Appendix 4-3: Annual Permit Report for the Lakeside Ranch Stormwater Treatment Area – Phase I

Permit Report (May 1, 2013–April 30, 2014)
Permit Number: 0287326

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SUMMARY

Based on Florida Department of Environmental Protection (FDEP) permit reporting guidelines, **Table 1** lists key permit-related information associated with this report. **Table 2** lists the attachments included with this report. **Table A-1** in Attachment A lists specific pages, tables, graphs, and attachments where project status and annual reporting requirements are addressed. This annual report satisfies the reporting requirements specified in the permit.

Table 1. Key permit-related information.

Project Name:	Lakeside Ranch Stormwater Treatment Area Phase I (STA North)
Permit Number:	0287326-003
Issue and Expiration Date:	Issued: 5/4/2012; Expires: 5/4/2017
Project Phase:	Stabilization
Permit Specific Condition Requiring Annual Report:	32
Reporting Period:	May 1, 2013–April 30, 2014
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Table 2. Attachments included with this report.

Attachment	Title
A	Specific Conditions and Cross-References
B	Water Quality Data
C	Hydrologic Data
D	Herbicides Usage

PROJECT STATUS

Water Year 2014 (WY2014) (May 1, 2013–April 30, 2014) marked the first year of flow-through operation for the Lakeside Ranch Stormwater Treatment Area (LRSTA) Phase I project.

CONCLUSIONS REGARDING PROJECT SUCCESS

The project demonstrated high phosphorus removal efficiency of over 97 percent.

PROBLEMS ENCOUNTERED

Flow-through in Cell 3, which sustained washouts during pump testing, had been delayed for repairs and to allow stabilization of soils with wetland vegetation at the downstream end of the cell. Dry summer conditions presented challenges to optimal operation of the project.

ACTIONS TO ADDRESS PROBLEMS

Washouts were repaired and desirable wetland plants were planted at the southeastern corner of Cell 3 to promote soil stabilization.

INTRODUCTION

PROJECT OVERVIEW

The Lakeside Ranch Stormwater Treatment Area (LRSTA) is a component of the Lake Okeechobee Watershed Construction Project – Lake Okeechobee Phase II Technical Plan. The Lake Okeechobee Phase II Technical Plan was authorized by the Northern Everglades and Estuaries Protection Act (NEEPA), pursuant to Subsection 373.4595(3)(b)(2), Florida Statutes (F.S.). The LRSTA is also a feature of the Lake Okeechobee Watershed Project, a Comprehensive Everglades Restoration Plan (CERP) project component, as defined in Section 373.1501, F.S.

Located in the Taylor Creek/Nubbin Slough sub-watershed, the LRSTA project is a 2,700-acre (1,090-hectare) stormwater treatment area (STA) in western Martin County on lands adjacent to Lake Okeechobee. The project was designed in two phases. Phase I, which includes construction of STA-North, canal improvements, and the installation of the S-650 pump station, was completed in July 2012. STA-North consists of three treatment cells with an effective treatment area of 919 acres (372 hectares). The implementation of Phase II, which includes the construction of a southern STA, a new pump station S-191A, and a discharge canal, is subject to future funding. The primary goal of the LRSTA project is to capture and reduce the amount of total phosphorus (TP) from the S-191 basin prior to discharge back into L-47 and eventually into

Lake Okeechobee. Phases I and II, together, are projected to remove 19 metric tons (mt) of TP annually from the S-191 basin (SFWMD, 2008).

LRSTA Phase I passed start-up monitoring requirements for phosphorus, mercury, and other toxicants, with approval from the FDEP to begin flow-through operation on March 29, 2013 (SFWMD, 2013). Pumping of water into Cells 1 and 2 began on July 3, 2013, but only Cell 2 was allowed to discharge. Flow-through operation in Cell 1 was initiated around the second week of July 2013, following confirmation that there were no protected black-necked stilt (*Himantopus mexicanus*) nests present. Flow-through in Cell 3, which sustained washouts during pump testing, had been delayed for repairs and to allow stabilization of soils at the downstream end of the cell with wetland vegetation.

This report provides a summary of flow-through (discharge) activities performed during WY2014 as part of stabilization operation (routine operations) for the LRSTA Phase I. Included in the report is a summary of water quality monitoring activities and STA performance, and a preliminary evaluation of compliance with the discharge requirements and conditions of the LRSTA permit (0287326).

PERMIT HISTORY

The original NEEPA permit and all modifications issued to SFWMD are as follows:

- 0287326-001, issued January 21, 2009, with an expiration date of January 21, 2014, was the original permit for the LRSTA Phase I project.
- 0287326-002, issued August 19, 2009, with an expiration date of January 21, 2014, was a modification for a general water use authorization during construction of the STA.
- 0287326-003, issued May 4, 2012, with an expiration date of May 4, 2017, was a major modification to include the Phase I (North) and Phase II (South) STAs. This permit superseded all previous permits and authorizations.
- 0287326-004, issued March 4, 2010, with an expiration date of January 21, 2014, was a modification to remove mercury from the Alternative Data requirement during the Initial Operational Testing and Monitoring Period.
- 0287326-005, issued July 27, 2010, with an expiration date of January 21, 2014, was a modification for the redesign of the Interim Outlet Canal (IOC) for the STA.
- 0287326-006, issued September 20, 2010, with an expiration date of January 21, 2014, was a modification for a general water use authorization for a permanent water supply at the STA pump station.

PERMIT MONITORING REQUIREMENTS

The water quality and fish tissue data discussed in this section are provided in Attachment B.

MONITORING SITES

Surface water quality parameters were monitored at six locations at LRSTA Phase I: S-650, S-652A, S-654A, S-656A, S-660, and the IOC (**Figure 1**). Global positioning satellite (GPS) coordinates and a description of each monitoring station are provided in **Table 3**. The S-650 inflow pump station is the inflow compliance monitoring point for the STA. The three outflow structures, S-652A (Cell 1), S-654A (Cell 2), and S-656A (Cell 3) are located at the downstream end of each cell. These structures convey water from the STA cell to the STA-North outlet canal. The seepage discharge weir (S-660) discharges seepage water from the west seepage collection ditch and the western portion of the south seepage collection ditch via the south seepage collection ditch that outfalls into the preservation area. The S-660 outfall structure is the temporary outflow compliance monitoring point for LRSTA Phase I. The IOC receives treated water from STA-North, the northern seepage ditch, and the eastern wetland area, before discharging to the L-47 rim canal through an improved, existing agricultural ditch located within the Phase II property.

Table 3. LRSTA surface water quality monitoring sites.

Station	Description	Latitude	Longitude
S-650	Inflow Pump Station to LRSTA	27°09'25.64"N	80°40'35.86"W
S-652A	Treatment Train Discharge 1	27°08'13.42"N	80°40'28.68"W
S-654A	Treatment Train Discharge 2	27°07'45.95"N	80°40'03.73"W
S-656A	Treatment Train Discharge 3	27°07'45.34"N	80°39'39.55"W
S-660	STA Phase I Seepage Discharge Weir	27°07'45.67"N	80°40'12.01"W
IOC	STA Phase I Interim Outfall Canal (IOC)	27°07'42.11"N	80°40'09.40"W

Fish samples for mercury and other toxicants analyses were collected within the treatment cells (LSRFISHC1, LSRFISHC2, and LSRFISHC3) and at a downstream location (LSRFISHDWN) of the LRSTA Phase I project area (**Figure 1**). All surface water and fish collection was conducted in accordance with the FDEP Quality Assurance Rule, 62-160 Florida Administrative Code (F.A.C.) and the approved water quality monitoring plan for the project (SFWMD, 2012).

