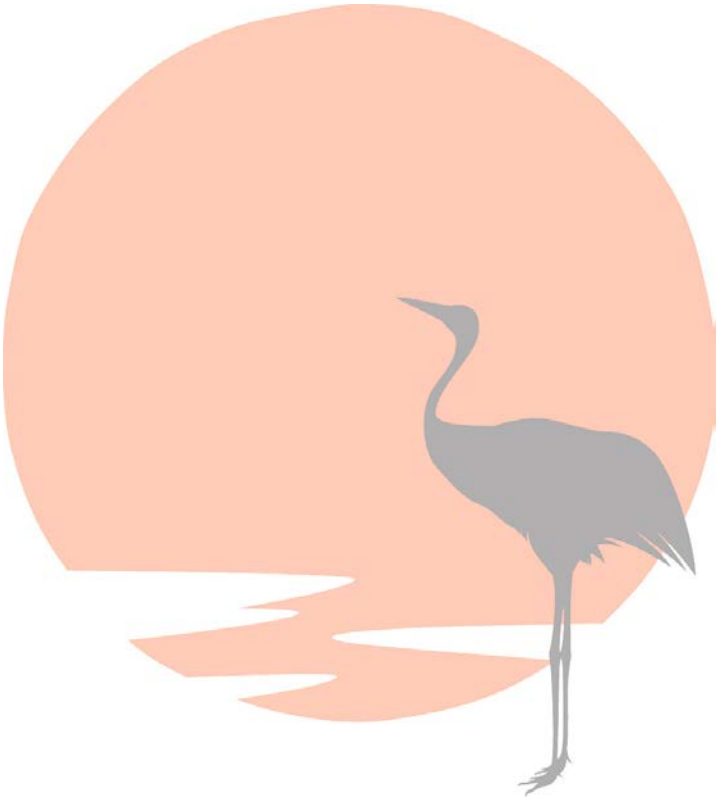
Appendix F
Sediment Management Plan



December 2012

Sarasota County | Southwest Florida Water Management District | Jones Edmunds | Janicki Environmental, Inc.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Jones Edmunds & Associates, Inc. investigated the Sarasota Bay Watershed in search of potential sediment management opportunities. They identified six projects with the potential to reduce sediment loading and improve water quality. Details concerning site and project selection are provided in Section 2, and project and program recommendations are provided in Section 3.

1.1 BACKGROUND INFORMATION

Sediment is fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits and is transported by, suspended in, or deposited by water (USEPA, 2003). Although sedimentation is a natural process, sediment becomes problematic when it is present in excessive quantities or is of poor quality.

Sediment plays an important role in influencing water quality, ecosystem health, and flood control. Population growth and development can accelerate erosion and sediment deposition, overwhelming our natural systems. Excessive erosion and sedimentation are significant chemical and physical issues in watershed management. Sediment alters the natural landscape and pollutes water, resulting in environmental and economic impairment. The U.S. Environmental Protection Agency (USEPA) recognizes sediment as a major contributor to impairment of the nation's waters and has cited sediment as the leading cause of impairment (USEPA, 2003). Sediment-control strategies are therefore a key component of watershed management planning efforts.

This appendix is the sediment management component of the comprehensive water quality management plan for the Sarasota Bay Watershed. Watershed-based loading of sediment and other associated pollutants, identification of other sediment sources, and potential management and preventative erosion and sedimentation measures for the Sarasota Bay Watershed are discussed in this document.

1.2 SEDIMENT SOURCES

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. Within an urbanized setting like the Sarasota Bay Watershed, sediment production has two primary sources: wash-off from land surface and in-stream channel erosion. Bank steepness, degree of concentration (runoff velocity), and stability (e.g., vegetation) influence the quantity of the sediment load that reaches the waterbody. Increased sediment load from wash-off and in-stream erosion can affect water quality, natural habitat, navigation, flood control, and recreational uses downstream. In addition, alterations in circulatory patterns caused by dredging can re-suspend and transport existing sediments.

1.2.1 Land Surface

In urban watersheds, the greatest contributor to wash-off is impervious surfaces. Impervious surfaces increase runoff volume and velocity, which carry a significant sediment load to the waterways. This increase can affect the physical character and the overall environmental condition of receiving tributaries. 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).

1.2.2 In Stream Processes

In their historical condition, waterways collected water, nutrients, and sediments from upland runoff and distributed these elements to the contiguous wetlands and bay in a manner that supported productive biological communities. The timing and quantities of flow suited the complex biological cycles of the streams and bay. The water collected and delivered by the waterways, with its dissolved and suspended load, was and is a major component of the raw materials that fuel the productivity of wetlands, streams, and bays.

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 by 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 from 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.

Stream channel erosion is a major contributor of sediment in urbanized watersheds. Channel erosion control should therefore be a priority in sediment management.

1.3 POLLUTANTS OF CONCERN

Sediment that is transported and deposited in waterbodies can disrupt aquatic ecosystems. Excess sediment can cloud the water, which can suffocate fish and block the light required by aquatic plants for photosynthesis. In addition, sediment-rich discharges tend to carry higher loadings of pollution because nutrients, pesticides, and heavy metals adsorb to and are transported along with sediment. Pollutants of concern including total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) are associated with the sediment and contaminants attached to sediment in the Sarasota Bay Watershed. Appendix C (Water Quality) of the Sarasota Bay Watershed Water Quality Management Plan (WQMP) provides additional information on these pollutants and the water quality in the Sarasota Bay Watershed.

Nitrogen and phosphorus are nutrients that occur in soils naturally; increased erosion increases the nutrient load to the system. Other common sources of nitrogen and phosphorus in an urbanized area are septic systems, pet wastes, industrial wastes, landfills, and fertilizer. Excess nutrients combined with the tropical temperatures in Sarasota County can lead to excessive algae growth impacting the recreational aspects of the waterways as well as creating an oxygen deficit for the marine life and aquatic habitats.

Suspended solids loads are primarily a function of land use; an increase in the amount of impervious area in urban development 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 adversely impact benthic habitats and the flood-control capacity of the system. Additionally, suspended solids may carry toxins and pathogens that adversely impact ecosystems.

Litter from lawn maintenance—such as leaves and grass clippings—and urban debris—such as cigarette butts, food packaging, and batteries—are also pollutants. Litter left on the ground frequently ends up in storm drains, ditches, and streams. In addition to being an eyesore, litter can contaminate waterways with excess nutrients and chemicals. Although natural streams have snags and leaf packs that provide habitat and nutrient processing, in large quantities they can add to the nutrient load in the waterway. Litter can also reduce and in some cases block flow, which can disrupt the ecosystem or cause flooding.

1.4 SEDIMENT CHARACTERISTICS IN THE WATERSHED

Florida's geology contains sedimentary deposits of marine origin, some of which are high in phosphorus content. The Sarasota Bay Watershed lies in a phosphorus-rich region, and local soils significantly influence the total phosphorus concentrations in the Little Sarasota Bay tributaries and estuary. Florida is divided into ecoregions for the proposed Numeric Nutrient Criteria (NNC), and there is currently a debate concerning the appropriate region for the Sarasota Bay Watershed. USEPA originally classified the watershed in the Bone Valley region (BV) but

re-evaluated and proposed that the area belongs in the Peninsula Region (PR); however, the Southwest Florida Water Management District (SWFWMD) submitted comments to USEPA that the area containing the Sarasota Bay Watershed should be kept in the BV region SWFWMD, 2010).

There is currently a debate concerning the appropriate ecoregion for the Sarasota Bay Watershed for Numeric Nutrient Criteria.

Previous studies show some sediment in the Sarasota Bay tributaries contains substantial levels of contaminants, including toxic metals, pesticides, petroleum, and other organic compounds. The Sarasota Bay Watershed is highly urbanized with older neighborhoods that provide only minimal stormwater retention or detention. The untreated runoff contributes sediment and associated pollutants to Hudson and Whitaker Bayous and Sarasota Bay. However, sediments in the bay proper have been reported to be uncontaminated.

Hudson Bayou has areas of polluted sediments. Studies reveal lead concentrations as high as 510 ppm in sediment throughout the bayou, including the tidal portion. Testing of sediments in Hudson Bayou determined that the pollution is more concentrated in the deeper sediments than in the top sediment layers, indicating that historical activities in the watershed impacted the quality of sediments in the waterway, but conditions may have improved.

