Appendix 2-4: Annual Permit Report for the C-111 Spreader Canal Phase 1 (Western) Project

Permit Report (May 1, 2013–April 30, 2014)
Permit Number: 0293559

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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:	C-111 Spreader Canal Phase 1 (Western) Project
Permit Number:	0293559-007
Issue and Expiration Date:	Issued: 10/8/2009; Expires: 10/8/2014
Project Phase:	Operations
Permit Specific Condition Requiring Annual Report:	35
Reporting Period:	May 1, 2013–April 30, 2014
Report Lead:	Chelsea Qiu cqiu@sfwmd.gov 561-682-6196
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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

PROJECT STATUS

During Water Year 2014 (WY2014), the project was in the regular operational and monitoring phase.

CONCLUSIONS REGARDING PROJECT SUCCESS

The project operated smoothly and as expected. This project is one of the components of the Comprehensive Everglades Restoration Plan (CERP). Although improvement of flows in Taylor Slough may be partly attributed to the benefits of this project (see the discussion of flows in the *Hydrometeorological Monitoring Summary* section of this report), it is too early to evaluate the project's success in achieving its objectives with the current phase and with less than two years of operation and monitoring data. However, we are encouraged by the observed hydrologic pattern of increased flow in Taylor Slough and decreased salinity in Florida Bay, which are anticipated outcomes of the project. A longer monitoring period and assessment during a wide range of meteorological conditions will reduce uncertainty about the relationship between the project's operations, stages, and flows in Taylor Slough, and salinity in Florida Bay.

PROBLEMS ENCOUNTERED

During the reporting period, through letters and at public meetings, local growers reported adverse effects to their crops from flooding in the C-111 basin agricultural areas located north of S-178.

ACTIONS TO ADDRESS PROBLEMS

To investigate concerns of local growers and to obtain a better understanding of the impact of the project on local groundwater, the South Florida Water Management District (SFWMD or District) is continuing to collect data from the existing monitoring network and is in the process of expanding the groundwater data collection network.

INTRODUCTION

PROJECT OVERVIEW

Project Description and History

The C-111 Spreader Canal Phase 1 (Western) (C-111 SCW) Project is one of the key projects that make up the Comprehensive Everglades Restoration Plan (CERP). It is the first CERP project constructed with direct benefit to Everglades National Park (ENP) including Florida Bay. The project is located in southern Miami-Dade County, and bounded by ENP, the Florida City-

Homestead area, and Manatee Bay. The project was implemented by SFWMD in cooperation with the United States Army Corps of Engineers (USACE).

Project Objective

The objective of the C-111 SCW Project is to improve the quantity, timing, and distribution of water delivered to Florida Bay via Taylor Slough, to improve the hydroperiod and hydropattern in the Southern Glades and Model Lands, and to reduce ecologically damaging flows to Florida Bay and other receiving waters. These objectives will be accomplished by implementing multiple, often separate, project features in phases.

The initial phase of the C-111 SCW Project is also known as the "Western Components" in the C-111 Spreader Canal Western Project Final Project Implementation Report and Environmental Impact Statement (USACE and SFWMD 2011), referred to as the PIR. The "Eastern Components" identified in the PIR are not part of this permit, and are therefore not included in this report.

Project Features

The following features are associated with the C-111 SCW Project (**Figure 1**):

- Frog Pond Detention Area (FPDA) and S-200 Inflow Pump Station
- Aerojet Canal Impoundment/Modifications including weirs and S-199 Inflow Pump Station
- Plugs in the C-110 Canal (north of the C-111 canal)
- Plug in the L-31E Canal (south of the S-20 structure)
- Incremental Operational Adjustments to Structures S-18C and S-20 (this has not yet been implemented)
- Construction of the S-198 Control Structure (not yet constructed; may be built in the future, if needed)

As stated in the C-111 SCW Project PIR, surface water flows will not be discharged directly into Taylor Slough or ENP by this project. The FPDA and Aerojet Canal features are intended to work in unison to create an approximately nine-mile hydraulic ridge adjacent to ENP. The ridge will serve to prevent groundwater flows moving into the C-111 canal from ENP and retain water in Taylor Slough, improving the quantity, timing, and distribution of flows into Florida Bay. Water removed from the C-111 canal to form the hydraulic ridge in the detention areas will gradually infiltrate into the ground and seep back into the canal. This water will then be pumped back via S-199 and S-200 to maintain the hydraulic ridge, lessening the volume of water from ENP that seeps east.

Frog Pond Detention Area

The FPDA is approximately 516 acres, and includes a 225-cubic feet per second (cfs) pump station (S-200), an aboveground header channel, and three detention cells (Cells 1-3). A cascading header canal retains water until the stage reaches approximately two and a half feet above existing ground level before the water flows into the three cells that make up the detention area. The header cell is supplied with water by a lined conveyance channel located along the northern edge of the reservoir. The 225-cfs pump station consists of three 75-cfs pumps to allow stepped operations (for more details, see the *Operation Record* subsection in the *Operations* section of this report).

Aerojet Canal

A second 225-cfs pump station (S-199) was constructed immediately upstream of the existing S-177 structure to route water to the Aerojet Canal. This pump station works in tandem with the FPDA and has similar operating criteria. This pump station discharges water to an aboveground flow-way, which in turn discharges to the Aerojet Canal.

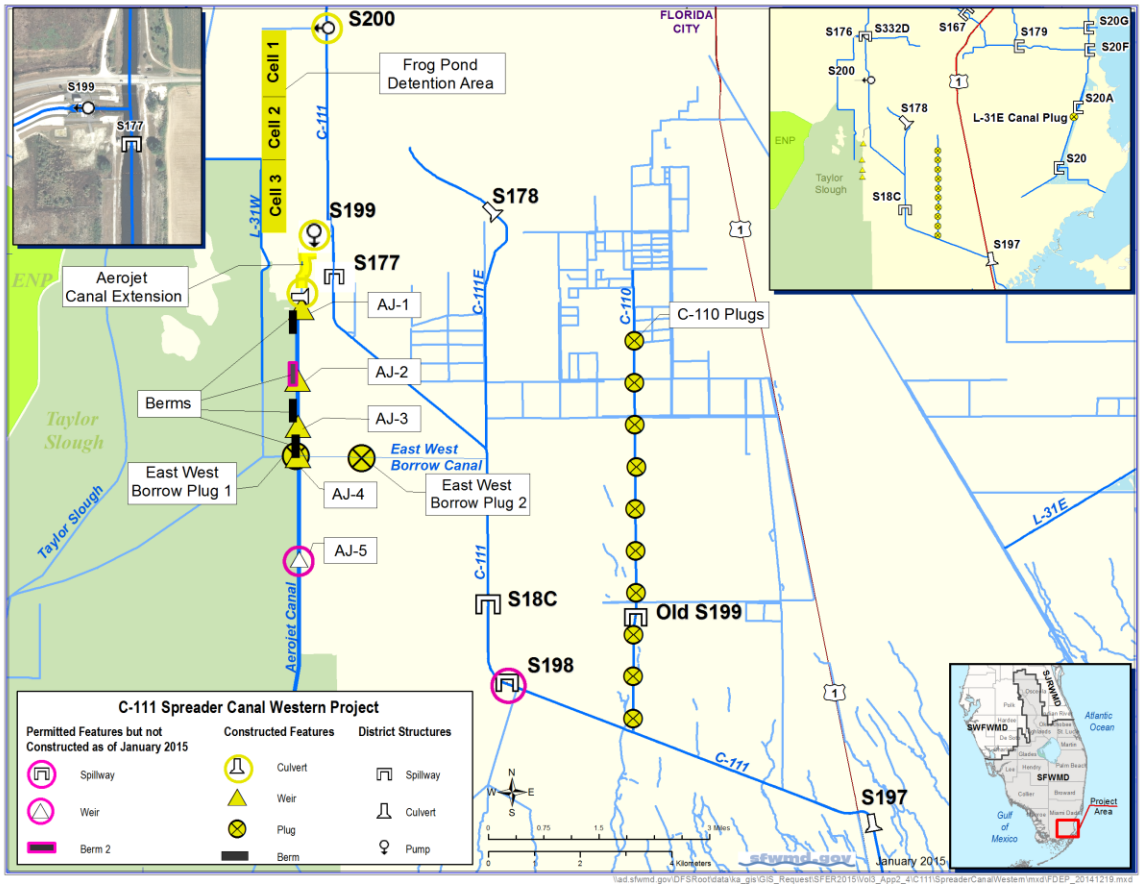

Figure 1. C-111 Spreader Canal Western (C-111 SCW) Project features.

PERMIT HISTORY

The original CERPRA permit and all modifications issued to SFWMD by FDEP are:

- 0293559-001, issued October 8, 2009, with an expiration date of October 8, 2014.
- 0293559-002, issued March 25, 2010, modified the design plan for the Aerojet Canal.
- 0293559-003, issued April 13, 2010, included the use of public water supply to service field office (trailer) restrooms.
- 0293559-004, issued June 9, 2010, included the use of an additional 1.43 acres adjacent to the FPDA project footprint to stockpile construction material.
- 0293559-005, issued June 20, 2011, included remedial actions within the former Blue Heron Aqua Farm fish farm infiltration pond, and changed the stage and flow monitoring locations.
- 0293559-006, issued December 20, 2011, expanded the project footprint, and clarified start-up monitoring requirements for the FPDA and long-term operational water quality monitoring requirements.
- 0293559-007, issued November 21, 2012, modified routine monitoring plans, including significant monitoring reductions. This annual report follows the requirements of the reduced monitoring plans.
- On January 9, 2014, FDEP approved elimination of other toxicants monitoring requirements associated with the permit.

OPERATIONS

INSPECTION/MAINTENENCE PROGRESS

An annual inspection of project features was conducted between September 1, 2013, and February 28, 2014. The inspection report was submitted separately to FDEP.

OPERATION RECORD

C-111 SCW Project features are intended to operate in conjunction with existing Central & Southern Florida (C&SF) Project features. The existing features are currently operated as outlined in the USACE's Everglades Restoration Transition Plan (ERTP). The C-111 SCW Project is a restoration project and only redistributes existing water within the lower C-111 basin. The project does not provide any new water to the regional system and, thus, poses no change to existing water supply operations.

The C-111 SCW Project resulted in two new operable pump stations upstream of S-177 (S-200 and S-199). Pump station S-200, which was constructed downstream of S-176, is intended to initiate pumping prior to reaching the open trigger for flood control operations at S-177 (currently when the headwater stage at S-177 reaches elevation 4.2 feet National Geodetic Vertical Datum of 1929 (ft NGVD)). It consists of three individual 75-cfs electric pumps that will trigger according to the schedule in **Table 3**. More information is available in the Preliminary Project Operating Manual (PPOM) (SFWMD 2013).

Table 3. S-200 pump station on/off headwater triggers [a]. [Note: cfs – cubic feet per second; ft NGVD – feet National Geodetic Vertical Datum of 1929.]

Pump	Rating	Pump on Elevation	Pump off Elevation
Unit 1	75 cfs	3.8 ft NGVD	3.6 ft NGVD
Unit 2	75 cfs	3.9 ft NGVD	3.6 ft NGVD
Unit 3	75 cfs	4.0 ft NGVD	3.6 ft NGVD
S-177 [b]	1,400 cfs	Open 4.3 ft NGVD	Close 3.6 ft NGVD

a. In addition to the headwater criteria listed above, all pumps will be shut off if the tailwater at S-200 reaches 8.5 ft NGVD29. Pumping at S-200 will also cease if ponding at a predetermined representative site, monitoring station R3110, within designated Cape Sable Seaside Sparrow Critical Habitat Unit 2 (C) (Subpopulation C) exceeds ten centimeters (elevation 4.95 ft NGVD29) during the critical portion of the nesting season, as identified by U.S. Fish and Wildlife Service, which is March 15 to June 30.

b. With S-177, open/close is shown for comparison.

