impacts of septic tank systems, wastewater treatment plants, and reuse water. Recommend effective corrective action.
					WQ-M: Support public involvement programs addressing water quality issues.
			Address hydrologic alterations, which cause adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.	HA-1: By 2015, identify, establish, and maintain a more natural seasonal variation (annual hydrograph) in freshwater flows for Caloosahatchee River, Peace River and its tributaries, Myakka River with special attention to Flatford Swamp and Tatum Sawgrass, Estero Bay and its tributaries.	HA-A: Develop a historic and current estuarine mixing model, focusing on salinity, indicator species that are sensitive to salinity changes, and better evaluate proposed capital and operations projects.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.
				HA-2: By 2020, restore, enhance, and improve where practical historic watershed boundaries and natural hydrology for watersheds within the CHNEP study area, with special attention to Outstanding Florida Waters and Class I water bodies.	HA-G: Reestablish hydrologic watersheds to contribute flows to their historic receiving water bodies.
					HA-H: Identify natural, existing, and target water budgets for each watershed.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.
				HA-3: By 2020, enhance and improve to more natural hydrologic conditions water bodies affected by artificially created structures throughout the CHNEP study area. Reduce negative hydrologic effects of artificially created structures such as weirs, causeways, dams, clay settling areas, and new reservoirs.	HA-J: Build and restore water conveyances to have shallow, broad, vegetated, and serpentine components that also restore floodplains.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation and water use.
				HA-4: By 2010, for each watershed, identify the linkages between local, water management district, state and federal government development permitting, and capital programs affecting water storage, flood control, and water quality. By 2012, identify and recommend reforms through tools such as comprehensive watershed management plans. By 2015, implement the reforms.	HA-L: Encourage the use of low-impact techniques in new and old developments.
					HA-M: Limit big-pulsed release events.
					HA-N: Implement watershed initiative projects to address hydrologic alterations, loss of water storage, changed hydroperiod and improve water quality.
					HA-O: Encourage, expand and develop incentives for the reuse of waters that are protective of water quality and natural hydrology.
					HA-P: Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation and water use.
Lemon Bay Interagency Comprehensive Watershed Management Plan	2004	Lemon Bay League	To protect water quality by preventing further degradation of the water resource and enhancing water quality where appropriate.	Protect and improve surface water quality.	Water quality sampling of creek systems.
					Biological characterization of tidal creek systems.
					Hydrologic restoration program.
					Sediment management program.
					Stormwater conservation and reuse program.
					Conservation of effluent ponds to stormwater management systems.
					Conversion of wastewater treatment plants to stormwater treatment plants.
					Biosolids handling initiative.
					Lemon Bay water quality monitoring.
				Protect groundwater quality.	Intermediate aquifer monitoring program.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Supply					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Sarasota County Comprehensive Plan	2006	Sarasota County Planning Department	Potable water service shall be provided to Sarasota County residents through the continual evolution of a centralized regional supply, treatment, and distribution system, and shall be provided in a safe, efficient, economical, sustainable and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 3)	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.
			Sarasota County shall provide programs to ensure safe, efficient, economical, and sustainable water supplies that provides customers the appropriate water quality for the intended use. (Chapter 4, Water Goal 2)	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.	See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.
Southern Coastal Comprehensive Watershed Management Plan	2000	Southwest Florida Water Management District	To ensure an adequate supply of the water resource for all reasonable and beneficial uses, now and in the future, while protecting and maintaining the water and related resources of the District.	Strategy: Seek inclusion of water resource/land use planning as a consistency requirement for Local Government Comprehensive Plans.	Use the District's Needs and Sources report as the source document for water supply availability.
					Include land use and water resource planning consistency as part of the District's 1999 legislative agenda.
					Seek opportunities to enhance linkages between the District and local governments as they relate to water resources and land use planning.
				Strategy: Improve coordination between land and water planners	Increase District involvement with the Tampa Bay and Southwest Florida Regional Planning Councils and local government planning departments.
					Develop an annual report summarizing the status of water supply, water resources, and new regulations for distribution to local land use planners and others.
					Develop procedures with local governments so that District input becomes part of government decisions on land use planning.
					Coordinate five-year planning documents, such as Comprehensive Plan updates and Basin Plans, on the same time frame.
				Strategy: Promote conservation and reuse.	Continue existing conservation programs and reuse system expansion.
					Continue interconnection and regionalization of reuse systems, where cost-effective, to improve efficiency and increase reclaimed water utilization.
					Investigate opportunities to develop reuse systems in new areas.
					Continue current funding levels and the associated programs and regulatory requirements for conservation and reuse.
					Investigate financial incentives to offset the costs of industrial and commercial reuse and conservation programs.
					Recognize and reward industries and other entities who have strong conservation and/or reuse programs.
					Develop pilot projects for stormwater reuse.
					Increase public awareness of the environmental costs of water use.
				Strategy: Improve compliance with water shortage restrictions and year-round conservation measures.	Educate the public on how year-round water conservation measures and water shortage restrictions affect them.
					When noticing adjacent property owners regarding water use permits, mention any water shortage restrictions included in the permit. For example, in noticing nearby homeowners when golf courses are issued water use permits, homeowners could be informed regarding the allowable golf course irrigation schedules and could assist in ensuring their compliance with water shortage restrictions.
					Coordinate with local governments to identify means of enforcing watering restrictions.
				Strategy: Develop alternative water sources.	Continue New Water Sources Initiative and Cooperative Funding Program to assist local governments in developing alternative supplies. Include alternative sources as a primary component of water supply plans.
					Continue regulatory requirements/incentives for alternative water sources.
					Optimize use of aquifer storage and recovery for reclaimed and surface water sources.
				Strategy: Adopt aquifer levels for the intermediate aquifer to establish limits on withdrawals that will not cause significant harm to the water resources or the ecology of the area.	Collect and evaluate hydrologic and ecological information necessary to establish minimum levels ground water for the Intermediate aquifer.
					Adopt minimum ground water levels for the Intermediate aquifer.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Water Supply					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
SWUCA Recovery Strategy	2006	Southwest Florida Water Management District	Reduce the rate of saltwater intrusion in coastal Hillsborough, Manatee and Sarasota counties by achieving the proposed minimum aquifer level for saltwater intrusion by 2025; once achieved, future efforts should seek further reductions in the rate of saltwater intrusion and the ultimate stabilization of the saltwater-freshwater interface		Resource monitoring, reporting and cumulative impact analysis
			Ensure that there are sufficient water supplies for all existing and projected reasonable beneficial uses.		Development and implementation of water resource development projects that will restore historically last lake and floodplain storage
					Provide financial incentives to encourage conservation and development of alternative supplies to ensure consistency with the Recovery Strategy
					Enhancements to existing rules
					Use of existing rules to effectively contribute to the Recovery Strategy
					Development of a regional water supply plan to achieve effective water management
Comprehensive Conservation and Management Plan (CCMP)	2008	Charlotte Harbor National Estuary Program	Address hydrologic alterations, which cause adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.	By 2015, identify, establish and maintain a more natural seasonal variation (annual hydrograph) in freshwater flows for Caloosahatchee River, Peace River and its tributaries, Myakka River with special attention to Flatford Swamp and Tatum Sawgrass, Estero Bay and its tributaries.	Identify gaps in flow data based on ecosystem needs and projected needs for water withdrawals due to population growth, development, agriculture, and mining. Implement data collection to address these gaps.
					Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.
				By 2010, for each watershed, identify the linkages between local, water management district, state and federal government development permitting and capital programs affecting water storage, flood control and water quality. By 2012, identify and recommend reforms through tools such as comprehensive watershed management plans. By 2015,	Encourage, expand, and develop incentives for the reuse of waters that are protective of water quality and natural hydrology.
					Support public involvement programs addressing watershed management issues of hydrology, water resource issues, water conservation, and water use.
Lemon Bay Interagency Comprehensive Watershed Management Plan	2004	Lemon Bay League	To ensure safe, efficient, economical, and sustainable water supplies that provide customers the appropriate water quality for the intended use	Evaluate future water needs and the capacity of existing supplies.	
				Identify and evaluate future water supply options.	Aquifer storage and recovery feasibility study.
					Stormwater conservation and reuse program.
					Conversion of wastewater treatment plants to stormwater treatment plants.
				Optimize water use efficiency and supply sustainability.	Aquifer storage and recovery feasibility study.
					Intermediate aquifer monitoring program.
					Stormwater conservation and reuse program.
					Conversion of wastewater treatment plants to stormwater treatment plants.
				Establish sound business practices to optimize the financial sustainability of water.	Conservation of effluent ponds to stormwater management systems.
					Conversion of wastewater treatment plants to stormwater treatment plants.
					Biosolids handling initiative.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Flooding

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Sarasota County Comprehensive Plan	2006	Sarasota County Planning Department	Sarasota County shall provide programs which prevent and mitigate the losses, cost, and human suffering caused by flooding; protect natural and beneficial functions of the floodplain (Chapter 4, Water Goal 2)		See Sarasota County Comprehensive Plan Summary following watershed Areas of Responsibility Summarys of Previous Goals and Objectives.
Alligator Creek Flood Protection Improvement Plan	2002	Sarasota County Stormwater Environmental Utility	To provide Sarasota County Stormwater with a tool to help determine and prioritize the flood protection capital improvements.	Implement projects that meet the LOS criteria in a cost effective manner.	2.1: Scenic Drive- Outfall to Intracoastal Waterway. 3.1: Culverts under Banyan Drive and storage in 150' ROW. 4.2: Briarwood Area conveyance improvements. 5.3: Bal Harbour/Shamrock Boulevard drainage improvements. 7.3: Quail Lake/Venice East Boulevard interconnect culvert. 8.1: Venice East Boulevard 5.5'x9.0' box culvert.
Gottfried Creek Basin Master Plan	1996	Sarasota County Stormwater Environmental Utility	To evaluate the existing and future flood control LOS in the basin and identify stormwater drainage improvements required to meet the existing and projected LOS.	Implement projects to address water quality LOS deficiencies.	G-1: Remove existing culvert and improve approximately 300 ft of existing ditch upstream of Viridian Street. (Englewood Lateral Improvement) G-2: Replace existing culvert across Elm Street with double 54 inch culverts. Eliminate culvert located about 50 ft east of Elm Street crossing. Restore about 250 ft of ditch cross section. (Englewood Lateral Improvement) G-3: Coordinate with FDOT to replace culverts on the north SR 776 crossing downstream from the Viridian Street pond with triple 60 inch RCPs. Replace existing culverts across the Florida Power easement with double 54 inch pipes. (Englewood Lateral Improvement) G-4: Clear and sang approximately 250 ft of existing ditch in the Artist Avenue area. Maintain existing culvert. (Englewood Lateral Improvement) G-6: Remove erosion deposits and provide erosion protection in about 700 ft of creek channel. Regrade banks to a 3:1 slope. (Englewood Lateral Improvement) G-8: Replace culverts across Florida Power easement with double 72 inch pipes. (Englewood Lateral Improvement) G-10: Maintain culvert across River Road. (South River Road Improvement) G-11: Replace about 300 linear ft of existing 29"x45" culvert. (South River Road Improvement)
Ainger Creek Comprehensive Basin Master Plan	1997	Sarasota County Stormwater Environmental Utility	To identify existing and future Level of Service deficiencies with respect to flood protection and establish a Stormwater Improvement Program and/or basin specific design criteria.	Implement alternatives to address water quality LOS deficiencies.	Improve outfall from Englewood Hospital to Ainger Creek Main by replacing twin 24"x38" ERCP culverts with twin 38"x60" ERCP culverts. Acquire additional real property rights to secure drainage maintenance for Englewood Hospital outfall. Coordinate with property owners in unplatted subdivision, located just east of North Port and just north of Charlotte County, and SWFWMD to restore north/south drainage ditch to Ainger Creek Main. Coordinate with landowner and Sarasota County's Environmentally Sensitive Lands Program to protect the Ainger Creek floodplain. Construct an overflow swale from Morningside Drive along the east side of Englewood Hospital. Acquire additional real property rights for overflow swale. Replace 24" CMP culvert at Morningside Drive with twin 29"x45" ERCP culverts. Replace 30"x54" CMPA culvert at Morningside Drive with twin 42" RCP culverts. Acquire real property rights for downstream segments of Englewood Farm Acres Lateral(s). Construct a swale in the existing public drainage easement located along the north side of Lots 1 through 5 and the east side of Lots 5 through 7 in Englewood Farms Acres subdivision. Construct culvert under Buckskin Court and tie into existing drainage system to the south. Construct a minimum 50 acre regional stormwater facility. Implement Ordinance No. 93-059.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Flooding

Plan	Year	Agency	Goal	Objective / Strategy	Recommendations
Forked Creek Basin Master Plan	1996	Sarasota County Stormwater Environmental Utility	To meet goals as stated in the Sarasota County Comprehensive Plan.	Implement projects to address both the flood control and water quality LOS.	F-1: Improve facilities to prevent localized flooding in the area around Franklin Street (various localized projects).
					F-3: Acquire easements and clear and snag 2,400 ft of existing channels from Manasota Beach Road to Overbrook Road.
					F-4: Install double 30 inch culverts at the inflow of the Overbrook Road pond. Add an additional 30 inch culvert at the outflow.
					F-5: Construct 1,500 ft drainage ditch along Manasota Beach Road and improve existing culverts to double 24 ft RCP.
					F-9: Clear and snag approximately 800 ft of creek channel downstream from wetland area.
					F-11: Clear and snag approximately 500 ft of creek channel immediately upstream from Dale Lake (SR 776 crossing).
					F-12: Clear and snag about 1,000 ft of channel downstream from the Keyway Road culvert. Remove spoil berms where feasible.
					F-14: Clear and snag about 300 ft of channel. Provide erosion protection on the creek banks.
					F-15: Provide erosion protection on the 800 ft segment of the creek channel along the Brook to Bay Trailer Ranch.
					F-16: Provide bank erosion control in secondary channel that runs along the south side of Almeda Isles subdivision.
					F-17: Provide bank erosion control in main channel downstream from the Dale Lake outfall.
Woodmere Creek Basin Master Plan	1999	Sarasota County Stormwater Environmental Utility	To identify existing and future flood protection Level of Service (LOS) deficiencies throughout the Woodmere Creek basin.	Implement projects to address flood control	Area 1 Olivia Rd Flooding: Replace Heron Rd 60" RCP culvert with 8' x 12' box culvert
					Area 1 Olivia Rd Flooding: Replace Kent Rd 72" RCP with 8' x 12' box culvert
					Area 1 Olivia Rd Flooding: Replace Pompano Rd 2-60" RCP culverts with 8' x 12' box culvert
					Area 2 Hourglass Lakes and Circlewood Condos: Replace Florida Rd 2-48" RCP with 6' x 12' box culvert
					Area 2 Hourglass Lakes and Circlewood Condos: Replace Englewood Rd 236" RCP with 2-60" RCP
					Area 2 Hourglass Lakes and Circlewood Condos: Regrade 1200' of channel from Englewood Rd to pond outfall and excavate lower pond banks for two ponds in Hourglass Lakes and Circlewood Condos
					Area 3 Japanese Gardens Mobile Home Park: Replace Heron Rd 60" RCP with 6' x 12' box culvert
					Area 3 Japanese Gardens Mobile Home Park: Replace Colonial Rd 54" RCP with 5' x 12' box culvert
					Area 3 Japanese Gardens Mobile Home Park: Replace Japanese Gardens 22" x 36" CMP outfall with a 34" x 54" ERCP and provide storm sewer outfalls to channel with new endwalls
					Area 4 Gulfview Estates: Replace Osceola Rd 24" x 38" ERCP with 54" RCP and regrade upstream channel
					Area 4 Gulfview Estates: Add new 42" RCP to existing 42" RCP at private road crossing and provide new headwalls
					Area 4 Gulview Estates: Replace Englewood Rd 30" RCP with 2-42" RCP
					Area 4 Gulview Estates: Replace Gulview Estates 2-18" RCP pond outfalls with 42" RCP and replace 2-18" RCP pond interconnections with 2-36" RCP

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Flooding					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Nonpoint Source Model Development and Basin Management Strategies for Lemon Bay	2004	Southwest Florida Water Management District	To reduce nonpoint source loadings from the Lemon Bay watershed to Lemon Bay.	Implement Hydrologic Restoration Program to restore freshwater systems that have been altered through manmade drainage activities to restore freshwater flows to estuary systems, enhance floodplain storage, and improve surface water quality through increased residence time in restored freshwater systems.	Alligator Creek Restoration. Forked Creek Western Branch Restoration Site. Forked Creek Eastern Branch Restoration Site. Manasota Key Restoration Site. Gottfried Creek Restoration Site. River Road Wetland Restoration Site. Ainger Creek Restoration.
Southern Coastal Comprehensive Watershed Management Plan	2004	Southwest Florida Water Management District	Minimize potential for damage from floods by protecting and restoring the natural water storage and conveyance functions of flood prone areas. The District shall give preference wherever possible to nonstructural surface water management methods.	Strategy: Enhance flood protection data collection and management.	Develop a data management system with appropriate standards to provide the information required to define the flood prone areas. Provide the requirements necessary, in an ARC/INFO based GIS format, to allow the transfer and formulation of input and output data from numerical models to a GIS. This will support further data development for other predictive models (i.e., water quantity, water quality, ground water, natural systems). It will also provide access to the data and modeling results for regulation within the watershed. Encourage the development of data transfer tools by the developers of stormwater management software. The goal is to have software with the capability to transfer the input data and output results to SWFWMD standards or to translate the information to data formats used by other stormwater management software and GIS. Use of data management tools to update the database through the regulatory process by requiring Environmental Resource Permit (ERP) submittals to include the data in the District's data standards. Perform aerial mapping with contour information (paper and digital formats) for areas in the watershed that have no such information or outdated information. Promote cooperative agreements to build data collection responsibilities based on need and the capabilities of the agency (FEMA, SWFWMD, Counties, Cities). Levels of Service (LOS) objectives should be set within project areas. These LOSs could be based on 25-year or 100-year, 24-hour events, and the number of homes affected, and length and classification of impacted roads, etc. could be used to develop a decision support matrix to evaluate the merits of multiple projects.
				Strategy: Obtain additional floodplain information.	Perform flood studies on unstudied areas. Set priorities based on current development pressures. Set priorities based on historic flooding problems.
				Strategy: Address increased runoff volume due to development.	Require modeling of current tailwater conditions and impacts of upstream volumes and timing on a site proposed stormwater management system and the proposed systems receiving water for stormwater management system permits. Permit applications should require "critical event" analysis. Promote the reuse of stormwater for non-potable water uses to increase storage in flood prone areas in stormwater management system applications.
				Strategy: Effective regulation and management of floodplain functions.	Ensure that regulations are enforced. That is, lands necessary for the provision of compensatory storage should be available when needed, systems should be designed to accommodate flooding during extreme events, and such systems should not increase the level of flood waters either upstream or downstream of the site. Regulations should require conservative estimates of seasonal high groundwater elevations when determining the amount of compensating storage for encroachment into the floodplain. During permitting, consider cumulative impacts of increased runoff volume in the watershed. Include inspection of stormwater management systems for integrity of impoundments, embankments, and other components of the system in current enforcement and inspection programs.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Flooding					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Southern Coastal Comprehensive Watershed Management Plan	2004	Southwest Florida Water Management District	Minimize potential for damage from floods by protecting and restoring the natural water storage and conveyance functions of flood prone areas. The District shall give preference wherever possible to nonstructural surface water management methods.	Strategy: Link water resource planning and land use planning.	Encourage local governments to establish levels of service for current (present) and targeted (build-out) conditions for the watershed's stormwater management infrastructure facilities for flood protection using methods developed by the Stormwater Level of Service (LOS) Conventions Committee.
					Assist local governments in using LOS criteria in their comprehensive plans to measure the watershed's current flood management capacity. Cooperate with FOOT and local governments on the design of roads. The roads should be designed to meet LOS. Signage programs, including flood elevation levels, could be developed to warn drivers of flooding conditions.
					Back legislation to require deeds or other documents for real estate to indicate if land is in a floodplain.
					Determine and establish appropriate setbacks from riparian systems for any structure (i.e., landward of 100-year flood plain) or some distance from 10-year flood plain or wetland boundaries.
					Coordinate with local and county governments to limit densities in floodplains.
					Encourage current open land uses (i.e., agricultural, recreational corridors) in floodplain to remain instead of land uses that allow alterations to the floodplain.
					Encourage conservation easements, green ways, and the efficient use of the required stormwater management storage, and placement of mitigation areas within existing flood prone areas.
					Promote clustering of development outside the floodplain.
					Encourage the use of density credits to cluster development outside flood plains, incentive-based regulation.
				Strategy: Adequately plan for future flood protection efforts.	Convince local governments that the entire watershed should be examined using a flood prone area analysis.
					Encourage local governments to inventory existing drainage systems.
					Encourage local governments to set goals for flood protection based on a consistent LOS policy.
					Incorporate other planning elements in the Stormwater Management Plan method, i.e., transportation, major developments of regional significance, greenway/wildlife corridors, recreation/parks, agricultural development, water supply, and environmental management.
					The Districts requirements for Stormwater Management Plans should develop a consistent framework for management throughout the watershed.
					Pursue special development codes for building construction in floodplains (i.e., no fill for house pads in floodplains, signage required for depth of flooding, etc.).
				Strategy: Determine ownership, operation and maintenance responsibilities for flood management systems.	Determine the ownership of identified stormwater management systems.
					Determine the responsible entity for operation and maintenance of identified stormwater management systems.
					Develop operation and maintenance plans for the flood management systems within the watershed. This includes developing strategies for maintaining and operating the systems, obtaining easements or ingress and egress agreements with property owners, and naming the governments or other responsible parties to complete the work.
				Strategy: Seek consistent source(s) of funding for flood management systems.	Alternatives to general revenue sources should be considered for funding of stormwater projects.
					Encourage the establishment of stormwater management utility fees.
					Encourage the establishment of special assessment districts
					Encourage contributions to regional facilities developed based on a Stormwater Management Master Plan.
					Develop an educational program implemented by the District for county and local governments that illustrate the available funding.
					Encourage cooperative projects or piggyback scenarios where many agencies contribute to a project developed through a watershed-wide study. Possibly provide credits for developers, roadway improvements (FDOT, Counties, Cities) who tie into regional projects that provide efficient stormwater quality and quantity storage, wetland mitigation, and protection of the floodplain and its function. Provide mechanisms for maintenance and operation funding.

LEMON BAY WATERSHED MANAGEMENT PLAN
Existing Goals, Objectives, and Recommendations

Flooding					
Plan	**Year**	**Agency**	**Goal**	**Objective / Strategy**	**Recommendations**
Southern Coastal Comprehensive Watershed Management Plan	2004	Southwest Florida Water Management District	Minimize potential for damage from floods by protecting and restoring the natural water storage and conveyance functions of flood prone areas. The District shall give preference wherever possible to nonstructural surface water management methods.	Strategy: Facilitate public education and understanding of flood protection are necessary in order to build support for stormwater management projects or programs that protect the natural floodplain and its function.	Educate public and elected officials that developments are often designed to flood relatively frequently (based on a probability of occurrence of a storm event), based on the level of service provided.
					Educate the public on the hydrologic cycle and its interaction with the water resource and the impacts on water use.
					Educate the public and elected officials that restricting development in the flood plain may result in significant monetary savings and enhance natural systems in the future.
					Clarify District flood protection responsibilities.
					Clarify the role of FEMA and their responsibilities and contribution to flood protection.
					Promote cooperation between the responsible jurisdictions on flood protection issues.
					Provide educational talks to technical groups.
Lemon Bay Interagency Comprehensive Watershed Management Plan	2004	Lemon Bay League	To prevent and mitigate the losses, cost, and human suffering caused by flooding; and to protect natural and beneficial functions of the floodplain.	Determine the depth and extent of area susceptible to riverine flooding.	Development of watershed budgets.
					Complete flood studies.
					Continuously update flood studies.
					Flood reporting program.
				Protect existing and future residents from flood damage.	Development of watershed budgets.
					Complete flood studies.
					Continuously update flood studies.
					Implementation of stormwater improvement program.
					Development of local flood mitigation program.
					Primary drainage system maintenance program.
					Secondary drainage system maintenance program.
					Use cost effective analysis to monitor stormwater improvement program.
					Develop strategies to address future development in the floodplain.
					Flood reporting program.
				Develop and implement cost effective management strategies to protect the natural functions of the floodplain.	Complete flood studies.
					Continuously update flood studies.
					Development of local flood mitigation program.
					Hydrologic restoration program.
					Develop strategies to address future development in the floodplain.
					Flood reporting program.

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Natural Systems		
Goal	**Objective**	**Policy**
Protect, maintain and, where deemed necessary in the public interest, restore the barrier island, beach, and estuarine systems of Sarasota County. (Chapter 2, Environmental Goal 1)	Construction activities on or off the shore of the barrier islands shall not detrimentally impact the barrier island system. (Environmental Objective 1.1)	Enforce Sarasota County Ordinances pertaining to construction seaward of the County's Gulf Beach Setback Line and Barrier Island Pass Hazard Line. (ENV Policy 1.1.1)
		Hardening of Gulf beaches or passes shall be prohibited unless such hardening has been found to be in the public interest. A hardening project that is determined to be in the public interest shall not impact lateral public pedestrian access, and shall minimize adverse impacts to coastal processes and resources, neighboring properties, and the values and functions of beaches and dune systems, and provide mitigation where determined by the Board of County Commissioners to be appropriate. Permanent disruptions to natural coastal processes and long-term erosion impacts shall be considered in deliberations. (ENV Policy 1.1.2)
		The County shall discourage offshore petroleum development activities and will not favorably consider rezoning or other governmental actions to provide ancillary support facilities onshore. (ENV Policy 1.1.3)
		In order to restore barrier island coastal processes and beach habitat, existing derelict shore protection structures located seaward of a beach nourishment project's Erosion Control Line (ECL) shall be removed where practicable. (ENV Policy 1.1.4)
		Notwithstanding any other policies or principles for evaluating development proposals that would conflict with the construction of a County Coastal Restoration Project, the Board of County Commissioners may approve and construct a County Coastal Restoration Project, provided the Coastal Restoration Project satisfies the following criteria: (1) Impacts to environmental resources shall be minimized and mitigated in accordance with County, state and federal permitting requirements (where these requirements conflict, the more stringent requirements shall be followed); (2) Impacts to lower quality habitats and resources shall be considered and used in the project before impacts to higher quality habitats and resources are considered and used. For purposes of this policy, a County Coastal Restoration Project shall be a County-initiated and managed: inlet restoration, spoil island restoration, waterways maintenance, beach nourishment, or dune restoration project. (ENV Policy 1.1.5)
	Exceed the current acreage of public beaches and dunes through the year 2020 in accordance with policies established in the Parks and Recreation Plan. (ENV Objective 1.2)	Fund the County's beach/dune protection and restoration program applicable to all County owned Gulf shoreline properties.(ENV Policy 1.2.1)
		Protect beaches, dunes and coastal vegetation from vehicular traffic and pedestrian traffic by providing vehicular parking, dune walkovers and by encouraging bicycle use through the provision of bicycle paths and storage racks. (ENV Policy 1.2.2)
		By 2009, develop a Beach and Inlet Management strategy with a monitoring program for Sarasota County, incorporating regional coordination and interaction, to: assess the nature and extent of coastal erosion; monitor the effectiveness of beach restoration programs determine the effect of storm events on sand movement; identify dominant coastal processes which would aid in evaluating permit applications and coastal decision making; incorporate the long-term effects of sea level rise within the management policies; identify the impacts of modified inlets on historic erosion rates; identify beach segments with common erosion/accretion histories; recommend beach management strategies for each segment, including maintenance; identify potential impacts to existing environmental conditions; identify and assess impacts to marine habitats and wildlife; ensure beach management strategies are environmentally sound; and develop a long term strategy for areas of chronic erosion. (ENV Policy 1.2.3)
	Maintain existing access to Gulf and bay waters for a variety of water dependent activities and if necessary, provide for additional access where feasible. (ENV Objective 1.3)	Extend every effort to increase the number of public beach access points and parking spaces. (ENV Policy 1.3.1)
		When coastal development is proposed, provision will be made for lateral public beach access to the wet sand beach where beach hardening practices are proposed. (ENV Policy 1.3.2)
		The County will identify areas suitable for water-dependent/water-related uses and develop and implement techniques to encourage development and expansion of such uses in these areas provided such uses will not degrade environmental resources. The County will discourage any conversion of water-dependent uses to non water-dependent uses, and shall prohibit conversion when land use changes reduce or eliminate public accessibility and recreation on waterways. The County will develop incentives for water dependent/water-related businesses to maintain their current use. (ENV Policy 1.3.3)
		Encourage the construction of dry dock storage as compared to wet slip docking facilities and encourage this storage upland of the Gulf and bay shorelines. (ENV Policy 1.3.4)
		The expansion of existing boating facilities in suitable areas shall be permitted preferentially to the construction of new facilities. New and expanded motorized boating facilities shall not be located in or adjacent to areas of significant manatee habitat and travelway as defined by the Manatee Protection Plan Implementation Code (MPPIC). No new motorized boating facilities shall be allowed within the Pansy Bayou and the Warm Mineral Springs and Creek. (ENV Policy 1.3.5)
		New construction and expansion of marine facilities of five slips or greater, shall be as defined in the Boat Facility Siting Plan (BFSP) contained within Sarasota County's Manatee Protection Plan and existing county code. Construction or expansion of boat ramps shall also be as defined by the BFSP. Amendments to the Boat Facility Siting Plan, shall be implemented by action of the Board of County Commissioners. (ENV Policy 1.3.6)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Natural Systems		
Goal	**Objective**	**Policy**
Protect and enhance wherever possible, the quality of the estuarine environment throughout Sarasota County. (Chapter 2, Environmental Goal 2)	Improve surface water quality including estuarine, freshwater, coastal streams, rivers, and bays, including the Myakka River and its tributaries. (ENV Objective 2.1)	Conduct a baseline assessment of water quality in County coastal streams, bays, and estuaries including the Myakka River and its tributaries. The County shall review waterways as per their designated use as outlined in Rule 62-302.400, F.A.C, identify impaired water bodies in the County, and develop restoration plans for those waters by 2009. (ENV Policy 2.1.1)
		Prohibit dredge and fill activities in the Gulf of Mexico, bays, rivers, and streams of the County except to maintain previously dredged and existing drainage canals. All new environmentally sound navigation channels and beach nourishment projects require approval by the Board of County Commissioners and must be determined to be in the public interest. The dredging of new navigation channels other than those just described shall be prohibited. (ENV Policy 2.1.2)
		Orient boating activities to suitable areas away from sensitive habitats, and restrict boat access in areas of marginal navigability in order to prevent bottom scour or damage to sensitive habitats. (ENV Policy 2.1.3)
		Sewage pump out facilities shall be required for new marinas and existing marinas whenever slips are added if they are served by central sewer. Marinas which sell petroleum and other such products shall provide adequate fuel spill containment devices in accordance with state and federal regulations. The County shall require all new marinas and, where feasible, existing marinas proposing expansion to obtain a Florida Clean Marina designation from the Florida Department of Environmental Protection. (ENV Policy 2.1.4)
		Monitoring surface water quality during the development activities of projects of significant impact as determined by Water Resources. This program, in conjunction with the NPDES permit program, will facilitate the monitoring of cumulative impacts of development on stormwater runoff and water quality. (ENV Policy 2.1.5)
	Increase the area and improve the habitat quality of coastal wetlands and marine resources. (ENV Objective 2.2)	Maintain a program of water quantity and quality data collection and analysis for estuarine areas. Coordinate with existing programs that perform biological and water quality data collection and analyses in Sarasota County and evaluate results to determine what further study is necessary. (ENV Policy 2.2.1)
		Develop and implement spoil island restoration plans in cooperation with state and regional agencies. (ENV Policy 2.2.2)
		Restore coastal wetlands and habitat including submerged aquatic vegetation through revegetation projects, shoreline softening, and management of mosquito-ditched mangroves. Where necessary, appropriate native coastal habitat restoration planting and enhancement projects shall be required in development orders authorizing shoreline hardening. (ENV Policy 2.2.3)
		Utilize the County's regulatory authority to restore damaged wetlands to their natural state. (ENV Policy 2.2.4)
		The County should participate in the Gulf of Mexico Alliance discussions on the health and restoration of the Gulf, especially the eastern portions. The County shall cooperate in advancing the understanding of system dynamics and the Board of County Commissioners shall consider relevant initiatives for support. (ENV Policy 2.2.5)
		Maintain a program of coastal systems data collection and analysis to assist in the protection of natural systems and in long-range, post-disaster planning. Coordinate with existing programs to ensure appropriate ecological data is available for required data analyses. (ENV Policy 2.2.6)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Natural Systems		
Goal	**Objective**	**Policy**
It shall be the Goal of Sarasota County, as a member of the Sarasota Bay and Charlotte Harbor National Estuary Programs to support the implementation of their regional Comprehensive Conservation and Management Plans (CCMP) to restore and improve the natural estuarine systems and related coastal components. (Chapter 2, Environmental Goal 3)	Participate in intergovernmental processes designed to pursue the goals and objectives of the Sarasota Bay and Charlotte Harbor Management Plans. (ENV Objective 3.1)	Participate in local, state, or federal scientific modeling of Sarasota Bay and Charlotte Harbor to determine the cumulative impact of development on the water resources of the harbor, bay, springs and Myakka River. (ENV Policy 3.1.1)
		Support the implementation of the Florida Department of Environmental Protection Lemon Bay Aquatic Preserve Management Plan. (ENV Policy 3.1.2)
Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)	Identify, manage, and protect all ecological communities, habitat corridors and wildlife, especially critical habitats and endangered, threatened, and species of special concern identified in official federal, state, or international treaty lists. (ENV Objective 4.4)	Review all development proposals for consistency with the "Principles for Evaluating Development Proposals in Native Habitats" as required by the Land Development Regulations (Ordinance No. 81-12, as amended). (ENV Policy 4.4.1)
		Development and infrastructure shall be configured or designed to optimize habitat connectivity, minimize habitat fragmentation, and minimize barriers to wildlife movement. Where deemed necessary by the County, configuration shall include artificial corridor components. (ENV Policy 4.4.2)
		By 2009, Sarasota County shall complete an updated native habitat land cover map and risk assessment study for each native habitat identified within the Comprehensive Plan. Current standards for native habitat impacts contained within "Principles for Evaluating Development Proposals in Native Habitats" shall be evaluated against this assessment for their validity. Remnant native habitats contained within urban areas shall be included within this analysis along with alternatives to the use of regulatory powers to encourage restoration and protection of native habitats that are threatened due to current land use practices. (ENV Policy 4.4.3)
		The County shall coordinate with state and federal agencies and shall support implementation of protection guidelines relating to listed species. Unless precluded by state or federal laws, the County may adopt more stringent regulations where deemed appropriate. The County will encourage effective communication between federal, state agencies, local organizations and the public regarding protected species and the ecological implications of projects proposed within the County. (ENV Policy 4.4.4)
		Require development order applicants to consult with the appropriate agencies, to use recognized sampling techniques to identify listed species, and to provide documentation of such coordination and compliance prior to County approval to conduct any activities that could disturb listed species or the habitat. (ENV Policy 4.4.5)
		Special measures shall be taken to protect sea turtles. (ENV Policy 4.4.6)
		The County shall coordinate with the West Coast Inland Navigation District (WCIND) and other state and federal agencies to ensure that areas of critical manatee habitat, including the Myakka River, are posted and maintained as manatee protection zones pursuant to state law. (ENV Policy 4.4.7)
		Development shall not adversely impact the manatee. (ENV Policy 4.4.8)
		Sarasota County shall complete a Habitat Conservation Plan (HCP) for the Florida Scrub-jay. Upon completion of the HCP, the County will apply for an Incidental Take Permit (ITP) under the Endangered Species Act from the United States Fish and Wildlife Service. Upon acceptance of an ITP by the Board of County Commissioners, Scrub habitats and Scrub-jay areas shall be protected to establish a Scrub-jay preserve as designed within the HCP and to comply with any stipulations set forth in the permit. Development orders covered by the HCP shall be consistent with the HCP and shall preserve Scrub habitats and Scrub species. (ENV Policy 4.4.9)
		By 2007, the County shall evaluate the effects of pre-clearing of native habitats, characterize the problem, and develop a strategy, which may include new regulations, to avoid the loss of native habitat function and value. (ENV Policy 4.4.10)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Natural Systems		
Goal	**Objective**	**Policy**
Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)	Preserve a network of habitat connectivity across the landscape that ensures adequate representation of native habitats suitable to support the functions and values of all ecological communities. (ENV Objective 4.5)	When land development involves the conversion of native habitats, the County's open space requirements shall be fulfilled first with habitats required to be preserved, then with habitats that should be conserved, then with other allowable types of open space. Open space shall be determined by applying the "Principles for Evaluating Development Proposals in Native Habitats," and shall focus on maintaining a network of connectivity throughout the landscape, favoring higher functioning habitat areas. Planted and maintained littoral zones may be credited toward the open space requirement as permitted by the County zoning regulations. The County may consider alternatives to conserved habitats or other allowable open space that clearly demonstrate, through planned development designs and environmental management plans, greater native habitat function and value and connectivity. (ENV Policy 4.5.1)
		Sarasota County shall implement the Land Management Master Plan and develop site-specific management plans for protected environmental lands within the County. (ENV Policy 4.5.2)
		Lands purchased for primarily environmental reasons shall be managed consistent with Sarasota County's Land Management Master Plan and individual site plans for specific sites. (ENV Policy 4.5.3)
		The County shall develop a strategy to ensure open space, as required through development review, contributes effectively to other environmental greenway programs. Selection of open space acreage shall favor factors such as onsite and adjacent off-site habitat connectivity. (ENV Policy 4.5.4)
		The County shall evaluate the ecological implications of future infrastructure improvement projects early in the planning process to ensure adequate protection of habitat connectivity, hydrological impacts, and wildlife and to allow for modification or abandonment of environmentally poor alignments. The County will assess the cumulative effects of proposed infrastructure projects to ensure that significant ecological linkage areas are protected and that pubic interest is adequately addressed. The County will give priority to social, historic, and environmental issues over engineering issues to ensure an environmentally sound transportation system. (ENV Policy 4.5.5)
		The County shall evaluate open space and native habitat protection strategies and, by 2007, adopt an amendment to the Land Development Regulations that achieves compliance with environmental goals. Particular focus shall be placed on the establishment or maintenance of a network of habitat connectivity, favoring higher functioning habitat areas. (ENV Policy 4.5.6)
		The Future Land Use Map Series shall be maintained to show the location of areas of high ecological value as identified by staff and approved by the Board of County Commissioners. (ENV Policy 4.5.7)
		Develop mechanisms to acquire and physically link natural areas into a contiguous system or otherwise protect environmentally significant lands through a voluntary program (Environmentally Sensitive Lands Protection Program). Coordinate County resources with state programs and with groups such as The Nature Conservancy and the Trust for Public Lands. Priority should be given to acquiring and otherwise protecting properties which are adjacent to or in close proximity to existing preservation and conservation areas and public resource lands, with emphasis on maintaining opportunities for a regional greenways system that may include a mix of flow ways, areas subject to flooding, native habitats, recreational trails, and wildlife corridors. (ENV Policy 4.5.8)
		The County shall develop mechanisms to acquire and physically link natural areas into a contiguous system, or otherwise protect and enhance urban green space through a voluntary program and coordinate County resources with State programs and groups focused on similar community outcomes. Priority should be given to acquiring and otherwise protecting properties which are adjacent to or in close proximity to existing preservation areas, with emphasis on maintaining opportunities for a regional greenways system that may include a mix of flow ways, areas subject to flooding, native habitats, recreational trails, and wildlife corridors. (ENV Policy 4.5.9)
		Sarasota County shall continue establishing incentive programs for landowners to protect the naturally beneficial features of the lands identified as having high ecological value, pursuant to Policy 4.5.2., rather than emphasizing reliance upon regulatory police power authority. These additional incentives shall utilize a full range of techniques as appropriate (including, but not limited to, tax incentives and provisions for variable lot sizes in rural areas) without increasing densities. (ENV Policy 4.5.10)
		The development review process shall require the identification of potential conservation and preservation area habitats in those areas which have the potential of becoming incorporated into an overall natural areas network through the voluntary incentive program. (ENV Policy 4.5.11)
		The clustering of residential developments or the implementation of other measures to first avoid, then minimize, and then mitigate adverse environmental impacts, shall be required whenever areas of significant native habitats are involved. (ENV Policy 4.5.12)
		Encourage the use of cluster and planned development that preserves and protects habitats in open space, and encourage development forms that provide enhanced open space preservation and protection of habitats in all zoning districts. (ENV Policy 4.5.13)
		The County shall implement and update, where necessary, guidelines in the Land Development Regulations (LDR), Zoning Ordinance, and/or other existing regulations which regulate development and specify the necessary design standards to protect environmentally significant/sensitive areas (for example, barrier islands, floodplains, watersheds, and water recharge areas) and on properties adjacent to Public Conservation/Preservation Lands. (ENV Policy 4.5.14)
		The County shall protect mangroves to the fullest extent allowed by County and State law. (ENV Policy 4.5.15)
		Maintain and promote rural and natural resource land management practices, such as prescribed burning, including a requirement that all new development in the rural areas or areas adjacent to Public Conservation/Preservation Lands shall, as part of the development review process, recognize and protect existing rural and natural resource land management practices. (ENV Policy 4.5.16)
		Protect the natural diversity, processes, and functions of natural communities in the public resource lands including Myakka River and Oscar Scherer State Parks, and Myakka State Forest. Coordinate with other government agencies to maintain and enhance soils, groundwater, surface and subsurface waters, shorelines, vegetative communities, and wildlife habitats within these management areas. (ENV Policy 4.5.17)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Natural Systems		
Goal	**Objective**	**Policy**
Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)	Preserve a network of habitat connectivity across the landscape that ensures adequate representation of native habitats suitable to support the functions and values of all ecological communities. (ENV Objective 4.5)	Native habitats set aside in preservation and conservation areas shall be managed in accordance with resource management plans, which are subject to review and approval by the County through the development review process, to ensure maintenance and, if necessary, enhancement of the functions and values of these native habitats in perpetuity. The County shall encourage and provide incentives for the maintenance and enhancement of privately-owned preservation and conservation areas set aside prior to the County's requirement to provide a resource management plan. (ENV Policy 4.5.18)
		The amount of wetland mitigation required will be based upon the most current state-approved methodology. (ENV Policy 4.5.19)
		Policy 2.1.2. of the Future Land Use Chapter shall include Figure 2-10: Sites of High Ecological Value, and Figure 2-9: Ecological Strategy Map, in Unincorporated Sarasota County as part of the Future Land Use Map Series. (ENV Policy 4.5.20)
	Coordinate future land uses and provision of urban services with the protection of environmental resources. (ENV Objective 4.8)	Land uses and land and water development shall be consistent with and governed by the environmental values and functions of Sarasota County's native habitats in accordance with the "Principles for Evaluating Development Proposals in Native Habitats." (ENV Policy 4.8.1)
		The County shall continue to require planted littoral zones to provide water quality treatment for surface waters and wildlife habitat. (ENV Policy 4.8.2)
Sarasota County shall provide programs which enhance, protect and conserve the hydrologic and ecological functions of natural systems including estuaries, freshwater and groundwater systems (Chapter 4, Water Goal 2)	Address the maintenance of existing facility capacity and ensure the adequacy of facilities to meet future needs. (Water Objective 2.1)	As the County develops stormwater management facilities, all facilities shall be developed with consideration for aesthetics and the possibility of incorporation into the County park system. (Water Policy 2.1.6)
		The County shall support creation of Watershed Management Plans, including the Lemon Bay Watershed, that include holistic management practices of the watershed to protect the health of the surface waters. (Water Policy 2.1.7)
Potable water service shall be provided to Sarasota County residents through the continual evolution of a centralized regional supply, treatment, and distribution system, and shall be provided in a safe, efficient, economical, sustainable, and environmentally sound manner concurrent with urban development. (Chapter 4, Water Goal 3)	Protect the functions of natural groundwater recharge areas and natural drainage features. Water Objective 3.4)	Sarasota County will protect its potable water supply system, contributing recharge areas, and related open space benefits through implementation of its Wellhead Protection Ordinance which shall identify inappropriate land uses and facilities including, but not limited to, underground fuel storage tanks, landfills, hazardous materials storage, and certain commercial and industrial uses. The County's Wellhead Protection Ordinance will be amended, as needed, for consistency with the Florida Department of Environmental Protection's rule governing wellhead protection adopted in May 1995. The protection effort may include requests to the Southwest Florida Water Management District for cooperative funding or technical assistance to further identify zones of protection and cones of influence around individual wellheads or well fields. (Water Policy 3.4.1)
		Usage and maintenance of potable water resources on the T. Mabry Carlton, Jr. Memorial Reserve shall be in accordance with the Environment Plan and monitoring requirements contained in the Southwest Florida Water Management District Water Use Permit for the well field, which requires that the County continue to monitor and assess any variations in the hydro period of wetlands, various aquifers, and flora and fauna. (Water Policy 3.4.2)
Preserve, protect and restore the integrity of the natural environment, historic and archeological resources, neighborhoods and preserve agricultural uses consistent with resource protection (Chapter 9, FLU Goal 1)	Protect environmentally sensitive lands, conserve natural resources, protect floodplains, maintain or improve water quality, and open space, and conserve and protect historic and archeological resources. (FLU Objective 1.1)	All development proposals must conform to the appropriate portions of the Environment Chapter's Primary Components and Guiding Principles before such proposals can be considered to be consistent with the Future Land Use Plan. (FLU Policy 1.1.1)
		Sarasota County will coordinate efforts to acquire public lands for conservation, preservation, and open space. (FLU Policy 1.1.8)
		Any new Public Conservation and Preservation Area, preserved /acquired pursuant to Policy 4.5.2. and 4.5.3. of the Environment Chapter, shall have all buffering and land use compatibility strategies incorporated to the extent feasible and finalized prior to the closing. (FLU Policy 1.1.10)
		Normal management practices associated with maintaining and restoring native habitats such as controlled burning within public and private Conservation/Preservation areas shall be permitted. (FLU Policy 1.1.11)
		Preserve and protect agricultural lands. (FLU Objective 1.3)
Coordinate future land uses with environmental characteristics and the availability of facilities, and ensure that sufficient acreage is designated for urban uses to accommodate the projected population growth. (Chapter 9, FLU Goal 2)	Coordinate land use designations with soil and topographic characteristics, the protection of historical and natural resources, existing land uses, forms of development, and the availability of public facilities. (FLU Objective 2.1)	The preparation of the Future Land Use Map shall take into consideration the projects included in the Five Year Schedule of Capital Improvements and Future Capital Improvements – 2025. (FLU Policy 2.1.1)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Quality