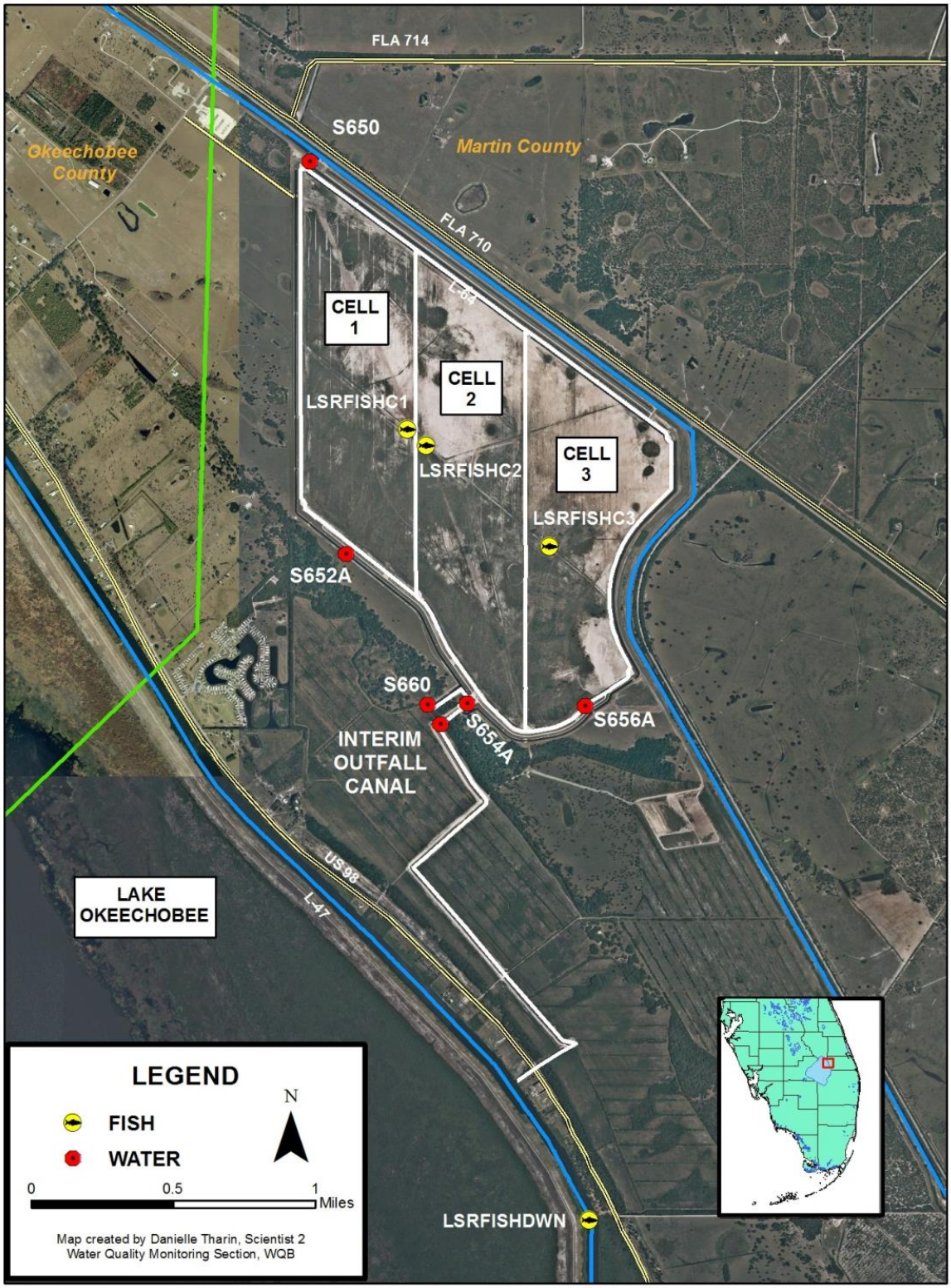

Figure 1. Water quality monitoring and fish sampling locations for LRSTA Phase I.

TOTAL PHOSPHORUS

WY2014 marked the first year of stabilization operation for treatment Cells 1 and 2 of LRSTA Phase I. However, flow-through and discharge activities for both cells did not start until July 2013; therefore, the stabilization operation was limited to approximately ten months during WY2014. Flow–weighted mean (FWM) TP concentrations at the inflow and outflow points of Cell 1 during this period averaged 320 and 22 micrograms per liter (µg/L), respectively, reflecting a TP concentration reduction of 93 percent (**Table 4**). Cell 2 had average FWM TP concentrations of 324 and 22 µg/L at the inflow and outflow points, respectively, indicating a net TP concentration reduction of over 93 percent. Although both cells demonstrated huge reductions in TP concentrations during the 10-month period, compliance with Specific Condition 23A1 for TP during the stabilization period cannot be determined until 12 months of data are available. As outlined in the existing operations permit, the stabilization period for the LRSTA Project "shall end when the 12-month flow-weighted average TP concentration at the outflow does not exceed, or is equal to, the 12-month flow-weighted average TP concentration at the inflow." Compliance with Specific Condition 23A1 will be assessed in the next annual report, when at least 12 months of TP data are available.

Table 4. Monthly flow-weighted mean TP concentrations (µg/L) at the inflow and outflow points of Cells 1 and 2 of LRSTA Phase I during WY2014.

Month	Cell 1		Cell 2	
	Inflow	Outflow	Inflow	Outflow
May 2013	ND	ND	ND	ND
June 2013	ND	ND	ND	ND
July 2013	508	33	532	24
August 2013	588	24	569	22
September 2013	411	23	420	20
October 2013	390	23	400	18
November 2013	287	19	286	13
December 2013	234	21	232	18
January 2014	206	15	203	25
February 2014	204	22	199	26
March 2014	173	21	172	33
April 2014	180	0	179	0
Average	320	22	324	22

ND – no data; flow-through operation began in July 2013.

DISSOLVED OXYGEN

Starting with this reporting period (WY2014), the new Florida Class III freshwater criterion was used to evaluate dissolved oxygen (DO) conditions in the STA (**Table 5**). The new DO standard states that no more than 10 percent of the daily average DO saturation (percent DO) values shall be below 38 percent in the Everglades bioregion for daily data, or, for instantaneous data (discrete measurements), the percent DO values shall not exceed the limit based on the calculated time-day specific translation (FDEP, 2013).

Table 5. Water quality parameters with Florida Class III surface water criteria specified in Section 62-302.530, F.A.C.

Parameter	Unit*	Class III Criteria
Dissolved Oxygen	mg/L	No more than 10% of daily average DO saturation values shall be below 38% in the Everglades Bioregion or for instantaneous data the %DO values shall not exceed the 10% limit based on the calculated time-day specific translation (FDEP, 2013)
Specific Conductance	µS/cm	Not greater than 50% of background or greater than 1,275 µS/cm, whichever is greater
pH		Not less than 6.0 or greater than 8.5
Alkalinity	mg/L	Not less than 20 mg/L
Unionized Ammonia	mg/L	Less than or equal to 0.02 mg/L

* mg/L – milligrams per liter
µS/cm – microsiemens per centimeter
NTU – nephelometric turbidity unit

To ensure the project is not degrading DO in downstream receiving waters, DO conditions at the inflow and outflow points of the LRSTA Phase I were assessed using instantaneous data. DO concentrations measured in milligrams per liter (mg/L) were converted to percent DO saturation using the temperature measured at the same sampling location. To assess compliance with the daily criterion, each measured DO level at a given time was compared to the calculated time-of-day–specific translation for that time. If the instantaneous DO is greater than or equal to the calculated value, the daily DO criterion is achieved (FDEP, 2013). For a monitoring location to be in compliance, the excursion rate for that site must be less than or equal to 10 percent.

DO concentrations differed among stations for the smallest observation (sample minimum), median, mean, and largest observation (sample maximum) (**Table 6**). Mean and median DO concentrations were highest at the outflow point of Cell 3 (S-656A). This station had the lowest excursion rate—10 percent—the only station that met compliance with respect to Specific Condition 23B. Excursion rates for the other stations ranged from 26 to 78 percent, which were out of compliance. Due to natural phenomena, it is common for DO concentrations to fall below the existing criteria in many of Florida's minimally disturbed and healthy fresh and marine water systems (FDEP, 2013).

Table 6. DO compliance summary for LRSTA Phase I for WY2014. [Note: minimum, median, mean, maximum, and standard deviation values are reported in mg/L; excursions were determined based on % DO saturation calculations provided in Attachment B].

Station	Samples	Minimum	Median	Mean	Maximum	Standard Deviation	Excursions	Excursion Rate*	Compliance Status
S-650	31	0.16	3.69	3.94	8.72	1.82	8	26%	Exceeds Criterion
S-652A	27	0.58	2.26	2.39	7.87	1.61	21	78%	Exceeds Criterion
S-654A	27	0.65	2.97	3.40	18.30	3.31	18	67%	Exceeds Criterion
S-656A	30	1.18	5.05	4.94	9.22	1.77	3	10%	Complies
S-660	28	0.53	3.50	3.52	8.63	2.01	15	54%	Exceeds Criterion
IOC	29	0.64	3.72	4.24	7.90	1.87	9	31%	Exceeds Criterion

* To be in compliance, a station's excursion rate must not exceed 10 percent.

OTHER WATER QUALITY PARAMETERS

Water quality parameters other than TP and DO were monitored at the inflow and outflow stations of LRSTA Phase I during WY2014 in accordance with the permit requirements. Compliance with Florida Class III standards was evaluated as follows:

1. If the average outflow concentration did not exceed applicable criteria, the STA was deemed in compliance.
2. If the average outflow concentration caused or contributed to an exceedance of applicable criteria, but did not exceed or was equal to, the average inflow concentration, then the STA was deemed in compliance.
3. If the average outflow concentration caused or contributed to an exceedance of applicable criteria, and also exceeded the average inflow concentration, then the STA was deemed out of compliance.