During current operation of the S-332D pump station, a significant amount of the pumped water returns to the C-111 canal as seepage from one or more of the S-332D cells. In order to reduce S-177 openings, the S-200 pumps may also be used on a "one-to-one" basis with the 125-cfs pumps at pump station S-332D, at any time that the S-177 headwater is at or above elevation of 3.8 ft NGVD. For example, if two of the 125-cfs diesel pumps are on at S-332D and the S-177 headwater is at least 3.8 ft NGVD, then up to two of the S-200 pumps can be turned on independent of the stages in **Tables 3** and **4.** The intent is not to restrict operations to a specific plan, but to allow for flexibility in order to maintain the stages within the operating range.

To avoid overtopping and to ensure the stability of the FPDA, pumping will cease if the stage in the header channel reaches 8.5 ft NGVD. Pumping at S-200 will also cease if ponding at a predetermined representative site, in this case monitoring station R3110, which is within designated Cape Sable Seaside Sparrow (CSSS) Critical Habitat Unit 2 (C), exceeds ten centimeters (elevation 2.36 ft NGVD) during the critical portion of the nesting season, March 15 to June 30, as identified by the U.S. Fish and Wildlife Service (USFWS). Operations at pump station S-199, which has been constructed immediately upstream of S-177 (downstream of Ingraham Highway [Florida State Road 9336]), mirror those at S-200, as shown in **Table 4**.

Table 4. S-199 pump station on/off headwater triggers [a].

Pump	Rating	Pump on Elevation	Pump off Elevation
Unit 1	75 cfs	3.8 ft NGVD	3.6 ft NGVD
Unit 2	75 cfs	3.9 ft NGVD	3.6 ft NGVD
Unit 3	75 cfs	4.0 ft NGVD	3.6 ft NGVD
S-177 [b]	1,400 cfs	Open 4.3 ft NGVD	Close 3.6 ft NGVD

a. In addition to the headwater criteria listed above, all pumps will be shut off if the tailwater at S-199 reaches 8.0 ft NGVD. Pumping at S-199 will also cease if ponding at a predetermined representative site, in this case monitoring station EVER4, within designated Cape Sable Seaside Sparrow Critical Habitat Unit 3 (D) (Subpopulation D) exceeds ten centimeters (elevation 2.36 ft NGVD) during the critical portion of the nesting season, from March 15 to June 30, as identified by U.S. Fish and Wildlife Service.

b. With S-177, open/close is shown for comparison.

Similar to the FPDA, in order to avoid overtopping, and to ensure stability of the Aerojet Canal perimeter berms, pumping will cease if the stage in the Aerojet Canal at the S-199 tailwater reaches 8.0 ft NGVD. Pumping at S-199 will also cease if ponding at a predetermined representative site, in this case monitoring station EVER4, which is within designated CSSS Critical Habitat Unit 3 (D), exceeds ten centimeters (elevation 2.36 ft NGVD) during the critical portion of the nesting season, March 15 to June 30, as identified by USFWS.

Incremental change of trigger stages at S-20 and S-18C, as described in Section 3 of the PPOM, is currently on hold. It was decided to delay the start of incremental testing of higher operating criteria at S-20 and S-18C due to concerns over local flooding. It is difficult to make a determination at this time whether the project has adversely affected adjacent lands in terms of flooding based on the limited duration of the data set. Monitoring will be continued through collection of groundwater well data, installation of additional wells in Fiscal Year 2015, and verification and potential collection of micro-topography data. The District will report changes in the next annual report and conduct interagency meetings when such information is available.

HYDROMETEOROLOGICAL MONITORING SUMMARY

There are 12 monitoring stations covered in the hydrometeorological monitoring plan. Their locations are shown in **Table 5** and **Figure 2**. Two of the stations collect rainfall data, in addition to flows and/or stages, while the other stations measure only flows and/or stages in the project area. Hydrometeorological data reported here were obtained from databases maintained by three government agencies: the District (DBHYDRO), U.S. Geological Service (USGS; Everglades Depth Estimation Network), and ENP.

Table 5. Hydrometeorological monitoring sites and parameters in the project area.

Site	Latitude	Longitude	Agency	Parameter	Reporting
S-200 (HW &TW)	25°26'38.95"	80°33'37.27"	SFWMD	Stage & Flow	Daily Average
S-199 (HW &TW)	25°24'11.63"	80°33'32.71"	SFWMD	Stage & Flow	Daily Average
S-177 (HW &TW)	25°24'10.41"	80°33'30.22"	SFWMD	Stage, Flow & Rainfall	Daily Average
S-18C (HW &TW)	25°19'50.42"	80°31'30.22"	SFWMD	Stage, Flow & Rainfall	Daily Average
S-197 (HW &TW)	25°17'13.43"	80°26'29.21"	SFWMD	Stage & Flow	Daily Average
C111AW (new Ag well)	25°23'35.47"	80°34'87.22"	SFWMD	Stage	Daily Average
C111AE (new Ag well)	25°23'33.37"	80°32'29.81"	SFWMD	Stage	Daily Average
NP-EPS (EPSW)	25°16'49.90"	80°30'11.42"	ENP	Stage	Daily Average
USGS-G-3356	25°25'08.30"	80°25'39.80"	USGS	Stage	Daily Average
R3110	25°26'46.00"	80°37'34.00"	USGS	Stage	Daily Average
EVER4	25°20'19.50"	80°32'48.00"	USGS	Stage	Daily Average
Taylor Slough Bridge	25°24'06.41"	80°36'24.22"	ENP	Flow	Daily Average

Note:
Ag – agriculture
ENP – Everglades National Park
HW – headwater
SFWMD - South Florida Water Management District
TW – tailwater
USGS – U.S. Geological Survey

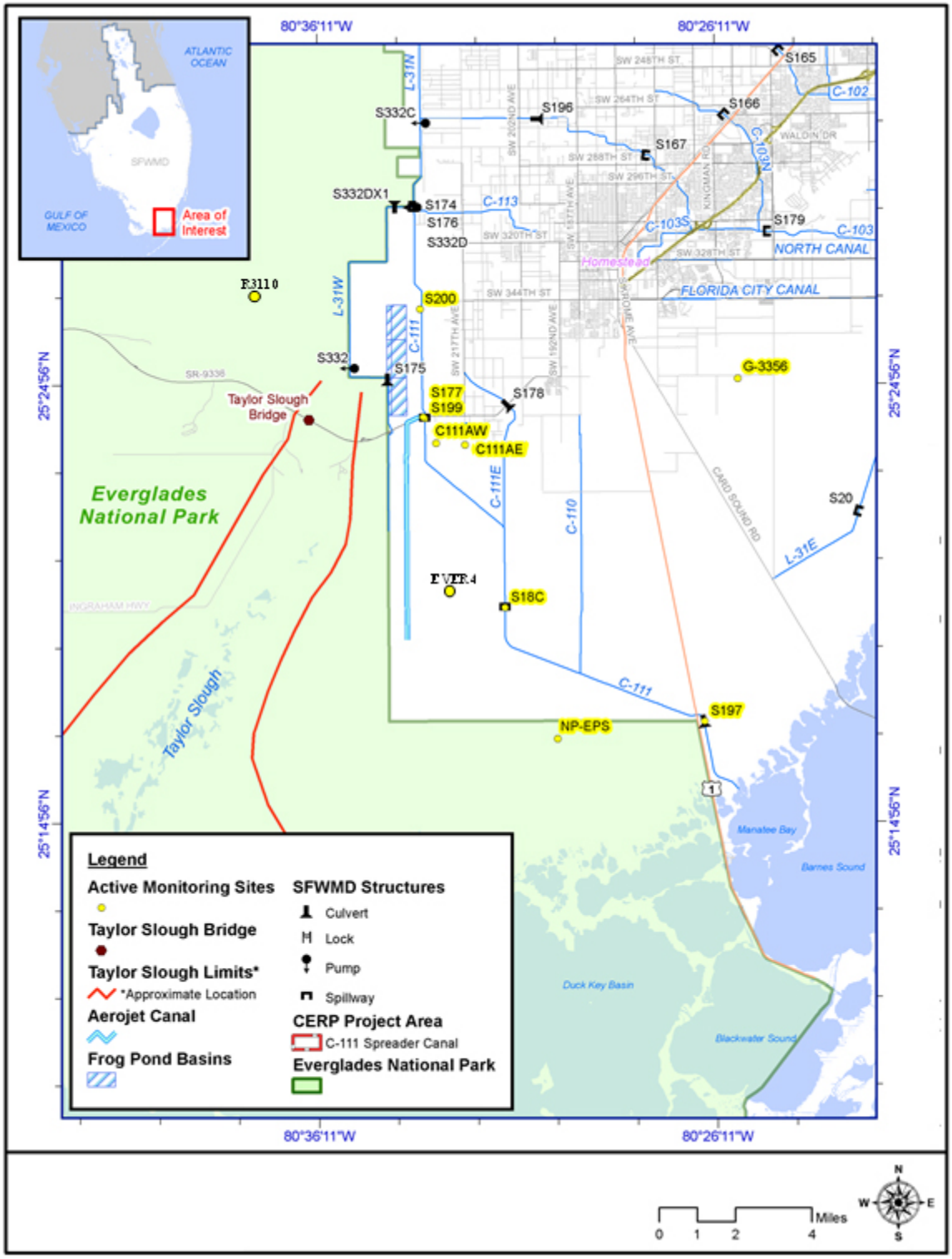

Figure 2. Hydrometeorological monitoring sites in the project area.

Table 6. Comparison of monthly rainfall in WY2014 (May 1, 2013–April 30, 2014) and historical averages in the project area.

Month	Total of Rainfall at S-177 (inches)	Total of Rainfall at S-18C (inches)
	WY 2014	WY 2014
May 2013	10.6	10.4
Jun 2013	5.6	5.3
Jul 2013	12.1	9.2
Aug 2013	5.6	3.1
Sep 2013	2.4	4.8
Oct 2013	1.7	2.6
Nov 2013	7.0	5.8
Dec 2013	1.8	1.8
Jan 2014	0.8	1.3
Feb 2014	2.2	1.9
Mar 2014	1.4	1.7
Apr 2014	0.7	1.0
Annual	**51.9**	**49.0**

Note: The historical annual rainfall in the project area is about 57 inches.

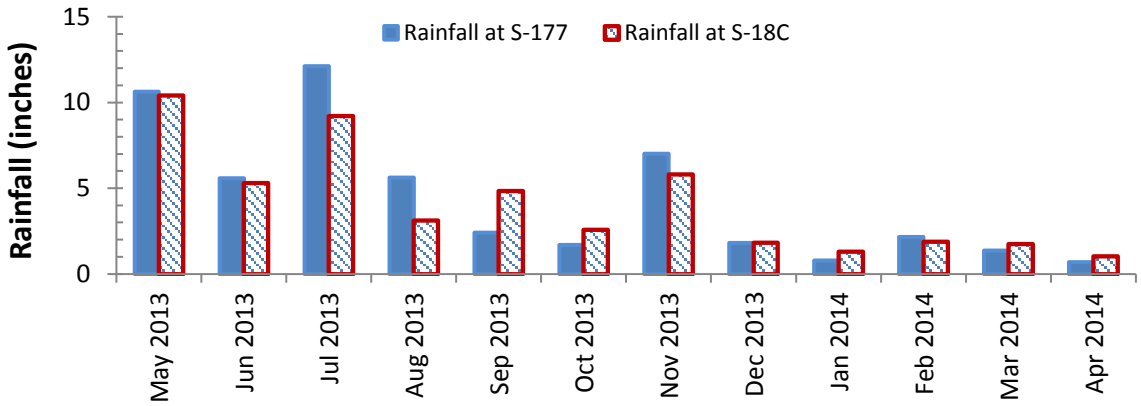

Figure 3. WY2014 monthly rainfall (in inches) at sites S-177 and S-18C.

RAINFALL

Daily rainfall data were retrieved from the District's DBHYDRO database for stations at S-177 and S-18C. The C-111 SCW project area received 52 inches of rainfall at S-177, and 49 inches at S-18C during WY2014. Historical annual rainfall in the project area is around 57 inches. Rainfall was lower than the historical average, and WY2014 was a relatively dry year. Monthly rainfall is shown in **Table 6** and **Figure 3**. About 70% of the annual rainfall was received in the wet season (May to October), and the remaining 30% in the dry season (November through April).