Goal	Objective	Policy
Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)	Protect the quality and quantity of all jurisdictional waters, recognize the ongoing study efforts, and ensure that the current water quality in the County be improved through the year 2010. (ENV Objective 4.2)	Utilize the County's regulatory authority to encourage shoreline softening rather than shoreline hardening practices. Where practical, shoreline planting and enhancement projects shall be required during development orders proposing shoreline hardening in accordance with Policy 2.2.3. Require effective vegetative buffer zones for all new construction adjacent to watercourses, wetlands, and bays. (ENV Policy 4.2.1)
		Support the efforts and consider recommendations from intergovernmental organizations concerning Sarasota's bays, the Myakka River watershed, and the Braden River watershed. (ENV Policy 4.2.2)
		Enforce the Myakka River Protection Zone regulations and all other County regulations designed to protect the Myakka River and the wild and scenic nature of the River. (ENV Policy 4.2.3)
		Mining activities (as defined by County Ordinance) are not permitted or permissible under the County zoning regulations within designated areas of special environmental significance and/or sensitivity. The watersheds of Cow Pen Slough and the Myakka River, including the tributaries of the Myakka River, are designated areas of special environmental significance. (ENV Policy 4.2.4)
		The County shall monitor and assess any variations in the hydroperiod of wetlands, various aquifers, and flora and fauna located on the T. Mabry Carlton Jr., Memorial Reserve in accordance with the provisions of Ordinance No. 82-94. (ENV Policy 4.2.5)
		Require Best Management Practices, as provided in the County's Earthmoving Ordinance, for conversion of native habitat to agricultural land uses, consistent with state and federal recommended standards, to reduce pesticides, fertilizer, and soil erosion. (ENV Policy 4.2.6)
Sanitary sewer service shall be provided to Sarasota County residents through the continual evolution of a centralized regional wastewater collection and treatment system, and shall be provided in a safe, clean, efficient, economical, and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 1)	Continue to correct existing wastewater facility deficiencies, and coordinate the acquisition, extension, and construction of, or increase in the capacity of, facilities to meet future needs. (Water Objective 1.1.)	A list of all wastewater treatment plants, both public and private, shall be maintained which includes, but is not limited to, the following: entity having operational responsibility, current rated plant capacity, existing treatment status (number and type of hookups), and all future committed capacity (number and type of hookups). (Water Policy 1.1.1)
		The Utilities Department shall continue to identify existing Sarasota County Utilities System facility deficiencies, as well as address implementation activities for establishing priorities for replacement and correction of existing facility deficiencies. (Water Policy 1.1.2)
		Consistent with the requirements in the Capital Improvements Plan, projects needed to correct existing deficiencies within the Sarasota County Utilities System shall be given priority in the formulation and implementation of the annual work schedules or programs of the Sarasota County Utilities Department. (Water Policy 1.1.3)
		The County shall continue implementation of the Franchise Acquisition, Consolidation, Implementation Plan – Wastewater Collection, Treatment, and Reuse Master Plan Wastewater Management Plan, which provides an engineered master plan for providing wastewater service to the unincorporated areas of Sarasota County concurrent with urban development and land use planning. (Water Policy 1.1.4)
		The Wastewater Management Plan shall be updated as acquisition and consolidation efforts warrant and as continuing engineering activities progress. (Water Policy 1.1.5)
		The County shall continue its on-going planning and engineering activities for providing central wastewater systems or alternative onsite systems to critical areas in the Urban Service Area currently served by onsite wastewater treatment and disposal systems. (Water Policy 1.1.6)
		The County shall prohibit the installation of onsite wastewater treatment and disposal systems in the areas designated Urban Service Area and Barrier Island on the Future Land Use Map Series, unless the installation and use shall not adversely affect the the quality of groundwater or surface water or adversely affect the natural function of floodplains as required by the provisions of the County Land Development Regulations (Ordinance No. 81 12, as amended); Ordinance No. 83-83 and Chapter 10D-6 F.A.C, regulating design, construction, installation, utilization, operation, maintenance, and repair of individual onsite wastewater treatment and disposal systems, as amended; and any more stringent regulations applicable. Further, the County shall require that all buildings served by onsite wastewater treatment and disposal systems, except approved onsite greywater systems, connect to a publicly-owned or investor-owned sewerage system within one year of notification by the County that such a system is available as defined in Chapter 10D - Section 6.042, Florida Administrative Code.
		As the County consolidates wastewater treatment plants, all facilities shall be developed with consideration for aesthetics and the possibility of incorporation into the County park system. (Water Policy 1.1.6)
	Maximize the use of existing and available central wastewater facilities and new facilities when they are constructed, and discourage urban sprawl. (Water Objective 1.2)	The County shall continue to require new development to connect to central wastewater systems consistent with the requirements contained in the Land Development Regulations based on the size of the development and distance to the existing system, the available capacity in the system, and the utility's rules allowing connection to the system. (Water Policy 1.2.1)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Quality		
Goal	**Objective**	**Policy**
Sanitary sewer service shall be provided to Sarasota County residents through the continual evolution of a centralized regional wastewater collection and treatment system, and shall be provided in a safe, clean, efficient, economical, and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 1)	Continue to explore and use alternative and supplemental water resources to conserve and replace the use of traditional potable water supplies. (Water Objective 1.3)	The County shall continue implementation of the reuse policies in the Wastewater Management Plan in order to reduce the demand on potable water supplies and withdrawals from ground water aquifers. (Water Policy 1.3.1)
		The County shall reclaim treated wastewater for irrigation purposes as its primary method of disposal for treated wastewater. The use of deep well injection or surface water discharge shall be used only when opportunities to use reclaimed water for irrigation is not available. (Water Policy 1.3.2)
	Protect the functions of natural ground water recharge areas, natural drainage features, and surface water bodies. (Water Objective 1.4)	The wastewater treatment plant inspection and compliance monitoring program shall continue. All wastewater treatment plants shall be monitored as outlined in the DEP Specific Operating Agreement. (Water Policy 1.4.1)
		The County shall continue to provide a program to ensure that septage and sludge are received and disposed of in an environmentally sound manner. (Water Policy 1.4.2)
		All sludge disposal sites and facilities shall be authorized, specifically identified, monitored, and routinely inspected for compliance with State and County regulations. (Water Policy 1.4.3)
		Sarasota County regulations for the disposal and use of septage and sludge shall provide for their efficient and beneficial use and prevent adverse environmental impacts. Land spreading and disposal of sludge shall be allowed only in areas that will not adversely impact groundwater resources and watersheds that drain into surface water supplies (which are used to meet potable water supply needs), recharge areas of a public water system, and/or Outstanding Florida Waters. The land spreading of septage shall be prohibited within the County. (Water Policy 1.4.4)
	Ensure that the issuance of development permits shall be conditioned upon adequate sanitary sewer service capacity. (Water Objective 1.5)	No construction permit shall be issued for new development which will result in an increase in demand upon deficient wastewater treatment facilities prior to the completion of improvements needed to bring the facility up to adopted level of service standards, unless provided for by existing State and County laws. (Water Policy 1.5.1)
		Issuance of development orders for any site proposing to utilize an onsite wastewater treatment and disposal system shall be contingent upon demonstration of compliance with applicable federal, State, and local permit requirements. Soil surveys shall be required for onsite wastewater treatment and disposal system permits. No individual onsite systems shall be permitted where soil conditions indicate that the system would not function without degrading water quality or where land alterations necessary to accommodate the system would interfere with drainage or floodplain functions. (Water Policy 1.5.2)
		Sanitary Sewer Level of Service: (1) Minimum average daily flow to be treated from domestic units shall be 200 gallons per Equivalent Dwelling Unit per day; and (2) Wastewater effluent shall meet standards defined by state law, permit requirements of the Florida Department of Environmental Protection, and County Ordinance when discharged to groundwater or surface water in the County. (Water Policy 1.5.3)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Quality		
Goal	**Objective**	**Policy**
Sarasota County shall provide programs which enhance water quality where appropriate (Chapter 4, Water Goal 2)	Address the maintenance of existing facility capacity, and ensure the adequacy of facilities to meet future needs. (Water Objective 2.1)	The County shall continue to operate a Stormwater Environmental Utility to provide for monitoring, maintenance, and improvement of the County's stormwater management system. The Utility shall continue cooperation with the municipalities, other appropriate governmental agencies, and public and/or private utilities, which will implement the CWM Plan. Replacement and correction of existing facility deficiencies as well as providing for future facility requirements shall be identified and prioritized for inclusion in the County's Capital Improvement Program. (Water Policy 2.1.1)
		The County and private developments shall monitor and maintain stormwater management and conveyance facilities to ensure that the stormwater facilities are adequately maintained and functioning in compliance with design requirements. (Water Policy 2.1.2)
		The County shall continue to fund the continuous maintenance of watershed maps and models for each drainage basin in the County through the Basin Master Planning Program to provide a basis of review for new development and other watershed alteration proposals as well as assure that stormwater management facilities are developed to attain the adopted level of service. Implementation of all detailed master plans shall be completed by 2001. Each detailed master plan shall be developed, in accordance with the Basin Master Plan Schedule, as a Sarasota County inter-department effort to ensure consideration of natural drainage functions. Basin master plans shall be developed in cooperation with the municipalities and adjacent Counties to address stormwater quality and quantity problems in basins crossing more than one political boundary. Each plan shall be designed to protect downstream and estuarine water from degradation by stormwater runoff. Each basin plan shall define the level of service and develop a cost-effective capital improvements program. As each basin plan is completed, the comprehensive plan, including the Capital Improvements Plan, shall be amended to incorporate and reflect the stormwater management facility improvements identified in the basin plan. (Water Policy 2.1.3)
		The County shall pursue providing regional stormwater management facilities, including those that could take the place of site-specific attenuation facilities. These regional facilities should be developed by the County and, when appropriate, funded by development in lieu of construction of onsite, private attenuation facilities. Water quality treatment facilities should be located onsite to promote source control of pollutants before they enter the County stormwater system. (Water Policy 2.1.5)
	Protect the functions of natural groundwater recharge areas and natural drainage features by providing for the maintenance of existing, and where feasible the restoration of the pre-development, water budgets to historical watercourses (as identified by the original United States General Land Office Township Plats from the Mid to Late 1800's). (Water Objective 2.2)	The County shall implement its Watershed Management Plan consistent with the National Pollutant Discharge Elimination System (NPDES) permit issued to the County by FDEP. The Comprehensive Stormwater Quality Program shall provide for management and control of stormwater runoff to reduce pollution at the source and discharge of pollutants into receiving waters from the County's stormwater system to the maximum extent possible. (Water Policy 2.2.1)
		The County shall require that the treatment of stormwater discharge meet standards which will ensure that there will not be adverse impacts on the quality of natural surface waters. (Water Policy 2.2.2)
		New development in the 100-year floodplains shall be consistent with all other Goals, Objectives, and Policies of the Sarasota County Comprehensive Plan. (Water Policy 2.2.3)
	Ensure that development and redevelopment provides for adequate stormwater management. (Water Objective 2.3)	No permit shall be issued for new development which will result in an increase in demand upon deficient stormwater facilities prior to the completion of improvements needed to bring the facility up to adopted level of service standards. (Water Policy 2.3.1)
		Stormwater Level Of Service: Stormwater Quality: no discharge from any stormwater facility shall cause or contribute to a violation of water quality standards in waters of the State as provided for in County Ordinances, Federal Laws and State Statutes. Water quality levels of service shall be set consistent with the protection of public health, safety and welfare; and natural resources functions and values. To protect water quality and maintain stormwater quality level of service standards. (Water Policy 2.3.2)
		Consistent with the National Pollutant Discharge Elimination System (NPDES) permit, the County's Watershed Management Plan shall establish water quality design criteria for each drainage basin. In establishing these criteria, the County shall consider recommendations from the Sarasota Bay and Charlotte Harbor National Estuary Programs. Drainage basin pollutant load reduction goals are to be established by the Southwest Florida Water Management District and the State Surface Water Ambient Monitoring Program. (WATER Policy 2.3.3)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Quality		
Goal	**Objective**	**Policy**
Potable water service shall be provided to Sarasota County residents through the continual evolution of a centralized regional supply, treatment, and distribution system, and shall be provided in a safe, efficient, economical, sustainable and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 3)	Protect the functions of natural groundwater recharge areas and natural drainage features. Water Objective 3.4)	Sarasota County will protect its potable water supply system, contributing recharge areas, and related open space benefits through implementation of its Wellhead Protection Ordinance which shall identify inappropriate land uses and facilities including, but not limited to, underground fuel storage tanks, landfills, hazardous materials storage, and certain commercial and industrial uses. The County's Wellhead Protection Ordinance will be amended, as needed, for consistency with the Florida Department of Environmental Protection's rule governing wellhead protection adopted in May 1995. The protection effort may include requests to the Southwest Florida Water Management District for cooperative funding or technical assistance to further identify zones of protection and cones of influence around individual wellheads or well fields. (Water Policy 3.4.1)
		Usage and maintenance of potable water resources on the T. Mabry Carlton, Jr. Memorial Reserve shall be in accordance with the Environment Plan and monitoring requirements contained in the Southwest Florida Water Management District Water Use Permit for the well field, which requires that the County continue to monitor and assess any variations in the hydroperiod of wetlands, various aquifers, and flora and fauna. (Water Policy 3.4.2)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Supply

Goal	Objective	Policy
Protect, maintain, and, where necessary, restore the natural resources of Sarasota County to ensure their continued high quality and critical value to the quality of life in the County. (Chapter 2, Environmental Goal 4)	Protect and conserve surface and groundwater resources. (ENV Objective 4.3)	Land use development activities in important groundwater recharge areas shall be consistent with water resources protection. (ENV Policy 4.3.1)
		Sarasota County will coordinate with other governmental and private entities to protect water resources. (ENV Policy 4.3.2)
		The County shall work with the Southwest Florida Water Management District, local municipalities, and other entities to protect the quality of Warm Mineral Springs, Little Salt Spring, their aquifers, and the creek system. The County will work with the State of Florida to secure matching funding for the acquisition of Warm Mineral Springs and Little Salt Spring or work with the owners to create a conservation easement over the springs and their tributaries. (ENV Policy 4.3.3)
		The County shall enforce ordinances that regulate borrow pits and other excavations, stockpiling, hauling and land fillings throughout Sarasota County including mitigation and restoration measures as necessary. (ENV Policy 4.3.4)
Potable water service shall be provided to Sarasota County residents through the continual evolution of a centralized regional supply, treatment, and distribution system, and shall be provided in a safe, efficient, economical, sustainable, and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 3)	Continue to correct existing potable water facility deficiencies and coordinate the acquisition, extension, and construction of, or increase in the capacity of, facilities to meet future needs. (Water Objective 3.1)	Sarasota County Utilities shall maintain up to date inventories indicating the available capacity and present demand for potable water facilities in the Sarasota County Utilities System service area. (Water Policy 3.1.1)
		Sarasota County Utilities shall continue to identify existing Sarasota County Utilities System facility deficiencies, as well as address implementation activities for establishing priorities for replacement and correction of existing facility deficiencies. This shall be an ongoing effort for the continual setting of capital improvement priorities. Efforts to correct these deficiencies shall be made on the basis of maximizing the use of existing facilities as well as economic feasibility under the Sarasota County Utilities preventive maintenance practices. (Water Policy 3.1.2)
		Consistent with the requirements in the Capital Improvements Plan, projects needed to correct existing deficiencies within the Sarasota County Utilities System shall be given priority in the formulation and implementation of the annual work schedules or programs of Sarasota County Utilities. (Water Policy 3.1.3)
		Potable water master plans and modeling of the Sarasota County Utilities System shall be updated as continued engineering and construction activities progress. (Water Policy 3.1.4)
		Continue to extend water lines to those portions of unincorporated Sarasota County developed with private wells utilizing the County's Line Extension Policy through the Sarasota County Utilities Capital Improvement Program and utilizing other mechanisms such as Municipal Service Benefit Unit non-ad valorem assessments. (Water Policy 3.1.5)
		Sarasota County will continue to explore sustainable alternative water resources in cooperation with state, regional, and local agencies and other local governments. County water supply planning will be coordinated with the Southwest Florida Water Management District's Regional Water Supply Plan. Additional water supply sources will need to be identified and developed to supplement existing sources. (Water Policy 3.1.6)
		As the County consolidates and develops potable water facilities, all facilities shall be developed with consideration for aesthetics and the possibility of incorporation into the County park system. (Water Policy 3.1.7)
	Maximize the use of existing and available central potable water facilities and new facilities when they are constructed, and discourage urban sprawl. (Water Objective 3.2)	Until such time as the Sarasota County Utilities System can expand its distribution system to provide centralized potable water service, individually owned platted lots of record located within the designated Urban Service Area, as adopted pursuant to Sarasota County Ordinance No. 81-30, may be provided potable water with a private well provided all other legislative and regulatory requirements are met. (Water Policy 3.2.1)
		The County shall mandate hookup to a centralized potable water system, where available, in accordance with State and County laws. (Water Policy 3.2.2)
		The County shall continue to require new development to connect to central water systems consistent with the requirements contained in the Land Development Regulations, based on the size of the development and distance to the existing system, if the capacity is available in the system, and the Utility's rules allow connection to the system. (Water Policy 3.2.3)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Water Supply		
Goal	**Objective**	**Policy**
Potable water service shall be provided to Sarasota County residents through the continual evolution of a centralized regional supply, treatment, and distribution system, and shall be provided in a safe, efficient, economical, sustainable, and environmentally sound manner, concurrent with urban development. (Chapter 4, Water Goal 3)	Continue to implement programs to conserve potable water resources. (Water Objective 3.3)	Sarasota County shall continue its efforts to implement water conservation programs, including such initiatives as the existing inverted water rate structure, low flow toilet rebates and showerhead exchange, and outreach educational programs. Water conservation programs shall operate in cooperation with the Southwest Florida Water Management District, Manasota Basin Board, and other appropriate entities, both public and private. (Water Policy 3.3.1)
		The County will continue to abide by the Southwest Florida Water Management District's (SWFWMD) emergency water shortage plan, and when necessary, the County may implement more restrictive water conservation measures, as may be required to protect and maintain the utility system. (Water Policy 3.3.2)
		The County will continue, in partnership with the Southwest Florida Water Management District (SWFWMD) to ensure through a variety of educational and enforcement activities, the proper abandonment of unused water wells. SWFWMD Quality of Water Improvement (QWIP) incentive funding will be utilized to the greatest extent possible to realize the goal of measurable aquifer water quality upgrading. (Water Policy 3.3.3)
		New development shall prioritize meeting irrigation needs through (1) demand management strategies, (2) reclaimed water, if available, (3) rain water or stormwater, and finally, (4) community ground water wells. (Water Policy 3.3.4)
	Ensure that the issuance of development permits shall be conditioned upon adequate potable water capacity. (Water Objective 3.5)	No permit shall be issued for new development which will result in an increase in demand upon deficient central potable water facilities prior to the completion of improvements needed to bring the facility up to adopted level of service standards, unless provided for by existing State and County laws. (Water Policy 3.5.1)
		The County Public Health Unit shall enforce potable water quality standards in accordance with the Federal Safe Drinking Water Act, Chapter 403, Part VI, Florida Statutes, "Florida Safe Drinking Water Act", and Chapter 62- 550, 62-551, 62-555, 62-560, or 10D-4, Florida Administrative Code, and as prescribed by the U.S. Environmental Protection Agency. However, the County may adopt more stringent standards if it deems necessary. (Water Policy 3.5.2)
		Issuance of development orders will be contingent upon demonstration of compliance with applicable federal, State, and local permit requirements for onsite potable water systems. (Water Policy 3.5.3)
		Potable Water Level of Service: (1) System capacity shall be based on 250 gallons per Equivalent Dwelling Unit per day based on peak flow plus the maintenance of minimum fire flow standards. (2) Minimum potable water quality shall be as defined by the U.S. Environmental Protection Agency, except where the State, or County may impose stricter standards. (Water Policy 3.5.4)
Preserve, protect and restore the integrity of the natural environment, historic and archeological resources, neighborhoods and preserve agricultural uses consistent with resource protection (Chapter 9, FLU Goal 1)	Protect environmentally sensitive lands, conserve natural resources, protect floodplains, maintain or improve water quality, and open space, and conserve and protect historic and archeological resources. (FLU Objective 1.1)	Development proposals within the watershed of an existing public potable surface water supply shall provide reasonable assurance, prior to the approval of such development, that the development will not degrade the quality of such water supply for potable use. In the development and application of necessary regulations and mitigation measures to protect public potable surface water supplies, Sarasota County shall coordinate with jurisdictions whose public potable surface water supplies could be affected. (FLU Policy 1.1.5)

SARASOTA COUNTY COMPREHENSIVE PLAN

Sarasota County Planning Department

Flood Protection

Goal	Objective	Policy
Sarasota County shall provide programs which prevent and mitigate the losses, cost, and human suffering caused by flooding, and protect natural and beneficial functions of the floodplain (Chapter 4, Water Goal 2)	Address the maintenance of existing facility capacity, and ensure the adequacy of facilities to meet future needs. (Water Objective 2.1)	The County and private developments shall monitor and maintain stormwater management and conveyance facilities to ensure that the stormwater facilities are adequately maintained and functioning in compliance with design requirements. (Water Policy 2.1.2)
		The County shall continue to fund the continuous maintenance of watershed maps and models for each drainage basin in the County through the Basin Master Planning Program to provide a basis of review for new development and other watershed alteration proposals as well as assure that stormwater management facilities are developed to attain the adopted level of service. Implementation of all detailed master plans shall be completed by 2001. Each detailed master plan shall be developed, in accordance with the Basin Master Plan Schedule, as a Sarasota County inter-department effort to ensure consideration of natural drainage functions. Basin master plans shall be developed in cooperation with the municipalities and adjacent Counties to address stormwater quality and quantity problems in basins crossing more than one political boundary. Each plan shall be designed to protect downstream and estuarine water from degradation by stormwater runoff. Each basin plan shall define the level of service and a cost- effective capital improvements program shall be developed. As each basin plan is completed, the comprehensive plan, including the Capital Improvements Plan, shall be amended to incorporate and reflect the stormwater management facility improvements identified in the basin plan. (Water Policy 2.1.3)
		As part of the Basin Master Planning Program, the County shall identify: (1) the extent of the existing 100-year floodplain, (2) all drainage facilities which fall below adopted level of service standards, (3) costs associated with improving such facilities to meet minimum drainage level of service standards, and (4) funding sources for those improvements. Where the improvements of drainage facilities are not feasible or desirable, alternative methods may be employed including, but not limited to, off-line reservoirs, parks designed for flooding, and floodways. If the completion of improvements to provide the adopted minimum level of service standards for existing development or existing roadways would result in un-acceptable adverse economic or social impacts to specific areas, a level of service less than the adopted minimum may be accepted for the specific area. (Water Policy 2.1.4)
	Protect the functions of natural groundwater recharge areas and natural drainage features by providing for the maintenance of existing, and where feasible the restoration of the pre-development, water budgets to historical watercourses (as identified by the original United States General Land Office Township Plats from the Mid to Late 1800's). (Water Objective 2.2)	New development in the 100-year floodplains shall be consistent with all other Goals, Objectives, and Policies of the Sarasota County Comprehensive Plan. (Water Policy 2.2.3)
	Ensure that development and redevelopment provides for adequate stormwater management. (Water Objective 2.3)	No permit shall be issued for new development which will result in an increase in demand upon deficient stormwater facilities prior to the completion of improvements needed to bring the facility up to adopted level of service standards. (Water Policy 2.3.1)
		Stormwater Level of Service - Stormwater Quantity: Stormwater management systems shall provide for adequate control of stormwater runoff. See Design Criteria, page 4-83 of the Sarasota County Comprehensive Plan. (Water Policy 2.3.2)
		The County shall work with the Southwest Florida Water Management District (SWFWMD) in an effort to coordinate approaches to planning and permitting of stormwater management and shall specifically request SWFWMD comment on a volume based approach to regulating stormwater management in addition to the common peak discharge rate approach. (Water Policy 2.3.4)
		Development shall provide for easy maintenance of outfalls for discharge of drainage. (Water Policy 2.3.5)
Preserve, protect and restore the integrity of the natural environment, historic and archeological resources, neighborhoods and preserve agricultural uses consistent with resource protection (Chapter 9, FLU Goal 1)	Protect environmentally sensitive lands, conserve natural resources, protect floodplains, maintain or improve water quality, and open space, and conserve and protect historic and archeological resources. (FLU Objective 1.1)	No development order shall be issued which would permit development in 100 year floodplains, as designated on Federal Emergency Management Agency Flood Insurance Rate Maps or adopted County flood studies, or on floodplain associated soils, defined as Soils of Coastal Islands, Soils of the Hammocks, Soils of Depressions and Sloughs, and Soils of the Floodplains and shown in Figure 2-2, that would adversely affect the function of the floodplains or that would degrade the water quality of water bodies associated with said floodplains in violation of any local, State, or federal regulation, including water quality regulations. (FLU Policy 1.1.6)

Appendix B

Pollutant Load Results

August 2010

Sarasota County

Southwest Florida Water Management District

HISTORICAL

BASIN	V (AC-FT/AC/YR)	BOD (LB/AC/YR)	TSS (LB/AC/YR)	TP (LB/AC/YR)	N (LB/AC/YR)	FECAL COLIFORM (LB/AC/YR)
AINGER CREEK	1.43	11.47	36.63	0.40	4.54	1.65
ALLIGATOR CREEK	1.37	9.57	36.28	0.54	4.27	2.11
FORKED CREEK	1.23	9.13	31.69	0.36	3.79	1.57
GOTTFRIED CREEK	1.25	9.17	33.14	0.36	3.83	1.60
LEMON BAY COASTAL	2.15	4.19	15.42	2.67	3.84	0.92
WOODMERE CREEK	1.14	8.20	28.03	0.34	3.46	1.52
LEMON BAY WATERSHED	1.45	8.74	30.85	0.80	4.02	1.59

CURRENT

BASIN	V (AC-FT/AC/YR)	BOD (LB/AC/YR)	TSS (LB/AC/YR)	TP (LB/AC/YR)	N (LB/AC/YR)	FECAL COLIFORM (LB/AC/YR)
AINGER CREEK	1.48	10.49	46.78	0.50	4.33	21.96
ALLIGATOR CREEK	2.05	25.91	140.77	1.45	7.33	147.39
FORKED CREEK	1.49	15.34	107.44	0.96	5.70	67.97
GOTTFRIED CREEK	1.51	14.66	102.84	0.88	5.45	58.76
LEMON BAY COASTAL	2.44	11.30	53.37	3.08	5.36	79.12
WOODMERE CREEK	1.78	22.87	84.95	1.28	6.31	143.46
LEMON BAY WATERSHED	1.79	16.23	92.66	1.35	5.72	80.13

FUTURE

BASIN	V (AC-FT/AC/YR)	BOD (LB/AC/YR)	TSS (LB/AC/YR)	TP (LB/AC/YR)	N (LB/AC/YR)	FECAL COLIFORM (LB/AC/YR)
AINGER CREEK	2.09	26.52	112.95	1.26	7.68	203.43
ALLIGATOR CREEK	2.18	31.09	150.07	1.61	8.31	185.43
FORKED CREEK	1.88	24.93	124.85	1.26	7.12	189.75
GOTTFRIED CREEK	1.94	25.89	135.84	1.32	7.42	195.14
LEMON BAY COASTAL	2.51	13.23	61.50	1.47	5.17	99.97
WOODMERE CREEK	1.91	29.69	107.18	1.56	7.83	191.82
LEMON BAY WATERSHED	2.10	24.91	118.77	1.40	7.23	176.97

Appendix C

Sediment Management Plan

August 2010

Sarasota County

Southwest Florida Water Management District

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 TASK OBJECTIVES

This Sediment Management Plan (SMP) is an element of the comprehensive watershed management plan for Lemon Bay. This element of the plan includes an analysis of the primary stream systems in Lemon Bay and their associated tributary areas to determine watershed-based loading of sediment and other associated pollutants, identify other sediment sources, and determine potential remedial and preventative erosion and sedimentation measures. Tasks for the SMP included field sampling, modeling, assessing methods for reducing erosion and sedimentation in the watershed, and evaluating and prioritizing projects proposed to reduce and prevent sedimentation.

1.2 EFFECT OF URBANIZATION ON SEDIMENTATION CYCLE

Sediment production is a natural watershed process, but urbanization and other land-use changes can impact the processes associated with the sedimentation cycle: erosion, transport, and deposition. Anthropogenic causes of sediment production that lead to erosion are increased impervious surface associated with urbanization, construction, soil compaction, streambed alteration, and vegetation removal.

Within an urban setting, sediment production has two primary sources. The first is wash-off from the terrestrial watershed surface. The second is in-stream channel erosion—typically following the pattern of degradation (down-cutting), loss of toe stability, and then bank sloughing. Another lesser source includes sediment load draining directly into the stream down the channel banks. Bank steepness, degree of concentration (runoff velocity), and stability (e.g., vegetation) influence the quantity of this portion of the sediment load.

In urban watersheds, the greatest contributor to increased wash-off is impervious surfaces. Impervious surfaces increase runoff volume and peak-flow rates, which carry a significant sediment load to the waterways. In addition to increasing runoff, urbanization decreases the magnitude of baseflow by limiting infiltration and increases the frequency of runoff events. Both can affect the physical character of the channel and the overall environmental condition of the stream. A study on the effect of imperviousness on sedimentation showed that significant degradation to stream stability, habitat, and water quality occurs at even minimal levels of imperviousness on the order of 10 to 15% (Fischenich, 2001).

An open channel is dynamic and will naturally adjust slope, sinuosity, width, and depth to maintain equilibrium in the system. The equilibrium is dominated by the flow through the system and the sediment load. The natural process of stream channel erosion is typically accelerated and heightened through urbanization in the watershed. Streams adjust to these changes within the physical constraints of bridges, bank stabilization measures, and other hardened surfaces to establish a new equilibrium condition that is often different than their previous “natural” state.

Impacts associated with the "new" equilibrium include the following:

- Greater and more frequent peak storm flows capable of eroding channel beds and banks.
- Enlargement of the channel through incision and widening processes or constriction of channels through sediment deposition.
- Decreased recharge of shallow- and medium-depth aquifers that sustain base and low flows.
- Higher nutrient and contaminant loading.
- Alteration of the channel substrate.
- Reduction of stream system function.

Erosion and sedimentation can contribute to water quality and water quantity problems. Nutrients, pesticides, and heavy metals are adsorbed to sediment originating in the upstream subbasins. The sediments are transported from the upstream areas of the watershed to the bay and estuaries by the interconnected creek and canal systems throughout Lemon Bay. The suspension and transport of these sediments in receiving waters directly affects the water quality (e.g., clarity and light penetration) that is important to preserve or improve the health of the bay. Water quantity impacts can include loss of flood conveyance and navigability through sedimentation or production of snags as well as property or structure damage through channel widening. Managing activities and upstream sources that increase sediment and flow within the Lemon Bay tributaries is a key component in managing the health of Lemon Bay.

1.3 SEDIMENT MANAGEMENT

Managing sedimentation in an urban setting requires a multi-pronged approach. Three management strategies will reduce unwanted sediment in the system:

- Providing source control to reduce or remove solids in upland areas.
- Implementing maintenance practices designed to reduce sedimentation.
- Improving eroding and sloughing banks for long-term stability.

These strategies lead to reduced turbidity, increased clarity, and reduced nutrient and sediment load. The end result is the improved health of the estuaries and Lemon Bay.

Providing source control to reduce or remove total suspended solids in the uplands keep pollutants from running off in stormwater and getting to the receiving waters of the channel and ditch system and ultimately Lemon Bay. Source control activities include low-impact development projects, street sweeping, and construction-area silt fencing.

Regularly scheduled maintenance practices ensure the proper functioning of flood control facilities. These practices also affect the amount of sediment, debris, and pollutants reaching County waterways. Included in these activities are cleaning out baffle boxes; removing excess

vegetation from swales and roadside ditches; replacing damaged infrastructure; and maintaining control structures, weirs, and pumps.

Bank stabilization in an urban setting is challenging. Stream banks throughout the County exhibit the following characteristics that lead to erosion and sloughing:

- Steep slopes due to lack of available easement space.
- Loose soil matrix on steep slopes without hearty root systems or moisture-holding capacity.
- Direct runoff washing out the top of banks.
- Lack of proper reinforcement for outfalls.

For stabilization to be effective in the long term, remediation and restoration should not be limited to a single point in the stream but will be more effective when conducted as multiple projects along a channel system.

