Appendix 2-3: Annual Permit Report for the Biscayne Bay Coastal Wetlands – L-31 East Culverts and Deering Estate Flow-way

Permit Report (May 1, 2011–April 30, 2012)
Permit Number: 0271729

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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, figures, and attachments where project status and annual reporting requirements are addressed. This annual report satisfies the reporting requirements specified in the permit.

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Table 1. Key permit–related information.

Project Name:	**Biscayne Bay Coastal Wetlands – L-31 East Culverts and Deering Estate Flow-way**	
Permit Number:	0271729-003	
Issue and Expiration Dates:	Issued: 5/23/2008; Expires: 5/23/2013	
Project Phase:	Operations	
Permit Specific Condition Requiring Annual Report:	27	
Relevant Period of Record:	May 1, 2011–April 30, 2012	
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Table 2. Attachments included with this report.

Attachment	Title
A	Specific Conditions and Cross-References
B	Water Quality, Toxicant, and Mercury Data
C	Flow and Stage Data
D	Surface Water Quality and Flow Statistical Summary
E	BBCW L-31E Culverts Annual Mitigation Monitoring Report
F	BBCW Deering Estate Flow-way Baseline Mitigation Monitoring Report
G	As-Built Certification for BBCW L-31E Culverts Maintenance Work (Inlet and Outlet Improvements)
H	Excursion Analysis for Class III Constituents (BBCW L-31 East Culverts)

INTRODUCTION

Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit 0271729, which was issued by the FDEP to the South Florida Water Management District (District or SFWMD) authorizes the District to construct and operate the L-31 East (L-31E) Culverts and Deering Estate Flow-way components of the Biscayne Bay Coastal Wetlands (BBCW) Project study area (**Figures 1** and **2**). Specific Condition 27 of the permit requires the District to submit an annual report to the FDEP detailing the progress of the BBCW Project and to incorporate the annual monitoring report into the South Florida Environmental Report (SFER). This document also serves as a comprehensive reference for water quality monitoring needed to evaluate the L-31E Culverts and Deering Estate Flow-way components' performance toward meeting the planned restoration goals, and to satisfy water quality sample data collection requirements outlined in the CERPRA permit.

L-31E CULVERTS COMPONENT

The L-31E Culverts component is located in Miami-Dade County between the C-102 and C-103 canals (Sections 4, 9, 28, 33, and Township 56 S Range 40 East and 57S Range 40 East). The component's goal is to reestablish, at least in part, historical sheetflow and wetland hydroperiods downstream of the project area. This component may also provide the additional benefit of mitigating impacts of discharging fresh water via the existing canals. The component is expected to achieve its objectives by redirecting flow that was historically discharged through structures S-21A, S-20F, and S-20G. This flow is now discharged into the coastal wetlands east of the L-31E levee, along Biscayne Bay, via four flap-gated culverts: S-23A, S-23B, S-23C, and S-23D (**Figure 1**).

To evaluate the performance of the L-31E Culverts component, Specific Condition 27(A) of the CERPRA permit requires the following:

- Monthly collection of water quality samples (turbidity, ammonia, color, total phosphorous, and nitrate-nitrite) and physiochemical data (specific conductance, dissolved oxygen, pH, temperature, and salinity (calculated)) at monitoring stations MI01, BB53, PR01, and MW01
- Monthly water level monitoring using stage gauges upstream and downstream of water control structures S-21A, S-20G, and S-20F
- Monthly calculated flow through culverts S-23A, S-23B, S-23C, and S-23D

Water quality samples for the L-31E Culverts component were analyzed by Miami-Dade County's Department of Regulatory and Economic Resources laboratory, under contract to the District, utilizing quantitative analytical methods approved by the FDEP. The Miami-Dade lab is certified by the National Environmental Laboratory Accreditation Conference (NELAC).

DEERING ESTATE FLOW-WAY COMPONENT

The Deering Estate Flow-way component is located in southeastern Miami-Dade County on the Deering Estate at Cutler, located at 1580 Old Cutler Road, Palmetto Bay, Florida (**Figure 2**). This component included an extension of a spur canal off the C-100A canal, a pump station with associated discharge piping, an outlet spreader structure, and a wetland area to be used for educational purposes. Excluding the spreader structure, these components were constructed on a 9.7-acre tract referred to as the "Powers Addition Parcel", located west of, and adjacent to, the Deering Estate.

The Deering Estate Flow-way component will redirect up to 100 cubic feet per second (cfs) of water from the C-100A canal system, through the C-100A spur canal into the Cutler Drain on the component site, and within the Deering Estate Flow-way, thus restoring a portion of the historic freshwater flow through the flow-way and into Biscayne Bay (**Figure 2**).

Deering Estate Flow-way construction (completed) included:

- A 500-foot extension of the C-100A canal
- A pump station (S-700) with two 25 cfs and one 50 cfs pumps.
- A 60-inch diameter pipe that takes the water under old Cutler Road and releases it into the Deering Estate wetlands

Miami-Dade County and the District are cooperating on this component with the following goals:

- Redirect up to 100 cfs of the existing point-source discharge from the S-123 structure by optimizing the capture and conveyance of freshwater from the C-100A spur canal to the coastal wetlands in the immediate vicinity of the Cutler Drain, east of Old Cutler Road
- Rehydration of the wetland region east of Old Cutler Road, and restoration of a more natural freshwater flow regime
- Establishment of an educational wetland on the Power's Addition Parcel

To evaluate performance of the Deering Estate Flow-way component, Specific Condition 27A of the CERPRA permit requires:

- Biweekly collection (when pumps are operated) of water quality samples (ammonia, total phosphorous, nitrate-nitrite, total Kjeldahl nitrogen) and physiochemical data (specific conductance, dissolved oxygen, pH, temperature) at Deering Estate pump station S-700
- Daily water level monitoring using a stage recorder upstream of Deering Estate pump station S-700
- Daily calculated flow through Deering Estate pump station S-700
- Toxicant and mercury monitoring according to Specific Conditions 19 and 22 of the FDEP permit

Component construction was completed on April 30, 2012, and water quality monitoring, as specified in the permit, will be conducted by the SFWMD when water is flowing.

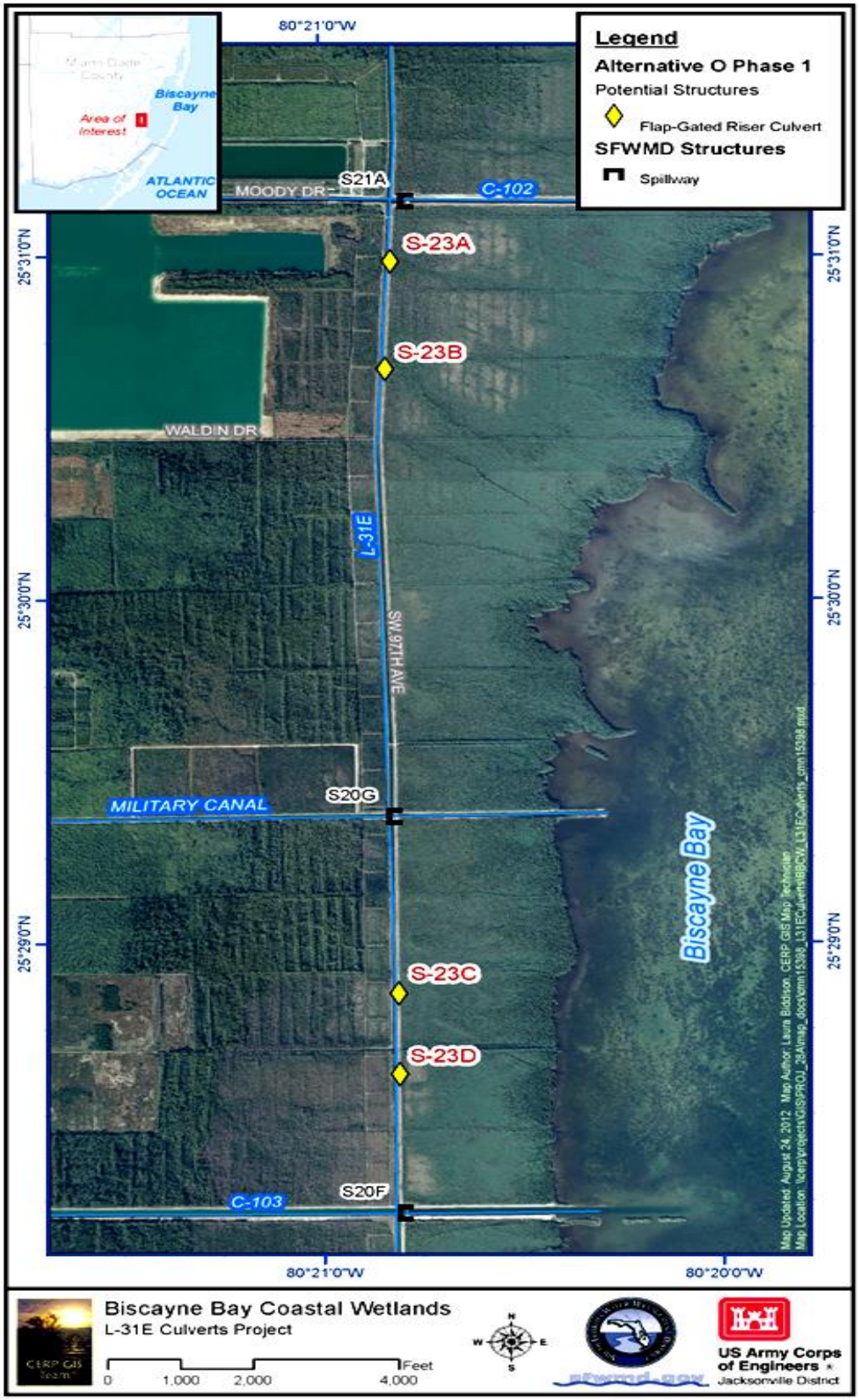


Figure 1. Biscayne Bay Coastal Wetlands – L-31E Culverts component

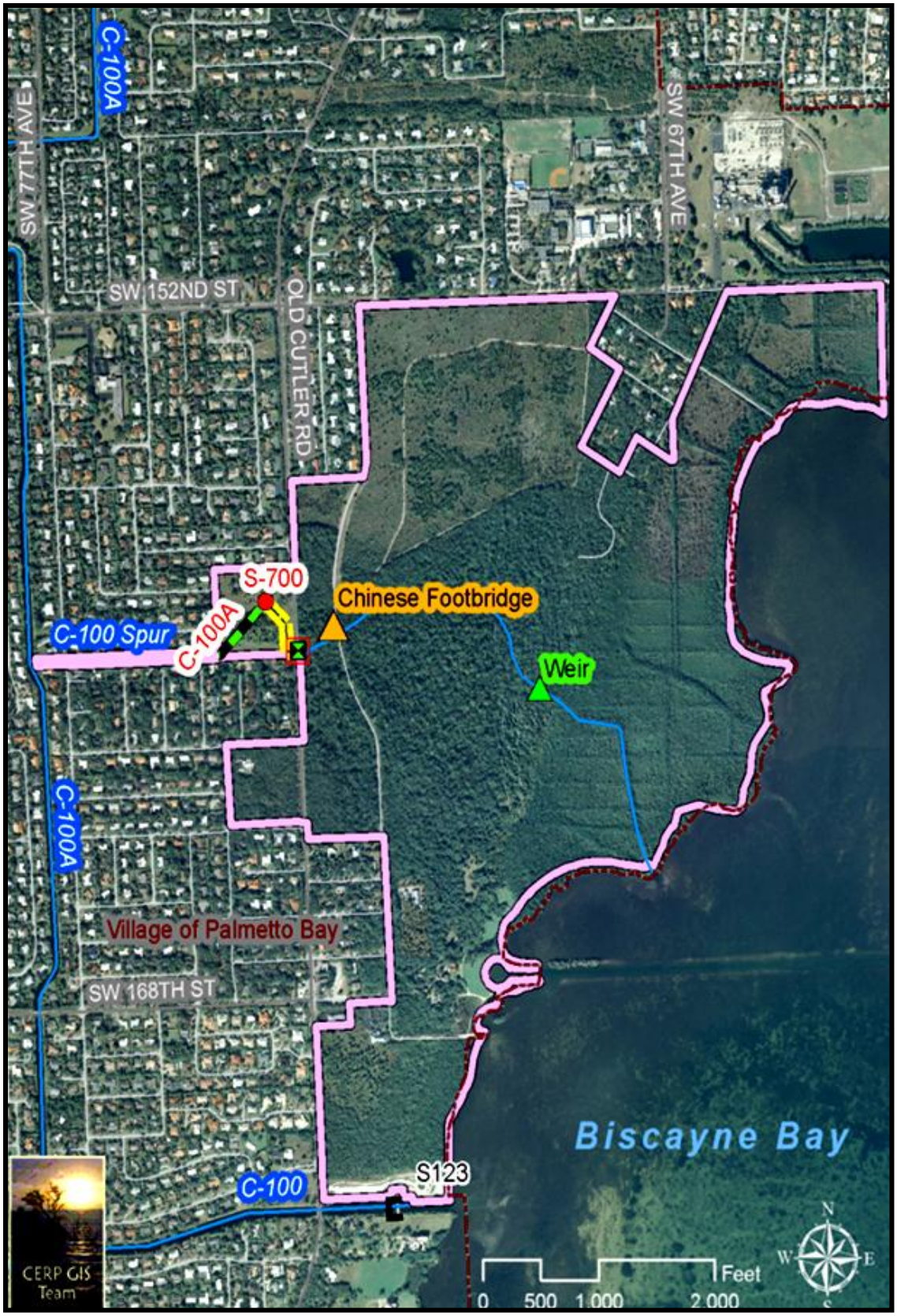


Figure 2. Biscayne Bay Coastal Wetlands Deering Estate Flow-way component

PROJECT EVALUATION

WATER QUALITY: L-31E CULVERTS COMPONENT

Monthly water quality samples were collected at monitoring sites BB53, MI01, MW01, and PR01 (**Figure 3**). The results of the statistical analysis of these data are presented in **Tables 3** through **20** and **Figures 4** through **19**. To evaluate the recent evolution of the system, this report includes a comparison of monthly water quality (WQ) parameters for the following three periods:

- October 2009 to May 2010 – considered the reference interval (8 months)
- June 2010 to April 2011 – considered as the first year (11 months)
- May 2011 to April 2012 – considered as the second year (12 months)

For each parameter, data sets of monthly values by site and period were assembled. The comparison of the three intervals was performed using Student's t-test for the averages of the data sets, and the Mann-Whitney U-test for the medians of the data sets.

The analyzed parameters are of two categories:

- Surface: color, dissolved ammonia, nitrite+nitrate, total phosphorus, total suspended solids, and turbidity. These are measured at a single depth close to the water surface (sampling depth is 0.5 m) (**Table 3**)
- Profile: dissolved oxygen, pH, salinity, specific conductivity, and temperature. These are measured at the water surface, middle, and bottom (**Table 4**), based on total water depth (TDEPTH) at the location and time of sampling event, as well as on sampling depth (DEPTH). The measurements are classified along the water profile as:
  - Surface (S) if DEPTH is less than 20 percent of TDEPTH
  - Middle (M) if DEPTH is 20 percent or more of TDEPTH but less than or equal to 80 percent of TDEPTH
  - Bottom (B) if DEPTH is greater than 80 percent of TDEPTH

The statistical analysis of WQ data is based on monthly values for each parameter, by site and profile (where applicable). The monthly value for a parameter represents either a monthly reading, when there was only one measurement per month, or an average monthly reading, when there were several measurements performed during the month. There are months with no measurements of a specific parameter at certain sites or profile depths, and for some data sets, the monthly values for certain parameters, sites, and periods might have only one value, or none. Such data sets are omitted from the comparisons. Data sets of monthly values by parameter and site for the three periods have been compared based on central tendencies using SYSTAT 13 software:

- Binary comparisons (i.e. reference vs. year 1, reference vs. year 2, and year 1 vs. year 2) between the averages of the data sets, characterizing the three periods, were performed using Student's t-test
- Binary comparisons (i.e. reference vs. year 1, reference vs. year 2, and year 1 vs. year 2) between the medians of the data sets, characterizing the three time intervals, were done using Mann-Whitney U test

Given the small size of the compared data sets ($n \leq 12$ since the longest of the compared time intervals has twelve months), and that some of these data sets are not normally distributed, the Mann-Whitney U test, which is a non-parametric technique, seems to be more appropriate. The

results of the comparisons are interpreted based on the significance level $\alpha = 0.05$. Hence, two compared data sets are considered as having a statistically significant difference if the associated p-value is less than 0.05.

When comparing central tendencies of two data sets, the percentage differences should also be evaluated. For example, when both of the compared data sets have small variability, a small difference between central tendencies might appear statistically significant. Nevertheless, this difference might be a small percentage, or might be less than the measurement error for the specific parameter, and therefore environmentally insignificant.

