

Maple Leaf Golf and Country Club Inflow Water Sampling Project 2015.

Background

In response to the Committee for Improvement of Stormwater letter of March 12, 2014 and their summary report (January of 2014) describing deterioration of water quality due to inflow sources the Board of MLGCC allocated \$1000 for water sampling to acquire baseline data on the park's watercourse. Within the scope of the resource the study selected 6 sampling sites and seven common parameters. The parameters were oil and grease, total nitrogen, nitrites, total phosphate, total suspended solids, biological oxygen demand and fecal choliform.

Sampling

Bottles supplied by Benchmark were secured to a holding device and submerged approximately 1 inch below the surface to collect samples at sites shown in Figure 1. During the sampling period the watercourse had reasonable flow without any floating surface debris. Total rainfall in July to that point was 5.05" with 1.5" of rainfall five days prior to sampling. The turbidity conditions throughout the watercourse were described as normal in reference to what is typically observed after any rainfall. Superintendent Nancy Miller collected the samples on July 22, 2015. Collection, storage and shipment adhered to protocol specifications provided by Benchmark EnviroAnalytical Inc., of North Port Florida. Analytical results were determined using EPA Standard Methods and meet NELAC Standards.

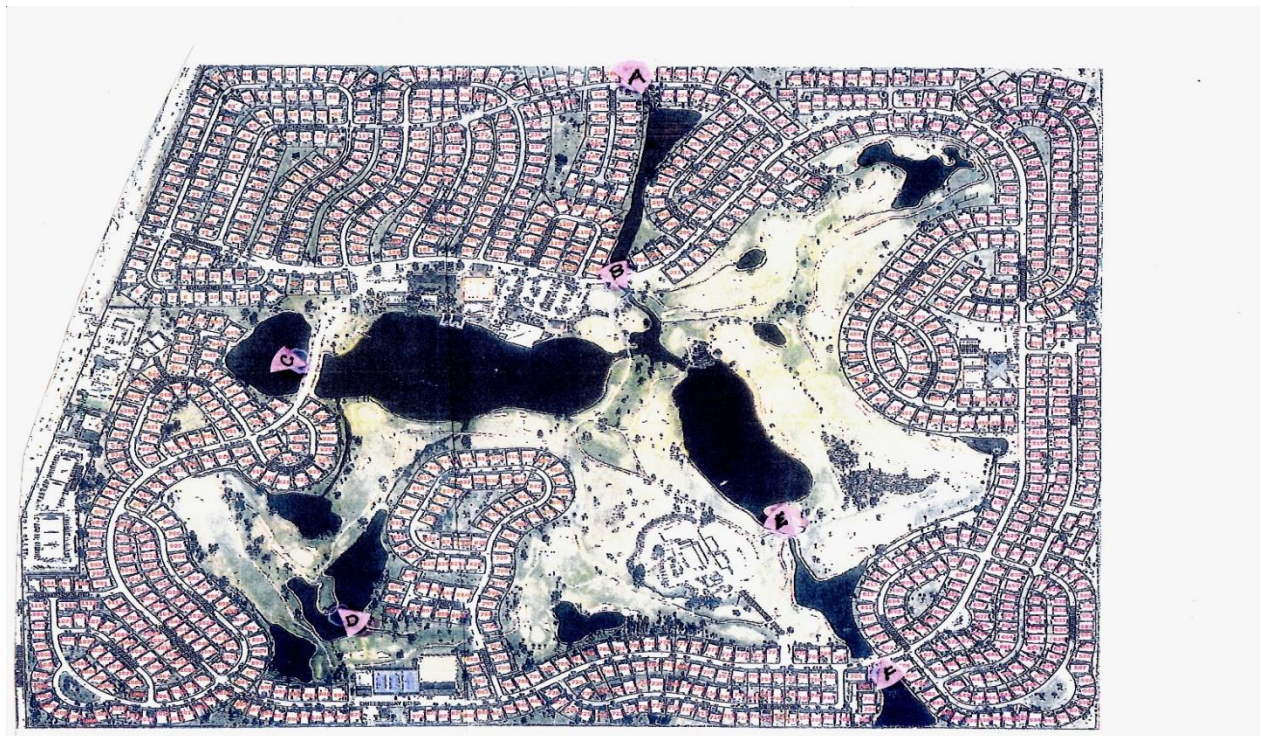


Figure 1. Sampling sites 2015 water inflow project.

Sample Design

Description: Site A: Rampart inflow at McKenzie Blvd conveyance at exit side of Park pipe. Site B: Exit side of Queensway conveyance pipe at practice putting green. Site C: West side of conveyance pipe at Humpback Bridge on Queensway. Site D: Backside of 17th green t-block. Site E: In front of weir at the tenth hole green. Site F: South side of the conveyance pipe under Queensway near cactus garden and last pond exiting Park.

Sites A, B, E and F represent the direction of water flow through the park's watercourse. Site C at the Humpback bridge represents a mixing zone for park runoff and portions of the inflow source. Past observations have shown that water currents in this area can flow in either direction. Site (D) behind the 17th green receives only park run off and is considered our control site.

