



MS4 Assessment Program to Satisfy Part V. – Monitoring Requirements

Submitted by City of West Palm Beach – MS4 Permit No. FLS000018-004

September 5, 2017

Introduction

Part V of the Municipal Separate Storm Sewer System (MS4) permit for Palm Beach County and co-permittees (FLS000018-004) calls for the creation of an assessment program to determine the overall effectiveness of the Stormwater Management Program (SWMP). This Assessment Program shall include the three following components:

- Water Quality Monitoring Plan,
- Pollutant Loading Estimate Plan, and
- Evaluation and Response Plan

The intent of the program is identify where local sources of urban stormwater are adversely affecting surface water resources so that decisions can be made to mitigate these effects accordingly. The program needs to be submitted to the Florida Department of Environmental Protection for approval within the first 12 months of the permit issuance.

A separate monitoring plan would be required if the City's MS4 drained into a waterbody with an existing TMDL approved prior to the issuance of this permit in accordance with Part VII.B.2.c. Since the City's system does not drain to a TMDL waterbody, West Palm Beach will not be submitting a separate plan.

Water Quality Monitoring Plan

The City of West Palm Beach has gone to great lengths to protect the potable water supply conveyed via M-Canal from Grassy Waters Preserve (Water Catchment Area) to Lake Mangonia and Clear Lake where the City's water treatment plant is located. These measures include diverting most of the stormwater within the City away from these waterbodies and ultimately to Lake Worth Lagoon via the C-17 and C-51 canals or directly through 48 direct outfalls to the Lake Worth Lagoon. There are several instances where treated stormwater is discharged to supplement both Grassy Waters and Clear Lake which will be further discussed below. The City has identified three receiving waterbodies to monitor the effects from stormwater contributions from its MS4: Lake Worth Lagoon, Grassy Waters Preserve and Clear Lake (Figure 1).