Tables 3 and **4** list the averages and medians of monthly value data sets for the three intervals: reference interval, first year, and second year. Also these tables list p-values provided by the Student's t-test and Mann-Whitney U test when comparing the central tendencies of the second year to the central tendency of reference interval and first year. The comparisons between listed intervals are done by parameter, site, and profile, where applicable.

The results are presented separately for surface and profile WQ parameters in Attachment D. Each file also includes summary statistics, including the normality test, for each data set by period, site, parameter, and profile (where applicable). To evaluate compliance with water quality criteria in WY2012, constituent concentrations were also compared to their respective Class III numeric criteria (in this case, marine/brackish water). If a constituent concentration exceeded its numeric criterion, an excursion was recorded and the total number of excursions and the percent of excursions for the BBCW L-31 East Culverts structures were tabulated (Attachment H).

Significant differences were found in the following surface WQ parameters (**Table 3**):

- Total phosphorus (TP) increased at all sites when comparing results from the second year to the reference period. The increases were substantial: 66 percent to 100 percent at BB53, 16 percent at MI01, 40 percent at MW01 and 60 percent at PR01. TP also increased by 50 percent from the first year to the second at BB53.
- Turbidity increased at BB53 by 50 percent when comparing the second year to the reference period Table 3.

Significant differences in profile WQ parameters were as follows (**Table 4**):

- Surface pH increased at MI01 from the reference interval to the second year by 4 to 5 percent. The pH increase is also evident when comparing the first and second years, when the increase is about 3 percent.
- Bottom pH increased at MW01 by 2 percent when comparing the averages of the data sets for the second year versus first year. The small percentage values of these pH increases might not be environmentally significant. In addition, some of the increases in medians are not statistically significant differences.
- Bottom salinity increased at PR01 by 45 percent when comparing averages for the second year and reference interval. The increase is about 14 percent when comparing the medians for the second year to the reference interval.
- Bottom specific conductivity at PR01 correlates with variations in salinity. Comparing averages of the second year to the reference interval found a decrease of 41 percent. The decrease is only about 13 percent when comparing the medians for the second year and reference interval.

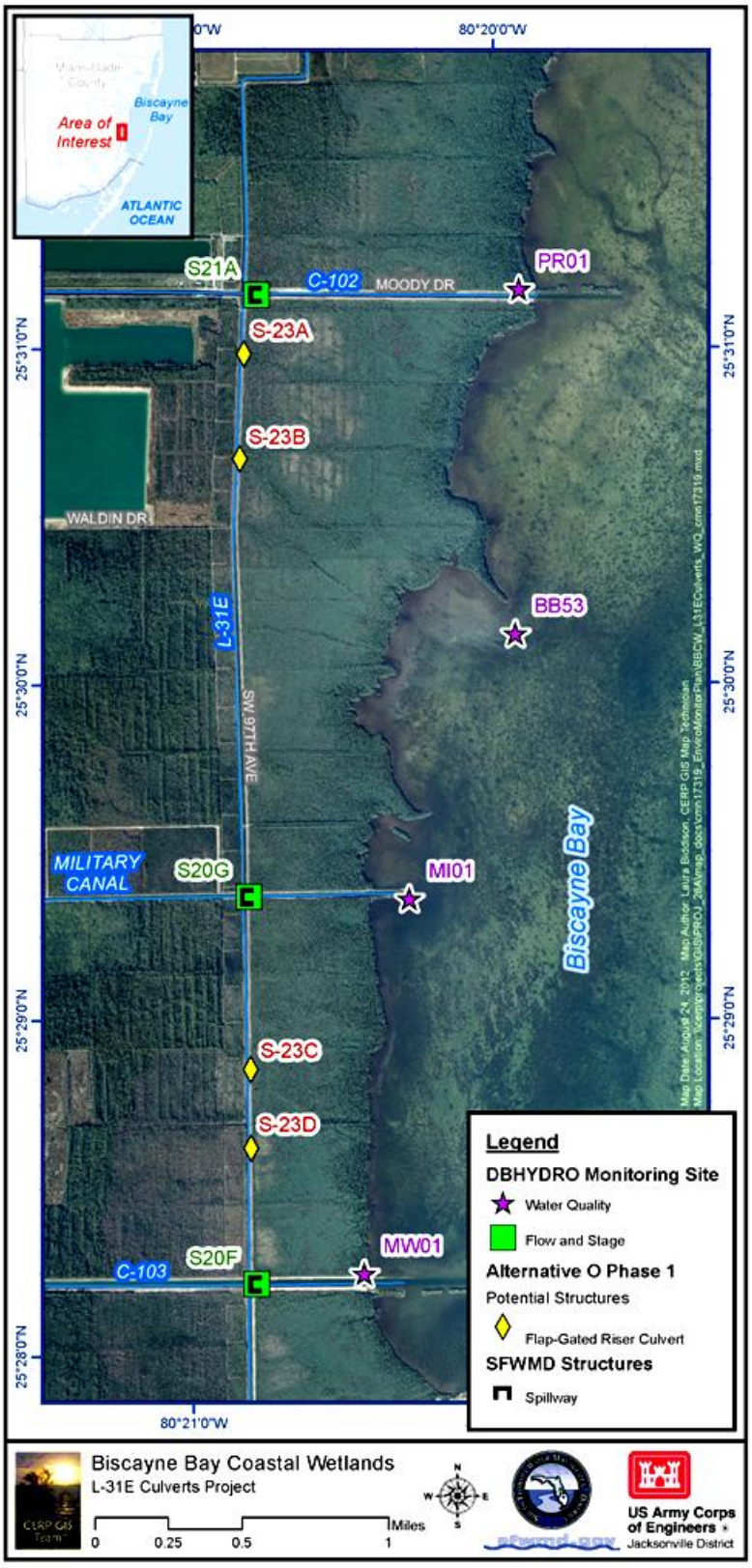


Figure 3. Location of water quality monitoring stations for the L-31E Culverts component.

Table 3. Surface water quality (WQ) parameters' monthly value data set averages and medians by site for the reference interval, first year, and second year. Results of comparisons between the second year and reference interval, and between the second and first years, are listed as p-values. Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets. (Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets)

Surface WQ Parameter	Time Interval	BB53				MI01				MW01				PR01			
		N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median
Color (PCU)	Reference Interval	7	17	2	18	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
	1st Year	11	17	2	18	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
	2nd Year	12	17	2	18	11	25	1	25	11	24	2	25	11	16	1	18
p-value	2nd Year vs. Reference		0.927		0.927		NA		NA		NA		NA		NA		NA
p-value	2nd Year vs. 1st Year		0.704		0.851		NA		NA		NA		NA		NA		NA
Dissolved Ammonia (mg/L)	Reference Interval	8	0.11	0.02	0.10	8	0.11	0.01	0.12	8	0.07	0.01	0.06	7	0.12	0.05	0.07
	1st Year	10	0.12	0.03	0.09	11	0.11	0.01	0.10	11	0.08	0.01	0.08	10	0.14	0.02	0.12
	2nd Year	12	0.10	0.01	0.09	12	0.10	0.01	0.11	12	0.09	0.01	0.08	12	0.13	0.02	0.12
p-value	2nd Year vs. Reference		0.731		0.969		0.464		0.483		0.267		0.229		0.901		0.420
p-value	2nd Year vs. 1st Year		0.609		0.921		0.638		0.829		0.418		0.403		0.741		0.596
Nitrite + Nitrate (mg/L)	Reference Interval	8	0.416	0.135	0.310	8	0.402	0.141	0.300	8	0.583	0.115	0.750	7	2.600	0.575	3.310
	1st Year	11	0.416	0.144	0.230	11	0.430	0.099	0.480	11	0.578	0.184	0.300	11	1.475	0.329	1.430
	2nd Year	12	0.293	0.099	0.145	12	0.313	0.075	0.290	12	0.307	0.090	0.175	12	1.638	0.466	1.435
p-value	2nd Year vs. Reference		0.475		0.333		0.588		0.787		0.078		0.053		0.216		0.063
p-value	2nd Year vs. 1st Year		0.490		0.686		0.360		0.295		0.207		0.295		0.778		0.951

Table 3. Continued. (Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets)

Surface WQ Parameter	Time Interval	BB53				MI01				MW01				PR01			
		N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median
Total Phosphorus (mg/L)	Reference Interval	8	0.003	0.000	0.003	8	0.006	0.000	0.006	7	0.005	0.001	0.005	7	0.005	0.000	0.005
	1st Year	11	0.004	0.000	0.004	10	0.008	0.001	0.008	7	0.008	0.001	0.007	11	0.007	0.001	0.006
	2nd Year	12	0.006	0.001	0.005	12	0.007	0.000	0.007	10	0.007	0.000	0.007	12	0.008	0.001	0.008
	p-value 2nd Year vs. Reference		**0.002**		**0.001**		**0.002**		**0.004**		0.067		**0.004**		**<0.001**		**0.001**
	p-value 2nd Year vs. 1st Year		**0.046**		**0.031**		0.656		0.865		0.250		0.208		0.395		0.347
Total Suspended Solids (mg/L)	Reference Interval	1	85.0	NA	85.0	1	56.0	NA	56.0	1	44.0	NA	44.0	1	6.0	NA	6.0
	1st Year	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
	2nd Year	9	64.2	6.3	65.0	8	40.4	6.8	41.0	7	58.0	5.1	60.0	8	41.4	7.4	46.5
	p-value 2nd Year vs. Reference		NA		NA		NA		NA		NA		NA		NA		NA
	p-value 2nd Year vs. 1st Year		NA		NA		NA		NA		NA		NA		NA		NA
Turbidity (NTU)	Reference Interval	8	0.6	0.1	0.6	8	1.2	0.2	1.1	8	0.9	0.1	0.6	7	1.0	0.2	0.8
	1st Year	9	0.8	0.1	0.8	9	0.9	0.1	0.8	9	0.9	0.2	0.7	9	1.1	0.1	1.1
	2nd Year	12	0.9	0.1	0.9	12	0.9	0.1	0.9	12	0.7	0.1	0.6	12	0.9	0.1	0.9
	p-value 2nd Year vs. Reference		**0.030**		0.079		0.153		0.313		0.181		0.322		0.590		0.832
	p-value 2nd Year vs. 1st Year		0.764		0.971		0.958		0.971		0.328		0.494		0.169		0.124

Table 4. Profile WQ parameters' monthly value data set averages and medians by site and profile depth (S: Surface; M: Middle; B: Bottom) for the reference interval, first year, and second year. Results of comparisons between the second year and reference interval, and between the second and first years, are listed as p-values. Bold underlined p values indicate statistically significant differences between central tendencies of the data sets. (Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets) *(Table continues on next page)*

Profile WQ Parameter	Profile Depth	Time Interval	BB53				MI01				MW01				PR01			
			N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median
Dissolved Oxygen (mg/L)	S	Reference Interval	8	7.6	0.7	7.6	8	5.8	0.6	6.0	8	5.7	0.6	6.1	7	6.2	0.7	6.3
		1st Year	11	7.7	0.5	7.3	11	5.6	0.4	5.5	11	5.7	0.4	5.7	11	5.4	0.3	5.0
		2nd Year	11	7.3	0.4	8.0	12	5.6	0.6	6.3	12	5.2	0.6	5.6	12	4.9	0.4	5.1
		p-value 2nd Year vs. Reference		0.663		0.741		0.794		0.643		0.614		0.758		0.169		0.151
		p-value 2nd Year vs. 1st Year		0.575		0.622		0.968		0.498		0.490		0.806		0.379		0.498
	M	Reference Interval	7	7.6	0.7	7.6	3	3.8	1.6	3.6	1	2.9	NA	2.9	1	5.0	NA	5.0
		1st Year	7	8.3	0.6	8.0	1	5.6	NA	5.6	1	4.6	NA	4.6	0	NA	NA	NA
		2nd Year	7	6.8	0.5	7.6	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
		p-value 2nd Year vs. Reference		0.428		0.565		NA		NA		NA		NA		NA		NA
		p-value 2nd Year vs. 1st Year		0.083		0.180		NA		NA		NA		NA		NA		NA
	B	Reference Interval	8	8.1	0.7	8.0	8	6.0	1.0	6.5	8	5.5	0.7	5.5	7	6.2	0.8	5.4
		1st Year	10	7.4	0.6	7.1	11	5.8	0.7	6.2	11	5.1	0.6	5.6	11	5.3	0.5	4.7
		2nd Year	11	6.8	0.4	6.8	12	4.9	0.5	4.8	12	5.2	0.6	5.3	11	5.8	0.3	5.8
		p-value 2nd Year vs. Reference		0.157		0.186		0.319		0.217		0.758		0.758		0.642		0.856
		p-value 2nd Year vs. 1st Year		0.444		0.460		0.295		0.268		0.956		0.878		0.436		0.250

Table 4. Continued. (Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets)

Profile WQ Parameter	Profile Depth	Time Interval	BB53				MI01				MW01				PR01			
			N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median
pH (units)	S	Reference Interval	8	8.11	0.07	8.07	8	7.65	0.04	7.64	8	7.80	0.08	7.75	7	7.61	0.08	7.74
		1st Year	11	8.08	0.05	8.06	11	7.73	0.07	7.75	11	7.82	0.09	7.83	11	7.63	0.06	7.56
		2nd Year	12	8.11	0.07	8.12	12	7.98	0.08	8.06	12	8.02	0.11	8.01	12	7.78	0.09	7.81
		p-value 2nd Year vs. Reference		0.990		0.817		**0.003**		**0.025**		0.126		0.105		0.208		0.163
		p-value 2nd Year vs. 1st Year		0.773		0.782		**0.028**		0.065		0.157		0.124		0.199		0.103
	M	Reference Interval	7	8.05	0.06	7.98	3	7.66	0.03	7.65	1	7.70	NA	7.70	1	7.45	NA	7.45
		1st Year	7	8.10	0.08	8.05	1	7.55	NA	7.55	1	7.99	NA	7.99	0	NA	NA	NA
		2nd Year	8	8.01	0.08	8.06	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
		p-value 2nd Year vs. Reference		0.685		0.728		NA		NA		NA		NA		NA		NA
		p-value 2nd Year vs. 1st Year		0.444		0.487		NA		NA		NA		NA		NA		NA
	B	Reference Interval	8	8.12	0.08	8.08	8	7.84	0.07	7.88	8	7.92	0.10	8.02	7	7.84	0.13	7.91
		1st Year	10	8.06	0.06	8.05	11	7.86	0.08	7.80	11	7.83	0.08	7.91	11	7.89	0.07	7.92
		2nd Year	12	8.06	0.08	8.05	11	7.82	0.11	7.79	12	8.08	0.08	8.10	12	7.97	0.07	7.94
		p-value 2nd Year vs. Reference		0.598		0.643		0.884		0.998		0.221		0.280		0.388		0.735
		p-value 2nd Year vs. 1st Year		0.985		0.843		0.812		0.869		**0.032**		0.069		0.418		0.538
Salinity (ppt)	S	Reference Interval	8	22.3	1.6	22.2	8	17.1	2.4	19.6	8	17.2	2.4	16.8	7	9.6	2.3	9.7
		1st Year	11	20.6	2.8	23.0	11	14.4	2.6	15.2	11	17.8	3.5	20.8	11	12.3	2.8	11.3
		2nd Year	12	23.6	2.4	21.5	12	19.0	3.4	15.9	12	23.0	3.4	22.3	12	16.5	3.7	13.1
		p-value 2nd Year vs. Reference		0.640		0.939		0.665		0.758		0.186		0.190		0.129		0.272
		p-value 2nd Year vs. 1st Year		0.424		0.498		0.300		0.498		0.302		0.295		0.377		0.498
	M	Reference Interval	7	20.8	0.9	21.8	3	11.6	3.3	13.4	1	12.2	NA	12.2	1	3.9	NA	3.9
		1st Year	7	22.2	3.7	25.8	1	8.0	NA	8.0	1	29.3	NA	29.3	0	NA	NA	NA
		2nd Year	8	23.0	3.3	19.9	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
		p-value 2nd Year vs. Reference		0.541		0.998		NA		NA		NA		NA		NA		NA
		p-value 2nd Year vs. 1st Year		0.865		0.998		NA		NA		NA		NA		NA		NA
	B	Reference Interval	8	22.0	1.7	21.7	8	21.7	0.9	22.0	8	24.9	2.2	26.7	7	16.7	2.7	19.8
		1st Year	10	20.5	3.0	21.5	11	21.0	2.3	22.4	11	23.2	3.3	27.7	11	20.0	2.8	21.3
		2nd Year	12	24.4	2.7	21.5	12	26.0	2.6	23.3	12	27.5	2.5	25.2	12	24.3	2.0	22.6
		p-value 2nd Year vs. Reference		0.448		0.939		0.151		0.440		0.441		0.939		**0.044**		**0.022**
		p-value 2nd Year vs. 1st Year		0.335		0.356		0.172		0.325		0.313		0.538		0.226		0.356

Table 4. Continued. (Bold underlined P-values indicate statistically significant differences between central tendencies of the data sets)

Profile WQ Parameter	Profile Depth	Time Interval	BB53				MI01				MW01				PR01			
			N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median	N	Average	Std Err	Median
Specific Conductivity (µS/cm)	S	Reference Interval	8	35,323	2,231	35,288	8	27,624	3,753	31,516	8	27,722	3,594	27,284	7	15,971	3,566	16,511
		1st Year	11	32,722	4,054	36,391	11	23,345	4,045	24,926	11	28,056	5,305	32,278	11	19,965	4,372	18,956
		2nd Year	12	37,118	3,358	34,240	12	30,037	4,950	26,079	12	35,880	4,984	35,419	12	26,182	5,463	21,747
		p-value 2nd Year vs. Reference		0.662		0.939		0.702		0.758		0.201		0.190		0.136		0.272
		p-value 2nd Year vs. 1st Year		0.414		0.498		0.307		0.538		0.295		0.295		0.385		0.498
	M	Reference Interval	7	33,298	1,373	34,554	3	19,281	5,092	22,251	1	20,443	NA	20,443	1	7,063	NA	7,063
		1st Year	7	34,881	5,492	40,409	1	13,885	NA	13,885	1	45,520	NA	45,520	0	NA	NA	NA
		2nd Year	8	36,244	4,693	31,950	0	NA	NA	NA	0	NA	NA	NA	0	NA	NA	NA
		p-value 2nd Year vs. Reference		0.563		0.998		NA		NA		NA		NA		NA		NA
		p-value 2nd Year vs. 1st Year		0.854		0.998		NA		NA		NA		NA		NA		NA
	B	Reference Interval	8	34,925	2,411	34,491	8	34,627	1,335	35,012	8	38,956	3,155	41,579	7	27,011	4,257	31,641
		1st Year	10	32,437	4,420	34,329	11	33,437	3,325	35,471	11	36,186	4,895	42,721	11	31,653	4,291	33,766
		2nd Year	12	38,241	3,760	34,227	12	40,424	3,683	36,743	12	42,554	3,467	39,498	12	38,194	2,802	35,844
		p-value 2nd Year vs. Reference		0.468		0.939		0.162		0.440		0.453		0.939		**0.049**		**0.018**
		p-value 2nd Year vs. 1st Year		0.330		0.356		0.174		0.325		0.302		0.460		0.219		0.356

Table 5. Monthly values and summary of statistical analysis of turbidity in nephelometric turbidity units (NTU) for the L-31E Culverts component during Water Year 2012 (WY2012) (May 1, 2011–April 30, 2012).

