Appendix 2-2: Annual Permit Report for the North Palm Beach County – Part 1 Project, L-8 Reservoir

Permit Report (May 1, 2010–April 30, 2011)
Permit Number: 0188365

Guy Germain

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SUMMARY

This annual permit report for the L-8 Reservoir Project (L8RP) was prepared for Water Year 2011 (WY2011, May 1, 2010 – April 30, 2011), and satisfies the reporting requirements specified in the permit (CERPRA permit 0188365). The report provides an evaluation of the results of the reservoir project's operations, and assesses whether any significant water quality degradation occurred as a result of utilizing the project's cells for temporary water storage. **Figure 1** is a basin map showing the area surrounding the L-8 Reservoir Project. **Figure 2** shows how the L-8 Reservoir Project connects to the regional system, and **Figure 3** shows the L-8 Reservoir Project facilities.

Water quality, stage, flow, and continuous specific conductance monitoring results are presented. **Table 1** list key permit-related information associated with this report for the L-8 Reservoir Project. Table A-1 in Attachment A shows a cross reference between the specific conditions in the permit and the annual report. Attachment B depicts flows for WY2011. Attachment C presents L-8 Reservoir Project piezometer depth to water data for WY2011. Detailed data for water quality, mercury in fish, specific conductance, and chloride are in Attachment D. Attachment E presents raw hydrological data.

The L8RP, which covers approximately 1,000 acres at an average depth of 40 feet, is made up of a series of interconnected rock pits from the mined-out portions of a limestone quarry in western Palm Beach County. The project scope included data compilation, screening and analysis, and a characterization of the water quality impacts from the L8RP. After the data screening and analyses were completed, trends were reviewed, and conclusions drawn based on the final data set. Based on the information presented in this document, and in compliance with permit requirements, no degradation in water quality has occurred to date in the L-8 canal or basin due to L8RP operation.

In WY2011, water from the cells and canals were sampled and tested for physical parameters, nutrients, gross alpha, and mercury. Sampling was conducted in the six reservoir cells (Class III waters), three sites in the L-8 canal (Class III waters), and one site in the M Canal (Class I water). The point at which compliance with the narrative and numerical Class III water quality standards is assessed is the outfall from the L8RP to the L-8 canal (SW6OUT). The exceptions are the Class

I water quality standard (WQS) for chloride and the Class III WQS for specific conductance, for which compliance is assessed at the edges of the FDEP-approved mixing zone at L8MZBN and L8MZBS. Monitoring locations are shown on **Figures 4** and **8**. Specific conductance was the only parameter that exceeded Class III standards at the outflow structure. Water quality data indicate that chlorides and specific conductance are higher in the cells than in the L-8 and M canals.

Table 1. Key permit-related information for the L-8 Reservoir.

Project Name:	L-8 Reservoir Project
Permit Number:	Base: 0188365 Latest Mod: 0188365-014
Issue and Expiration Date:	Issue: March 30, 2007 Expiration: March 30, 2012
Project Phase:	Completed
Permit Condition Requiring Annual Monitoring Report:	Specific Condition 11, page 8
Relevant Period of Record:	May 1, 2010–April 30, 2011
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Table 2. Attachments included with this report.

Attachment	Title
A	Specific Conditions and Cross-References
B	Total Monthly Flow at the Inflow and Outflow Points of the L-8 Reservoir for WY2011
C	L-8 Reservoir Project Piezometer Depth to Water Data for WY2011
D	Raw Data for Water Quality and Mercury in Fish
E	Raw Data for Hydrology

During this reporting period, the L-8 and M canal sites had higher concentrations of nutrients (mainly nitrogen and phosphorus species) than the L-8 Reservoir Project cells (**Table 6**, **Figure 5**). Nutrient concentrations within the L8RP reported since it began test-phase operation in December 2001 have frequently been lower than samples collected from the L-8 and M canals. The L8RP cells are not a source of nutrients, and no other major contributing sources of nutrients are known, other than the L-8 canal.

During WY2011, the average gross alpha concentration was over four times higher at the outflow structure (SW6OUT) than at the M canal structure (SW3) (**Table 6**). In past water years, the cells routinely contained values above the Class III criteria. Gross alpha values in the L-8 and M canals are very low. Class III requirements were met at the compliance points. It has been shown in the past and currently that the higher gross alpha concentrations from the reservoir do not affect the concentrations of gross alpha in the L-8 or M canals.

Mercury analyses were performed during this reporting period on fish samples. Mosquitofish samples were collected from each of the cells and in the L-8 Canal adjacent to Cell 3 (L8GRC). Large-bodied fish samples (bluegill and largemouth bass) were collected at a downstream site (GRL) 15 miles east of the L-8 Reservoir in the M Canal by the outflow to Grassy Waters Preserve. Currently, the U.S. Environmental Protection Agency's (USEPA) recommended methylmercury (MeHg) fish tissue human consumption criterion is 0.3 milligrams per kilogram (mg/kg) for the edible portions of all fish species. Total mercury (THg) is measured as a substitute of MeHg in fish from South Florida. THg in largemouth bass from the downstream site exceeded the USEPA recommended limit for human consumption but was below the 75^{th} percentile of THg level in largemouth bass for the WCAs. This exceedance was likely due to unstable hydrology in the Grassy Water Preserve where seasonal dryout promoted mercury oxidation in the soil.

On February 18, 2011, the South Florida Water Management District (SFWMD or District) submitted an application to the Florida Department of Environmental Protection (FDEP) requesting temporary relief from Specific Condition 22 of CERPRA Permit No. 0188365-012, in the form of an exemption pursuant to Subsection 373.406(6), Florida Statutes, for the purpose of conducting a dry season operational pilot test. This exemption provided temporary relief from the 800-meter mixing zone authorized in the L-8 CERP permit. While in place, the compliance point for chlorides was extended to Lake Mangonia. This lake supplies drinking water for the city of West Palm Beach. The pilot test utilized the L-8 Reservoir as an alternative water supply source for the delivery of water to the Grassy Waters Preserve and Northwest Fork of the Loxahatchee River during the 2011 dry season (February–April). Subsequently, on February 28, 2011, the FDEP authorized a temporary deviation from the permit requirement to allow water from the L-8 Reservoir to be delivered eastward into the Grassy Waters Preserve for eventual delivery north to the Northwest Fork of the Loxahatchee River for a limited duration of time (30 non-consecutive days). On March 29, 2011, the District provided the FDEP with initial water quality results from the pilot operational test and requested an additional 30-day (non-consecutive) extension of the pilot test to collect further information necessary for the design and planning aspects associated with the Loxahatchee River Watershed Restoration Project. In accordance with the requirements of Section 373.406(6), Florida Statutes, the FDEP reviewed this information on April 4, 2011, and granted the District an extension of the pilot test for an additional 30 days. A separate report on the results of the pilot test is being prepared and will be submitted to FDEP when complete.

INTRODUCTION

Water quality sampling for the L-8 Reservoir Project began in November 2001. In February 2003, FDEP executed a Consent Agreement (OGC File No. 030272-50 RO) that allowed the connection of Pits C and D (Cell 1) to the reservoir project pits. In March 2003, the South Florida Water Management District (SFWMD or District) submitted the First Annual Monitoring Report to the Florida Department of Environmental Protection (FDEP). This report presents the results of the L-8 Reservoir Project's monitoring program. The objective is to ensure that the discharge water meets water quality standards, and that water quality is suitable for water supply and environmental deliveries through the city of West Palm Beach M canal. The assessment is required by the permit to ensure that the collection and analysis of the water quality data complied with FDEP-approved quality assurance/quality control (QA/QC) procedures.

DESCRIPTION OF REGIONAL SYSTEM

The L-8 basin encompasses approximately 170 square miles, with the majority located in northwestern Palm Beach County and approximately 2 square miles in southwestern Martin County (**Figure 1**). The majority of the land in the Upper L-8 basin is comprised of the J.W. Corbett Wildlife Management Area, owned and managed by the Fish and Wildlife Conservation Commission, and DuPuis Reserve, owned and managed by the SFWMD. However, there are areas in close proximity to Lake Okeechobee that consist of agricultural land. The Lower L-8 basin, located downstream of the M canal includes the Indian Trail Improvement District (ITID) service area and several square miles of agricultural and rural area.