Previous studies found contaminated sediment in Whitaker Bayou as well. The bayou drains a part of the City of Sarasota that is highly urbanized, consisting primarily of older development. Whitaker Bayou also receives effluent from the City of Sarasota's advanced wastewater treatment facility, but the discharge from the treatment facility has been demonstrated to have minimal negative impact on the receiving waterbody and has met antidegradation standards as defined in the Florida Administrative Code. In August 2011, the City started construction on a deep well injection system to remove this discharge from entering the bayou.

1.5 SEDIMENT MANAGEMENT

Development throughout the watershed contributes to increased sediment loading to Sarasota Bay tributaries and Sarasota Bay. Controlling sedimentation by managing upstream sources and activities that increase stream erosion and sediment flowing to tributaries is a key component of effective sediment management.

Managing sedimentation in an urban setting requires a multi-pronged approach. We recommend the following three management strategies to 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 will reduce turbidity, increase clarity, and reduce nutrient and sediment load and therefore improve the health of the estuaries and Sarasota Bay.

Providing source control to reduce or remove TSS in the uplands keeps pollutants from running off in stormwater and reaching the receiving waters of the channel and ditch system and ultimately Sarasota Bay. Source-control activities include low-impact development (LID) projects, street sweeping, construction-area silt fencing, and capturing solids in dedicated, maintainable sedimentation areas.

Regularly scheduled maintenance practices minimize the amount of sediment, debris, and pollutants reaching County waterways. These activities include cleaning out baffle boxes, removing excess vegetation from swales and roadside ditches, replacing damaged infrastructure, and maintaining control structures and weirs.

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

- Steep slopes.
- Loose soil matrix on steep slopes without hearty root systems or moisture-holding capacity.
- Direct runoff washing out the top of banks.
- Outfalls not properly reinforced.

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

Watershed management includes identifying sediment problems, identifying the sediment sources, and recommending improvement projects. The activities listed above will improve the health of the system.

2.0 SEDIMENT MANAGEMENT OPPORTUNITIES

Jones Edmunds identified potential sediment management opportunities in the Sarasota Bay Watershed. Project and site-selection methodology are provided in the following subsections. Analysis of project and programmatic recommendations to reduce erosion and sedimentation in Sarasota Bay and its tributaries are described in Section 3.

2.1 METHODOLOGY

Jones Edmunds collected and assembled information, including previous studies, GIS data, and stakeholder input, to identify potential sediment management projects. Jones Edmunds began the investigation with a GIS desktop analysis to identify sediment 'hot spots' throughout the watershed. These hot spots were refined to potential sediment management project sites. This methodology is summarized in Figure 2-1 and detailed in the following sections. Finally, Jones Edmunds conducted a field investigation of these sites to evaluate potential sediment treatment options.

2.1.1 INVESTIGATION

2.1.1.1 Identification of Hot Spots

Jones Edmunds reviewed observations, input from stakeholders and County staff, and previous studies and data. Previous sediment studies in the Sarasota Bay Watershed are listed below. The sediment sampling locations for each study are shown in Figure 2-2.

- Sediment Contaminants in Selected Sarasota Bay Tributaries (1992).
- Bay Bottom Habitat Assessment (1993).
- Water and Sediment Quality: Trends and Status for Sarasota Bay (1993).
- Framework for Action Chapter 2: Physical and Chemical Properties; Bay Water and Sediment Quality (1993).
- Sarasota Bay – The Voyage to Paradise Reclaimed (1995).
- Surface Water and Sediment Sample Collection and Analysis for Big Slough, Hudson Bayou, and Phillippi Creek Basins, Sarasota County, Florida (1998).
- Whitaker Bayou Reconnaissance Report (2005).
- Hudson Bayou Stormwater Study (2001).
- County-Wide Survey of Sediment Quality at Weir Structures (2003).
- Sarasota Bay Estuary Program Outfall Prioritization Project (2007).