Month	BB53	MI01	MW01	PR01
May 2011	0.60	1.10	0.40	0.90
June 2011	0.50	1.00	0.80	1.40
July 2011	0.70	0.70	0.70	1.20
August 2011	0.50	0.60	0.50	0.90
September 2011	1.20	1.20	0.70	0.80
October 2011	0.60	0.60	0.60	0.70
November 2011	1.10	0.90	0.60	0.50
December 2011	1.10	0.80	0.60	0.70
January 2012	1.10	1.10	0.90	1.00
February 2012	1.10	0.80	0.50	1.30
March 2012	1.50	0.90	1.00	0.80
April 2012	0.60	0.50	0.60	0.60
Mean	0.88	0.85	0.66	0.9
SD	0.335	0.224	0.173	0.28
1st Quartile	0.60	0.64	0.54	0.70
Median	0.90	0.85	0.60	0.85
3rd Quartile	1.10	1.06	0.76	1.12
Max	1.50	1.20	1.00	1.40
Shapiro-Wilk Normality Test p-value	0.059	0.786	0.468	0.601

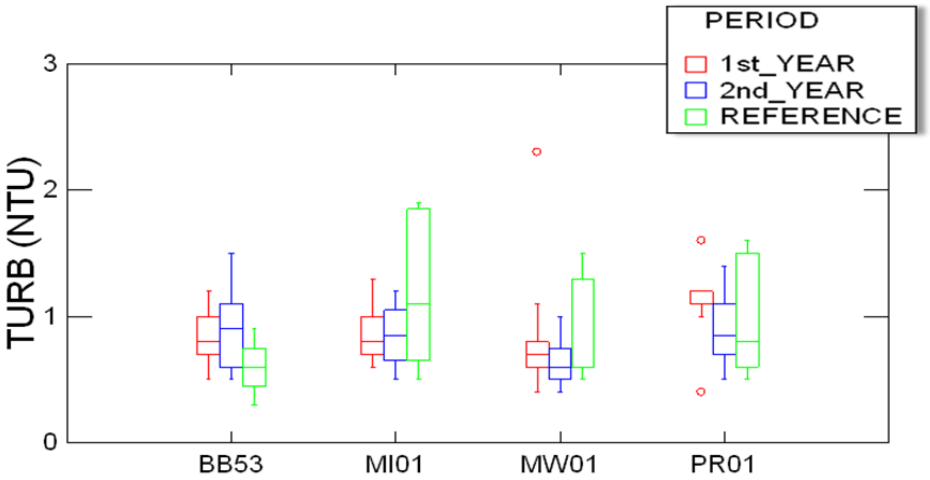


Figure 4. Box-plot comparison of three periods for turbidity (NTU) in the L-31E Culverts component.

Table 6. Monthly values and summary of statistical analysis of total phosphorus in milligrams per liter (mg/L) for the L-31E Culverts component for WY2012

Month	BB53	MI01	MW01	PR01
May 2011	0.005	0.009	0.006	0.011
June 2011	0.004	0.009	0.007	0.009
July 2011	0.012	0.006	0.007	0.008
August 2011	0.007	0.007	0.005	0.01
September 2011	0.004	0.007	0.006	0.006
October 2011	0.005	0.007	0.006	0.007
November 2011	0.004	0.007	0.006	0.005
December 2011	0.004	0.007	0.005	0.006
January 2012	0.007	0.008	0.007	0.009
February 2012	0.006	0.009	0.007	0.007
March 2012	0.006	0.007	0.005	0.006
April 2012	0.008	0.008	0.010	0.011
Mean	0.006	0.0076	0.0064	0.0079
SD	0.0023	0.001	0.0014	0.0021
1st Quartile	0.004	0.007	0.0054	0.006
Median	0.0055	0.007	0.006	0.0075
3rd Quartile	0.007	0.0086	0.007	0.0096
Max	0.012	0.009	0.01	0.011
Shapiro-Wilk Normality Test p-value	0.002	0.019	0.031	0.304

* Contains missing data

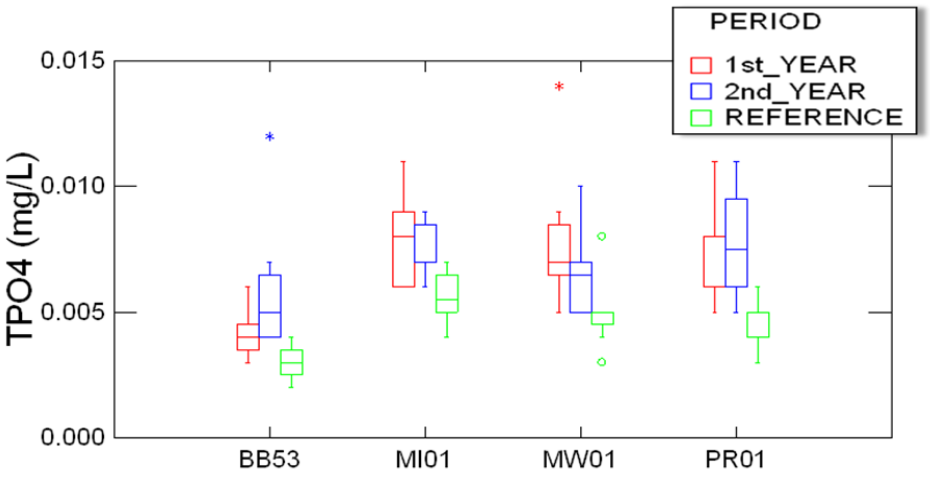


Figure 5. Box-plot comparison of three periods for total phosphorus (TPO4 in mg/L) in the L-31E Culverts component.

Table 7. Monthly values and summary of statistical analysis of color in platinum-cobalt units (PCU) for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	10	*	*	*
June 2011	15	30	40	20
July 2011	25	30	25	20
August 2011	18	25	26	20
September 2011	18	25	25	15
October 2011	25	20	25	20
November 2011	10	30	25	18
December 2011	15	20	15	10
January 2012	12	22	17	20
February 2012	18	30	15	10
March 2012	25	20	30	10
April 2012	18	15	20	20
Mean	17.42	24.27	23.91	16.64
SD	5.43	5.27	7.26	4.52
1st Quartile	13.25	20	17.5	10.83
Median	18	25	25	20
3rd Quartile	22.08	30	25.83	20
Max	25	30	40	20
Shapiro-Wilk Normality Test p-value	0.117	0.007	0.163	0.004

* Contains missing data

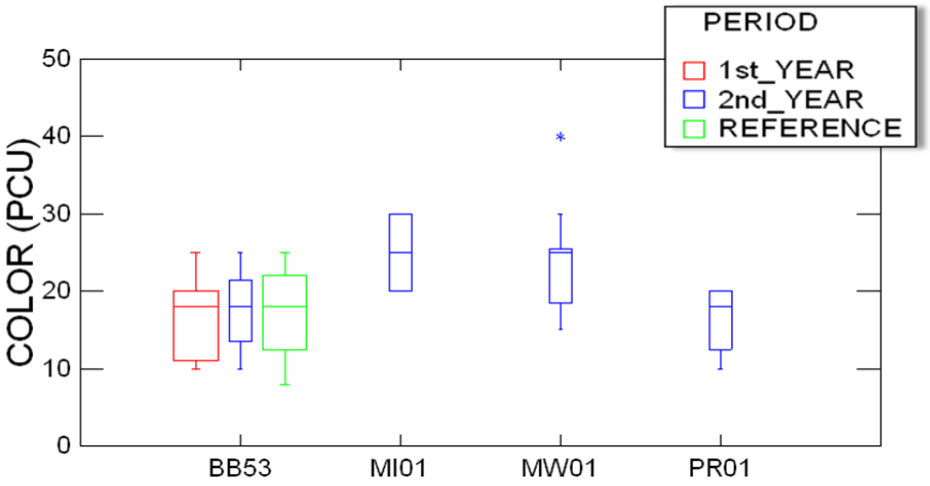


Figure 6. Box-plot comparison of three periods for color (PCU) in the L-31E Culverts component.

Table 8. Monthly values and summary of statistical analysis of total suspended solids (TSS) in mg/L for the L-31E Culverts component for WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	*	*	*
June 2011	68	59	68	62
July 2011	73	45	60	69
August 2011	92	34	68	51
September 2011	*	*	*	*
October 2011	45	11	*	10
November 2011	*	*	*	*
December 2011	40	*	*	*
January 2012	52	37	54	43
February 2012	52	20	33	29
March 2012	65	47	51	17
April 2012	88	70	72	50
Mean	63.89	40.38	58	41.38
SD	18.31	19.35	13.48	21.01
1st Quartile	49.67	25.83	51.50	22.00
Median	65	41	60	46.5
3rd Quartile	78	54	68	57.42
Max	92	70	72	69
Shapiro-Wilk Normality Test p-value	0.434	0.978	0.37	0.712

* Contains missing data

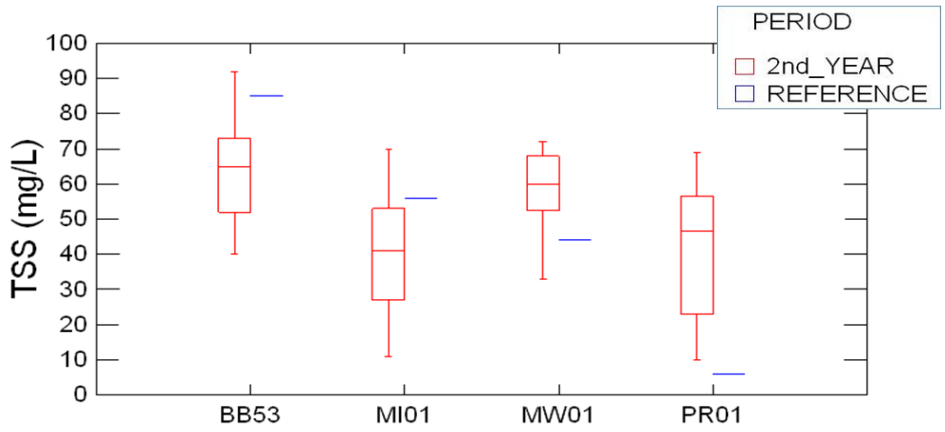


Figure 7. Box-plot comparison between the reference interval and 2nd year interval for TSS (mg/L) in the L31-E Culverts component. (Note: reference interval had only one available TSS monthly value for each site, and 1st year interval had no TSS measurements.)

Table 9. Monthly values and summary of statistical analysis of bottom specific conductivity in microsiemens per centimeter (µS/cm) for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	*	*	*
June 2011	60,303	62,363	62,309	59,060
July 2011	42,930	46,594	35,521	35,187
August 2011	28,158	45,133	52,054	43,110
September 2011	*	34,676	44,333	32,262
October 2011	*	34,480	30,364	35,494
November 2011	22,724	21,441	29,676	22,164
December 2011	24,424	24,254	26,743	31,755
January 2012	*	*	*	*
February 2012	27,884	32,094	38,783	31,736
March 2012	32,550	37,091	36,384	36,193
April 2012	47,992	52,106	55,345	45,321
Mean	35,871	39,023	41,151	37,228
SD	13,266	12,601	11,990	9,982
1st Quartile	25,866	31,441	30,307	31,753
Median	30,354	35,883	37,583	35,340
3rd Quartile	45,883	47,053	52,328	43,294
Max	60,303	62,363	62,309	59,060
Shapiro-Wilk Normality Test p-value	0.194	0.735	0.403	0.455

* Contains missing data

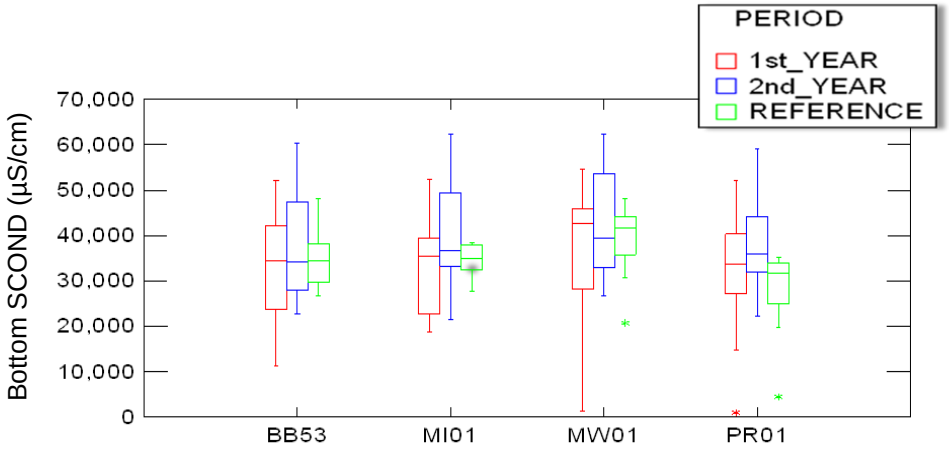


Figure 8. Box-plot comparison of three periods for bottom specific conductivity (SCOND) in µS/cm in the L-31E Culverts component.

Table 10. Monthly values and summary of statistical analysis of surface specific conductivity in µS/cm for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	*	*	*
June 2011	*	*	62,154	60,374
July 2011	44,481	38,271	51,313	40,224
August 2011	42,901	21,641	43,757	20,236
September 2011	28,195	7,156	20,812	5,482
October 2011	29,859	5,191	12,795	9,913
November 2011	21,976	18,483	14,543	3,441
December 2011	24,393	19,545	9,675	13,242
January 2012	*	*	*	*
February 2012	28,015	15,757	34,005	10,682
March 2012	32,563	29,205	35,647	10,236
April 2012	47,948	50,555	53,934	39,736
Mean	33,370	22,867	33,864	21,357
SD	9,392	14,516	18,801	18,929
1st Quartile	26,808	12,890	14,397	9,544
Median	29,859	19,545	34,826	11,962
3rd Quartile	43,428	32,227	51,531	39,777
Max	47,948	50,555	62,154	60,374
Shapiro-Wilk Normality Test p-value	0.547	0.285	0.558	0.312

* Contains missing data

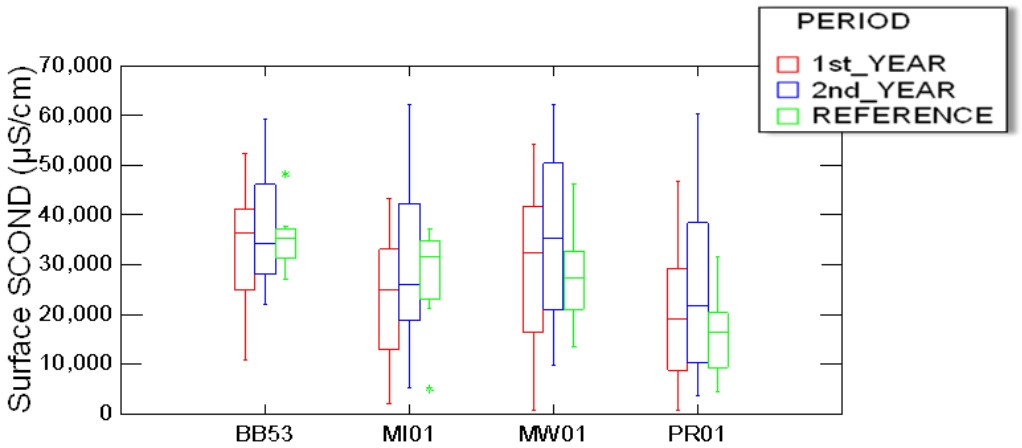


Figure 9. Box-plot comparison of three periods for surface specific conductivity in µS/cm in the L-31E Culverts component.