The regional flow in the L-8 basin (**Figure 2**) is complex and has several operating procedures that affect the flow into and out of the system. The upstream water source is Lake Okeechobee via SFWMD's Culvert 10A. Culvert 10A is a structure consisting of five 10-ft diameter corrugated metal pipe (CMP) culverts with inverts at elevation 5.5 ft National Geodetic Vertical Datum (NGVD). Four of the culverts have flap gates on the lake side, and the center barrel has a 10 ft x 10 ft operable slide gate. Therefore, the inflow into the L-8 canal through Culvert 10A is a function of the head difference between the lake and canal water levels. Throughout the L-8 basin, water is discharged into the L-8 canal for drainage as well as withdrawn for water use. The current water use consists of both public water supply and irrigation. The water used for public water supply is pumped using the city of West Palm Beach's Control 2 Pump Station located on the M canal. Water then flows east via the M canal and eventually to the city's water supply lakes, Lake Mangonia, and Clear Lake, where it is withdrawn for treatment.

Water in the L-8 canal is withdrawn from and discharged to the L-8 canal during the operation of the L-8 Reservoir Project. The withdrawal/discharge location is south of the confluence of the L-8 and M canals. The reservoir is used for storage of excess runoff from the basin to reduce discharges from the basin to the C-51 canal and ultimately to tide. The water stored can then be either discharged during the dry season for water supply for the city of West Palm Beach or for environmental purposes. During the wet season, the water can be discharged back into the L-8 canal between storm events at relatively lower rates, once the stage in the L-8 canal has dropped to within normal operating range to recover storage capacity in the reservoir.

Discharges into the L-8 canal, excluding Lake Okeechobee and the L-8 Reservoir at Palm Beach Aggregates, Inc. (PBA), include Indian Trail Improvement District and Water Conservation Area 1 (WCA-1). The water discharged from ITID consists of the stormwater runoff from the 19,000-acre M-1 basin. Water is discharged from the ITID M-1 Basin Impoundment Area through its L-8 outfall structure located approximately 11 miles north of State Road 80. The discharges from WCA-1 are dependent on the operating criteria of SFWMD's structures S-5AS, S-5AE, and S-5AW.

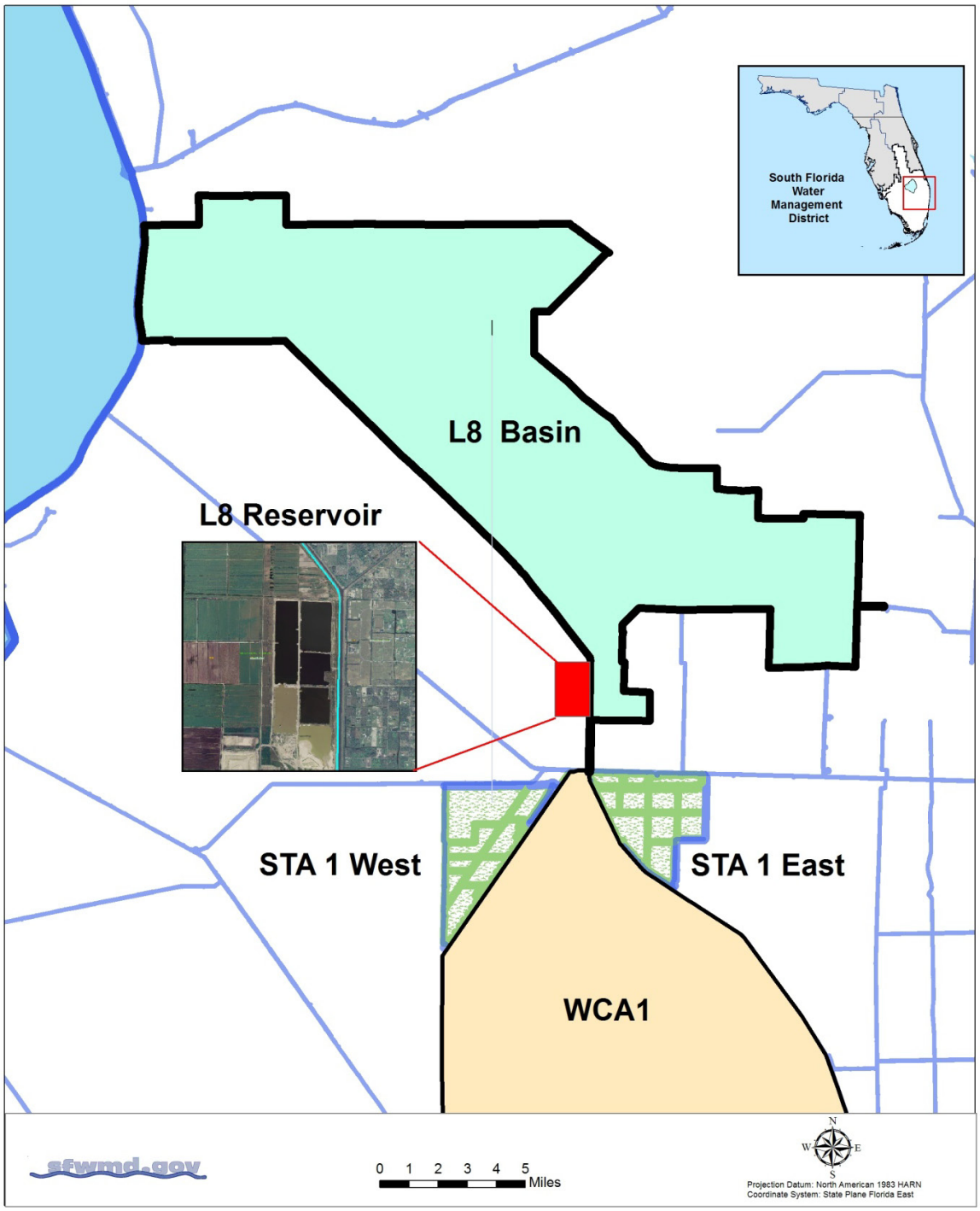

Figure 1. L-8 Reservoir and Basin.