FLOWS

Flows were monitored at six locations, including S-200, S-199, S-177, S-18C, S-197, and Taylor Slough Bridge (TSB). All flow data were downloaded from the District's DBHYDRO database, except for TSB, for which the data were obtained through ENP. **Table 7** and **Table 8** show the monthly flows at these locations. Daily flow variations are depicted in **Figure 4**.

S-200 began pumping from the C-111 canal into the FPDA in July 2013, and stopped pumping in March 2014. Annual average flow was 86 cfs. Similarly, S-199 started pumping from the C-111 canal into the Aerojet Canal in July 2013, and ended in March 2014, with an annual average flow of 49 cfs. S-200 and S-199 were consistently in operation during the wet season, and pumping ceased late in the dry season, when the water level in the C-111 canal was too low. In the wet season, both S-200 and S-199 reached their maximum discharge capacities of 225 cfs (**Figure 4**).

High discharges occurred at S-177 in May, June, July, and September 2013, with monthly mean flows ranging from 138 to 184 cfs. Flows at this location during the remainder of WY2014 were minimal. At S-18C, WY2014 discharges were sustained with monthly mean flows ranging from as low as 3 cfs to over 400 cfs. The annual average flows in WY2014 were 53 cfs at S-177, and 164 cfs at S-18C.

At S-197, the southernmost structure of the District, there were only two brief discharge events in WY2014, occurring from July 18–22, and October 22. Discharges ranged from 110 cfs to 834 cfs, averaging about 110–665 cfs within the two discharge events. The annual average flow at S-197 was 9 cfs.

TSB recorded an average flow of 107 cfs in WY2014, which is a 25 percent increase over the historical average (87 cfs from 1992 to 2013). While WY2014 rainfall was below the historical average in the project area, the 25 percent increase in flows in Taylor Slough may be partly attributed to the benefits of the C-111 SCW Project. Other structure modifications and operations, as well as changes in hydrology, may also have contributed to the increase in TSB flows.

A challenge in this region is short and long-term management of seepage from ENP. Regional groundwater levels have increased over time due to water supply, implementation of restoration projects, operational changes, the combined effects of independently planned projects, and external factors. In Taylor Slough, hydroperiods and water levels at station EPSW (south of S-18C in Southern Glades) have increased under the Interim Operational Plan (IOP), indicating that more water was stored in ENP, due at least in part to restoration efforts. Increased tailwater at S-18C over the same period is likely due to a variety of factors, including water supply conveyance via the L-31 Canal and seepage from nearby marshes (likely Taylor Slough) (RECOVER, 2014).

Table 7. Monthly flow at the C-111 structures during WY2014.

Month	Average Flow (cfs)				
	S-200	S-199	S-177	S-18C	S-197
May 2013	0	0	66	99	0
Jun 2013	0	0	184	309	0
Jul 2013	122	69	156	401	107
Aug 2013	198	34	0	210	0
Sep 2013	93	32	138	248	0
Oct 2013	134	121	14	144	4
Nov 2013	102	92	0	147	0
Dec 2013	143	99	0	168	0
Jan 2014	96	69	9	120	0
Feb 2014	112	64	31	112	0
Mar 2014	36	13	28	10	0
Apr 2014	0	0	6	3	0
Annual	**86**	**49**	**53**	**164**	**9**

Table 8. Comparison of monthly flows historically and during WY2014 at Taylor Slough Bridge.

Month	Average Flow at Taylor Slough Bridge (cfs)	
	WY2014	Historical Flow (1992-2013)
May 2013	12	11
Jun 2013	105	78
Jul 2013	327	103
Aug 2013	197	155
Sep 2013	255	214
Oct 2013	202	206
Nov 2013	41	105
Dec 2013	118	60
Jan 2014	18	34
Feb 2014	3	22
Mar 2014	0	11
Apr 2014	12	6
Annual	**107**	**84**

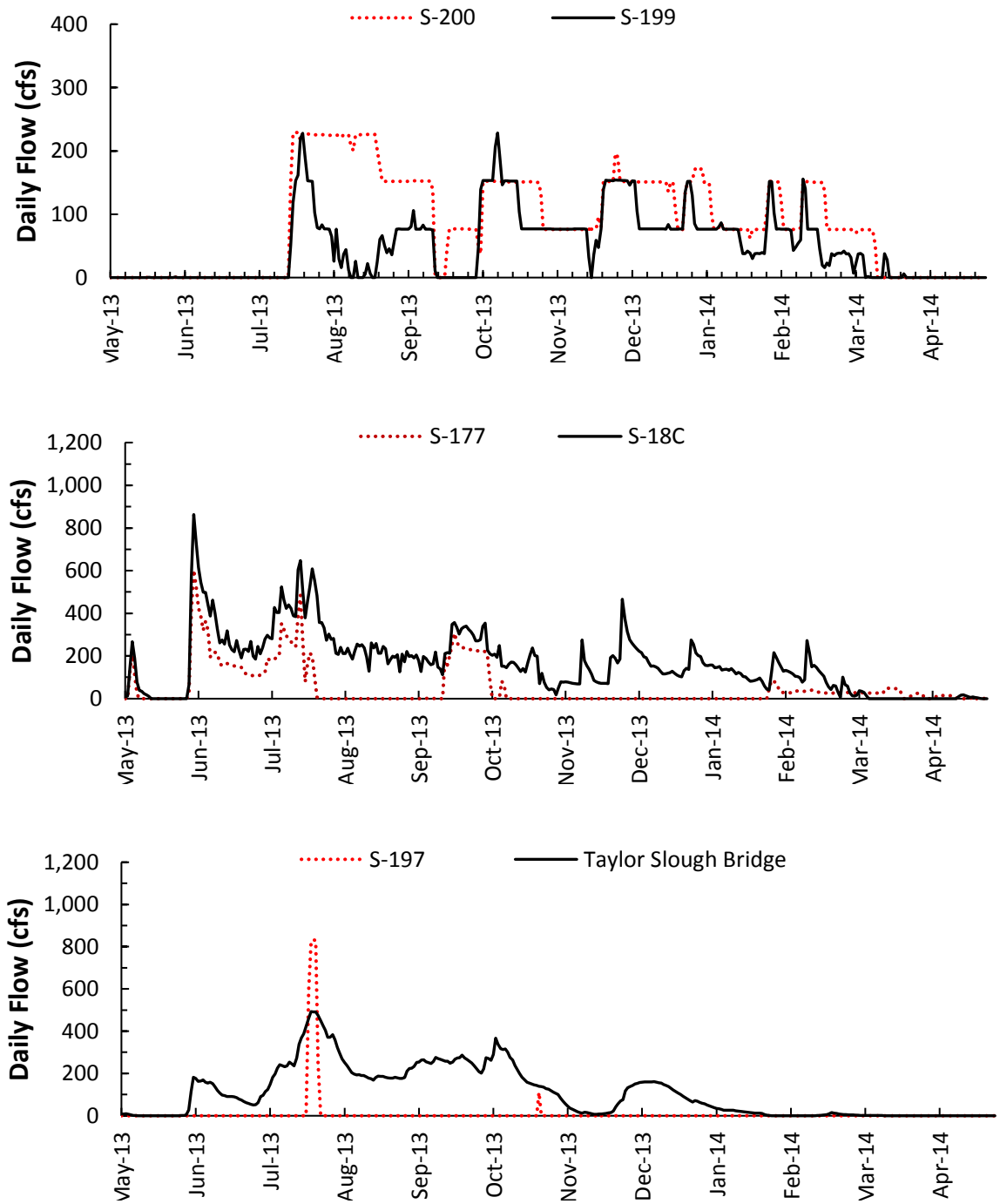

Figure 4. Variation of daily flows in cubic feet per second (cfs) at the C-111 structures during WY2014.

STAGES

Table 9 shows the headwater and tailwater levels at five structures in the C-111 SCW Project area. S-200, S-199, and S-177 were operated with similar headwater levels. S-177 tailwater and S-18C headwater were similar levels and were controlled by the downstream structure, S18C. **Table 10** shows monthly water levels of six monitoring wells in the project area. Daily variations are shown in **Figure 5**.

The tailwater of S-200 was maintained between 6 and 9 ft NGVD when the pump was operational (**Figure 5**, top panel). After March, when pumping ceased, water level returned to 6 feet. Similarly, the tailwater of S-199 remained between 6 and 8 ft NGVD between July and March 2014, during pumping, and returned to 6 ft NGVD when pumping ceased in March 2014.

S-18C tailwater and S-197 headwater were controlled by the S-197 structure to maintain similar water levels during operation. S-197, which discharges directly into Manatee Bay, had the lowest tailwater levels among all of the stage monitoring stations due to its location near the coast (**Figure 5**, middle panel). Water levels at NP-EPS, located east of S-197, were slightly lower than S-197 headwater (**Figure 5**, middle panel).

Water levels at C111AW and C111AE, located between S-177 and S-18C, exhibited similar patterns as S-177 tailwater and S-18C headwater (**Figure 5**, bottom panel). USGS-G-3356, the easternmost site in this area, is probably more influenced by the operation of S-20 than by the operation of structures listed in **Table 6** (**Figure 5**, bottom panel).

R3110 and EVER4 are used to monitor water levels and hydroperiods in CSSS Unit 2 (C) and Unit 3 (D), respectively (see **Figure 6**). These sites are the reference locations for stopping pumping during the critical portion of the nesting season for CSSS. In WY2014, both pumps, S-200 and S-199, were not operational during the CSSS nesting season. For more information on on/off triggers for these pump stations, see **Tables 3** and **4**.

In addition to stage monitoring listed in **Table 6**, an ongoing soil moisture study funded by the District has been conducted by the University of Florida. In addition to C111AW and C111AE, four agriculture study sites were chosen and continuously monitored for water table elevations and soil water content. Collected data were used to calibrate modeling tools developed to predict basin-wide water level responses to changes in canal stages. Data from this study are available upon request.

Table 9. Headwater and tailwater levels at C-111 structures in WY2014.

Month	Headwater (ft NGVD29)					Tailwater (ft NGVD29)				
	S-200	S-199	S-177	S-18C	S-197	S-200	S-199	S-177	S-18C	S-197
May 2013	3.7	3.7	3.7	1.9	2.4	6.1	6.1	2.5	1.8	1.2
Jun 2013	3.9	3.7	3.7	2.4	2.4	6.1	6.1	2.5	2.3	0.8
Jul 2013	4.1	3.8	3.8	2.5	2.5	7.6	7.0	2.6	2.5	1.1
Aug 2013	3.8	3.7	3.7	2.4	2.3	8.9	6.7	2.4	2.3	1.1
Sep 2013	3.9	3.7	3.7	2.5	2.4	7.7	6.7	2.5	2.4	1.4
Oct 2013	3.4	3.6	3.6	2.4	2.4	8.2	7.5	2.5	2.4	1.7
Nov 2013	3.5	3.6	3.6	2.3	2.5	8.0	7.2	2.6	2.2	1.8
Dec 2013	3.5	3.5	3.5	2.4	2.4	8.5	7.5	2.6	2.3	1.2
Jan 2014	3.4	3.3	3.3	2.3	2.3	8.0	7.3	2.4	2.2	1.2
Feb 2014	3.4	3.4	3.4	2.2	2.3	8.2	7.2	2.5	2.1	1.2
Mar 2014	3.2	3.2	3.2	1.9	2.2	7.0	6.4	2.4	1.8	1.1
Apr 2014	2.7	2.8	2.7	1.5	1.7	6.0	6.1	2.0	1.5	1.0

Table 10. Stage levels in ft NGVD29 in monitoring wells during WY2014.
[Note: CSSS – Cape Sable Seaside Sparrow]