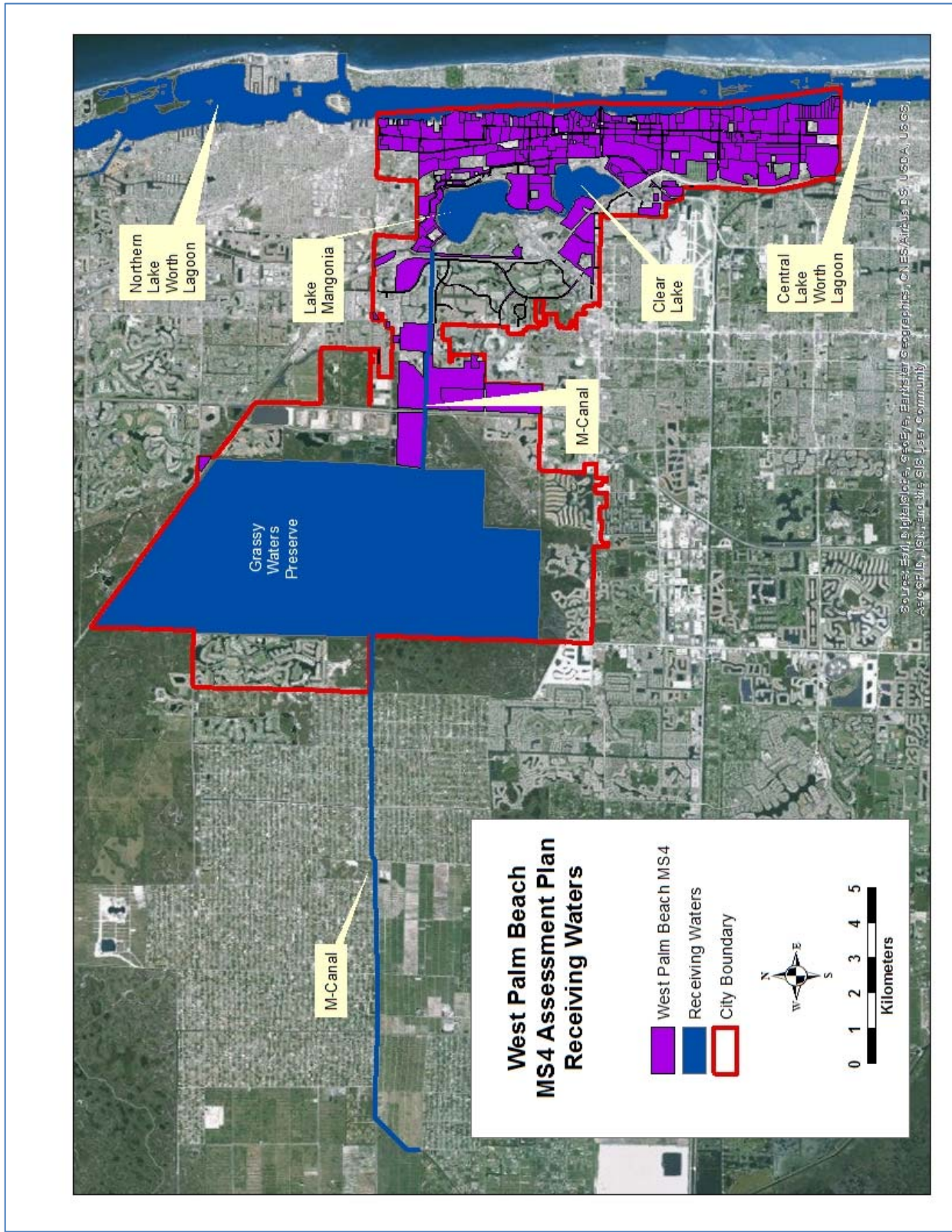


Figure 1. Receiving Waterbodies for City of West Palm Beach.

Receiving Waters

Lake Worth Lagoon

Lake Worth Lagoon is currently monitored by Palm Beach County Environmental Resources Management via an Interlocal agreement between the Palm Beach County MS4 Co-Permittees and the Northern Palm Beach County Improvement District. The City, along with other entities discharges stormwater to both the North and Central Estuarine Nutrients Regions of Lake Worth Lagoon. Both of these segments were listed as impaired for nutrient parameters and copper during the 2016 assessment cycle. The impairment isn't likely due to a single discharge location as the Lagoon integrates pollutants from numerous sources. The City's 2017 Stormwater Master Plan has planned for a series of best management practices (both structural and nonstructural) to reduce loads to the Lake Worth Lagoon.

Grassy Water Preserve

Grassy Waters was purchased and protected as the primary potable water supply for the City of West Palm Beach and other municipalities. Monitoring with Grassy Waters is ongoing to ensure its integrity as one of the last, least impacted parcels of the original Everglades. Recently, developments along the perimeter have been allowed to discharge treated excess stormwater into the preserve. These discharges are monitored as required by the Environmental Resource Permits, 50-03926-P (Baywinds) and 50-02120-S-06 (Ibis). The City will utilize these data to assess any potential changes in Grassy Waters. These data will be supplemented with the most recent Impaired Waters Rule database to provide data necessary to assess the status and trends with regards to Grassy Waters.

Clear Lake and Lake Mangonia

Clear Lake, along with the adjacent Lake Mangonia, are the two storage lakes for the potable water supply with the East Lobe of Clear Lake as the withdrawal point for the City's water treatment plant. There are no direct stormwater inputs to either of the lakes within the City's limits but indirect stormwater may be contributed by the L-8 canal (pumped into M-Canal at Control 2), M-Canal, C-17 Canal, Grassy Waters (as previously mentioned) and the Renaissance Stormwater Project. The C-17 Canal receives stormwater from various areas and the City looks to use it to augment the water supply when necessary. The Renaissance Stormwater Project is an alum-injection stormwater treatment facility for a portion of downtown West Palm Beach whose waters could be used supplement Clear Lake and is monitored as part of its Environmental Resource Permit, 50-04000-P. Lake Mangonia has been listed as impaired for fecal coliform as part of Cycle 3 of FDEP's Assessment Program. Monitoring of the source waters along the system will ensure the integrity of the water supply while enduring the waters meet surface water quality standards. These data will be supplemented with the most recent Impaired Waters Rule database to provide data necessary to assess the status and trends with regards to Clear Lake and Lake Mangonia.

Monitoring Logistics

Sampling Locations, responsible agency and frequency are listed in Table 1 and located on Figures 1-3. The stations are all part of existing programs maintained by either the City of West Pam Beach or Palm Beach County ERM. Stations can be adjusted based annual reviews of the data which could adjust the locations and number of samples collected with prior approval from FDEP. It may be necessary to negotiate for additional samples with the Lagoon as the current locations may be focused on the discharges from C-17 and C-51 canals rather than representing the entire Lake Worth Lagoon.