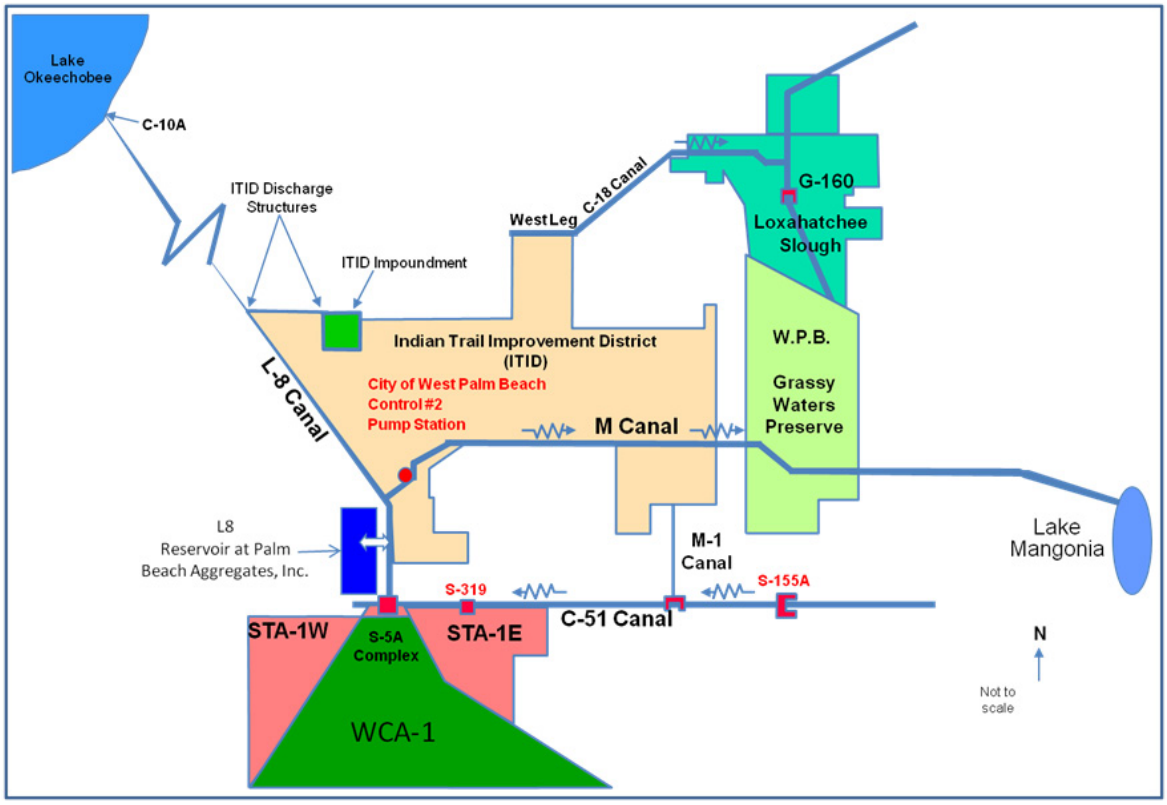

Figure 2. L-8 Reservoir Project connections to the regional system.

L-8 RESERVOIR PROJECT

LOCAL HYDROLOGY

The mining operation in the cells associated with the L-8 Reservoir Project is complete and no longer influences the project operation. Mining operations still continue on other areas of PBA property, west of the L-8 Reservoir site.

The inflow structure from the L-8 canal to Cell 1/2 consists of two 72 inch x 472 linear feet of reinforced concrete pipe (RCP) culverts with invert elevations of +7.5 ft NGVD, each with a 6 ft x 6 ft sluice gate, and another 100 ft of 72-inch CMP culvert. The discharge structure is equipped with one 75 cubic feet per second (cfs) capacity pump that discharges to the water control structure box, and out of the twin 72-inch RCP culverts to the L-8 canal. In May 2008, two additional 37.5 cfs diesel pumps were added to the discharge location to aid in the draw down for the seepage test. A successful seepage test was conducted in February 2009, after which the two diesel pumps were removed. The seepage test was part of the acquisition agreement between the SFWMD and PBA before final payment to PBA could occur. Flow data are provided in Attachment B.

GEOLOGY

The PBA rock quarry is located in central Palm Beach County, Florida, and is centered approximately 2 miles north of SR 80, near 20-Mile Bend. The area surrounding PBA was historically used for agricultural purposes, and to some extent continues to be utilized for growing of sugarcane and turf. Within the last decade or so, PBA and its predecessor (GKK, Inc.) have mined soil and rock materials for the purpose of building and road construction. The quarry was subdivided into six pits, and each pit was dewatered by pumping from sumps and perimeter rim ditches. Each pit was originally excavated to approximately 30 feet below surrounding grade for mining purposes. Each pit has been excavated further to approximately 50 feet below surrounding grade for the reservoir project.

Based upon review of the U.S. Geological Survey (USGS) Loxahatchee, Florida quadrangle map, dated 1971 and photo-revised 1984, the PBA site has a natural ground surface elevation of approximately +15 feet with respect to the National Geodetic Vertical Datum of 1929 (NGVD). Research of the Soil Survey of Palm Beach County Area, Florida, published by the U. S. Department of Agriculture, Soil Conservation Service (SCS) indicates the site is masked by the soil association Holopaw fine sand. This is nearly level, poorly drained sand that has loamy subsoil at a depth of 40 to 72 inches. Under natural conditions (i.e., absent drainage improvements), the water table is near the ground surface.

According to the "Guide to the Physiographic Divisions of Florida" (Brooks and Merrit, 1981), the site lies between the Eastern Flatwoods District (Green Ridge-Loxahatchee Karst) and the Gold Coast and Florida Bay District (Everglades, Andytown Ridges and Sloughs). The Green Ridge-Loxahatchee Karst is described as poorly drained open flatwoods with cypress strands and heads, while the Andytown Ridges and Sloughs is a freshwater marsh with varying thickness of peat. In his "Geologic Map of Florida," Dr. Brooks maps the site as Qftg, the Fort Thompson Group. This area consists of clastic and shell deposits associated with the middle and early Pleistocene stands of sea level.

Geologic conditions at the PBA site consist of thin depths of surficial peat and sands over a relatively thick deposit of well-cemented sand and shell of marine origin. The cemented layer is referred to as the "Carbonate Rich" zone. It has been reported that the South Florida peninsula formerly existed with sea stands considerably higher than those that currently exist (LBFH and DE&T, 2005). A series of shallow inland tidal channels became home for thousands of marine animals. These and other life forms accumulated over time into reefs, which later lithified into the cemented sand and shell "Carbonate Rich" zone. Beneath this layer, a thick deposit of sand and gravel with some cemented zones is common to this geologic area.

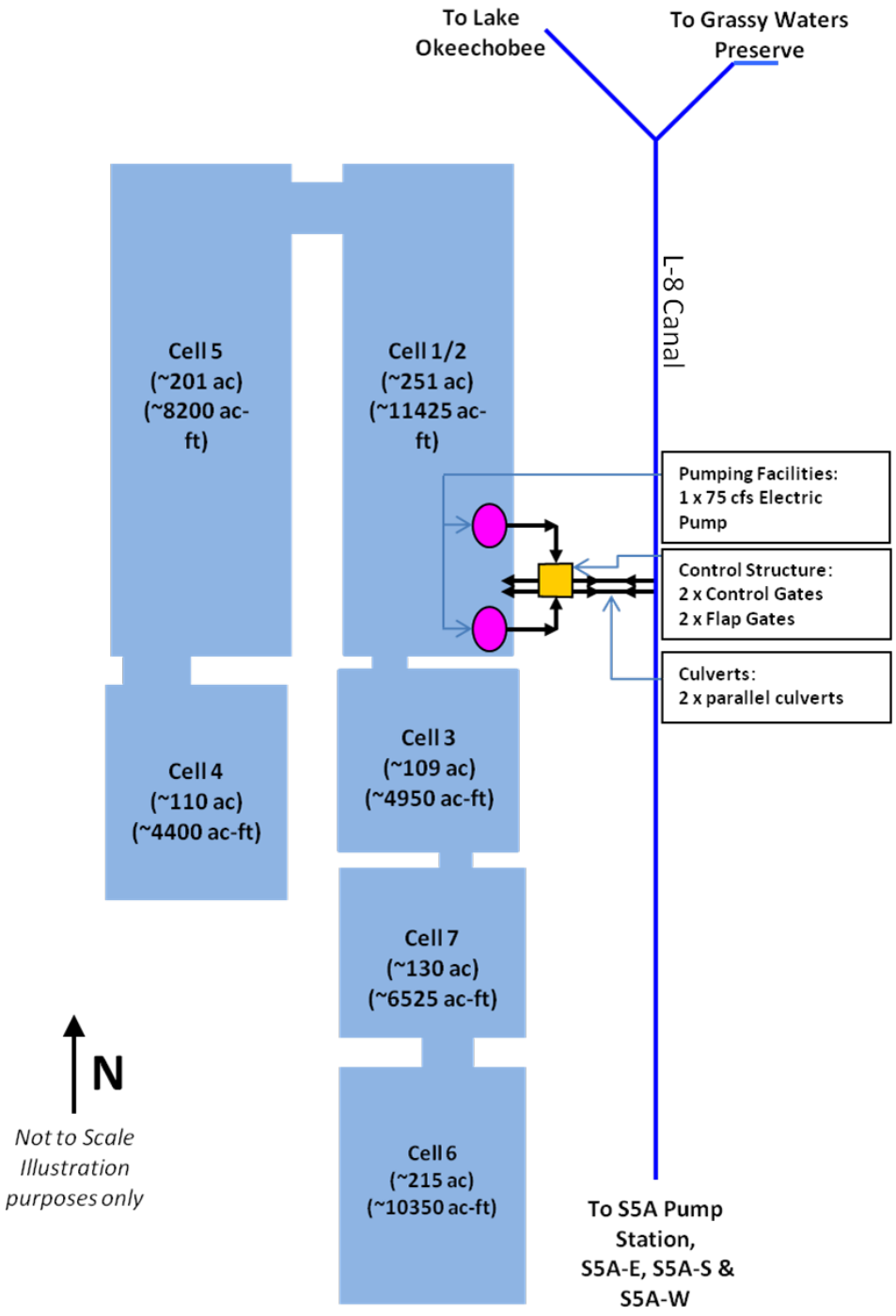

Figure 3. L-8 Reservoir project facilities.