Parameters

The parameters were chosen based on past field observations. Contamination of the water column from oil, grease and turbidity from the inflow source has been constant. Nitrogen and phosphate are common nutrients and major ingredients in compounds used for turf and grass maintenance. Biological oxygen demand provides a measure of aquatic health in support of fish and benthic habitat. In hindsight inclusion of dissolved oxygen would have provided better information. In addition to TSS the inclusion of measured turbidity (NTU) would have been beneficial. Another consideration was the fact these compounds are typical indicators of water quality used in local assessment procedures.

Results and Observations

Laboratory results are summarized in Table 1. All concentrations (above MDL) at the control site (D) were significantly improved relative to the concentrations observed at the inflow. The concentration of TSS was 2.5 times lower at site D which would indicate the site receives some input of suspended solids from park property. Fecal coliform was not detected at site E which represents a 200 fold reduction compared to site A. Measurements at sites A,B,E and F represent the main flow of the watercourse through the park. The concentration of TSS is reduced almost by a factor of 5 while the fecal choliform count was reduced to "not detected" which represented a 200 fold reduction. Oil and grease concentrations remained at approximately constant levels (1.1 to 1.6 mg/L) from the source to exit. Biological oxygen demand results behaved similar to those of oil and grease with concentrations relatively constant from the source to exit sites but somewhat elevated at sites C and D. The increased BOD levels are likely the additive effect of park runoff to the inflow stormwater contribution. Concentrations of total nitrogen ranged from 1.9 to 1.1 mg/l and total phosphate 0.13 mg/L to >MDL. There appeared to be park inputs of these parameters which would be anticipated given their application on the golf course and lawns within the park.

Table 1. Concentration of measurements for selected parameters.

MDL	Parameter	Station				C	D
		A	B	E	F		
		Inflow	conduit	weir	outflow	humpback	control pond
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0.99	Oil and Grease	1.3	1.5	1.6	1.1	0.99	0.99
0.05	TKN-NH3	1.28	1.22	1.15	1.37	1.66	1.9
0.004	NOX	0.018	0.008	0.004	0.008	0.008	0.004
0.008	TP	0.017	0.027	0.018	0.029	0.13	0.008
0.57	TSS	26.2	16	4.2	6.6	12	11
0.5	BOD	1.6	1.68	1.64	1.67	2.5	3.1
10	FC	270	110	20	10	10	10

Acronyms

- MDL** *method detection limit*
- TKN-NH3** *total nitrogen.*
- NOX** *nitrites*
- TP** *total phosphate*
- TSS** *total suspended solids*
- BOD** *biological oxygen demand*
- FC** *fecal coliform*

Comments

The oil and grease measurements are most likely underestimated. The sampling technique employed would capture mainly “dissolved oil” content and only sub sample surface oil. From previous field observation there are visible oil sheens on surface waters and significant retention of oil slicks on the ponds’ fauna and flora. Similarly we attribute the source of fecal coliform to inflowing water as this parameter decreases in concentration with distance from the source and is not detected at sites C and D. While inflowing water is the major source of TSS, there were additional but lesser loadings from park runoff. Inflowing water and pond waters exhibit similar concentrations of total nitrogen and phosphate. One exception was the concentration of 0.13 mg/L at site C for total phosphate. This area underwent extensive construction in 2014 that may have resulted in the resuspension of older more contaminated sediments. Overall given the application rates of fertilizers, golf course BMPs must be functioning well as the increase in nutrients for both N and P are well within specified water quality criteria. BOD levels in park waters were well within acceptable ranges. This was not totally expected given the high levels of suspended solids and infers that the solids are primarily silica in nature. This could be addressed with a % organic matter measurement if future testing is done.

Overview

Table 2 provides criteria for Class 3 surface waters in Florida as a form of comparison. Runoff is not a class 3 water type. Florida has no water quality criteria for stormwater, so that poses a problem. The Florida NPDES permitting system for construction of new M4s stresses that the process should improve water quality conditions. The parameters we are dealing with TSS, oil/grease and nutrients are highlighted as problematic especially for storm waters. A NPDES permit was issued for Rampart but interpretation of the Regulations may exempt the Rampart construction from water quality requirements as it may could be classified as reconstruction of an existing stormwater facility performed by the County. Although we have measurements, one time measurements would not be accepted as proof of impairment. Typically a geometric mean of several measurements is required. In the two years since the construction we have seen no visual improvement to TSS and oil and grease. It could be argued it is worse. Another obstacle is that our data does not include a loading factor. This would require flow data.

Table 2. Class 3 water quality guidelines.

Parameter	Florida	EPA
Oil and grease	5 mg/L	dependent upon LC50 range of affected water life
TKN-NH3	subjective	2-6 mg/L is normal range
NOX	subjective	range is .001-0.25, 10 m/l for human health
TP	subjective	0.10 mg/L, normal waters in the 0.025 mg/L range
TSS	none	< 29 NTU, should not reduce photosynthetic point by more than 10 %
BOD	none	a high BOD (10) is not good
FC	<200 average	

Despite these shortcomings we feel that the Corporation needs to approach the County and SWFMD on the issues of debris, suspended solids and oil contamination. The fecal choliform count needs to be addressed.

Michael Comba

Chairperson

Committee for Improvement of Stormwater