Month	C111AW	C111AE	NP-EPS	USGS G-3356	R3110 for CSSS Subpopulation C (Unit 2)	Ever4 for CSSS Subpopulation D (Unit 3)
May 2013	2.6	2.5	1.5	2.3	4.9	2.1
Jun 2013	2.6	2.6	1.8	2.5	5.6	2.4
Jul 2013	2.8	2.8	2.0	2.8	5.8	2.6
Aug 2013	2.5	2.5	1.8	2.4	5.6	2.5
Sep 2013	2.6	2.6	1.9	2.6	5.7	2.5
Oct 2013	2.6	2.6	1.9	2.3	5.7	2.6
Nov 2013	2.7	2.7	1.8	2.2	5.3	2.5
Dec 2013	2.6	2.6	1.9	2.2	5.4	2.6
Jan 2014	2.5	2.5	1.8	2.0	5.1	2.4
Feb 2014	2.5	2.5	1.8	2.1	4.9	2.3
Mar 2014	2.3	2.3	1.6	1.8	3.8	2.1
Apr 2014	1.8	1.8	1.4	1.4	2.9	1.5

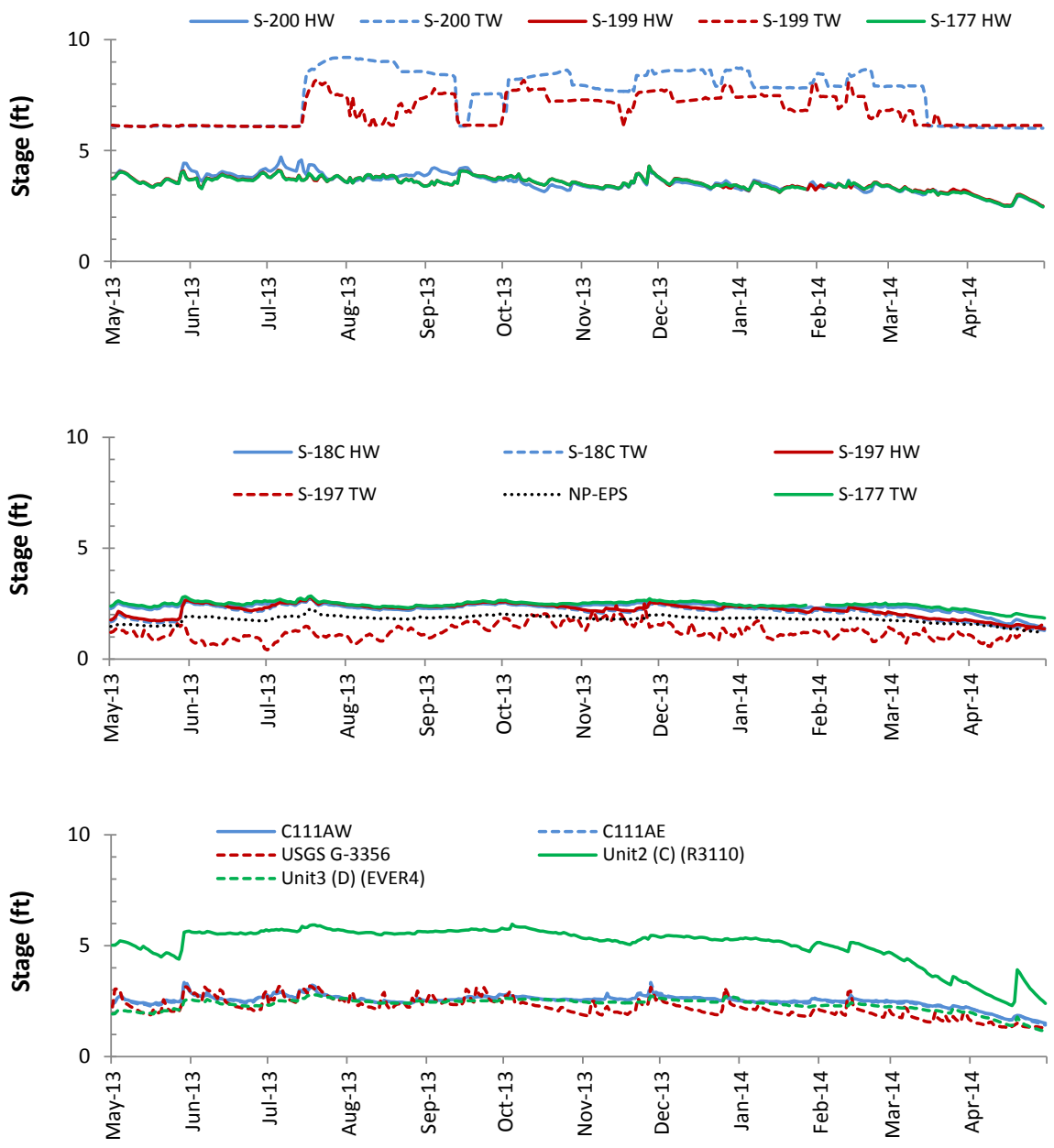

Figure 5. Water stage levels in ft NGVD29 for the C-111 SCW Project during WY2014.

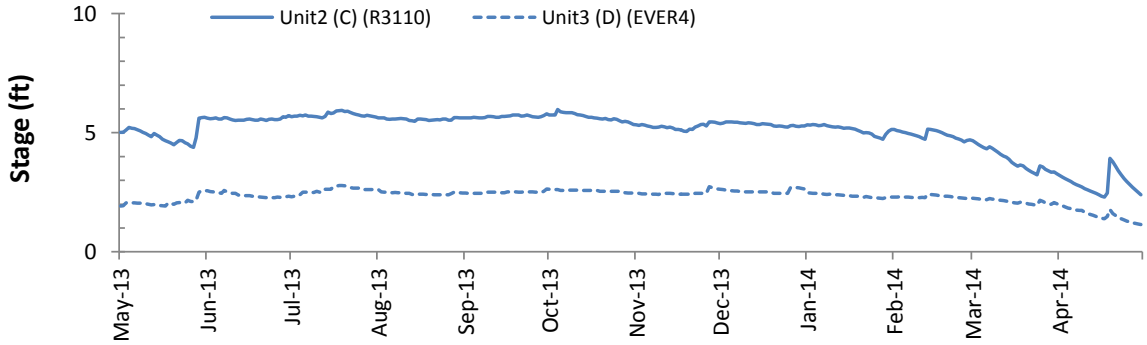

Figure 6. Water stage levels in ft NGVD29 in Cape Sable Seaside Sparrow subpopulation areas during WY2014.

WATER QUALITY MONITORING SUMMARY

Water quality data evaluated in this report were retrieved from the District's DBHYDRO database. The District follows strict quality assurance/quality control procedures, outlined in the District's Chemistry Laboratory Quality Manual (SFWMD, 2013) and Field Sampling Quality Manual (SFWMD, 2013). The laboratory manual was developed in accordance with National Environmental Laboratory Accreditation Conference requirements, and both the laboratory and field manual were developed in accordance with the FDEP Quality Assurance Rule (Chapter 62-160, Florida Administrative Code [F.A.C.]). The quality manuals describe procedures the water quality monitoring program follows to obtain accurate data for assessing the progress being made toward achieving water quality standards.

PERMIT SAMPLING SITES

In addition to authorizing the operation and maintenance of C-111 SCW Project structures, the permit requires a routine water quality monitoring program to characterize the quality of water discharged through District structures. Currently, the C-111 SCW Project permit requires water quality monitoring at five sites in the project area, as specified in **Table 11** and **Figure 7**.

Table 11. Water quality monitoring sites in the project area.

Site	Latitude	Longitude	Description
S-332DX	25°28'59.92"	80°33'46.40"	At the eastern end of the land in front of S-332D pump
S-177 (S199)	25°24'10.40"	80°33'30.20"	At the S-177 and S-199 structure
S-200	25°26'38.94"	80°33'37.26"	At the S-200 structure
AJC1	25°22'36.66"	80°33'58.18"	In the Aerojet Canal downstream of the fish farm
FPDAH1	25°26'37.00"	80°34'25.75"	In the Frog Pond Detention Area header canal

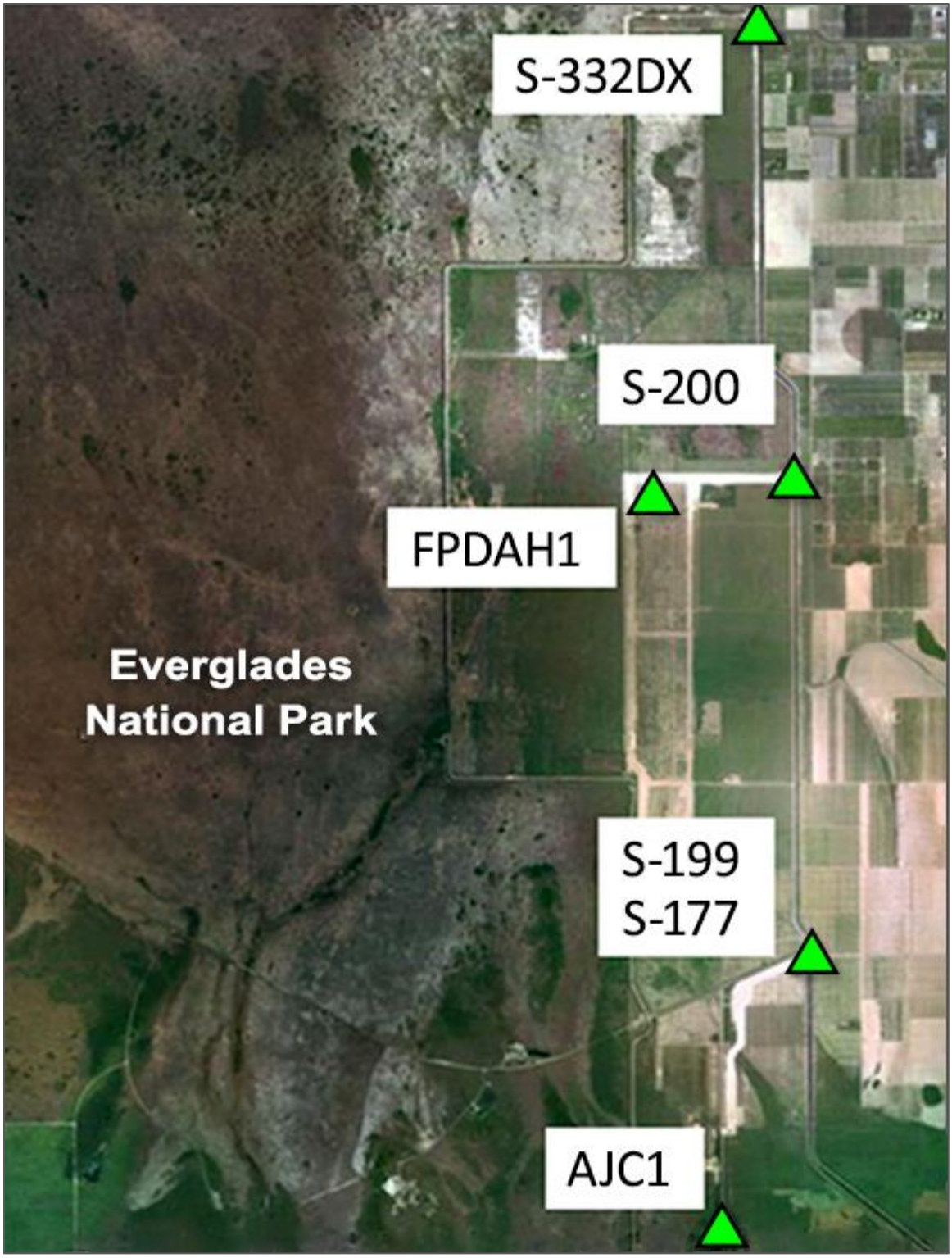

Figure 7. Water quality and fish monitoring sites in the C-111 SCW Project area.

ASSESSMENT OF WATER QUALITY DATA

All water quality samples were collected at a 0.5-meter depth from the water surface. At S-200 and AJC1, physical parameters and grab samples for nutrients were collected weekly if structures recorded flows (WRF). At the other monitoring sites, water quality grab samples and physical parameters were collected weekly if flowing, otherwise monthly (WF/M).