WATER QUALITY

MONITORING LOCATIONS

Surface water sampling locations are listed in **Table 3** and shown on **Figure 4**.

Table 3. Surface water quality monitoring locations.

Sample Station	Sample Location	Coordinates	
		Latitude	Longitude
SW-3	M Canal at the west side of the Seminole Pratt Whitney Road bridge	264553.918	801825.728
SW-6IN	Inflow Structure Southeast corner of Cell 1/2	264338.836	802149.982
SW-6OUT	Outflow Structure Southeast corner of Cell 1/2	264339.412	802154.419
L8MZBN	L-8 Canal 800 meters north of the discharge location	264404.689	802147.253
L8MZBS	L-8 Canal 800 meters south of the discharge location	264313.305	802148.492

Note: Latitude and Longitude coordinates are in Degrees Minutes and Decimal Seconds

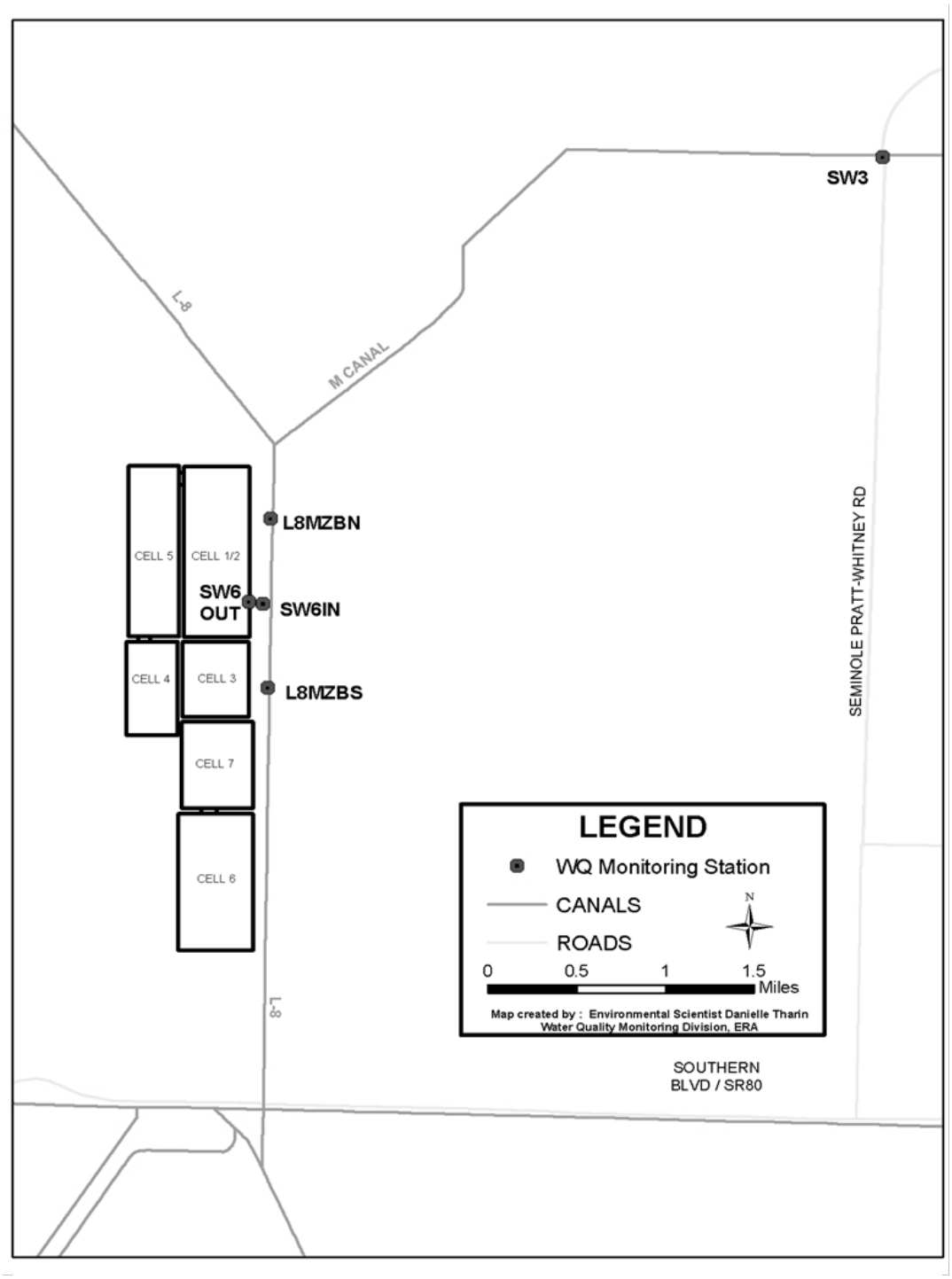

Figure 4. L-8 Reservoir Project water quality sampling locations.

SAMPLING PROTOCOL

Surface water samples were collected from all sampling locations on a weekly basis only during inflow or outflow events (**Figure 4**). Gross alpha is sampled monthly only during inflow and outflow events at SW6OUT and SW3. SW3 is a downstream reference site sampled weekly when water is discharged from the reservoir. During this reporting period all monitoring was conducted by District staff. The samples were obtained from 0.5 meters below the water surface. Specific conductivity, pH, dissolved oxygen, and temperature were measured in the field for all samples.

Water Quality Standards

Review of Chapter 62-302.530, Florida Administrative Code (F.A.C.), Criteria for Surface Water Quality Classifications, indicates the following water quality criteria for Class I (Potable Water Supply) and Class III (Predominantly Fresh Waters) Waters for selected analytical parameters (**Table 4**).

Table 4. Surface water quality criteria.

Parameter	Units	Surface Water Criteria	
		Class I	Class III
Chlorides	mg/L	≤ 250	NA
Specific Conductance	µS/cm	≤ 1275*	≤ 1275*
Dissolved Oxygen	mg/L	≥ 5.0	≥ 5.0
pH	Standard	6.0 < pH < 8.5	
Gross Alpha	pCi/L	≤ 15	≤ 15

Notes:

µS/cm = µS/cm = microSiemens per centimeter

mg/L = milligrams per liter

pCi/L = picoCuries per liter

* 1,275 µS/cm or 50% above background, whichever is greater.

Data Summary Tables

Table 5. Statistical summary of physical parameters monitored in the M and L-8 canals and L-8 Reservoir during WY2011.