Table 11. Monthly values and summary of statistical analysis of surface temperature in degrees Celsius (°C) for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	27.54	28.36	27.32	28.83
June 2011	27.72	28.24	28.26	28.43
July 2011	33.15	33.75	33.59	32.62
August 2011	33.09	32.62	33.21	31.98
September 2011	29.61	30.78	29.47	28.51
October 2011	26.02	28.03	26.22	27.07
November 2011	26.73	26.05	25.68	26.68
December 2011	24.50	23.58	24.05	24.89
January 2012	*	*	*	*
February 2012	24.14	24.58	24.55	24.82
March 2012	21.81	21.72	20.80	22.90
April 2012	27.60	29.30	28.11	28.23
Mean	26.967	27.323	27.007	27.225
SD	3.735	4.017	3.915	3.304
1st Quartile	24.32	23.962	24.26	24.725
Median	27.135	27.987	26.918	27.643
3rd Quartile	28.665	29.86	29.065	28.478
Max	33.144	33.836	33.559	32.73
Shapiro-Wilk Normality Test p-value	0.457	0.787	0.858	0.566

* Contains missing data

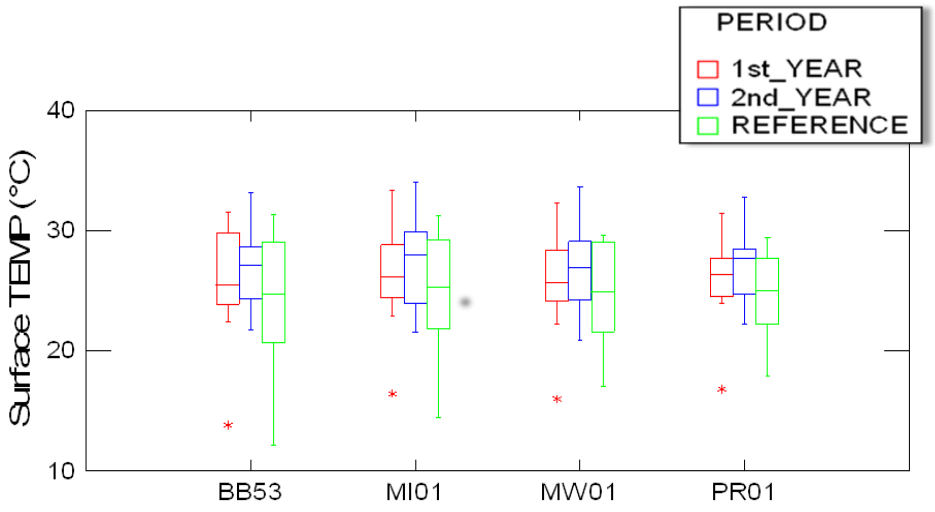


Figure 10. Box-plot comparison of three periods for surface temperature (°C) in the L-31E Culverts component.

Table 12. Monthly values and summary of statistical analysis of bottom temperature (°C) for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	27.52	26.47	26.17
June 2011	27.69	27.71	27.36	26.92
July 2011	*	33.25	33.13	32.45
August 2011	33.08	33.69	32.86	32.83
September 2011	29.61	29.92	30.93	30.02
October 2011	*	27.47	25.46	25.72
November 2011	26.68	25.48	25.41	26.42
December 2011	24.31	23.58	23.68	23.70
January 2012	*	*	*	*
February 2012	24.14	24.68	24.13	24.39
March 2012	*	21.45	20.64	20.38
April 2012	27.55	27.39	26.94	26.82
Mean	26.955	26.97	26.592	26.467
SD	3.754	3.976	3.982	3.824
1st Quartile	24.225	24.13	23.905	24.045
Median	27.115	27.43	25.965	26.295
3rd Quartile	28.65	28.815	29.145	28.47
Max	33.08	33.69	33.13	32.83
Shapiro-Wilk Normality Test p-value	0.454	0.464	0.494	0.626

* Contains missing data

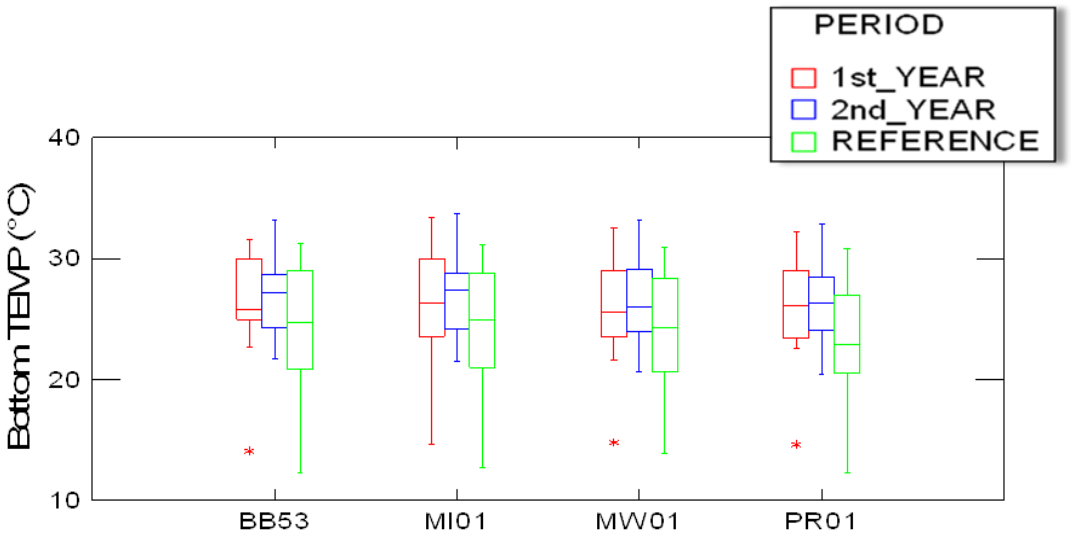


Figure 11. Box-plot comparison of three periods for bottom temperature (°C) in the L-31E Culverts component.

Table 13. Monthly values and summary of statistical analysis for surface salinity in practical salinity units (psu) for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	39.61	33.00	34.05	34.67
June 2011	32.57	41.62	41.75	40.39
July 2011	28.49	24.07	33.43	25.48
August 2011	27.36	12.87	27.97	11.97
September 2011	17.26	3.90	12.38	2.96
October 2011	18.46	2.78	7.33	5.56
November 2011	13.18	10.92	8.42	1.80
December 2011	14.81	11.64	5.44	7.62
January 2012	*	*	*	*
February 2012	17.24	9.2	21.33	6.04
March 2012	20.37	18.08	22.52	5.78
April 2012	31.17	33.03	35.56	25.26
Mean	23.602	18.969	22.973	16.483
SD	8.181	11.829	11.902	11.902
1st Quartile	17.25	11.118	12.62	5.76
Median	21.535	15.917	22.34	13.102
3rd Quartile	29.83	27.095	32.882	24.315
Max	39.61	41.62	41.75	40.39
Shapiro-Wilk Normality Test p-value	0.509	0.189	0.599	0.226

* Contains missing data

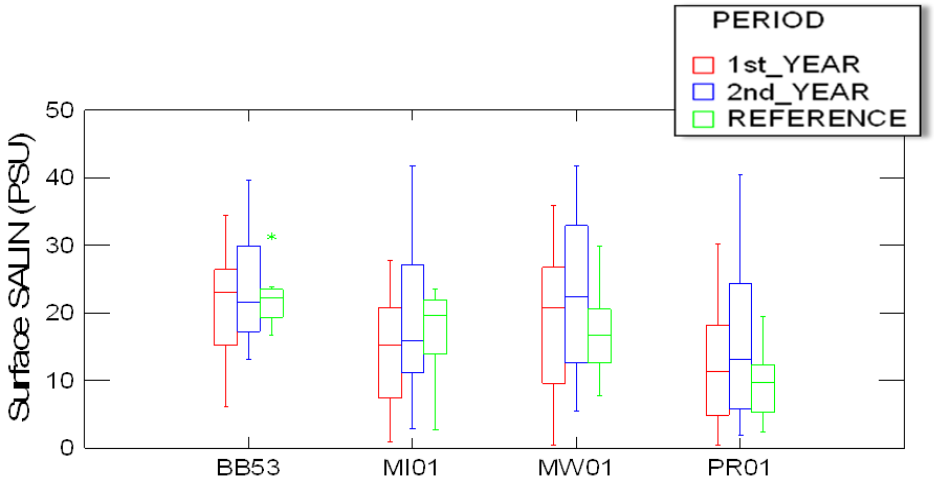


Figure 12. Box-plot comparison of three periods for surface salinity (PSU) in the L-31E Culverts component.

Table 14. Monthly values and summary of statistical analysis for bottom salinity in PSU for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	38.97	39.35	32.34
June 2011	40.36	41.93	41.9	39.44
July 2011	27.38	30.01	22.18	21.97
August 2011	17.24	28.94	34	27.52
September 2011	*	21.68	28.46	20.02
October 2011	*	21.6	18.81	22.34
November 2011	13.67	12.85	18.34	13.31
December 2011	14.83	14.73	16.39	19.79
January 2012	*	*	*	*
February 2012	17.15	20.01	24.68	19.77
March 2012	20.37	23.53	23.04	22.91
April 2012	31.2	34.23	36.65	29.29
Mean	24.429	25.96	27.46	24.32
SD	9.232	9.061	8.617	6.886
1st Quartile	17.195	20.805	20.495	19.905
Median	21.528	23.285	25.2	22.625
3rd Quartile	30.685	32.12	35.325	28.405
Max	40.36	41.93	41.9	39.44
Shapiro-Wilk Normality Test p-value	0.167	0.682	0.37	0.384

* Contains missing data

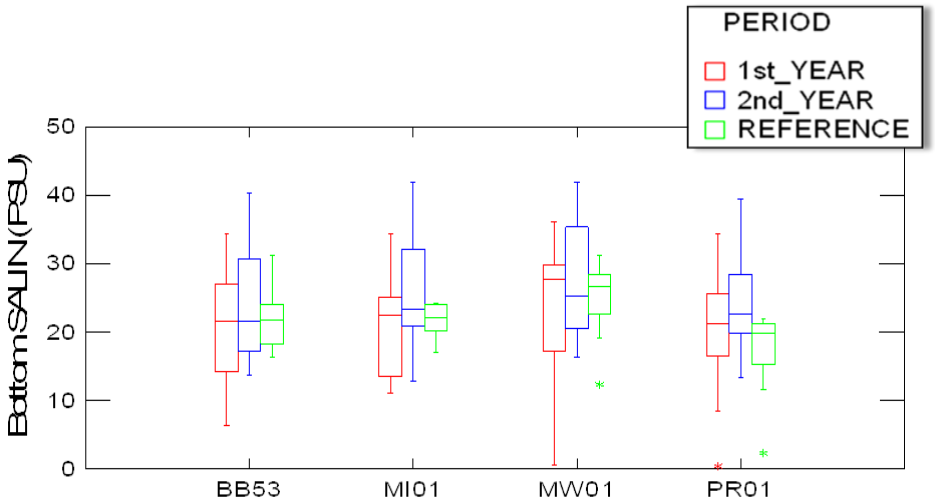


Figure 13. Box-plot comparison of three periods for bottom salinity (PSU) in the L-31E Culverts component.

Table 15. Monthly values and summary of statistical analysis for surface pH for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	8.37	8.21	8.24	7.98
June 2011	8.37	8.21	8.24	7.98
July 2011	8.37	8.34	8.48	8.14
August 2011	8.49	8.34	8.48	8.14
September 2011	7.94	7.58	7.73	7.57
October 2011	7.72	7.72	7.59	7.59
November 2011	8.00	8.01	7.84	7.68
December 2011	7.73	7.56	7.29	7.06
January 2012	8.13	7.86	7.84	7.72
February 2012	8.01	7.63	7.90	7.33
March 2012	8.24	8.15	8.27	7.98
April 2012	8.12	8.13	8.10	7.91
Mean	8.10	8.00	8.00	7.80
SD	0.25	0.29	0.36	0.33
1st Quartile	8.00	7.70	7.80	7.60
Median	8.12	8.10	8.00	7.82
3rd Quartile	8.37	8.21	8.26	7.98
Max	8.49	8.34	8.48	8.14
Shapiro-Wilk Normality Test p-value	0.774	0.284	0.961	0.527

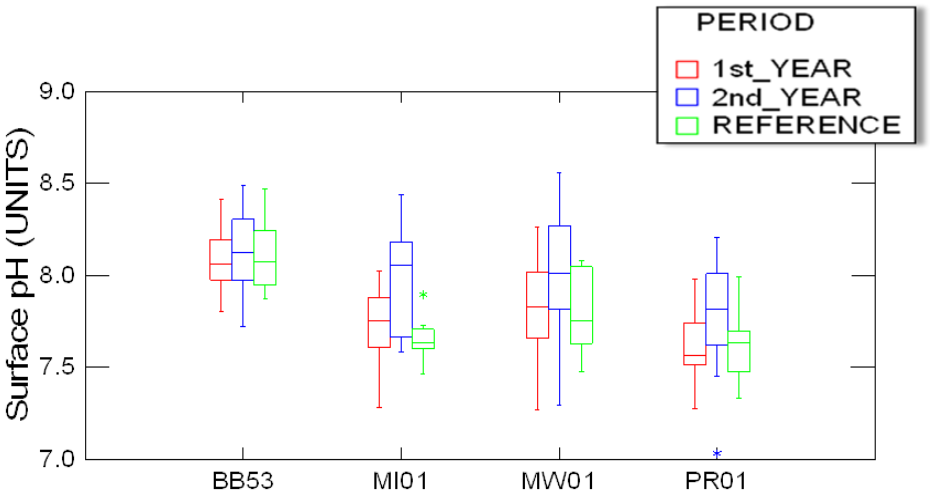


Figure 14. Box-plot comparison of three periods for surface pH in the L-31E Culverts component.

Table 16. Monthly values and summary of statistical analysis for bottom pH for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	8.34	8.17	8.30	8.06
June 2011	8.37	8.28	8.48	8.16
July 2011	8.55	8.53	8.58	8.26
August 2011	7.92	7.58	7.76	7.82
September 2011	7.70	7.52	7.65	7.67
October 2011	7.82	8.21	7.92	8.06
November 2011	7.69	7.71	7.29	7.00
December 2011	8.12	7.92	7.94	7.79
January 2012	*	*	*	*
February 2012	8.01	7.76	7.95	7.57
March 2012	8.25	8.18	8.27	8.01
April 2012	8.11	8.2	8.08	7.96
Mean	8.062	7.823	8.082	7.972
SD	0.28	0.366	0.281	0.235
1st Quartile	7.815	7.55	7.83	7.9
Median	8.05	7.79	8.095	7.935
3rd Quartile	8.292	8.13	8.295	8.10
Max	8.55	8.33	8.52	8.53
Shapiro-Wilk Normality Test p-value	0.785	0.603	0.661	0.166

* Contains missing data

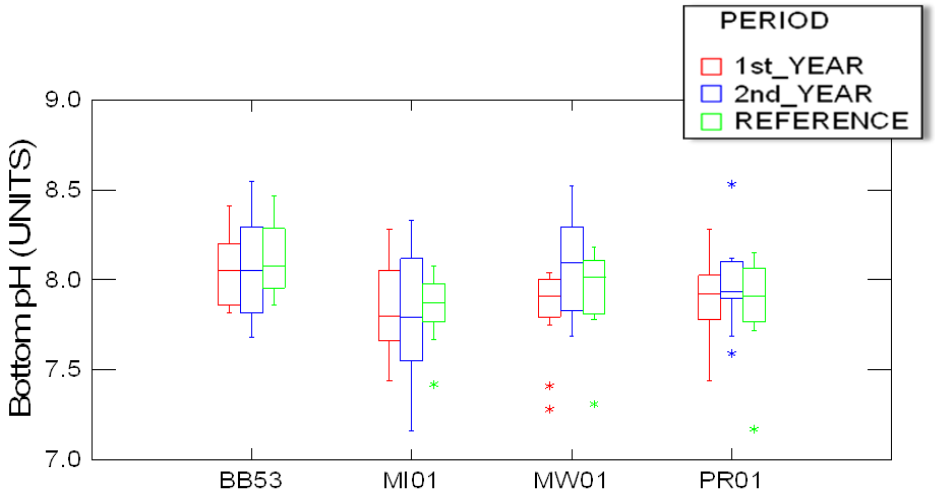


Figure 15. Box-plot comparison of three periods for bottom pH in the L-31E Culverts component.