Physical Parameters

Physical parameters analyzed for the project include temperature, dissolved oxygen (DO), pH, specific conductance, turbidity, and total suspended solids (TSS). Temperature, DO, pH, and specific conductance were measured in situ at the time of grab sample collection. Turbidity samples from S-177 were collected quarterly. TSS samples at S-177 were collected WF/M. Samples at S-200 and Aerojet Canal were collected WRF for laboratory analysis. **Table 12** shows the surface water quality parameters of Florida Class III criteria required by the permit. **Table 13** shows the statistical summary of physical parameters, including the number of samples measured, the average, the standard deviation, the range of constituent concentrations, and selected data percentiles (25th, median, and 75th).

Table 12. Surface water quality parameters with Florida Class III criteria specified in Section 62-302.530, Florida Administrative Code.

Parameter	Units	Florida 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 > 50 percent of background or > 1,275 µS/cm, whichever is greater
pH	Standard Units	Not < 6.0 or > 8.5
Turbidity	NTU	≤ 29 NTUs above background conditions

Table 13. Statistical summary of physical parameters measured at C-111 SCW Project monitoring sites.

Temperature (ºC)				Total Suspended Solids (mg/L)			
Statistics	**S-200**	**S-177 (S-199)**	**AJC1**	**Statistics**	**S-200**	**S-177 (S-199)**	**AJC1**
Count	41	42	43	Count	41	42	43
Average	26.3	26.3	26.2	Average	3	3	3
STD	0.8	1.0	1.8	STD	0.0	0.0	0.3
Min	24.5	23.3	22.2	Min	3	3	3
1st Quartile	25.6	25.8	25.1	1st Quartile	3	3	3
Median	26.3	26.6	26.2	Median	3	3	3
3rd Quartile	27.0	27.0	27.1	3rd Quartile	3	3	3
Max	27.9	28.0	30.0	Max	3	3	5
pH				**Dissolved Oxygen (mg/L) ***			
Statistics	**S-200**	**S-177 (S-199)**	**AJC1**	**Statistics**	**S-200**	**S-177 (S-199)**	**AJC1**
Count	41	42	43	Count	41	42	43
Average	N/A	N/A	N/A	Average	2	3	5
STD	N/A	N/A	N/A	STD	1	2	1
Min	6.8	6.9	7.1	Min	1	1	2
1st Quartile	7.2	7.3	7.5	Median	1	3	5
Median	7.3	7.4	7.6	Max	4	8	8
3rd Quartile	7.4	7.5	7.7	Excursions	37	21	2
Max	7.4	7.5	7.7	Excursion Rate	90%	50%	5%
Excursions	0 (41)	0 (42)	0 (43)	Compliance	Exceeds Criterion	Exceeds Criterion	Complies
Turbidity (NTU)				**Specific Conductance (µS/cm)**			
Statistics	**S-200**	**S-177 (S-199)**	**AJC1**	**Statistics**	**S-200**	**S-177 (S-199)**	**AJC1**
Count	N/A	5	5	Count	41	42	43
Average	N/A	1.4	1.1	Average	523	526	511
STD	N/A	N/A	N/A	STD	8	18	15
Min	N/A	0.6	0.8	Min	494	506	451
1st Quartile	N/A	N/A	N/A	1st Quartile	520	516	511
Median	N/A	1.2	N/A	Median	523	521	516
3rd Quartile	N/A	N/A	N/A	3rd Quartile	527	528	519
Max	N/A	0.0	0.0	Max	527	528	519
Excursions	N/A	0 (5)	0 (5)	Excursions	0 (41)	0 (42)	0 (43)

Note: ºC – degrees Celsius; µS/cm – microsiemens per centimeter; Max – maximum; mg/L – milligrams per liter; Min – minimum; NTU – nephelometric turbidity units; STD – standard deviation; and N/A – not applicable.

For excursions, the first number is the number of excursions and the number in parentheses is the total number of samples analyzed.

* DO average, standard deviation, minimum, median, and maximum values are reported in mg/L. To be in compliance, a site's DO excursion rate must be less than or equal to 10%. Excursions were determined based on % DO saturation calculations provided in Attachment B.

All of the physical parameters consistently met the water quality criteria specified in Section 62-302.530, F.A.C. (**Table 13**), except DO at S-177 and S-200. **Figure 8** shows variation of DO saturation during WY2014 at the three required monitoring sites. DO conditions at AJC1 were the best, with saturation lower than the limit 5% of the time, meeting the 10% Florida Class III criteria. DO at S-200 and S-199 showed more occurrences of events that were lower than the limits. However, from upstream at S-200 to downstream at site S-199, the DO excursion rate improved from 90% to 50%. The favorable DO conditions at AJC1 and the improvement of the DO excursion rate as water moves downstream indicate that the C-111 SCW Project did not contribute to DO degradation in the project area.

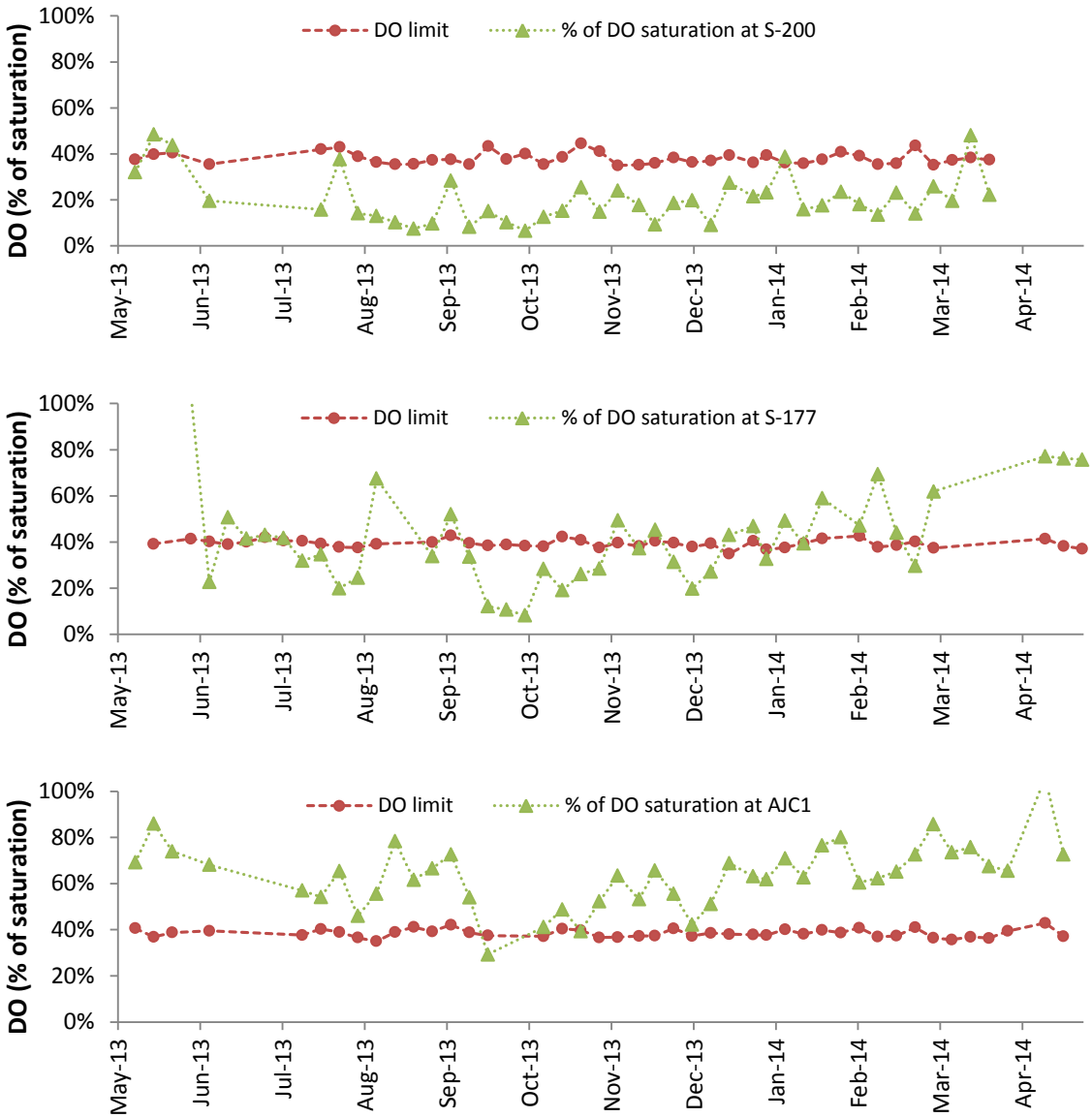

Figure 8. Variation of dissolved oxygen saturation (%) at three C-111 SCW Project monitoring sites during WY2014.

Water depths in the FPDA and Aerojet Canal were reported weekly when there were flows. The seasonal variations are shown in **Figure 9.** The FPDA was shallow, with a depth up to 3 feet (**Figure 9**, top panel), which is close to the design depth. The maximum design depth in the FPDA is about 5–6 feet. Water will overflow to the east detention area through weirs if the water level is higher than the maximum depth. After S-200 stopped pumping in March 2014, the FPDA dried out quickly. Water depth in the Aerojet Canal varied between 22–25 feet (bottom panel of **Figure 9**). During the dry season, when S-199 stopped pumping, water depth decreased slightly, to about 22 feet.

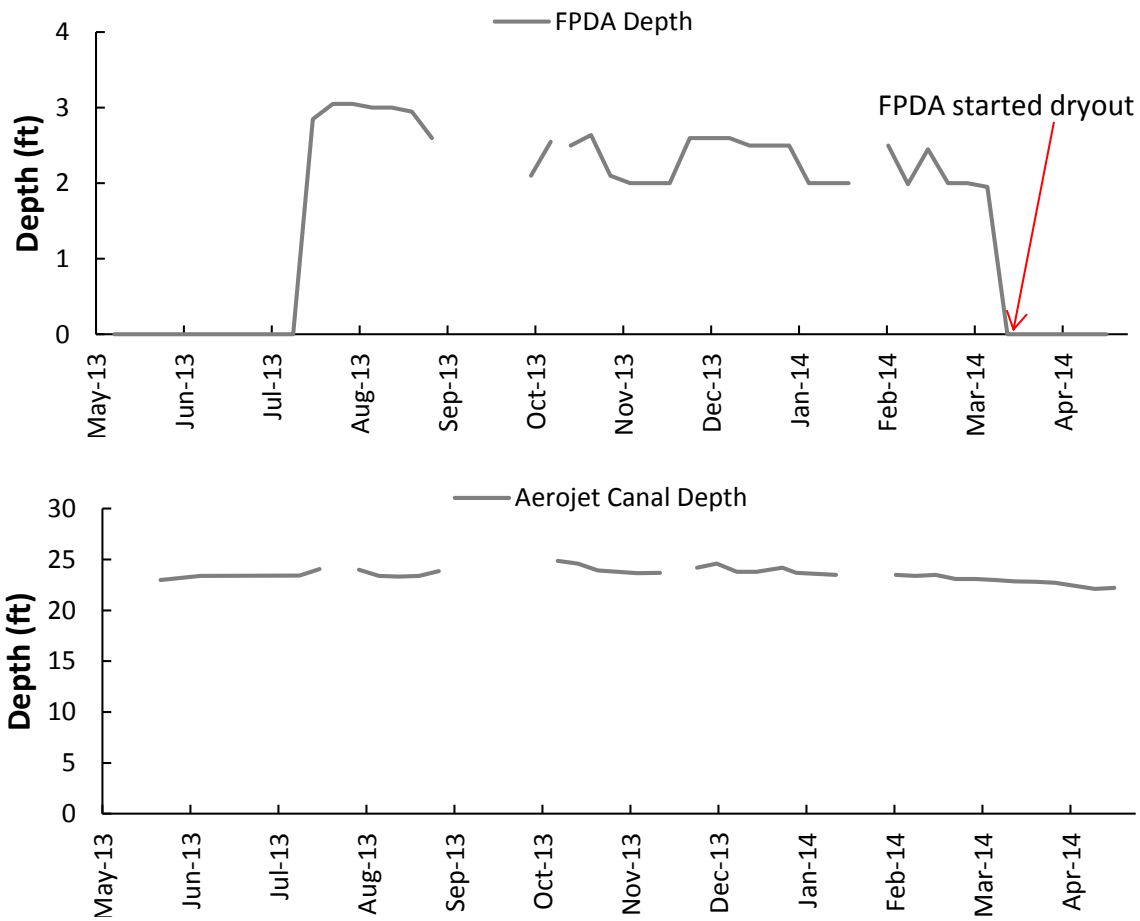

Figure 9. Depth changes in the Frog Pond Detention Area (top) and Aerojet Canal (bottom) during WY2014.