Temperature (°C)						pH (units)					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	14	23	23	---	---	Count	14	23	23	---	---
Avg	31.0	27.3	27.6	---	---	Avg	7.71	8.02	8.40	---	---
STD	1.2	3.5	3.5	---	---	STD	0.14	0.37	0.09	---	---
Min	27.6	20.9	21.2	---	---	Min	7.50	7.30	8.10	---	---
25%	30.4	24.4	24.3	---	---	25%	7.60	7.73	8.40	---	---
Median	31.4	28.2	28.2	---	---	Median	7.70	8.10	8.40	---	---
75%	31.8	30.3	30.6	---	---	75%	7.80	8.38	8.40	---	---
Max	32.3	32.2	33.2	---	---	Max	8.00	8.50	8.50	---	---
Dissolved Oxygen (mg/L)						**Specific Conductance (µS/cm)**					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	14	22	22	---	---	Count	14	23	23	21	21
Avg	6.03	6.82	8.21	---	---	Avg	436	1,281	2,009	912	1,160
STD	1.04	2.12	1.12	---	---	STD	80.2	669.0	133.9	684.9	591.7
Min	4.61	3.55	7.07	---	---	Min	339	353	1,423	345	571
25%	5.07	4.90	7.40	---	---	25%	361	529	2,006	435	674
Median	5.92	6.54	7.83	---	---	Median	443	1,202	2,042	469	989
75%	6.80	8.77	8.66	---	---	75%	466	1,976	2,052	1,360	1,983
Max	8.11	10.60	10.90	---	---	Max	593	2,144	2,135	2,160	2,081
Sulfate (mg/L)						**Calculated Chloride (mg/L)[a]**					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	14	22	23	---	---	Count	---	---	23	21	21
Avg	19.2	91.6	159.1	---	---	Avg	---	---	390.7	151.7	205.7
STD	9.9	52.7	6.9	---	---	STD	---	---	29.2	149.3	129.0
Min	6.2	14.8	139.0	---	---	Min	---	---	263.0	28.0	77.3
25%	8.4	46.3	156.3	---	---	25%	---	---	390.2	47.7	99.8
Median	24.8	80.0	158.0	---	---	Median	---	---	398.0	55.0	168.4
75%	27.8	151.0	162.8	---	---	75%	---	---	400.0	249.2	385.1
Max	31.0	172.0	170.0	---	---	Max	---	---	418.2	423.7	406.5

Note:

[a] Chlorides were calculated from specific conductance using the equation specified in CERPRA Permit No. 0188365-008: Chloride = 0.218(Specific Conductance) - 47.2. Chloride equation has a specific conductance range limit of 270 - 3847 µS/cm.

--- Data was not available

Table 6. Statistical summary of nutrients and radiological parameters monitored in the M and L-8 canals and L-8 Reservoir during WY2011.

Total Phosphorus (mg/L)						Total Kjeldahl Nitrogen (mg/L)					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	14	23	23	---	---	Count	14	23	23	---	---
Avg	0.081	0.070	0.015	---	---	Avg	1.01	1.17	0.89	---	---
STD	0.018	0.044	0.003	---	---	STD	0.15	0.20	0.05	---	---
Min	0.058	0.015	0.009	---	---	Min	0.80	0.94	0.81	---	---
25%	0.067	0.035	0.013	---	---	25%	0.92	1.01	0.86	---	---
Median	0.081	0.059	0.015	---	---	Median	0.95	1.09	0.88	---	---
75%	0.094	0.097	0.018	---	---	75%	1.10	1.30	0.93	---	---
Max	0.123	0.181	0.020	---	---	Max	1.32	1.62	0.99	---	---
Nitrate + Nitrite as N (mg/L)						**Total Nitrogen (mg/L)**					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal	Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	14	23	23	---	---	Count	14	23	23	---	---
Avg	0.046	0.102	0.005	---	---	Avg	1.05	1.27	0.89	---	---
STD	0.057	0.097	0.002	---	---	STD	0.19	0.29	0.05	---	---
Min	<0.005	<0.005	<0.005	---	---	Min	0.81	0.94	0.81	---	---
25%	0.005	0.005	0.005	---	---	25%	0.92	1.03	0.86	---	---
Median	0.011	0.082	0.005	---	---	Median	0.95	1.18	0.88	---	---
75%	0.099	0.146	0.005	---	---	75%	1.21	1.44	0.93	---	---
Max	0.159	0.317	0.014	---	---	Max	1.42	1.89	0.99	---	---

Gross Alpha (pCi/L)					
Statistics	SW-3 M Canal	SW-6IN L8 Canal	SW-6OUT Cell 1/2	L8MZBN L8 Canal	L8MZBS L8 Canal
Count	5.0	---	7.0	---	---
Avg	1.7	---	7.7	---	---
STD	0.6	---	1.4	---	---
Min	<1.2	---	6.3	---	---
25%	1.2	---	6.6	---	---
Median	1.7	---	7.0	---	---
75%	2.0	---	9.1	---	---
Max	2.6	---	9.8	---	---

Note: --- Data was not available

ASSESSMENT OF WATER QUALITY DATA

Surface water quality data for the L-8 Reservoir Project (May 2009–April 2010) and mercury in fish are provided in Attachment D.

Gross Alpha

Gross alpha is a by-product of radioactive decay and occurs naturally in the environment. It is present in varying amounts in nearly all rock, soils, and water. Gross alpha was sampled at two sites; SW6OUT and SW-3 (see **Table 6**). The average gross alpha concentration was over four times higher at the outflow structure (SW6OUT) than at the M canal structure (SW3). Gross alpha at SW6OUT ranged from 6.3 to 9.8 picoCuries per liter (pCi/L). Gross alpha at SW-3 ranged from <1.2 pCi/L to 2.6 pCi/L. The state criterion is <15 pCi/L for both state Class I and Class III waters. Based on the Class I and III criterion, there were no gross alpha values above the criterion at any of the monitoring locations. Therefore, water from the L-8 Reservoir Project does not appear to cause or contribute to an increase in gross alpha in the L-8 or M canals during normal operations.

Nutrients

The nutrients analyzed in the L-8 and M canals and L-8 Reservoir include total phosphorus (TP), total Kjeldahl nitrogen (TKN), NOX (NO2+NO3) and total nitrogen (TN). All nutrients had higher concentrations in both canals than in the reservoir (**Table 6**; **Figure 5**). **Table 6** also shows the highest TP concentration from the reservoir at SW6OUT was 0.02 milligrams per liter (mg/L), while the highest in the canals was 0.181 mg/L. The highest TN concentration in the reservoir was 0.99 mg/L, and the highest TN concentration in the canals was 1.89 mg/L. Based on available data, the L-8 Reservoir does not appear to cause or contribute to an increase of phosphorus or nitrogen in the L-8 basin.

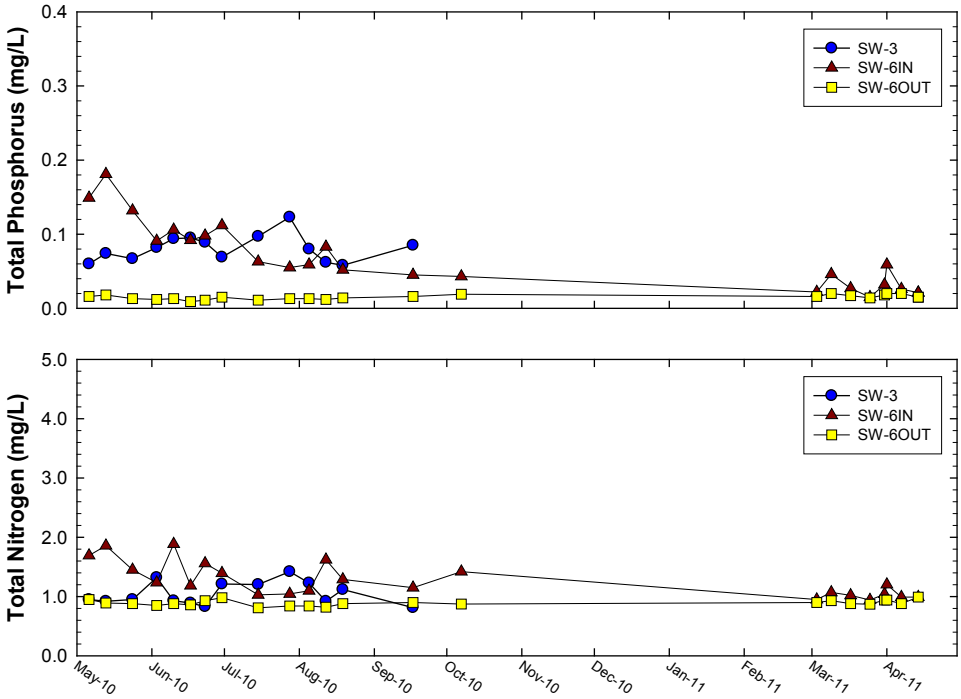

Figure 5. Time series plots of total phosphorus and total nitrogen measured at three structures during WY2011.