Constraints of an urban system require management practices to limit the potentially harmful effects of erosion and sedimentation, which include reduced flood control and increased pollution. Performing the activities listed above will improve the health of the system by increasing flood control and improving several water quality components by reducing turbidity, increasing clarity, and reducing nutrient and sediment load. The end result is the improved health of both the estuaries and Lemon Bay.

This sediment management plan summarizes:

- Existing studies in the watershed.
- Investigation sites from this scope of work.
- Pollutant loading from upland areas.
- Best Management Practices' efficiencies.
- Potential projects from previous and current work efforts.

Section 6 evaluates potential sediment load reduction projects within the watershed and Section 7 prioritizes and recommends the projects.

2.0 EXISTING DATA

Between 1992 and 2008, 26 studies focusing on sediment and erosion have been conducted with components in the Lemon Bay watershed. The types of studies are discussed below; the recommendations from the studies are included in Section 5 Potential Projects.

Table 2-1 summarizes the data collected for the various types of studies. Study locations across the watershed are shown in Figure 2-1. More detailed descriptions, locations, and recommendations for the previous studies are in Section 5 Potential Projects.

2.1 SEDIMENT ABATEMENT STUDIES

Nineteen Sediment Abatement Studies throughout the County have been completed by Greenman-Pederson, Inc., Southeast (formerly Berryman & Henigar) for the County's Navigable Waterways Program; three of the studies were on the Lemon Bay watershed. The studies were used to assess potential locations to reduce land-based sediment accumulation in County waterways. These studies are typically for areas of a few square miles. No sampling was included, only an inspection of shorelines and coastal areas to identify problem sites, such as drainage outfalls and steep eroding banks. Estimates of pollutant loading from land-use-based sediment load and recommendations for reducing erosion and sediment deposition in the waterways are included. Of the three studies in Lemon Bay, two were in the Forked Creek subbasin and one in Lemon Bay Coastal subbasin.

2.2 COUNTY-WIDE WEIR STUDY

A 2003 Post, Buckley, Schuh & Jernigan County-wide Weir Study (Weir Study) surmised that a portion of the fine-grained sediments that contain elevated concentrations of nitrogen and metals are blocked by the weirs, preventing the pollutants from being transported downstream and into the Bay segments.

Two sites studied were in Alligator Creek and two in Forked Creek, with results reported for the two sites in Alligator Creek and one site in Forked Creek. None of these sites was used in the comparison of core samples upstream and downstream of the weirs. None of the three sites evaluated in Lemon Bay were ranked as a high priority for cleanup or removal of contaminated sediments. The Weir Study provides a matrix that ranks sites based on exceedance of Effects Levels and Target Cleanup Levels of heavy metal concentrations as determined by Florida Department of Environmental Protection (FDEP).

2.3 ALLIGATOR CREEK SEDIMENT MANAGEMENT PLAN

In April 2006, Berryman & Henigar completed a Sediment Management Plan for the Alligator Creek subbasin within the Lemon Bay watershed. The investigation divided Alligator Creek into six systems and found the banks of each system showed signs of moderate to severe erosion

attributed to steep slopes and non-cohesive, sandy soils. The recommendations are conceptual-level bank treatments for the reduction and management of sediment to Alligator Creek.

Table 2-1 Existing Sediment Management Studies and Sampling Programs for the Lemon Bay Watershed

Lemon Bay Study	Author	Year	Study Location	No. Sample Location	Information Obtained					
					Sediment Volume	Grain Size Analysis	Sediment Quality			
							Nutrients	Metals	Organics	Other
Special Purpose Study										
Sediment Quality at Weirs	Post, Buckley, Schuh & Jernigan	2003	Sarasota County	3	no	yes	yes	yes	yes	no
Management Plan										
Alligator Creek Sediment Management Plan	Berryman & Henigar, Inc	2006	Alligator Creek	0	Estimated Loading	no	no	no	no	no
Sediment Abatement Studies										
Forked Creek Neptune SAS	Berryman & Henigar, Inc	2006	Forked Creek	0	Estimated Loading	no	no	no	no	no
Brucewood Bayou SAS	Greenman-Pederson, Inc.	2007	Lemon Bay Coastal	0	Estimated Loading	no	no	no	no	no
Dale Lakes SAS	Greenman-Pederson, Inc.	2007	Forked Creek	0	Estimated Loading	no	no	no	no	no

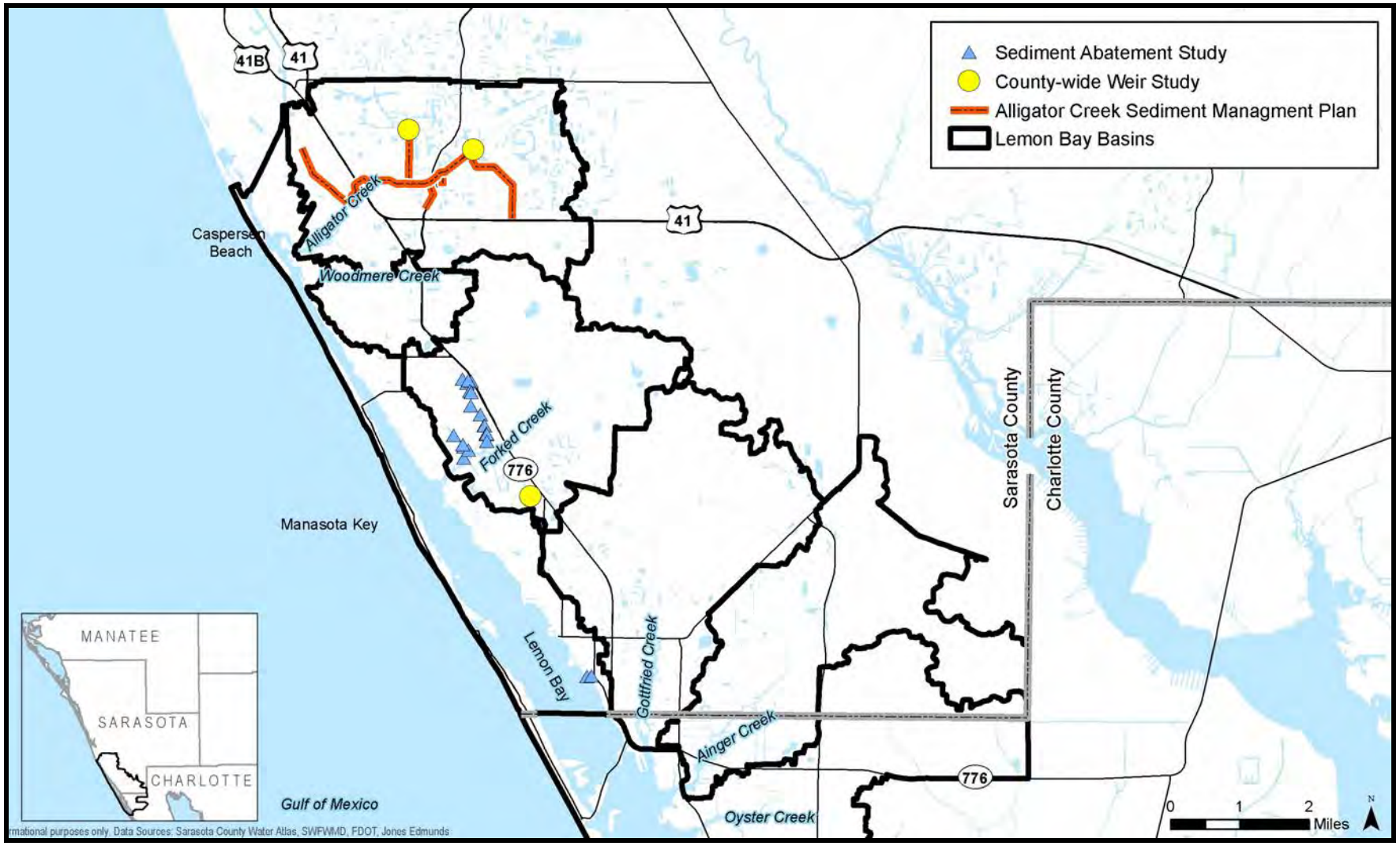

Figure 2-1 Previous Study Locations in Lemon Bay

3.0 FIELD INVESTIGATION

3.1 SAMPLING LOCATION CRITERIA

Jones Edmunds conducted sediment sampling as part of this Watershed Management Plan (WMP) work effort in order to identify areas of recent sediment erosion and accretion that were not identified in previous studies. Sample locations from previous studies are shown in Figure 2-1. Jones Edmunds evaluated existing information to identify additional sampling sites. Sites visited between March 2007 and May 2009 are shown in Figure 3-1. The sites were selected based on the following parameters:

- Accessibility.
- No previous sampling.
- Representative of system.
- Observed erosion/scoring or sediment accumulation.
- Observations made during a field reconnaissance conducted in May 2008.
- County staff input.

The sites include locations in six subbasins:

- Alligator Creek.
- Woodmere Creek.
- Forked Creek.
- Gottfried Creek.
- Ainger Creek.
- Lemon Bay Coastal.

The mainstems and the tributaries are represented. Laboratory testing was not part of this sampling.

3.2 SAMPLING AND ANALYSIS PROCEDURES

The sediment testing consisted of two elements: unconsolidated sediment depth and general physical characteristics. The upstream sites will assess the potential load from relatively undeveloped land in the basin headwaters. The downstream sites will provide data on potential erosion and deposition from urban areas.

1. Depth of sediment—The sediment depth at each site was measured using a stiff metal rod. The probe was manually pushed down into the sediment until refusal and the depth was measured. Three depth probes were taken at each sampling site—one near each toe and one near the middle of the channel bottom. The depth of standing or flowing water in the channel was also measured. In addition, general site conditions were recorded. The channel cross-section width was

measured at water level, a GPS location point was recorded at each cross section, and photographs were taken in the upstream and downstream directions at each location (included in the next subsection). A GIS feature class was also created containing the field measurements (Figure 3-2).

2. General Physical Characteristics—Unconsolidated sediment samples were examined in the field for general physical features, including qualitative descriptions of composition (organic, sand, clay, etc.), and relative percent of large organic matter/detritus.

3.3 SAMPLING SITE DESCRIPTIONS

Sites investigated for this study focused on bank stability and sediment accumulation from in-stream processes. The observations include these focus issues but also noted are any applicable upland contributing factors to sedimentation. The in-stream processes of bank erosion and sedimentation are part of the natural system but are accelerated by urbanization and anthropogenic activities in surrounding areas. Additionally, several sites were visited to help form a proactive plan to alleviate future sediment loading and accumulation to the waterways with future development. The site visits and potential projects are presented within the following areas of interest:

- Alligator Creek.
- Woodmere Creek.
- Forked Creek.
- Gottfried Creek.
- Ainger Creek.
- Lemon Bay Coastal.

Table 3-1 shows characteristics of soil groups found at the sites. The soil groups throughout the watershed range from somewhat poorly drained to very poorly drained; have an average depth to water table of less than 18 inches; and originate from sandy, loamy marine deposits. Loose, sandy soils do not aggregate or hold water well and by nature are more erodible—particularly on steep slopes.

Jones Edmunds conducted the site investigations between May 2008 and June 2009. Jones Edmunds, County, Southwest Florida Water Management, and Wolf Enterprises staff investigated five sites in March 2008. Jones Edmunds evaluated sites and/or measured sediment depth at 55 sites in Lemon Bay in between October 2008 and June 2009. Details concerning these site visits are provided in the following subsections arranged by basin, beginning with Alligator Creek.

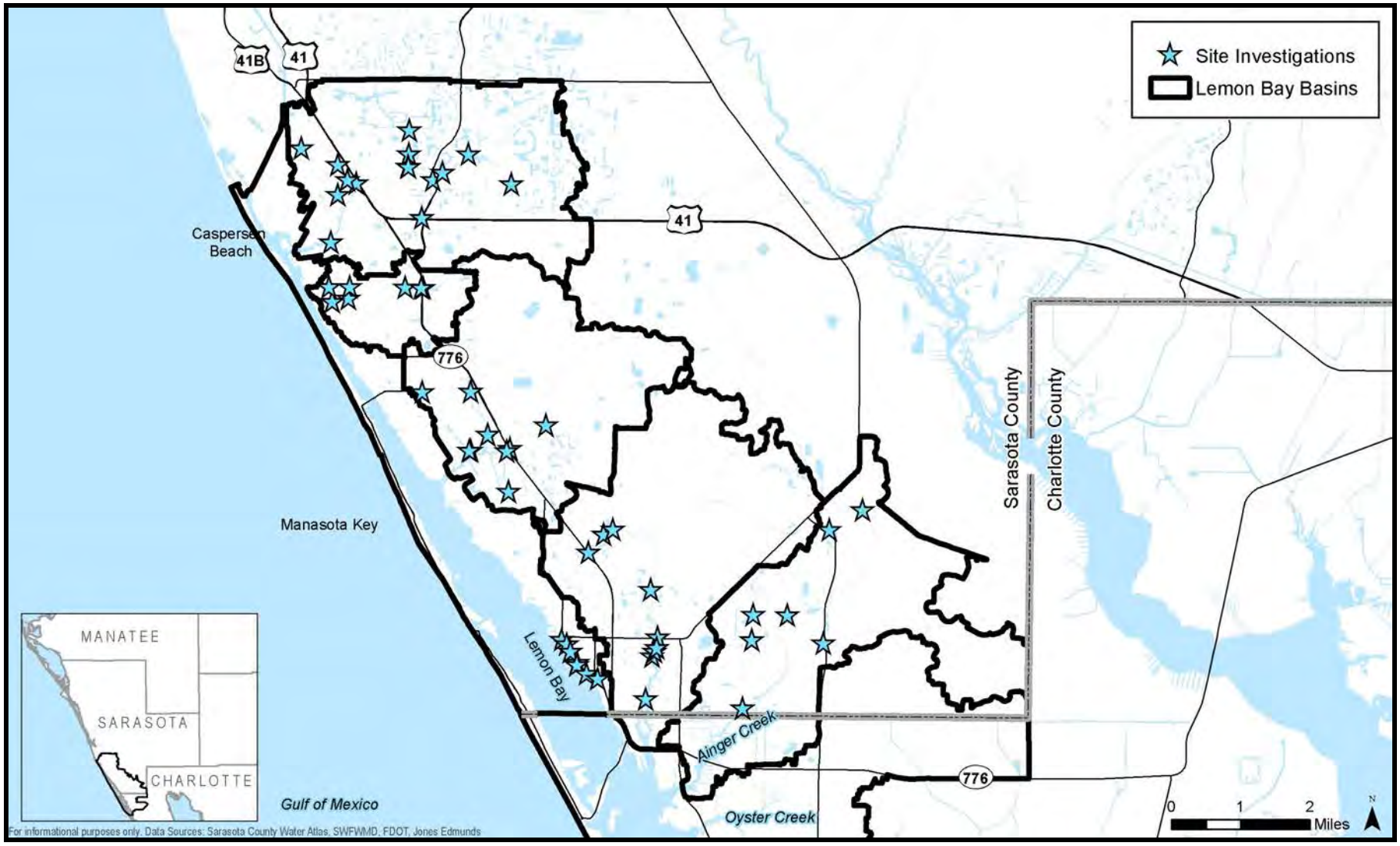

Figure 3-1 Location of Site Investigations

Table 3-1 NRCS Soil Descriptions

Soil Name	Landform	Parent Material	Slope	Drainage Class	Depth to Water Table (DTWT)
Bradenton fine sands	Flats on marine terraces, rises on marine terraces	Sandy & loamy marine deposits	0 to 2%	Poorly drained	About 0 to 12 inches
Cassia fine sands	Ridges on marine terraces, rises on marine terraces	Sandy marine deposits	0 to 2%	Somewhat poorly drained	About 18 to 42 inches
EauGallie & Myakka fine sands	Flatwoods on marine terraces	Sandy & loamy marine deposits	0 to 2%	Poorly drained	About 6 to 18 inches
Felda fine sands	Drainage ways on marine terraces	Sandy & loamy marine deposits	0 to 2%	Poorly drained	About 0 to 6 inches
Felda fine sands (depressional)	Depressions on marine terraces	Sandy & loamy marine deposits	0 to2%	Very poorly drained	About 0 inches
Felda & Pompano fine sands	Floodplains on marine terraces	Sandy & loamy marine deposits	0 to 2%	Poorly drained	About 0 to 6 inches
Floridana mucky fine sands	Drainage ways on marine terraces, flats on marine terraces	Sandy & loamy marine deposits	0 to 2%	Very poorly drained	About 0 to 6 inches
Floridana & Gator fine sands (depressional)	Depression on marine terraces	Sandy & loamy marine deposits	0 to 2%	Very poorly drained	About 0 inches
Holopaw fine sands (depressional)	Depressions on marine terraces	Sandy & loamy marine deposits	0 to 2%	Very poorly drained	About 0 inches
Pineda fine sands	Drainage ways on marine terraces	Sandy & loamy marine deposits	0 to 2%	Poorly drained	About 0 to 12 inches
Symrna fine sands	Flats on marine terraces	Sandy marine deposits	0 to 2%	Poorly drained	About 6 to 18 inches

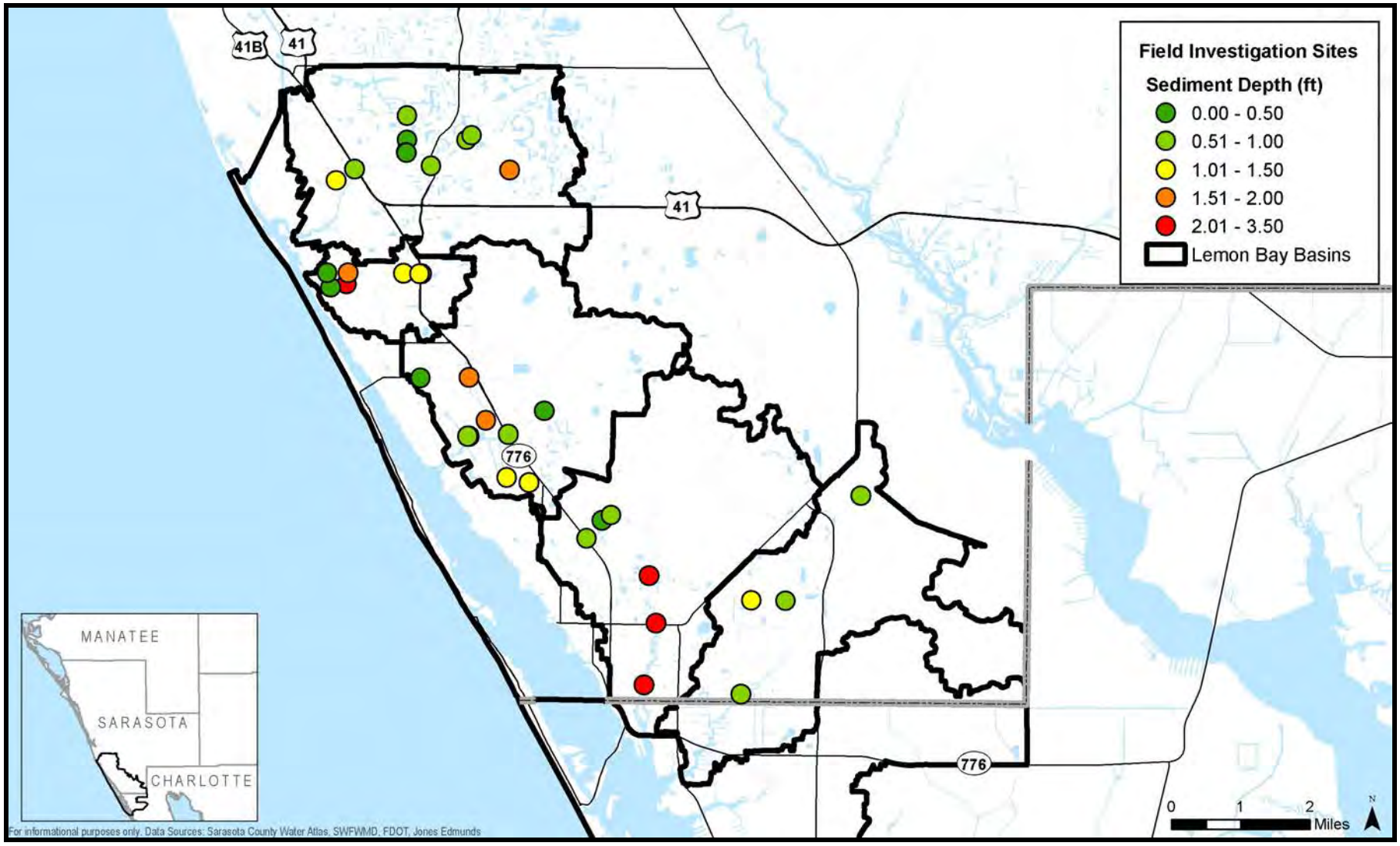

Figure 3-2 Sediment Depth Measurements from County-wide Weir Study and Jones Edmunds Field Investigations

3.3.1 Alligator Creek

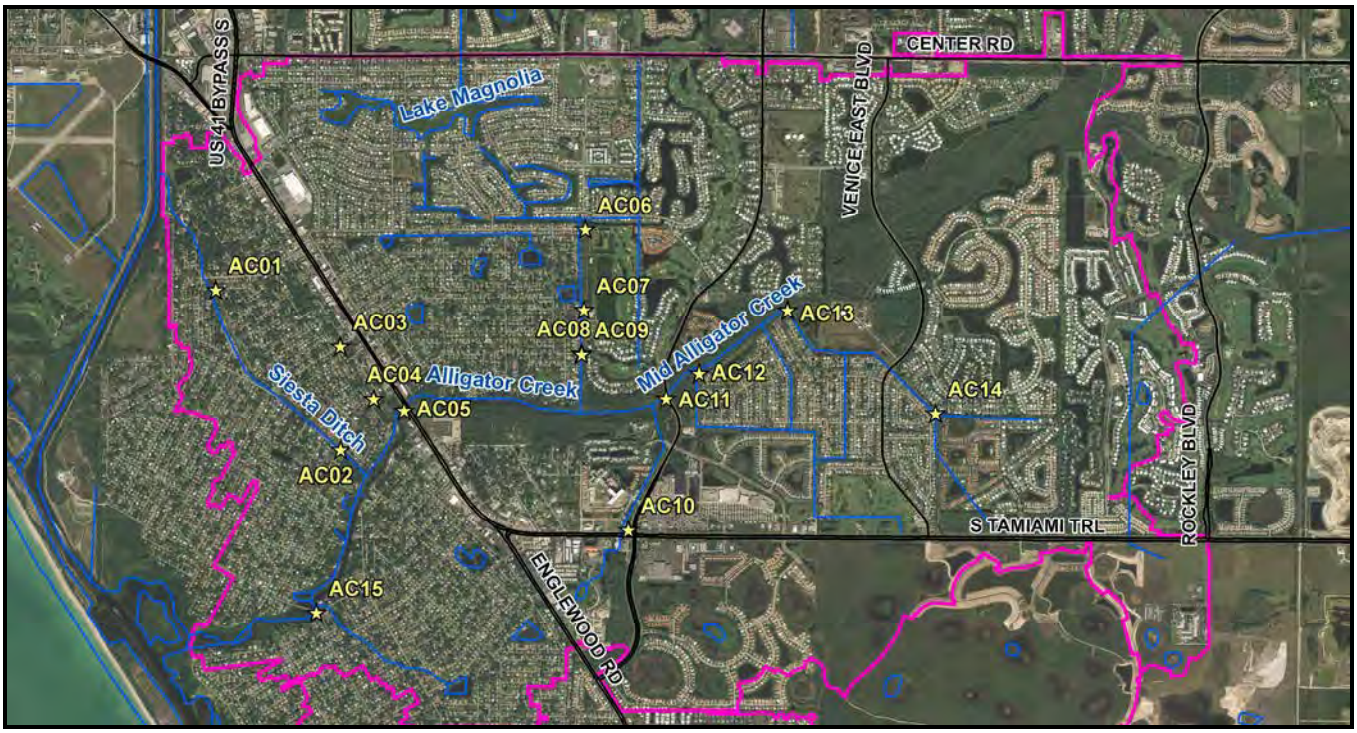

Figure 3-3 Alligator Creek Site Visit Locations (2007 Aerial Photograph, SWFWMD)

AC01: Siesta Ditch North

The upstream end of this channel segment is at the intersection of Thistle Road and Quincy Road. The channel segment runs parallel to Quincy Road for approximately half a mile. The area is drained by a small roadside swale system to two culverts that discharge to the channel. The banks are sparsely vegetated with nuisance vegetation and the soil is non-cohesive, sandy soils. The water surface was covered with hydrilla.

The downstream end of the segment opens slightly and a swale system from the west merges into the primary ditch. The nuisance vegetation through the downstream segment is very dense.

The area is medium-density residential land use. The NRCS native soils are primarily Holopaw fine sand, Pineda fine sand, and Eau Gallie/Myakka fine sands. The photos below show the general bank conditions found throughout the channel segment. Sediment depth was not measured at the site.

Photo: AC01: Looking South

Photo: AC01: General Bank Condition

AC02: Siesta Ditch South

The channel segment is located west of Tamiami Trail and flows parallel to Siesta Drive. The adjacent roadways are drained by a small roadside swale system but Siesta Drive discharges stormwater runoff directly to the channel. The banks are loose, non-cohesive sand that does not have good moisture-retaining characteristics. The nuisance vegetation does not have deep root systems to help create a cohesive soil matrix. The banks slopes are very steep, approximately 2:1 (H:V). The area is medium-density residential land use; backyard fences are at the edge of the sloughing top of bank. The channel segment is a remnant of an agricultural drainage system and provides effective flood control. The NRCS native soils are primarily Pineda fine sand and Eau Gallie/Myakka fine sands. Sediment depth measured in October 2008 averaged 1.8 feet. The streambed is sandy and contained little vegetation, but had collected urban debris.

Photo: Siesta Ditch AC02-upstream (Looking North)

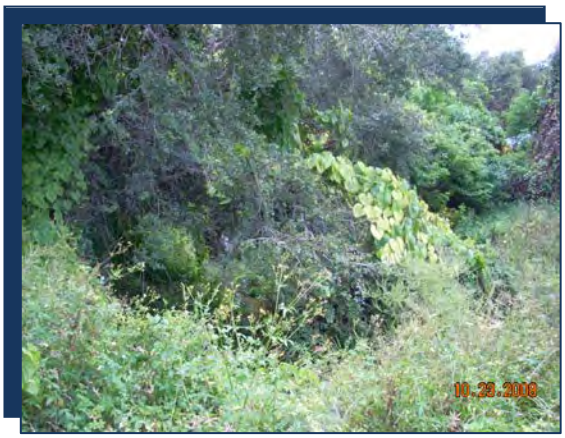

Photo: Siesta Ditch AC02-downstream (Looking South)

AC03 and AC04: Datura Ditch

This ditch segment, located between Seminole Drive and Baffin Drive, has private homes on both the east and west banks. The slopes are steep (less than 2:1 (H:V)) along the entire segment with backyard fences and electrical poles at the top of the sloughing banks. Nuisance vegetation is prevalent on the very loose, sandy soils on the banks and does not provide any cohesiveness to the soil matrix. The vegetation was dense and could interfere with the flood control function of the waterway. The ditch is surrounded by medium-density residential land use with

commercial/industrial only one block away on US41. The NRCS native soils are primarily Pineda fine sand and Eau Gallie/Myakka fine sands. Sediment depth was not measured at this site.

Photo: AC03 Upstream (Looking North)

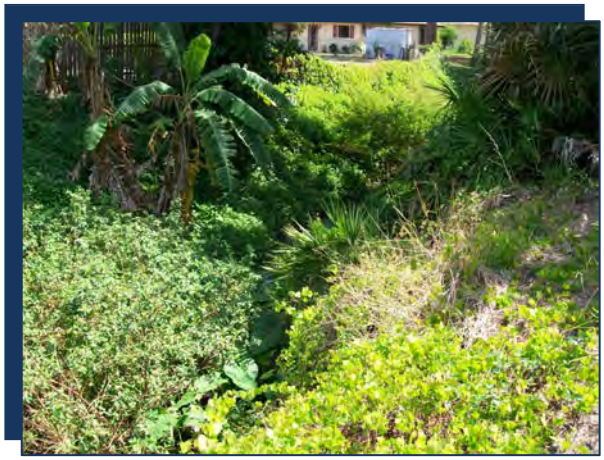

Photo: AC03 Downstream (Looking South)

AC05: Alligator Creek at US41

The channel segment is from US-41 extending eastward approximately 1 mile upstream. The channel banks are steep, less than 2:1 (H:V), and show evidence of undercutting and top of bank erosion caused by overland flow entering the channel. Surrounding land use is medium-density residential and commercial. The NRCS soil type in the upland areas is Eau Gallie/Myakka fine sand. Mangroves line a portion of the north bank. Sediment depth measured 0.8 feet in October 2008.

The County is in the process of designing a recreational trail from Jacaranda Blvd to US-41 along this channel segment.

Photo: AC05 Upstream (Looking West)

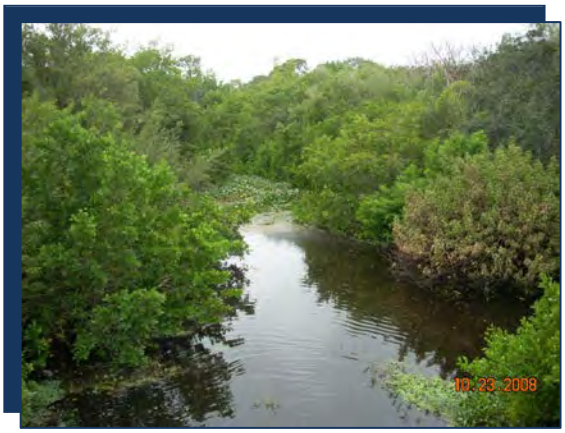

Photo: AC05 Downstream (Looking East)

AC06: Briarwood Road

This site is at the end of Briarwood Road at the entrance to the decommissioned WWTP. The channel segment on the north side of Briarwood Road is densely vegetated. The channel had

standing water but did not reach the invert of the 3-CMPs installed to convey flow from the upstream lake system to channel to Alligator Creek. Erosion was pronounced on the eastern slope of the downstream segment although the bank slope is relatively gentle at approximately 4:1 (H:V). The vegetation in the channel showed evidence of being sprayed with herbicide and the decaying vegetation left in the channel. The south bank was covered with nuisance vegetation but the soil matrix was very loose and signs of erosion were present. The site has varied land use: medium-density residential, recreational (golf course), and a decommissioned utility. The NRCS predominant native soil type is Eau Gallie/Myakka fine sands. Sediment depth was not measured at the site.

Photo: AC06 Culverts

Photo: AC06 General Bank Condition

Photo: AC06 Downstream (Looking South)

AC07: Darwin Road

The site is adjacent to large reclaimed water storage ponds. The banks are steep, less than 3:1 (H:V), and characterized by sloughing and erosion on the east bank with a proliferation of nuisance vegetation on the west bank. The soil matrix is non-cohesive. Surrounding land use classifications are medium-density residential, recreational (golf course), and utilities. Greater than 90% of the NRCS native soil is Eau Gallie/Myakka fine sands. The bottom sediments were sandy and mucky and flow was stagnant. Sediment depth measured at the site was 0.4 feet in October 2008.

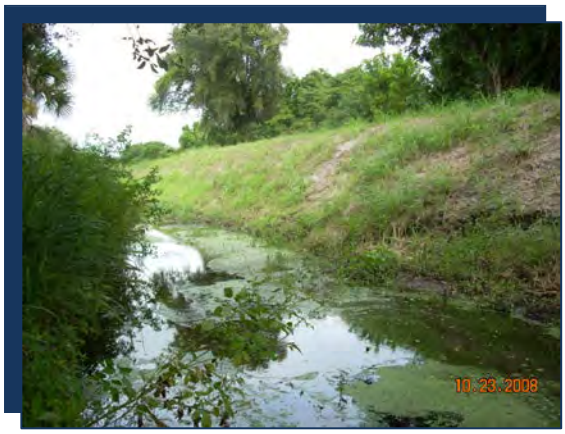

Photo: AC07 Upstream (Looking North)

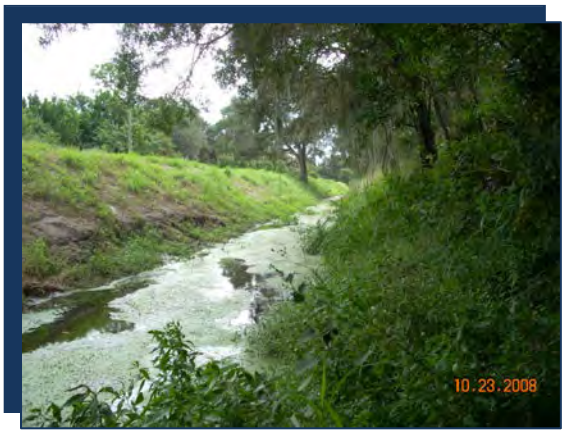

Photo: AC07 Downstream (Looking South)

AC08 and AC09: East Baffin Drive

The sites are at the east end of East Baffin Road adjacent to the channel. The swale on the north side of the road flows directly into the channel and the flow on the south side reaches the channel through a culvert. The outfall locations were densely vegetated. County maintenance crews had recently denuded the swales along the roadway. Erosion and loose sediment were evident throughout the system.

Photo: AC08 Denuded Swale (Looking West)

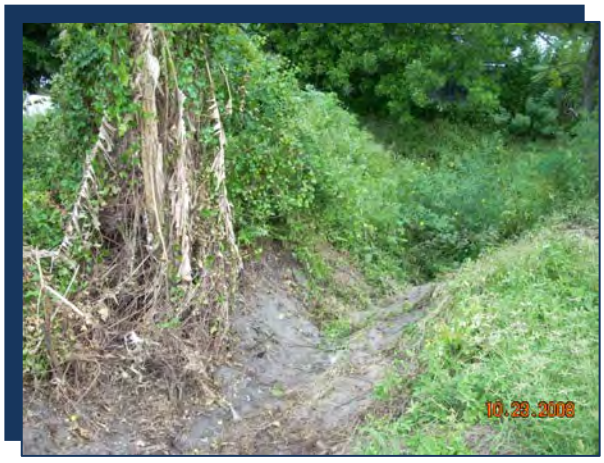

Photo: AC08 Swale Outfall (Looking East)

Photo: AC09 Culvert Outfall

AC10: Jacaranda at US41

The site, located at the corner of Jacaranda Blvd and Tamiami Trail, is surrounded by commercial/industrial land use and a large transportation corridor. The banks of the ditch are approximately 4:1 (H:V) and fully sodded and maintained. Sediment accumulation is apparent along the channel segment. The site is a confluence of several storm sewer systems from the east and south. It was not readily apparent which of the systems was transporting the sediment load observed in the ditch. Sediment depth was not measured at the site.

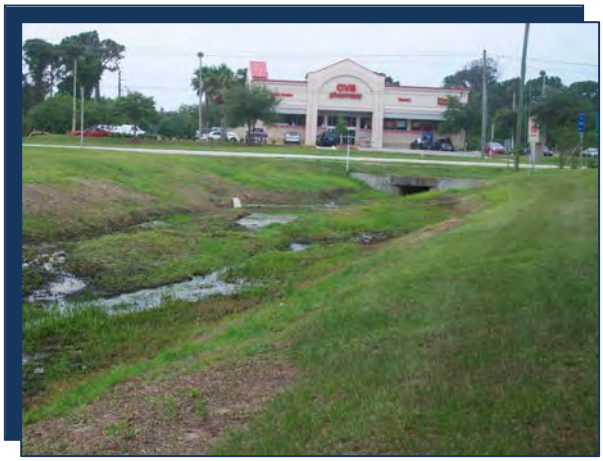

Photo: AC10 Upstream (Looking South)

Photo: AC10 Adjacent Detention Pond

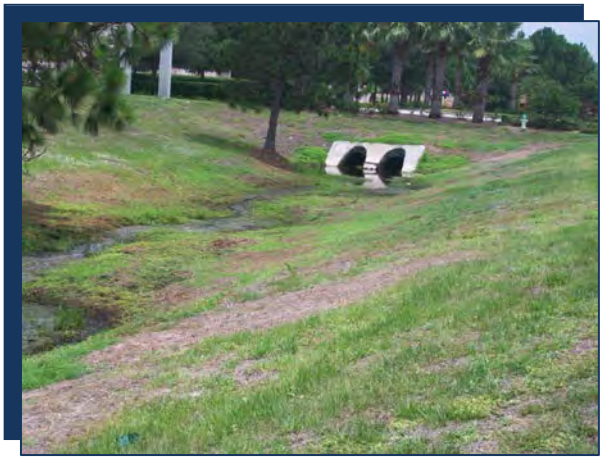

Photo: AC10 Downstream (Looking North)

AC11: Alligator Creek at Jacaranda Bridge

The channel segment is upstream and downstream of the Jacaranda Bridge at Alligator Creek. The banks are steep and show evidence of erosion and top of bank erosion caused by overland flow entering the channel. The south bank is sodded and maintained; the north bank is vegetated with native and nuisance vegetation. The south bank has loose, sandy soils. The surrounding land-use classifications are high-density residential and commercial/industrial. Greater than 90% of the NRCS native soil is Eau Gallie/Myakka fine sands with the channel bottom being Delray fine depressional sands. Sediment depth measured at the site was 1.0 feet in October 2008.

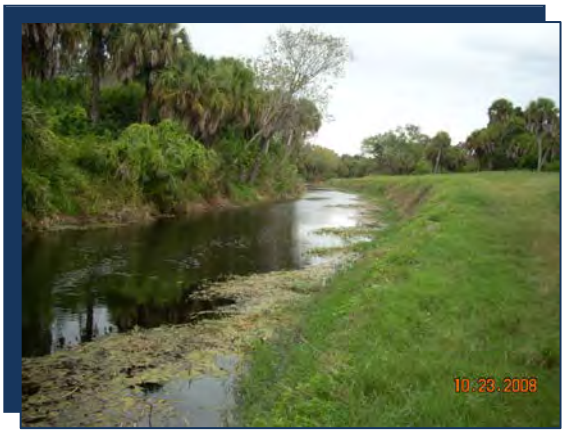

Photo: AC11 Upstream (Looking Northeast)

Photo: AC11 Downstream (Looking Southwest)

AC12: Woodmere Park Library

The channel segment starts at the Woodmere Park Library and extends 1300 feet to Alligator Creek. The banks are steep, less than 3:1 (H:V), and show signs of eroding, sloughing, and undercutting. Primrose was pervasive along the entire eastern bank. Manicured lawns extend to the top of bank on the east side with evidence of grass clippings in the channel. The channel bottom had several sandbars toward the upstream end. The surrounding land-use classifications are high-density residential and commercial/industrial. Greater than 90% of the NRCS native soil is Eau Gallie/Myakka fine sands with the channel bottom being Delray fine depressional sands. Sediment depth was not measured at the site. The area on the west bank of the channel segment is County-owned property.

Photo: AC12 Sediment Deposits and Undercutting

Photo: AC12 Downstream (Looking North)

Photo AC12 Upstream (Looking South)

AC13 and AC14: Venice Gardens WRF

The channel segment is approximately 1 mile long. The upstream segment is characterized by very loose, sandy soils and sloughing of the banks with a proliferation of nuisance vegetation that does not add cohesiveness to the soil matrix. The banks on the downstream portion of the channel segment show signs of erosion and undercutting. Decaying vegetation from herbiciding was in Alligator Creek during the field investigation in October 2008.