Water year average concentrations at the inflow (S-650) and outflow points (S-652A, S-654A, S-656A, S-660, and IOC) were compared to determine whether the STA contributed to an exceedance of a specific parameter (**Table 7**). Mean inflow and outflow pH values were between 6.7 and 6.9, which are within the Class III pH limits (6.0–8.5), the optimal pH conditions for most organisms, especially aquatic life (Julian et al., 2014).

Table 7. Summary of other water quality parameters measured at LRSTA Phase I project during WY2014. [Note: Includes number of excursions for parameters with Florida Class III surface water criteria]

Parameter	Unit [a]	Type	Samples	Minimum	Maximum	Median	Mean	Standard Deviation	Excursions
S-650									
pH		Field	31	6.4	7.6	7.0	6.9 [b]	NA	0(31)
Specific Conductance	µS/cm	Field	31	190	777	446	470	170	0(31)
Temperature	°C	Field	32	18.7	29.1	26.0	25.1	2.9	
Total Nitrogen [c]	mg/L	Calculated	32	1.23	2.04	1.63	1.64	0.22	
Total Kjeldahl Nitrogen	mg/L	Grab	32	1.20	2.00	1.50	1.57	0.24	
Nitrate/Nitrite (as nitrogen [N])	mg/L	Grab	32	<0.005	0.247	0.042	0.077	0.082	
Ammonia (as N)	mg/L	Grab	30	0.038	0.301	0.118	0.129	0.068	
Unionized Ammonia (as N)	mg/L	Calculated	29	0.000	0.007	0.001	0.001	0.001	0(29)
Alkalinity (as calcium carbonate [$CaCO_3$])	mg/L	Grab	32	45	145	91	91	27	0(32)
Total Sulfate	mg/L	Grab	32	4.7	67.8	23.2	24.5	16.9	
S-652A									
pH		Field	27	6.4	7.2	6.8	6.7 [b]	NA	0(27)
Specific Conductance	µS/cm	Field	27	156	800	281	407	236	0(27)
Temperature	°C	Field	28	17.8	29.6	24.6	24.8	3.6	
Total Nitrogen [c]	mg/L	Calculated	28	1.15	1.88	1.31	1.38	0.18	
Total Kjeldahl Nitrogen	mg/L	Grab	28	1.15	1.87	1.31	1.38	0.18	
Nitrate/Nitrite (as N)	mg/L	Grab	28	<0.005	0.005	<0.005	<0.005	0.000	
Ammonia (as N)	mg/L	Grab	26	0.008	0.062	0.019	0.023	0.013	
Unionized Ammonia (as N)	mg/L	Calculated	25	0.000	0.000	0.000	0.000	0.000	0(25)
Alkalinity (as $CaCO_3$)	mg/L	Grab	28	40	105	62	67	21	0(28)
Total Sulfate	mg/L	Grab	27	0.9	61.6	3.0	17.2	21.9	

a. Key to Units: µS/cm – microsiemens per centimeter; °C – degrees Celsius; mg/L – milligrams per liter.
b. Mean pH was calculated from the negative logarithm of the hydrogen ion concentration.
c. Total nitrogen is the sum of total Kjeldahl N and nitrate/nitrite N.

Table 7. Continued.

Parameter	Unit [a]	Type	Samples	Minimum	Maximum	Median	Mean	Standard Deviation	Excursions
S-654A									
pH		Field	27	6.3	7.1	6.8	6.7 [b]	NA	0(27)
Specific Conductance	µS/cm	Field	27	149	569	284	320	141	0(27)
Temperature	°C	Field	28	16.5	29.0	23.3	23.7	3.8	
Total Nitrogen [c]	mg/L	Calculated	28	1.10	1.68	1.34	1.33	0.14	
Total Kjeldahl Nitrogen	mg/L	Grab	28	1.10	1.67	1.34	1.33	0.14	
Nitrate/Nitrite (as N)	mg/L	Grab	28	<0.005	0.008	<0.005	<0.005	0.001	
Ammonia (as N)	mg/L	Grab	26	0.009	0.031	0.018	0.018	0.006	
Unionized Ammonia (as N)	mg/L	Calculated	25	0.000	0.000	0.000	0.000	0.000	0(25)
Alkalinity (as $CaCO_3$)	mg/L	Grab	28	37	93	61	61	19	0(28)
Total Sulfate	mg/L	Grab	27	0.6	23.7	3.4	6.8	7.8	
S-656A									
pH		Field	30	6.4	7.5	7.0	6.8 [b]	NA	0(30)
Specific Conductance	µS/cm	Field	30	62	487	188	236	149	0(30)
Temperature	°C	Field	31	19.6	30.6	26.5	25.7	3.6	
Total Nitrogen [c]	mg/L	Calculated	31	0.87	2.11	1.33	1.33	0.23	
Total Kjeldahl Nitrogen	mg/L	Grab	31	0.87	2.11	1.33	1.33	0.23	
Nitrate/Nitrite (as N)	mg/L	Grab	31	<0.005	0.010	<0.005	<0.005	0.001	
Ammonia (as N)	mg/L	Grab	29	0.011	0.040	0.018	0.019	0.006	
Unionized Ammonia (as N)	mg/L	Calculated	28	0.000	0.000	0.000	0.000	0.000	0(28)
Alkalinity (as $CaCO_3$)	mg/L	Grab	31	14	82	39	46	22	2(31)
Total Sulfate	mg/L	Grab	30	0.3	17.1	3.3	6.6	6.4	

a. Key to Units: µS/cm – microsiemens per centimeter; °C – degrees Celsius; mg/L – milligrams per liter.
b. Mean pH was calculated from the negative logarithm of the hydrogen ion concentration.
c. Total nitrogen is the sum of total Kjeldahl N and nitrate/nitrite N.

Table 7. Continued.

Parameter	Unit [a]	Type	Samples	Minimum	Maximum	Median	Mean	Standard Deviation	Excursions
S-660									
pH		Field	28	6.5	7.2	6.8	6.8 [b]	NA	0(28)
Specific Conductance	µS/cm	Field	28	491	794	569	574	67	0(28)
Temperature	°C	Field	29	19.7	31.2	25.7	25.3	3.1	
Total Nitrogen [c]	mg/L	Calculated	29	1.53	2.36	1.98	1.93	0.19	
Total Kjeldahl Nitrogen	mg/L	Grab	29	1.51	2.29	1.87	1.86	0.19	
Nitrate/Nitrite (as N)	mg/L	Grab	29	0.012	0.156	0.066	0.070	0.039	
Ammonia (as N)	mg/L	Grab	29	0.029	0.501	0.309	0.283	0.122	
Unionized Ammonia (as N)	mg/L	Calculated	28	0.000	0.003	0.001	0.001	0.001	0(28)
Alkalinity (as $CaCO_3$)	mg/L	Grab	29	111	142	129	128	8	0(29)
Total Sulfate	mg/L	Grab	29	9.9	20.4	12.5	13.2	2.4	
IOC									
pH		Field	29	6.5	7.3	7.0	6.9 [b]	NA	0(29)
Specific Conductance	µS/cm	Field	29	213	672	427	432	150	0(29)
Temperature	°C	Field	30	19.9	30.6	25.7	25.2	3.1	
Total Nitrogen [c]	mg/L	Calculated	30	1.04	1.85	1.31	1.34	0.16	
Total Kjeldahl Nitrogen	mg/L	Grab	30	1.02	1.83	1.28	1.29	0.18	
Nitrate/Nitrite (as N)	mg/L	Grab	30	0.005	0.176	0.020	0.043	0.048	
Ammonia (as N)	mg/L	Grab	28	0.019	0.218	0.043	0.062	0.049	
Unionized Ammonia (as N)	mg/L	Calculated	27	0.000	0.001	0.000	0.000	0.000	0(27)
Alkalinity (as $CaCO_3$)	mg/L	Grab	30	49	164	100	108	40	0(30)
Total Sulfate	mg/L	Grab	30	3.5	44.1	9.5	11.9	8.5	

a. Key to Units: µS/cm – microsiemens per centimeter; °C – degrees Celsius; mg/L – milligrams per liter.
b. Mean pH was calculated from the negative logarithm of the hydrogen ion concentration.
c. Total nitrogen is the sum of total Kjeldahl N and nitrate/nitrite N.