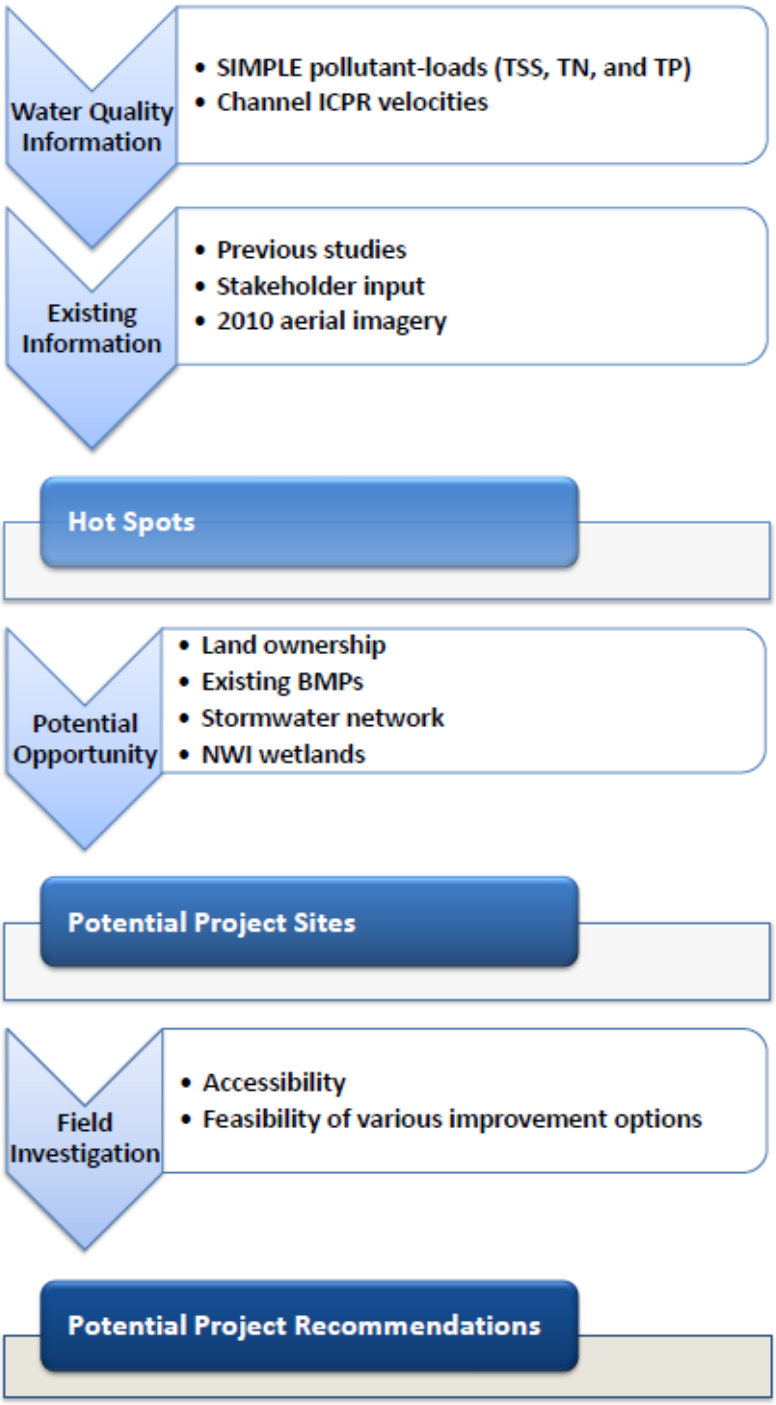


Figure 2-1 Sediment Management Opportunity Identification Methodology

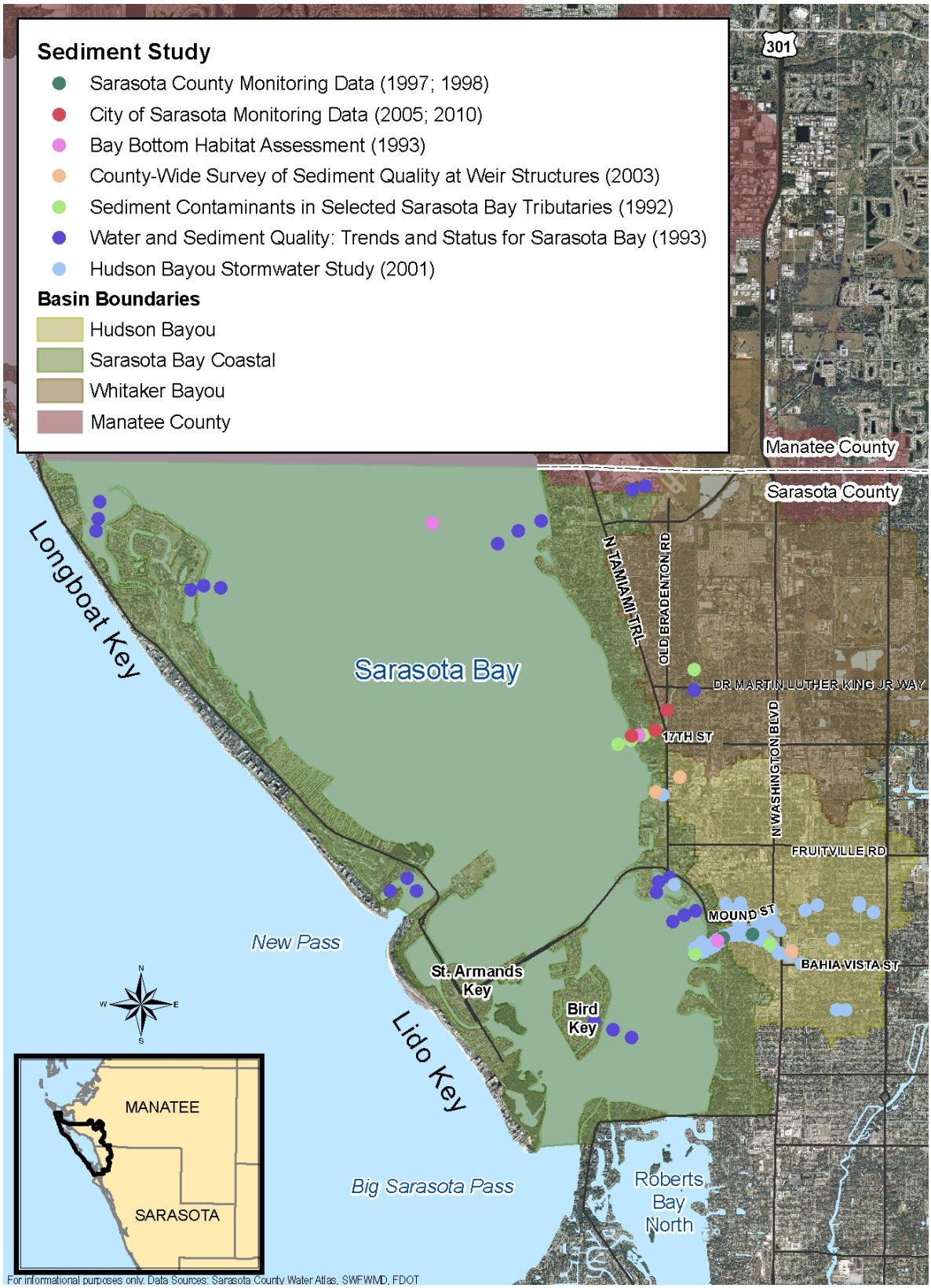


Figure 2-2 Previous Sediment Studies Sampling Points

Jones Edmunds used GIS to compile and review data developed from the Pollutant Loading Model results with aerials and other base data and information obtained from Sarasota County, SWFWMD, Florida Department of Environmental Protection (FDEP), and previous watershed studies and data. These datasets and information included the following:

- Pollutant loads as estimated from the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE) (TSS, TP, and TN)—Pollutant-load results are detailed in the Pollutant Loading Analysis Technical Support Document: Current Loadings.
- Sarasota County surface water Interconnected Channel and Pond Routing (ICPR) model velocity results.
- 1948 U.S. Department of Agriculture (USDA) aerial imagery.
- 2010 SWFWMD aerial imagery.
- Areas of concern identified in previous studies.
- Areas of concern noted by stakeholders and County staff.

A GIS desktop analysis of the data above yielded potential erosion and/or sedimentation hot spots in the watershed.

2.1.1.2 Identification of Potential Project Sites

Jones Edmunds compiled the potential sediment hot spots with additional base data obtained from Sarasota County. Specifically, these datasets included the following:

- Sarasota County parcels.
- Existing best management practices (BMPs).
- Sarasota County Stormwater Inventory.

From the GIS desktop analysis of the parameters above, Jones Edmunds identified seven potential sediment management project sites in the watershed (Table 2-1 and Figure 2-3).

Table 2-1 List of Potential Sediment Management Project Sites

ID	Site Name	SIMPLE Basin ID
1	Brother Geenen Way	105
2	Robert Taylor Community Complex	111
3	Orange Avenue	109
4	Bayfront Drive North	101
5	Bayfront Drive South	101
6	Sarasota High School at Hatton Street Ditch	102
7	Sarasota High School at Tamiami Trail	102

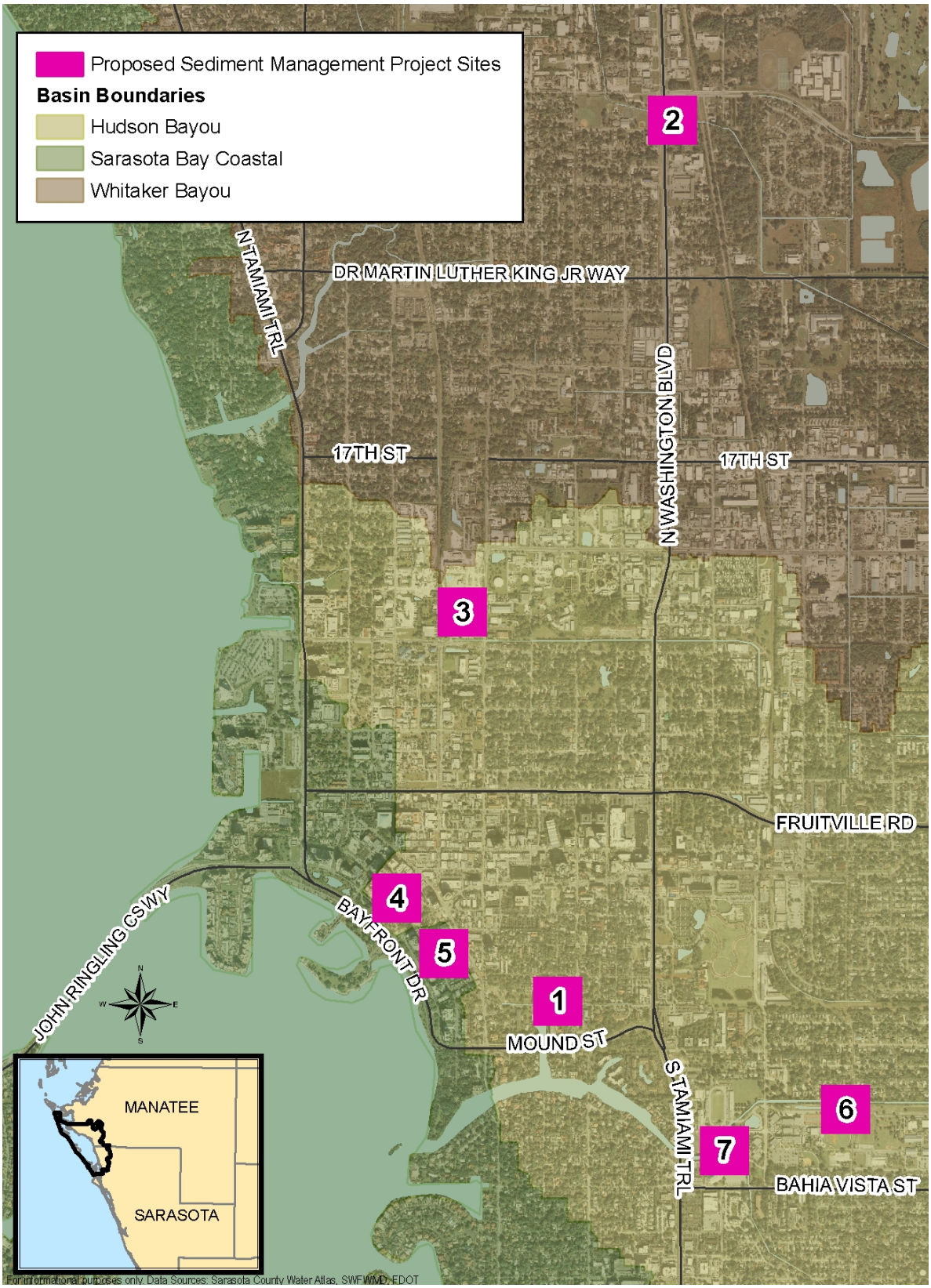


Figure 2-3 Proposed Sediment Management Project Sites

2.1.1.3 Field Investigation

Jones Edmunds visited the proposed sediment management sites in April 2011 to characterize the potential project areas and identify and determine potential sediment management options, including possible programmatic recommendations.