The surrounding land use is high-density residential and utilities. The easement is 40 feet wide along the length of the channel with the top of bank generally extending beyond the easement boundary. Greater than 90% of the NRCS soil type is EauGallie/Myakka fine sands with the downstream portion of the channel being Manatee loamy sand. Sediment depth measured at the upstream end of the segment was 1.9 feet and 1.0 foot in the downstream segment in October 2008.

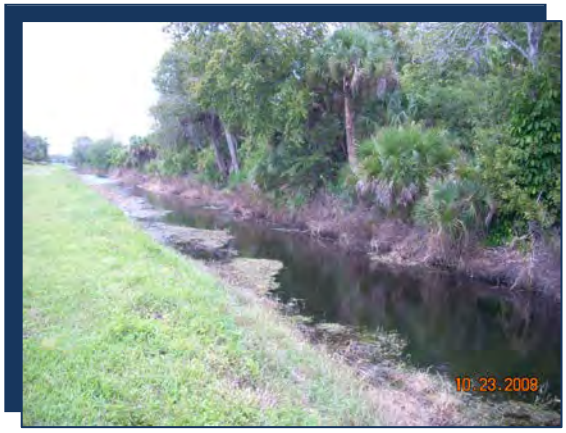

Photo: AC13 Downstream (Looking Southwest)

Photo: AC13 Small stream intersecting at Dorchester

Photo: AC14 Upstream (Looking Southeast)

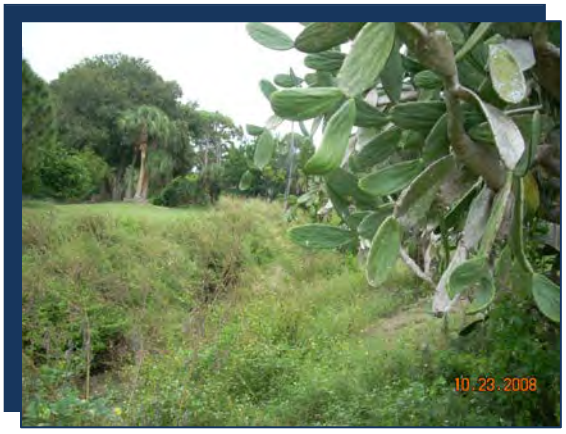

Photo: AC14 Downstream (Looking Northwest)

AC15: Alligator Creek Downstream at Shamrock Drive

The site was inaccessible for sediment depth measurements and is entirely a tidally-driven area, approximately 3500 feet east of the Intracoastal Waterway. The creek narrows to 65 feet to flow through the Shamrock Drive Bridge. Mangroves line most of the bank although seawalls are present. The creek is surrounded by medium-density residential land use. Sedimentation is visible in aerial photographs.

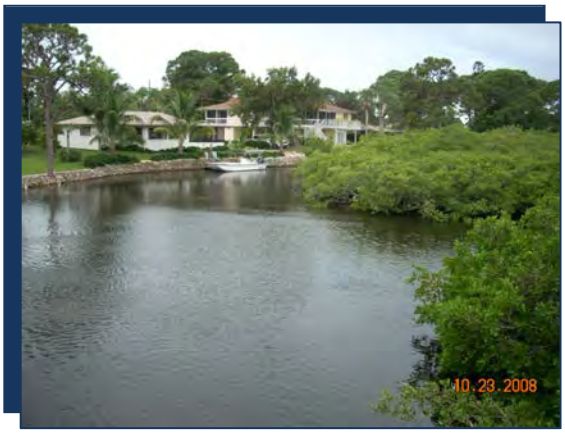

Photo: AC15 Upstream (Looking West)

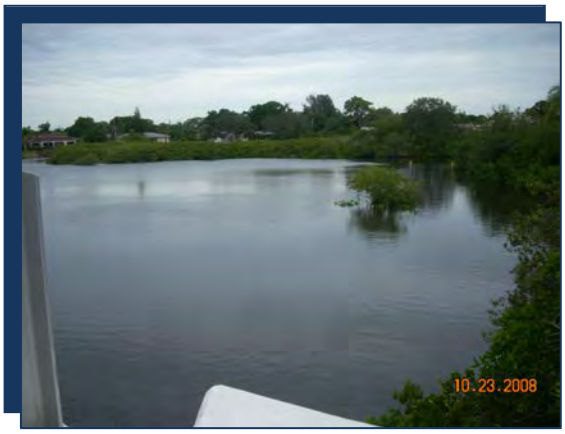

Photo: AC15 Downstream (Looking West)

3.3.2 Woodmere Creek

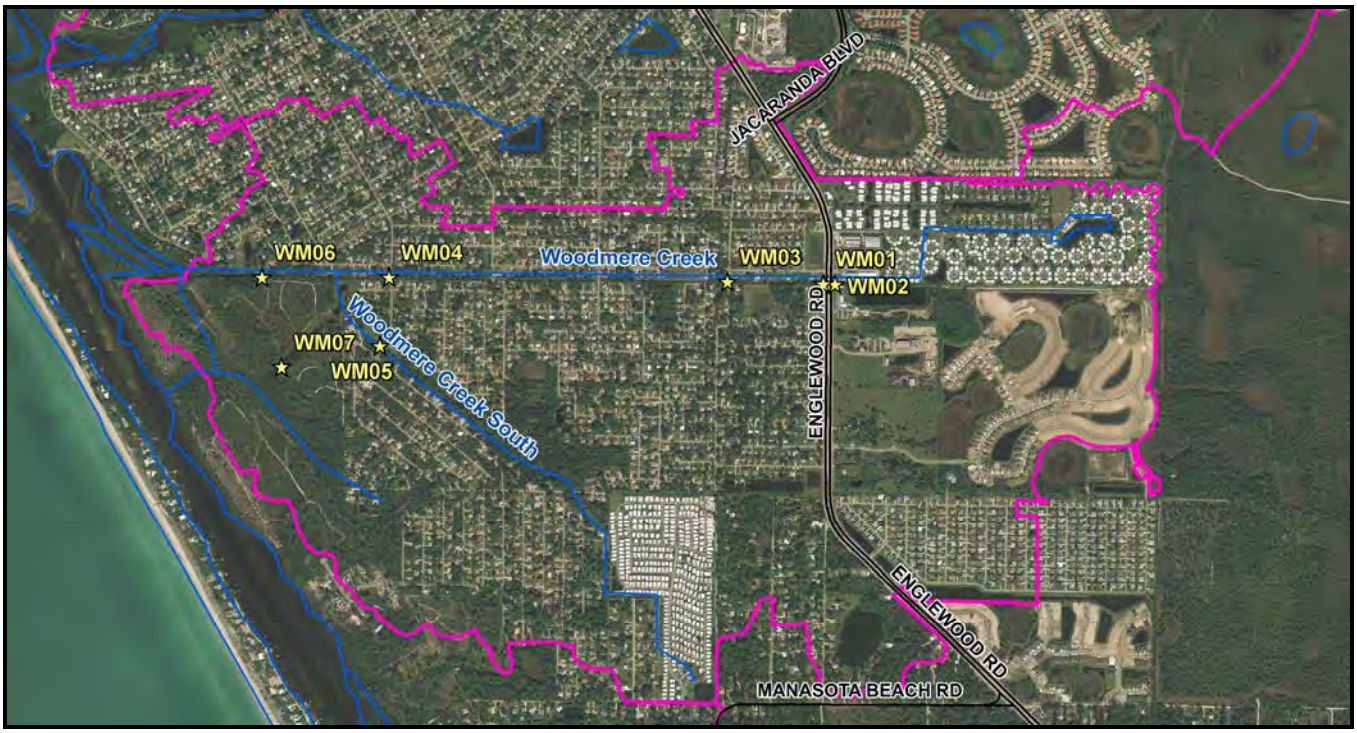

Figure 3-4 Woodmere Creek Site Visit Locations (2007 Aerial Photograph, SWFWMD)

WM01 and WM02: Woodmere Creek at US41

The site is where Woodmere Creek crosses US41. The upstream side is adjacent to a nursery and a flea market. The banks are heavily vegetated with nuisance species. The slope is approximately 4:1 (H:V). The streambed has aquatic vegetation and is mucky. Sediment depth measured 1.9 feet in October 2008.

The downstream channel segment is heavily vegetated and County maintenance staff denude the banks to maintain the flood capacity of the channel. Natural recruitment is allowed to take place; nuisance vegetation has filled in the banks. The process of denuding has contributed to the erosion and sloughing of the banks found through the channel segments. The soil matrix is loose, sandy soils without any cohesiveness. Sediment depth measured in October 2008 was 1.3 feet.

Photo: WM01 Upstream (East of US41 March 2008)

Photo: WM01 Upstream (East of US41 October 2008)

Photo: WM02 Downstream culverts (West of US41)

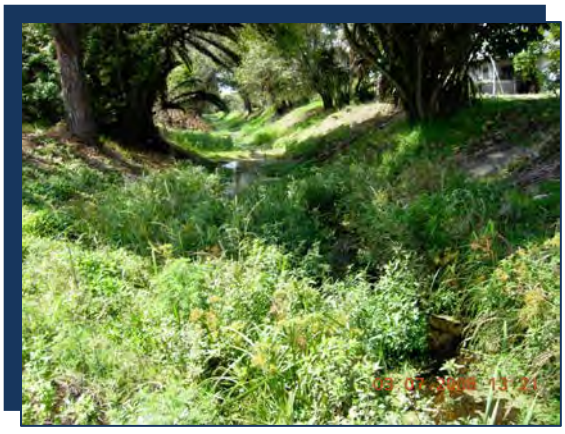

Photo: WM02 Downstream (West of US41 March 2008)

Photo: WM02 Downstream (West of US41 October 2008)

WM03: Florida Road

The site is west of Florida Road approximately 140 feet south of Rutgers Road in Woodmere Creek. The banks are heavily vegetated. County maintenance staff denude the banks to maintain the flood capacity of the channel. Natural recruitment is allowed to take place; nuisance vegetation has filled in the banks. The process of denuding has contributed to the erosion and

sloughing of the banks found through the upstream and downstream segments adjacent to the site. The sediment depth measured in October 2008 was 1.4 feet.

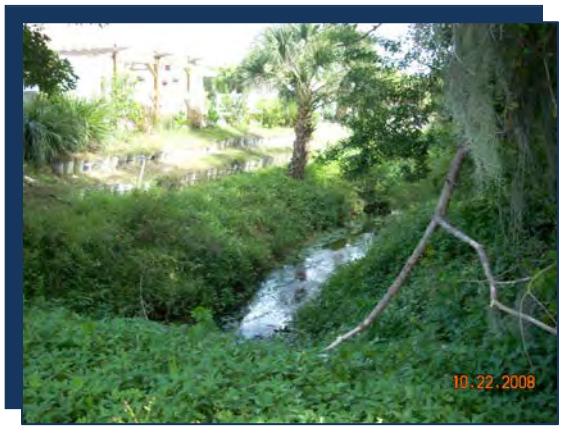

Photo: Woodmere Creek WM03-upstream

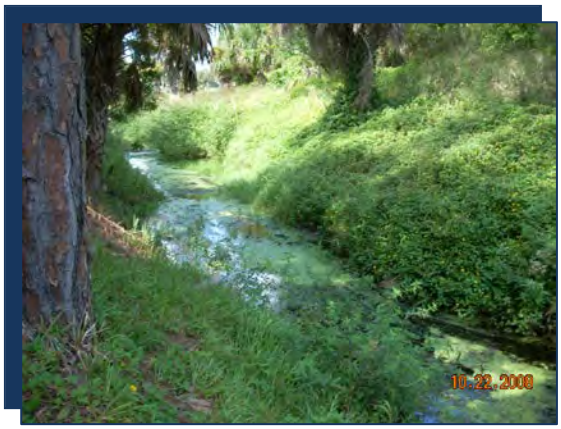

Photo: Woodmere Creek WM03-downstream

Photo: Woodmere Creek WM03-downstream culvert

WM04: Heron Road Bridge

The slope of the banks in the upstream and downstream channel segments are less than 3:1 (H:V). The streambed is mucky with some aquatic vegetation. Hydrilla was evident on the water surface and the flow was stagnant. The easement is 50 feet wide. The segment ends adjacent to the Lemon Bay Preserve. The surrounding area is medium-density residential land use with little stormwater treatment prior to runoff reaching the channel. The predominant NRCS soil groups are Pomello fine sand and Eau Gallie/Myakka fine sands. Sediment depth measured 1.8 feet in October 2008.

Photo: WM04 Upstream (Looking East)

Photo: WM04 Downstream (Looking West)

WM05: Heron Road and Seneca Road

The site is the channel segment along Woodmere Creek South 140 feet northeast of the intersection of Seneca Drive and Heron Road. The downstream segment flows approximately 900 feet to the Lemon Bay Preserve. The streambed has dense aquatic vegetation and the sediment is mucky. The banks are gently sloped but dense with nuisance vegetation. The surrounding land use is medium-density residential. The predominant NRCS soil types are Holopaw fine sand and Eau Gallie/Myakka fine sand. Sediment depth measured 2.2 feet in October 2008.

Photo: WM05 Upstream (Looking Southeast)

Photo: WM05 Downstream (Looking Northwest)

WM06 and WM07: Preservation Area

Woodmere Creek travels through the Lemon Bay Preserve and out to Lemon Bay. The channel is tidally influenced at the site. Mangroves line the south bank; manicured yards are adjacent to the north bank. The adjacent land uses are medium-density residential, hardwood conifers, and wetland forested mixed. The predominant NRCS soil groups are Eau Gallie/Myakka fine sands and Holopaw fine sand. Approximately 1600 feet west of Heron Road the sediment depth measured 0.5 feet in October 2008.

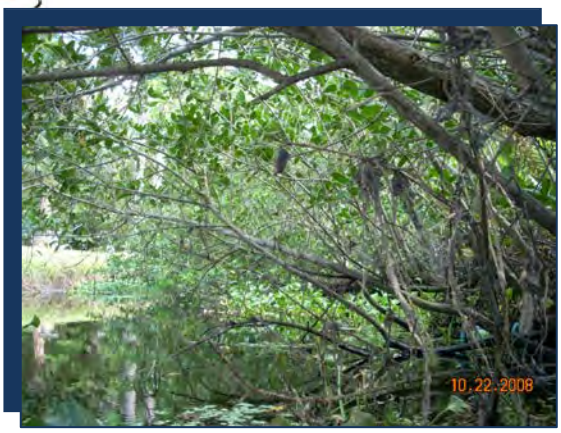

Photo: WM06 Upstream (Looking East)

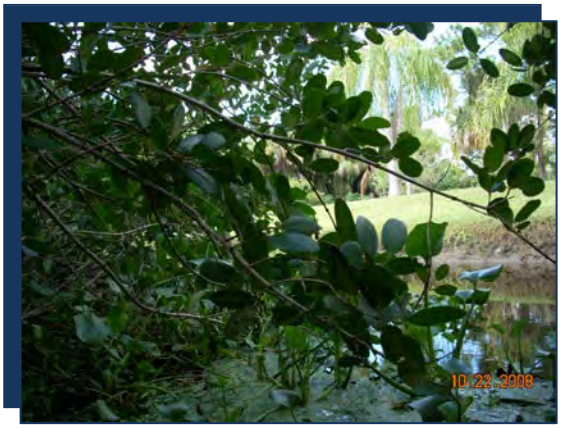

Photo: WM06 Downstream (Looking West)

Photo: WM07 Preservation Area Weir

3.3.3 Forked Creek

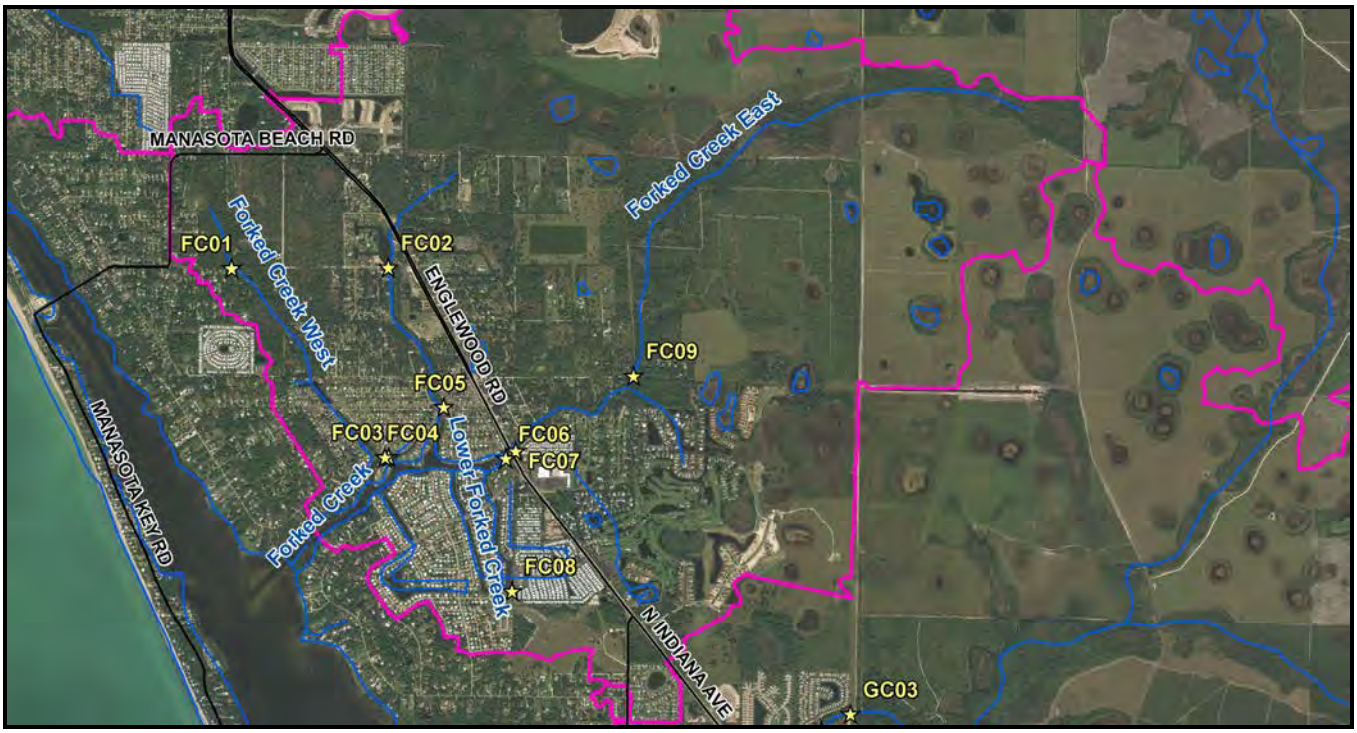

Figure 3-5 Forked Creek Site Visit Locations (2007 Aerial Photograph, SWFWMD)

FC01: West 5th Street

The site was a dry stream bed adjacent to West 5th Street, a limestone roadway. The flowpath was not discernable during the site visit.

Photo: FC01 Upstream

Photo: FC01 Downstream

FC02: 5th Street

The outfall from Dale Lake is a small channel at the south end of the lake at the east end of 5th Street. A 400 feet swale from Englewood Road to the lake discharges at the outfall as well as a roadside swale from the west. The channel segment is densely vegetated at the outfall point with nuisance and exotic vegetation. Over 90 percent of the surrounding land use is medium-density residential. NRCS soil types are Eau Gallie /Myakka fine sands and Boca and Hallandale soils. Sediment depth measured 1.6 feet in October 2008.

Photo: Forked Creek FC02-downstream

FC03 and FC04: San Remo Drive

The sites are within the canal system tributary to Forked Creek. Stormwater discharge into the canal is untreated. The banks are selectively hardened with some mangroves present. Homeowners reported mangroves being cut down by County maintenance workers. The bottom is sandy and does not have any aquatic vegetation. Sediment depth measured at the sites was 1.1 feet and 1.0 foot respectively in October 2008.

Photo: FC03 Mangroves

FC05: Overbrook Road

The bridge west of Forked Creek Drive on Overbrook Road was replaced in 2008. Accumulated sediment south of the bridge is visible in 2007 aerial photographs. The site is surrounded by

high-density residential land use. Stormwater runoff flows directly to the channel through a driveway culvert/roadside swale system. Overbrook Road is in good repair but several of the local neighborhood roads are pitted and graveled with accumulated sediment on the pavement and at the edge of the pavement. NRCS soil types are primarily Pomello and Cassia fines sands. Sediment depth measured in October 2008 was 1.6 feet.

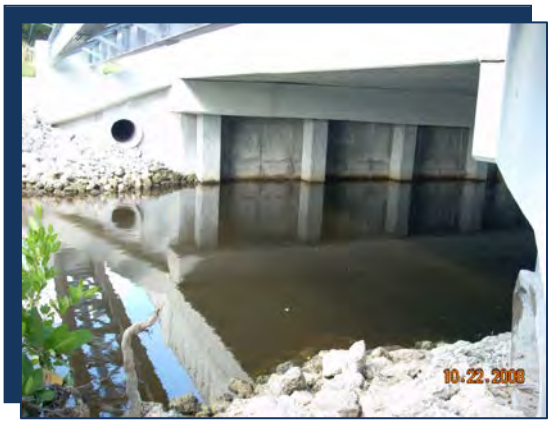

Photo: FC05 Bridge

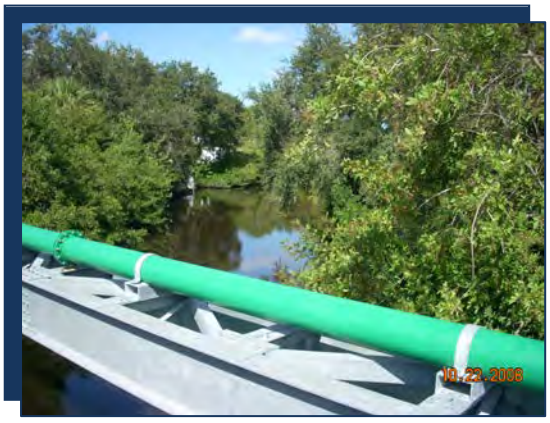

Photo: FC05 Upstream (Looking North)

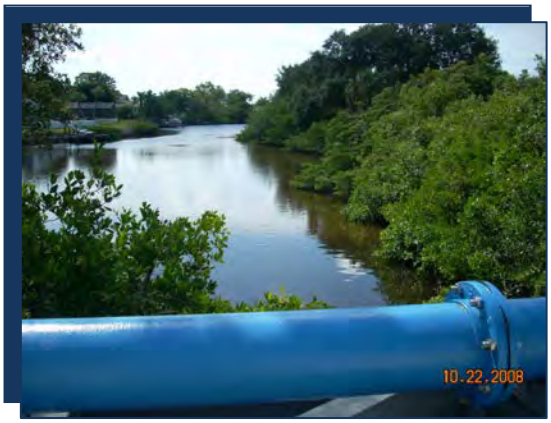

Photo: FC05 Downstream (Looking South)

FC06 and FC07: Forked Creek at US41

The site is in a highly-urbanized portion of the Forked Creek basin. A mobile home community is adjacent to the creek on the upstream side and residents report the creek to be unnavigable due to the accumulated sediment. The southern bank has a seawall while the northern bank is mangroves. The system is tidally influenced and the bottom sediment appears mucky. Sediment depth measured 1.0 ft in October 2008.

On the downstream side of the bridge, the south bank was hardened with a seawall from the bridge to about 300 feet downstream. Residents reported the channel had been dredged to remove excess sediment that interfered with recreational boat traffic. The north bank had mangroves for approximately 200 feet and then was hardened by seawalls. Several culverts discharge to Forked Creek adjacent to the bridge.

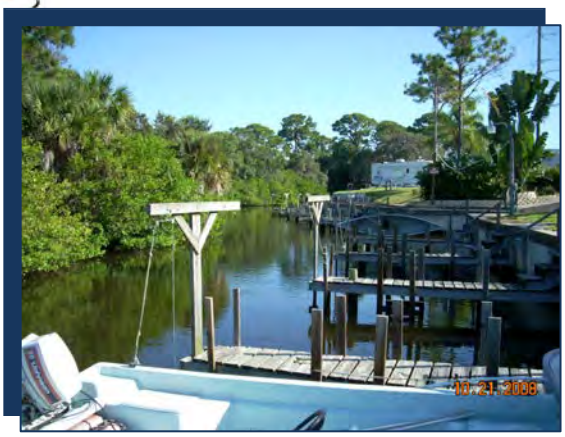

Photo: FC06 Upstream (Looking East)

Photo: FC06 Downstream (Looking West)

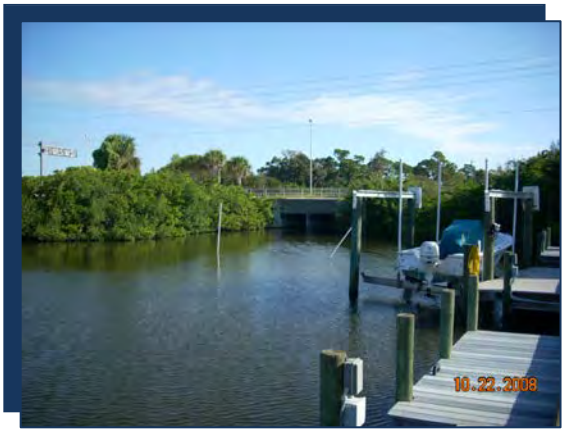

Photo: FC07 Upstream (Looking East)

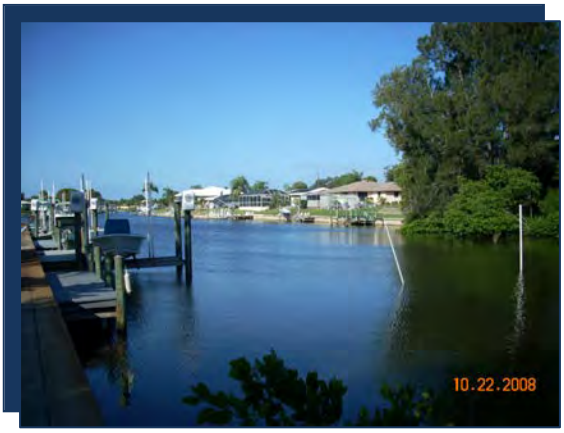

Photo: FC07 Downstream (Looking West)

FC08: Buchan Airport

The site is located on the Buchan Airport property owned by the County. The stream outfalls into a canal connected to Forked Creek. The stream has several stepped weirs to keep the water level in the stream elevated upstream to US 41. The stepped system has kept the water stagnant and covered with duckweed. Residents in the adjacent subdivisions have expressed concern about the amount of sediment being transported down the stream and into the canal. The outfall is approximately 3 feet above the high tide water line. The sediment at the seawall was measured at greater than 1.5 feet in October 2008.

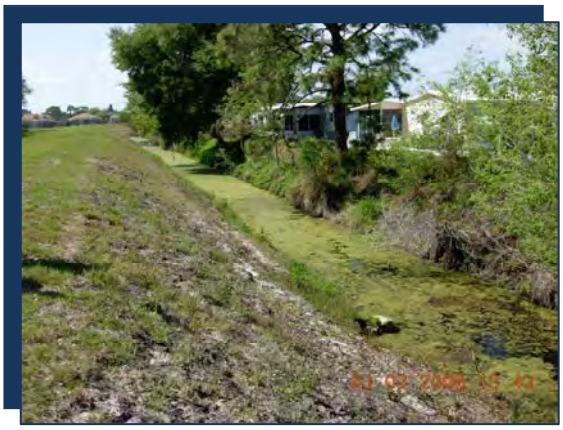

Photo: FC08 Upstream (Looking East)

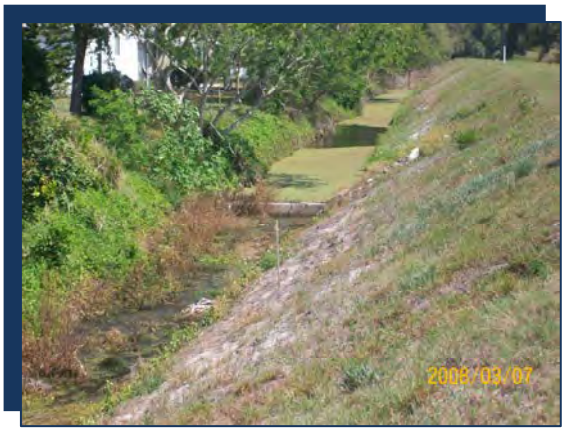

Photo: FC08 Downstream (Looking West)

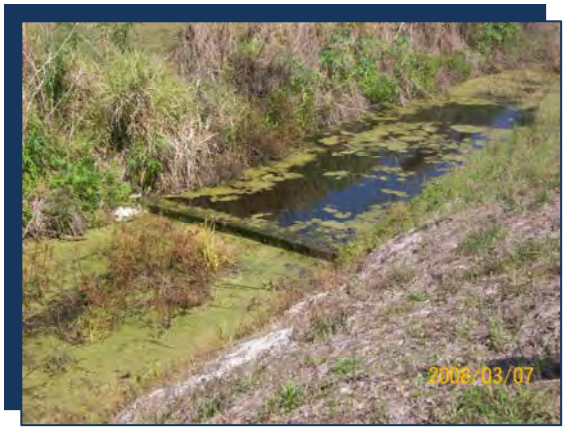

Photo: FC08 Step Weir

Photo: FC08 Outfall

Photo: FC08 Outfall

FC09: Keyway Road

The site is at the end of a limestone road on private property. The surrounding land use is low-density residential, pasture and cropland, and pine flatwoods. NRCS soil types are Pineda fine sand, Holopaw fine sand and Eau Gallie/Myakka fine sands. Access was limited but the system appeared natural with 0.4 feet of sediment accumulation measured in October 2008.

Photo: FC09 Upstream

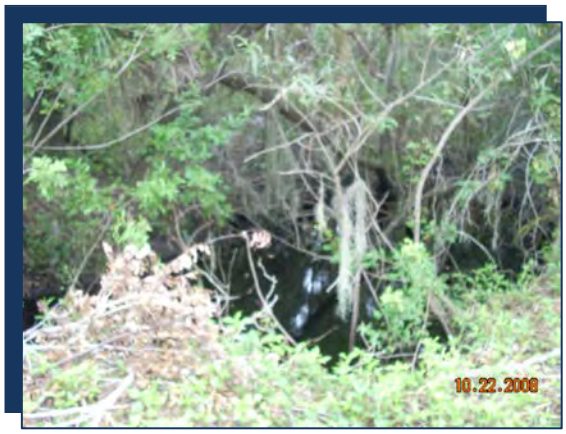

Photo: FC09 Downstream

3.3.4 Gottfried Creek

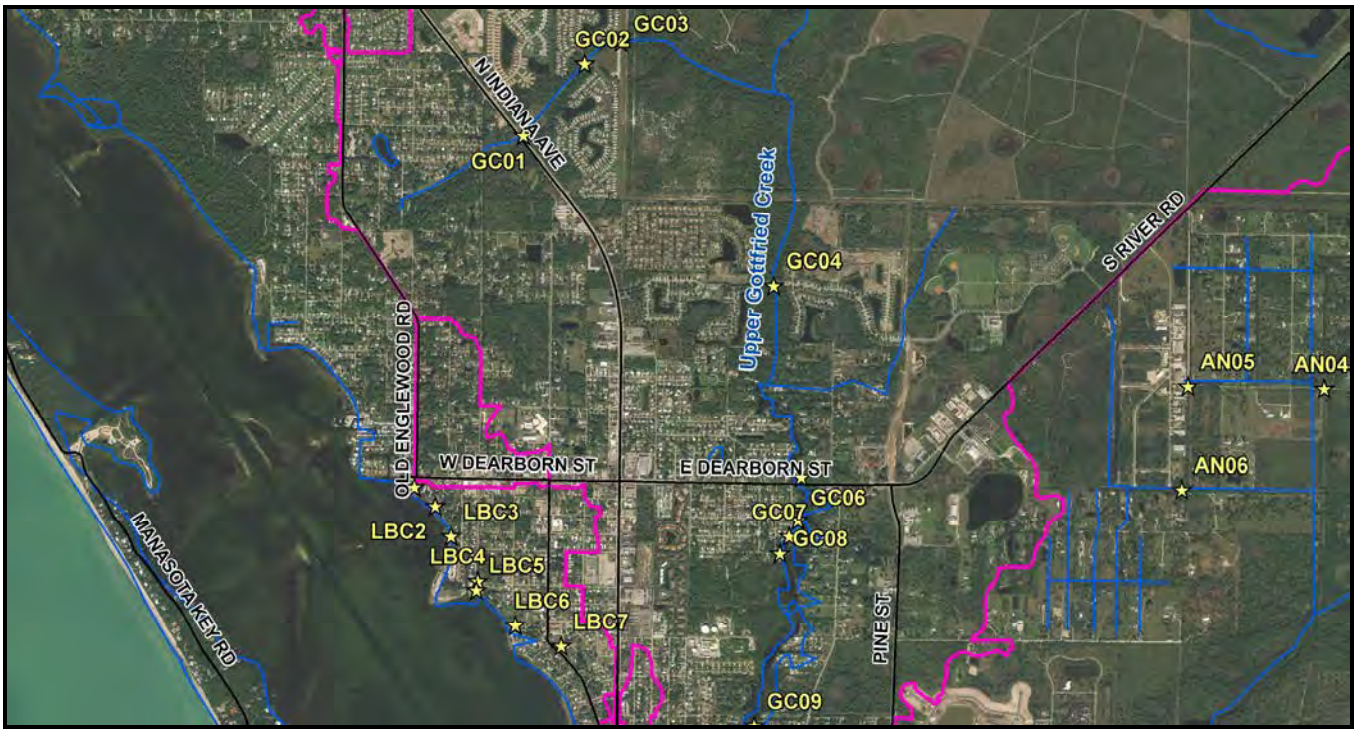

Figure 3-6 Gottfried Creek Site Visit Locations (2007 Aerial Photograph, SWFWMD)

GC01: Bridge on Indiana Avenue

The site is downstream (east) of Indiana Ave between Yosemite Drive and Tangerine Woods Boulevard. between two FDOT ponds. Upstream of the site is a nursery discharging directly to the channel. The channel bed was sandy with a significant amount of organics. NRCS soil types are Eau Gallie/Myakka fine sands, Manatee loamy sands, and Holopaw fine sands. The sediment depth measured in October 2008 was 0.8 feet.

GC02 and GC03: Tangerine Woods Blvd to FPL Easement

The gently sloping channel segment flows from Tangerine Woods Boulevard east to the power easement on the east side of the subdivision. The water surface was covered with hydrilla and other aquatic vegetation along the 650 feet segment. No erosion, sloughing, or undercutting was apparent. Surrounding land use is high-density residential, hardwood conifer mix, open land and utilities. NRCS soil types are Holopaw fine sands and Eau Gallie/Myakka fine sands. Sediment depths measured in October 2008 were 0.1 feet and 0.7 feet upstream and downstream, respectively.

Photo: GC02 Upstream

Photo: GC02 Downstream

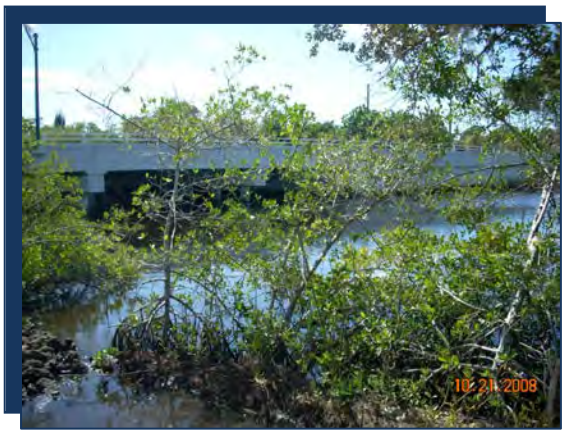

Photo: GC02 Downstream Culvert

Photo: GC03 Upstream

Photo: GC03 Downstream

GC04: Park Forest

The site is in the Park Forest subdivision and is a relatively natural stream system. A small oxbow has formed but does not affect the flood capacity of the stream. The banks show some evidence of undercutting. The bottom sediments are mucky and devoid of aquatic vegetation. The site is surrounded by medium-density residential land use that receives stormwater treatment prior to entering the natural stream system. NRCS soil groups are Boca and Hallandale soils. Sediment depth measured 3.3 feet in October 2008.

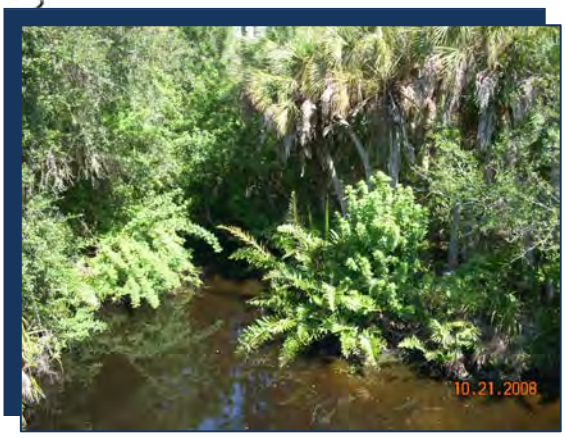

Photo: GC04 Upstream (Looking South)

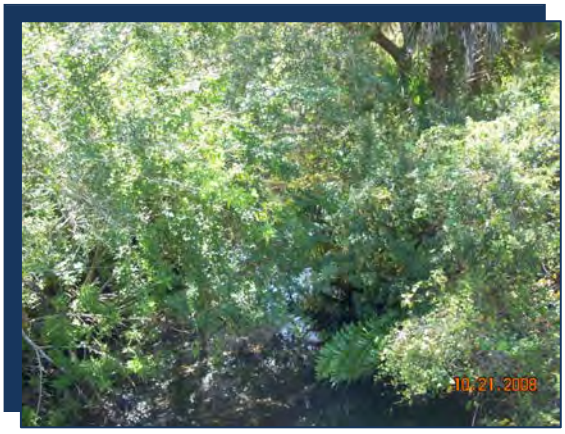

Photo: GC04 Downstream (Looking North)

GC05: Dearborn Street Bridge

The site is upstream of the Dearborn Street Bridge. The channel is surrounded by low- and medium-density residential land use. NRCS soil types are Boca and Hallandale soils in the uplands and Kesson and Wulfert mucks adjacent to the channel. The system is tidally influenced with a mucky bottom and the banks were generally hardened by seawalls. Sediment depth measured 2.4 feet in October 2008.

Photo: GC05 Basin Area

GC06, GC0, and GC087: Local Roadways

The sites are at the east ends of Langsner, Court, and Cowles Streets respectively. For Langsner and Court Streets, the roadways are graded for stormwater runoff to flow directly into the creek. The end of the pavement is between 50 and 75 feet from the top of bank of the creek. The land surface appears to be several feet higher than the water surface elevation (the site visit was after several days of heavy rainfall in June 2009).

For the site at the end of Cowles Street, the land surface was 10 feet above the water surface. A nearby homeowner reported never seeing water from the creek come close to the top of bank and did not observe runoff from any of the adjacent roadways. The small depressional area at the top of the bank had large—70 to 80 feet tall—Australian pines.

The surrounding land use types are low- and medium-density residential. NRCS soil types are Cassia fine sand and Eau Gallie/Myakka fine sands.