Physical Parameters

The physical parameters analyzed in the reservoir and canals include temperature, dissolved oxygen, pH, specific conductance, and calculated chloride. As shown on **Figure 6** and in **Table 5**, specific conductance was consistently higher in the reservoir than in the canal sites. The mixing zone monitoring sites L8MZBN and L8MZBS were initiated in October 2007. These sites are located 800 meters north and south of where the discharge water enters the L-8 canal. These sites are monitored every 15 minutes for specific conductance along with SW6OUT when water was discharged from the reservoir. Time-weighted daily average values required by the CERPRA permit were calculated from the 15 minute values recorded, are provided in Attachment D.

The average daily specific conductance is required to be less than 1,275 microsiemens per centimeter (µS/cm) at the mixing zone boundaries. As shown in **Figure 6** and **Table 5**, specific conductance concentrations recorded during routine sample collection (inflow and outflow events) did exceed the state Class III criteria for conductivity of <1,275 µS/cm at the two mixing zone sites because of the pilot test (noted in the *Summary* section of this appendix) that occurred from March–May 2011. In order to conduct the pilot test, an exemption was granted. This exemption provided temporary relief from the 800-meter mixing zone authorized in the L-8 CERP permit. While in place, the compliance point for chlorides was extended to Lake Mangonia. At SW3 (M Canal Class I site, which has the same criteria as Class III), conductivity levels did not exceed the <1,275 µS/cm criteria at any time during WY2011. SW6OUT had an average concentration of 2,009 µS/cm, with a maximum of 2,135 µS/cm. SW6IN had an average concentration of 1,281 µS/cm, with a maximum of 2,144 µS/cm. SW3 had an average concentration of 436 µS/cm, with a maximum of 593 µS/cm. These findings show that even though conductivity levels may be above the Class III criteria within the reservoir, it is well mixed and diluted as it is pumped to the M canal. On July 21, 2011, an 800-meter mixing zone for specific conductivity from the point of discharge of the L-8 Reservoir was authorized through August 26, 2013 (permit modification 0188365-015).

Calculated chloride concentrations are presented in **Table 5** and **Figure 7**. Chlorides were calculated from the specific conductance values recorded when routine samples were collected only during inflow and outflow events by using the following equation (specified in CERPRA Permit 0188365-008): [Chloride = 0.218(Conductivity) – 47.2]. Since chloride is derived from specific conductance, the same scenarios for specific conductance explained above apply to chloride. There is no state Class III standard for chloride. SW6OUT and SW6IN exhibited the same increases as mentioned above for conductivity. Daily specific conductance and calculated chloride data for the L-8 Reservoir Project are provided in Attachment D.

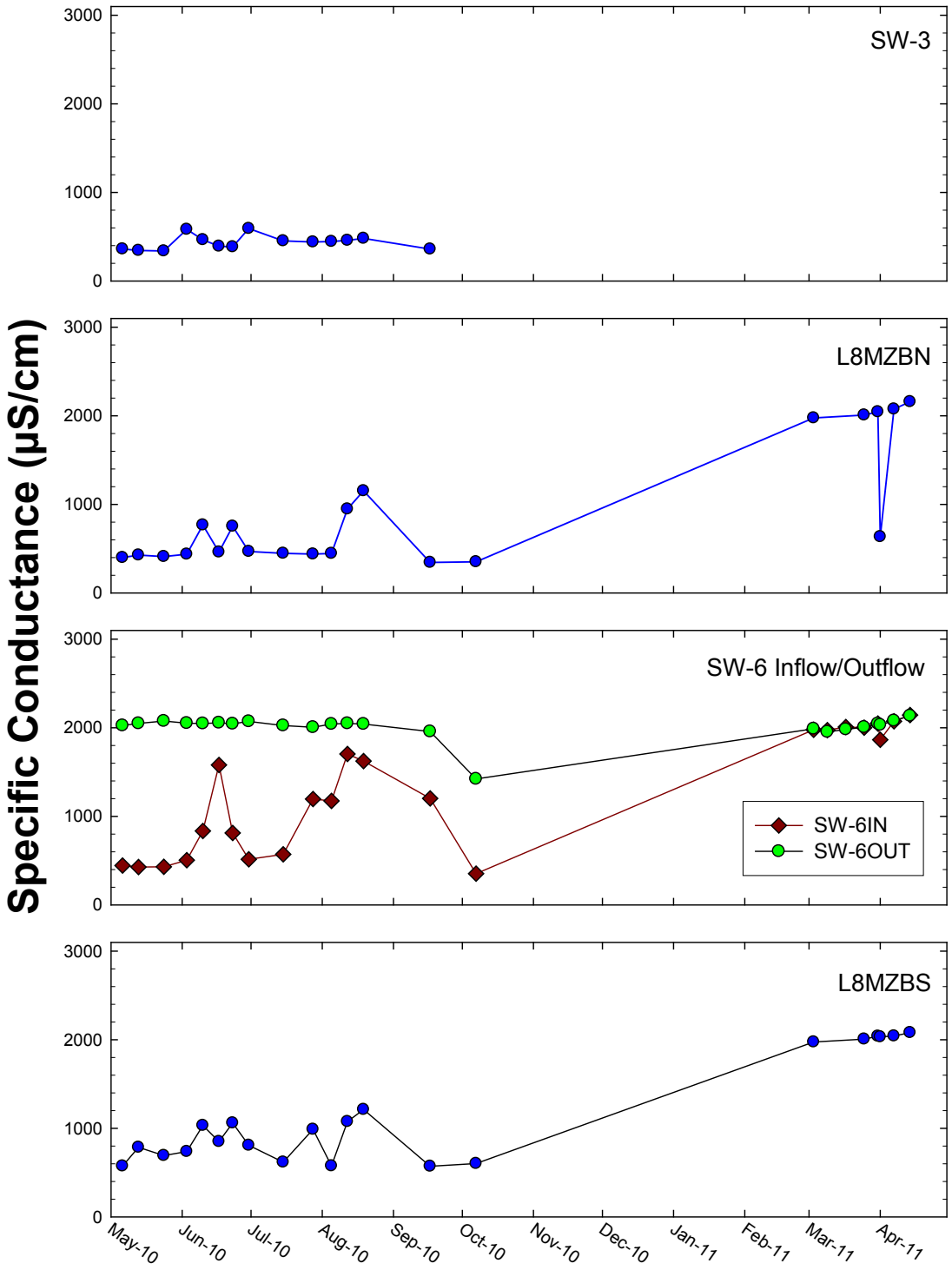

Figure 6. Time series plots of specific conductance levels at three structures and two mixing zone stations (L8MZBN and L8MZBS) during WY2011.