3.0 ANALYSIS\RECOMMENDATIONS

The following sections provide investigation summaries and recommendations for the selected project sites as well as program recommendations to help manage sediment in the watershed.

3.1 PROJECTS

This section describes the potential sediment management projects.

3.1.1 Site 1—Brother Geenen Way

3.1.1.1 GIS Desktop Analysis

The Brother Geenen Way site is in the Hudson Bayou Basin and is slightly northeast of the north branch of Hudson Bayou (Figure 3-1). Previous studies indicate high levels of lead in sediment in this system. Untreated stormwater from a large contributing area discharges into the bayou from a 36-inch pipe that runs through this site. SIMPLE pollutant-load results show elevated TSS and TP in the area. The County parcel coverage is void here; therefore, the site is assumed to be County easement. County staff indicated that there is an Automated Rainfall Monitoring System (ARMS) station (HUD-3) onsite and suggested the area as a potential location for a restoration project.

3.1.1.2 Field Investigation

This site is in a residential area and meets the tidal creek to Hudson Bayou on the west. A heavy tree canopy is over most of the site, and the creek banks are very steep and deep. An ARMS station is onsite. County staff indicated that the City of Sarasota is building a Multi-Use Recreational Path (MURP) through this site.

3.1.1.3 Recommendation

Implementing a sediment sump and diversion to capture sediment from the creek before it reaches the bayou would be beneficial; however, there does not appear to be enough space to accommodate a settling area and the MURP project. Therefore, Jones Edmunds recommends that the City incorporate LID into the MURP project.

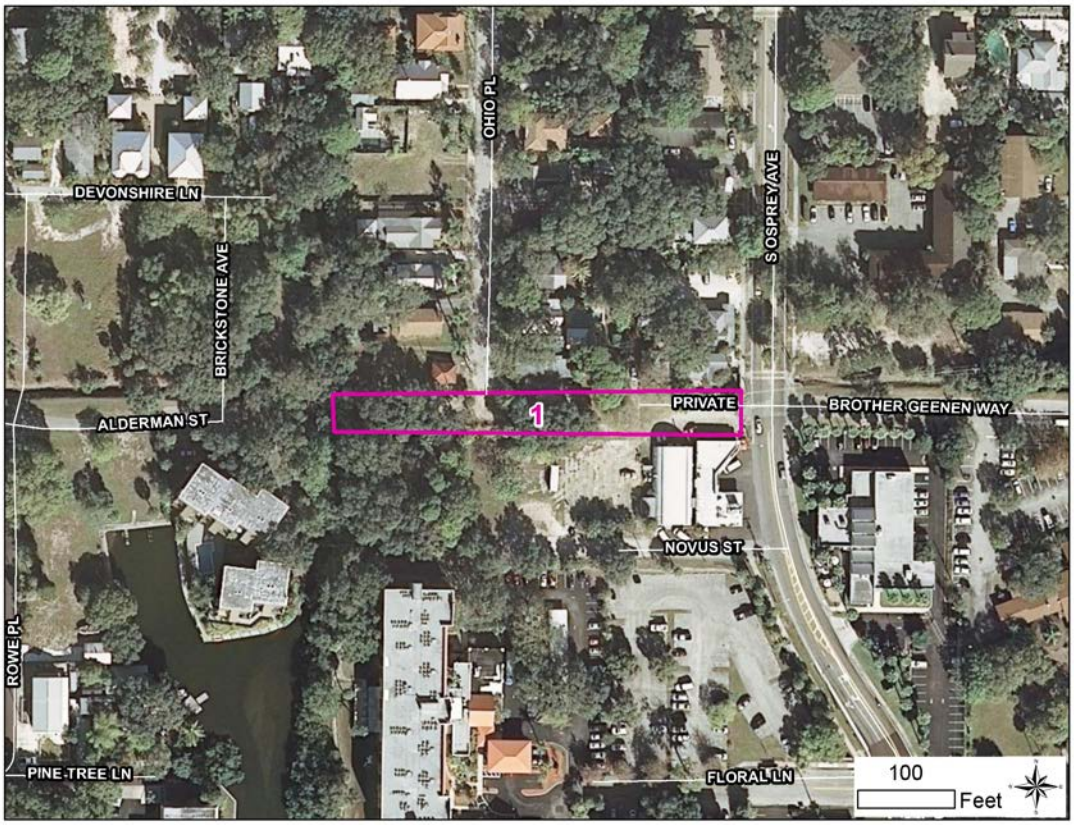


Figure 3-1 Aerial View of Site 1 (SWFWMD, 2010)

3.1.2 Site 2—Robert Taylor Community Complex

3.1.2.1 GIS Desktop Analysis

The Robert Taylor Community Complex site is in the Whitaker Bayou Basin near the area of Myrtle Street, Washington Street, and Leonard Reid Avenue (Figure 3-2). The site contains sediment build-up and bare earth west of Washington Boulevard, sediment build-up east of Washington Street, and dense vegetation east of Leonard Reid Avenue. The portion of Site 2 west of Washington Boulevard is owned by the City of Sarasota. The eastern portion of the property does not have parcel data and is assumed to be County easement.

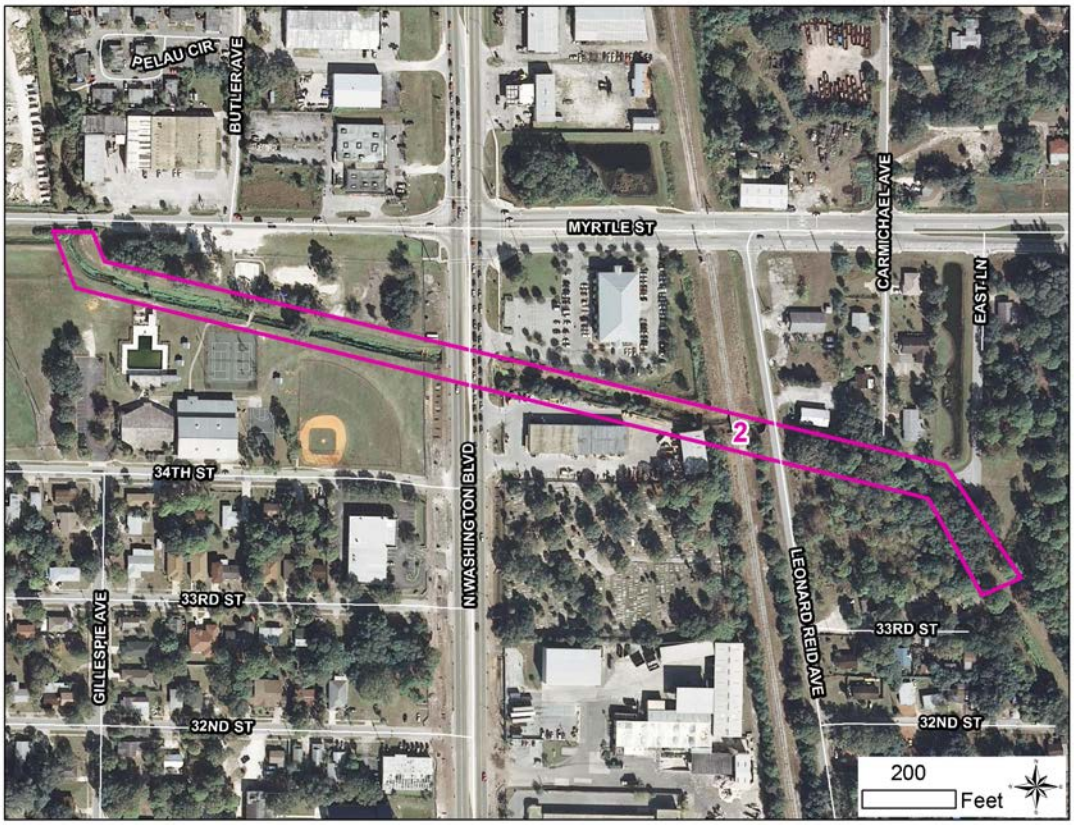


Figure 3-2 Aerial View of Site 2 (SWFWMD, 2010)

3.1.2.2 Field Investigation

The downstream portion (west of Washington Boulevard) of this proposed area is under construction. The upstream area appears viable for a project.