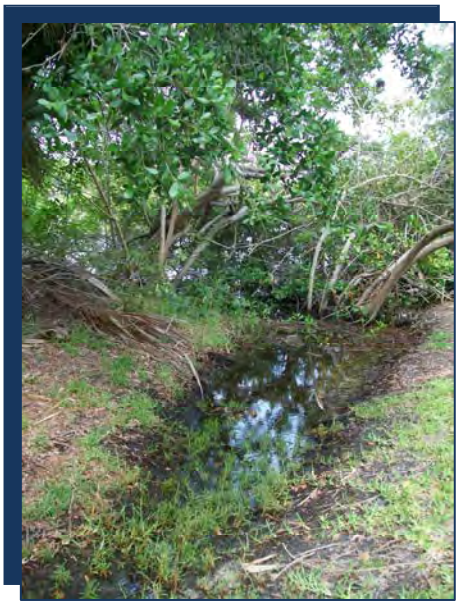

Photo: GC07 Looking East at Gottfried Creek

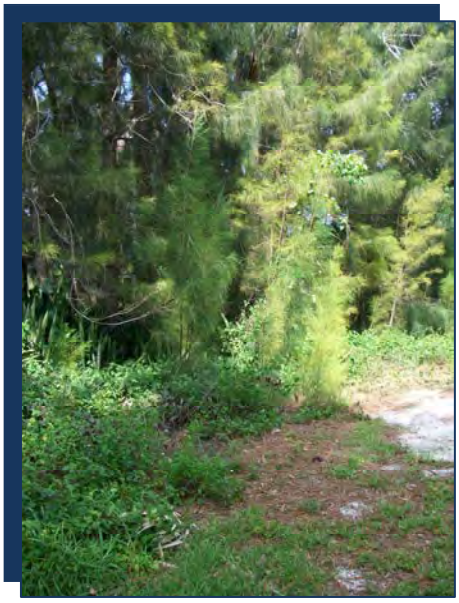

Photo: GC08 Looking East at Gottfried Creek

GC09: Cortes Drive

The site is at the end of Cortes Drive off of South Oxford Drive. Between the end of the cul de sac and the mangroves is a drop inlet with a pipe that discharges directly to the tidally-influenced creek. The roadway is in poor condition with accumulated sediment and gravel on the surface and along the edge of pavement. Much of the sediment on the roadway is crumbling roadway material. Sediment depth measured at the pipe outfall was 3.5 feet in October 2008.

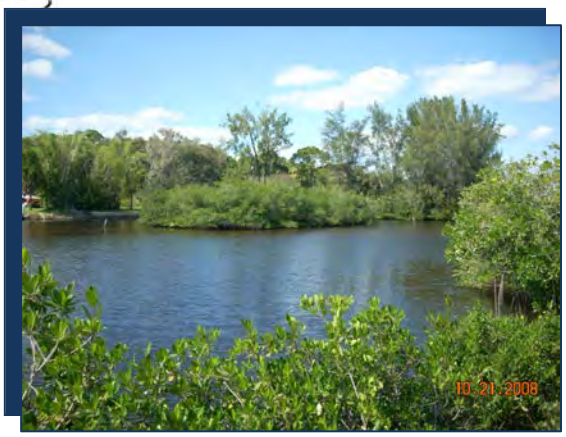

Photo: GC09 Upstream (Looking North)

Photo: GC09 Downstream (Looking South)

Photo: GC09 Upland

Photo: GC09 Outlet

3.3.5 Ainger Creek

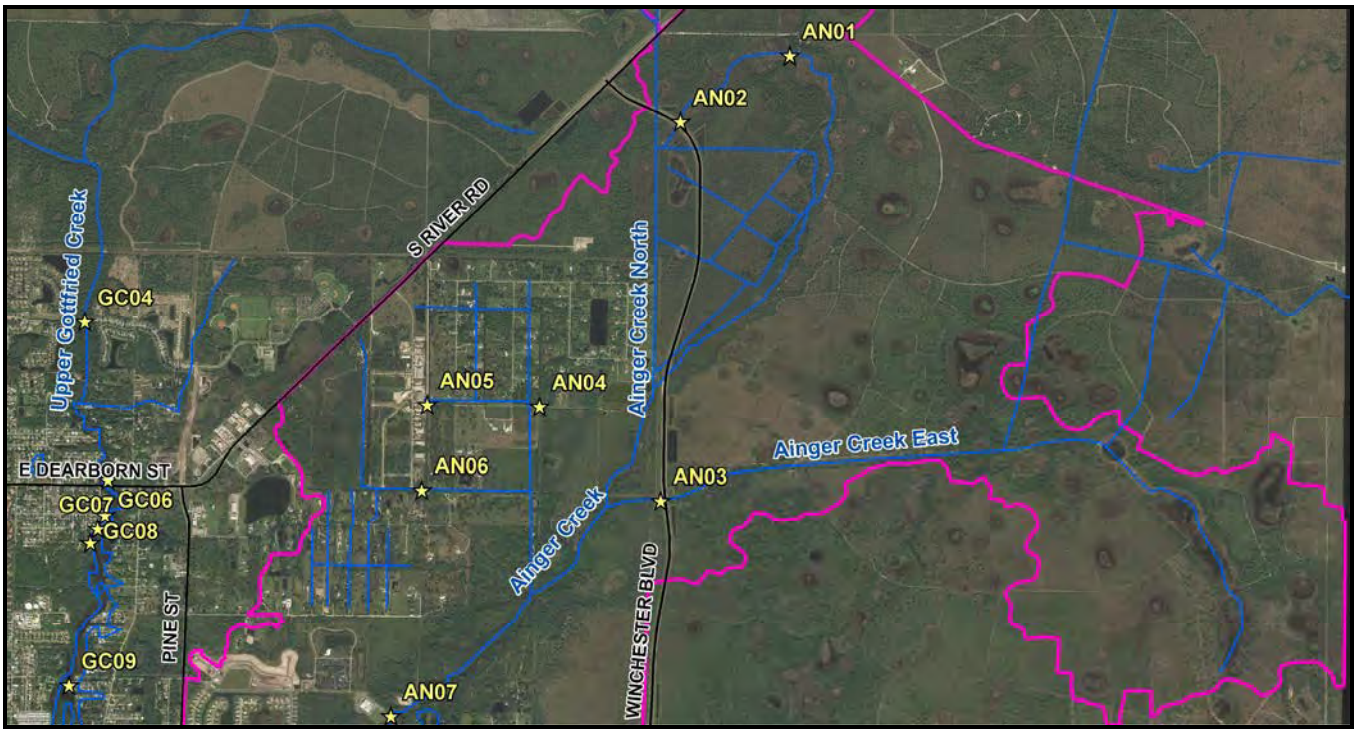

Figure 3-7 Ainger Creek Site Visit Locations (2007 Aerial Photograph, SWFWMD)

AN01: Myakka State Forest

The site is in the state park approximately 3000 feet east of the park entrance. During our visit the flow was stagnant and the river bottom was covered with vegetation. The muck smelled like sulphur. The surrounding land use is fresh water marshes and open rural land. The primary NRCS soil groups are Pople fine sand, Holopaw fine sand, and Delray depressional sand. Sediment depth measured 0.6 feet in October 2008.

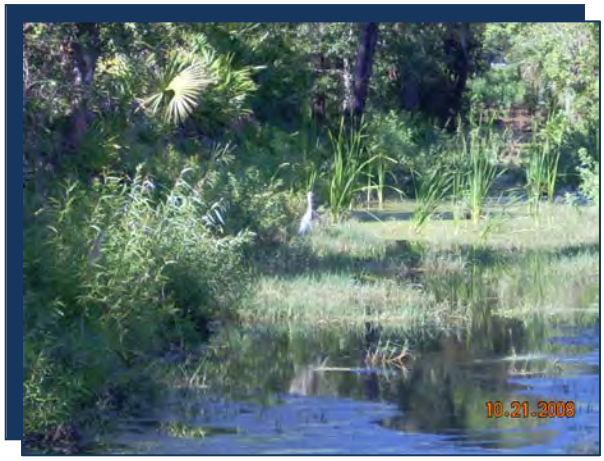

Photo: AN01 Wetland

AN02 and AN03: Winchester Road

The stormwater system along Winchester Road is extensive, consisting of treatment ponds, wetlands, and culverts. Unfortunately, the stormwater system was inaccessible. The surrounding area is undeveloped and primarily natural ecosystems. No erosion or sediment accumulation was evident.

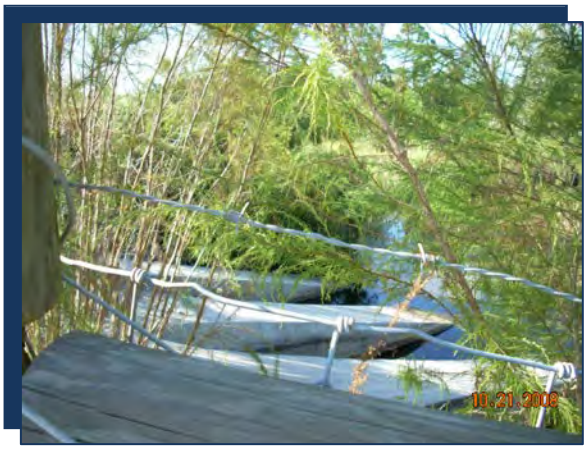

Photo: AN03 SW Treatment System

Photo: AN03 SW Treatment System

AN04: East Melody Lane

The site is at the end of a limestone road and channel is a former agricultural drainage ditch. The banks are stable, vegetated, and show no signs of erosion. The surrounding land use is low-density residential and agriculture. The NRCS soil type is Eau Gallie/Myakka fine sands. The water surface was covered with duck weed and the channel bottom consisted of a mixture of sand and muck with aquatic vegetation. Sediment depth measured 0.9 feet in October 2008.

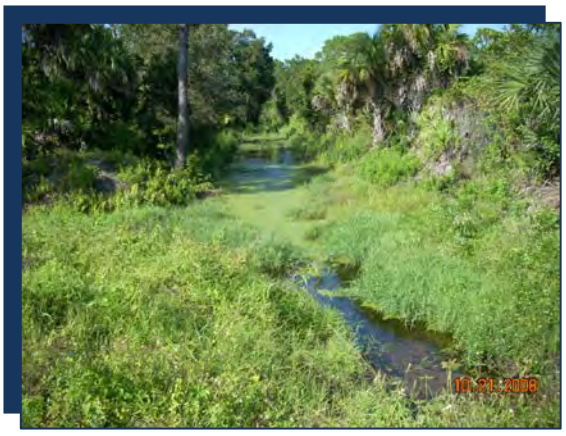

Photo: AN04 Upstream (Looking North)

Photo: AN04 Downstream (Looking South)

AN05: Melody Lane

The site is a half a mile west of AN04 and the discharge point of approximately 136 acres through 2 42-inch culverts. The downstream channel segment is severely degraded. The bottom sediment is mucky and smells of sulphur. An industrial complex is adjacent to but not discharging to the channel segment. The upstream area that discharges to the channel is low-

density residential and agriculture. The predominant NRCS soil is Eau Gallie/Myakka fine sands. The sediment measured in the stream bed was approximately 1.5 feet.

Photo: AN05 Upstream (Looking North)

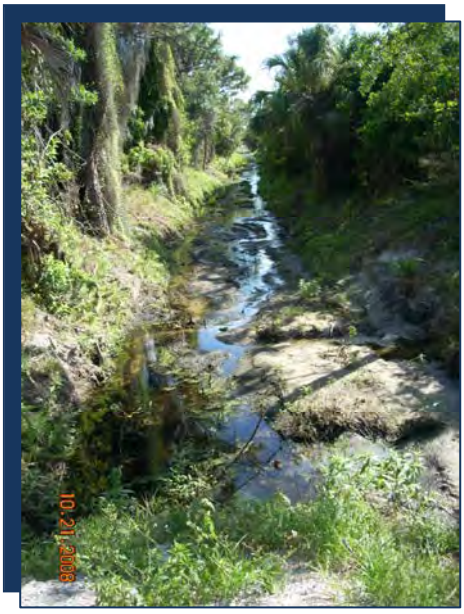

Photo: AN05 Downstream (Looking South)

AN06: Paul Morris Drive

The site is adjacent to the outfall end of AN05. Melody Lane and was inaccessible for measurements.

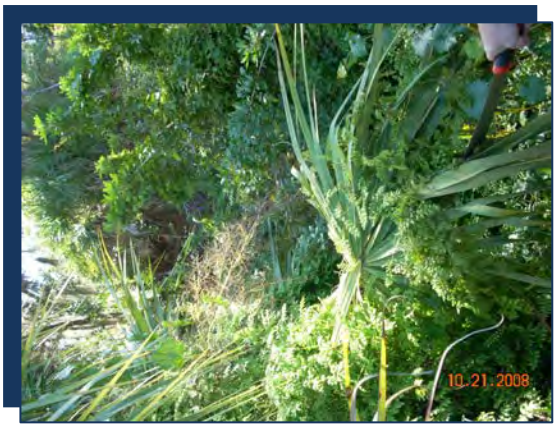

Photo: AN06 Downstream (Looking East)

AN07: YMCA

The site is at the back of the YMCA property at the east end of Medical Blvd. The YMCA site and adjacent development to the north and west have stormwater treatment systems. The area to the east is predominantly a natural system. No erosion or undercutting was visible on the banks. The NRCS soil types are Eau Gallie/Myakka fine sands, Holopaw fine sand, and Pople fine sand.

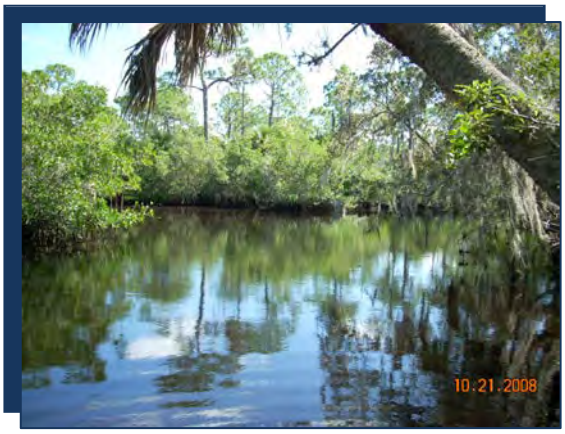

Photo: AN07 Upstream (Looking West)

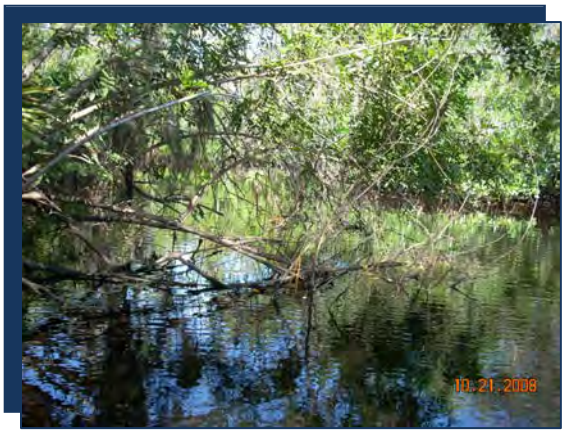

Photo: AN07 Downstream (Looking East)

3.3.6 Lemon Bay Coastal

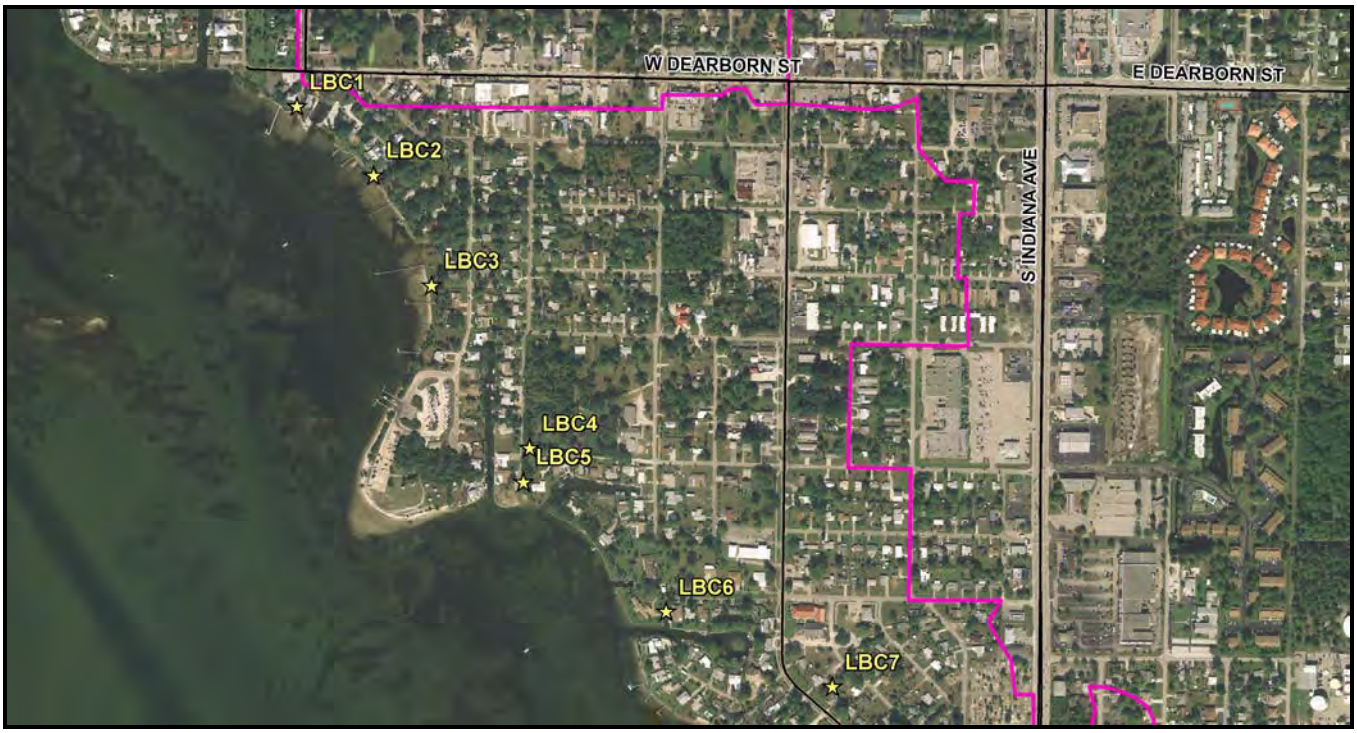

Figure 3-8 Lemon Bay Coastal Site Visit Locations (2007 Aerial Photograph, SWFWMD)

Jones Edmunds visited seven sites in the coastal area adjacent to Gottfried Creek. Sediment accumulation is visible at the outfalls to Lemon Bay in the aerial photographs. During high tides, the outfalls are often inaccessible and salt water flows into the stormwater culverts and swales restricting outflow of runoff. Deposition of sand in the stormwater system is common as the tide recedes. Sediment depth measurements were not taken at these sites.

The largest outfall (LBC1) is a box culvert structure with a grate on the top that is the discharge for the storm sewer system along the refurbished Dearborn Street. The bottom of the box is filled with sand. The upstream end of the box culvert is a ditch-bottom inlet (DBI) with 3 culverts conveying flow in and one conveying flow to the outfall. Approximately 4 inches of accumulated sediment was measured in the bottom of the DBI in March 2009.

Photo: LBC1 Pier adjacent to outfall March 2009

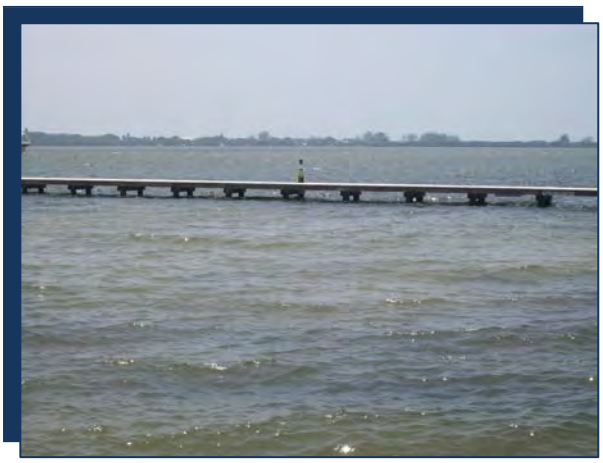

Photo: LBC1 Pier adjacent to outfall June 2009

Photo: LBC1 Outfall (Looking North)

A small area (LBC2) at the end of Cherokee Drive provides minimal treatment of roadway runoff as flow travels overland to the bay.

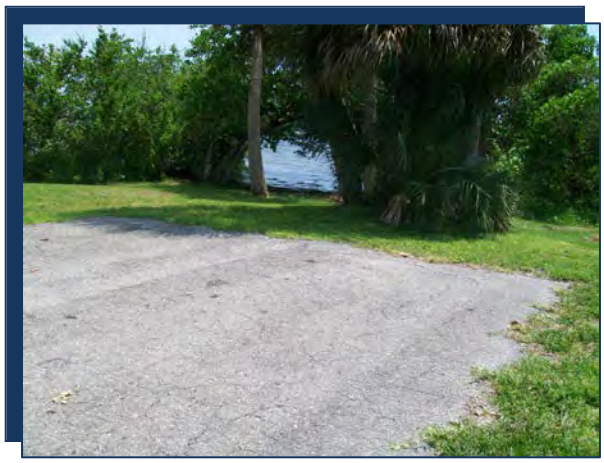

Photo: LBC2 (Looking West)

Sites LBC4 and LBC5 are adjacent to Magnolia Drive. The swale parallel to the roadway is dense with nuisance vegetation. West Palm Grove Avenue to the east is limestone. Further upstream is a 3.5 acre area of hardwood conifers. During high tides, the salt water reaches more than 200 feet upstream into the swale. Easement area is available for a local-scale stormwater retention pond.

Photo: LBC4 and LBC5 (Looking East)

LBC6 is adjacent to Brucewood Bayou and was included as a site visit to evaluate the recommendations from the Sediment Abatement Study (2007).

LBC7 is a large stormwater vault. The site visit was to evaluate the potential for any further opportunities for sediment removal.

4.0 SPATIALLY INTEGRATED MODEL FOR POLLUTANT LOADING ESTIMATES

Jones Edmunds developed a County-wide pollutant-loading model within a GIS framework for Sarasota County. The model is referred to as the *Spatially Integrated Model for Pollutant Loading Estimates* (SIMPLE) and uses computational methods from the Watershed Management Model (WMM) and the Harvey Harper Method (Harper, 2004) as well as additional methods to predict either monthly, seasonal, and annual loads from a variety of point sources, non-point sources (e.g., direct runoff and base flow), and septic tanks.

For this modeling effort, Jones Edmunds used NEXRAD rainfall data from February 2004 through April 2008. After the hydrology module of the model was run, the pollutant-loading portion of the model was split into six modules: direct runoff, base flow, wet/dryfall, irrigation, point-source, and septic tank. These modules estimated the load of various pollutant indicators such as biochemical oxygen demand (BOD), total suspended solids (TSS), nitrogen, phosphorus, and heavy metals by subbasin. For this study, the subbasins generally corresponded to the Groups defined in the County's ICPR stormwater models and associated GIS geodatabases.

Total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) are three primary constituents found in runoff and evaluated for removal efficiencies in this plan.

Suspended solids loading is primarily a function of land use. An increase in the amount of impervious area found in urban areas is associated with an increase in suspended solids in stormwater runoff. If suspended solids remain suspended, the particulates reduce water clarity, and limit the amount of sunlight reaching marine life. Suspended solids that settle in a stream system can adversely impact benthic habitats and the flood control capacity of the system.

Nitrogen and phosphorus are nutrients found in soils naturally but are elevated due to anthropogenic activities. Increased erosion, usually associated with urban development, can add nutrients as well as solids to the stream system. Fertilizer contributes to the nutrient load in runoff when lawns are unable to assimilate the amount of fertilizer applied. Excess nutrients combined with the tropical temperatures found in Sarasota County can lead to excessive algae growth impacting the recreational aspects of the waterways and creating an oxygen deficit which affects the marine life and aquatic habitats.

Figure 4-1, Figure 4-2, and Figure 4-3 show the spatial variation of these components in stormwater runoff in pounds per acre per year.

The data shown in Table 4-1 represents the average pounds per acre per year loading from January 1995 through December 2007, for TSS, TP, and TN in each subbasin.

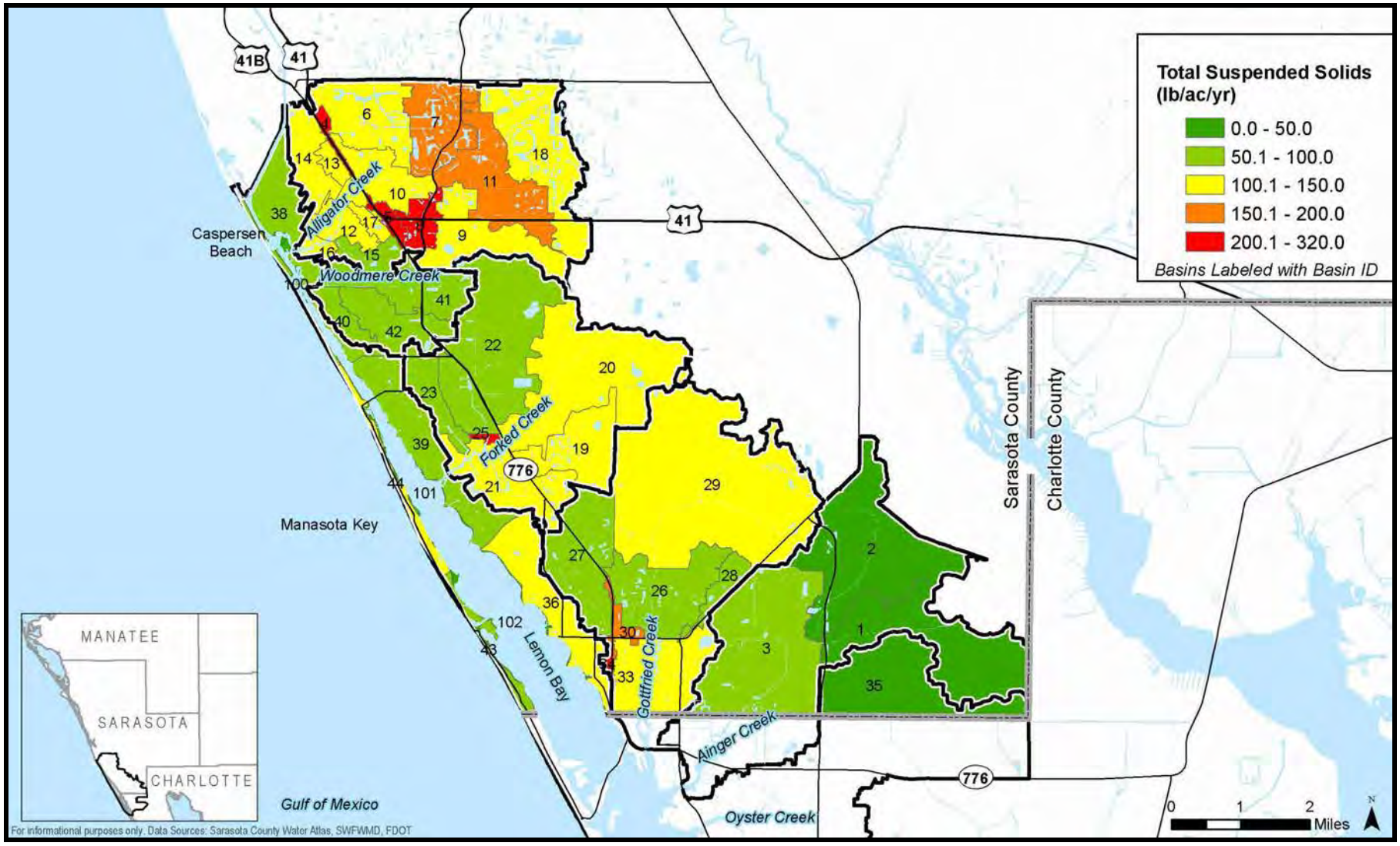

Figure 4-1 Total Suspended Solids Loading to Lemon Bay

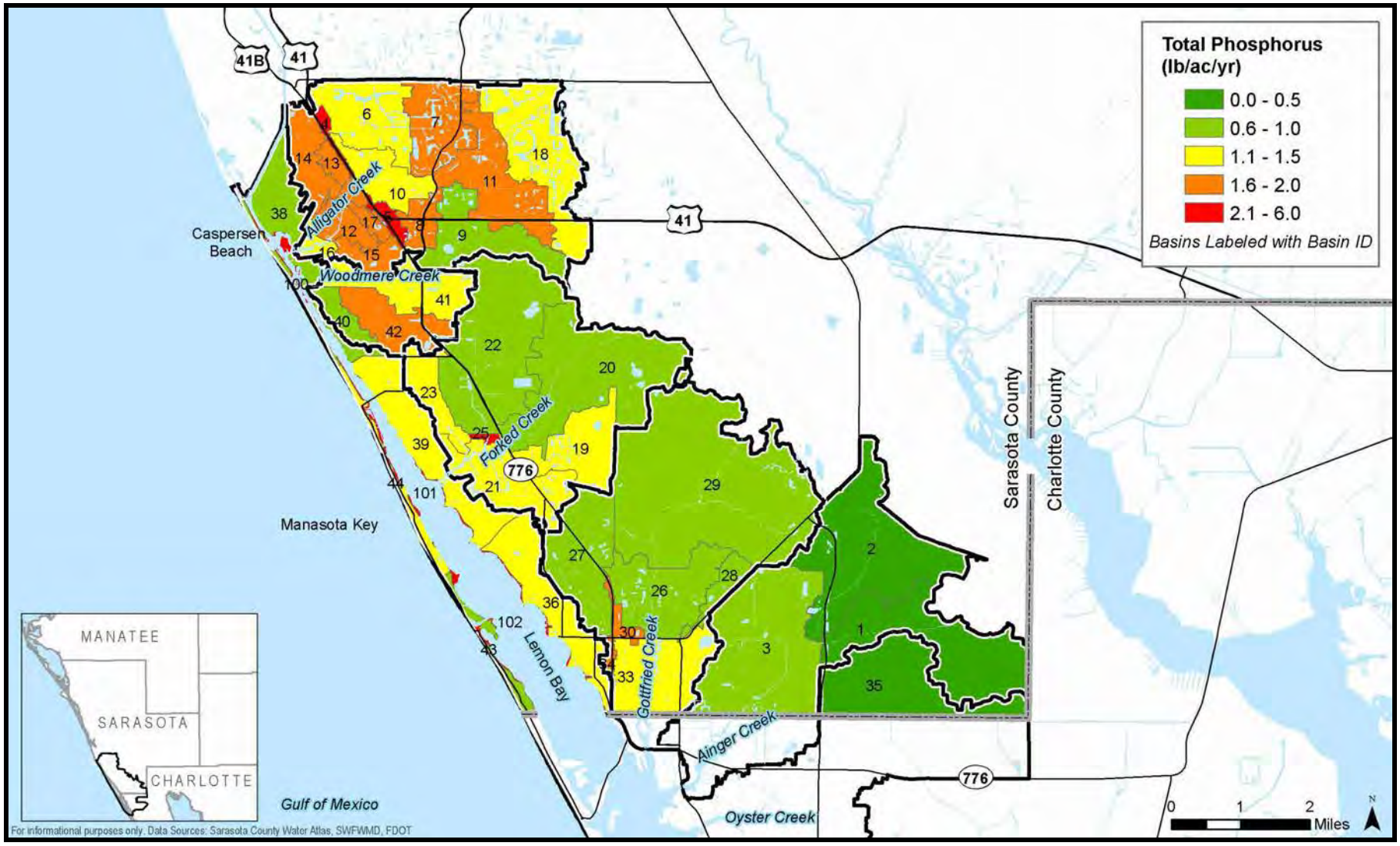

Figure 4-2 Total Phosphorus Loading to Lemon Bay

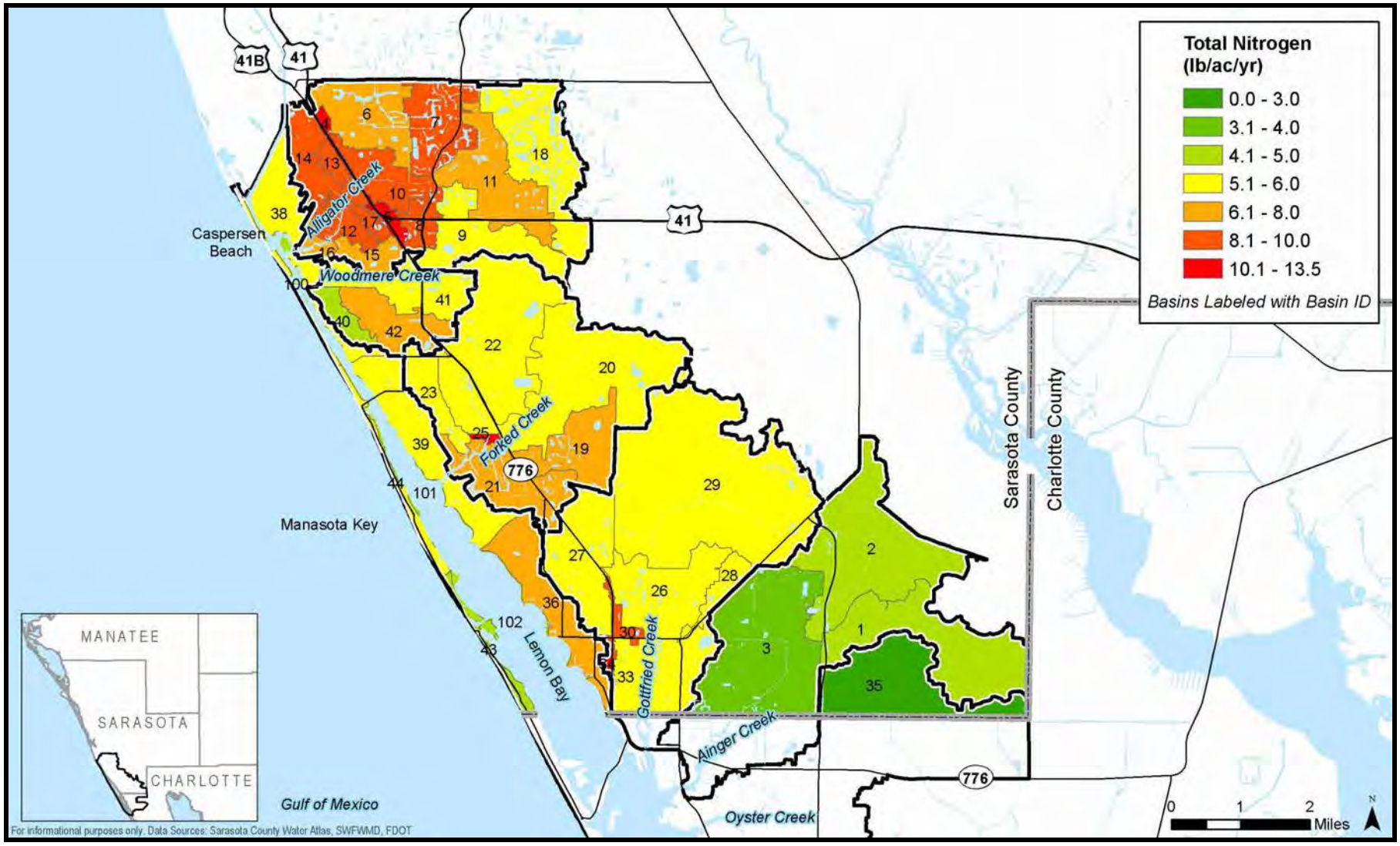

Figure 4-3 Total Nitrogen Loading to Lemon Bay

Table 4-1 Annual Average Pollutant Loads (lb/ac/yr) and Rank

Subbasin ID	Basin Name	ICPR Group	Area (ac)	TSS (lb/ac/yr)	TSS Rank	TP (lb/ac/yr)	TP Rank	TN (lb/ac/yr)	TN Rank
1	Ainger Creek	AIC-EAST	1548.33	42.19	39	0.43	39	4.78	36
2	Ainger Creek	AIC-NRTH	1958.70	44.33	38	0.44	38	4.41	38
3	Ainger Creek	AIC-STH	2052.44	52.58	36	0.62	37	3.92	39
4	Alligator Creek	AC-41NW	73.18	319.98	1	2.24	2	13.34	1
5	Alligator Creek	AC-41SE	113.51	277.32	2	2.20	3	12.22	2
6	Alligator Creek	AC-BRIAR	815.10	102.96	23	1.44	16	7.18	17
7	Alligator Creek	AC-JAC	721.57	162.03	8	1.72	8	8.24	12
8	Alligator Creek	AC-LAT1	243.22	228.95	5	1.54	13	9.19	5
9	Alligator Creek	AC-LAT2	799.60	105.68	21	0.87	29	5.32	31
10	Alligator Creek	AC-LOW	457.47	128.81	14	1.38	17	8.29	11
11	Alligator Creek	AC-MID	948.17	198.82	6	1.73	7	7.82	14
12	Alligator Creek	AC-SVMD	323.12	134.66	11	1.59	11	8.37	10
13	Alligator Creek	AC-SVNE	101.81	127.60	15	1.85	5	9.11	6
14	Alligator Creek	AC-SVNW	446.02	114.39	17	1.72	9	8.44	9
15	Alligator Creek	AC-SVSE	235.42	96.77	25	1.58	12	8.00	13
16	Alligator Creek	AC-SVSW	138.56	130.08	13	1.46	15	7.61	15
17	Alligator Creek	AC-TRPN	88.53	142.18	9	1.78	6	8.85	8
18	Alligator Creek	AC-UP	1293.83	118.10	16	1.13	22	5.32	30
19	Forked Creek	FC-BOCA	719.31	130.14	12	1.19	19	6.10	20
20	Forked Creek	FC-EAST	1952.02	101.54	24	0.82	31	5.59	26
21	Forked Creek	FC-LOWER	813.19	140.45	10	1.35	18	6.34	18
22	Forked Creek	FC-MID	1966.30	92.27	28	0.81	32	5.28	33
23	Forked Creek	FC-WEST	382.66	90.89	29	1.08	23	5.95	21
25	Forked Creek	LBP-FC	29.12	262.44	3	2.46	1	10.11	4
26	Gottfried Creek	GC-MID	942.70	71.19	35	0.86	30	5.29	32
27	Gottfried Creek	GC-NOLAT	1007.38	87.79	32	0.99	27	5.65	24
28	Gottfried Creek	GC-RIVER	213.49	88.70	30	0.70	36	5.51	28
29	Gottfried Creek	GC-UPPER	3758.43	109.70	19	0.81	33	5.25	34
30	Gottfried Creek	GC-776	148.63	182.90	7	1.54	14	8.87	7

Table 4-1 Annual Average Pollutant Loads (lb/ac/yr) and Rank

Subbasin ID	Basin Name	ICPR Group	Area (ac)	TSS (lb/ac/yr)	TSS Rank	TP (lb/ac/yr)	TP Rank	TN (lb/ac/yr)	TN Rank
33	Gottfried Creek	GC-LOWER	941.71	109.83	18	1.00	26	5.48	29
34	Gottfried Creek	GC-LOWER	25.80	247.30	4	1.86	4	10.56	3
36	Lemon Bay Coastal	LBC-LOWER	886.92	109.15	20	1.14	21	6.28	19
38	Lemon Bay Coastal	LBC-UPPER	895.18	95.54	26	0.96	28	5.64	25
39	Lemon Bay Coastal	LBC-MID	977.88	71.73	34	1.02	25	5.56	27
40	Woodmere Creek	LBP-WC	220.86	50.86	37	0.72	35	4.85	35
41	Woodmere Creek	WC-NORTH	696.78	88.13	31	1.16	20	5.93	22
42	Woodmere Creek	WC-SOUTH	557.05	94.50	27	1.65	10	7.37	16
43	Lemon Bay Coastal	LBC-LOWER	219.60	71.96	33	0.79	34	4.73	37
44	Lemon Bay Coastal	LBC-MID	278.78	104.77	22	1.04	24	5.78	23

4.1 POLLUTANT REDUCTION EFFICIENCIES IN BEST MANAGEMENT PRACTICES

Structural BMPs provide treatment for stormwater runoff. Structural BMPs are generally stormwater ponds (wet and dry), constructed wetlands, grassed swales or ditches, bioretention systems, and filtration systems. Non-structural BMPs include LID practices, public education, source control, BMP inspection and maintenance, conservation easements, and buffer zones. A complete discussion of BMPs is provided in Chapter 7, Section 4.