Table 14. Statistical summary of nutrient parameters at C-111 SCW project monitoring sites for WY2014.

Ammonia (NH_4) (mg/L)				Total Kjeldahl Nitrogen (TKN) (mg/L)			
Statistics	**S-200**	**S-177 (S-199)**	**AJC1**	**Statistics**	**S-200**	**S-177 (S-199)**	**AJC1**
Count	N/A	42	43	Count	41	42	43
Average	N/A	0.039	0.015	Average	0.619	0.584	0.519
STD	N/A	0.026	0.012	STD	0.151	0.112	0.056
Min	N/A	0.005	0.005	Min	0.500	0.440	0.420
1st Quartile	N/A	0.018	0.006	1st Quartile	0.570	0.520	0.490
Median	N/A	0.040	0.009	Median	0.590	0.550	0.520
3rd Quartile	N/A	0.055	0.021	3rd Quartile	0.620	0.600	0.530
Max	N/A	0.105	0.053	Max	1.490	1.060	0.760

Nitrate + Nitrite as N (NO_x) (mg/L)				Orthophosphate (OPO_4) (mg/L)			
Statistics	**S-200**	**S-177 (S-199)**	**AJC1**	**Statistics**	**S-200**	**S-177 (S-199)**	**AJC1**
Count	41	42	43	Count	41	42	43
Average	0.014	0.018	0.023	Average	0.002	0.002	0.002
STD	0.015	0.015	0.016	STD	0.000	0.000	0.000
Min	0.005	0.005	0.005	Min	0.002	0.002	0.002
1st Quartile	0.005	0.005	0.007	1st Quartile	0.002	0.002	0.002
Median	0.007	0.016	0.020	Median	0.002	0.002	0.002
3rd Quartile	0.021	0.024	0.037	3rd Quartile	0.002	0.002	0.002
Max	0.060	0.064	0.053	Max	0.002	0.002	0.002

Total Phosphorus (TP) (mg/L)				
Statistics	**S-200**	**S-177 (S-199)**	**S-18C**	**AJC1**
Count	41	42	52	43
Average	0.006	0.006	0.004	0.006
STD	0.003	0.002	0.001	0.002
Min	0.003	0.003	0.002	0.003
1st Quartile	0.005	0.004	0.003	0.004
Median	0.005	0.005	0.004	0.006
3rd Quartile	0.006	0.007	0.004	0.007
Max	0.020	0.014	0.007	0.012

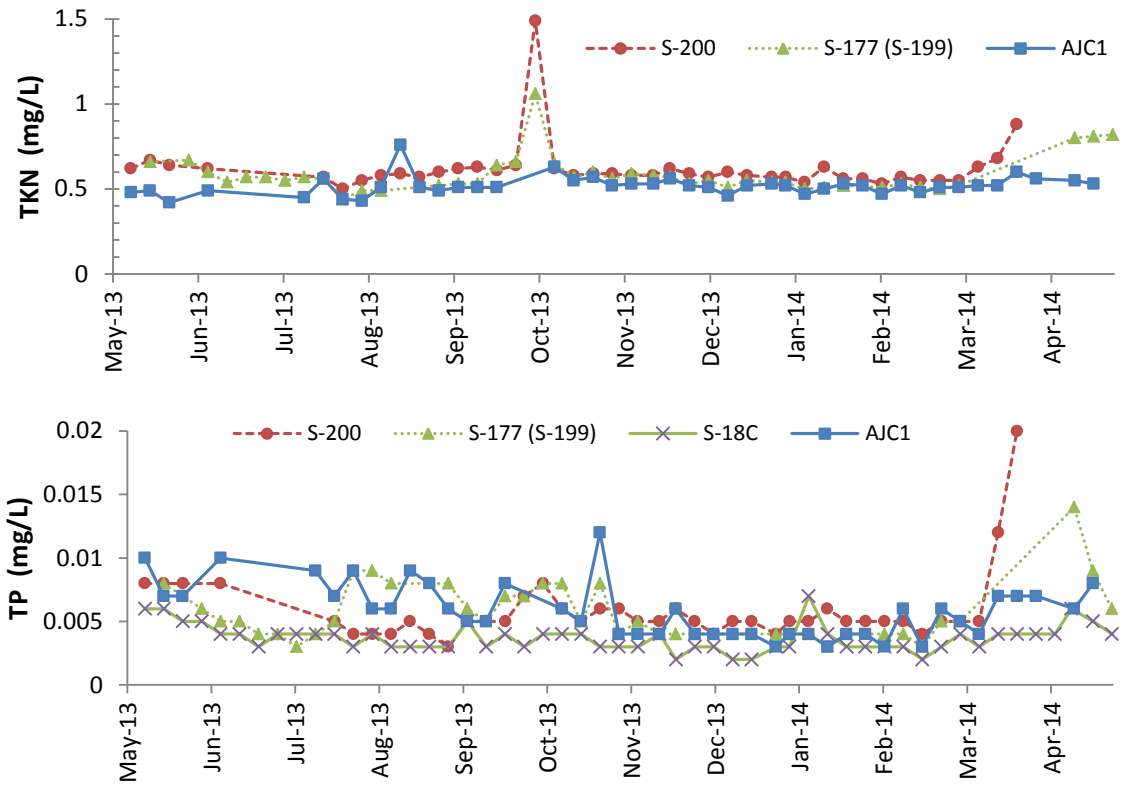

Figure 10. Total Kjeldahl nitrogen (top) and total phosphorus (bottom) variations at C-111 SCW Project monitoring sites during WY2014.

Nutrient Parameters

Nutrient parameters analyzed include ammonia, total Kjeldahl nitrogen (TKN), nitrate + nitrite as N (NO_x), orthophosphate, and total phosphorus (TP). Nutrient data are summarized in **Table 14**, with individual measurements included in **Attachment B**. The statistical summary table reports the number of sample observations, the average, the standard deviation, the range of constituent concentrations, and selected data percentiles (1st quartile, median, and 3rd quartile). Nutrients in Class III criteria have narrative descriptions. The statistical tables provide basic information about water quality conditions in the project area.

For nitrogen constituents, AJC1 had generally lower concentrations than S-200 and S-177 in the C-111 canal. TKN varied in a narrow range of 0.42–0.88 mg/L, except one high TKN event that occurred on October 1, 2013 (**Figure 10**, top panel). The high TKN concentrations at S-200 and S-199 in October probably resulted from the presence of aquatic vegetation. With respect to phosphorus, orthophosphate concentrations remained at 2 parts per billion (ppb), the detection limit, and were low in the project area. TP concentrations at AJC1 were slightly higher than the canal water in the dry season, when water levels were low. The average TP concentration at AJC1 was 6 ppb (**Figure 10**, bottom panel). Based on the available data, the C-111 SCW Project does not appear to cause or contribute to an increase in phosphorus or nitrogen in the area.

ECOLOGICAL MONITORING SUMMARY

For this project, ecological monitoring includes (1) hydroperiods in the Southern Glades and Model Lands and (2) coastal zone salinities in Florida Bay.

HYDROPERIODS

C-111 SCW Project features are intended to restore more natural (pre-drainage) hydroperiods within the Southern Glades and Model Lands. Through partnerships between SFWMD and other government agencies, including ENP, USGS, and USACE, real-time water level data are collected at hundreds of water level gauges throughout the District's boundaries. In order for these data to be meaningful for reporting hydroperiods within the Southern Glades and Model Lands, SFWMD staff expanded the domain of the existing South Florida Water Depth Assessment Tool (SFWDAT), and developed a project-specific post-processing query for the project area, which routinely produces annual hydroperiod maps for the area of interest.

The SFWDAT interpolates between hundreds of existing water level gauges to produce spatially continuous estimates of mean daily surface water elevations for hydrologically distinct basins within the Everglades Protection Area. Water depth surfaces are calculated by subtracting the best available ground surface elevation (or gridded elevation models) from the interpolated water elevation surfaces, and the resultant water depths are summarized by color ramped hydroperiod maps.

Inundated days (**Table 15**) represent the average of tens of thousands of cells for the two zones, the Southern Glades and Model Lands, in a 30-day period. Therefore, the annual hydroperiod is calculated in terms of a total of 360 days. The Southern Glades was inundated most of the wet season. In April of the dry season, scattered areas of higher ground were exposed. The hydroperiod of the Model Lands was shorter than that of the Southern Glades. Even in the wet season, a small area in the Model Lands remained exposed. The average hydroperiod in WY2014 was 333 days in the Southern Glades, and 225 days in the Model Lands. **Figure 11** shows a map of hydroperiods around the C-111 SCW Project area for WY2014.

Table 15. Hydroperiods in the Southern Glades and Model Lands.

Month	Days Inundated (30-day period)	
	Southern Glades	Model Lands
May 2013	28	19
Jun 2013	29	19
Jul 2013	29	25
Aug 2013	29	22
Sep 2013	29	25
Oct 2013	29	24
Nov 2013	29	22
Dec 2013	29	20
Jan 2014	28	17
Feb 2014	28	17
Mar 2014	27	10
Apr 2014	19	6
WY2014 Hydroperiod (360-day period)	**333**	**225**

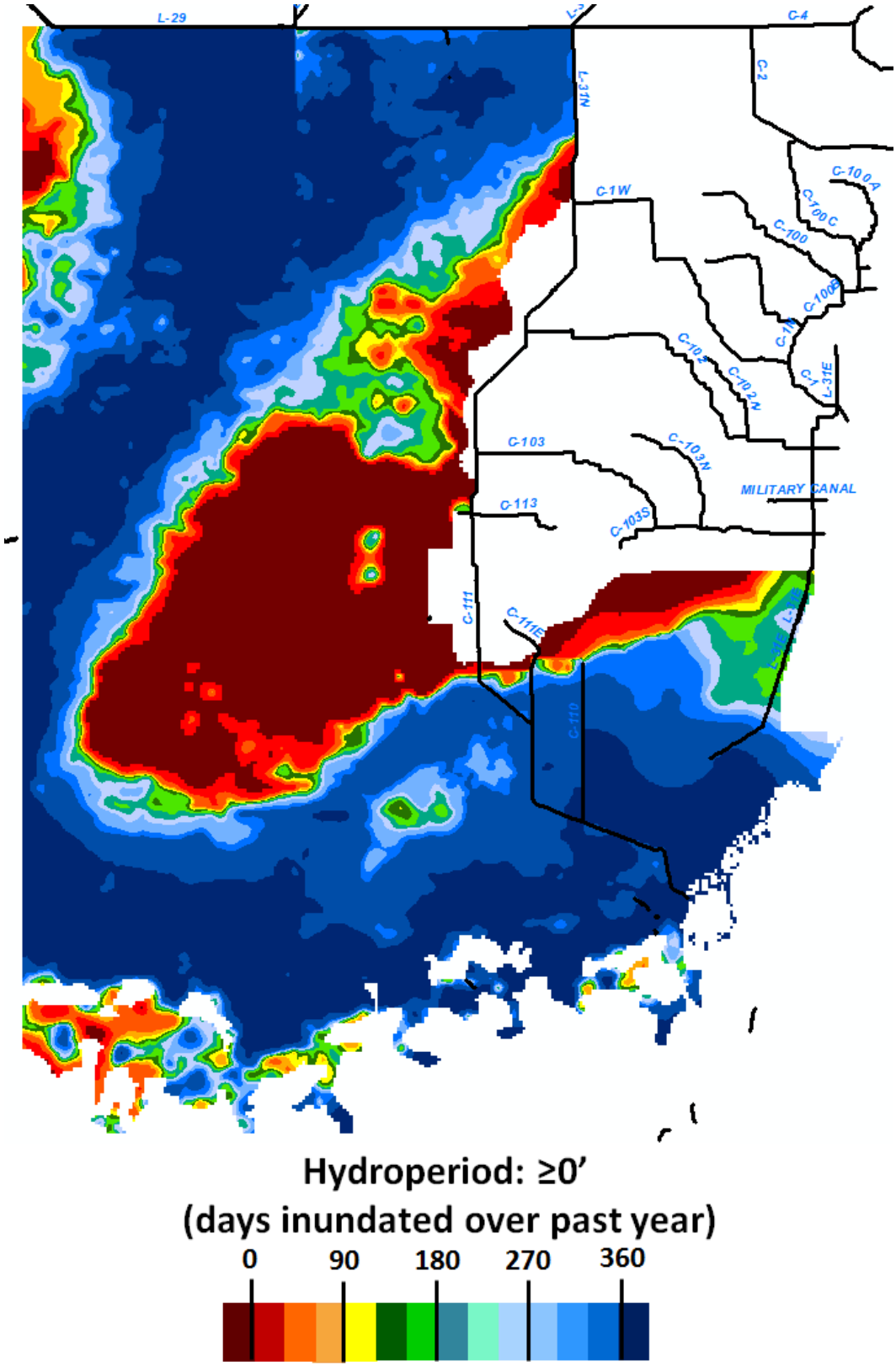

Figure 1. WY2014 hydroperiods in the C-111 SCW Project area.