Alkalinity, a measure of the water's buffering capacity, averaged 91 mg/L at the inflow (**Table 7**). Average alkalinity values at the outflow stations ranged from 46 to 128 mg/L. Except for the two excursions recorded at the Cell 3 outflow (S-656A), alkalinity at all stations was well above the current Class III water quality criterion of 20 mg/L of alkalinity as calcium carbonate. This indicates that the water in the LRSTA Phase I project had sufficient alkalinity to counter dramatic pH changes that could be detrimental to the health of sensitive organisms.

Average specific conductance at the inflow was 470 microsiemens per centimeter (µS/cm), and ranged from 236 to 574 µS/cm at the outflow locations (**Table 7**). All specific conductance values were well below the Florida Class III standard of 1,275 µS/cm. This limit is meant to preserve natural background conditions and to protect aquatic organisms from stressful ion concentrations (Payne and Xue, 2012).

Unionized ammonium-nitrogen (N), the form of N that is toxic to fish and other aquatic life, was almost non-existent in water samples collected at all permit locations (**Table 7**). Unionized ammonium-N was only detected at the inflow station (S-650), with average concentration of 0.001 mg/L, well below the current Class III standard of 20 mg/L, which was adopted by the state to protect aquatic life from potential toxic effects of this form of N and is not a nutrient-related criterion (Julian et al., 2014).

Total nitrogen (TN), calculated as the sum of total Kjeldahl nitrogen and nitrate+nitrite-N, averaged 1.64 mg/L at the inflow (S-650) and about 1.35 mg/L at the three discharge structures (S-652A, S-654A, and S-656A) for a net TN concentration reduction of 18 percent by the treatment cells (**Table 7**). Currently, there is no numeric criterion for N, and it is still regulated by the narrative criterion. The narrative criterion specifies that nutrient concentrations in a water body cannot be altered to cause an imbalance in the natural populations of aquatic flora or fauna (Julian et al., 2014).

Sulfate levels at the inflow and outflow stations were generally low. Average concentrations ranged from 6.6 mg/L at the Cell 3 outflow (S-656A) to 24.5 mg/L at the inflow (S-650) (**Table 7**). Since none of the water quality parameters with Class III standards caused or contributed to an excursion from applicable water quality standards, in terms of average outflow concentrations (outside of two exceedances for alkalinity), the LRSTA Phase I project is deemed in compliance with Specific Condition 23C of the permit.

MERCURY

In accordance with the procedures and guidelines outlined in the approved water quality monitoring plan (SFWMD, 2012) and the requirements of Specific Condition 27 of the existing operating permit, mercury concentrations in surface water and fish tissue were monitored at the LRSTA-North during the first year of the three-year Phase 2 - Tier 1 monitoring period, as outlined in *A Protocol for Monitoring Mercury and Other Toxicants* (FDEP and SFWMD, 2011). Surface water samples for total mercury (THg) and methylmercury (MeHg) were collected at all permit sites (**Figure 1**) on a quarterly basis. Composite samples of mosquitofish (*Gambusia holbrooki*) were collected within all three cells (LSRFISHC1, LSFISHC2, and LSRFISHC3) and from a downstream location (LSRFISHDWN) (**Figure 1**) on a quarterly basis. Samples of bluegill sunfish (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*) were collected from the same locations on an annual basis. All fish samples were analyzed for THg. No water or mosquitofish samples were collected during the first quarter of WY2014 because of dry conditions and repairs to Cell 3. Data collected on February 4, 2013, which have not been reported previously, are included in this report.

Surface Water Assessment

THg concentrations in LRSTA Phase I project surface water ranged from 0.7 to 3.7 nanograms per liter (ng/L) (**Table 8**)—well below the Class III water quality standard of 12 ng/L. THg concentrations at the inflow ranged from 2.1 to 3.6 ng/L. Except for a high value of 3.7 ng/L at S-654A (Cell 2 outflow), all THg concentrations at the inflow site were greater than the THg concentrations at the outflow locations. The average THg concentration was 3.1 ng/L at the inflow and 1.4 ng/L at the three outflow points, for a THg concentration reduction of almost 56 percent by the treatment cells.

MeHg concentrations varied from 0.24 to 0.28 ng/L at the inflow site and from 0.04 to 0.92 ng/L at the outflow locations (**Table 8**). The average MeHg concentration at the inflow was 0.26 ng/L, which is slightly lower than the average outflow MeHg concentration of 0.29 ng/L. Currently, there is no water quality standard for MeHg in surface water.

Table 8. Surface water THg and MeHg concentrations (in ng/L) at the inflow and outflow stations of the LRSTA Phase I for WY2014.

Station [a]	Date Collected	THg	MeHg [b]
S-650 (Inflow)	February 4, 2013	3.5	0.24
	September 10, 2013	3.6	-
	December 10, 2013	3.0	0.28
	March 19, 2014	2.1	0.25
S-652A (Cell 1 Outflow)	February 4, 2013	0.7	0.11
	September 10, 2013	1.2	0.16
	December 10, 2013	1.0	0.10
	March 19, 2014	1.0	0.22
S-654A (Cell 2 Outflow)	February 4, 2013	0.5	0.04
	September 10, 2013	1.3	0.19
	December 10, 2013	1.0	0.15
	March 19, 2014	1.1	0.18
S-656A (Cell 3 Outflow)	February 4, 2013	1.7	0.92
	September 10, 2013	3.7	0.73
	December 10, 2013	1.3	0.23
	March 19, 2014	1.7	0.47
S-660 (Seepage Discharge)	February 4, 2013	2.0	0.32
	September 10, 2013	2.2	0.39
	December 10, 2013	2.0	0.21
	March 19, 2014	2.1	0.27

a. Collection of water samples for THg and MeHg at the IOC was not required.
b. The missing value was fatally flagged.

Mosquitofish Assessment

THg concentrations in mosquitofish collected during four sampling events in the interior of the treatment cells and at a downstream location are summarized in **Table 9**. THg varied from 18 to 78 nanograms per gram (ng/g), with an average of 22 ng/g for Cell 1, 34 ng/g for Cell 2, 58 ng/g for Cell 3, and 28.8 ng/g for the downstream site. Except for the value obtained from Cell 3 on February 14, 2014, all other values were well below the United States Environmental Protection Agency (USEPA) standard of 77 ng/g for trophic level III fish. The 75th percentile for the period of record (WY1998–WY2014) for mosquitofish collected in the Everglades Protection Area is 98 ng/g (N=685). No THg value for mosquitofish was above 75th percentile for WY2014.

Table 9. THg in mosquitofish monitored at LRSTA Phase I in WY2014. Values are on a wet weight basis.

Station	Date Collected	THg (ng/g)
LSRFISHC1 (Cell 1 Interior)	February 4, 2013	24
	September 5,2013	26
	November 7, 2013	18
	February 6, 2014	19
	Average	*22*
LRSFISHC2 (Cell 2 Interior)	February 4, 2013	43
	September 5,2013	38
	November 7, 2013	26
	February 6, 2014	28
	Average	*34*
LRSFISHC3 (Cell 3 Interior)	February 4, 2013	62
	September 5,2013	34
	November 7, 2013	59
	February 6, 2014	78
	Average	*58*
LRSFISHDWN (Downstream)	February 4, 2013	33
	September 5,2013	27
	November 7, 2013	25
	February 6, 2014	26
	Average	*28*

Large-bodied Fish Assessment

THg concentrations in bluegill sunfish and largemouth bass collected from the interior of each cell and from a downstream location between November 11 and 14, 2013, are shown in **Table 10**. Values are the average of five individual samples. No largemouth bass were available for sampling in Cell 1. The average THg in bluegill sunfish was 131 ng/g for Cell 1, 226 ng/g for Cell 2, 148 ng/g for Cell 3, and 63 ng/g for the downstream location. The THg in bluegills collected from the three cells exceeded the USEPA standard of 77 ng/g for trophic level III fish, but not the THg in bluegills collected at the downstream site. All values for sunfish THg were well below the 75th percentile for bluegill sunfish from the Everglades Protection Area (230 ng/g, N=1,531).

The average THg concentration in largemouth bass was 230 ng/g for Cell 2, 482 ng/g for Cell 3, and 362 ng/g for the downstream location. Although THg in largemouth bass collected from Cell 3 and the downstream location exceeded the USEPA standard of 346 ng/g for trophic level IV fish (USEPA, 2001), all values were below the 75th percentile for largemouth bass from the Everglades Protection Area (679 ng/g, N=2,828).

Table 10. THg in large-bodied fish collected at LRSTA Phase I in WY2014. Values are on a wet weight basis and are the average of five samples.