Table 17. Monthly values and summary of statistical analysis for bottom dissolved oxygen (DO) in mg/L for the L-31E Culverts component for WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	*	7.87	6.77	5.79
June 2011	5.98	5.84	4.88	4.69
July 2011	*	5.89	5.46	5.79
August 2011	4.15	4.17	2.67	5.14
September 2011	5.95	4.2	2.84	4.46
October 2011	*	6.08	6.69	6.45
November 2011	7.36	4.01	6.31	6.7
December 2011	6.85	3.53	5.1	5.8
January 2012	*	*	*	*
February 2012	1.05	1.95	0.91	0.34
March 2012	9.12	6.05	7.28	6.57
April 2012	6.21	5.48	4.95	5.02
Mean	6.842	4.886	5.166	5.801
SD	1.455	1.593	2.12	0.92
1st Quartile	5.958	3.785	3.86	5.05
Median	6.85	4.84	5.28	5.79
3rd Quartile	7.96	5.97	6.73	6.54
Max	9.13	7.87	8.13	7.4
Shapiro-Wilk Normality Test p-value	0.922	0.715	0.553	0.789

* Contains missing data

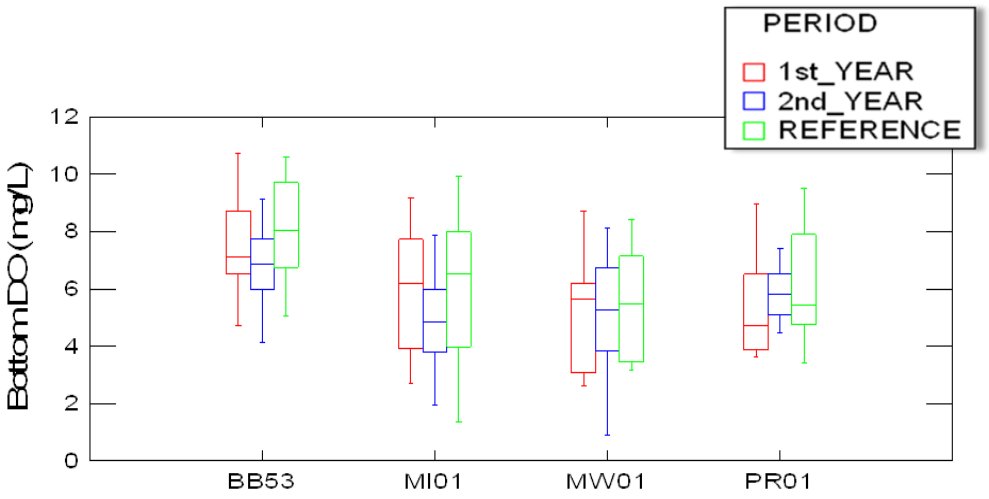


Figure 16. Box-plot comparison of three periods for bottom DO in the L-31E Culverts component.

Table 18. Monthly values and summary of statistical analysis for surface DO in mg/L for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	8.62	6.52	6.85	3.93
June 2011	7.80	5.42	5.24	5.12
July 2011	5.90	5.91	6.28	4.41
August 2011	4.40	4.38	2.91	4.65
September 2011	5.57	5.24	3.37	4.95
October 2011	8.17	7.68	6.37	6.13
November 2011	8.01	6.21	5.20	5.67
December 2011	8.14	6.04	6.14	5.92
January 2012	*	*	*	*
February 2012	1.19	1.57	0.71	1.9
March 2012	8.91	7.54	7.51	7.85
April 2012	6.23	5.3	4.9	3.8
Mean	7.265	5.606	5.216	4.943
SD	1.477	1.973	2.174	1.548
1st Quartile	5.983	4.88	3.87	4.225
Median	8.01	6.25	5.618	5.052
3rd Quartile	8.17	6.873	6.352	5.755
Max	8.91	7.42	8.48	7.595
Shapiro-Wilk Normality Test p-value	0.074	0.012	0.609	0.46

* Contains missing data

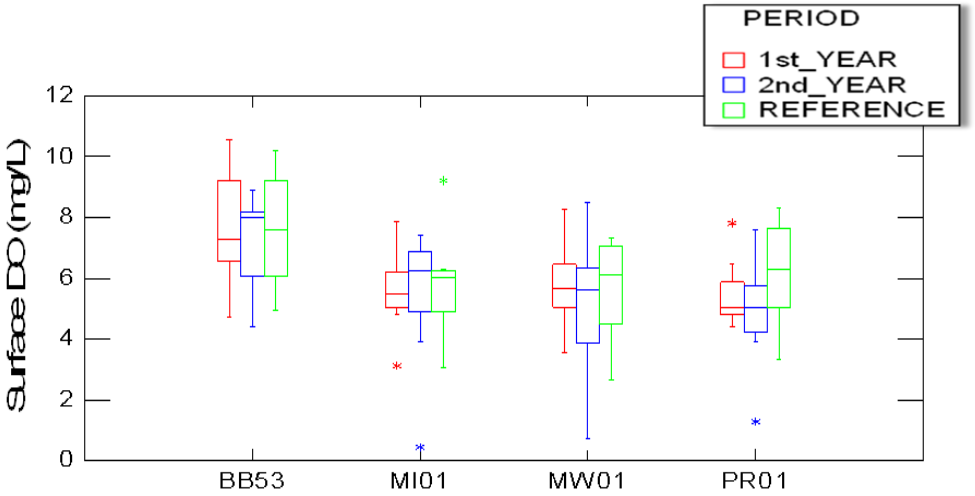


Figure 17. Box-plot comparison of three periods for surface DO in the L-31E Culverts component.

Table 19. Monthly values and summary of statistical analysis for ammonia in mg/L for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	0.11	0.12	0.11	0.17
June 2011	0.12	0.13	0.14	0.13
July 2011	0.17	0.13	0.14	0.29
August 2011	0.09	0.1	0.11	0.13
September 2011	0.19	0.14	0.09	0.06
October 2011	0.1	0.05	0.05	0.06
November 2011	0.07	0.06	0.06	0.08
December 2011	0.06	0.07	0.04	0.06
January 2012	0.07	0.05	0.06	0.22
February 2012	0.07	0.16	0.07	0.11
March 2012	0.08	0.05	0.05	0.04
April 2012	0.11	0.12	0.13	0.17
Mean	0.1	0.1	0.09	0.13
SD	0.04	0.04	0.04	0.08
1st Quartile	0.07	0.055	0.055	0.06
Median	0.09	0.11	0.08	0.12
3rd Quartile	0.1175	0.13	0.12	0.17
Max	0.19	0.16	0.14	0.29
Shapiro-Wilk Normality Test p-value	0.059	0.096	0.129	0.221

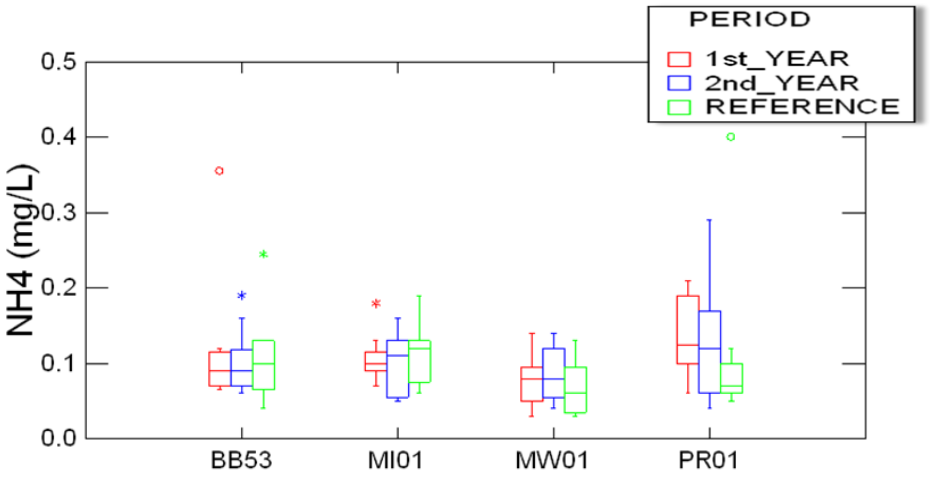


Figure 18. Box-plot comparison of three periods for ammonia in the L-31E Culverts component.

Table 20. Monthly values and summary of statistical analysis for Nitrate + Nitrite (NOX) in mg/L for the L-31E Culverts component during WY2012.

Month	BB53	MI01	MW01	PR01
May 2011	0.11	0.12	0.11	0.17
June 2011	0.12	0.13	0.14	0.13
July 2011	0.17	0.13	0.14	0.29
August 2011	0.09	0.1	0.11	0.13
September 2011	0.19	0.14	0.09	0.06
October 2011	0.1	0.05	0.05	0.06
November 2011	0.07	0.06	0.06	0.08
December 2011	0.06	0.07	0.04	0.06
January 2012	0.07	0.05	0.06	0.22
February 2012	0.07	0.16	0.07	0.11
March 2012	0.08	0.05	0.05	0.04
April 2012	0.11	0.12	0.13	0.17
Mean	0.1	0.1	0.09	0.13
SD	0.04	0.04	0.04	0.08
1st Quartile	0.07	0.055	0.055	0.06
Median	0.09	0.11	0.08	0.12
3rd Quartile	0.1175	0.13	0.12	0.17
Max	0.19	0.16	0.14	0.29
Shapiro-Wilk Normality Test p-value	0.059	0.096	0.129	0.221

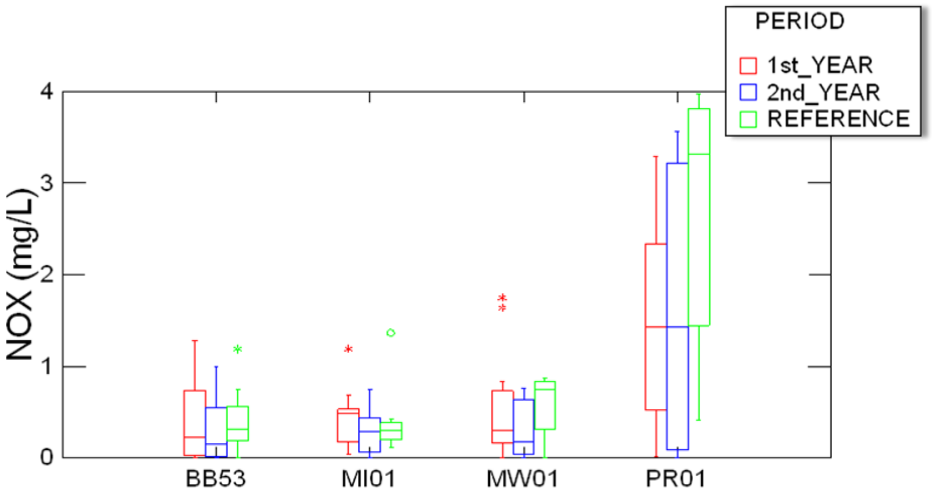


Figure 19. Box-plot comparison of three periods for NOX (mg/L) in the L-31E Culverts component.

MERCURY MONITORING

In accordance with Specific Condition 22, the District is mandated to implement tier-wise monitoring and evaluation of mercury in specific media in restoration projects that may potenially discharge water with negative impacts to the downstream receiving waters (FDEP and SFWMD, 2011). During the start-up period (Phase I), surface sediments, mosquitofish (*Gambusia holbrooki*) and large-bodied fish (sun fish (*Lepomis* spp.), and largemouth bass (*Micropterus salmoides*)) should be collected for initial evaluation.

Sediment, surface water, and mosquitofish samples were collected between February and April 2012. Preliminary results and evaluation of samples are provided here. Large-bodied fish will be sampled during the annual collection event in October/November 2012.

SEDIMENT ASSESSMENT

The evaluation criterion for mercury in sediment is: "If absolute concentrations of MeHg (methylmercury), or %MeHg (i.e., percentage of THg (total mercury) that is in the MeHg form) in soils/sediment from an operation unit exceeds the 90% upper confidence interval for within-basin sediments or, if not available, the 75th percentile concentration (or %MeHg) for all basins, then the potential exists for excessive MeHg production and, accordingly, it is recommended that the project proceed to Phase 1 – Tier 3."

Surface sediment was sampled at station S700ES on February 16, 2012, for THg and MeHg (**Table 21**). The THg and MeHg concentrations are 0.026 and 0.00014 miligrams per kilogram (mg/kg), respectively. The THg concentration is well below the 75th percentile from all basins (Water Conservation Areas, Everglades National Park, and Big Cypress National Park) (Cohen et al., 2009). There is not sufficient data from this and other basins to evaluate MeHg concentrations in sediment.

Table 21. Concentrations of methylmercury (MeHg) and total mercury (THg) in the Biscayne Bay Coastal Wetlands during the startup period.

Date	Station	Media	Parameter	Unit	Value	Reference Value	USEPA Criterion
Feb. 2012	S700SE	Sediment	THg	mg/kg	0.026	0.227*	NA
Feb. 2012	S700SE	Sediment	MeHg	mg/kg	0.00014	NA	NA
Apr. 2012	S700	Surface water	THg	ng/L	0.48	2.89#	12
Apr. 2012	S700	Surface water	MeHg	ng/L	0.1	0.23#	NA
Apr. 2012	S700	Mosquitofish	THg	mg/kg	0.022	0.04†	0.077

* 75th percentile from all basins

\# 90th percentile from Everglades National Park (site P33 and P34)

† 75th percentile from WCAs

SURFACE WATER ASSESSMENT

The evaluation criterion for THg in surface water is stated as: "If a Water Quality Standard (in Chapter 62-302, F.A.C.) is exceeded". The Florida Class III water quality standard for mercury in surface water is 12 nanograms per liter (ng/L). Surface water samples were collected at station S700 (inflow) on April 16, 2012, for THg and MeHg analysis (**Table 21**). The THg and MeHg concentrations were 0.48 and 0.10 ng/L, which are well below 90th percentile for the Everglades National Park (sites P33 and P34). The THg concentration is also well below the U.S. Environmental Protection Agency (USEPA) standard of 12 ng/L. Therefore, this criterion was not violated.

MOSQUITOFISH ASSESSMENT

The evaluation criterion for mosquitifish is "If Hg in any (quarterly) mosquitofish composite exceeds the 90% upper confidence level of the basin-wide average or, if basin-specific data are lacking, exceeds the 75th percentile concentration for the period of record for all basins." A mosquitofish sample that consisted of appriximately 100 individuals as a composite was taken from station S700 on April 17, 2012. The USEPA recommended methylmercury fish tissue criterion of 0.077 mg/kg for Trophic Level II and III fish. The THg concentration in mosquitofish from BBCW are well below the 75th percentile of THg concentration in mosquitofish from the Water Conservation Areas and Everglades National Park, as well as the USEPA standard (**Table 21)**. Therefore, this criterion was not violated.

In summary, mercury concentrations in sediment, surface water, and mosquitofish samples were determined for the project start-up period. The THg and MeHg concentrations in all media are below the 75th percentile (all basins), 90th percentile (basin-wide), and USEPA criteria.

TOXICANT MONITORING

Initial toxicant monitoring in sediment, surface water, and fish started in 2012 at pump station S-700 for the Biscayne Bay Coastal Wetland Project, following the requirements of Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) Permit 0271729-003. Parameters identified in **Table 22** were analyzed in each of the specified matrices. Evaluations have been performed to determine if Phase 1 – Tier 2: Field Sampling for initial start-up monitoring are in compliance to transition to Phase 2 – Tier 1: Routine Monitoring during Stabilization Period sampling outlined in the monitoring plan, dated April 24, 2012.

Sections 1.2a, 1.2b, and 2.1.a of "A Protocol for Monitoring Mercury and Other Toxicants (Protocol)" dated April 15, 2011, makes the following recommendations:

- If, after the one-time sediment sampling event, any detected toxicants do not exceed effects-based numerical sediment quality assessment guidelines, sediment monitoring would be terminated.
- If, after one sampling and action level criteria are met, then surface water sampling can proceed to Phase 2 – Tier 1: Routine Monitoring during Stabilization Period.
- If levels of other toxicants in tissues do not exceed recognized background tissue concentrations or benchmarks established in ecological risk assessments completed as part of the Environmental Site Assessment (ESA), then sampling can proceed to Phase 2 – Tier 1: Routine Monitoring during Stabilization Period.

