

City Project 19052-110
Harbor Isle Lake Monitoring Deep Lake Aeration

Final Report

Prepared for:

City of St. Petersburg
Engineering & Capital Improvement Department

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1.0 Introduction and Objectives

Harbor Isle Lake is located in northeast St. Petersburg and is surrounded by a neighborhood of 218 single-family homes. The lake abuts Bayou Grande to the north. The lake has been experiencing an extended algae bloom which the City is trying to remedy with the use of a nanobubbler and other mitigation attempts. To assess these mitigation efforts had on the lake, Janicki Environmental Inc., with staff from Greenman Pedersen, Inc. (GPI), conducted monitoring of the lake. The following provides a summary of that effort and serves as the final report of Task Order 1 between the City of St Petersburg (City) and GPI.

2.0 Mitigation

The City's contractor instituted several different mitigation options to control the persistent blue-green algae bloom that had been occurring in the lake. The first technique was the installation of Nanobubblers on December 18, 2020. Once installed, the units operated continuously throughout sampling period (September 11, 2020). Nanobubble technology is described as a long-term, slow approach mitigation technique that pumps compressed air into the water column.

The other two methods included:

- the injection of Green Clean (a chemical that is expected to control an algal bloom) on two separate dates - March 11 and September 11.
- the addition of alum, which is expected to reduce the available phosphorus in the water column. This occurred on May 5.

3.0 Monitoring Plan

Three locations were chosen for monitoring (Figure 1). At the request of the City, one station was located near the lake's outfall to Bayou Grande. The remaining two were located in the center of the lake and in the south lobe. Each sampling event consisted of visiting all of the sites via kayak on the same day.



Figure 1. Location of the sampling sites on Harbor Isle Lake.

Water quality parameters included parameters that could characterize and algae bloom including nutrients (nitrogen and phosphorus), chlorophyll *a*, total suspended solids, and *in situ* meter readings (Table 1). Laboratory analyses were conducted at a National Environmental Laboratory Accreditation Program certified laboratory.

Table 1. Water quality parameters collected during each sampling event.	
Laboratory Analysis	<i>In situ</i> Analysis
Orthophosphate (PO ₄ -P)	Temperature
Total Phosphorus (TP)	Dissolved Oxygen
Ammonia (NH ₄ -N)	pH
Nitrate-Nitrite(NO ₂ -NO ₃ -N)	Secchi Depth
Total Kjeldahl Nitrogen (TKN)	Overall Depth
Total Nitrogen (TN)	
Chlorophyll <i>a</i> (corrected)	
Total Suspended Solids (TSS)	

4.0 Data Summary

Over the course of the project, there were 9 sampling events that occurred. During these events, several different mitigation activities occurred including the installation of nanobubblers, several chemical treatments and an alum treatment. The following time-series plots illustrate the monitoring results in relation to the mitigation activities (Figure 2-4). The mean of the surface and deep *in situ* is used for temperature, pH, specific conductance and salinity. Where available, a reference line representing the Lakewatch historical mean for several parameters collected on the lake.

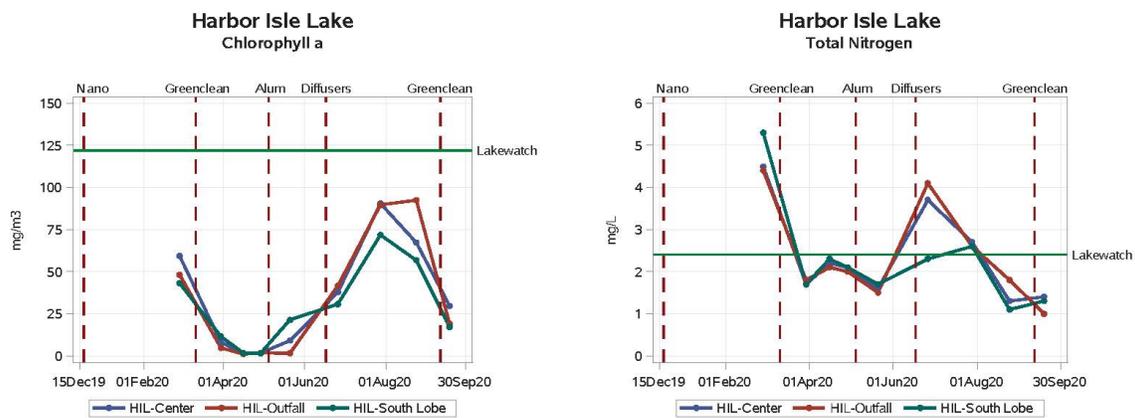


Figure 2. Chlorophyll *a* (left) and Total Nitrogen (right) results from Harbor Isle Lake.