The banks of the waterway are eroded between Leonard Reid Avenue and Washington Boulevard (Figure 3-3). Runoff from Hertz Equipment Rental to the south appears to discharge to the stream without any treatment. There is sediment accumulation in the waterway, primarily under the railroad piers, and excessive duckweed in the waterway. A grassed swale parallel to Leonard Reid Avenue from Myrtle Street drains to the waterway (Figure 3-4). This area is mapped in the Bus Rapid Transit (BRT) alternatives, which may use railroad corridors.

Figure 3-3 Waterway on South Side of Myrtle Street, West of Leonard Reid Avenue, Facing West

Figure 3-4 Swale Parallel to Leonard Reid Avenue, Facing Southwest

There is also erosion along the banks of the waterway on the east side of Leonard Reid Avenue. (Figure 3-5). A small church has a gutter downspout discharging directly to the stream. Erosion at the top of bank has occurred at the outflow from the gutter (Figure 3-6).

Figure 3-5 Waterway on South Side of Myrtle Street, east of Leonard Reid Avenue, Facing South

Figure 3-6 Waterway and Church on South Side of Myrtle Street, East of Leonard Reid Avenue, Facing North

3.1.2.3 Recommendation

Jones Edmunds recommends bank restoration and stabilization between Leonard Reid Avenue and Washington Boulevard. A linear BMP to capture and treat the runoff from Hertz Equipment Rental in the drainage right-of-way should also be considered. The swale adjacent to Leonard Reid Avenue should be retrofitted with a biofiltration/bioretention swale. Adding a sediment sump and native vegetation along the waterway on the west side of Washington Boulevard would reduce the amount of sediment entering the system and moving downstream.

A bioswale to treat runoff from the church property should be constructed east of Leonard Reid Avenue. Gutter bubblers on the church gutter system should also be implemented.

Jones Edmunds does not recommend improvements for the portion of this site that is under construction.

3.1.3 Site 3—Orange Avenue

3.1.3.1 GIS Desktop Analysis

Site 3 is in the Hudson Bayou Basin and is on the City property west of Orange Avenue and 11th Street. A railroad track crosses the western part of the site (Figure 3-7). The area has elevated SIMPLE TSS loads and is adjacent to a large area of bare earth. Stormwater from 12th Street and the wastewater treatment plant flows via pipes down Orange Avenue, continues west along the northern bounds of Site 3, and eventually discharges at Pioneer Park.

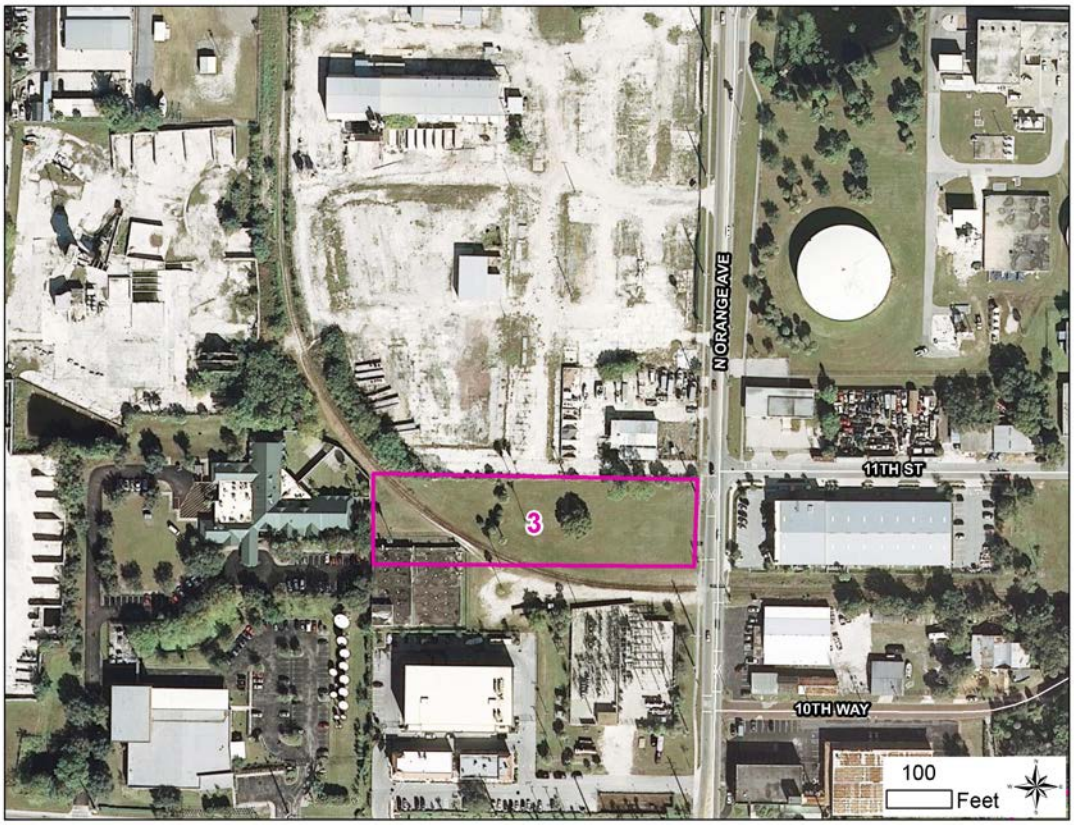


Figure 3-7 Aerial View of Site 3 (SWFWMD, 2010)

3.1.3.2 Field Investigation

The parcel is in an industrial area on the south side of a junk yard (Figure 3-8). A concrete slab of unknown purpose is present in the middle of the site (Figure 3-9). No facilities are noted in the data collected during the literature search for this plan. Additionally, an FPL substation is immediately south (Figure 3-10).

Figure 3-8 Site 3, Facing Northwest

Figure 3-9 Marked Concrete Slab at Site 3

Figure 3-10 Site 3, Facing Southeast

3.1.3.3 Recommendation

Jones Edmunds recommends diverting flow through a treatment system at this site to improve water quality before it gets to the bay. The parcel is large enough to accommodate a stormwater pond (+/-0.5 acre) to treat redirected flow from the 48-inch pipe as well as a sediment sump to remove solids. The area could also be used as a neighborhood enhancement by creating a park-like setting.

3.1.4 Site 4—Bayfront Drive North

3.1.4.1 GIS Desktop Analysis

Site 4 is in the Sarasota Bay Coastal Basin. This area appears to act as a buffer between Bayfront Drive and the businesses and residences in downtown Sarasota (Figure 3-11). The stormwater inventory shows underground infrastructure discharging to the bay without any treatment.

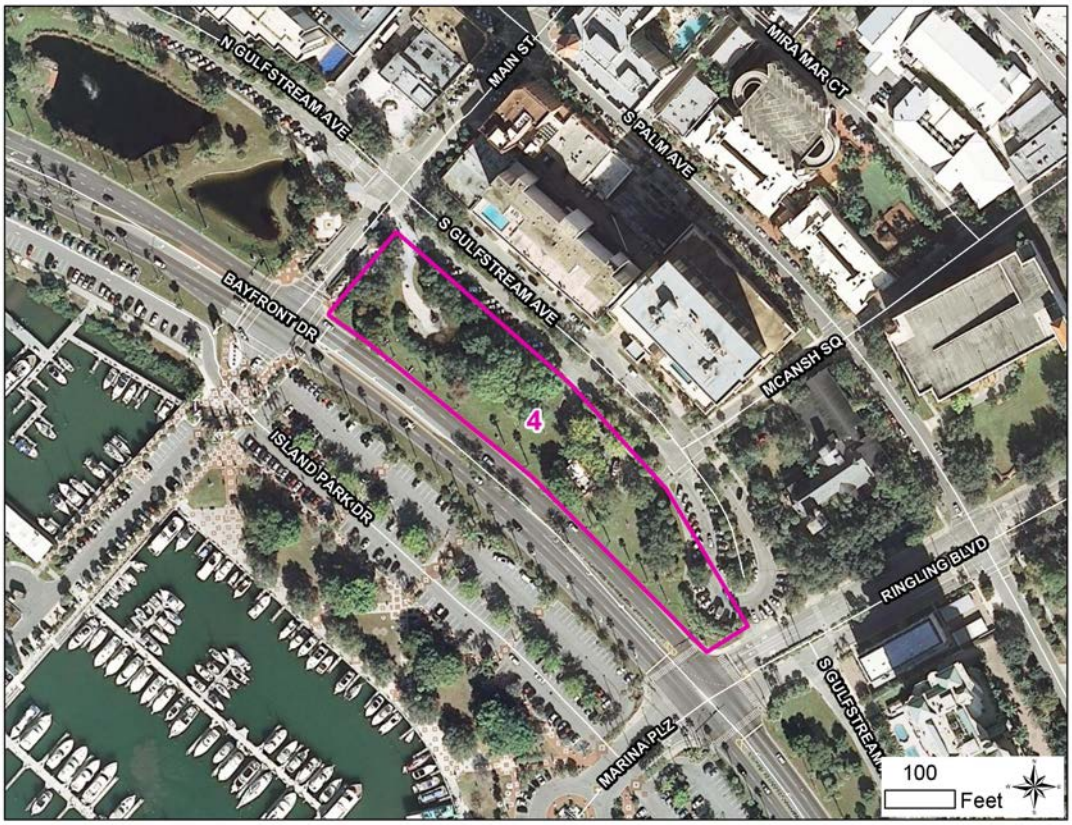


Figure 3-11 Aerial View of Site 4 (SWFWMD, 2010)