COASTAL ZONE SALINITY

Because of improved timing, distribution, and flows within Taylor Slough, the C-111 SCW Project is expected to improve (reduce) salinities within the nearshore Florida Bay embayments. Modeling associated with the project indicated that the net improvement of salinity concentrations in the nearshore embayments could be about 3 percent. With less frequent gate openings at S-197, salinities within Manatee Bay are anticipated to increase correspondingly. However, salinity can be affected by a multitude of factors, including freshwater inflows, tides, wind, and currents. Long-term monitoring data, covering both with and without project conditions, are needed to detect the overall impact of the project on salinity in Florida Bay. This section summarizes salinity monitoring data collected in WY2014.

Continuous measurements of salinity were recorded at five stations: four in the lower Taylor Slough by USGS (McCormick Creek at Terrapin Bay, Upper Taylor River, Taylor Mouth, and Trout Creek at Joe Bay), and one in Manatee Bay (MBTS) by the District. USGS data were collected as part of the CERP Restoration Coordination and Verification Program/USGS funded Coastal Gradients project. The locations of these sites are shown in **Table 16** and **Figure 11**. Salinity data were recorded every 15 minutes at all stations.

Table 16. Salinity monitoring sites in the C-111 SCW Project area.
[Note: ft – feet; mi – miles; and USGS – United States Geological Survey.]

Site	Latitude	Longitude	Agency	Description
TB - Terrapin Bay (USGS site name: McCormick Creek)	25°10'05.50"	80°44'00.92"	USGS	Approximately 500 ft. upstream of the mouth, 17 mi. east of Flamingo.
TR - Taylor River (USGS site name: Upstream Taylor River)	25°12'37.07"	80°38'51.60"	USGS	Located upstream on the left bank, approximately 12 mi. northwest of Key Largo.
TM - Taylor Mouth (USGS site name: Taylor River Mouth)	25°11'26.14"	80°38'20.59"	USGS	Located at the mouth of Taylor River on the left bank, approximately 10 mi. northwest of Key Largo.
TC - Trout Creek (USGS site name: Trout Creek)	25°12'53.66"	80°32'00.61"	USGS	Located on left bank, 100 ft. upstream of mouth of Trout Creek, 10 mi. northwest of Key Largo.
MBTS - Manatee Bay Temperature & Salinity	25°14'21.9"	80°25'18.1"	SFWMD	Manatee Bay, approx. 4 mi. from Gilbert's Resort, Overseas Hwy. boat ramp, Key Largo.

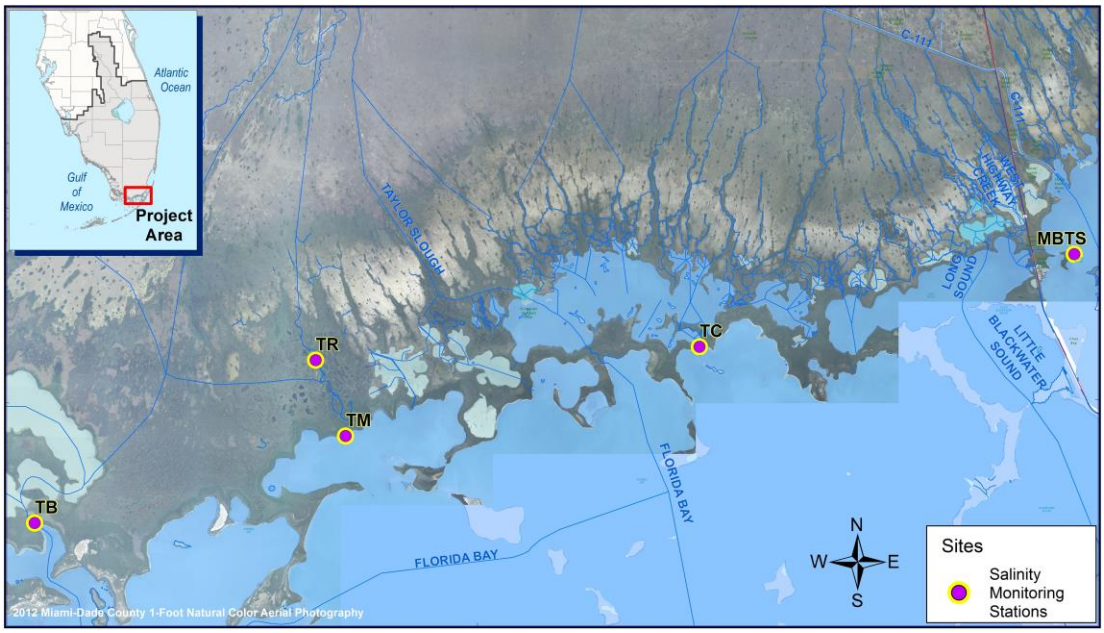

Figure 11. Salinity monitoring stations in Florida Bay.

Table 17 shows a statistical summary of daily salinity data collected in WY2014, and **Figure 12** shows monthly average salinity at the five monitoring sites during WY2014 versus the historical monthly average salinity during May 2002 to April 2012. Overall, salinities at all stations showed a strong seasonal pattern, with lower salinity in the wet season and higher salinity in the dry season. For most of the year, salinities at those sites were less than 25. Hypersalinity (higher than 35), a typical phenomenon in Florida Bay, occurred briefly at Manatee Bay (MBTS) in May 2013, and at Terrapin Bay (TB) in April 2014. Salinity also varied greatly with location. The Taylor River (TR) station, located in the upstream Taylor Slough, had the lowest mean and median salinity among the five monitoring sites due to freshwater discharges from Taylor Slough. At the downstream sites, such as Taylor Mouth (TM), salinity increased. Trout Creek (TC) and Terrapin Bay also had relatively low salinity in the wet season. Manatee Bay, the northernmost station, had the highest salinity among the five sites due to reduced freshwater inputs from the C-111 canal (S-197 only opened two times in WY2014).

While Manatee Bay salinity levels were comparable to historical values, monthly salinities at the other four stations were lower than historical averages for most of the water year (**Figure 12**). Since implementation of the C-111 SCW in June of 2012, conditions in Taylor Slough have been wetter than average (lower salinity and higher flow than historical averages), which is an intended outcome of project operations. However, the positive hydrologic effects observed cannot be fully attributed to the project, but are likely a combination of project effects, precipitation, and operational changes that have occurred in the area over the last decade. Determination of the relative contribution of rainfall and the C-111 SCW will require additional data collection and assessment during a wide range of meteorological conditions covering both wet and dry years.

Table 17. Statistical summary of WY2014 daily salinity in Florida Bay.

Statistics	TB (Terrapin Bay)	TR (Taylor River)	TM (Taylor Mouth)	TC (Trout Creek)	MBTS (Manatee Bay)
Count	357	365	365	365	365
Mean	15	4	12	16	28
STD	8	7	8	9	3
Min	4	0	1	1	13
1st Quartile	8	0	5	8	26
Median	12	1	10	16	28
3rd Quartile	19	3	18	23	30
Max	41	27	29	35	36
<15	218	331	243	170	2
Days of Salinity >=15 & <25	94	29	84	129	64
Days of Salinity >=25 & <30	20	4	37	33	210
Days of Salinity >=30 & <35	16	0	0	33	79
Days of Salinity >=35	9	0	0	0	10
Historical Long-Term Mean	24	11	19	21	29
Data Period for Historical Mean	2002-2011	2007-2011	2002-2011	2002-2011	2002-2011

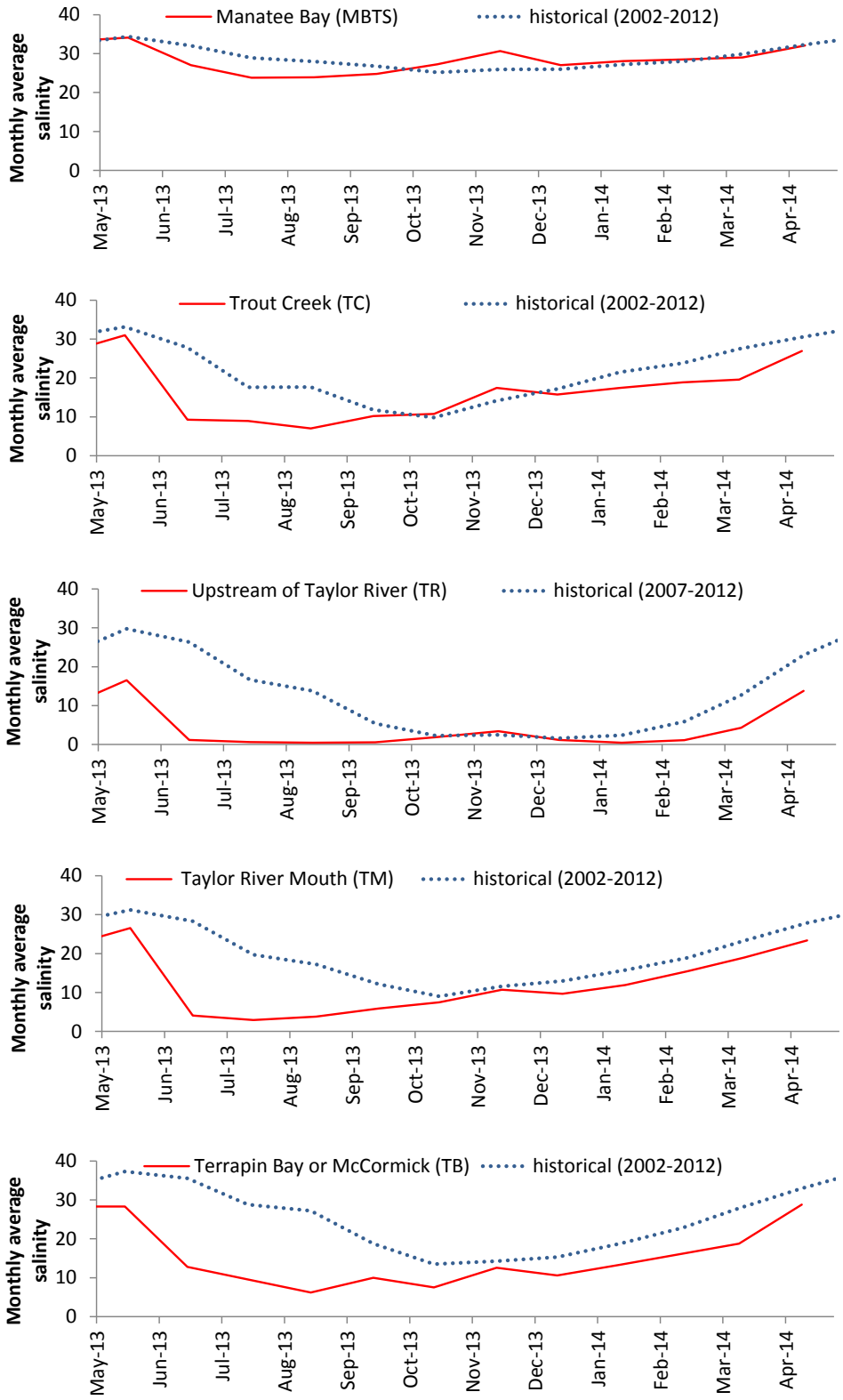

Figure 12. 2Monthly average salinity in WY2014 versus historical salinity in Florida Bay.