Table 1. Monitoring Locations					
Waterbody	Station ID	Latitude	Longitude	Agency	Frequency
North Lake Worth Lagoon	LWL-1	26.68690	-80.044161	PBC ERM	Monthly
North Lake Worth Lagoon	11	26.8313	-80.0602	PBC ERM	Monthly
North Lake Worth Lagoon	13	26.8085	-80.0561	PBC ERM	Monthly
North Lake Worth Lagoon	LWL-4	26.8004	-80.0443	PBC ERM	Monthly
Central Lake Worth	LWL-8	26.6754	-80.0469	PBC ERM	Monthly
Central Lake Worth	18C	26.6407	-80.0400	PBC ERM	Monthly
Central Lake Worth	18D	26.6293	-80.0457	PBC ERM	Monthly
Central Lake Worth	LWL-11	26.6155	-80.0458	PBC ERM	Monthly
Central Lake Worth	LWL-13	26.5839	-80.0443	PBC ERM	Monthly
Grassy Waters	GW1	26.0891	-80.1693	CWPB	Monthly
Grassy Waters	GW3	26.7683	-80.1770	CWPB	Monthly
Grassy Waters	GW5	26.7239	-80.1812	CWPB	Monthly
Grassy Waters	GW7	26.7690	-80.1501	CWPB	Monthly
L-8 Tieback	Control 2 (Upstream)	26.7554	-80.3457	CWPB	Monthly
M-Canal	M-Canal	26.7660	-80.2254	CWPB	Monthly
M-Canal	Control 4	26.7510	-80.1192	CWPB	Monthly
C-17 Canal	C17_CANAL_A	26.7356	-80.0902	CWPB	Monthly
C-17 Canal	C17_CANAL_B	26.7657	-80.0911	CWPB	Monthly
Lake Mangonia	Lake Mangonia Middle	26.7399	-80.0756	CWPB	Monthly
Clear Lake	Clear Lake Middle	26.7142	-80.0703	CWPB	Monthly