The SIMPLE model calculates removal of pollutants from runoff for BMPs in a given subbasin. Existing BMP pollutant removal is included in the total pounds per acre per year loading. The model uses the following removal efficiencies in the runoff loading calculations:

Table 4-2 Modeled Removal Efficiencies

SIMPLE Model	Removal Efficiency (%)		
BMP Type	TSS	TP	TN
Dry Retention	90	90	27
Wet Detention	90	70	90
Dry Retention with Filtration	90	50	90

4.1.1 Source Control

Source control is a part of non-structural best management practices that reduces sedimentation and improves water quality before runoff reaches the County's waterways.

Street Sweeping

New technology incorporated into street sweepers has brought about a re-evaluation of the benefits and effectiveness of street sweeping. Vacuum-assisted and regenerative-air sweepers are now able to pick up the fine-grained sediments that carry a large portion of the pollutant load. Two distinctive but not mutually exclusive removal rates are cited in the literature: the removal of sediment load and the removal of nutrients associated with the sediment load due to stormwater runoff.

The amount of sediment removed by street sweeping depends on several factors. The intensity of a rainfall event, the length of time between events, particle size, land use, and the location of the impervious surface (up gradient or down gradient) all contribute to determining the efficiency of removal and the quantity of sediment removed from the potential sediment load to stormwater runoff. The frequency of sweeping in wet and dry seasons impacts the overall removal rates and the US Geological Survey reports that only a small fraction of the total load is removed unless

intensive sweeping programs are implemented. Total sediment load reduction by street sweeping is cited in the literature as 15 to 90% of the potential sediment load to the stormwater system.

Sedimentation Devices

Sedimentation devices (e.g., CDS Units, baffle boxes) are designed to retain coarse-grained sediment with fine-grained sediment usually passing through. The removal efficiency of the unit depends on the size of the sump and the amount of sediment and debris collected in the sump. As the sump fills, the efficiency of sediment removal starts to decrease; sediment captured in the sump will start to become re-suspended in the water column as the sump is filled and collected debris will be flushed downstream.

Maintenance Buffer

Buffer zones along watercourses provide important benefits, including water quality improvement, flood protection, bank stabilization, and habitat protection. While most research has focused on forested buffers, the same benefits may be realized in an urban setting. A buffer in an urban setting is typically an area of vegetation consisting of trees, shrubs, and grass designed to:

- Trap and remove sediment, phosphorus, nitrogen and other nutrients.
- Protect stream banks from erosion by providing hearty root systems to increase the cohesiveness of the soil matrix and reduce the velocity of overland flow.

Width, slope, and sediment size impact removal efficiency of a buffer zone. Previous studies recommend a 15-ft minimum buffer.

Table 4-3 shows the range of removal efficiencies of structural, nonstructural, and source control BMPs found in technical publications.

Table 4-3 Range of Pollutant Removal Efficiencies (%) of Common BMPs

Study	Year	Dry Retention			Wet Detention			Dry Retention w Filtration			Offline Systems/ Constructed Wetlands			Porous Pavement			Grassed Swales			Bioretention			Other Filtration			Buffer Zones			Street Sweeping			Catch Basin/Baffle Box		
		TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN	TSS	TP	TN
Evaluation of Current Stormwater Design Criteria within the State of Florida	2007	80-99	61-99	80-99	55-94	20-91	4-63	77-98	0-92	0-80	89-95	76-92	30-85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
The Cost and Effectiveness of Stormwater Management Practices	2005	—	15-45	—	—	30-65	—	—	50-80	—	—	15-45	—	—	30-65	—	—	15-45	—	—	—	—	—	30-80	—	—	—	—	—	—	—	—	—	—
Technical Memorandum: The Runoff Reduction Method	2008	—	—	—	—	50-75	30-40	—	25	15	—	50-75	25-55	—	25	25	—	15	20	—	20-40	40-60	—	60-65	30-45	50-85	—	—	—	—	—	—	—	—
Urban Pollutant Loads and General BMP Cost Analysis	2005	50	30	—	90	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Effective Use of BMPs in Stormwater Management	2005	61	19	21	58-78	48-62	21-43	75	60-70	55-60	36-96	21-89	19-48	82-95	65	80-85	7-69	14-37	14-55	80	65-87	49	—	—	—	—	—	—	37-50	9-28	—	10-25	—	—
Permeable Pavement Summary Fact Sheet	2005	—	—	—	—	—	—	—	—	—	—	62	88	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Stormwater Pollutant Removal Criteria	2004	40-60	20	20	50-90	50	30	—	—	—	90	50	30	0-80	60	50	—	—	—	90	60	30	60-80	30-50	30-35	—	30	30	—	—	—	—	—	—
Stormwater Management Program for Nutrient Control	2004	—	—	—	—	40	25	—	—	—	—	35	40	—	—	—	—	20	20	—	35	40	—	45	35	—	—	—	—	—	—	—	—	—
Riparian Forest Buffer Practice and Riparian Grass Buffer Practice	2007	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45-65	65-85	—	—	—	—	—	—
Final Report of the Statewide Task Force on Riparian Forest Buffers	2000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37-99	6-97	7-95	—	—	—	—	—	—
Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping	2008	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18-72	10-30	15-45	39-75	3-6	14-27
Potential Effects of Structural Controls and Street Sweeping on Stormwater Loads to the Lower Charles River, Massachusetts	2002	62	46	—	62	46	—	78	56	—	—	—	—	—	—	—	—	—	—	45	32	—	—	—	—	—	—	—	25-95	5-90	—	—	—	—
Residential Street Dirt Accumulation Rates and Chemical Composition and Removal Efficiencies	2004	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20-92	—	—	—	—	—
New Developments in Street Sweeper Technology Article 121	2002	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45-65	30-55	—	—	—	—
Stormwater Best Management Practices in an Ultra Urban Setting: Selection and Monitoring	2006	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55-93	40-74	42-77	—	—	—

Complete references provided in Appendix G.

5.0 POTENTIAL PROJECTS

Using the results of field investigations and previous studies, Jones Edmunds prepared 24 conceptual plans (Table 5-1) for potential erosion- and sedimentation-control projects within the Lemon Bay Watershed. The projects originate from two sources: field investigations and previous studies. The first type is conceptual plans developed under this study for the more severe in-stream erosion and sedimentation problems identified by County maintenance staff and during Jones Edmunds' field investigations for areas that were not analyzed under previous studies. The second type of project comes from the recommendations included in previous sediment abatement studies and other special-interest studies.

In the discussions on the second type of projects, suggested modifications to the original recommendations are included where applicable and included in the conceptual plans. The revisions are based on current site evaluations and recommendations formed within the framework of this study. The Sediment Abatement Studies were evaluated as overall projects, not as the individual sites.

Evaluation and prioritization of the projects are summarized in Section 6.

5.1 CONCEPTUAL PLAN DESCRIPTIONS AND FIGURES

Sarasota County streams present several challenging elements for restoring and managing sediment that are common in many urban settings:

- Steep channel side slopes.
- Unconsolidated sand side slopes causing unstable conditions.
- Narrow channel corridors resulting from limited drainage easements and rights-of-way.
- Need for continuing channel maintenance.

County staff identified several locations for potential improvement. The field investigations described in Section 3 identified additional sites. Additionally, Jones Edmunds reviewed recommendations from previous studies and revised some of the recommendations based on current conditions. While the improvements are intended to relieve persistent sediment accumulation and erosion problems, the long-term effect is the reduction of the sediment load to the stream or creek and ultimately to Lemon Bay. As part of the SMP, Jones Edmunds prepared conceptual plans for 24 of the sites as these locations represent the most severe problems identified.

Table 5-1 shows the conceptual plans grouped by subbasin area and Figure 5-1 shows the location of each proposed project within the watershed.

Table 5-1 Conceptual Plan Identification		
Plan ID	Subbasin	Project Name
LBS01	Alligator Creek	Siesta Ditch North
LBS02	Alligator Creek	Siesta Ditch South
LBS03	Alligator Creek	Datura Ditch
LBS04	Alligator Creek	Lake Magnolia
LBS05	Alligator Creek	Briarwood Rd to Alligator Creek
LBS06	Alligator Creek	Woodmere Park Library
LBS07	Alligator Creek	Venice Gardens WRF
LBS08	Alligator Creek	Alligator Creek at US 41 Bridge
LBS09	Alligator Creek	General
LBS26	Alligator Creek	Venice East Low-Impact-Development Demonstration Project
LBS10	Woodmere Creek	Woodmere Creek at US 41
LBS11	Woodmere Creek	Heron Rd and Seneca Rd
LBS12	Forked Creek	5th Street
LBS13	Forked Creek	Overbrook Drive
LBS14	Forked Creek	Fairview Dr
LBS15	Forked Creek	Bridge St
LBS16	Forked Creek	Forked Creek at US 41
LBS17	Forked Creek	Buchan Airport
LBS18	Forked Creek	General
LBS19	Gottfried Creek	Court St-Langsner St
LBS20	Gottfried Creek	Cortes Dr
LBS21	Gottfried Creek	General
LBS22	Ainger Creek	Melody Rd
LBS23	LB Coastal	Cherokee St
LBS24	LB Coastal	Magnolia Ave
LBS25	LB Coastal	Dearborn Street Low-Impact-Development Pilot Project

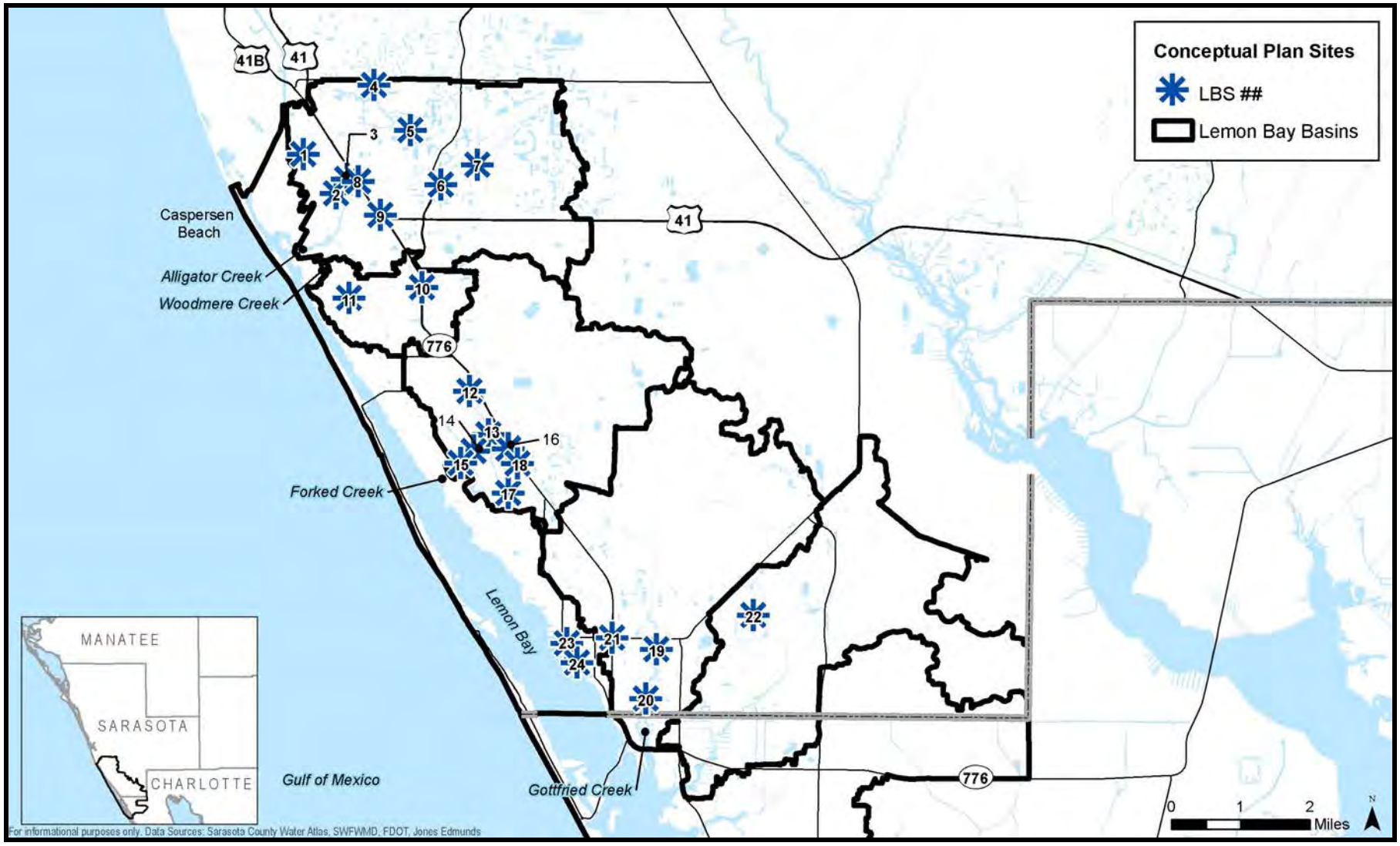

Figure 5-1 Conceptual Plan Site Locations

5.1.1 Alligator Creek Basin

5.1.1.1 LBS01: Siesta Ditch North

The 2006 Alligator Creek SMP characterizes the banks as highly eroded with severe sloughing and considerable sediment deposition along the channel bottom. Conceptual-level bank treatment recommendations from the study are to stabilize the banks via gabions, revegetate the banks with desirable herbaceous species, and schedule regular maintenance.

Quincy Road runs parallel to the north segment of Siesta Ditch for approximately half a mile. Quincy Road, as well as the adjacent roadways, do not have a curb and gutter system and are in poor condition with accumulated sediment and gravel on the surface and along the edge of pavement. Much of the sediment on the roadway is crumbling roadway material that moves to the channel segment when runoff commences. Four culverts discharge into the upstream end of the channel segment from residential areas that do not have any stormwater treatment. Two corrugated pipes project into the channel without any erosion control visible. Figure 5-2 shows the following recommended sediment control improvements at the site:

- Adding a sediment removal structure at the upstream discharges.
- Amending soil, hydroseeding, and planting adjacent to Quincy Road.
- Disconnecting roof drains.
- Adding riprap to outfalls.
- Adding a sediment sump downstream.
- Regrading top of bank adjacent to Quincy Road.
- Add trees and shrubs to the top of bank adjacent to Siesta Drive.

5.1.1.2 LBS02: Siesta Ditch South

The 2006 Alligator Creek SMP characterizes the banks as sloughing due to direct runoff from Siesta Drive. Conceptual-level bank treatment recommendations from the study are to construct a curb along Siesta Drive to divert stormwater away from the system, stabilize the banks via gabions, revegetate the banks with desirable herbaceous species, and schedule regular maintenance.

The site is located at the intersection of Siesta Drive and West Baffin Road. The soil quality along the top of bank and adjacent to the roadway is poor, as is the soil matrix of the side slopes. The steep banks are characterized by erosion and sloughing. Sediment depth upstream of the culvert under West Baffin Road was measured at 1.5 feet on the toe of slopes and 0.6 feet at the stream centerline. The homes in the surrounding residential area are on septic systems. Recommended sediment control improvements at the site are:

- Monitoring water quality.
- Incorporating a sidewalk, bioswale, trees, and vegetation along the top of bank.

- Amending soil to improve moisture-holding capacity.
- Removing nuisance vegetation.
- Adding native vegetation on the banks to stabilize slopes and in the flowpath to improve water quality.
- Installing a low-flow sedimentation weir.
- Adding riprap.

5.1.1.3 LBS03: Datura Ditch

The channel extends between the backyards of the homes on Datura Road and Virginia Avenue and the drainage easement is only 20 feet wide leaving little space for channel improvements. Bank stabilization with geoweb and geofabric may be a first alternative and if unsuccessful, the problem may require hardening the steep banks with gabions.

5.1.1.4 LBS04: Lake Magnolia

Several FDEP 319 grant projects are currently being proposed for the lake system. These projects have not been finalized as of this submittal date and are not included in the analysis of the site.

Based on the County's ICPR model, a 30-acre catchment including over 1 linear mile of Center Road drains to Lake Magnolia. The lake is plagued with several water-quality issues and adding a sediment removal structure to the upstream end would help to alleviate much of the sediment load reaching the lake from Center Road. Additionally, street-sweeping would provide source control to reduce the amount of sediment being carried in stormwater runoff to the lake. Figure 5-4 shows the recommended sediment control improvements at the site:

- Adding a sediment removal structure.
- Sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.

5.1.1.5 LBS05: Briarwood Road to Alligator Creek

The County-wide Weir Study scored the site with 3 points based on an exceedance of SCTL-R of arsenic; the target is 0.8 mg/kg and the measured concentration was 1.5 mg/kg. No recommendations were made in the study for the site.

The 2006 Alligator Creek SMP characterizes the banks as highly eroded with sloughing slopes and sediment deposition apparent in the channel bottom. The banks show overgrowth of nuisance and exotic vegetation. Conceptual-level bank treatment recommendations from the study are to reduce the slopes from 2:1 to 4:1, widen the bottom along the eastern bank, remove nuisance and exotic vegetation, stabilize the bank via erosion control blankets, revegetate banks with desirable herbaceous species, and schedule regular maintenance.

The channel shows signs of erosion, sloughing, and undercutting. Urban debris was found along the entire segment. Homes along the southern portion of the channel have roof drains discharging directly to the channel. Denuding of the roadside swales that discharge to the channel is common practice that adds to the heavy sedimentation observed through the segment. Figure 5-6 shows the recommended sediment control improvements at the site:

- Adding a maintenance buffer.
- Regrading and revegetating banks.
- Amending soil to improve moisture-holding capacity.
- Stabilizing banks with geoweb and geofabric.
- Disconnecting roof drains.

5.1.1.6 LBS06: Woodmere Park Library

The 2006 Alligator Creek SMP characterizes the channel segments as relatively shallow with minimal signs of erosion and contributing less sediment to Alligator Creek than other segments. Conceptual-level bank treatment recommendations from the study are to widen the ditch bottom along the western bank, reduce the slopes from 2:1 to 4:1, stabilize the banks via erosion control blankets, revegetate the banks with desirable herbaceous species, and schedule regular maintenance.

The steep banks show signs of sloughing, erosion, and undercutting at the flow line. The channel segment is within a County-owned easement. Regrading the banks, amending the soil, and planting native plants with hearty root systems is recommended. Figure 5-7 shows the recommended sediment control improvements at the site:

- Adding a buffer zone.
- Amending soil to improve moisture-holding capacity.
- Adding riprap at outfalls.
- Removing accumulated sediment.

5.1.1.7 LBS07: Venice Gardens WRF

The 2006 Alligator Creek SMP characterized the channel segment as showing minimal erosion at the downstream outfall to Alligator Creek with bank erosion increasing in severity at the upstream end near Tamiami Trail. Conceptual-level bank treatment recommendations from the study are to widen the bottom along the eastern bank, reduce the slopes from 2:1 to 4:1, stabilize the banks via erosion control blankets, revegetate the banks with herbaceous species, and schedule regular maintenance.

The segment is characterized by steep sandy banks with nuisance vegetation. The easement available for remediation varies in width along the segment and the recommendations vary accordingly. Figure 5-8 shows the recommended sediment control improvements at the site:

- Adding a buffer zone.
- Regrading and revegetating banks.
- Stabilizing banks using geoweb and geofabric.
- Amending soil to improve moisture-holding capacity.

5.1.1.8 LBS08: Alligator Creek at US 41 Bridge

The ACSMP characterizes the erosion in the channel from minimal to severe. The southern banks of the system have steep, sandy slopes and show signs of sloughing and undercutting. Recommendations from the study include reducing the slopes from 2:1 to 4:1, stabilizing the banks via erosion control blankets, revegetating the banks with herbaceous species, scheduling regular maintenance, removing Brazilian Pepper with herbicide application, restoring mangroves, and installing a culvert.

This site is located upstream of the US 41 bridge at Alligator Creek. The stream reach is tidally influenced. The north bank is lined with mangroves and residential properties. The south bank is very steep and shows signs of erosion and instability. No vegetation is found on the slope into the watercourse on the south bank. During field reconnaissance, several acres of water lettuce and terrestrial plants had herbicide applied and were left to decompose in the watercourse. Although this is common practice, the plant matter settles to the bottom and creates organic "soup" that is detrimental to the health of the ecosystem. Figure 5-9 shows the following recommended sediment control improvements at the site:

- Stabilizing the top of bank and toe of slope with geoweb and geofabric.
- Removing excess nuisance vegetation from the north bank and restoring the mangroves.
- Disconnecting the roof drains.
- Avoid impacts to mangroves on the north bank.
- Adding a recreational trail.

5.1.1.9 LBS09: Alligator Creek General

Results from the SIMPLE model show US41 through Alligator Creek ranked Number 1 in pounds per acre per year for TSS in the watershed. Sediment source control recommended for the site (Figure 5-10) is sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.

5.1.1.10 LBS25: Venice East Low-Impact-Development Demonstration Project

Sarasota County in partnership with the Southwest Florida Water Management District (SWFWMD) has finished a draft of a Low Impact Development (LID) Manual for the Sarasota County area. The manual covers four LID techniques including:

- Greenroofs with cisterns.
- Pervious paving.
- Stormwater harvesting.
- Detention with biofiltration.

Biofiltration/bioretention techniques raised numerous questions with the committee that helped develop the manual. Among the questions were concerns about the effect of high seasonal high water tables on the efficiency of treatment techniques that are dependant on infiltration of stormwater. Additionally, there were questions about how bioretention differed from retention that is currently permitted by SWFWMD. Sarasota County believes that the addition of a broader palette of plants as well as possibly "engineered soils" has the potential to improve the efficiency of these systems.

Venice East Blvd is between Center Road and US41 and is surrounded by medium-density residential on the north end, commercial development on the south end, and Alligator Creek in the center. The location for the demonstration project was chosen because of the diversity of the terrain and close proximity to the Creek. The proposed project intends to demonstrate the effectiveness of bioretention areas with a focus on:

- Planting a wide vegetative palette.

- Engineering soil amendments with products such as "Bold and Gold" with a goal of encouraging denitrification of stormwater pollutants that infiltrate through the system.

- Developing soil amendments similar to "Bold and Gold" that are formulated using Sarasota County waste products such as compost and mulch from the Solid Waste handling facility and harvested/dried aquatic vegetation that are specifically formulated to assist with the denitrification process.

- Demonstrating techniques that can be used to retrofit existing neighborhood streets that currently have no stormwater treatment.

Figure 5-2 LBS01: Alligator Creek: Siesta Ditch North

Figure 5-3 LBS02: Alligator Creek: Siesta Ditch South

Figure 5-4 LBS03: Alligator Creek: Datura Ditch

Figure 5-5 LBS04: Alligator Creek: Lake Magnolia

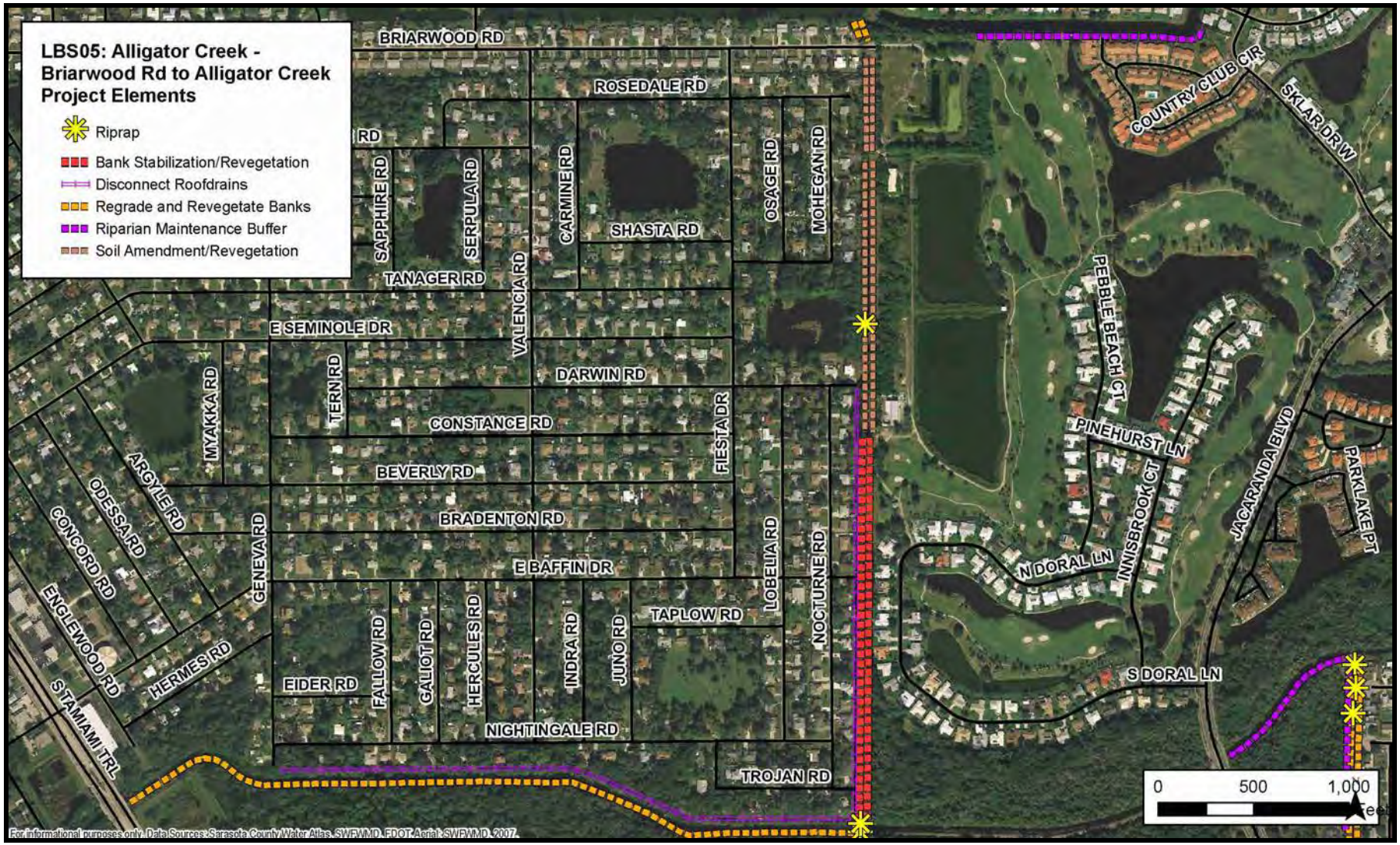

Figure 5-6 LBS05: Alligator Creek: Briarwood Road to Alligator Creek

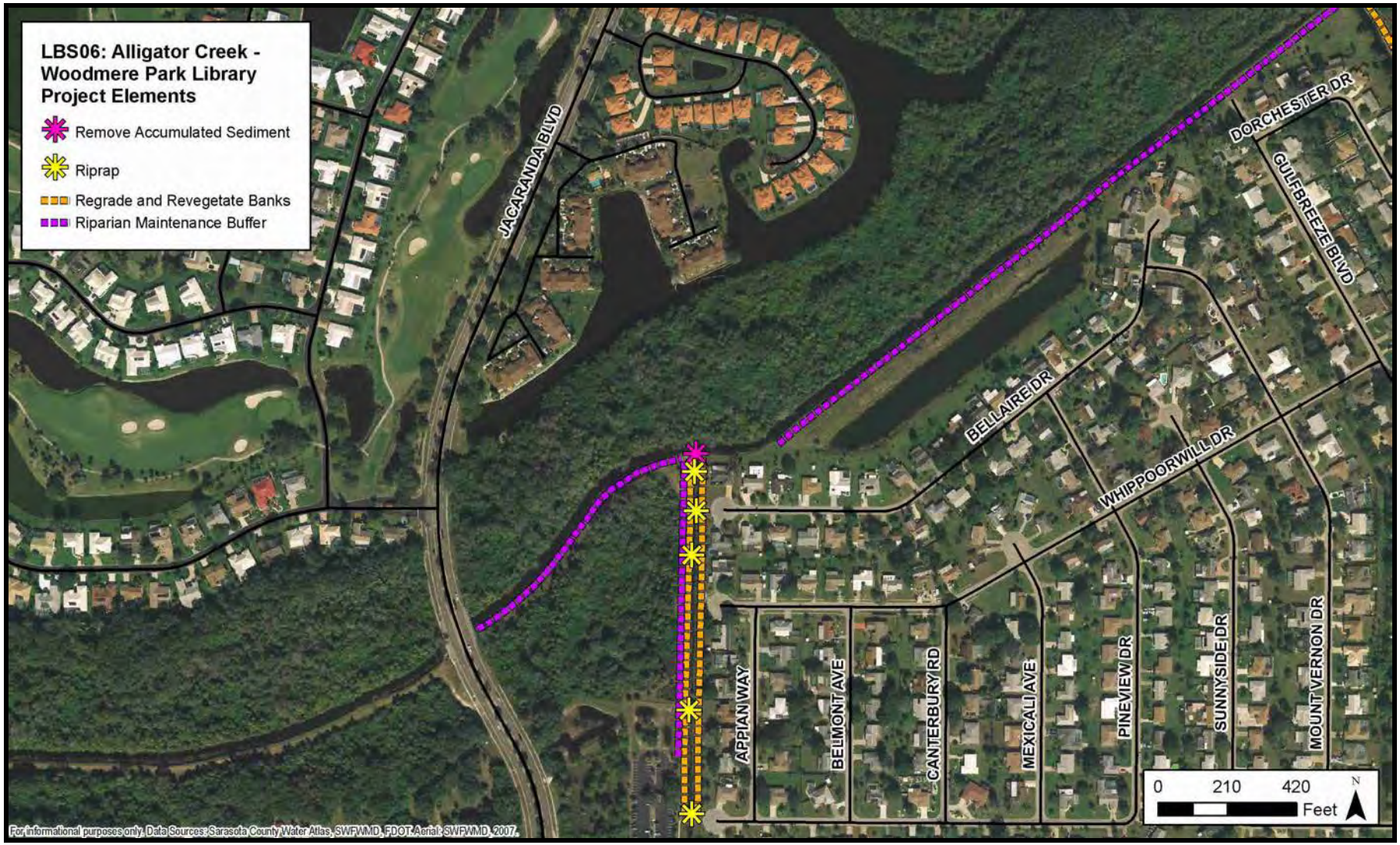

Figure 5-7 LBS06: Alligator Creek: Woodmere Park Library

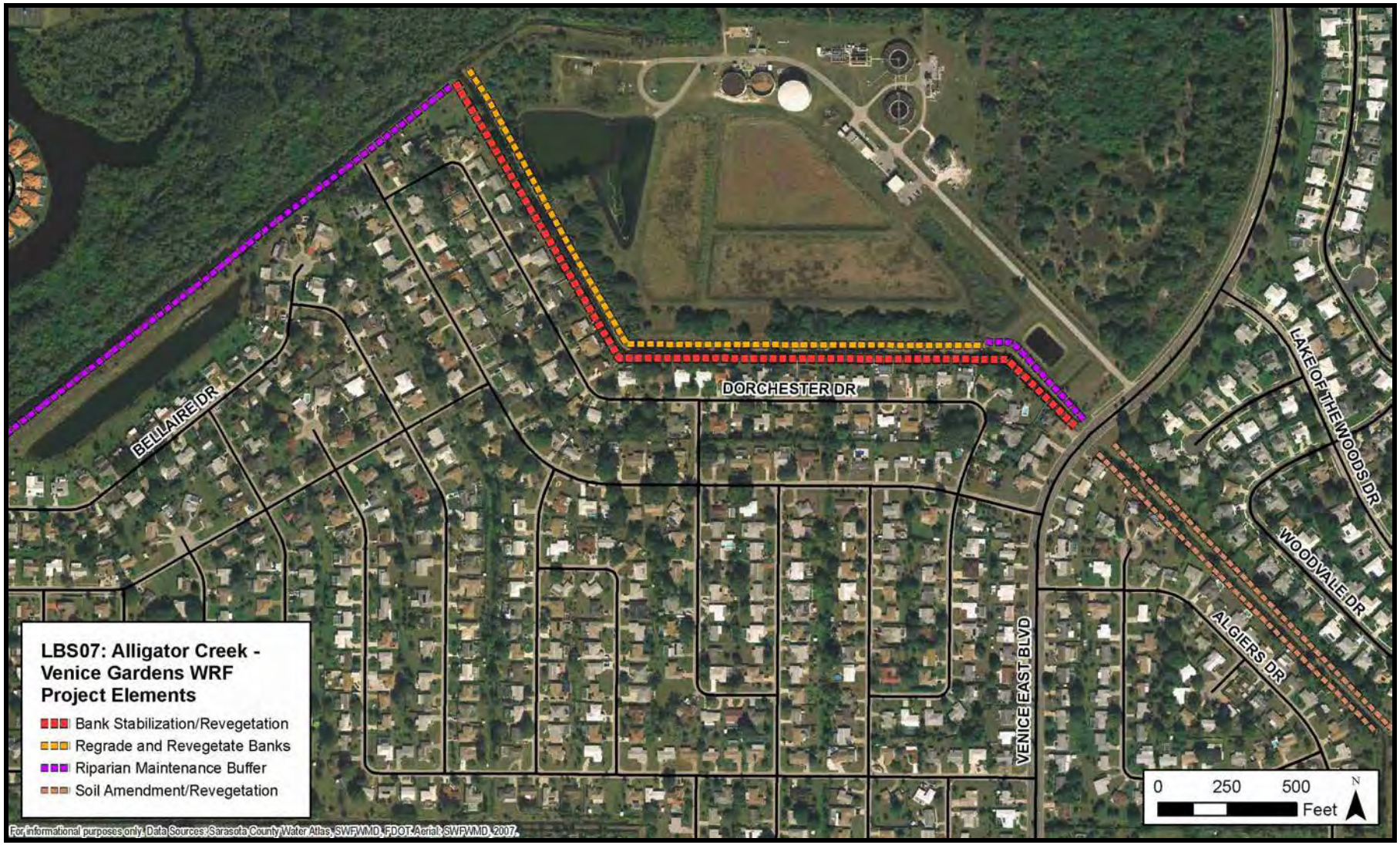

Figure 5-8 LBS07: Alligator Creek: Venice Gardens WRF

Figure 5-9 LBS08: Alligator Creek: Alligator Creek at US 41 Bridge

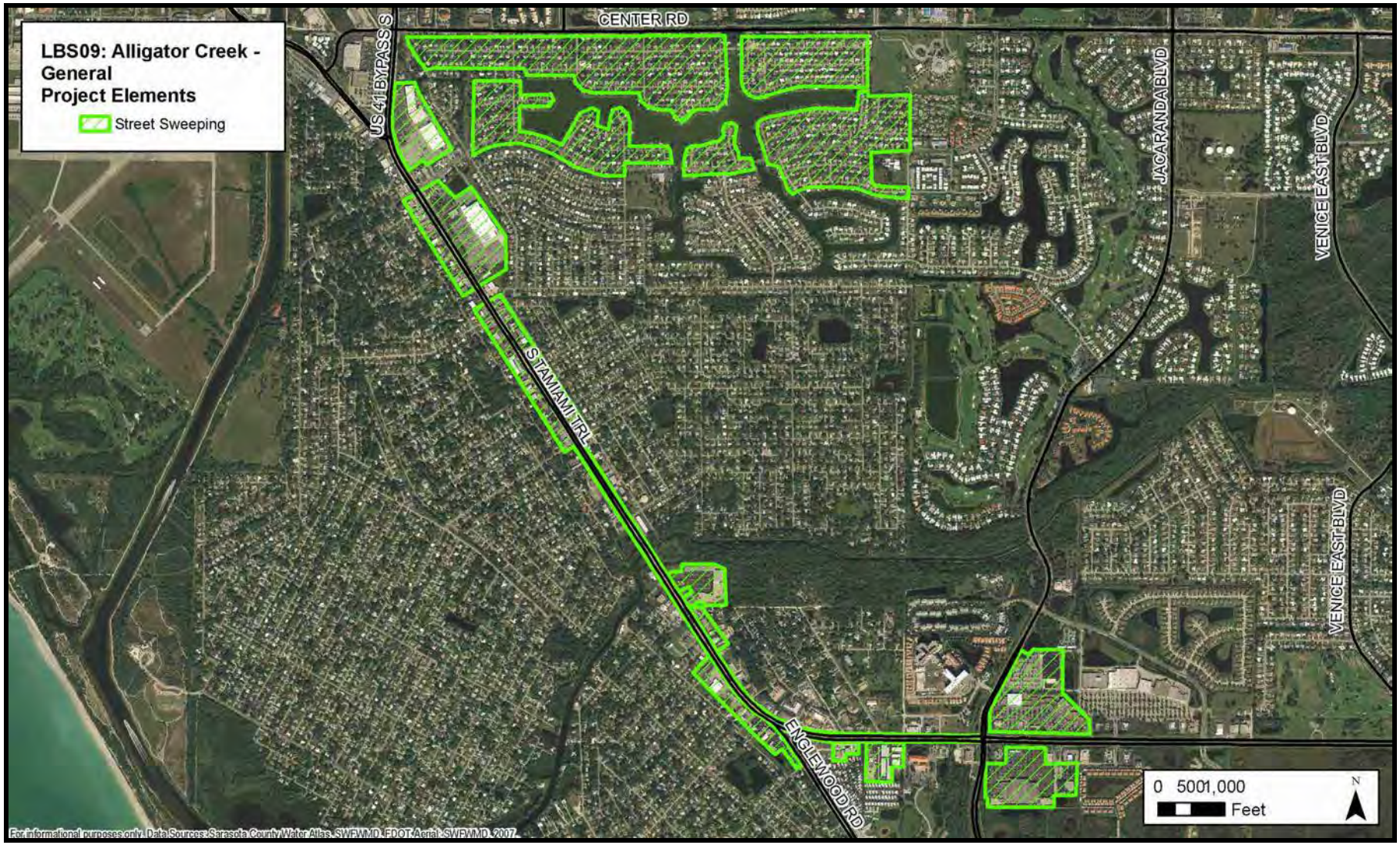

Figure 5-10 LBS09: Alligator Creek: General

5.1.2 Woodmere Creek

5.1.2.1 LBS10: Woodmere Creek at US 41

The site is on the west side of US 41 where Woodmere Creek flows under US 41. Thick, heavy, and exotic nuisance vegetation covers the banks. This site had been denuded by County maintenance crews late in 2007 and contributed heavy sediment loads downstream prior to the re-emergence of the vegetation. Sediment accumulation was observed at the downstream end of the culverts. Sediment depth is 1.3 feet at the outfall. Figure 5-11 shows the following recommended sediment control improvements at the site:

- Removing nuisance vegetation by mechanical means without denuding the banks.
- Monitoring water quality of the runoff from the nursery adjacent to the flea market.
- Adding cisterns for beneficial stormwater runoff use in residential areas.
- Adding riprap to outfalls for erosion control.
- Adding a sediment removal structure.
- Stabilizing banks using geoweb and geofabric.
- Adding a maintenance buffer.

5.1.2.2 LBS11: Heron Road and Seneca Road

The channel is tributary to the Lemon Bay Preserve and on private property. The nuisance vegetation is dense upstream and downstream of the bridge. Figure 5-12 shows the following recommended sediment control improvements at the site:

- Removing nuisance vegetation by mechanical means without denuding the banks.
- Removing accumulated sediment.
- Adding riprap at outfall.