ACTION LEVEL CRITERIA

- If concentrations of other toxicants do not exceed the critical benchmarks established in ecological risk assessments completed as part of the ESA, or do not exceed Sediment Quality Assessment Guidelines, or
- If water-column concentrations of other toxicants do not exceed the water quality standard in Chapter 62-302, Florida Administrative Code, or
- If levels of other toxicants in tissues do not exceed recognized background tissue concentrations or benchmarks established in ecological risk assessments completed as part of the ESA

ACTION LEVEL CRITERIA ASSESSMENT

Sediment and surface water samples for the initial start-up monitoring prior to discharge were collected on February 16, 2012. None of the samples had any detectable pesticide concentrations. Therefore, the critical evaluation or Action Level Criteria were met. Initial mosquitofish collection was also attempted on February 16, 2012; however, no fish were present. A second attempt to collect mosquitofish, on April 16, 2012, was successful and did not detect any pesticide residues. Therefore, the critical evaluation or Action Level Criteria were met.

FINAL RECOMMENDATION

All action criteria for toxicant monitoring were met; therefore, the Phase 1 – Tier 2: Field Sampling can move to Phase 2 – Tier 1: Routine Monitoring during Stabilization Period as outlined in the Monitoring Plan (April 24, 2012).

Table 22. Toxicant parameters and matrices analyzed

Analyte	Surface Water	Sediment	Fish tissue
o,p'_DDD	-	-	X
p,p'_DDD	X	X	X
o,p'_DDE	-	-	X
p,p'_DDE	X	X	X
o,p'_DDT	-	-	X
p,p'_DDT	X	X	X
chlordane	X	X	X
cis-chlordane	-	-	X
trans-chlordane	-	-	X
cis-nonachlor	-	-	X
trans-nonachlor	-	-	X
alpha endosulfan	X	X	X
beta endosulfan	X	X	X
endosulfan sulfate	X	X	X

-: parameter was not analyzed in the matrix listed in the heading of the column in which it appears

X: parameter was analyzed in the matrix listed in the heading of the column in which it appears

OPERATION

FLOW: L-31E CULVERTS COMPONENT

The L-31E culverts are passive, flap-gated devices designed to divert available fresh water from the L-31E canal into adjacent wetlands. During the 2011 dry season (November 2011–April 2012), the District experienced below-average rainfall in this region, which resulted in relatively low flows.

The statistical analysis of flow and stage data performed for this reporting period, and the purpose of the analysis, is to compare flow values at the four stations (S-23A, S-23B, S-23C, S-23D), and the total flow of these stations.

Flow data analysis is based on total monthly flow at each station. The reference interval had no flow data and, therefore, the comparison is performed only between the first and second years, defined as follows:

- First year – June 2010 to April 2011 (11 months)
- Second year – May 2011 to April 2012 (12 months)

Comparisons between data sets by station, as well as for total flow, were completed using SYSTAT 13 software in the following two ways (Attachment C):

- Comparison between set averages using Student's t-test
- Comparison between set medians using Mann-Whitney U test

Given the small size of the data sets, and that there is no guarantee that each set is normally distributed, the comparison test is the appropriate statistical comparison to use.

The results of the comparisons are interpreted based on a significance level of $\alpha = 0.05$. Hence, two compared data sets are considered to have a statistically significant difference if the associated p-value is less than 0.05.

No statistically significant differences between the first and second year averages, or medians of total monthly flows, were found at any station or for total flow.

The daily flow rates for culverts S-23A and S-23 B were based on the mean daily stage at structure S-21A, while daily flow rate for culverts S-23C and S-23D were based on mean daily flow rates at S-20F. Values for each of the four culverts were derived manually by entering the mean daily stage at the physically closed structure (S-21A or S-20F) into the design rating curve (**Figure 20**) and identifying the corresponding flow rate.

During this reporting period, monthly average flow and stage data are presented in **Tables 23** and **24**, and **Figures 21** through **25**. The total quantity of water discharged through the L-31E Culverts component area was approximately 4,703 acre-feet.

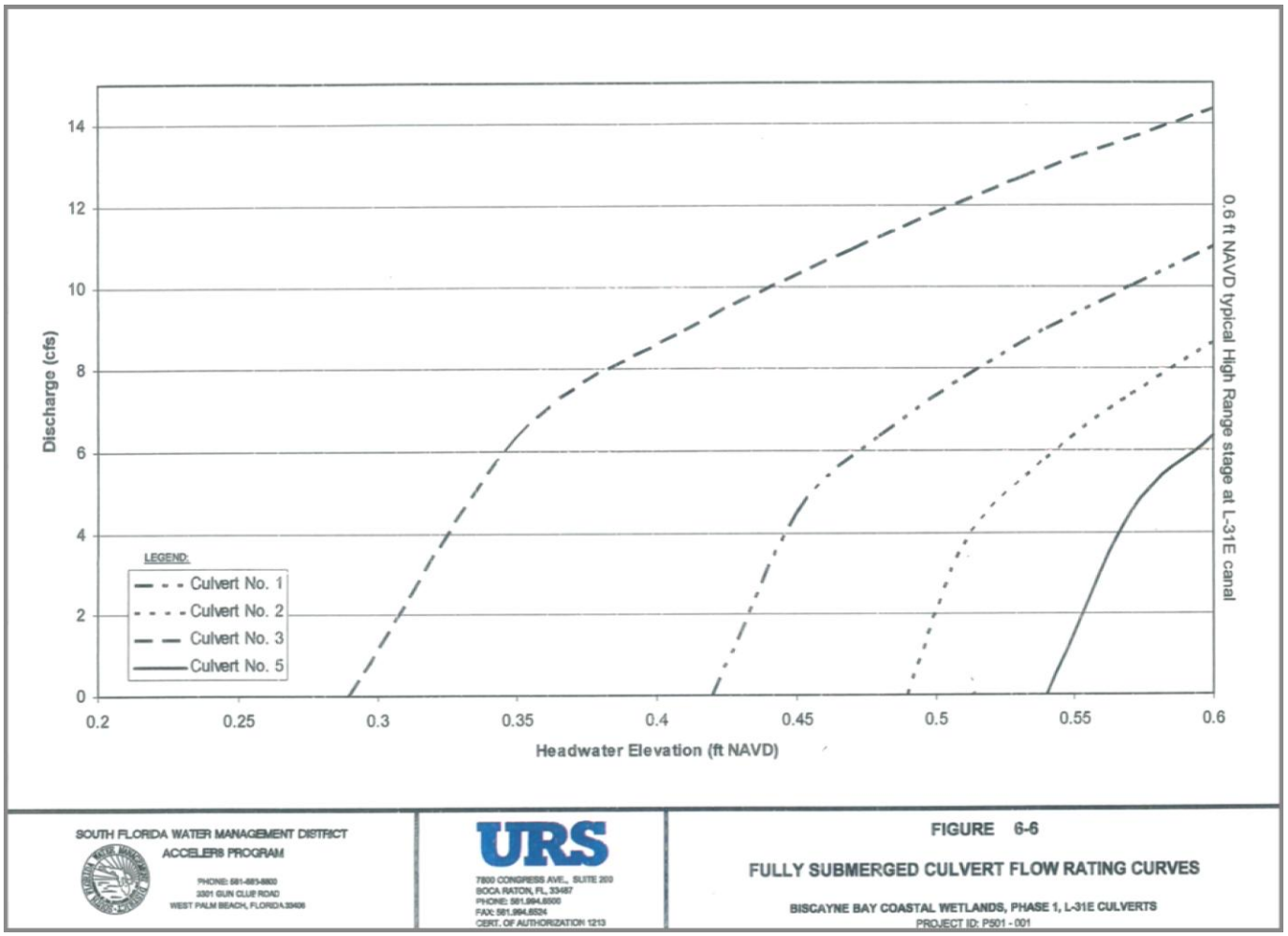


Figure 20. Biscayne Bay Coastal Wetlands – L-31E Culverts component fully submerged culvert flow curves, with headwater elevation in feet, related to the National Geodetic Vertical Datum of 1929 (ft NGVD29) from structures S-21A, S-20G, and S-20F, utilized to calculate discharges in cubic feet per second (cfs) for culverts S-23A, S-23B, S-23C, and S-23D (URS, 2007).

Table 23. Monthly average stage in ft NGVD29 for the Biscayne Bay Coastal Wetlands – L-31E Culverts component.

Month	Headwater			Tailwater		
	S-20 F Spillway on C103 Canal	S-21A Spillway on C102 (Princeton) Canal	S20-G Spillway on Military Canal	S-20 F Spillway on C103 Canal	S-21A Spillway on C102 (Princeton) Canal	S20-G Spillway on Military Canal
May 2011	0.80	1.14	0.95	0.68	0.77	0.82
Jun 2011	0.94	1.02	1.05	0.83	0.92	0.98
Jul 2011	2.02	2.00	2.01	0.89	0.85	0.93
Aug 2011	1.89	1.99	1.97	1.06	1.06	1.06
Sep 2011	2.03	2.04	2.05	1.13	1.15	1.14
Oct 2011	1.72	1.69	1.74	1.38	1.39	1.38
Nov 2011	1.48	1.47	1.46	1.39	1.40	1.40
Dec 2011	1.30	1.31	1.37	0.97	0.99	0.97
Jan 2012	1.28	1.65	1.40	0.50	0.53	0.50
Feb 2012	1.38	1.39	1.52	0.83	0.86	0.86
Mar 2012	1.52	1.62	1.52	0.79	0.84	0.82
Apr 2012	1.39	1.83	1.49	0.84	0.91	0.87

Table 24. Monthly average flow (cfs) for Biscayne Bay Coastal Wetlands – L-31E Culverts component.

Month	S-23A	S-23B	S-23C	S-23D
May 2011	0	0	0	0
Jun 2011	0	0	0	15
Jul 2011	97	201	16	360
Aug 2011	80	210	6	237
Sep 2011	92	222	36	354
Oct 2011	50	76	20	126
Nov 2011	0	0	0	15
Dec 2011	0	0	0	0
Jan 2012	0	0	0	0
Feb 2012	0	0	0	0
Mar 2012	0	0	0	0
Apr 2012	57	87	0	14
Total	**376**	**796**	**78**	**1121**

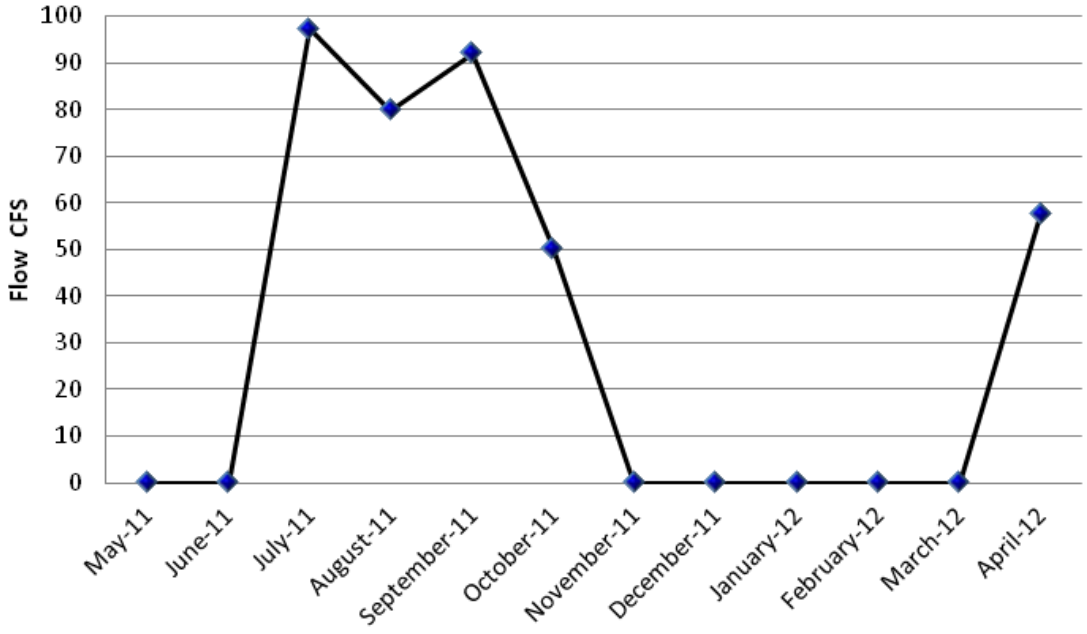


Figure 21. Monthly average flow (cfs) for culvert S-23A during WY2012.

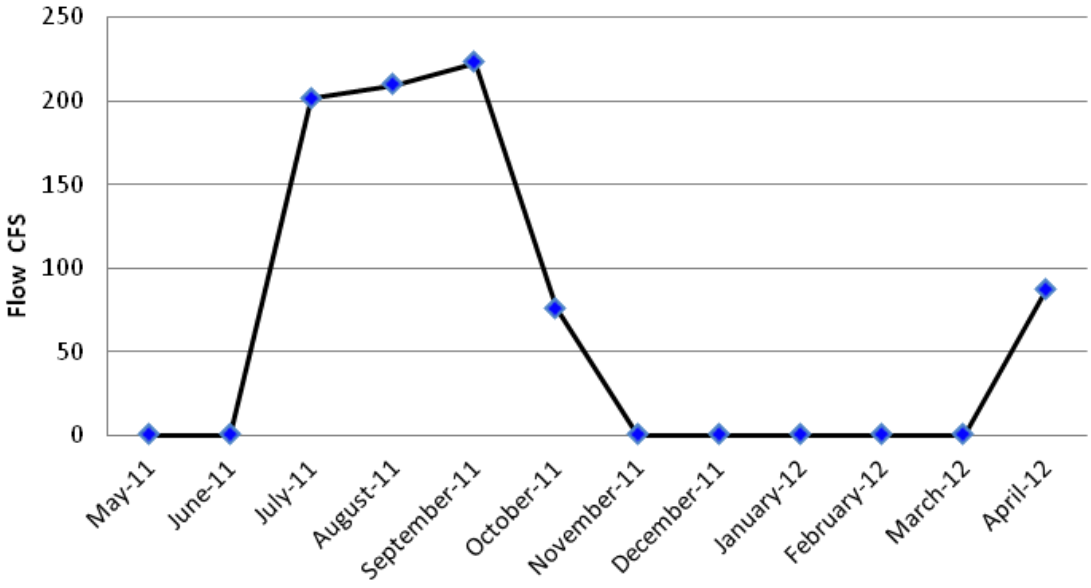


Figure 22. Monthly average flow (cfs) for culvert S-23B during WY2012.

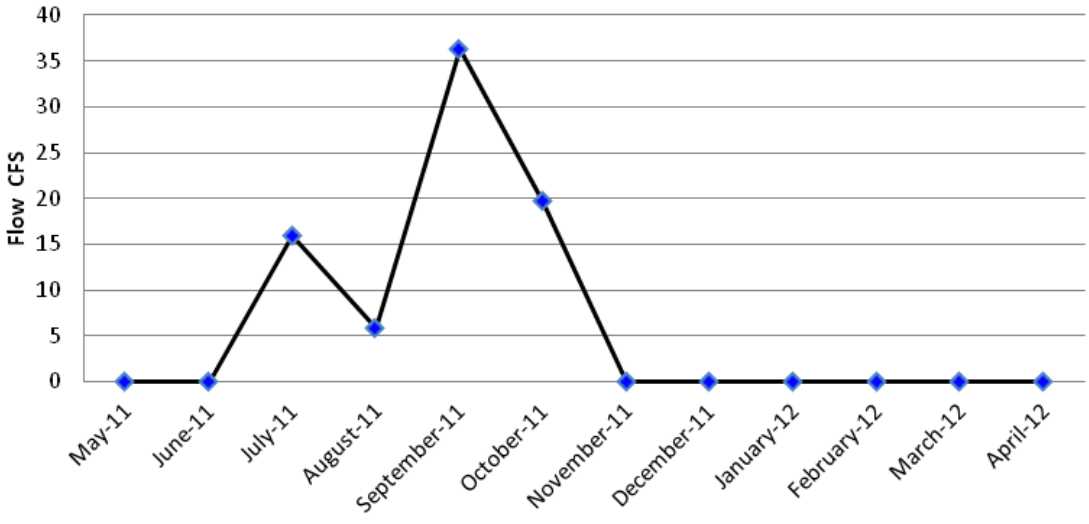


Figure 23. Monthly average flow (cfs) for culvert S-23C during WY2012.