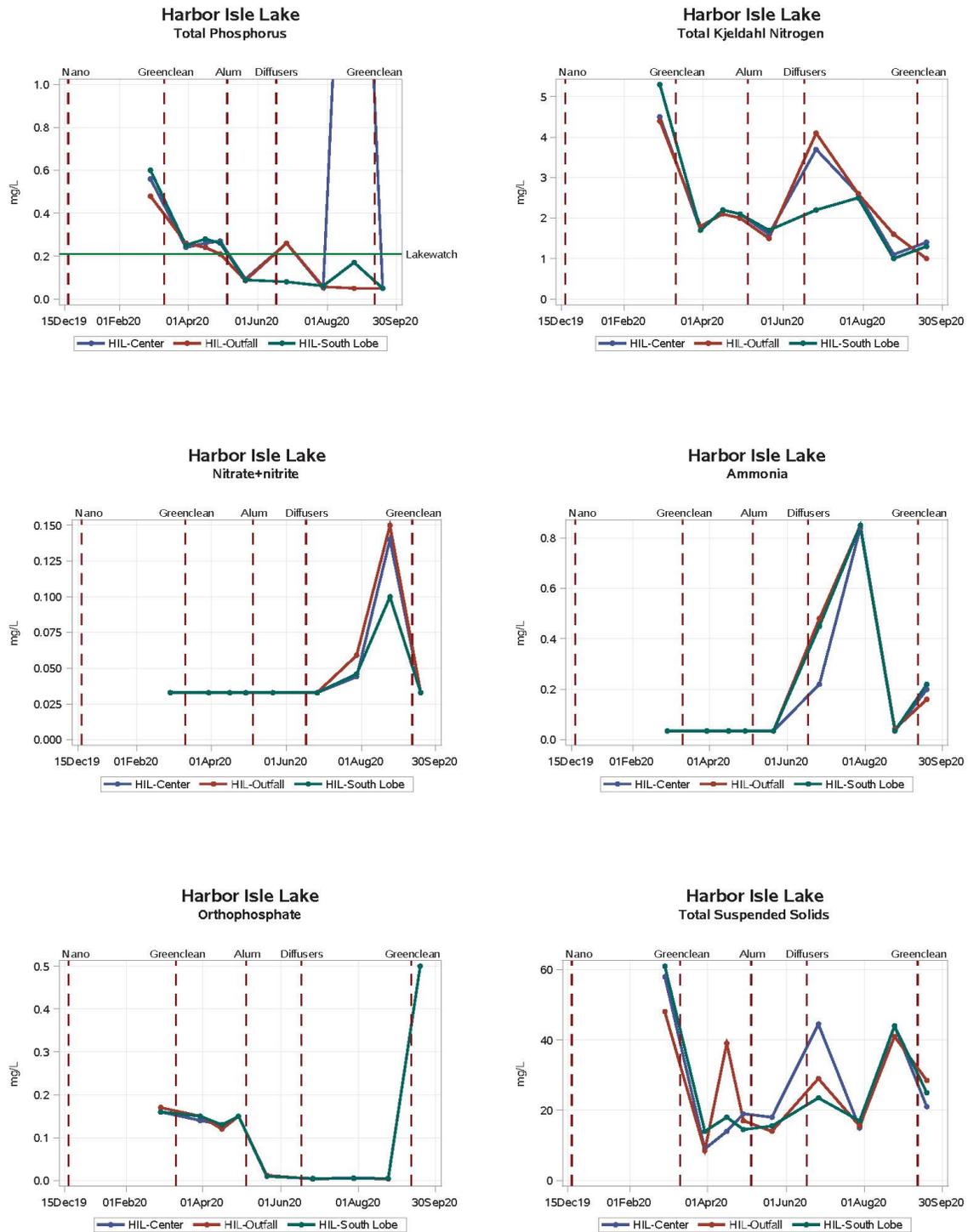


Figure 3. Total Phosphorus (top, left), nitrate+nitrite (top, right), ammonia (middle, right), orthophosphate (bottom, left), and total suspended solids (bottom, right) results from Harbor Isle Lake.