3.1.4.2 Field Investigation

This site has a public restroom at the south end and a curb inlet unusually positioned in the center of the parcel (Figure 3-12).

Figure 3-12 Site 4, Facing South

3.1.4.3 Recommendation

Jones Edmunds recommends replacing the curb inlet with a water feature, such as a stormwater pond. We also recommend diverting a portion of flow from the storm sewer system through the site to provide some treatment for runoff before it reaches the bay.

Additionally, curb cuts could be added to the east side of Tamiami Trail to allow runoff to enter the grassed area for infiltration and provide treatment along the roadway corridor.

3.1.5 Site 5—Bayfront Drive South

3.1.5.1 GIS Desktop Analysis

Site 5 is in the Sarasota Bay Coastal Basin. This area appears to act as a buffer between Bayfront Drive and the businesses and residences in downtown Sarasota (Figure 3-13). The stormwater inventory shows underground infrastructure discharging to the bay without any treatment.

Figure 3-13 Aerial View of Site 5 (SWFWMD, 2010)

3.1.5.2 Field Investigation

This site is narrow and slopes down from the northwest toward Gulf Stream Avenue (Figure 3-14). Runoff from the east flows into curb inlets and pipes to the bay and does not appear to flow over this site. There is a stormwater inlet at the northwest corner of this site at the southwest corner of the intersection of Ringling Boulevard and South Gulfstream Avenue.

Figure 3-14 Site 5, Facing South

3.1.5.3 Recommendation

Jones Edmunds recommends diverting a portion of the flow from the storm sewer system to a winding bioswale system with the underdrain discharging farther down in the storm sewer to provide water quality treatment before discharging to the bay. We also recommend adding benches, walkways, and educational kiosks for neighborhood enhancement. Additionally, curb cuts could be added to the east side of Tamiami Trail to allow runoff to enter the grassed area and install a bioswale for infiltration to provide treatment of runoff from Bayfront Drive.

3.1.6 Site 6—Sarasota High School at Hatton Street Ditch

3.1.6.1 GIS Desktop Analysis

Site 6 is in the Hudson Bayou Basin north of Sarasota High School. Stormwater runoff from a large drainage area flows through the Hatton Street ditch and eventually into Hudson Bayou (Figure 3-15). The ditch was noted on the Sarasota Bay Watershed tour as a potential area for restoration and/or mitigation.

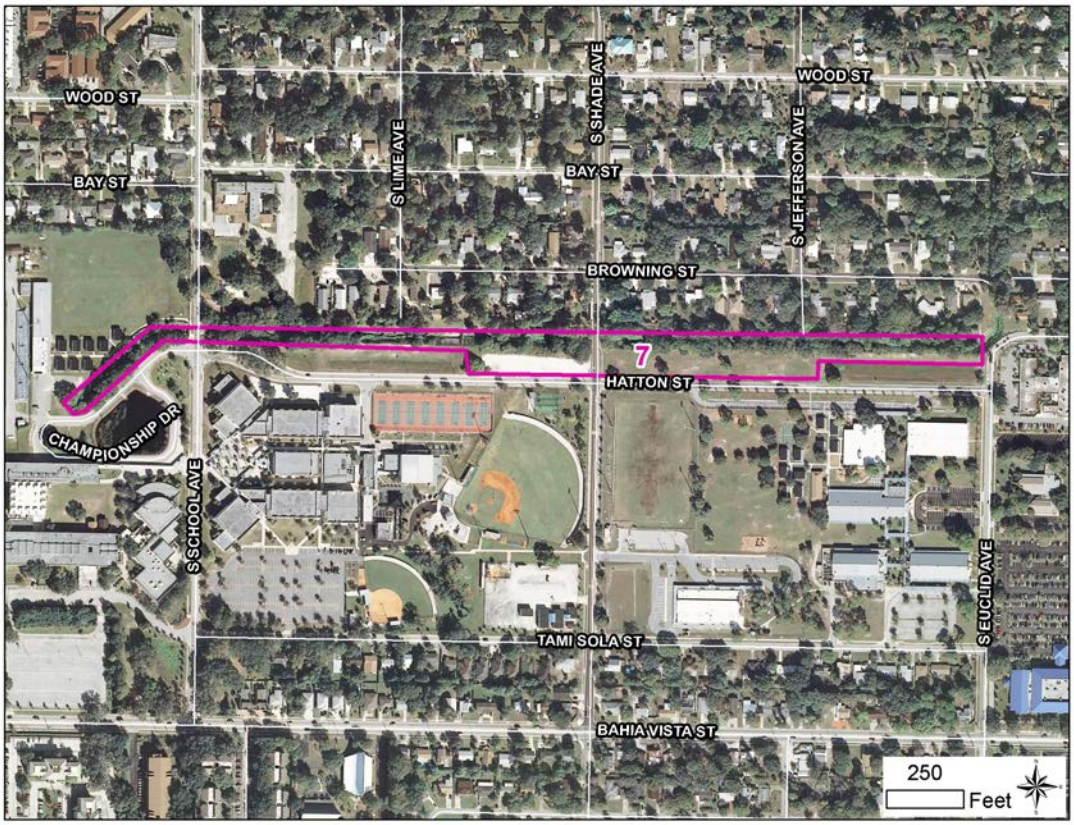


Figure 3-15 Aerial View of Site 6 (SWFWMD, 2010)

3.1.6.2 Field Investigation

The Hatton Street ditch has very steep banks, erosion, and sedimentation (Figure 3-16). There are multiple discharges without erosion-control measures (Figure 3-17), and a large weir west of Shade Avenue controls flow through the ditch (Figure 3-18). On the south side of the Hatton Street ditch are two stormwater ponds for the high school.

Figure 3-16 Hatton Street Ditch, Facing East

Figure 3-17 Outfalls to Hatton Street Ditch

Figure 3-18 Weir in Hatton Street Ditch, Facing Northwest

3.1.6.3 Recommendation

Jones Edmunds recommends removing exotic invasive plants and stabilizing the banks. The channel modifications should be modeled after the recently completed Upper Mullet Creek Erosion Control and Channel Improvements project in Safety Harbor, Florida, which incorporated geoweb and articulating blocks that provided function and aesthetics.

The berm between the pond and the ditch on the north side is significantly higher than the grate elevation on the control structure in the pond. The berm between the two should be lowered to make room to regrade the very steep north bank.

The waterway on the east side of Shade Avenue should be widened, and a sediment sump and wetland area should be added on the south side of the ditch. This would also provide educational opportunities.

Additionally, multiple LID techniques should be incorporated on the school site to reduce flow to the ponds and provide educational opportunities.

3.1.7 Site 7—Sarasota High School at Tamiami Trail

3.1.7.1 GIS Desktop Analysis

Site 7 is in the Hudson Bayou Basin. Previous studies revealed lead-contaminated sediment in this reach. A network of ditches and pipes conveys stormwater from a very large area through Site 7, which is the most downstream point in the watershed before stormwater is released at the head of Hudson Bayou. There is sediment buildup in the north part of the site and dense vegetation just downstream (Figure 3-19). The site is County-owned.