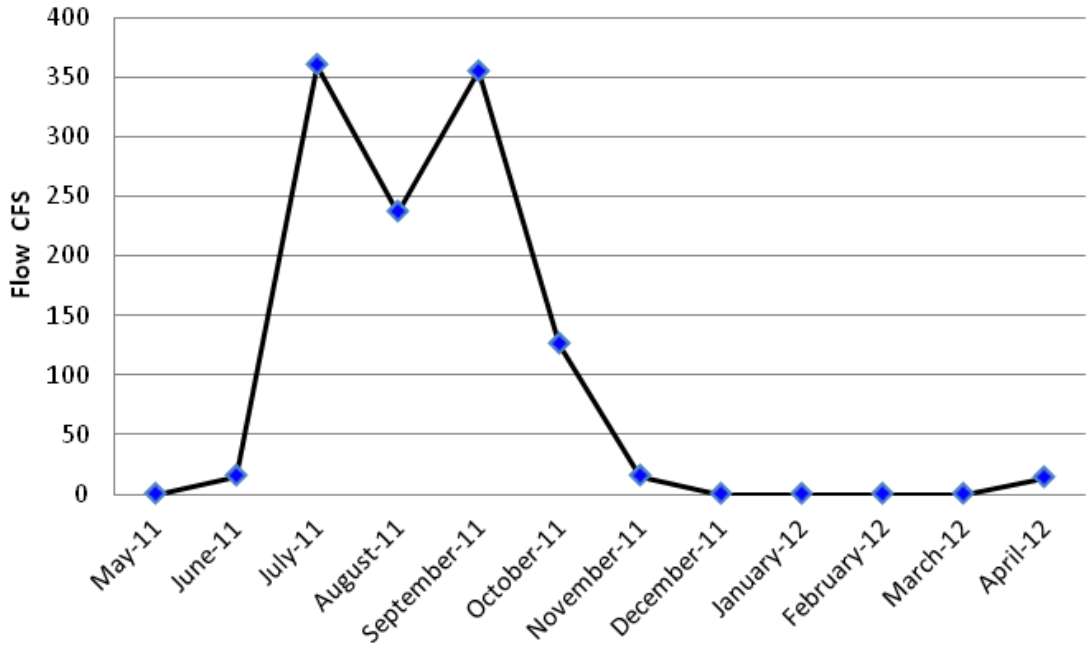


Figure 24. Monthly average flow (cfs) for culvert S-23D during WY2012.

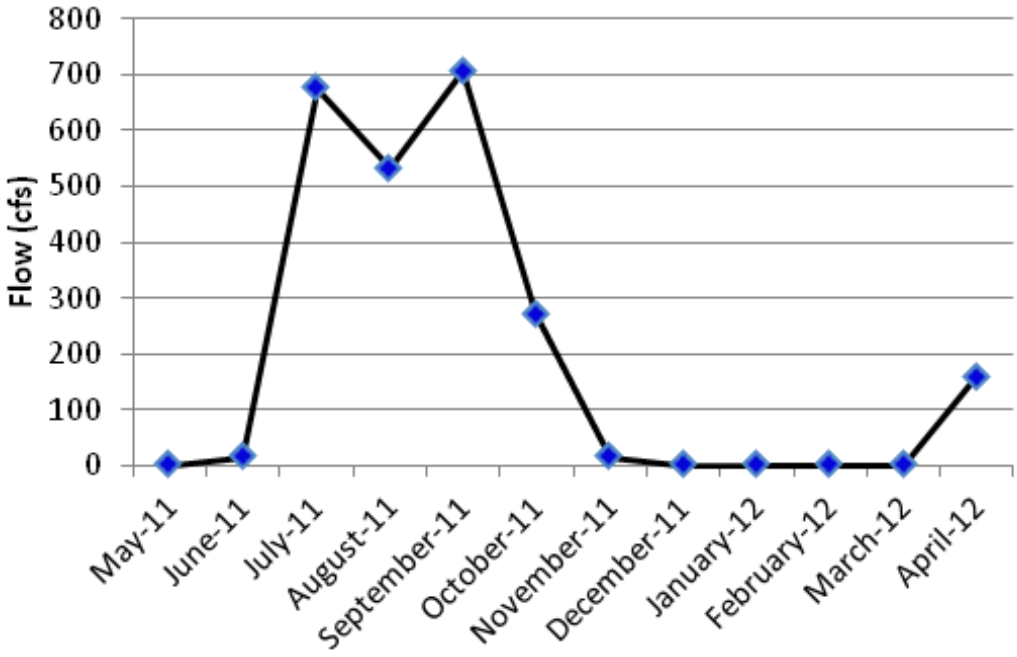


Figure 25. Monthly average flow (cfs) for all culverts in the Biscayne Bay Coastal Wetlands – L-31E Culverts component for WY2012.

DEERING ESTATE FLOW-WAY COMPONENT

The District submitted the final version of the Preliminary Project Operating Manual for the Deering Estate Flow-way component of the Biscayne Bay Coastal Wetlands Project to the FDEP on January 10, 2012. Construction was completed on March 26, 2012, and the District initiated testing and certification of the pump station.

HERBICIDE AND PESTICIDE TRACKING

Exotic plant species within the L-31E Culverts component were treated chemically (herbicides) and mechanically. During the reporting period, exotic vegetation within approximately 239 acres in the vicinity of the S-23A, S-23B, S-23C, and S-23D culverts were treated with herbicides, including triclopyr (3.75 gallons). The dominant exotic species removed or treated were Austrilian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), day jessamine (*Cestrum diurnum*), and shoebutton ardisia (*Ardisia elliptica*). The application of herbicides was successful, and the District will continue to treat and manage exotic vegetation within the L-31E Culverts component area (Attachment E).

INLET AND OUTLET IMPROVEMENTS

During routine maintenance inspections of the L-31E culverts, it was determined that component performance was being hindered by aquatic vegetation clogging the manatee barrier upstream of the culverts, and by accumulated sediment and silt blocking the flap gate downstream of the culverts. To resolve these issues, and using the Adaptive Management Concept for CERP projects, the District will remove accumulated downstream sediment, ensure that the depth of

each downstream sump, relative to each pipe invert, closely matches the depths depicted in the permitted design cross-sections, and will install floating debris barriers across the mouth of each culvert inlet channel. The District acquired approval from the U.S. Army Corps of Engineers (USACE) [BBCW-L-31E Culverts Maintenance Work-As-Built Certification Permit SAJ-1994-01327 (NW-AAZ)] and FDEP to initiate this activity in May 2012. It is anticipated that that work will be completed by August 2012 (Attachment G).

ECOLOGICAL MONITORING

DEERING ESTATE FLOW-WAY COMPONENT

In accordance with Special Conditions 11 and 12 of USACE Permit SAJ-2007-139 (IP-AAZ), and the Mitigation Monitoring Plan for the Deering Estate Flow-way Project, dated February 07, 2010, the District completed the baseline monitoring event on October 24, 2011, and submitted the report to the USACE on March 22, 2012 (Attachment F). The Deering Estate Flow-way will redirect water from the C-100A canal system through the existing C-100A spur canal into the Cutler Drain on the project site and within the Deering Estate Flow-way, thus restoring a portion of the historic freshwater flow through the Deering Estate Flow-way and into Biscayne Bay (**Figure 2**). Implementation of the Deering Estate Flow-way component is expected to result in higher water levels in Cutler Creek within the Deering Estate.

Hydrologic Performance

The areas affected by water deliveries will be monitored for hydrologic changes downstream of the project area at two existing wetland staff gauges, and at two existing groundwater monitoring stations. Refer to Attachment F for the Deering Estate Baseline Mitigation Monitoring Report and **Figure 26**. Monitoring will be conducted for at least three years after completion of construction of the pump station, and annual reports will be submitted to the USACE.

To evaluate performance, baseline data for water quality and physicochemical data were collected within the rehydration area. At Stations 1 and 3, surface water grab samples were collected monthly and analyzed for specific conductance, dissolved oxygen, pH, temperature, and calculated salinity. Water levels were recorded from the staff gauges in ft NGVD29. Refer to Attachment F for the Deering Estate Baseline Mitigation Monitoring Report.

At Stations 2 and 5, groundwater was monitored *in situ* for specific conductance, temperature, salinity, and groundwater level, using YSI data sondes every 15 minutes. Once additional monitoring efforts are complete, which will allow for data comparison, performance will be evaluated and included in subsequent annual reports and the SFER.

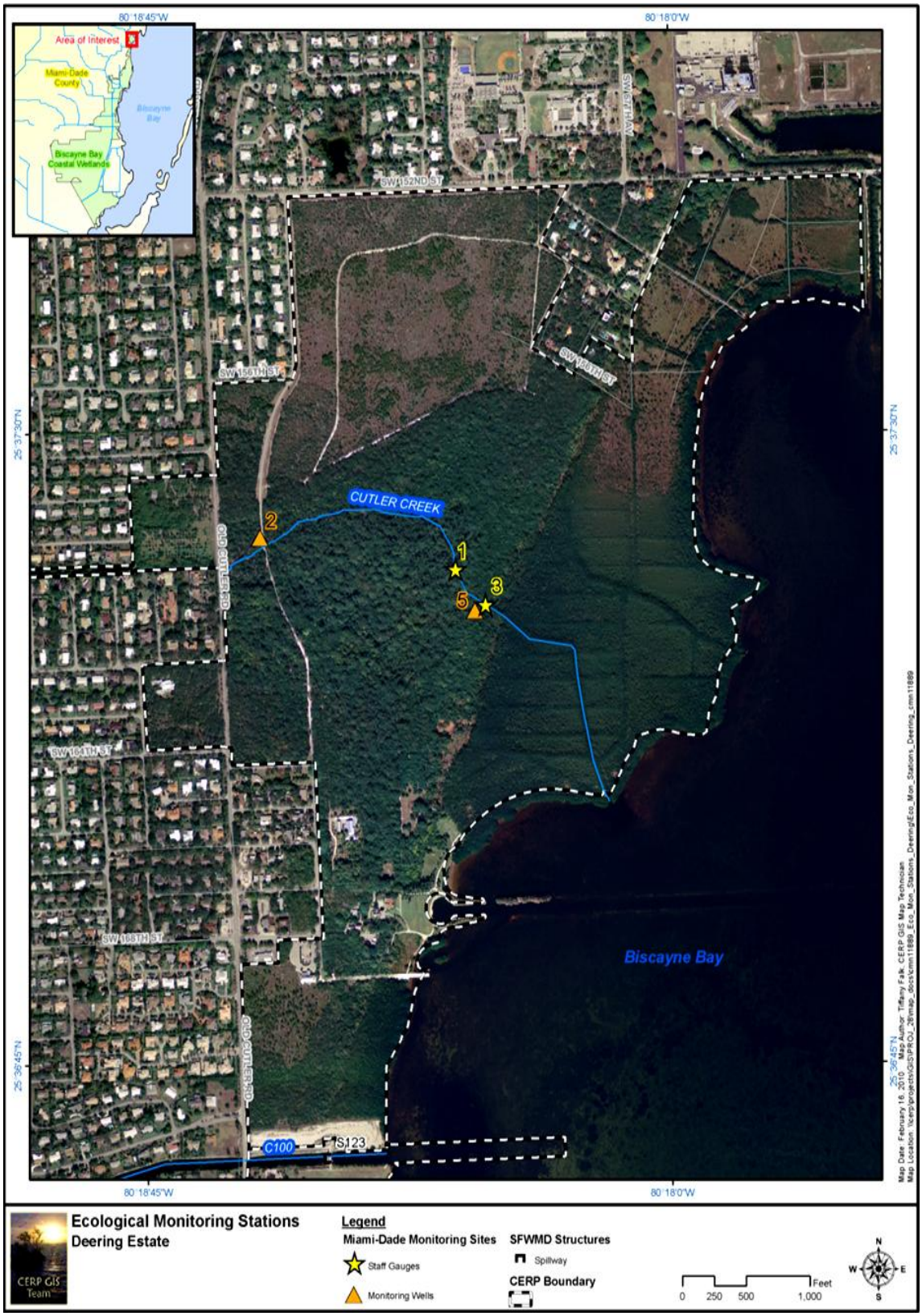


Figure 29. Locations of hydrological monitoring stations for the Deering Estate Flow-way.

L-31E CULVERTS COMPONENT (AUGUST 2010–SEPTEMBER 2011)

In accordance with Specific Conditions 9(a) and 9(b) of USACE permit SAJ-1994-1327 (IP-TKW), the District shall perform ecological monitoring of project benefits at two of the four culvert (S-23A and S-23D) locations, including the mitigation enhancement areas. The project area is anticipated to be enhanced by water deliverables (salinity concentrations, water stage, wetland vegetation, and algal compositions). In accordance with Specific Conditions 11(a) and 11(b) of USACE permit SAJ-1994-1327 (IP-TKW), the District completed routine mitigation compliance monitoring on September 19, 2011. The *First Annual Mitigation Monitoring Report for the Biscayne Bay Coastal Wetlands, L-31East Culverts* was submitted by the District to the USACE on January 9, 2012 (Attachment E).

Requirements

In accordance with Special Conditions 10 and 11 of USACE permit SAJ-1994-1327 (IP-TKW) and the Ecological Monitoring Plan for L-31E component (dated May 5, 2008), the District will perform monthly monitoring events and report annually on the project benefits based on the following performance standards (Attachment E):

- **Aquatic Food Web Monitoring:** Improvement of the aquatic food web, including establishment of appropriate wetland periphyton communities that reflect an increasing salinity gradient from the culverts eastward to the shoreline. No increase in pollution-tolerant plant species, or elimination or reduction of existing desirable species.
- **Vegetation Monitoring:** Less than 5 percent cover of Category I and II invasive exotic plant species, pursuant to the most current list established by the Florida Exotic Pest Plant Council, within the mitigation enhancement areas.
- **Water Level and Flow Monitoring:** Hydrologic enhancement, by redirecting flow from coastal canals to the coastal wetlands, at the culvert delivery points. The project is anticipated to capture approximately 4 percent of the available water from the major conveyance canals (C-102 and C-103), and redistribute the water at the culvert locations, thereby re-creating/restoring remnant tidal creeks, or portions thereof, or associated wetland areas.
- **Water Physiochemical Monitoring:** Salinity concentrations in coastal wetlands become more suitable and hypersaline zones are reduced. The direction and movement of the salinity gradient of restored tidal creeks in interior wetlands will be measured to ensure parameters more characteristic of an estuarine system.

To evaluate performance, the following data will be collected on a monthly basis:

- Water quality samples and physiochemical data (specific conductance, DO, pH, temperature, and [calculated] salinity) collected at the following locations:
  - Upstream of culvert S-23A
  - Immediately downstream of culvert S-23A
  - 50 meters downstream of culvert S-23A
  - 100 meters downstream of culvert S-23A
  - Upstream of culvert S-23D
  - Immediately downstream of culvert S-23D
  - 50 meters downstream of culvert S-23D

  - 100 meters downstream of culvert S-23D
- Water level (stage gauges) monitoring at:
  - Upstream and downstream of water control structures S-21A, S-20G, and S-20F
  - Upstream and downstream of culverts S-23A and S-23D
  - 100 meters downstream of culverts S-23A and S-23D
- Calculated flow through culverts S-23A, S-23B, S-23C, and S-23D
- Vegetation monitoring by measuring vegetation cover, by species, along 100-meter transects east of the levee at culverts S-23A and S-23D, and height of ten dwarf red mangrove (*Rhizophora mangle*) trees along transect S-23D

Ecological monitoring of the L-31E Culverts component has been conducted over the last year to document project benefits and performance. The project is anticipated to provide improvements to salinity concentrations, water stages, wetland vegetation, and algal composition within the wetland area affected by culvert water deliveries.

During the first annual reporting period, South Florida experienced extreme drought conditions. Beginning in October 2010, water levels along the transect downstream of culvert S-23A fell below the minimum level required for sampling and remained at or below this level through June 2011. From December 2010 through June 2011, water levels along the transect downstream of the culvert S-23D fell below the minimum level required for sampling. Once water began to flow (from July 2011 through September 2011), inundations were observed along the entire length of the transects, with water depths of approximately 12–24 inches; however, no periphyton communities were observed. During this reporting period, various species of birds, amphibians, invertebrates, fish, and reptiles were observed within the vicinity of culverts S-23A and S-23D (Attachment E).

Based on the data collected during the first year of ecological monitoring and comparison to baseline data, there has not been a significant change in the composition and coverage of vascular plants downstream of the S-23A and S-23D culverts. Comparison of baseline vegetation data collected in August 2010, and annual average of vegetation data, indicates that there was no significant change in red mangrove height along transect S-23D. The percent coverage of Category I and Category II invasive plant species, based on the Florida Exotic Pest Plant Council's 2009 List of Invasive Plant Species, was less than five percent within the mitigation enhancement areas. Additionally, chemical and mechanical treatment of exotic plant species was conducted within approximately 27 acres of the project area (Attachment E).

The component met or exceeded the 4 percent diversion target during four of the twelve months in which water was available for diversion, but only diverted 2.9 percent of all water available for diversion over the entire monitoring period. Although the 4 percent overall target was not reached, it is important to recognize that almost 6,900 acre-feet of valuable fresh water was diverted to the Biscayne Bay Coastal Wetlands as a result of the L-31E Culverts component.

Overall, following the first year of monitoring, the project is trending towards success by diverting approximately 2.9 percent of available water to the Biscayne Bay Coastal Wetlands, and by having no more than 5 percent exotic vegetation within the mitigation enhancement area. Due to extreme drought conditions, water physiochemical data was limited within the wetland areas affected by culvert water deliveries during the first annual monitoring period. Once additional monitoring efforts are completed, during the second annual monitoring period, comparison data and project performance can be better evaluated.