Figure 2. Sampling Locations in the Lake Worth Lagoon

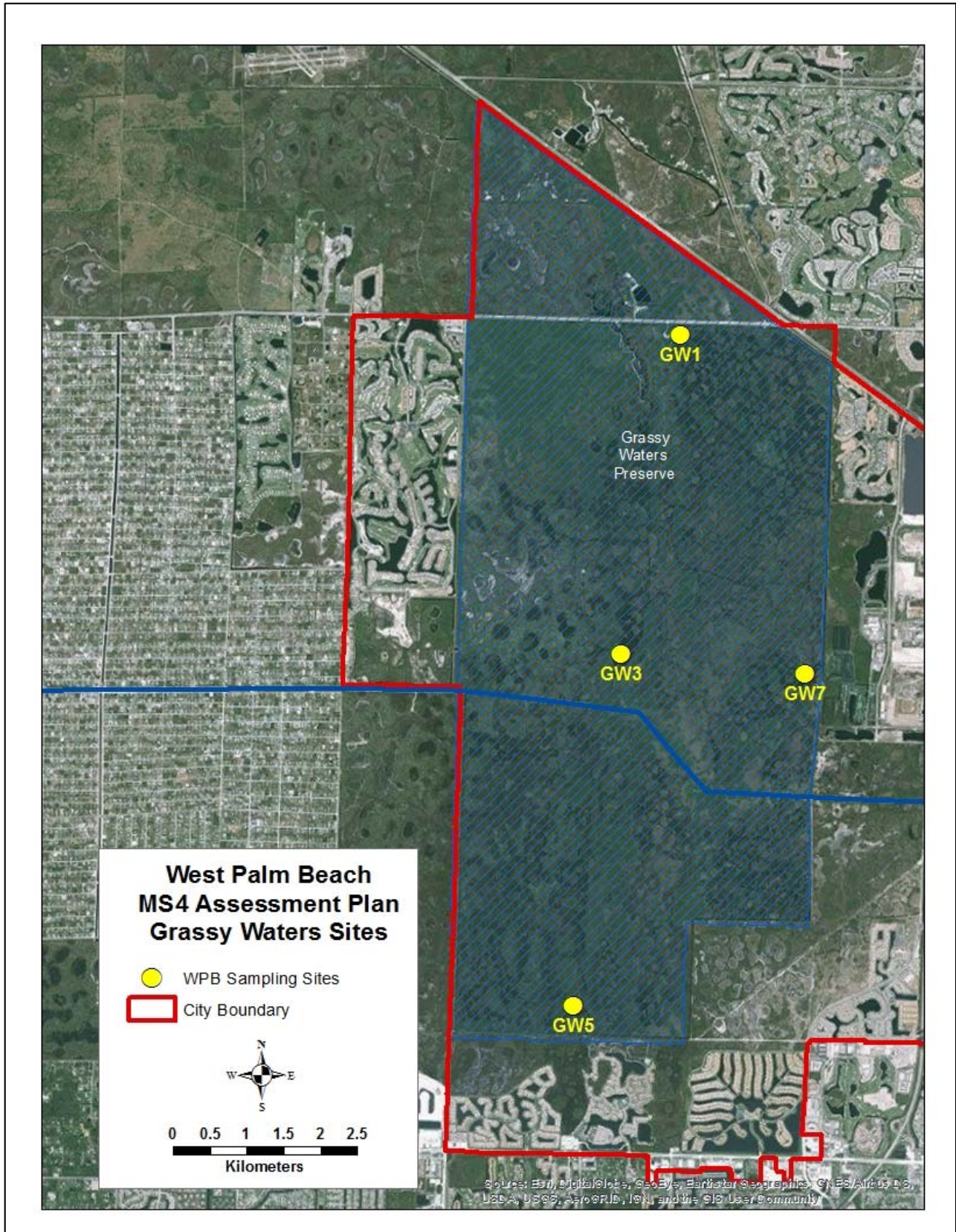


Figure 3. Sampling Locations in Grassy Waters Preserve

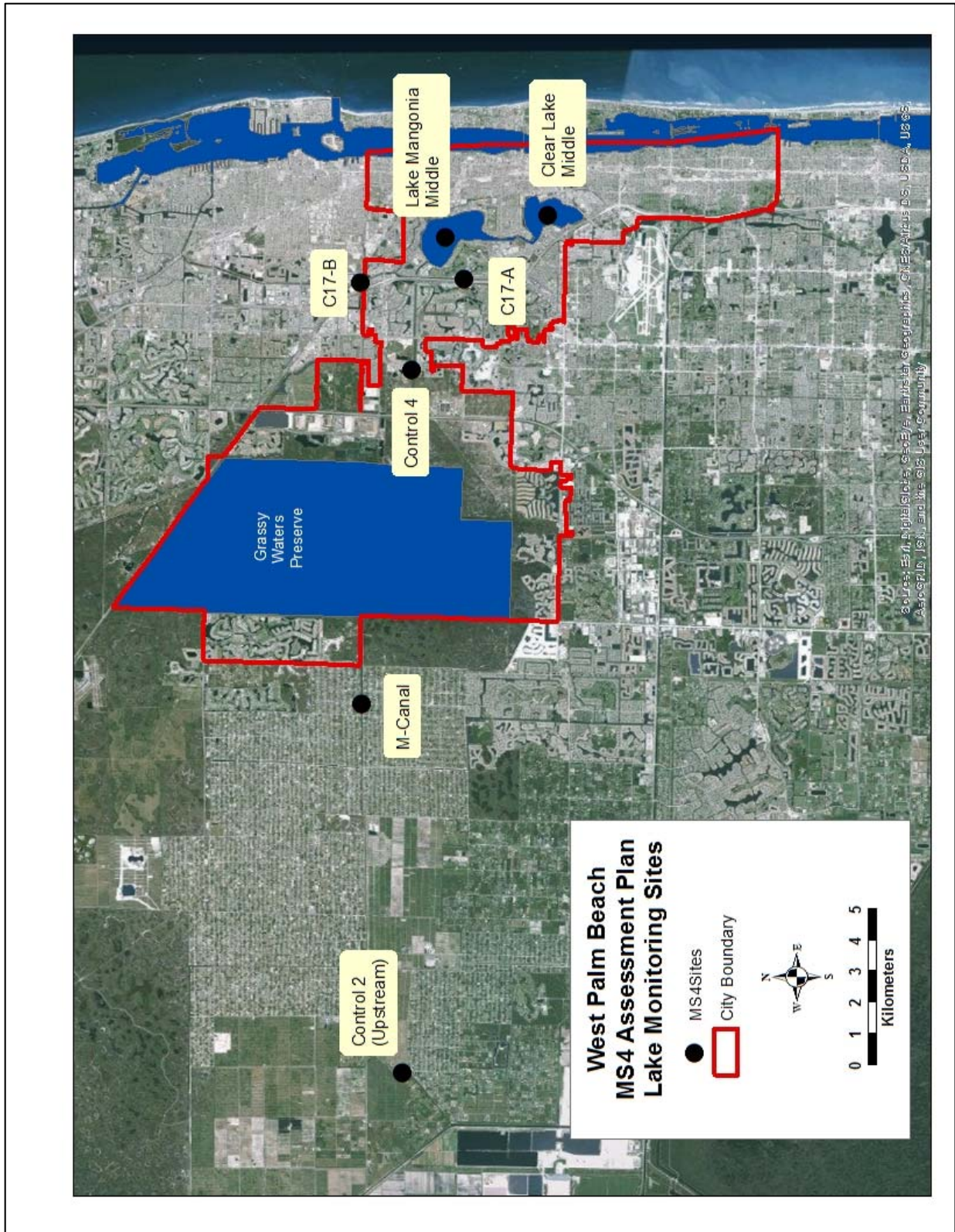


Figure 4. Sampling Locations for Clear Lake and Lake Mangonia

Parameters are listed in Table 2. All data and records, including field testing, sample collection, preservation, laboratory analysis, quality assurance shall be maintained for 5 years and ambient water quality data will be uploaded into the FDEP Watershed Information Network, the replacement for STORET. All samples will be collected and analyzed in accordance with 40CFR Part 136 and the Rule 62-160 F.A.C.

Table 2. Parameters to be included as part of the Assessment Program		
Parameter	Units	Comments
Temperature	°c	<i>In situ</i>
Conductivity (salinity)	µmhos	<i>In situ</i>
Dissolved Oxygen (concentration)	mg/L	<i>In situ</i>
Dissolved Oxygen (% saturation)	%	<i>In situ</i>
pH	SU	<i>In situ</i>
Nitrate + Nitrite	mg/L	
Total Kjeldahl Nitrogen	mg/L	
Ammonia	mg/L	
Total Nitrogen	mg/L	
Total Phosphorus	mg/L	
Total Suspended Solids	mg/L	
Turbidity	NTU	
Alkalinity	mg/L as CaCO ₃	Freshwater
Color	PCU	Freshwater
Microbiological	MPN	<i>Enterococci</i> in marine waters, <i>Escherichia coli</i> in freshwaters
Arsenic	µg/L	Sampled quarterly by PBCO ERM
Cadmium	µg/L	Sampled quarterly by PBCO ERM
Copper	µg/L	Sampled quarterly by PBCO ERM
Lead	µg/L	Sampled quarterly by PBCO ERM
Zinc	µg/L	Sampled quarterly by PBCO ERM

Pollutant Loading Estimate Plan

The City recently completed its Stormwater Master Plan which included the development of the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE) specifically for the City of West Palm Beach. The model was originally developed for Sarasota County for compliance with MS4 permit with funding from the Southwest Florida Water Management District. The model is run within a GIS framework allowing for the easy adjustment of spatial features such as landuse changes and implementation of BMPs. This was intended to make the development of loading estimates easier.