Station	Date Collected	Bluegill Sunfish THg (ng/g)	Largemouth Bass THg (ng/g)
LSRFISHC1 (Cell I Interior)	November 11, 2013	131	Not enough sample
LSRFISHC2 (Cell 2 Interior)	November 11, 2013	226	230
LSRFISHC3 (Cell 3 Interior)	November 11, 2013	148	105
LSRFISHDWN (Downstream)	November 14, 2014	63	362

OTHER TOXICANTS MONITORING

In accordance with the approved water quality monitoring plan (SFWMD, 2012) and Specific Condition 27 of the current operating permit, the SFWMD performed monitoring for other toxicants under Phase 2 - Tier 1, Routine Monitoring during the Stabilization Period (FDEP and SFWMD, 2011). **Table 11** summarizes the other toxicants monitoring requirements for LRSTA Phase I. Surface water and fish samples were collected from the same sites used for mercury monitoring (**Figure 1**).

Table 11. Other toxicants monitoring requirements for Phase 2 - Tier 1, Routine Monitoring during the Stabilization Period for LRSTA Phase I for WY2014.

Matrix	Location	Collection Method	Frequency	Parameters [a]
Surface Water	S-650 S-652A S-654A S-656A S-660 IOC	Grab	Quarterly	aldrin, atrazine, alpha BHC, beta BHC, delta BHC, gamma BHC, chlordane, p,p'-DDD, p,p'-DDE, p,p'-DDT, dieldrin, endosulfan sulfate, endrin, endrin aldehyde, ethion, malathion, simazine, toxaphene, arsenic, barium, cadmium, chromium, copper, lead, and zinc
Mosquitofish (*Gambusia* spp.)	LSRFISHC1 LSRFISHC2 LSRFISHC3 LSRFISHDOWN	Net or Trap	Quarterly	cis-chlordane, aldrin, alpha BHC, atrazine, beta BHC, cis-nonachlor, delta BHC, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, dieldrin, endosulfan sulfate, endrin, ethion, gamma BHC, malathion, simazine, toxaphene, trans-chlordane, trans-nonachlor, arsenic, barium, cadmium, chromium, copper, lead, and zinc
Sunfish and Bass	LSRFISHC1 LSRFISHC2 LSRFISHC3 LSRFISHDOWN	Electrofishing	Annually	cis-chlordane, aldrin, alpha BHC, atrazine, beta BHC, cis-nonachlor, delta BHC, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, dieldrin, endosulfan sulfate, endrin, ethion, gamma BHC, malathion, simazine, toxaphene, trans-chlordane, trans-nonachlor, arsenic, barium, cadmium, chromium, copper, lead, and zinc

a. Key to parameters:
o,p'-DDD – ortho para dichlorodiphenyldichloroethane
o,p'-DDE – ortho para dichlorodiphenyldichloroethylene
o,p'-DDT – ortho para dichlorodiphenyltrichloroethane
p,p'-DDD – para para dichlorodiphenyldichloroethane
p,p'-DDE – para para dichlorodiphenyldichloroethylene
p,p'-DDT – para para dichlorodiphenyltrichloroethane

Surface Water Assessment

Surface water samples were collected for pesticides and metals analyses at all permit locations (**Figure 1**) on September 10 and December 10, 2013, and on March 18–19, 2014. Pesticides were detected during the December 2013 and March 2014 sampling events (**Table 12**). The only pesticides detected were atrazine and malathion. To evaluate the potential impacts on aquatic life, the observed concentrations were compared to the appropriate criteria outlined in 62-302.530, F.A.C. Only malathion has a specifically listed criterion of 0.1 µg/L. For other detected compounds, acute and chronic toxicity criteria were calculated as one-third and one-twentieth, respectively, of the amount lethal to 50% of the test organisms in 96 hours, using the lowest technical grade effective concentration 50 (EC_{50}) or lethal concentration 50 (LC_{50}) reported in the literature for the species significant to the indigenous aquatic community (62-302.200, F.A.C.). None of the detected concentrations (**Table 12**) exceeded 62-302, F.A.C. criteria (**Table 13**).

Table 14 provides an evaluation of metal concentrations in surface water collected at permit locations in LRSTA Phase I. None of the detected metals were above action-level criteria.

Table 12. Detected pesticide concentrations (in µg/L) in surface water samples collected at LRSTA Phase I during WY2014.

Station	Date Collected	Pesticide Detected	Concentration (µg/L)
S-650 (Inflow)	March 18, 2014	atrazine	0.034 [a]
S-652A (Cell 1 Outflow)	December 10, 2013	malathion	0.011 [a]
S-654A (Cell 2 Outflow)	March 18, 2014	atrazine	0.110
S-656A (Cell 3 Outflow)	December 10, 2013 December 10, 2013 March 18, 2014	atrazine malathion atrazine	0.034 [a] 0.017 [a] 0.200
S-660 (Seepage Discharge)	March 18, 2014	atrazine	0.016 [a]
IOC	March 18, 2014	atrazine	0.28 [a]

[a.] The value reported is less than the practical quantification limit, and greater than or equal to the method detection limit.

Table 13. Toxicity of detected pesticides (in µg/L) to selected freshwater aquatic invertebrates and fishes.
[Note: Numbers in parentheses correspond to references listed in the table footnotes]

Pesticide Common Name	Water Flea (*Daphnia magna*)			Fathead Minnow # (*Pimephales promelas*)			Bluegill (*Lepomis macrochirus*)			Largemouth Bass (*Micropterus salmoides*)			Rainbow Trout # (*Oncorhynchus mykiss*)			Channel Catfish (*Ictalurus punctatus*)		
	48 hr EC_{50}	Acute Toxicity *	Chronic Toxicity *	96 hr LC_{50}	Acute Toxicity	Chronic Toxicity	96 hr LC_{50}	Acute Toxicity	Chronic Toxicity	96 hr LC_{50}	Acute Toxicity	Chronic Toxicity	96 hr LC_{50}	Acute Toxicity	Chronic Toxicity	96 hr LC_{50}	Acute Toxicity	Chronic Toxicity
Atrazine	6,900 (2)	2,300	345	15,000 (2)	5,000	750	16,000 (1)	5,333	800	-	-	-	8,800 (1)	2,933	440	7,600 (1)	2,533	380
													5,300 (3)	1,767	265			
Malathion	1 (4)	0.3	0.05	8,650 (4)	2,883	433	103 (4)	34	5.2	285 (4)	95	14	200 (4)	67	10	8,970 (4)	2,990	449
	1.8 (8)	0.6	0.09				110 (5)	37	5.5				170 (5)	57	9			
				9,000 (5)	3,000	450	12 (6)	4	0.6				100 (6)	33	5	7,620 (2)	2,540	381
	1.0 (9)	0.33	0.05				30 (9)	10	1.5				29 (7)	10	1			
													4 (9)	1.3	0.2			

Species is not indigenous. Information is given for comparison purposes only.

* 62-302.200, F.A.C., for compounds not specifically listed, acute and chronic toxicity standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50 percent of the test organisms in 96 hours, where the 96-hour LC50 is the lowest value that has been determined for a species significant to the indigenous aquatic community.

- No data

(1) Hartley and Kidd (1987)
(2) U.S. EPA (1991)
(3) U.S. EPA (2006)
(4) Johnson and Finley (1980)
(5) U.S. EPA (1977)
(6) Davis (1970)
(7) Schneider (1979)
(8) U.S. EPA (1972)
(9) U.S. EPA (2006)

Table 14. Selected metal concentrations and Florida Class III freshwater standards for surface water samples collected at LRSTA Phase I during WY2014.