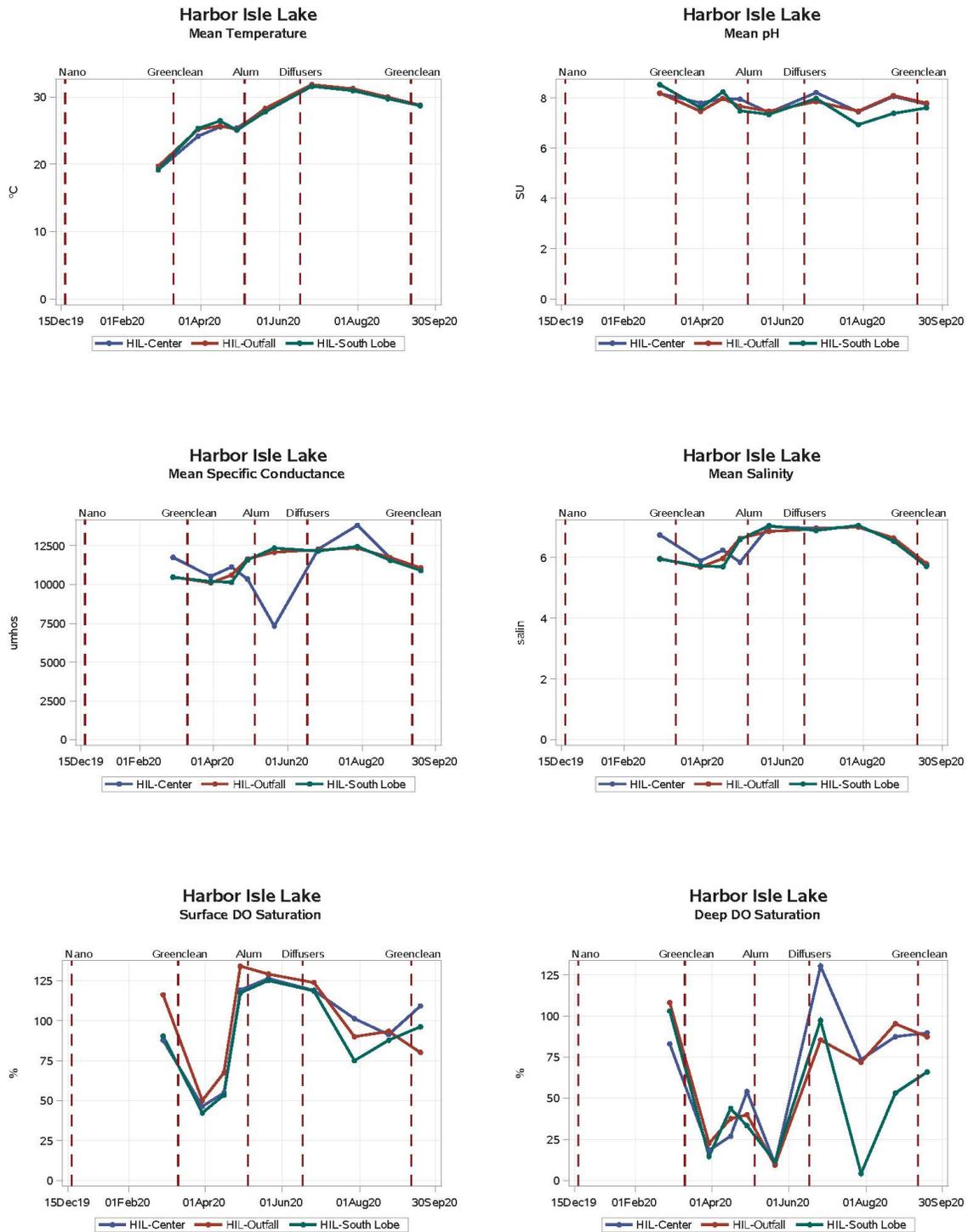


Figure 3. Total Phosphorus (top, left), nitrate+nitrite (top, right), ammonia (middle, right), orthophosphate (bottom, left), and total suspended solids (bottom, right) results from Harbor Isle Lake.

5.0 Conclusions and Recommendations

The sampling effort provided some insight into the effectiveness of each of the mitigation strategies. The initial Green Clean application reduced the chlorophyll *a* concentrations for approximately two months and did not reduce the available nutrients significantly. The second application followed a significant increase in chlorophyll *a* during the summer months. The alum treatment initially reduced the orthophosphate significantly, but this effect was short-lived. There are no apparent improvements in the lake that can be attributed to the Nannobubblers method.

This effort focused on the water quality in Harbor Lake and the potential improvements that may be attributed to the various mitigation methods applied during the study period. We recommend that an investigation of the potential internal nutrient flux from the sediments to further characterize the nutrient budget for the Harbor Isle Lake. This flux can be compared to the rate of nutrient supply coming from the adjacent watershed.