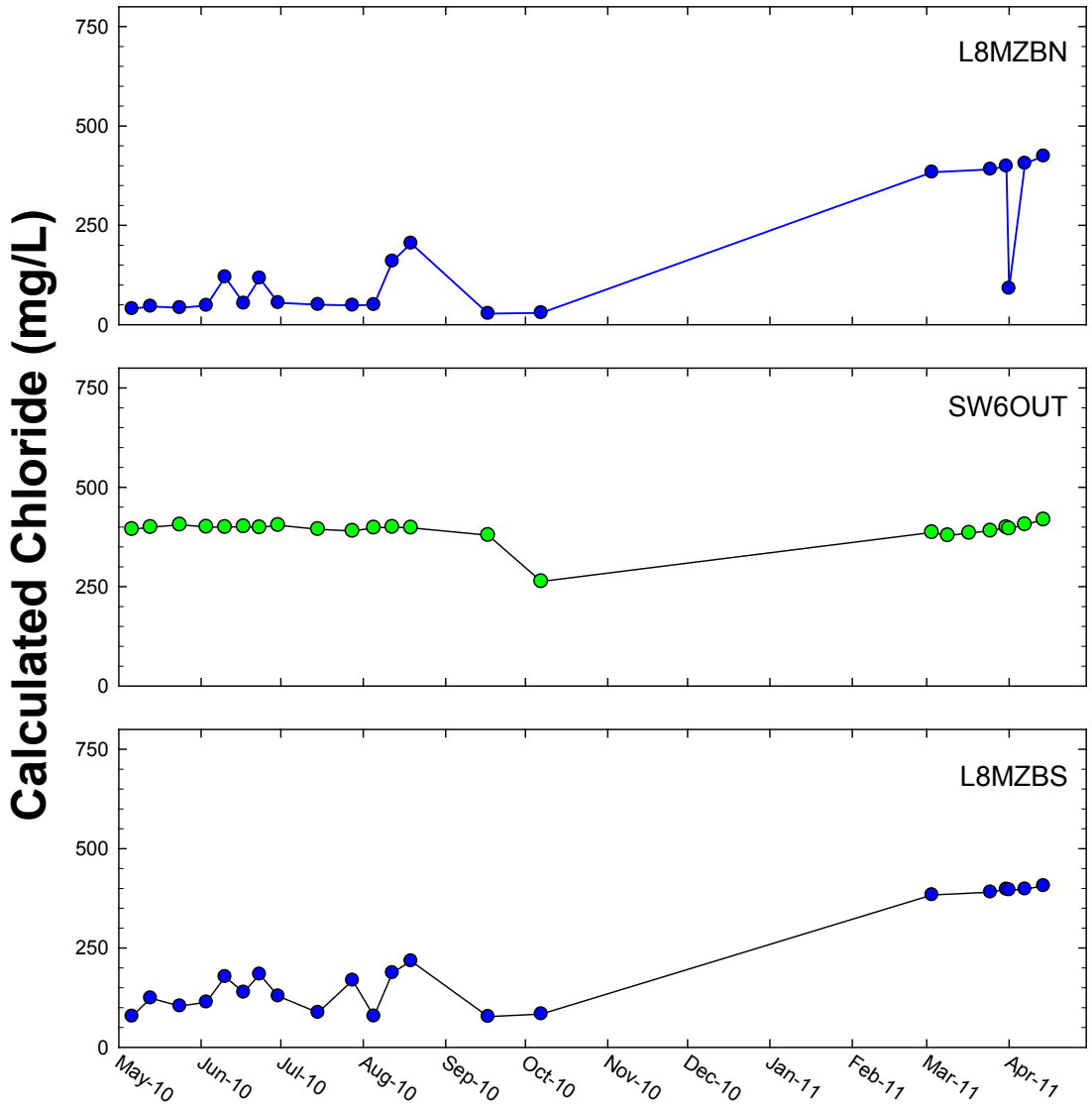

Figure 7. Time series plots of calculated chloride levels at the outflow structure to the L-8 canal (SW6OUT) and mixing zone stations (L8MZBN and L8MZBS) during WY2011.

MERCURY MONITORING

On December 31, 2009, the FDEP issued the District a minor permit modification (0188365-012-EM), where mercury monitoring for the L-8 reservoir project be updated to reflect the transfer from Phase 2-Tier 1 (Routine Monitoring During Stabilization Period) to Phase 3-Tier 1 (Routine Operational Monitoring from Year 4 to Year 9). In Phase 3-Tier 1, surface water sampling is discontinued, frequency of mosquitofish (*Gambusia holbrooki*) collection is reduced to semiannually, but was taken three times in WY2011. Mosquitofish are collected and combined together from all the cells (named L8FISH) and from a location adjacent to the L-8 Reservoir in the L-8 canal (L8GRC) and analyzed for total mercury (THg). Frequency of large-bodied fish collection is reduced to one collection event every three years and was not scheduled for WY2011. Annually sunfish (*Lepomis* sp.*)* and largemouth bass (*Micropetrus salmoides*) were also collected and analyzed for THg at GRL, a site about 15 miles east of the L-8 Reservoir in the M canal by the outflow to Grassy Waters Preserve. **Figure 8** shows the locations of the monitoring sites for mercury.

The U.S. Environmental Protection Agency's (USEPA) recommended methylmercury (MeHg) fish tissue criterion is 0.077 mg/kg for trophic level II and III fish and 0.346 mg/kg for bass. Total mercury (THg) was measured as a substitute of MeHg in fish from south Florida. **Table 7** shows all the samples collected during this reporting period. THg concentrations in mosquitofish from the L-8 Reservoir are well below the USEPA standards. However, the average THg concentration for sunfish (0.089 mg/kg) and largemouth bass (0.494 mg/kg) from GRL were above these standards. This site has been exposed to seasonal dryout where soil oxidaiton may lead to high mercury methylation rates in this location.

The 75th percentiles for the period of record (WY1998–WY2010) for mosquitofish is 0.082 mg/kg, sunfish is 0.240 mg/kg, and largemouth bass is 0.675 mg/kg. **Table 7** shows that all the samples collected during this reporting period for water and fish have results well below these standards.

All fish species collected from the interior and downstream sampling locations do not show a statistical temporal increase in THg concentration between the calendar years 2006 and 2010 ($p < 0.05$).

Table 7. Total mercury from fish in the L-8 Reservoir and L-8 and M canals for WY2011.

Mosquitofish	Station	Sampling Dates				WY1998-WY2009 75th Percentile	FDEP Criterion
Ultra-trace Total Mercury[a] (mg/kg)		6/3/2010	10/5/2010	3/28/2011		0.082	NA
	L8GRC	0.011	0.023	0.019			
		6/3/2010	10/5/2010	3/28/2011			
	L8FISH	0.048	0.024	0.057			
Large Fish (Bluegill and Bass)[b]	**Station**	**No. of Samples**	**Bluegill**	**No. of Samples**	**Bass**	**WY1998-WY2009 75th Percentile[c]**	**USEPA Criterion**
Ultra-trace Total Mercury (mg/kg)	GRL	5	0.089	5	0.494	0.240/0.675	0.077/0.346

NOTES:

[a] = Mosquitofish data were determined from composite samples consisitng of 100 fish

[b] = THg concentrations for bluegill and largemouth bass are averages of five individuals each