Station	Metal	September 10, 2013			December 10, 2013			March 19, 2014		
		Concentration (µg/L[a])	Remark Code	Criteria (µg/L)	Concentration (µg/L)	Remark Code	Criteria (µg/L)	Concentration (µg/L)	Remark Code	Criteria (µg/L)
S650	arsenic	1.3		50	1.06		50	0.84	I [b]	50
	barium	16.6		- [d]	23.2		-	26.8		-
	cadmium	BDL[c]		0.26 [e]	BDL		0.34	BDL		0.42
	chromium	1.2	I	81 [f]	1.2		112.2	0.91	I	140.5
	copper	BDL		8.7 [g]	0.65	I	12.3	0.55	I	15.5
	lead	0.26	I	2.9 [h]	0.34	I	4.8	0.23	I	6.8
	zinc	BDL		112 [i]	BDL		157	BDL		198.6
S652A	arsenic	0.41	I	50	0.55	I	50	0.6	I	50
	barium	4.74		-	6		-	24.8		-
	cadmium	BDL		0.18	BDL		0.23	BDL		0.41
	chromium	0.31	I	54.6	0.41	I	73	0.31	I	137.2
	copper	BDL		5.8	BDL		7.8	BDL		15.2
	lead	BDL		1.57	BDL		2.5	BDL		6.6
	zinc	BDL		74.7	BDL		101	BDL		194
S654A	arsenic	0.42	I	50	0.57	I	50	0.6	I	50
	barium	4.7		-	5.7		-	12.7		-
	cadmium	BDL		0.17	BDL		0.23	BDL		0.35
	chromium	BDL		52.7	0.34	I	71.2	BDL		114.6
	copper	BDL		5.6	BDL		7.6	BDL		12.6
	lead	BDL		1.5	BDL		2.4	BDL		5.0
	zinc	BDL		72	BDL		98	BDL		161
S656A	arsenic	0.33	I	50	0.31	I	50	0.4	I	50
	barium	3.7		-	3.6		-	7.66		-
	cadmium	BDL		0.14	BDL		0.18	BDL		0.30
	chromium	BDL		41	BDL		55	BDL		97.8
	copper	BDL		4.3	BDL		5.8	BDL		10.6
	lead	BDL		1.0	BDL		1.6	BDL		3.9
	zinc	BDL		55.1	BDL		75	BDL		137
S660	arsenic	1.5		50	1.4		50	1.07		50
	barium	40		-	24.8		-	21.5		-
	cadmium	BDL		0.38	BDL		0.42	BDL		0.45
	chromium	2.2		125	1.6		140	1.3		150
	copper	BDL		13.8	BDL		15.5	BDL		16.6
	lead	BDL		5.7	BDL		6.8	BDL	I	7.5
	zinc	BDL		176.5	BDL		198	BDL		212
Interim Outfall Canal (IOC)	arsenic	0.78	I	50	0.85	I	50	1.02		50
	barium	8.48		-	13.5		-	23		-
	cadmium	BDL		0.24	BDL		0.32	BDL		0.5
	chromium	0.58	I	75	0.71	I	103	0.93	I	160
	copper	BDL		8.1	BDL		11.2	BDL		17.7
	lead	BDL		2.6	BDL		4.2	BDL		8.3
	zinc	BDL		104	BDL		143	BDL		227

a. µg/L – micrograms per liter
b. I – value reported is less than the practical quantification limit, and greater than or equal to the method detection limit
c. BDL – below detection limit
d. no standard
e. Cadmium ≤ $e^{(0.7409[lnH]-4.719)}$ where "lnH" means the natural logarithm of total hardness expressed as milligrams per liter of calcium carbonate (mg/L of $CaCO_3$).
f. Chromium (III) ≤ $e^{(0.819[lnH]+0.6848)}$ where "lnH" means the natural logarithm of total hardness expressed as mg/L of $CaCO_3$.
g. Copper ≤ $e^{(0.8545[lnH]-1.702)}$ where "lnH" means the natural logarithm of total hardness expressed as mg/L of $CaCO_3$.
h. Lead ≤ $e^{(1.273[lnH]+4.705)}$ where "lnH" means the natural logarithm of total hardness expressed as mg/L of $CaCO_3$.
i. Zinc ≤ $e^{(0.8473[lnH]+0.884)}$ where "lnH" means the natural logarithm of total hardness expressed as mg/L of $CaCO_3$.

Fish Assessment

Mosquitofish samples for the Routine Monitoring during Stabilization Period were collected on February 7, September 5, and November 7, 2013, and on February 6, 2014. All detected concentrations of metals were below levels of concern (**Table 15**). Pesticides were only detected during the last sampling event. All detected pesticide concentrations were below levels of concern (**Table 16)**.

Metals and pesticides detected in the annual large-bodied fish collection, which occurred at three locations on November 11 and 14, 2013, were below the critical evaluation or action-level criteria for fish (**Tables 17** and **18**).

Table 15. Summary of mosquitofish metal analysis for the LRSTA Phase I project during WY2014. (Values are milligrams per kilogram or mg/Kg).

Metal (mg/Kg) [a]	Sampling Date and Station					Criteria		
	Sampling Date	LSRFISHC1	LSRFISHC2	LSRFISHC3	LSRFISHDWN	Tissue Residue for the Protection of Human Health (mg/Kg) (Environment Canada, 1999)	Toxicity Thresholds for Fish and Wildlife (mg/Kg) (Hinck et al., 2009)	No Observed Adverse Effect Levels (mg/Kg body weight per day) (USEPA, 2007)
Arsenic	7-Feb-13	BDL [b]	BDL	BDL	0.087 I [c]	3.2	2.2 TO 11.6	NC [d]
	5-Sep-13	BDL	BDL	BDL	0.053 I			
	7-Nov-13	BDL	0.038 I	BDL	0.14 I			
	6-Feb-14	BDL	0.048 I	0.045 I	0.095 I			
Barium	7-Feb-13	1.65	1.24	2.03	2.49	750	NC	NC
	5-Sep-13	2.44	2.05	2.28	2.19			
	7-Nov-13	2.11	2.22	2.62	2.4			
	6-Feb-14	2.02	1.84	2.45	2.7			
Cadmium	7-Feb-13	BDL	BDL	BDL	BDL	5.4	0.23 TO 15.6	NC
	5-Sep-13	BDL	BDL	BDL	BDL			
	7-Nov-13	BDL	BDL	BDL	BDL			
	6-Feb-14	BDL	BDL	BDL	BDL			
Chromium	7-Feb-13	2.01	1.76	6.52	5.32	54	1.0	NC
	5-Sep-13	2.84	2.07	12.2	4.49			
	7-Nov-13	6.97	24.7	6.46	7.47			
	6-Feb-14	12.8	5.33	15	6.48			
Copper	7-Feb-13	1.32	1.23	1.89	1.39	400	11.0 to 42.0	NC
	5-Sep-13	1.46	1.26	1.57	1.29			
	7-Nov-13	1.44	1.83	1.52	1.82			
	6-Feb-14	1.86	1.39	1.66	1.63			
Zinc	7-Feb-13	51.3	44.6	55.4	43.4	3,200	40 to 64	66.1
	5-Sep-13	54.2	51.2	38.7	41			
	7-Nov-13	48.7	43.3	43.2	34.2			
	6-Feb-14	49.1	47.7	45.7	40.9			

a. mg/Kg – milligrams per kilogram
b. BDL – below detection limit
c .I – value reported is less than the practical quantification limit and greater than or equal to the method detection limit
d. NC – no criteria

Table 16. Summary of pesticide analysis in mosquitofish collected on February 6, 2014 for the LRSTA Phase I project during WY2014. (Values are micrograms per kilogram or µg/Kg).

Station	DDTr [a] (µg/Kg wet weight) (includes o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT)	Criteria								
		p,p'-DDE (µg/Kg wet weight) (Newfields, 2006) [b]					Whole fish benchmark for protection of fish eating wildlife (Newell et al., 1987)	Whole fish total DDTr (µg/Kg dry weight; tissue residue) (Environment Canada, 1999)		Total DDTr (µg/Kg dry weight) (USEPA, 2000)
		Bald Eagle	Great Blue Heron	Little Blue Heron	White Pelican	Wood Stork	Whole fish total DDTr µg/Kg wet weight	Protection fish for consuming birds	Available tissue residue for protection of human health	Screening value for recreational fishers
LSRFISHC1	0.59 I [c]	14,700	10,000	5,200	12,200	10,100	200	1,000	320	117
LSRFISHC2	0.89									
LSRFISHC3	0.8									
LSRFISHDWN	1.4									

a. Key:
µg/Kg – micrograms per kilograms
o,p'-DDD: ortho, para dichlorodiphenyldichloroethane
p,p'-DDD: para, para dichlorodiphenyldichloroethane
o,p'-DDE: ortho, para dichlorodiphenyldichloroethylene
p,p'-DDE: para, para dichlorodiphenyldichloroethylene
o,p'-DDT: ortho, para dichlorodiphenyltrichloroethane
p,p'-DDT: para, para dichlorodiphenyltrichloroethane

b. Screening levels correspond to exposure equal to no-observed-adverse-effects levels, wet weight basis, for overall receptor diet.

c. I – value reported is less than the practical quantification limit, and greater than or equal to the method detection limit.