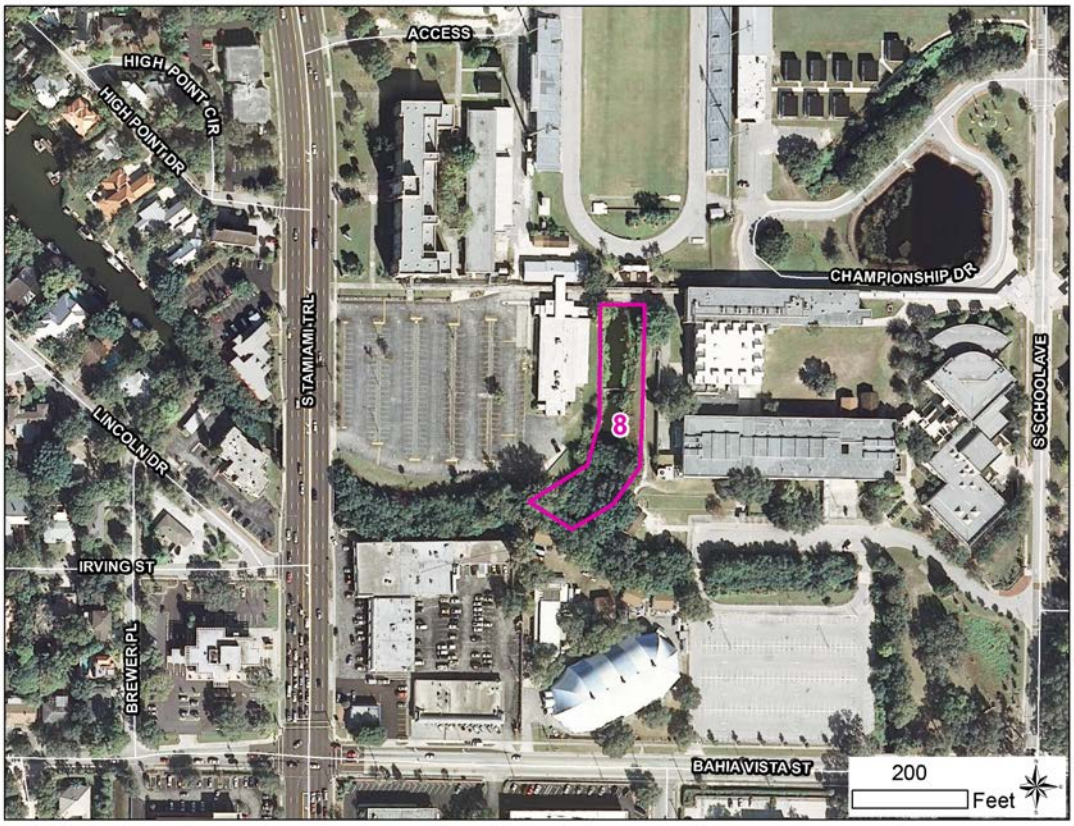


Figure 3-19 Aerial View of Site 7 (SWFWMD, 2010)

3.1.7.2 Field Investigation

The waterway is between the school maintenance building and the school. There is erosion on both banks, and herbicide has been applied on the west bank (Figure 3-20). A large weir controls the flow through this site (Figure 3-21). There is significant algae growth north of the weir and non-native vegetation in the waterway on the south side of the weir. The stretch of dead dried vegetation along the length of both sides of the waterway is evidence of herbicide use. There is an ARMS station with a small dock in disrepair onsite.

Figure 3-20 Site 7, Facing North

Figure 3-21 Site 7, Facing South

3.1.7.3 Recommendation

Jones Edmunds recommends eliminating the use of herbicides within the top of bank of the channel adjacent to the weir, adding a skimmer to the weir, pulling back the top of bank on the west side (adjacent to the maintenance building), regrading the eroded slopes, and moving the dumpsters and trash cans away from the waterway. There are educational opportunities at this site, such as LID and water quality testing projects for environmental science classes at the high school. This would also encourage environmental stewardship among the students.

We also recommend improvements to the high school parking lot west of this site. Adding curb cuts and biofiltration medians would decrease the sediment washing from the lot directly into the bayou just downstream from this site.

3.2 GENERAL SEDIMENT MANAGEMENT MEASURES

3.2.1 Geofabrics

3.2.1.1 Description

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 (biodegradable) life spans to provide permanent protection or to provide vegetation with the proper conditions to become established. Non-biodegradable netting underlain by straw or mulch can also be used to allow time for vegetation to develop hearty root systems. Steeper slopes (less than 3:1 (H:V)) may require a geoweb, an additional element for stabilization. A geoweb averages 6 inches deep and contains pockets for soil media to be held in place, which help revegetate the bank and prevent sloughing. Either product can be used individually, but on steep banks using both a geofabric and a geoweb will generally provide a longer-term solution.

3.2.1.2 Recommendation

We recommend installing geofabrics on County projects as appropriate.

3.2.2 Soil Amendment

3.2.2.1 Description

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, and some of

the factors to consider are longevity, pH, texture, and salinity of the soil. Soil amendment does not depend on installing geofabric and may be done independently.

3.2.2.2 Recommendation

The County should implement the Composting Pilot Study recommended in the Roberts Bay Watershed Management Plan (Chapter 8, RBP26). Compost collected during the study should be worked into stream banks that need to be stabilized during routine maintenance by County staff.

The County should evaluate the results of the composting study to determine the most beneficial soil amendment material based on cost, maintenance requirements, and effectiveness of preventing erosion.

3.2.3 Vegetation

3.2.3.1 Description

Planting and recruiting native vegetation with adequate root systems are common practices 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.

3.2.3.2 Recommendation

Native plant species will provide longer-term erosion control and bank protection and should be planted during regular maintenance or during the construction of new County projects. The appropriate selection of plants during the design phase of a project is essential as fast-growing plants with abundant foliage may impede the flow and reduce the overall flood capacity of a conveyance system. Suggested plantings of upland and wetland plant species for stream/ditch bank stabilization are listed in Table 3-1, and suggested wetland plants for stormwater ponds are listed in Table 3-2. These are general recommendations for plantings for successful recruitment of vegetation.

Table 3-1 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-inch 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 3-2 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

3.2.4 Sediment Sumps

3.2.4.1 Description

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 the optimal location and size of the sump.

3.2.4.2 Recommendation

The County should perform regular maintenance on their sediment sumps. 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.

3.2.5 Monitoring for Constituents of Concern

3.2.5.1 Description

FDEP 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 effects. 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 developed Soil Cleanup Target Levels (SCTL) to help protect human health from direct exposure to anthropogenically-contaminated soils in residential and commercial settings. Table 3-3 shows the current FDEP guidelines.

Table 3-3 FDEP Guidelines

Metal	SCTL (residential)	SCTL (commercial)	TEL	PEL
	Sediment Contamination (mg/kg)			
Aluminum (Al)	80,000	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	130,000	N/A	N/A
Beryllium (Be)	120	1,400	N/A	N/A
Cadmium (Cd)	82	1,700	0.676	4.21
Chromium Cr)	210	470	52.3	160
Copper (Cu)	150	89,000	18.7	108
Lead (Pb)	400	1,400	30.2	112
Nickel (Ni)	340	35,000	15.9	42.8
Selenium (Se)	440	11,000	N/A	N/A
Silver (Ag)	410	8,200	0.733	1.77
Thallium (Tl)	6.1	150	N/A	N/A
Zinc (Zn)	26,000	630,000	124	271
Mercury (Hg)	3	17	0.13	0.696

3.2.5.2 Recommendation

We recommend monitoring for constituents of concern in areas that have been identified by others as having heavy metal contaminants.

3.2.6 Street Sweeping

3.2.6.1 Description

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 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 sweeping events, particle size, land use, and the location of the impervious surface (up gradient or down gradient) all contribute to the amount of

sediment available for sweeping and the efficiency of sediment 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 U.S. Geological Survey (Breault et al., 2005) 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.

3.2.6.2 Recommendation

We recommend street sweeping select areas in the watershed twice per month during the wet season and every other month during the dry season to maximize removal of sediment and pollutants between rain events. Based on the hot spot analysis, street sweeping is recommended for the following areas in order of priority (Figure 3-22):

1. Roadways in the Whitaker Bayou basin south of Dr. Martin Luther King Jr. Way.
2. Roadways in the Hudson Bayou basin from Fruitville Road and Washington Boulevard to the Bayou.
3. Roadways throughout the downtown area in the Hudson Bayou basin, including Bayfront Drive.
4. Roadways in the northern Hudson Bayou basin that drain to the 10th Street boat ramp.
5. Bayfront Boulevard and roadways adjacent to the bay in the Sarasota Bay Coastal basin from 22nd Street south to Hudson Bayou.