Figure 5-11 LBS10: Woodmere Creek: Woodmere Creek at US41

Figure 5-12 LBS11: Woodmere Creek: Heron Road and Seneca Road

5.1.3 Forked Creek

5.1.3.1 LBS12: 5th Street

West of Englewood Road between Shane Road and 5th Street is Dale Lake, an approximately 5-acre stormwater pond. At the south is a channel outfall 1 mile north of Forked Creek. A Sediment Abatement Study identified 14 basins as contributing to the sediment and pollutant load along this tributary to Forked Creek. Maintenance and updating of the culvert-swale system at Keyway Road and East Crest Drive was recommended in the study.

Several opportunities for sediment control were found at the channel outfall from Dale Lake during the field visit. A 400-foot ditch conveys flow from Englewood Road to the lake without any treatment. The ditch outfall is adjacent to the channel outfall from the lake so the residence time for the runoff is minimal. A limestone roadway and parking lot are adjacent to the stormwater system and add to the pollutant load to the lake. Figure 5-13 shows the following recommended sediment control improvements at the site:

- Regrading and revegetating banks
- Adding erosion control and riprap.
- Applying limestone treatment on roadway to reduce dust and particles from washing into the adjacent waterways.
- Adding a bioretention swale to convey flow from Englewood Road to the channel.
- Adding a maintenance buffer.
- Adding a sediment removal structure.

5.1.3.2 LBS13: Overbrook Drive

From the Sediment Abatement Study at Neptune Drive, five basins were identified as contributing to the sediment and pollutant load along this tributary to Forked Creek. No new BMPs were recommended for this reach from the study.

The SIMPLE model results show that this catchment has the third highest TSS load in lb/ac/yr for all of Lemon Bay. On the southwest corner of Overbrook Drive and Forked Creek Drive is an oddly-shaped empty lot. The lot could be utilized as a wet detention pond. Stormwater currently travels through a culvert-swale system to Forked Creek without any attenuation. Supporting infrastructure is necessary to convey the stormwater from Englewood Road and the adjacent neighborhood to the pond. The stormwater pond would function to not only treat runoff but reduce the sediment load currently being conveyed to the creek. Figure 5-14 shows the following recommended sediment-control improvements at the site:

- Adding a stormwater treatment pond
- Building supporting infrastructure.

5.1.3.3 LBS14: Fairview Drive

Fairview Drive ends in a small roundabout less than 40 feet from Forked Creek. The street is entirely built out and the small area between the roundabout and the creek provides a local-scale opportunity for stormwater treatment. The contributing area is 1.2 acres and a dry pond would retain the roadway runoff from small rain events. Figure 5-15 show the following recommended sediment control improvements at the site:

- Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff.
- Adding bioretention swales for attenuation and treatment.

5.1.3.4 LBS15: Bridge Street

Bridge Street ends less than 100 feet from the creek. The flow travels down the slope of the roadway directly to the creek. Within the 100 feet that is currently overland flow, a small dry retention pond would retain the roadway runoff from small rain events reducing the amount of sediment being carried directly to the creek. Figure 5-16 shows the following recommended sediment control improvements at the site:

- Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff.
- Adding bioretention swales to attenuation and treatment.
- Adding mangroves and riprap to the shoreline to provide additional stability.

5.1.3.5 LBS16: Forked Creek at US 41

During field reconnaissance, residents reported excessive sedimentation on the upstream side of the bridge. Figure 5-17 shows the following recommended sediment control improvements at the site:

- Adding a dry retention pond.
- Adding mangroves and riprap.
- Regrading and revegetating banks.
- Adding riprap.
- Removing an obstruction in the channel.
- Adding a maintenance buffer
- Creating a bioretention swale to capture and treat runoff from the entrance.

5.1.3.6 LBS17: Buchan Airport

The County-wide Weir Study collected samples upstream and downstream of a weir. The sampling indicated a TEL exceedance of cadmium, the target is 0.596 mg/kg and the upstream

measurement showed a concentration of 1.2 mg/kg and the downstream showed 1.4 mg/kg. No recommendations were made for the site in this study.

Immediately upstream of the airport fence line is a widening in the creek. On the south side is the end of the airport property and on the north side is a drainage easement behind the Alameda Gardens. This section of airport property is used for RC airplane enthusiasts. By increasing this slightly widened area and lowering the elevation, a treatment wetland could be created, improving the quality of the water entering the canal. A small sediment sump should be at the upstream end of the treatment wetland to catch the sediment moving down the stream bed and causing the sedimentation problem in the canal.

Figure 5-18 shows the following recommended sediment control improvements at the site:

- Adding aquatic plants in flowpath.
- Cutting v-notches in concrete weirs to facilitate flow.
- Adding a maintenance buffer.
- Creating a flow-through wetland.
- Removing accumulated sediment from behind stepped weirs bi-annually.
- Add riprap to discharge structures from Alameda Gardens.

5.1.3.7 LBS18: Forked Creek General

From the SIMPLE model, the TSS in stormwater runoff for the catchments in Forked Creek range from 90.89 lb/ac/yr to 262.44 lb/ac/yr. Several areas have pavement that is pitted and graveled and generally in poor condition. Additionally, sand is blown in from the coastal areas. Recommended sediment-control improvements for areas with degraded pavement are sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.

Figure 5-13 LBS12: Forked Creek: 5th Street

Figure 5-14 LBS13: Forked Creek: Overbrook Drive

Figure 5-15 LBS14: Forked Creek: Fairview Drive

Figure 5-16 LBS15: Forked Creek: Bridge Street

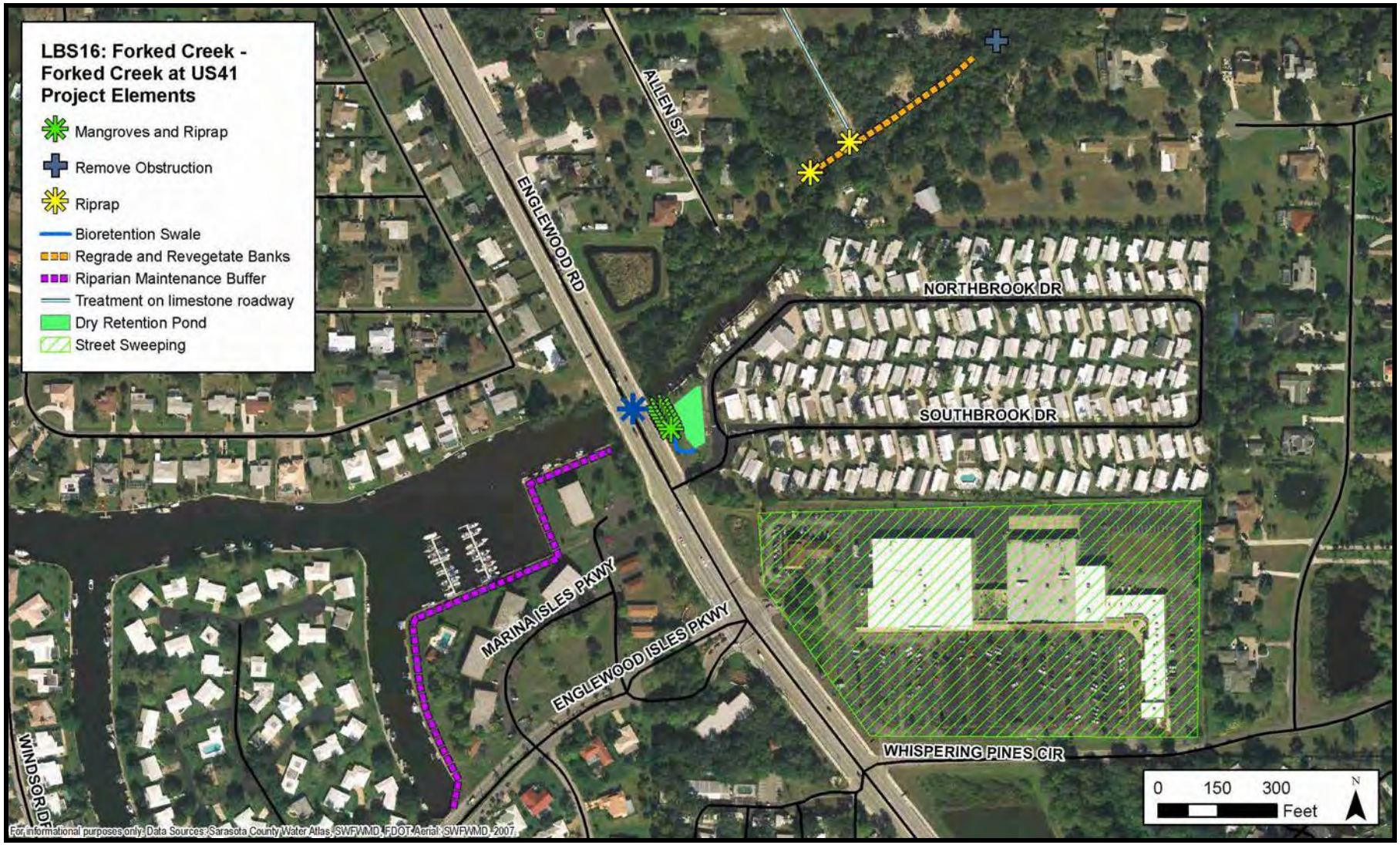

Figure 5-17 LBS16: Forked Creek: Forked Creek at US 41 Bridge

Figure 5-18 LBS17: Forked Creek: Buchnan Airport

Figure 5-19 LBS18: Forked Creek: General

5.1.4 Gottfried Creek

5.1.4.1 LBS19: Court Street-Langsner Street

Court and Langsner Streets are roadways that end within 100 feet of Gottfried Creek. The roadways are not in good repair and have excess gravel and fine sediment accumulated on the surface. The roadways are sloped for stormwater runoff to flow directly to the creek without any attenuation or treatment. A local-scale dry retention pond at the end of each roadway will capture and retain sediment from small rainfall events. Figure 5-20 shows the following recommended sediment control improvements at the site:

- Adding dry retention ponds at the end of the roadway to provide treatment to stormwater runoff.
- Adding mangroves and riprap to the shoreline to provide additional stability.

5.1.4.2 LBS20: Cortes Drive

Cortes Drive is a 900 ft roadway flowing toward Gottfried Creek. The existing small depressional area at the end of the cul de sac may allow for some treatment, but additional planting and small scale excavation of a dry retention pond will allow for greater treatment of the roadway runoff in storm events. The following are recommended sediment-control improvements for the site:

- Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff.
- Adding bioretention swales to attenuation and treatment.
- Replacing damaged discharge structure.

5.1.4.3 LBS21: Gottfried Creek General

The catchments adjacent to South Indiana Avenue (SR 776) are ranked Numbers 4 and 7 in TSS load lb/ac/yr from the SIMPLE model results. Recommended sediment management through this area is bi-monthly street sweeping because of TSS load.

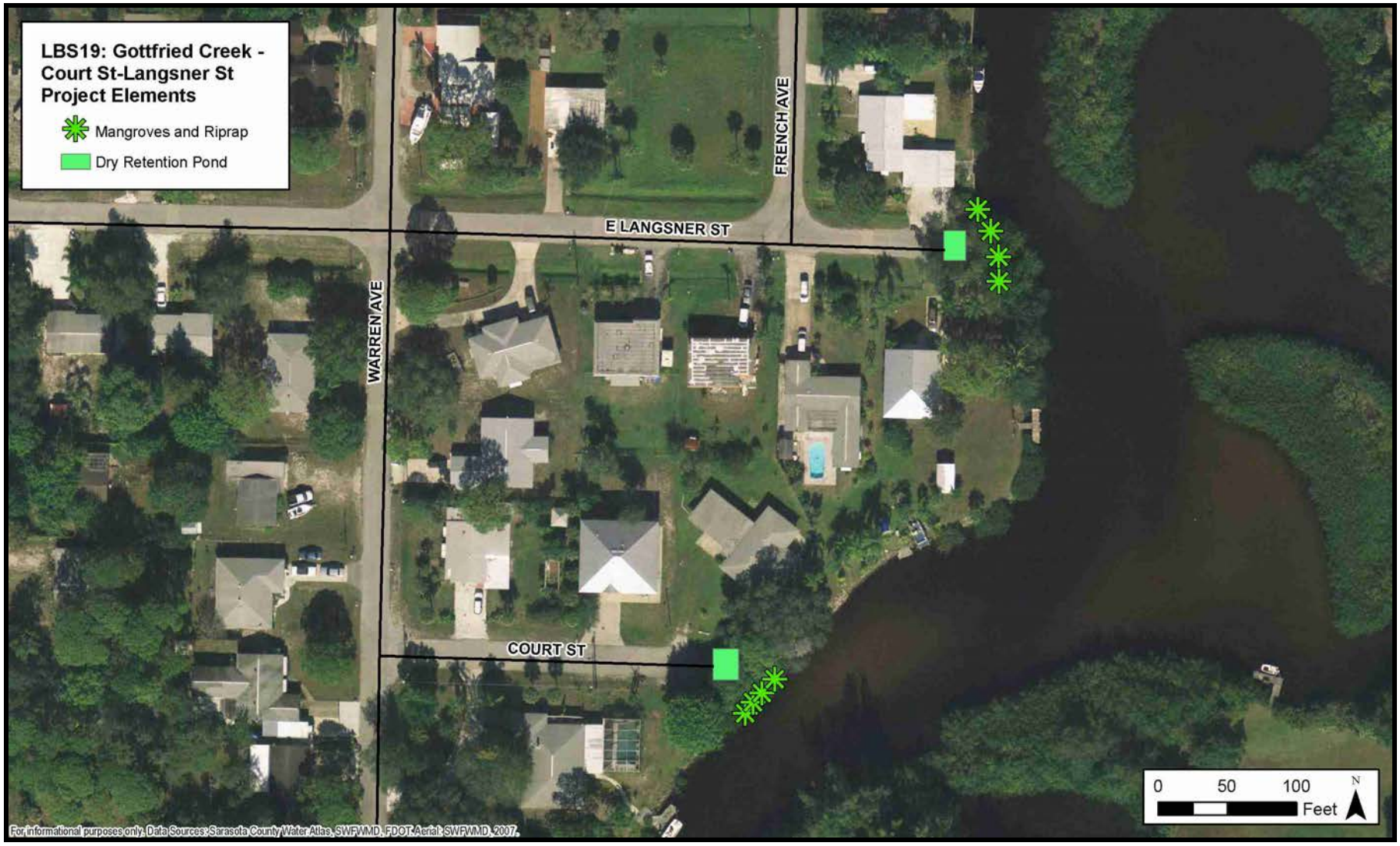

Figure 5-20 LBS19: Gottfried Creek: Court Street and Langsner Street

Figure 5-21 LBS20: Gottfried Creek: Cortes Drive

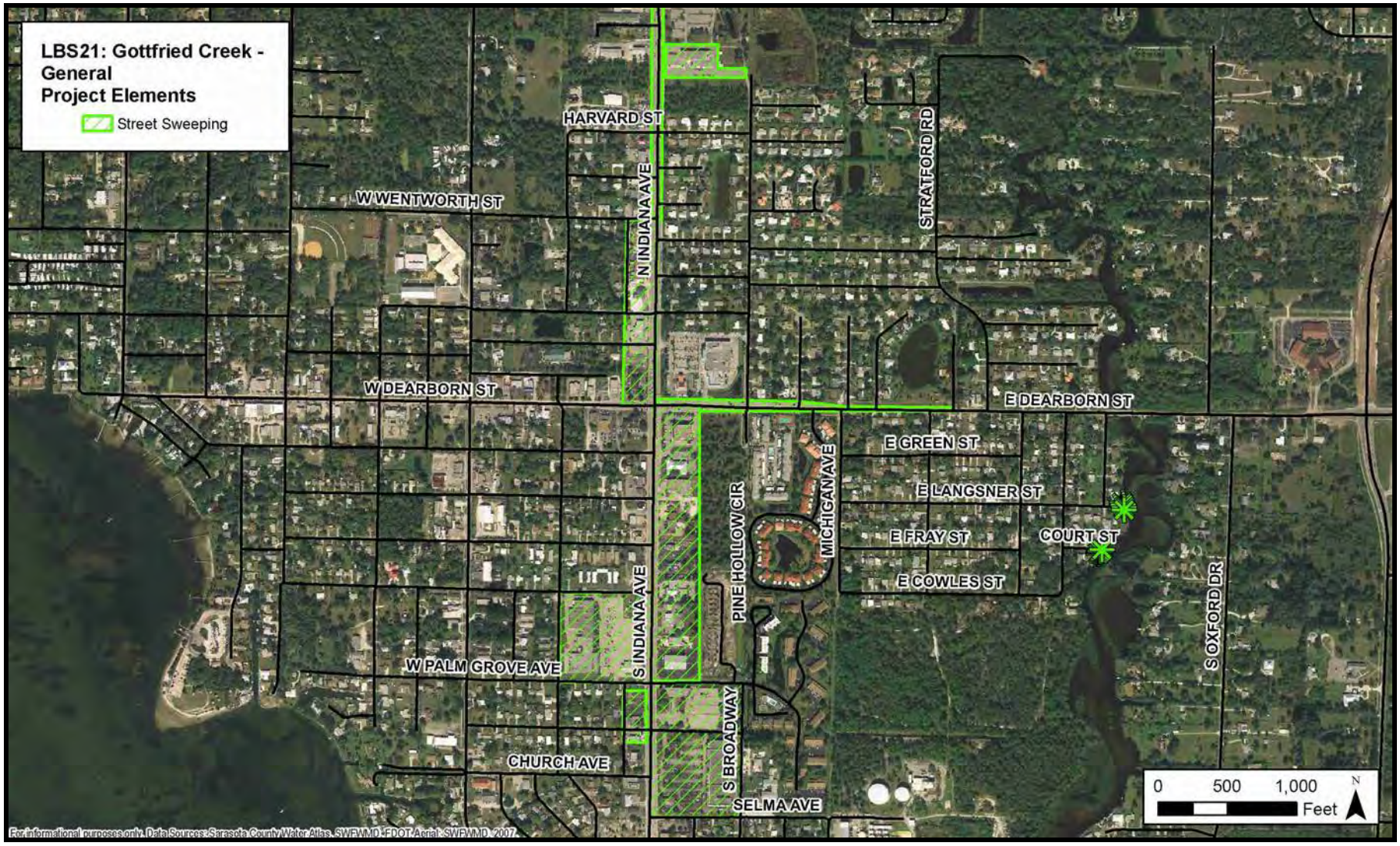

Figure 5-22 LBS21: Gottfried Creek: General

5.1.5 Ainger Creek

5.1.5.1 LBS22: Melody Road

In Ainger Creek, the site is off South River Road on Melody Lane before the ninety degree bend in the road. The ditch system in this area appears to have served as an agricultural drainage system in the past. The flow from this system enters the upstream portion of Ainger Creek. The upstream basin area of the stream is an industrial area along a limestone road. The stream bed is filled with organics and muck and had a foul odor.

Dredging sediment and planting native vegetation will restore this previously ditched channel to a functional stream. A sediment sumps at the upstream end of the restored stream will minimize sediments from the adjacent industrial area and limestone roadways from entering the receiving water which drain to Ainger Creek

Figure 5-23 shows the following recommended sediment control improvements at the site:

- Removing accumulated sediment.
- Adding riprap to the outfall.
- Constructing a sediment sump.
- Creating a 2000-foot bioretention area.
- Treating limestone on Melody Lane.
- Street sweeping through adjacent industrial area.

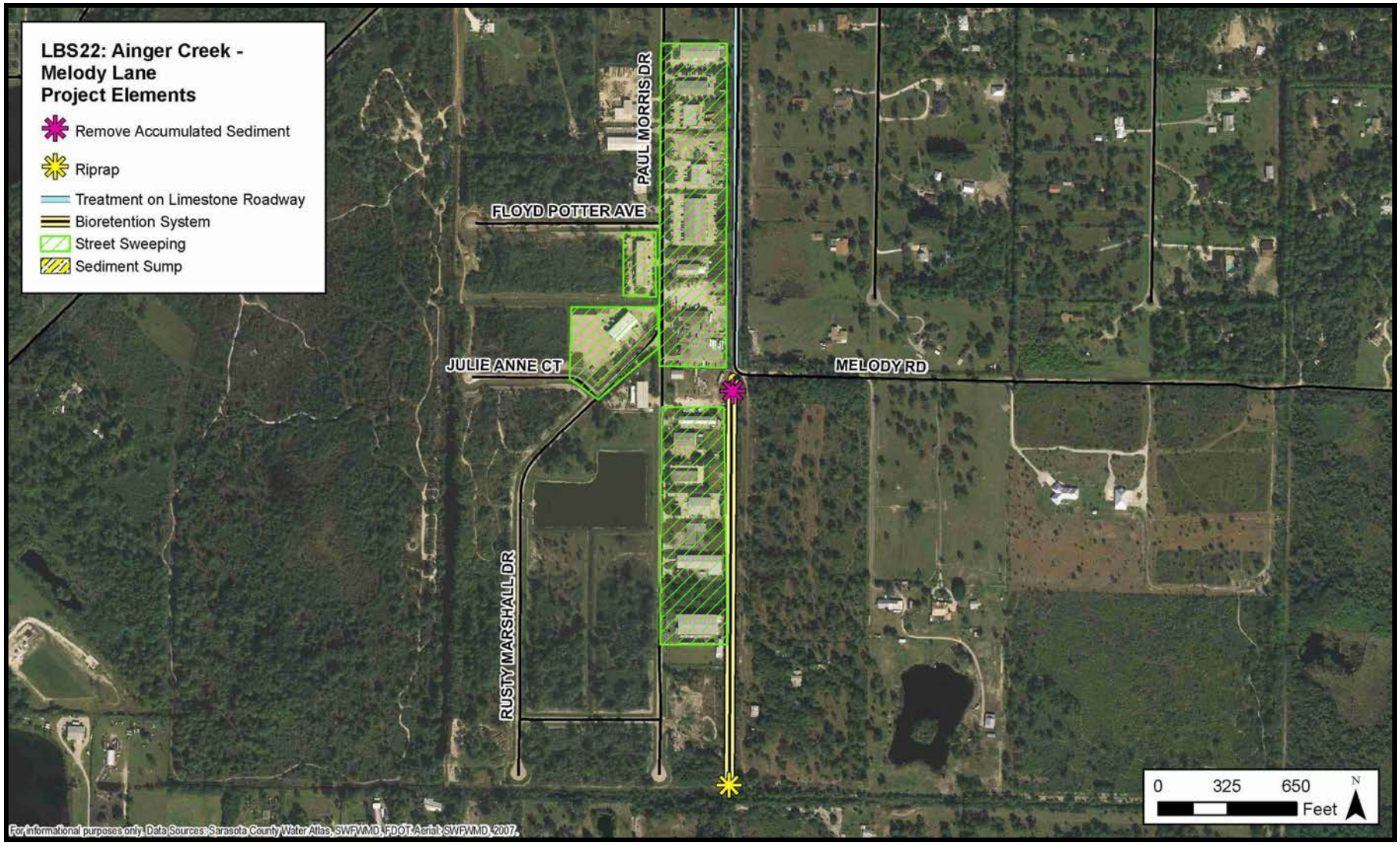

Figure 5-23 LBS22: Ainger Creek: Melody Lane

5.1.6 Lemon Bay Coastal

5.1.6.1 LBS23: Cherokee Street

Stormwater runoff from the sloped roadway flows directly to Lemon Bay. Swales with driveway culverts are on both sides of the road and discharge directly to the bay as well. Figure 5-25 shows the following recommended sediment control improvements at the site:

- Constructing a dry retention pond.
- Adding riprap and erosion control along the shoreline.
- Regrading roadside swales.

5.1.6.2 LBS24: Magnolia Avenue

From the Sediment Abatement Study of Brucewood Bayou, the two outfalls reviewed discharge to navigable canals in a residential area adjacent to the Intercoastal Waterway. The study recommended proper maintenance of the swale system upstream of the discharge to provide adequate treatment and sediment removal. For the discharge under South McCall Road, the construction of an enhanced nutrient separating baffle box was recommended.

To the east of Magnolia Avenue is a large wetland. The wetland provides some treatment for stormwater runoff but the addition of a dry retention pond would reduce the amount of sediment transported into the bay. Figure 5-26 shows the following recommended sediment control improvements at the site:

- Treating limestone on West Palm Grove Avenue.
- Constructing a dry retention pond.
- Creating a bioswale on the east side of Magnolia Avenue for additional treatment of stormwater runoff.

With this work effort, a review of recommendations from previous studies was completed. Table 5-2 summarizes the recommendations from the current work assignment and previous studies. Recommendations from several projects were revised based on current conditions in the watershed; these are also included in the summary table. The projects are grouped by subbasin area. Several recommendations are generalized and common to multiple projects. The following section discusses the generalized elements in the proposed projects.

5.1.6.3 LBS26: Dearborn Street Low-Impact-Development Pilot Project

The area parallel to West Dearborn Street from CR 776 west to Lemon Bay bound by Cocoanut Avenue on the north and Green Street on the south has been designated as the Englewood Community Redevelopment Area. Stormwater runoff receives minimal treatment before discharging to Lemon Bay. As part of the redevelopment, the County is moving forward with the

Dearborn Street Low-Impact-Development Pilot Project to provide stormwater treatment through this area within the right-of-way and County owned parcels. The project encompasses approximately 50 acres.

The proposed project intent is to capture the runoff as close to the source as possible in bioretention areas. The bioretention areas will replace the existing ditch system. The proposed system consists of vegetated swales, engineered soils, and perforated pipe all surrounded by an impermeable liner. Additional elements to the proposed project are cistern use, stormwater harvesting, and pervious pavement. Figure 5-24 shows the proposed project limits.

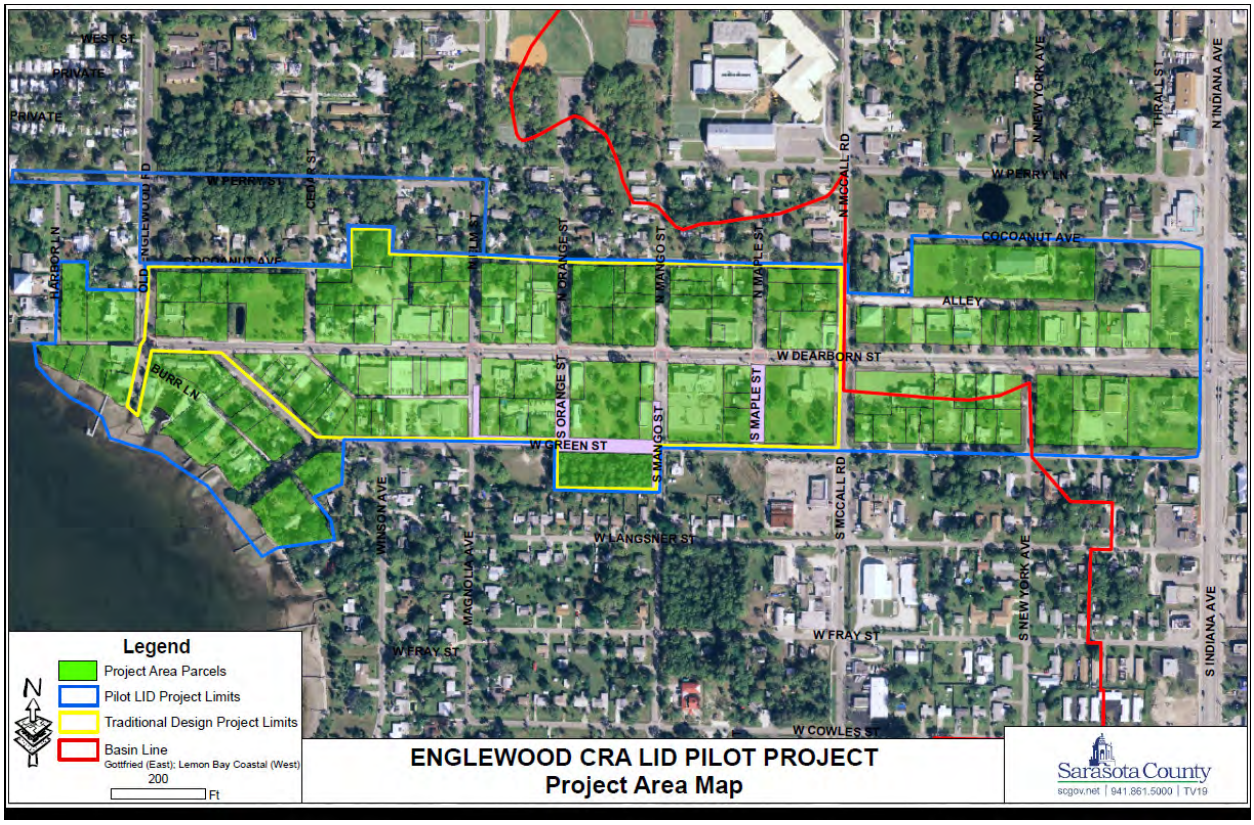

Figure 5-24 Englewood Community Redevelopment Area

(Source: Sarasota County GIS-Stormwater Environmental Utility)

Figure 5-25 LBS23: Lemon Bay Coastal: Cherokee Drive

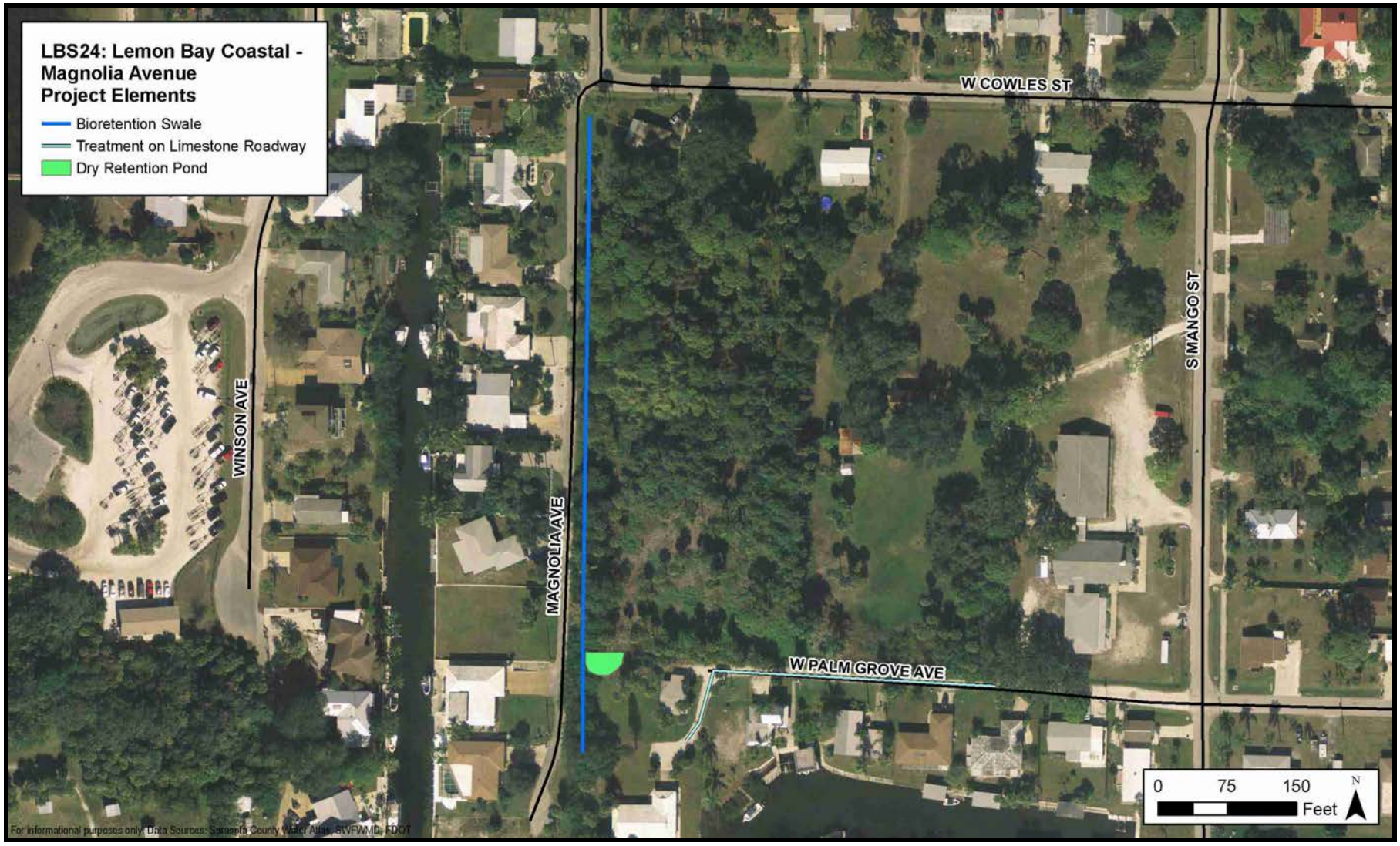

Figure 5-26 LBS24: Lemon Bay Coastal: Magnolia Avenue

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
Alligator Creek	ACSMP	System 5			Stabilizing the banks via gabions. Revegetating the banks with desirable herbaceous species. Scheduling regular maintenance.	See Conceptual Plan LBS01.
Alligator Creek	Jones Edmunds	AC01	Siesta Ditch North	LBS01	Adding a sediment removal structure. Amending soil and planting adjacent to Quincy Road. Disconnecting roof drains. Adding riprap. Adding a sediment sump. Regrading top of bank adjacent to Siesta Drive. Add trees and shrubs to the top of bank adjacent to Siesta Drive.	No changes to original recommendations.
Alligator Creek	ACSMP	System 5			Constructing a curb along Siesta Drive to divert stormwater away from the system. Stabilizing the banks via gabions. Revegetating the banks with desirable herbaceous species. Scheduling regular maintenance.	See Conceptual Plan LBS02.
Alligator Creek	Jones Edmunds	AC02	Siesta Ditch South	LBS02	Monitoring water quality. Incorporating a sidewalk, bioswale, trees and vegetation along the top of bank. Amending soil to improve moisture holding capacity. Removing nuisance vegetation. Adding native vegetation on the banks to stabilize slopes and in the flowpath to improve water quality. Installing a low-flow sedimentation weir. Adding riprap.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
Alligator Creek	Jones Edmunds	AC03/04	Datura Ditch	LBS03	Hardening steep banks with gabions.	No changes to original recommendations.
Alligator Creek	Jones Edmunds		Lake Magnolia	LBS04	Adding a sediment removal structure. Sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.	
Alligator Creek	ACSMP	System 1			Reducing the slopes from 2:1 to 4:1. Widening the bottom along the eastern bank. Removing nuisance and exotic vegetation. Stabilizing the bank via erosion control blankets. Revegetating banks with desirable herbaceous species. Scheduling regular maintenance.	See Conceptual Plan LBS05
Alligator Creek	Weir Study	W28-07T	Briarwood Rd		No recommendations for this site	No changes to original recommendations.
Alligator Creek	Jones Edmunds	A C06	Briarwood Rd to Alligator Creek	LBS05	Adding a maintenance buffer. Regrading and revegetating banks. Amending soil to improve moisture holding capacity. Stabilizing banks with geoweb and geofabric.	No changes to original recommendations.
Alligator Creek	ACSMP	System 2	Jacaranda at Tamiami		Removing nuisance and exotic species. Realigning stream bank. Revegetating with native herbaceous, shrub, and tree species. Scheduling regular maintenance. Widening the channel bottom along the eastern bank.	No recommendations at this time.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
					Stabilizing the bank via erosion control blankets.	
Alligator Creek	ACSMP	System 3	Woodmere Park		Widening ditch bottom along the western bank. Reducing the slopes from 2:1 to 4:1. Stabilizing banks via erosion control blankets. Revegetating banks with desirable herbaceous species. Scheduling regular maintenance.	See Conceptual Plan LBS06.
Alligator Creek	Jones Edmunds	AC12	Woodmere Park Library	LBS06	Adding a buffer zone. Amending soil to improve moisture holding capacity. Adding riprap at outfalls. Removing accumulated sediment.	No changes to original recommendations.
Alligator Creek	ACSMP	System 4			Widening the bottom along the eastern bank. Reducing the slopes from 2:1 to 4:1. Stabilizing the banks via erosion control blankets. Revegetating the banks with herbaceous species. Scheduling regular maintenance.	See Conceptual Plan LBS07.
Alligator Creek	Weir Study	W28-04	Liesl Dr		No recommendations from the study.	Monitor site for constituents of concern
Alligator Creek	Jones Edmunds	AC13	Venice Gardens WRF	LBS07	Adding a buffer zone. Regrading and revegetating banks. Stabilizing banks using geoweb and geofabric. Amending soil to improve moisture holding capacity.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
Alligator Creek	ACSMP	System 6	Alligator Creek		Reducing the slopes from 2:1 to 4:1. Stabilizing banks via erosion control blankets. Revegetating banks with desirable herbaceous species. Scheduling regular maintenance. Removing Brazilian Pepper by herbicide application. Restoring mangroves. Installing a culvert.	See Conceptual Plan LBS08.
Alligator Creek	Jones Edmunds	AC05	Alligator Creek at US41 Bridge	LBS08	Stabilizing the top of bank and toe of slope with geoweb and geofabric. Removing excess nuisance vegetation from the north bank and restoring the mangroves. Disconnecting the roof drains.	No changes to original recommendations.
Alligator Creek	Jones Edmunds		General	LBS09	Sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.	No changes to original recommendations.
Woodmere Creek	Jones Edmunds	WM01/02	Woodmere Creek at US41	LBS10	Removing nuisance vegetation by mechanical means without denuding the banks. Monitoring water quality of the runoff from the nursery adjacent to the flea market. Adding cisterns for beneficial stormwater runoff use in residential areas. Adding riprap to outfalls for erosion control. Adding a sediment removal structure. Stabilizing banks using geoweb and geofabric. Adding a maintenance buffer.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
Woodmere Creek	Jones Edmunds	WM05	Heron Rd and Seneca Rd	LBS11	Removing nuisance vegetation by mechanical means without denuding the banks. Removing accumulated sediment. Adding riprap at outfall.	No changes to original recommendations.
Forked Creek	Jones Edmunds	FC02	5th Street	LBS12	Regrading and revegetating banks. Adding erosion control and riprap. Applying limestone treatment on roadway to reduce dust and particles from washing into the adjacent waterways. Adding a bioretention swale to convey flow from Englewood Rd to the channel. Adding a maintenance buffer. Adding a sediment removal structure.	No changes to original recommendations.
Forked Creek	Jones Edmunds	FC05	Overbrook Dr	LBS13	Adding a stormwater treatment pond and supporting infrastructure.	No changes to original recommendations.
Forked Creek	GPI SAS	FC05	Dale Lakes		No new BMPs recommended.	See Conceptual Plan LBS14
Forked Creek	Jones Edmunds	FC03/04	Fairview Dr	LBS14	Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff. Adding bioretention swales to attenuation and treatment.	No changes to original recommendations.
Forked Creek	Jones Edmunds		Bridge St	LBS15	Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff. Adding bioretention swales to attenuation and treatment.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
					Adding mangroves and riprap to the shoreline to provide additional stability.	
Forked Creek	Jones Edmunds	FC06/07	Forked Creek at US41	LBS16	Adding a dry retention pond. Adding mangroves and riprap. Regrading and revegetating banks. Adding riprap. Removing an obstruction in the channel. Adding a maintenance buffer. Creating a bioretention swale to capture and treat runoff from the entrance.	No changes to original recommendations.
Forked Creek	Weir Study	W35-02	Buchnan Airport		No recommendations from the study.	No changes to original recommendations.
Forked Creek	Jones Edmunds	FC08	Buchnan Airport	LBS17	Adding aquatic plants in flowpath. Cutting v-notches in concrete weirs to facilitate flow. Adding a maintenance buffer. Creating a flow-through wetland. Removing accumulated sediment from behind stepped weirs bi-annually. Add riprap to discharge structures from Alameda Gardens.	No changes to original recommendations.
Forked Creek	GPI SAS	FC03/04	Neptune Dr		No new BMPs recommended.	No changes to original recommendations.
Forked Creek	Jones Edmunds		General	LBS18	Sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
Gottfried Creek	Jones Edmunds	GC06/07	Court St-Langsner St	LBS19	Adding dry retention ponds at the end of the roadway to provide treatment to stormwater runoff. Adding mangroves and riprap to the shoreline to provide additional stability.	No changes to original recommendations.
Gottfried Creek	Jones Edmunds	GC09	Cortes Dr	LBS20	Adding a dry retention pond at the end of the roadway to provide treatment to stormwater runoff. Adding bioretention swales to attenuation and treatment. Replacing damaged discharge structure.	No changes to original recommendations.
Gottfried Creek	Jones Edmunds		General	LBS21	Sweeping the streets bi-monthly to remove loose gravel and sediment from the roadways.	No changes to original recommendations.
Ainger Creek	Jones Edmunds	AN05	Melody Lane	LBS22	Removing accumulated sediment. Adding riprap to the outfall. Constructing a sediment sump. Creating a 2000-LF bioretention area. Treating limestone on Melody Lane. Street sweeping through adjacent industrial area.	No changes to original recommendations.
LB Coastal	Jones Edmunds	LBC2	Cherokee St	LBS23	Constructing a dry retention pond. Adding riprap and erosion control along the shoreline. Regrading roadside swales.	No changes to original recommendations.
LB Coastal	Jones Edmunds	LBC6	Magnolia Avenue	LBS24	Treating limestone on West Palm Grove Avenue. Constructing a dry retention pond.	No changes to original recommendations.