Table 17. Summary of large-bodied fish metal analyses for the LRSTA Phase I project during WY2014. [Note: Values are in milligrams per kilogram (mg/Kg)]

Metal (mg/Kg) [a]	Sampling Date, Station, and Fish				Criteria		
	Nov. 14, 2014	Nov. 11, 2013	Nov. 11, 2013	Nov. 14, 2013	Tissue Residue for the Protection of Human Health (mg/Kg) (Environment Canada, 1999)	Toxicity Thresholds for Fish and Wildlife (mg/Kg) (Hinck et al., 2009)	No Observed Adverse Effect Levels (mg/Kg body weight per day) (USEPA, 2007)
	LSRFISHC1	LSRFISHC2	LSRFISHC3	LSRFISHDWN			
Arsenic	Bluegill: 0.042 I [b] Bluegill: 0.057 I Bluegill: 0.042 I	Bluegill: 0.048 I Bluegill: 0.053 I Bluegill: 0.051 I Bluegill: 0.046 I Bluegill: 0.051 I	Bluegill: 0.038 I Bluegill: 0.068 I Bluegill: 0.066 I Bluegill: 0.094 I Bluegill: 0.054 I	Bass: 0.033 I Bluegill: 0.1 I Bluegill: 0.079 I Bluegill: 0.061 I Bluegill: 0.076 I Bluegill: 0.1 I	3.2	2.2 to 11.6	NC [c]
Barium	Bluegill: 0.3 I Bluegill: 0.45 Bluegill: 0.57 Bluegill: 0.3 I Bluegill: 0.33 I	Bluegill: 0.21 I Bluegill: 0.29 I Bluegill: 0.21 I Bluegill: 0.26 I Bluegill: 0.69	Bluegill: 0.39 Bluegill: 0.25 I Bluegill: 0.58 Bluegill: 0.5 Bluegill: 0.31 I	Bluegill: 0.65 Bluegill: 1.15 Bluegill: 1.32 Bluegill: 1.06 Bluegill: 0.94	750	NC	NC
Chromium	BDL [d]	BDL	BDL	Bluegill: 0.24 I Bluegill: 0.12 I	54	1.0	NC
Copper	Bluegill: 0.29 I Bluegill: 0.33 I Bluegill: 0.42 Bluegill: 0.18 I Bluegill: 0.35 I	Bass: 0.15 I Bass: 0.11 I Bluegill: 0.31 I Bluegill: 0.4 Bluegill: 0.3 I Bluegill: 0.34 I Bluegill: 0.44	Bass: 0.13 I Bass: 0.16 I Bluegill: 0.3 I Bluegill: 0.23 I Bluegill: 0.34 I Bluegill: 0.32	Bass: 0.18 I Bass: 0.16 I Bass: 0.096 I Bluegill: 0.39 I Bluegill: 0.68 Bluegill: 0.36 Bluegill: 0.33 I Bluegill: 0.47	400	11.0 to 42.0	NC
Zinc	Bluegill: 16.8 Bluegill: 12.9 Bluegill: 27.2 Bluegill: 9.1 Bluegill: 16.9	Bass: 4.7 Bass: 3.8 Bluegill: 13 Bluegill: 19.1 Bluegill: 17.7 Bluegill: 23.1 Bluegill: 16.2	Bass: 3.4 Bass: 4.2 Bluegill: 7.93 Bluegill: 14.3 Bluegill: 21.8 Bluegill: 19 Bluegill: 22.8	Bass: 4.7 Bass: 4.7 Bass: 3 Bluegill: 18.9 Bluegill: 48.3 Bluegill: 17.7 Bluegill: 16.1 Bluegill: 20.2	3,200	40 to 64	66.1

a. mg/Kg – milligrams per kilogram
b. I - value reported is less than the practical quantification limit, and greater than or equal to the method detection limit
c. NC – no criteria
d. BDL – analyte was below detection limit

Table 18. Summary of large-bodied fish pesticide analysis for the LRSTA Phase I project during WY2014. (Values are micrograms per kilogram or µg/Kg).

Date Collected	Station	DDTr [a] (µg/Kg wet weight) (includes o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT)	Criteria								
			p,p'-DDE (µg/Kg wet weight) (Newfields, 2006) [b]					Whole fish benchmark for protection of fish-eating wildlife (Newell et al., 1987)	Whole fish total DDTr (µg/Kg dry weight; tissue residue) (Environment Canada, 1999)		Total DDTr (µg/Kg dry weight) (USEPA, 2000)
			Bald Eagle	Great Blue Heron	Little Blue Heron	White Pelican	Wood Stork	Whole fish total DDTr µg/Kg wet weight	Protection fish for consuming birds	Available tissue residue for protection of human health	Screening value for recreational fishers
14-Nov-13	LSRFISHC1	Insufficient fish were collected for pesticide analysis	14,700	10,000	5,200	12,200	10,100	200	1,000	320	117
11-Nov-13	LSRFISHC2	Bass 1.2									
11-Nov-13	LSRFISHC3	Bass 1.7 Bass 0.8 I [c] Bluegill 1.7 Bluegill 4.7									
14-Nov-13	LSRFISHDWN	Bass 0.22 I Bass 0.62 I Bass 0.23 I									

a. Key:
µg/Kg – micrograms per kilograms
o,p'-DDD: ortho, para dichlorodiphenyldichloroethane
p,p'-DDD: para, para dichlorodiphenyldichloroethane
o,p'-DDE: ortho, para dichlorodiphenyldichloroethylene
p,p'-DDE: para, para dichlorodiphenyldichloroethylene
o,p'-DDT: ortho, para dichlorodiphenyltrichloroethane
p,p'-DDT: para, para dichlorodiphenyltrichloroethane
b. Screening levels correspond to exposure equal to no-observed-adverse-effects levels, wet weight basis, for overall receptor diet.
c. I – value reported is less than the practical quantification limit, and greater than or equal to the method detection limit

STA PERFORMANCE EVALUATION

This section provides a summary of LRSTA Phase I project performance for the current reporting period as required in Specific Condition 32E of the permit. Hydrologic data discussed in this section are provided in Attachment C. Only Cells 1 and 2 went into flow-through operation during WY2014, while Cell 3 was undergoing repairs due to damage sustained in 2012 from Tropical Storm Isaac. Pumping operation in Cells 1 and 2 began on July 3, 2013, but only Cell 2 was allowed to discharge due to the continued presence of protected black-necked stilt (*Himantopus mexicanus*) nests in Cell 1. Flow-through operation in Cell 1 was initiated during July 2013, following confirmation that black-necked stilt nests were no longer present. The STA operated for less than ten months during WY2014, the first year of stabilization (flow-through) operation for the project.

Using the Nutrient Load Program (NLP), the SFWMD's standard program for calculating nutrient loads for the STAs (SFWMD, 2010), a monthly summary of flows, loads, and FWM TP concentrations was generated for the inflow and outflow points of Cells 1 and 2 of the LRSTA Phase I project. Flow data recorded at the inflow structure of Cell 1 (S-651) and Cell 2 (S-653) and the TP data collected at S-650, the inflow compliance monitoring point for the STA, were used in the NLP run to calculate inflow TP loads and FWM concentrations (**Tables 19** and **20**).

During WY2014, Cell 1 captured and treated 3,096 acre-feet (ac-ft) of runoff water from the S-191 basin and discharged 1,990 ac-ft back into L-47 canal (**Table 19**). Cell 1 retained 1.17 mt of TP out of the 1.22 mt it received in WY2014, for a treatment efficiency of over 95 percent. The difference in median inflow and outflow loads (81.9 versus 2.8 kilograms [kg]) was found to be statistically significant by the Mann-Whitney U test (U=8.00, P=0.002). As discussed in the *Total Phosphorus* section of this report, Cell 1 achieved a TP concentration reduction of 93 percent during this period. The median inflow FWM concentration of 287 µg/L was significantly higher than the median outflow FWM concentration of 22 µg/L, based on the Mann Whitney U test (U=0.00, P<0.001).

Table 19. Monthly flows, loads, and FWM TP concentrations at the inflow and outflow points of Cell 1 of the LRSTA Phase I project during WY2014.

Month	Inflow (S-651)			Outflow (S-652A)		
	Flow (ac-ft)	Load (kg)	FWM Concentration (µg/L)	Flow (ac-ft)	Load (kg)	FWM Concentration (µg/L)
May 2013	ND[a]	ND	ND	ND	ND	ND
June 2013	ND	ND	ND	ND	ND	ND
July 2013	308	192.8	508	99	4.0	33
August 2013	297	215.3	588	388	11.4	24
September 2013	113	57.2	411	38	1.1	22
October 2013	625	300.9	390	302	8.4	22
November 2013	112	39.8	287	24	0.5	19
December 2013	265	76.3	234	104	2.8	21
January 2014	345	87.6	206	156	2.9	15
February 2014	872	219.1	204	794	21.6	22
March 2014	156	33.2	173	85	2.4	23
April 2014	3	0.6	180	0	0.0	0
Sum	**3,096**	**1,222.8**	**320**[b]	**1,990**	**55.1**	**22**

a. ND – no flow-through data; b. 10-month FWM concentration average

Table 20. Monthly flows, loads, and FWM TP concentrations at the inflow and outflow points of Cell 2 of the LRSTA Phase I project during WY2014.