The current version of the model is set to provide pollutant load estimates for the following parameters: biochemical oxygen demand, copper, total nitrogen, total phosphorus, total suspended solids, and zinc. The event mean concentrations used were derived locally and reported in the 2013 Year 3 Joint Annual Report for Palm beach County. The model will easily accommodate additional parameters if warranted. The model also uses locally derived landuse runoff coefficients. SIMPLE also accommodates BMPs with spatially specific pollutant removal efficiencies.

Since the model was developed specifically to accommodate the MS4 permit evaluation and utilizes locally derived inputs, it is recommended that to model's domain be expanded for use throughout the region to provide similar loadings for comparison. For more information on the model, please refer to Volume 2 of the City of West Palm Beach Stormwater Master Plan (2017).

Evaluation and Response Plan

The data from the water quality monitoring and pollutant loading estimates will be integrated with additional data, i.e. rainfall, IWR datasets, and reported annually with each Annual Report. The report will include a discussion of the status and trends of the receiving waters and pollutant loads. Where sufficient data exists, trends will be developed using the seasonal Kendall Tau approach which removes seasonal trends that are common in water quality data as a result of seasonal fluctuations in temperature and rainfall and allows better resolution of increasing/decreasing trends.

The results from the above analyses will be used to direct further actions within the MS4 areas to reduce pollutants to the maximum extent practicable. This could include additional targeted monitoring to identify specific areas in need of changes to the SWMP, increased street sweeping, implementing focused educational activities or prioritize for stormwater retrofits. It is the intent that data will aid in guiding the decision of which approach to take.

Each report will include an update on the implementation of the monitoring plan, including a discussion of possible changes to the plan based on results which will be submitted to FDEP for approval. As part of the Year 4 annual report, the Assessment Program will be resubmitted for approval by FDEP. As part of that submittal will be an evaluation of the Assessment Program's ability to assess the effectiveness of the SWMP and suggest changes accordingly.