Table 5-2 Summary of Recommendations

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Original Recommendation	Changes to Original Recommendations From Other Studies
					Creating a bioswale on the east side of Magnolia Avenue for additional treatment of stormwater runoff.	
LB Coastal	GPI SAS	LBC6	Brucewood Bayou		Maintaining swale and culvert system. Installing a nutrient separating baffle box.	See Conceptual Plan LBS24

Projects LBS25: Venice East Blvd LID Demonstration Project and LBS26: Dearborn Street LID Pilot Project were reviewed by others and not included in this task.

5.2 GENERAL DESIGN CONSIDERATIONS

The projects presented above are conceptual and, as such, a detailed engineering evaluation of site conditions including survey and geotechnical information was not included in the conceptual design. The final design of any project to reduce sediment in the channels and ditches should include a professional geotechnical evaluation and survey of the site.

Several recommendations are common to the potential projects:

- Adding geofabrics and geoweb for bank stabilization.
- Amending soils.
- Planting native vegetation or revegetation.
- Constructing sediment sumps.
- Monitoring sites for constituents of concern.
- Adding riprap.
- Sweeping streets.

5.2.1 Geofabrics

Geosynthetic fabrics or geofabrics are used to enhance the subgrade and prevent soil erosion without hardening the channel bank. Erosion-control fabrics are available with long and short life spans and permanent, partial, or complete erodibility. The fabric is generally straw or mulch with non-biodegradable netting. The straw or mulch is designed to degrade over time as vegetation develops hearty root systems. Steeper slopes (less than 3:1 (H:V)) may require an additional element for stabilization, a geoweb. A geoweb averages 6 inches deep and contains pockets for soil media to be held in place, which aid revegetation of the bank and prevent sloughing. Either product can be used individually, but on steep banks using both a geofabic and a geoweb will generally provide a longer-term solution.

5.2.2 Soil Amendment

Soil amendment is aimed at improving water retention, permeability, infiltration, drainage, and structure of the soil and providing a better environment for root systems. For amendment to be successful, the amendment media needs to be thoroughly mixed into the soil and not just buried. Soil amendment products are organic or inorganic. Common organic amendments are sawdust, wood chips, compost, manure, sphagnum moss, and biosolids. Common inorganic amendments are tire chunks, perlite, and vermiculite. Choosing a soil amendment is site specific; factors to consider are: longevity, pH, testure, and salinity of the soil. Soil amendment does not depend on installing geofabric and may be done independently.

5.2.3 Vegetation

Planting and recruiting of native vegetation with adequate root systems is a common practice in bank stabilization. Vegetation protects the soil against erosion by building soil structure. The plants create a more cohesive soil matrix and filter pollutants commonly found in stormwater runoff.

Native species of plants will provide longer-term erosion control and bank protection. The appropriate selection of plants during the design phase is essential as fast-growing plants with abundant foliage may impede the flow and reduce the overall flood capacity of the system. Suggested plantings of upland and wetland plant species for stream/ditch bank stabilization are listed in Table 5-3 and wetland plants are listed in Table 5-4. These are general recommendations for plantings; for successful recruitment of vegetation, plantings should be evaluated during the design phase.

Table 5-3 Proposed Species for Stream/Ditch Stabilization

Common Name	Scientific Name	Location	Size
Yaupon holly	*Ilex vomitoria*	Upper side slopes	1 gallon
Dwarf palmetto	*Sabal minor*	Upper side slopes	1 gallon
Knotgrass	*Paspalum vaginatum*	Upper side slopes	1 gallon
Sand cordgrass	*Spartina bakerii*	Upper side slopes	4" liner
Cinnamon fern	*Osmunda cinnamomea*	Lower side slopes	1 gallon
Bacopa	*Bacopa spp.*	Lower side slopes	Bare root
Lizards tail	*Saururus cernuss*	Lower side slopes	Bare root

Table 5-4 Proposed Wetland Plant Species for Stormwater Ponds

Common Name	Scientific Name	Location
Soft rush	*Juncus effuses*	Side slopes
Sand cordgrass	*Spartina bakerii*	Side slopes
Yellow canna	*Canna* sp.	Side slopes
Giant bulrush	*Scirpus californicus*	Pond basin
Pickerelweed	*Pontedaria cordata*	Pond basin
Cow lily	*Nuphar luteum*	Pond basin
Water lily	*Nymphae odorata*	Pond basin

5.2.4 Sediment Sumps

Sediment sumps allow coarse-grained suspended solids to settle out of the flow, reducing the sediment load carried downstream. When the sumps are designed in conjunction with a low-flow weir for small storm events, a fraction of the finer-grained sediment will also settle out of the water behind the weir. Properly designed sediment sumps allow suspended sediment to settle out of the flow in a desirable location—one that will not adversely impact the natural system. Detailed design studies of flow rate, particle characteristics, and settling rates will provide optimal location and size of the sump. The design should consider soil type, drainage area, desired removal efficiency, flow rate, and accessibility for maintenance and sediment removal. When a sump is filled to 40 to 50% of the original capacity, accumulated sediment should be removed to maintain the design removal efficiency of the BMP.

5.2.5 Monitoring for Constituents of Concern

Monitoring for constituents of concern is recommended at multiple sites. The Florida Department of Environmental Protection has developed two levels of guidance to address heavy metal contaminant concentrations in sediment: Effects Levels and Target Cleanup Levels.

Threshold Effect Level (TEL) and Probable Effect Level (PEL) address lower and upper limits for adverse biological effects on aquatic organisms. The TEL represents the upper limit of the range of sediment contaminant concentrations in which no adverse effects on aquatic organisms have been shown through testing and sampling. Within this range, concentrations of sediment-associated contaminants are not considered to represent significant hazards to aquatic organisms (FDEP, Chapter 5, p. 37). The PEL represents the lower limit of the range of contaminant concentrations that are usually or always associated with adverse biological effect. The concentrations of sediment-associated contaminants are considered to represent significant and immediate hazards to aquatic organisms. Within this range of concentrations, adverse biological effects are possible, but it is difficult to predict the occurrence, nature, and severity of the effects.

Additionally, FDEP has developed Soil Cleanup Target Levels (SCTL) to help protect human health by direct exposure to anthropogenically contaminated soils in residential and commercial settings. Table 5-5 reflects the current FDEP guidelines.

Table 5-5 FDEP Guidelines				
Metal	SCTL (residential)	SCTL (commercial)	TEL	PEL
	Sediment Contamination (mg/kg)			
Aluminum (Al)	80000	n/a	n/a	n/a
Antimony (Sb)	27	370	n/a	n/a
Arsenic (As)	2.1	12	7.24	41.6
Barium (Ba)	120	130000	n/a	n/a
Beryllium (Be)	120	1400	n/a	n/a
Cadmium (Cd)	82	1700	0.676	4.21
Chromium Cr)	210	470	52.3	160
Copper (Cu)	150	89000	18.7	108
Lead (Pb)	400	1400	30.2	112
Nickel (Ni)	340	35000	15.9	42.8
Selenium (Se)	440	11000	n/a	n/a
Silver (Ag)	410	8200	0.733	1.77
Thallium (Tl)	6.1	150	n/a	n/a
Zinc (Zn)	26000	630000	124	271
Mercury (Hg)	3	17	0.13	0.696

5.2.6 Maintenance Activities

Adding riprap and sweeping streets are maintenance activities that contribute to the improved health of the system through consistent practice. With urbanized stormwater systems, outfalls will continue to flow to the waterways. The potential for erosion and channel degradation is greater without any reinforcement at outfalls to dissipate energy.

5.3 CONCEPTUAL LEVEL ESTIMATE OF PROBABLE COST

The projects presented in Section 5 are conceptual. Table 5-6 summarizes the conceptual level estimates of probable cost for the project recommendations. The generalized estimates were based on the extents of and current site conditions in the project areas. The project estimates include the estimated annual maintenance cost where applicable. The project cost includes estimated materials, labor, and engineering design services. Maintenance costs are summarized in the table below.

Table 5-6 Conceptual Level Estimates of Probable Cost

Project ID	Area of Interest	Project Name	Total Project Cost+	Construction Cost	Engineering Design Services*	Maintenance Cost
LBS01	Alligator Creek	Siesta Ditch North	$3,190,000	$2,599,000	$591,000	$5,000
LBS02	Alligator Creek	Siesta Ditch South	$1,500,000	$1,221,000	$278,000	$10,000
LBS03	Alligator Creek	Datura Ditch	$1,350,000	$1,104,000	$251,000	$0
LBS04	Alligator Creek	Lake Magnolia	$124,000	$92,000	$32,000	$6,000
LBS05	Alligator Creek	Briarwood Rd to Alligator Creek	$3,010,000	$2,454,000	$558,000	$0
LBS06	Alligator Creek	Woodmere Park Library	$460,000	$375,000	$85,000	$13,000
LBS07	Alligator Creek	Venice Gardens WRF	$2,440,000	$1,987,000	$452,000	$0
LBS08	Alligator Creek	Alligator Creek at US 41 Bridge	$680,000	$550,000	$125,000	$0
LBS09	Alligator Creek	General	$0	$0	$0	$8,000
LBS10	Woodmere Creek	Woodmere Creek at US 41	$1,824,000	$1,486,000	$338,000	$6,000
LBS11	Woodmere Creek	Heron Rd and Seneca Rd	$72,000	$49,000	$23,000	$3,000
LBS12	Forked Creek	5th Street	$363,000	$296,000	$67,000	$2,000
LBS13	Forked Creek	Overbrook Drive	$329,000	$268,000	$61,000	$0
LBS14	Forked Creek	Fairview Drive	$26,000	$15,000	$9,000	$2,000
LBS15	Forked Creek	Bridge Street	$59,000	$40,000	$19,000	$2,000
LBS16	Forked Creek	Forked Creek at US 41	$572,000	$466,000	$106,000	$0
LBS17	Forked Creek	Buchnan Airport	$788,000	$642,000	$146,000	$5,000
LBS18	Forked Creek	General	$0	$0	$0	$4,000
LBS19	Gottfried Creek	Court St / Langsner St.	$51,000	$34,000	$16,000	$1,000
LBS20	Gottfried Creek	Cortes Dr	$24,000	$15,000	$9,000	$2,000
LBS21	Gottfried Creek	General	$0	$0	$0	$6,000
LBS22	Ainger Creek	Melody Rd	$1,116,000	$909,000	$207,000	$7,000
LBS23	Lemon Bay Coastal	Cherokee St / Dearborne St	$63,000	$43,000	$20,000	$1,000
LBS24	Lemon Bay Coastal	Magnolia Ave	$43,000	$29,000	$14,000	$1,000

+Total Project Cost includes Mobilization and Contingency costs along with Construction costs and Engineering Design Services

*Design services include Survey, Geotechnical Investigation, Engineering Design and Permitting

6.0 EVALUATION MATRIX

The projects discussed in the section above vary considerably in terms of size, cost, benefits, and other factors. To evaluate the projects in a consistent manner, Jones Edmunds created a qualitative evaluation matrix that considers the following criteria:

- Severity of problem—Problems that are the most extensive in area/length/volume or that have the potential to cause damage to buildings or infrastructure were given the highest ranking.
- Feasibility—Available BMP space, ownership, and constructability were all considered in feasibility.
- Cost—This criterion considered two costs: construction and operation/maintenance.
- Benefits—Four benefits were considered under this criterion: erosion control/stabilization, sediment removal, flood control, and water quality. Natural systems and water supply benefits were not used as part of the evaluation of the projects.

Each criterion for the site was scored on a scale of 1 to 5. A value of 1 represents the least favorable score or an evaluation category without actionable recommendations. For example, a value of 1 represents a problem with very low severity, insufficient space for the solution, minimal benefits, or a high cost. A value of 5 represents the most favorable score.

In the evaluation of each category, the following scoring system was used for consistency as cited below:

- Severity: For sites discussed in the County-wide Weir Study—for sites receiving 4 points in the original study, severity was scored with 3 points in the matrix and received a comment to continue to monitor the site for constituents of concern; for sites receiving 0 or 3 point in the original study, severity was scored with 1 point in the matrix. Additionally, if sediment depth from field measurements indicated a sediment accumulation of greater than 1 foot, the site was scored as a 4 or 5.

- BMP Space Available: Scores range from 3 to 5 based on the general location of the available space.

- County-owned Land: Scores range from 1 to 5 based on the ownership of the parcel. A higher score was awarded for land that was partially or fully within County drainage easements.

- Constructability: Scores ranged from 2 to 5 based on the relative ease of permittability of the overall project.

- Maintenance Effort: Sites without any original or revised recommendations score a 1. For sites requiring monitoring or cleaning out of structures, the score is 2. Sites requiring bank stabilization or riprap with no maintenance requirements score a 4 or 5.

- Construction Costs: The score was based on the Project Cost from the cost estimates provided in Section 5.4.

- Erosion Control/Stabilization: Sites requiring riprap or bank stabilization score a 5. Sites without any requirements score a 2.

- Sediment Removal: Projects specifically removing sediment from the system or reducing erosion on the stream bank score a 5. Catch basins/baffle boxes score a 4 for removal efficiencies. Sites with no recommendations or monitoring score a 1.

- Flood Control: Most projects are flood control neutral and score a 2; several projects will have flood control benefits and score between 3 and 5.

- Water Quality: Most projects are water quality neutral and score a 2; some projects had nutrient-removal values (Section 6.3) associated with them and were scored accordingly; some projects will remove contaminated sediment and score a 5.

Results and rankings for all the project evaluations discussed in the previous section are presented in Table 6-1. Scores for each criterion are computed as arithmetic averages of values within the criterion and total scores for each project are calculated as the total point value of the criteria scores. Table 6-2 shows each site ranked within the basin areas.

Table 6-1 Ranking of Potential Projects

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Severity	Feasibility	Cost	Benefits	Score	Rank
Forked Creek	Jones Edmunds	FC08	Buchnan Airport	LBS17	5	5.00	3	4.75	17.75	1
Alligator Creek	Jones Edmunds	AC01	Siesta Ditch North	LBS01	5	4.67	2	4.5	16.17	2
Alligator Creek	Jones Edmunds	AC12	Woodmere Park Library	LBS06	4	4.67	3.5	4	16.17	3
Alligator Creek	Jones Edmunds	-	General	LBS09	5	5.00	2.5	3.5	16.00	4
Forked Creek	Jones Edmunds	FC06/07	Forked Creek at US41	LBS16	5	3.67	3	4.25	15.92	5
Alligator Creek	Jones Edmunds	AC02	Siesta Ditch South	LBS02	5	4.67	2	4	15.67	6
Alligator Creek	Jones Edmunds	AC13	Venice Gardens WRF	LBS07	4	4.67	3	4	15.67	7
Forked Creek	Jones Edmunds	-	General	LBS18	4	5.00	3	3.5	15.50	8
Gottfried Creek	Jones Edmunds	-	General	LBS21	4	5.00	3	3.5	15.50	9
Alligator Creek	Jones Edmunds	AC06	Briarwood Rd to Alligator Creek	LBS05	5	4.00	2.5	3.75	15.25	10
Forked Creek	Jones Edmunds	N/A	Bridge St	LBS15	3	4.67	3.5	3.75	14.92	11
Forked Creek	Jones Edmunds	FC05	Overbrook Dr	LBS13	3	4.33	3.5	4	14.83	12
Alligator Creek	Jones Edmunds	N/A	Lake Magnolia	LBS04	3	4.67	3.5	3.5	14.67	13
Forked Creek	Jones Edmunds	FC02	5th Street	LBS12	4	4.67	2.5	3.5	14.67	14
Woodmere Creek	Jones Edmunds	WM01/02	Woodmere Creek at US41	LBS10	5	3.33	2	4.25	14.58	15
Alligator Creek	ACSMP	System 5	Siesta Ditch South		5	4.00	2	3.5	14.50	16
Ainger Creek	Jones Edmunds	AN05	Melody Lane	LBS22	3	4.00	3	4.5	14.50	17
Alligator Creek	ACSMP	System 1	Briarwood		5	4.33	2	3	14.33	18
Alligator Creek	ACSMP	System 3	Woodmere Park		4	4.33	3	3	14.33	19
Gottfried Creek	Jones Edmunds	GC09	Cortes Dr	LBS20	3	4.67	3.5	3	14.17	20
Woodmere Creek	Jones Edmunds	WM05	Heron Rd and Seneca Rd	LBS11	4	3.33	3.5	3.25	14.08	21
Alligator Creek	ACSMP	System 5	Siesta Ditch North		5	4.00	2	3	14.00	22
Forked Creek	Jones Edmunds	FC03/04	Fairview Dr	LBS14	3	4.33	3.5	3	13.83	23
Gottfried Creek	Jones Edmunds	GC06/07	Court St-Langsner St	LBS19	3	4.33	3.5	3	13.83	24
Alligator Creek	Jones Edmunds	AC03/04	Datura Ditch	LBS03	5	3.00	2.5	3.25	13.75	25
Alligator Creek	Jones Edmunds	AC05	Alligator Creek at US41 Bridge	LBS08	4	3.00	3	3.75	13.75	26
LB Coastal	Jones Edmunds	LBC2	Cherokee St-Dearborne St	LBS23	3	4.33	3.5	2.75	13.58	27
Alligator Creek	ACSMP	System 2	Jacaranda and Tamiami		4	4.00	2	3.25	13.25	28
Alligator Creek	ACSMP	System 4	Venice Gardens WRF		4	4.00	2	3.25	13.25	29
LB Coastal	Jones Edmunds	LBC6	Magnolia Avenue	LBS24	3	3.67	3.5	3	13.17	30
Alligator Creek	ACSMP	System 6	Alligator Creek		4	3.33	2	3	12.33	31
LB Coastal	GPI SAS	LBC6	Brucewood Bayou		3	3.67	3	2.25	11.92	32
Alligator Creek	Weir Study	W28-07T	Briarwood Rd		1	1.00	2	1.75	5.75	33
Alligator Creek	Weir Study	W28-04	Liesl Dr		1	1.00	2	1.75	5.75	34
Forked Creek	Weir Study	W35-02	Buchnan Airport		1	1.00	1	1.25	4.25	35
Forked Creek	GPI SAS	FC05	Dale Lakes		1	1.00	1	1	4.00	36
Forked Creek	GPI SAS	FC03/04	Neptune Dr		1	1.00	1	1	4.00	37

Projects LBS25: Venice East Blvd LID Demonstration Project and LBS26: Dearborn Street LID Pilot Project were analyzed by others and are not included in the evaluation.

Table 6-2 Potential Project Ranking by Basin

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Severity	Feasibility	Cost	Benefits	Score	Basin Rank
Ainger Creek	Jones Edmunds	AN05	Melody Lane	LBS22	3	4.00	3	4.5	14.50	1
Alligator Creek	Jones Edmunds	AC01	Siesta Ditch North	LBS01	5	4.67	2	4.5	16.17	1
Alligator Creek	Jones Edmunds	AC12	Woodmere Park Library	LBS06	4	4.67	3.5	4	16.17	2
Alligator Creek	Jones Edmunds	-	General	LBS09	5	5.00	2.5	3.5	16.00	3
Alligator Creek	Jones Edmunds	AC02	Siesta Ditch South	LBS02	5	4.67	2	4	15.67	4
Alligator Creek	Jones Edmunds	AC13	Venice Gardens WRF	LBS07	4	4.67	3	4	15.67	5
Alligator Creek	Jones Edmunds	AC06	Briarwood Rd to Alligator Creek	LBS05	5	4.00	2.5	3.75	15.25	6
Alligator Creek	Jones Edmunds	N/A	Lake Magnolia	LBS04	3	4.67	3.5	3.5	14.67	7
Alligator Creek	ACSMP	System 5	Siesta Ditch South		5	4.00	2	3.5	14.50	8
Alligator Creek	ACSMP	System 1	Briarwood		5	4.33	2	3	14.33	9
Alligator Creek	ACSMP	System 3	Woodmere Park		4	4.33	3	3	14.33	10
Alligator Creek	ACSMP	System 5	Siesta Ditch North		5	4.00	2	3	14.00	11
Alligator Creek	Jones Edmunds	AC03/04	Datura Ditch	LBS03	5	3.00	2.5	3.25	13.75	12
Alligator Creek	Jones Edmunds	AC05	Alligator Creek at US41 Bridge	LBS08	4	3.00	3	3.75	13.75	13
Alligator Creek	ACSMP	System 2	Jacaranda and Tamiami		4	4.00	2	3.25	13.25	14
Alligator Creek	ACSMP	System 4	Venice Gardens WRF		4	4.00	2	3.25	13.25	15
Alligator Creek	ACSMP	System 6	Alligator Creek		4	3.33	2	3	12.33	16
Alligator Creek	Weir Study	W28-07T	Briarwood Rd		1	1.00	2	1.75	5.75	17
Alligator Creek	Weir Study	W28-04	Liesl Dr		1	1.00	2	1.75	5.75	18
Forked Creek	Jones Edmunds	FC08	Buchnan Airport	LBS17	5	5.00	3	4.75	17.75	1
Forked Creek	Jones Edmunds	FC06/07	Forked Creek at US41	LBS16	5	3.67	3	4.25	15.92	2
Forked Creek	Jones Edmunds	-	General	LBS18	4	5.00	3	3.5	15.50	3
Forked Creek	Jones Edmunds	N/A	Bridge St	LBS15	3	4.67	3.5	3.75	14.92	4
Forked Creek	Jones Edmunds	FC05	Overbrook Dr	LBS13	3	4.33	3.5	4	14.83	5
Forked Creek	Jones Edmunds	FC02	5th Street	LBS12	4	4.67	2.5	3.5	14.67	6
Forked Creek	Jones Edmunds	FC03	Fairview Dr	LBS14	3	4.33	3.5	3	13.83	7
Forked Creek	Weir Study	W35-02	Buchnan Airport		1	1.00	1	1.25	4.25	8
Forked Creek	GPI SAS	FC05	Dale Lakes		1	1.00	1	1	4.00	9
Forked Creek	GPI SAS	FC03/04	Neptune Dr		1	1.00	1	1	4.00	10
Gottfried Creek	Jones Edmunds	-	General	LBS21	4	5.00	3	3.5	15.50	1
Gottfried Creek	Jones Edmunds	GC09	Cortes Dr	LBS20	3	4.67	3.5	3	14.17	2
Gottfried Creek	Jones Edmunds	GC06/07	Court St-Langsner St	LBS19	3	4.33	3.5	3	13.83	3
LB Coastal	Jones Edmunds	LBC2	Cherokee St-Dearborne St	LBS23	3	4.33	3.5	2.75	13.58	1
LB Coastal	Jones Edmunds	LBC6	Magnolia Avenue	LBS24	3	3.67	3.5	3	13.17	2
LB Coastal	GPI SAS	LBC6	Brucewood Bayou		3	3.67	3	2.25	11.92	3

Table 6-2 Potential Project Ranking by Basin

Area of Interest	Study	Project ID	Location	Conceptual Plan Number	Severity	Feasibility	Cost	Benefits	Score	Basin Rank
Woodmere Creek	Jones Edmunds	WM01/02	Woodmere Creek at US41	LBS10	5	3.33	2	4.25	14.58	1
Woodmere Creek	Jones Edmunds	WM05	Heron Rd and Seneca Rd	LBS11	4	3.33	3.5	3.25	14.08	2

6.1 PROPOSED PROJECTS' POLLUTANT REMOVAL VALUES

Sediment removal is the primary focus of the BMPs proposed in the conceptual plans but several of the BMPs have water quality improvement components. TSS, TN and TP are the only pollutant constituents quantified in this evaluation although some BMPs are effective in removing other constituents of concern.

Twenty-one proposed projects contain BMPs with associated removal efficiencies for TSS, TP, and TN. Table 6-3 shows the estimated range of pounds per year of pollutant removed by the proposed BMP. If a project did not include specific BMPs to further treat stormwater runoff (i.e., bank stabilization), it is not listed in the table.

The results of the SIMPLE model were used to calculate normalized pounds per acre per year value by catchment area. To calculate the range of pollutant removal by BMP, the normalized results by catchment from the SIMPLE model were multiplied by the contributing area to create a pounds-per-year value. The pounds-per-year values were multiplied by the minimum and maximum reported efficiencies for the BMP to give a range of potential pounds per year of pollutant removed from stormwater runoff.

Table 6-3 Estimated Pollutant Removal by Proposed BMP

Project ID	Basin	Project Name	BMP Type	Estimated Drainage Area	Estimated Pollutant Removal (lb/yr) (rounded)		
					Total Suspended Solids	Total Phosphorus	Total Nitrogen
LBS01	Alligator Creek	Siesta Dr North	Sediment Removal Structure	16.0	700 - 1400	0 - 5	20 - 40
			Sediment Sump	25.0	700 - 2000	0	0
		Total			1400 - 3400	0 - 5	20 - 40
LBS02	Alligator Creek	Siesta Dr South	Bioswale	1.5	0 - 100	0 - 5	5 - 10
		Total			0 - 100	0 - 5	5 - 10
LBS04	Alligator Creek	Lake Magnolia	Sediment Removal Structure	30.0	1200 - 2300	0 - 5	30 - 60
			Street Sweeping	223.0	6900 - 14000	40 - 80	400 - 800
		Total			8100 - 16000	40 - 90	400 - 860
LBS05	Alligator Creek	Briarwood Rd to Alligator Creek	Maintenance Buffer	5.0	200 - 400	0 - 5	20 - 30
		Total			200 - 400	0 - 5	20 - 30
LBS06	Alligator Creek	Woodmere Park Library	Maintenance Buffer	8.0	600 - 1400	0 - 10	40 - 50
		Total			600 - 1400	0 - 10	40 - 50
LBS07	Alligator Creek	Venice Gardens WRF	Maintenance Buffer	6.0	400 - 1000	5 - 10	30 - 40
		Total			400 - 1000	5 - 10	30 - 40
LBS09	Alligator Creek	General	Street Sweeping	190.0	15700 - 31000	50 - 100	500 - 1100
		Total			15700 - 31000	50 - 100	500 - 1100

Table 6-3 Estimated Pollutant Removal by Proposed BMP

Project ID	Basin	Project Name	BMP Type	Estimated Drainage Area	Estimated Pollutant Removal (lb/yr) (rounded)		
					Total Suspended Solids	Total Phosphorus	Total Nitrogen
LBS10	Woodmere Creek	Woodmere Creek at US41	Sediment Removal Structure	18.0	600 - 1200	0 - 5	15 - 30
			Cisterns	20.0	500 - 1000	0 - 5	30 - 60
			Maintenance Buffer	4.0	100 - 300	0 - 5	15 - 20
		Total			1300 - 2500	0 - 15	60 - 110
LBS12	Forked Creek	5th Street	Bioswale	2.3	0 - 200	0 - 5	0 - 10
			Maintenance Buffer	2.5	100 - 200	0 - 5	0 - 10
			Sediment Removal Structure	2.3	100 - 200	0	0 - 5
			Limestone Roadway Treatment	0.6	10 - 30	0	0
		Total			200 - 600	0 - 5	15 - 20
LBS13	Forked Creek	Overbrook Dr	Stormwater Treatment Pond	10.0	1400 - 2500	5 - 20	0 - 70
		Total			1400 - 2500	5 - 20	0 - 70
LBS14	Forked Creek	Fariview Dr	Dry Retention Pond	1.2	100 - 200	0 - 10	0 - 10
		Total			100 - 200	0 - 10	0 - 10
LBS15	Forked Creek	Bridge St	Dry Retention Pond	1.0	100 - 100	0 - 5	0 - 10
		Total			100 - 100	0 - 5	0 - 10
LBS16	Forked Creek	Forked Creek at US41	Dry Retention Pond	12.0	1000 - 1200	0 - 10	50 - 70
			Maintenance Buffer	8.5	300 - 700	0 - 5	30 - 40

Table 6-3 Estimated Pollutant Removal by Proposed BMP

Project ID	Basin	Project Name	BMP Type	Estimated Drainage Area	Estimated Pollutant Removal (lb/yr) (rounded)		
					Total Suspended Solids	Total Phosphorus	Total Nitrogen
			Bioswale	1.5	0 - 100	0 - 5	0 - 5
		Total			1300 - 2100	10 - 15	90 - 110
LBS17	Forked Creek	Buchnan Airport	Treatment Wetland	40.0	4300 - 5500	10 - 50	50 - 120
		Total			4300 - 5500	10 - 50	50 - 120
LBS18	Forked Creek	General	Street Sweeping	25.0	1000 - 1900	0 - 10	35 - 80
		Total			1000 - 1900	0 - 10	35 - 80
LBS19	Gottfried Creek	Court St-Langsner St	Dry Retention Pond	3.5	300 - 400	0 - 3	15 - 20
		Total			300 - 400	2 - 3	15 - 20
LBS20	Gottfried Creek	Cortes Dr	Dry Retention Pond	2.5	200 - 300	0 - 5	10 - 14
			Bioswale	2.5	100 - 200	0 - 5	5 - 10
		Total			300 - 500	0 - 5	15 - 25
LBS21	Gottfried Creek	General	Street Sweeping	56.0	3100 - 6000	10 - 20	110 - 250
		Total			3100 - 6000	10 - 20	110 - 250
LBS22	Ainger Creek	Melody Ln	Bioretention Area	45.0	500 - 1900	15 - 25	70 - 110
			Sediment Sump	35.0	500 - 1300	0	0
			Street Sweeping	21.0	300 - 700	0 - 5	20 - 40
			Limestorne Roadway Treatment	1.3	10 - 30	0	0

Table 6-3 Estimated Pollutant Removal by Proposed BMP

Project ID	Basin	Project Name	BMP Type	Estimated Drainage Area	Estimated Pollutant Removal (lb/yr) (rounded)		
					Total Suspended Solids	Total Phosphorus	Total Nitrogen
		Total			1300 - 3900	15 - 30	90 - 150
LBS23	LB Coastal	Cherokee St-Dearborne St	Dry Retention Pond	0.5	0 - 100	0 - 5	0 - 5
		Total			0 - 100	0 - 5	0 - 5
LBS24	LB Coastal	Magnolia Ave	Dry Retention Pond	0.7	100 - 100	0 - 5	0 - 5
			Bioswale	5.0	100 - 400	0 - 5	10 - 20
			Limestone Treatment	0.7	10 - 40	0	0
		Total			200 - 600	0 - 5	15 - 25

Projects LBS25: Venice East Blvd LID Demonstration Project and LBS26: Dearborn Street LID Pilot Project were evaluated by others.

In reviewing the ten subbasins discharging the most total suspended solids in pound per acre per year, six of the subbasins are in Alligator Creek, two are in Forked Creek, and two are in Gottfried Creek. Three of the subbasins represent major transportation corridors—Tamiami Trail (US41) in Alligator Creek and Indiana Avenue (CR 776) in Gottfried Creek.

Table 6-4 Top TSS Producing Subbasins

Subbasin ID	Basin Name	ICPR Group	Area (ac)	TSS (lb/ac/yr)	TSS Rank
4	Alligator Creek	AC-41NW	73.18	319.98	1
5	Alligator Creek	AC-41SE	113.51	277.32	2
8	Alligator Creek	AC-LAT1	243.22	228.95	5
11	Alligator Creek	AC-MID	948.17	198.82	6
7	Alligator Creek	AC-JAC	721.57	162.03	8
17	Alligator Creek	AC-TRPN	88.53	142.18	9
25	Forked Creek	LBP-FC	29.12	262.44	3
21	Forked Creek	FC-LOWER	813.19	140.45	10
34	Gottfried Creek	GC-LOWER	25.80	247.30	4
30	Gottfried Creek	GC-776	148.63	182.90	7

After reviewing the project components and pollutant removal estimates, several projects were reclassified as Water Quality conceptual projects. The projects are LBS04, LBS09, LBS13, LBS14, LBS15, LBS17, LBS18, LBS19, LBS20, LBS21, LBS23, LBS24, LBS25, and LBS26. The focus of each of these projects was not sediment removal due to erosion or sediment abatement with bank stabilization. These projects focused on TSS removal through source control or the BMP proposed has the primary mechanism of water quality improvement. Chapter 8 Project Analysis contains the recommendations for these projects.

7.0 RECOMMENDATIONS AND PRIORITIZATION

The diversity of Lemon Bay presents challenges to sediment management. Alligator Creek, Woodmere Creek and the coastal area are heavily urbanized and offer remediation opportunities primarily in the form of stabilizing banks, amending soil to increase cohesiveness, and removing nuisance and exotic vegetation. Forked Creek is moderately developed. Seven projects ranging from local-scale to regional-scale are proposed to cover the diversity of sedimentation sources observed in the basin. Gottfried Creek and Ainger Creek are relatively rural and would most benefit from implementing and enforcing guidelines for urban growth and development.

7.1 ALLIGATOR CREEK

The single largest opportunity to reduce sediment migrating to Lemon Bay is source control of the TSS in stormwater runoff from the US41 transportation corridor in Alligator Creek. Persistent street sweeping along the Tamiami Trail and adjacent commercial properties will reduce the amount of sediment available for transport to Lemon Bay.

The banks along the tributaries to Alligator Creek are generally characterized by loose, sandy, non-cohesive soils. Soil amendment will increase the moisture-holding capacity of the soil matrix making it more desirable for native plants. Through some of the segments, the easement is not wide enough to allow for slope reduction; geoweb and geofabric will provide stability on the steeper slopes and combined with soil amendment will allow native vegetation with hearty root systems to flourish.

7.2 WOODMERE CREEK

Implementation of buffer zones will reduce sediment and urban debris as well as improve water quality by reducing the organic debris load flowing into the Woodmere Creek. The practice of denuding channel banks, while effective at increasing flood capacity quickly and efficiently, is detrimental to the health of the system and Jones Edmunds recommends the maintenance practice be eliminated except in cases of public safety due to flooding.

Cistern usage in select subdivisions would reduce the rooftop debris captured in stormwater runoff and provide residents with a beneficial reuse option.

7.3 FORKED CREEK

Seven conceptual projects were presented in the basin. Several are local-scale projects designed to be implemented and evaluated as pilot projects for pollutant-load removal efficiencies. The projects are small dry ponds at the end of a sloped roadway to capture and treat runoff from small events. The conceptual designs are basic enough to be translated to other sites and may prove a cost effective way to reduce the sediment load and improve the water quality of runoff

discharging directly to the creek. Evaluation of the pond effectiveness is measurable as the bulk weight of the sediment removed by County maintenance staff.

Buchnan Airport provides an opportunity to build a stormwater treatment system for areas east of Englewood Road that drain through the airport site as well as capture the sediment that is missed in urban development and construction. As a somewhat regional treatment system, the project can be viewed as sediment reduction and water quality protective measures for the future. This project ranked Number 1 in scoring the sediment management plan prioritization matrix.

7.4 GOTTFRIED CREEK

The Indiana Avenue transportation corridor has the third largest TSS runoff in the watershed. The roadway is less than 1 mile from the bay, persistent street-sweeping as a source control will reduce the amount of sediment available to be transported to Lemon Bay. Sediment build-up is visible at the coastal outfalls in aerial photographs.

7.5 AINGER CREEK

Urban development has not impacted Ainger Creek to the same degree as the rest of the watershed. One project has been proposed in the basin adjacent to an industrial area. As urban development proceeds into the basin, the County has the opportunity to incorporate buffer zones, soil amendment, and LID practices as well as inspection and enforcement other sedimentation preventative measures during public and private construction projects.

7.6 LEMON BAY COASTAL

Two local-scale projects are proposed in the coastal area adjacent to Gottfried Creek to minimize sediment being transported from the uplands to Lemon Bay.

7.7 ADDITIONAL RECOMMENDATIONS

Restoration and rehabilitation are necessary to alleviate anthropogenic sediment accumulation that impedes flow regimes and navigability of waterways and disrupts natural systems. Proactive maintenance practices will help the County achieve long-term goals and achieve sustainability for the waterways and natural systems.

As a parallel task in this WMP, Jones Edmunds evaluated County-wide maintenance practices. Several of the practices are specific to sediment accumulation and erosion and are discussed below.

Maintaining the hundreds of miles of channels in the County is a massive work effort. The County has several mechanisms for monitoring, reporting, and correcting activities that may lead to increased sediment deposition in the County's stormwater system and waterways, such as:

- The County's Environmental Services Department has a Strategic Maintenance Plan for the Drainage Operations Division that outlines maintenance schedules and routine maintenance practices.

- The maintenance staff is proactive in monitoring and reporting sediment issues as part of their routine duties.

- The County's MS4 Permit summarizes prevention and enforcement tasks associated with minimizing erosion due to construction.

Additionally, an asset-management system is being implemented throughout the County that will improve the tracking of maintenance requests and regularly scheduled maintenance.

Recommendations from the maintenance evaluation to reduce sediment loads are as follows:

- For the most effective removal of nutrients, baffle boxes should be cleaned at least monthly during the wet season and quarterly during the dry season to remove sediment and vegetation.

- Sediment sump cleanout should be scheduled bi-annually. If during regular maintenance, County staff observe sediment buildup that exceeds 50% of the sump volume, regular maintenance should be scheduled more frequently.

- A normal practice by the County maintenance staff is to use herbicides within a watercourse or on adjacent banks. To facilitate achieving TMDL levels set for Lemon Bay and prevent muck buildup in the channel, decaying vegetation should not be left in the watercourse.

- As a regular maintenance practice, County staff excavates and denudes roadside swales to eliminate vegetation and remove possible sediment accumulation. Within the 2 weeks after the excavation, County staff will re-sod the bare soil. Denuding should be replaced with mechanized removal of vegetation to a minimum length leaving root systems in place.

- Removing exotic-invasive species during routine maintenance creates a more natural system. However, the removal process must not destabilize the stream banks. This activity would be best suited to maintenance during the dry season. Ideally, re-introducing native species will decrease maintenance requirements.

- For industrial and densely-populated areas, where space for additional stormwater BMPs is not available, bi-monthly street sweeping removes sediment and pollutants before either reaches the stormwater system.

- Public outreach is recommended for educating homeowners, landscapers, and lawn-maintenance workers on proper maintenance along streams and ditches.