Month	Inflow (S-653)			Outflow (S-654A)		
	Flow (ac-ft)	Load (kg)	FWM Concentration (µg/L)	Flow (ac-ft)	Load (kg)	FWM Concentration (µg/L)
May 2013	ND	ND	ND	ND	ND	ND
June 2013	ND	ND	ND	ND	ND	ND
July 2013	807	529.9	532	416	12.4	24
August 2013	989	693.4	569	546	14.9	22
September 2013	166	85.6	420	100	2.5	20
October 2013	1154	569.7	400	351	7.6	18
November 2013	345	121.9	286	20	0.3	13
December 2013	1165	333.8	232	44	1.0	18
January 2014	920	229.8	203	4	0.1	25
February 2014	1386	341.1	199	352	11.2	26
March 2014	704	149.6	172	6	0.2	33
April 2014	27	6.1	179	0	0.0	
Sum	**7,663**	**3,060.9**	**324**[b]	**1,838**	**50.2**	**22**

ND – no flow-through data; b. 10-month FWM concentration average

Cell 2 performed better than Cell 1, removing practically all of the TP mass it received in WY2014 (**Table 20**). 3.06 mt of TP was loaded into Cell 2, while only 0.05 mt (50 kg) was discharged back into L-47 canal, resulting in a net TP load removal of 3.01 mt and a phosphorus removal efficiency of over 98 percent. The reduction in TP loads from inflow to outflow was highly significant based on Mann-Whitney U test results (U=4.00, P<0.001). Cell 2 had FWM TP concentrations of 323 and 22 µg/L at the inflow and outflow points, respectively, reflecting a net TP reduction of over 93 percent. Results of the Mann-Whitney U test show that the net reduction in TP concentration from inflow to outflow was highly significant (U=0.00, P<0.001).

Based on the statistical evaluation of preliminary performance data, it is clear that the project performed in a manner consistent with the design objectives and water quality performance estimates. During the 10-month operational period, the two cells combined removed 4.29 mt of TP from S-191 basin, for a treatment efficiency of over 97 percent. The design TP removal rate for LRSTA Phase I is 10 mt annually with a removal efficiency of 40 percent. Although the design load reduction was not met this reporting year, the project removed phosphorous with far greater efficiency than projected (40 percent) during the first year of stabilization operation. Once all three cells are operational, the project is expected to achieve the target load reduction goal of 10 mt.

The establishment of desirable wetland vegetation within the treatment cells will remain the focus of STA optimization efforts in WY2015. Currently, total vegetation cover in Cells 1, 2, and 3 is estimated to be 85, 90, and 70 percent, respectively. Dominant species include cattail (*Typha* spp.), torpedograss (*Panicum repens*), spikerush (*Eleocharis* spp.), pickerelweed (*Pontederia cordata*), maidencane (*Panicum hemitomon*), and pennywort (*Hydrocotyle* spp). To encourage natural recruitment of native wetland plants, efforts to eradicate undesirable vegetation in the cells will continue. During WY2014, the SFWMD treated 569 acres (230 hectares), and sprayed 59, 46, 162, 135, 32, and 135 pounds of diquat, flumioxazin, triclopyr, glyphosate, 2,4-D, and imazapyr, respectively, to treat various plant species that can impact cover of desirable species for water quality treatment or STA function (**Attachment D**).

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Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions, actions taken, and cross-references presented in this report for the LRSTA Phase I project (NEEPA permit 0287326-003).

Specific Condition	Description	Applicable Phase	Action Taken	Included in This Report As:			
				Narrative (page #s)	Figure	Table	Attachment
23	Stabilization/Post Stabilization	Stabilization	No action needed	1–4, 16, 20, 25–26		1	
23A1	Phosphorus/Stabilization	Stabilization	Achieved a net reduction in TP loads and concentration	2–3, 6, 25–26		4	B
23B	Dissolved Oxygen	Stabilization	DO was evaluated as required. Only Cell 3 outflow (S-656A) met applicable criteria for DO.	7–8		5–6	B
23C	Other Water Quality Parameters	Stabilization	No water quality parameters with Class III standards contributed to exceedances in terms of average outflow concentrations.	8–12		7	B
23D	Vegetation	Stabilization	No action needed	1–3, 26			D
24	Public Health, Safety, or Welfare	Stabilization	No action needed				
25	Data Quality	Stabilization	No action needed	4			B
25A	Quality Assurance and Quality Control	Stabilization	Sampling and analyses performed in accordance with Chapter 62-160, F.A.C. and the SFWMD's water quality monitoring plan	4			B
25B	Method Detection Limits (MDLs)	Stabilization	MDLs reported in accordance with Rule 62-4.246, F.A.C.				B
26	Routine Operational Monitoring Requirements	Stabilization	Monitoring conducted in accordance with the water quality monitoring plan	4			
27	Mercury and Other Toxicants Monitoring	Stabilization	Mercury and other toxicants monitoring conducted under Phase 2 -Tier 1, routine monitoring	12–24		8–18	B

Table A-1. Continued.

Specific Condition	Description	Applicable Phase	Action Taken	Included in This Report As: Narrative (page #s)	Figure	Table	Attachment
28	Removal of Parameters	Stabilization	No action needed				
29	Addition of Parameters	Stabilization	No action needed				
32	Annual Reports	Stabilization	Annual report (this document) was prepared and submitted as required	All	All	All	All
32A	General Information	Stabilization	General information included in the report	All	All	All	All
32B	Construction Summary	Stabilization	No action needed				
32C	Water Quality Data	Stabilization	All water quality data included in the report	4–26		4–20	B
32D	Hydraulic Retention Time	Stabilization	No action needed				
32E	Performance Evaluation	Stabilization	Statistical evaluation of STA performance was conducted	25–26		19–20	B
32F	Herbicide and Pesticide Tracking	Stabilization	Herbicides usage summarized in Attachment D	26			D
32G	Implementation Schedules	Stabilization	No action needed				
33	Vegetation Conditions	Stabilization	No action needed				
34	Factors Outside the Permittee's Control	Stabilization	No action needed				
35	Emergency Suspension of Sampling	Stabilization	No action needed				
36	Permit Modifications	Stabilization	No action needed				
37	Permit Renewal	Stabilization	No action needed				
38	Department Review and Approval	Stabilization	No action needed				

Attachment B: Water Quality Data

This project information is required by Specific Condition 32C of the Lakeside Ranch STA permit (0287326-003), and is available upon request.

Attachment C: Hydrologic Data

This project information is required by Specific Condition 32C of the Lakeside Ranch STA permit (0287326-003), and is available upon request.

Table C-1. Total monthly flow (in ac-ft) at the inflow and outflow points of the LRSTA Phase I for WY2014.

Month	Cell 1		Cell 2	
	Inflow (S-651)	Outflow (S-652A)	Inflow (S-653)	Outflow(S-654A)
May 2013	ND[a]	ND	ND[a]	ND
June 2013	ND	ND	ND	ND
July 2013	308	99	807	416
August 2013	297	388	989	546
September 2013	113	38	166	100
October 2013	625	302	1,154	351
November 2013	112	24	345	20
December 2013	265	104	1,165	44
January 2014	345	156	920	4
February 2014	872	794	1,386	352
March 2014	156	85	704	6
April 2014	3	0	27	0
Total	3,096	1,990	7,663	1,838

a. Flow-through commenced in July 2013

Table C-2. Total monthly rainfall (in inches) recorded at station S-308 near LRSTA Phase I for WY2014.

Month	Rainfall (inches)
May 2013	6.04
June 2013	7.40
July 2013	9.36
August 2013	4.85
September 2013	8.13
October 2013	2.60
November 2013	1.02
December 2013	0.37
January 2014	3.27
February 2014	2.67
March 2014	1.67
April 2014	0.69
Total	48.07

Attachment D: Herbicides Usage

This project information is required by Specific Condition 32F of the Lakeside Ranch STA permit (0287326-003), and is available upon request.

Table D-1. Herbicide usage for routine control and maintenance of undesirable vegetation within LRSTA Phase I during WY2014.

Herbicide	Area Sprayed (acres)	Total Applied (lbs.)	Targeted Vegetation
Diquat	46.3	20.0	Water lettuce
Flumioxazin	46.3	1.9	Water lettuce
Triclopyr	162	31.5	Primrose willow
Glyphosate	40	15.2	Torpedograss
Imazapyr	40	1.0	Torpedograss
Diquat	5.5	4.0	Floating plants
Glyphosate	25	30.4	Aquatic grass
2,4-D	25	7.6	Aquatic grass
Imazapyr	25	1.0	Aquatic grass
Diquat	6.9	6.0	Water lettuce
2,4-D	6.9	9.5	Water lettuce
Imazapyr	70	2.5	Primrose willow
Glyphosate	70	37.5	Primrose willow