[c] = 75th percentile levels for Bluegill / Bass

NA = Not Applicable

L8GRC = Telemetry platform in L-8 Canal east of Cell 3

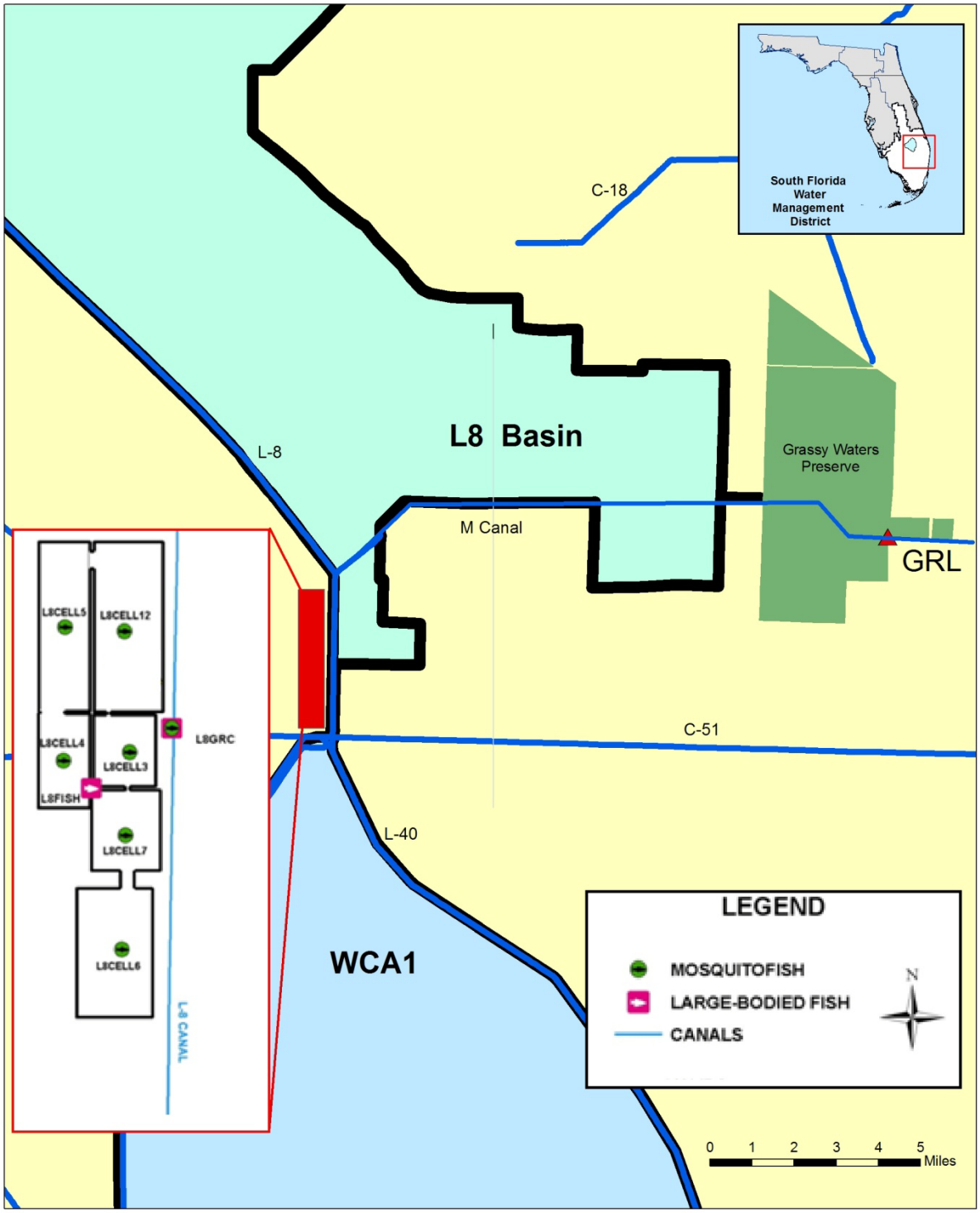

Figure 8. Mercury monitoring locations.

PESTICIDE MONITORING

Per permit minor modification 0188365-010-EM, dated July 30, 2009, all pesticide monitoring has been eliminated from the L-8 Reservoir Project. As such, no pesticides results are included in this year's report.

WATER QUALITY CONCLUSIONS

Based on the preceding analyses and results, and in compliance with permit requirements, there has been no degradation in water quality due to the operation of the L8RP in the L-8 canal or basin in this reporting period.

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Brooks, H.K., and J.M. Merritt. 1981. Guide to the Physiographic Divisions of Florida. Florida Cooperative Extension Service Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Fl.

Florida Administrative Code, Section 62-302.530, Criteria for Surface Water Quality Classifications. On-line at https://www.flrules.org/gateway/ruleno.asp?id=62-302.530.

LBFH, Inc. and DE&T. 2005. L-8 Reservoir Project Water Quality Assessment Report. Prepared for the South Florida Water Management District, West Palm Beach, FL

USEPA. 2001. Water Quality Criteria: Notice of Availability of Water Quality Criterion for the Protection of Human Health: Methylmercury. U.S. Environmental Protection Agency, Federal Register Environmental Document. On-line at http://www.epa.gov/fedrgstr/EPA-WATER/2001/January/Day-08/w217.htm.

Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions, actions taken, and cross-references presented for the L-8 Reservoir Project (CEPRA Permit No. 0188365) in this report.

Specific Condition	Description	Applicable Phase	Action & Frequency	Reported in 2012 SFER *(All references are to Volume III, unless otherwise noted)*			
				Table	Narrative	Figure	Attachment
3	Best Management Practices (BMPs)	Only during Construction	Did not occur during WY2011				
4	Turbidity Monitoring	Only during Construction	Did not occur during WY2011				
5	Water Quantity and Flooding Impacts		No impacts occurred during WY2011				
6	Operating Plan		Was followed during WY2011				
7	Water Reservation/Allocation		Complied with, as required.				
8	Monitoring Requirements		Monitoring conducted as required.				B,C,D
9	Mercury Monitoring		Monitoring conducted as required.	2,7	1,3,18	8	D
10	Daily Monitoring of Stage		Monitoring conducted as required.		1		D
11	Annual Water Quality Monitoring Requirements and Reporting		Monitoring and reporting conducted as required.	1,2,3,4,5,6	1,3,4,9,11, 14,15,20	4,5,6,7	B,C,D
12	Quality Assurance and Quality Control		Our lab Followed all appropriate criteria				D
13	Method Detection Limits (MDLs)		Our lab Followed all appropriate criteria				D

Specific Condition	Description	Applicable Phase	Action & Frequency	Reported in 2012 SFER *(All references are to Volume III, unless otherwise noted)*			
				Table	Narrative	Figure	Attachment
14	Removal of Parameters		No parameters were removed during WY2011				
15	Addition of Parameters		No parameters were added during WY2011				
16	Emergency Suspension of Sampling	N/A	N/A				
18	Permit Modifications		No permit modifications occurred during WY2011				
19	Construction	Only during Construction	No new construction occurred during WY2011				
20	Permit Renewal	N/A	N/A				

Attachment B: Total Monthly Flow at the Inflow and Outflow Points of the L-8 Reservoir for WY2011

Table B-1. Total monthly flow at the inflow and outflow points of the L-8 Reservoir for WY2011.

Month	Inflow[1]	Outflow[2]
	(acre-feet)	(acre-feet)
May 2010	93	3201
June 2010	81	3494
July 2010	447	2376
August 2010	262	1510
September 2010	0	1951
October 2010	2293	0
November 2010	0	0
December 2010	0	0
January 2011	0	0
February 2011	0	0
March 2011	0	5299
April 2011	0	2864

Notes:

1. The flows were computed based on the following data:
   a) Break Point (15-minutes) readings of the L-8 Canal levels were used as head water elevations while break-point reservoir levels were used as tail water elevations.
   b) Break-point gate openings were obtained from the operations provisional database.

2. The flows were computed based on the following DBHYDRO data:
   a) The constant pump speed of the electric pump is 440 RPM.
   b) Break Point (15-minutes) readings of the reservoir levels were used as head water elevations.

Attachment C: L-8 Reservoir Project Piezometer Depth to Water Data for WY2011

Table C-1. Piezometer depth-to-water data.

	PZ5A	PZ5B	PZ5C	PZ5D	PZ8A	PZ8B
Piezometer Depth (feet)	15.5	35.5	55.5	75.5	20	40
Surveyed Elevation (TOC in feet) (03/29/07) ± 0.1	22.95	23.08	23.19	23.02	26.8	26.57
Actual Depth (feet (3/29/07)	18	38.02	58.2	78.3	23.02	43.14
	Depth to Water (feet)					
Dates Measured	**PZ5A**	**PZ5B**	**PZ5C**	**PZ5D**	**PZ8A**	**PZ8B**
5/6/2010	12.6	12.74	12.86	12.71	15	14.91
5/20/2010	17.26	17.41	17.52	17.35	18.96	18.73
9/17/2010	14.57	14.82	14.99	14.95	15.83	15.92
10/7/2010	14.5	14.77	14.95	14.95	15.81	15.91
4/7/2011	17.55	17.68	17.78	17.61	18.79	18.73

Attachment D: Raw Data for Water Quality and Mercury in Fish

This project information is required by Specific Condition 11(a) of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) Permit-Operations Authorization for the L-8 Reservoir Project, and is available upon request.

Attachment E:
Raw Data for Hydrology

This project information is required by Specific Condition 11(a) of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) Permit-Operations Authorization for the L-8 Reservoir Project, and is available upon request.