BIOLOGICAL OPINION

The C-111 SCW Project operation implemented the terms and conditions described in the Biological Opinion. Results were reported to the USFWS and are available upon request.

OTHER TOXICANTS

The SFWMD conducted monitoring for other toxicants in surface water and mosquitofish under Phase 2 – Tier 1, Routine Monitoring during Stabilization Period (FDEP and SFWMD, April 2011), within the C-111 SCW Project.

INTRODUCTION

Specific Condition 27 and Table 1 of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit (Permit No. 0293559-007), issued to the District on November 21, 2012, require the District "to collect and analyze surface water quality data in accordance with the Water Quality Monitoring Plan (October 31, 2012) using the parameters and frequencies identified in Table 1 at the sites shown on Figure 2 in the permit.

OTHER TOXICANTS MONITORING REQUIREMENTS

The Monitoring Plan lists the Phase 2 – Tier 1 collection matrix (surface water and fish), along with locations, method, frequency, and parameters for C-111 SCW Project, which are summarized in **Table 18**.

Table 18. C-111 SCW Project Phase 2 – Tier 1: Routine Monitoring During Stabilization Period.

Matrix	Location	Collection Method	Frequency	Parameters [a]
Mosquitofish (*Gambusia* spp.)	FPDAH1, AJC1	net or trap	quarterly	cis-chlordane, trans-chlordane, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, cis-nonachlor, trans-nonachlor, toxaphene, copper, zinc
Surface Water	S-332DX, S-177	grab	quarterly	chlordane, p,p'-DDD, p,p'-DDE, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, toxaphene
Surface Water	FPDAH1, AJC1	grab	quarterly	copper, 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

OTHER TOXICANTS MONITORING DATA

Routine monitoring for surface water pesticides, surface water metals, and pesticides and metals in fish occurred for selected analytes under project codes PEST, PIE, and C111F, respectively, at specific locations (**Figure 7** and **Table 18**).

Surface Water Data

Copper and zinc were not detected in surface water samples collected at selected locations (**Table 19**). Surface water samples collected for pesticides analysis at the S-332DX and S-177 sites (**Figure 7**) during June 2013 did not contain any detectable levels of pesticides.

Fish Data

Mosquitofish (*Gambusia holbrooki*) analytical data are outlined in **Table 20** for metals and pesticides. The only pesticide analyte detected was p,p'-DDE. However, the analytical lab, FDEP Central Laboratory, did not properly preserve the samples for pesticide analysis collected during the July 2013 sampling event. Results are reported for informational purposes only.

Table 19. Summary of surface water metals analysis for the C-111 SCW Project.

Date	Station	Comment	Metal	Concentration (µg/L) [a]
5/14/13	FPDAH1	Site dry, no sample	copper	-
			zinc	-
	AJC1	-	copper	BDL [b]
			zinc	BDL
7/9/2013	FPDAH1	Site dry, no sample	copper	-
			zinc	-
	AJC1	-	copper	BDL
			zinc	BDL

a. µg/L – micrograms per liter
b. BDL – below detection limit

Table 20. Summary of mosquitofish metals and pesticides analysis for the C-111 SCW Project.

Date	Station	Metal (mg/kg [a] wet weight)		Pesticide (µg/kg [b] wet weight)
		Copper	Zinc	p,p'-DDE
7/25/2013	AJC1	1.61	60	2.0 I [c] Y [d]
	FPDAH1	1.7	28.4	BDL [e]

a. mg/kg – milligrams per kilogram.
b. µg/kg – micrograms per kilogram
p,p'-DDE –para, para dichlorodiphenyldichloroethylene
c. I – value reported is less than the practical quantification limit, and greater than or equal to the method detection limit
d. Y – the laboratory analysis was from an improperly preserved sample. The data may not be accurate.
e. BDL – below detection limit

Summary

Since none of the monitored compounds were detected in the samples, other toxicants for this project were in compliance with the F.A.C. Class III Standards for the water year.

MERCURY

The District is mandated to implement tier-wise monitoring and evaluation of mercury in specific media in restoration projects. This is described in *A Protocol for Monitoring Mercury and Other Toxicants* (Protocol) (FDEP and SFWMD, 2011). The C-111 SCW Project is currently under Phase 2 - Tier 1: Routine Monitoring during Stabilization Period. Surface water is collected quarterly for total mercury (THg) and methylmercury (MeHg) analysis. Mosquitofish (*Gambusia holbrooki*) composite samples will be collected quarterly while large-bodied fish (sunfish, *Lepomis sp.*, and largemouth bass, *Micropterus salmoides*) will be collected annually for THg analysis at designated stations described in the C-111 SCW Project mercury and other toxicants monitoring plan. Surface water samples were collected at station S332DX, located at the eastern end of the land in front of the S-332D structure. Mosquitofish composite and large-bodied fish were collected at station AJC1 in the Aerojet Canal south of the fish farm and station FPDAH1 in the FPDA Header Canal. Preliminary results and evaluation of samples taken during the second year Phase 2 - Tier 1 monitoring are presented below.

SURFACE WATER ASSESSMENT

Surface water samples were collected at station S332DX quarterly for total mercury (THg) and methylmercury (MeHg) analysis (**Table 21**). THg level ranged from 0.21 to 0.75 ng/L, with an average of 0.53 ng/L, well below the USEPA standard of 12 nanograms per liter. The THg level fluctuated over time, and there was no apparent trend of change during WY2014. MeHg levels ranged from 0.022 to 0.140 ng/L, with an average of 0.10 ng/L. Similar to THg, there was no apparent trend of change in MeHg level during WY2014.

Table 21. Quarterly surface water total mercury (THg) and methylmercury (MeHg) levels at station S332DX during WY2014.

Date Collected	THg (ng/L)	MeHg (ng/L)
7/9/2013	0.21	0.022
10/16/2013	0.60	0.140
1/15/2014	0.75	0.110
4/9/2014	0.56	0.140

MOSQUITOFISH ASSESSMENT

Quarterly composite samples (N=1 per station) of mosquitofish (≥100 fish/composite) were collected at stations AJC1 and FPDAH1 for THg determinations during WY2014. One composite sample was flagged due to improper storage at the contract analytical laboratory (FDEP) (**Table 22**). The THg level for mosquitofish varied from 0.016 to 0.036 mg/kg, with an average of 0.026 mg/kg (excluding the flagged value) at AJC1. Only three composite samples were collected at FPDAH1, and one sample was flagged. The two valid data were 0.01 mg/kg. None of the values exceeded the USEPA standard for trophic level 3 (TL3) fish (THg = 0.077 mg/kg) for wildlife protection (**Table 22**).

Table 22. Total mercury level (THg, mg/kg) in quarterly mosquitofish composite samples collected during WY2014.

Date Collected	AJC1	FPDAH1
10/21/2013	0.016	0.01
7/25/2013	0.021*	0.017*
1/23/2014	0.025	0.01
4/22/2014	0.036	ND
Average	**0.038**	**0.012**

* Sample was improperly preserved by the contract analytical laboratory (FDEP); flagged with qualifier code "Y".

LARGE-BODIED FISH ASSESSMENT

Annual collection of sunfish (N=5) and largemouth bass (N=5) at AJC1 and FPDAH1 was performed during WY2014. Five bluegill sunfish and five largemouth bass were collected at AJC1, while no sunfish and only one largemouth bass was collected at FPDAH1. The target size range (total length) for sunfish is from 102 mm to 178 mm. The target size range for largemouth bass is 307 mm to 385 mm (Protocol, 2011). All 5 sunfish collected were bluegill sunfish (*Lepomis macrochirus*) and were within target size ranges. All largemouth bass collected at AJC1 were also within the target size range, while the individual collected from FPDAH1 was slightly below the target range (303 mm).

Results show that at AJC1 bluegill sunfish THg levels ranged from 0.078 to 0.223 mg/kg, with an average of 0.138 mg/kg, while largemouth bass THg levels ranged from 0.581 to 1.740 mg/kg, with an average of 0.864 mg/kg. No sunfish was collected, but one largemouth bass was collected at FPDAH1with a THg level of 0.066 mg/kg (**Table 23**). Both sunfish and largemouth bass collected at AJC1 exceeded the USEPA THg standard (0.077 mg/kg for TL3 fish, and 0.346 mg/kg for TL4 fish) at AJC1. However, the single largemouth bass collected at FPDAH1 displayed a THg value of 0.066 mg/kg, which is below the USEPA standard for TL4 fish for wildlife protection.

Table 23. Total mercury level (THg, mg/kg) in large-bodied fish collected on October 9, 2013.

Species	AJC1			FPDAH1		
	Average	SD	Count	Average	SD	Count
Bluegill Sunfish	0.138	0.053	5	ND	ND	0
Largemouth Bass	0.864	0.494	5	0.066	ND	1

ND: No data

SUMMARY

In summary, mercury levels in surface water and fish samples were measured during the project's second year, Phase 2 - Tier 1 monitoring period (WY2014). Surface water THg levels were below the USEPA standard. Mosquitofish THg levels at both stations did not exceed the USEPA standard. Bluegill sunfish and largemouth bass collected at AJC1 exceeded the USEPA TL3 and TL4 fish standards.

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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 C-111 Spreader Canal Phase 1 (Western) Project (CERPRA permit 0293559-007).

Specific Condition	Description	Applicable Phase	Action Taken	Included in This Report in:			
				Narrative (page #'s)	Figure	Table	Attachment
2	Threatened and Endangered Species	Construction and Operation	No action needed				
3	Contaminated Sites and Residual Agrichemicals	Construction and Operation	No contamination found after initial operations				
4	Wetland Impact and Restoration	Operation	Routine operation followed the Preliminary Project Operating Manual (2013).				
22	Project Operation Plan	Operation	Operation was consistent with the Preliminary Project Operating Manual (2013).	5 – 6		3 – 4	
23	Water Quality Compliance, Hydrometeorological and Ecological Monitoring Plans	Operation	Monitoring plans were consistent with those approved in November 2012 permit modification.	7, 16, 24	2		
24	Pump Testing and Maintenance	Operation	Pumps were in operation most of the time.				
25	Emergency Discharge Frog Pond Detention Area	Operation	No action needed.				
26	Public Health, Safety, and Welfare	Operation	Discharges did not pose a serious danger to public health/safety/welfare.				
27	Water Quality Monitoring	Operation	Water quality monitoring program was conducted as required.	16 – 23	7 – 10	12 – 14	B, C
28	Start-up Monitoring for Frog Pond Detention Area (modified in 0293559-006)	Operation	Not needed				
29	Mercury and Pesticide Monitoring	Operation	Mercury and pesticide monitoring programs were conducted as required.	28 – 34	13	18 – 23	

Table A-1. Continued.

Specific Condition	Description	Applicable Phase	Action Taken	Included in This Report in:			
				Narrative (page #'s)	Figure	Table	Attachment
30	Removal of Monitoring Requirements	Operation	Elimination of other toxicants monitoring was approved by FDEP on January 9, 2014.				
31	Addition of Monitoring Requirements	Operation	Not needed				
32	Facility Inspection Plan and Reports	Operation	Inspection was conducted during WY2014, and the report was submitted separately.	5			
33	Construction Status Report	Construction	Not needed				
34	As-Built Certification and Record Drawings	Construction	Not needed				
35	Annual Reports	Operation	Annual report completed and submitted as required	All	All	All	All
36	Emergency Suspension of Sampling	Operation	Not needed				

Attachment B: Water Quality Data

This project information is required by Specific Condition 35 of the C-111 Spreader Canal Phase 1 (Western) Project permit (0293559-007), and is available upon request.

Attachment C: Hydrologic Data

This project information is required by Specific Condition 35 of the C-111 Spreader Canal Phase 1 (Western) Project permit (0293559-007), and is available upon request.