3.2.7 Maintenance Buffer

3.2.7.1 Description

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.

The width and slope of the buffer zone as well as the sediment size impact the removal efficiency of a buffer zone.

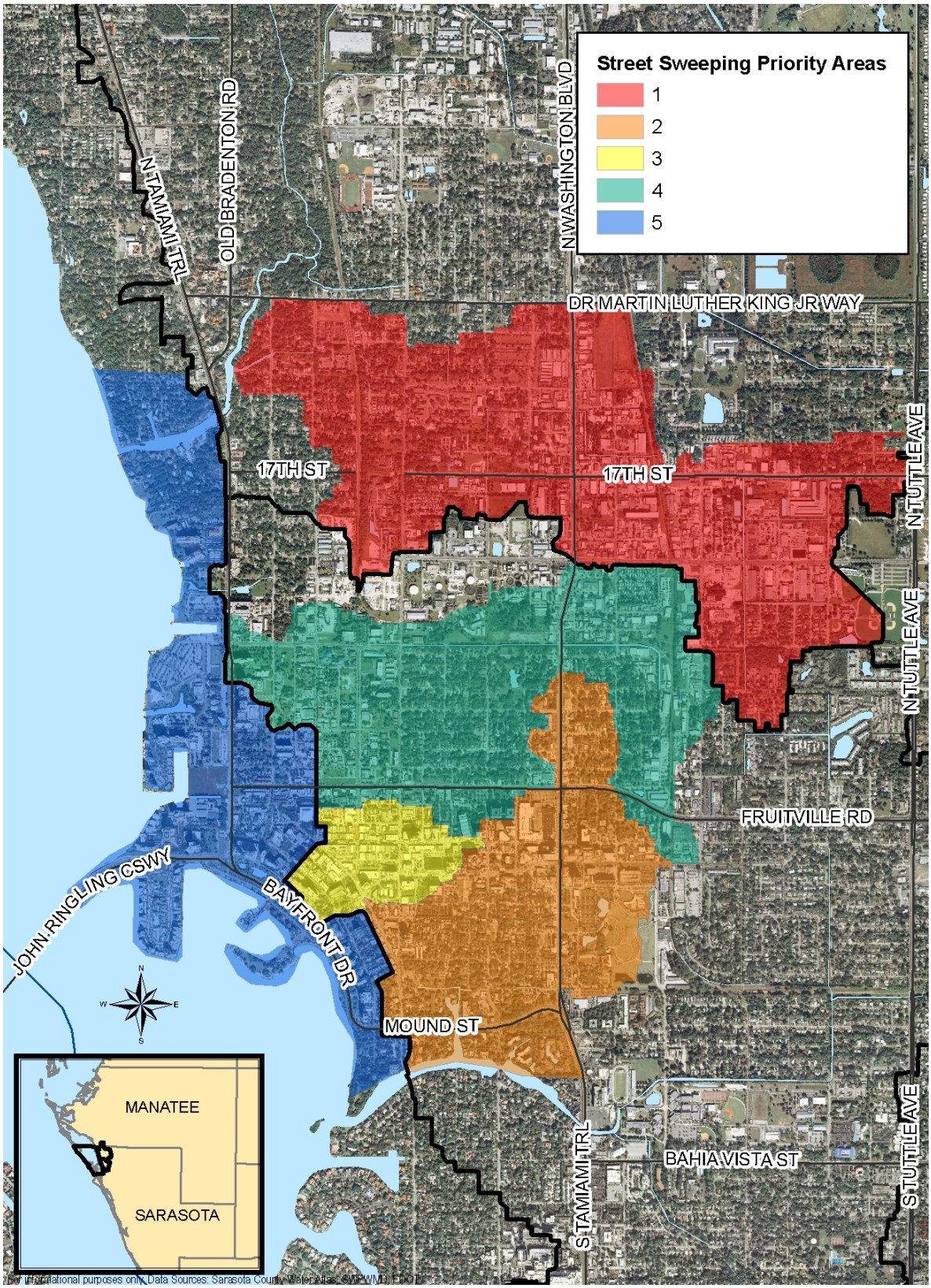


Figure 3-22 Sarasota Bay Watershed Street Sweeping Priority Areas

3.2.7.2 Recommendation

We recommend working with residents through Neighborhood Environmental Stewardship Team or other programs to evaluate areas that could be improved by the addition of buffer zones. Adding buffers on properties that were developed along waterways before the land development regulations were implemented should be a primary goal.

3.2.8 Strategic Maintenance Plan

3.2.8.1 Description

The *Strategic Maintenance Plan*, adopted in 1999, establishes level-of-service (LOS) goals for maintenance activities in the County. The plan identifies maintenance practices and classifies practices into *Routine*, *Extraordinary*, and *Support* activities in which the staff engages for maintenance repairs, improvement, management, and operation of the public stormwater system.

Stormwater maintenance has traditionally played an active role in maintaining the flood capacity of the stormwater system throughout the County. A more robust maintenance program incorporating the recommendations described below will play a larger role in improving the quality of the runoff reaching the estuaries and bays of Sarasota County.

3.2.8.2 Recommendation

Jones Edmunds recommends the following approach to expand and enhance the focus of the stormwater maintenance process to include water quality in addition to flood protection:

- Implement the 1999 Strategic Maintenance Plan.
- Achieve the inspection and maintenance frequency required in the MS4 Permit.
- Update the Strategic Maintenance Plan.
- Adopt practices listed below when fiscally feasible.

Updating the *Strategic Maintenance Plan* and adopting several non-structural BMPs and source-control practices may provide the best opportunities to increase awareness and implement maintenance improvements aimed at improving water quality. The following modifications, additions, or removal of maintenance practices will help the County meet its water quality goals:

- Inspection and Permit Compliance:
  - NPDES Inspection.
  - Asset Management.
- FEMA Community Rating System.
- Facility Maintenance and BMPs:
  - Facilities: Scheduling.
  - Facilities: Denuding Conveyance Features.

- Non-Structural BMPs: Buffer Zones.
- Non-Structural and Structural BMPs: LID.
- Source Control: Street Sweeping.
- Source Control: Herbicides.
- Source Control: Fertilizer Management.
- Source Control: Harvesters.

Jones Edmunds analyzed current maintenance policies and procedures as part of the Roberts Bay North and Lemon Bay Watershed Management Plans (WMPs). The recommendations listed above are detailed in the Roberts Bay North and Lemon Bay WMPs.

3.2.9 Keep Sarasota County Beautiful

3.2.9.1 Description

Keep Sarasota County Beautiful is a County-wide program with a mission to enhance and promote public interest and participation in the general improvement of the environment throughout Sarasota County. This is done through education, cleanup programs, recycling and other methods of reducing solid waste. It is an affiliate of Keep America Beautiful, Inc., a national, non-profit, public education organization dedicated to improving waste handling practices in American communities.

3.2.9.2 Recommendation

Litter is one of the most visible stormwater pollution issues in the watershed. Jones Edmunds recommends that the County increase the number of community cleanup projects in the watershed through the Keep Sarasota County Beautiful program. The County should work with homeowner associations and neighborhoods to recruit volunteers and organize educational and cleanup events. The County should also work with marinas to organize boating cleanups.

In addition, Jones Edmunds recommends the County review dumpster and trash can locations and handling and inspection procedures. The County should make sure that there are adequate trash receptacles in public areas, especially in marinas, along the waterfront, and near major storm drains, and they that are being properly emptied and maintained.

4.0 CONCLUSION

Six of the potential project sites were deemed viable locations for projects designed to improve erosion and sedimentation issues (Table 4-1). Implementation of these projects and programmatic recommendations will significantly reduce erosion, sediment, and associated pollutant loading and improve water quality in the Sarasota Bay Watershed.

Table 4-1 Recommended Sediment Management Projects

ID	Site Name	Recommended
1	Brother Geenen Way	
2	Robert Taylor Community Complex	x
3	Orange Avenue	x
4	Bayfront Drive North	x
5	Bayfront Drive South	x
6	Sarasota High School at Hatton Street Ditch	x
7	Sarasota High School at Tamiami Trail	x

Jones Edmunds will calculate pollutant-load reduction, develop conceptual plans and cost estimates, and provide project and program rankings for the selected project sites in Appendix G.