LITERATURE CITED

Cohen, M.J., S. Lamsal, T.Z. Osborne, J.C. Bonzongo, S. Newman and K.R. Reddy. 2009. Soil total mercury concentrations across the Greater Everglades. Soil Science Society of America Journal 73: 675-685.

FDEP and SFWMD. 2011. A Protocol for Monitoring Mercury and Other Toxicants. Florida Department of Environmental Protection and South Florida Water Management District. Tallahassee, FL and West Palm Beach, FL.

URS. 2007. Final Design Report, L-31E Culverts. URS Corporation, Boca Raton, FL, submitted under Work Order CN040936, WO#37, Job No. 38616570 to South Florida Water Management District, West Palm Beach, FL. September 7, 2007.

Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions, actions taken, and cross-references presented for the Biscayne Bay Coastal Wetlands - L-31 East Culverts and Deering Estate Flow-way components (CERPRA Permit #: 0271729-003) in this report.

Specific Condition	Description	Applicable Phase	Action Taken	Reported in the 2013 SFER in: *(All references are to Volume III, unless noted)*			
				Narrative (page #'s)	**Figure**	**Table**	**Attachment**
15	Operation of Passive Structures	Operation	Operation of passive structures was conducted as required	33 - 38	20 - 25	23 - 24	
19	Public Health, Safety, and Welfare	Operation	Discharges did not pose a serious danger to public health/safety/welfare				
20	Water Quality Monitoring Program	Operation	Water quality monitoring plan submitted within 90 days before starting flow; water quality monitoring program conducted as required				
20A	Quality Assurance and Quality Control	Operation	Done as required	6			B
20B	Method Detection Limits (MDLs)	Operation	Done as required				B
22	Mercury and Other Toxicants: Monitoring Plan	Operation	Monitoring plan completed and submitted, and baseline data collected and evaluated, as required	30 - 33		21 - 22	B
23	Removal of Parameters	Operation	No action needed				
24	Addition of Parameters	Operation	No action needed				
27	Annual Reports	Operation	Annual report completed and submitted as required	All	All	All	All
27A	Water Quality Data	Operation	Records include all required details	9 - 12	1 - 24	3 - 20	A - C
27B	Performance Evaluation	Operation	Annual performance evaluated and reported as required	9 - 47	24 - 28	1 - 24	E - H
27C	Annual Herbicide and Pesticide Tracking	Operation	Use of herbicides and pesticides tracked and reported as required	41	28		B
27D	Implementation Schedules	Construction & Operation	No action needed				
28	Permit Modifications	Operation	No action needed				
29	Permit Renewal	Operation	No action needed				
30	Department Review and Approval	Operation	No action needed				

Attachment B: Water Quality, Toxicant and Mercury Data

This project information is required by Specific Conditions 27A and 27C of the Biscayne Bay Coastal Wetlands – L-31 East Culverts and Deering Estate Flow-way component permit (0271729-003), and is available upon request.

Attachment C: Flow and Stage Data

This project information is required by Specific Conditions 27A and 27B of the Biscayne Bay Coastal Wetlands – L-31 East Culverts and Deering Estate Flow-way component permit (0271729-003), and is available upon request.

Attachment D: Surface Water Quality and Flow Statistical Summary

This project information is required by Specific Conditions 27A and 27B of the Biscayne Bay Coastal Wetlands – L-31 East Culverts and Deering Estate Flow-way component permit (0271729-003), and is available upon request.

Attachment E: BBCW L-31E Culverts Annual Mitigation Monitoring Report

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Ref. No. 01092012-01

January 9, 2012

Ms. Deborah L. Wegmann, Chief
Special Projects and Enforcement Branch
U.S. Army Corps of Engineers-Jacksonville District
701 San Marco Boulevard
Jacksonville, FL 32207-0019

Dear Ms. Wegmann:

Subject: Biscayne Bay Coastal Wetland Project - L-31E Culverts
Permit No. SAJ-1994-1327 (IP-TKW)
1st Annual Mitigation Monitoring Report

The U.S. Army Corps of Engineers issued the above referenced permit to the South Florida Water Management District on May 2, 2008, for the L-31E Culverts Project, a component of the Biscayne Bay Coastal Wetlands. In accordance with Special Condition 11(d), please find enclosed the 1st Annual Mitigation Monitoring Report for Biscayne Bay Coastal Wetlands, L-31E Culverts.

If you have questions or need additional information, please contact Leslye Waugh at (561) 682-6483 or via e-mail at lwaugh@sfwmd.gov.

Sincerely,

Jayne Bergstrom

Jayne Bergstrom
Section Administrator
Permit Acquisition & Compliance
Office of Everglades Policy & Coordination

JB/am
Enclosure

c: Jorge Jaramillo, SFWMD
Robert Kirby, USACE
Bahram Charkhian, SFWMD
Leslye Waugh, SFWMD
Richard Fike, FWS

First Annual Mitigation Monitoring Report for the Biscayne Bay Coastal Wetlands, L-31 East Culverts

USACE Permit Number: SAJ-1994-1327 (IP-TRW)

Submitted to:

U. S. Army Corps of Engineers
Enforcement Section
P.O. Box 4970
Jacksonville, FL 33401

Submitted by:

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Prepared by: Bahram Charkhian, Leslye Waugh, and John Shaffer

January 6, 2012

Table of Contents

Table 1- Attachments included with this report

Attachment A	Photographs
Attachment B	L-31E Culvert Flow Rating Curve

Table 2- Key permit-related information

USACE Permit	
Project Name	BBCW, L-31E Culverts
Permit Number	SAJ-1994-1327 (IP-TRW)
Issue Date	May 2, 2008
Expiration Date for Construction	November 13, 2012
Project Phase	Operations
Relevant Permit Conditions	Special Conditions 9, 10, 11, and 12
Relevant Period of Record	October 1, 2010-September 30, 2011
Report Generator	Bahram Charkhian 561-682-2284 bcharkh@sfwmd.gov
Permit Coordinator	Leslye Waugh 561-682-6483 lwaugh@sfwmd.gov
Permittee's Consultant	Miami-Dade County Permitting, Environmental and Regulatory Affairs (PERA) Stephen Blair and Josh Mahoney Miami-Dade County Park & Natural Areas Management and Open Spaces Dallas Hazelton
Directions to Project Site	Exit Homestead Extension of Florida Turnpike at Exit 2 for SW 312th St/Campbell Dr. in Homestead, FL. Head east on SW 312th St. Turn south onto SW 137th Ave. Turn east onto SW 328th St/N Canal Dr. Turn left into Biscayne National Park and make immediate left onto L-31E Canal right-of-way/SW 97th Ave. Continue north along canal levee, culverts are north of S-20F Structure.
Project Commencement	January 11, 2010
Project Completion	June 10, 2010

1.0 Project Overview

The U.S. Army Corps of Engineers (Corps or USACE) issued Permit No. SAJ-1994-1327 (IP-TKW) on May 15, 2008, to the South Florida Water Management District (District or SFWMD). The permit authorizes the District to construct four (4) flap-gated culverts collectively known as the L-31East (L-31E) Culverts Project **(Figures 1 and 2)**, an early work element of the Biscayne Bay Coastal Wetlands (BBCW) Project, a component of the Comprehensive Everglades Restoration Plan (CERP).

The project is located along the L-31E Canal, east of the L-31E Levee, within the coastal wetlands of Biscayne Bay, in Sections 28 and 33, Township 56 south, Range 40 east, and in Sections 4, 9, and 16, Township 57 south, Range 40 east, in southeastern Miami-Dade County. The project site is bordered by Biscayne Bay to the east, the L-31E Levee and Canal to the west, C-102 Canal to the north, and the C-103 Canal to the south **(Figure 1)**.

The L-31E Culverts project, in conjunction with future implementation of the L-31E Flow Way project, is intended to achieve several of CERP objectives, namely; improve distribution of freshwater to Biscayne Bay and Biscayne National Park (BNP), improve freshwater and estuarine habitat, improve salinity distribution within Biscayne Bay and re-establish productive nursery habitat along the bay shoreline. The project's goal is to reestablish, at least in part, historical sheet flow and wetland hydro-periods downstream of the project area with the installation of flap–gated culverts at four (4) locations along the L-31E Canal.

It was anticipated that the project would result in 0.33 acre of impact to jurisdictional waters of the United States. Once construction was completed, only 0.03 acres of wetlands were actually impacted. According to Special Condition 9, these wetland impacts were to be offset by project benefits which included enhancement to salinity concentrations, water stages, wetland vegetation, and algal composition within the wetland area affected by culvert water deliveries. This "mitigation enhancement area" is estimated to be about one (1) acre for each culvert, four (4) acres total for the project.

Construction for the culverts began on January 11, 2010, and was completed on June 10, 2010. Ecological monitoring commenced within 60 days of completion of the culverts in accordance with Special Condition 11 and the approved Ecological Monitoring Plan for L-31E Project dated May 5, 2008, beginning with the baseline monitoring event in August 2010 and followed by monthly monitoring events. Monitoring events are conducted by District and Miami-Dade County Permitting, Environmental and Regulatory Affairs (PERA) staff. Water physiochemical data (temperature, pH, conductivity, dissolved oxygen, salinity, and stage), and vegetation data at two (2) of the four (4) culverts (S-23A and S-23D) are monitored monthly **(Figure 4)**. Data collected between October 1, 2010-September 30, 2011, is summarized in this report.

After one year of monitoring, the project is trending towards success by diverting approximately 2.9% of available water to the Biscayne Bay Coastal Wetlands, and having no more than 5% exotic vegetation within the mitigation enhancement area. Due to extreme drought conditions experienced throughout South Florida in 2011, fewer data points for water stage and water physiochemical monitoring were collected. Once additional monitoring efforts are completed during the second annual monitoring period to allow for comparison data, project performance can be better evaluated.

2.0 Requirements

In accordance with Special Conditions 10 and 11 of Corps permit #SAJ-1994-1327 (IP-TKW) and the Ecological Monitoring Plan for L-31E Project dated May 5, 2008, the District will perform monthly monitoring events and report annually on the L-31E project benefits based on the following performance standards:

(a) **Aquatic Food Web Monitoring:** Improvement of the aquatic food web, including establishment of appropriate wetland periphyton communities that reflect an increasing salinity gradient from the culverts eastward to the shoreline. No increase in pollution tolerant plant species or elimination/reduction of existing desirable species.

(b) **Vegetation Monitoring:** Less than 5 percent cover of Category I and II invasive exotic plant species pursuant to the most current list established by the Florida Exotic Pest Plant Council, within the mitigation enhancement areas

(c) **Water Level and Flow Monitoring:** Hydrologic enhancement by redirecting flow from coastal canals to the coastal wetlands at the culvert delivery points. The project is anticipated to capture approximately 4% of the available water from the major conveyance canals (C-102 and C-103) and redistribute the water at the culvert locations thereby recreating / restoring remnant-tidal creeks or portions thereof or associated wetland areas.

(d) **Water Physiochemical Monitoring:** Salinity concentrations in coastal wetlands become more suitable and hypersaline zones are reduced. The direction and movement of the salinity gradient of restored tidal creeks in interior wetlands will be measured to ensure parameters more characteristic of an estuarine system.

To evaluate project performance, the following data will be collected on a monthly basis:

(a) Water quality samples and physiochemical data (specific conductance, dissolved oxygen, pH, temperature, and [calculated] salinity) collected at eight (8) locations:

1. Upstream of Culvert S-23A
2. Immediately downstream of culvert S-23A
3. 50 meters downstream of culvert S-23A
4. 100 meters downstream of culvert S-23A
5. Upstream of Culvert S-23D
6. Immediately downstream of culvert S-23D
7. 50 meters downstream of culvert S-23D
8. 100 meters downstream of culvert S-23D

(b) Water level (stage gauges) monitoring at:

1. Upstream and downstream of water control structures S-21A, S-20G, and S-20F
2. Upstream and downstream of Culverts S-23A and S-23D
3. 100 meters downstream of Culverts S-23A and S-23D

(c) Calculated flow through culverts S-23A, S-23B, S-23C, and S-23D.

(d) Vegetation monitoring, vegetation cover by species along a 100 meter transects east of the levee at culverts S-23A and S-23D, and height of ten (10) dwarf *R. mangle* trees along transect S-23D.

3.0 Summary Data

3.1 Aquatic Food Web Monitoring: During the first annual reporting period, there was no increase in pollution tolerant plant species or elimination/reduction of desirable species. Wetland periphyton communities were not observed within the vicinity of Culverts S-23A and S-23D. However, various species of birds, amphibians, invertebrates, fish, and reptiles were observed within the vicinity of Culverts S-23A and S-23D **(Table 3).**

Table 3-List of Species observed within vicinity of Culverts S-23A and S-23D during the first year of routine ecological monitoring

Culvert S-23A	**Species**	**Common Name**
Invertebrates	*Cardisoma guanhumi*	Blue land crab
	Gonatista grisea	Grizzled mantid
Amphibians	*Osteopilus septentrionalis*	Cuban tree frog
Reptiles	*Nerodia fasciata*	Banded water snake
Birds	*Butorides virescens*	Little green heron
	Dumetella carolinensis	Gray catbird
Culvert S-23D	**Species**	**Common Name**
Invertebrates	*Callinectes sapidus*	blue crab
Fish	*Cichla cellaris*	butterfly peacock bass
	Cichlasoma urophthalmus	Mayan cichlid
	Eucinostomus californiensis	Graceful mojarra
	Eucinostomus melanopterus	Flagfin mojarra
	Gambusia holbrooki	Eastern mosquitofish
	Poecilia latipinna	Sailfin molly
	Floridichthys carpio	Goldspotted killifish
	Mugil curema	White mullet
	Strongylura marina	Atlantic needlefish
Reptiles	*Nerodia fasciata*	Banded water snake
Birds	*Ardea alba*	Great egret
	Ardea herodias	great blue heron
	Butorides virescens	Little green heron

3.2 Vegetation Monitoring: Vegetation monitoring was implemented to detect changes in the composition of vegetation in response to increased freshwater flows from the culverts to the coastal wetlands. The project area is also monitored for Category I and II invasive exotic plant species. The District conducted monthly vegetation monitoring, between October 2010 and September 2011, along two (2) 100-meter transects downstream of Culverts S-23A and S-23D **(Figure 4)** to document the composition and coverage of vascular plant species found in the groundcover and canopy strata.

The line-intercept method was used to document all vascular plant species along a 100-meter transect in the canopy (>4.5 feet) and the groundcover (≤4.5 feet) strata within the transitional mangrove forest located downstream of Culvert S-23A **(Tables 4 and 5)**. The canopy stratum consists primarily of *Rhizophora mangle* (red mangrove), *Conocarpus erectus* (buttonwood), and *Laguncularia racemosa* (white mangrove). The groundcover stratum is dominated by *Acrostichum aureum* (golden leather fern) and *R. mangle*. The combination of shading by moderate to dense canopy cover combined with dense cover by *A. aureum* in the groundcover appears to preclude the development of a wetland graminoid or herbaceous community in the monitoring area. *Bacopa monnieri* (smooth water hyssops), a herbaceous wetland plant, was observed during several events but its distance from the culvert and ephemeral presence at the monitoring site appear to indicate a more random occurrence rather than a result of recently modified hydrology.

The above referenced methodology was also used to document plant species and species cover in the scrub red mangrove habitat located downstream of Culvert S-23D **(Table 6)**. This system is comprised almost entirely (~78%) of dwarfed *Rhizophora mangle* (red mangrove) with occasional *Laguncularia racemosa* (white mangrove) and *Utricularia foliosa* (leafy bladderwort) near the culvert basin. There is no canopy stratum at this location. Monitoring data collected during the first year indicate a slight decrease (R^2=0.414) in areal coverage of *R. mangle*, possible due to freezing and cold temperature in the winter of 2011 **(Attachment A, Figure 13)**.

In addition to vegetation percent cover, the height of dwarf red mangrove trees (*R. mangle*) along transect S-23D are monitored on a monthly basis. Statistical analysis of monitoring data collected indicates no change in the height (cm) of the ten (10) *R. mangle* individuals located at each of the following locations; Start (5 meters), middle (50 meters), and end (100 meters) along the 100 meter transect at Culvert S-23D **(Table 7)**.

Based on field observations and review of the monitoring data collected during the first year of ecological monitoring, there has not been a significant change in the composition and coverage of vascular plants downstream of the S-23A and S-23D culverts. The comparison of baseline vegetation data collected in August 2010 and first annual average of vegetation data is shown in **Tables 4, 5, and 6**.

During this reporting period, the percent of coverage of Category I and II invasive plant species based on the Florida Exotic Pest Plant Council's-2009 List of Invasive Plant Species was less than five (5) percent **(Table 4, 5, and 6)**. Additionally, chemical and mechanical treatment of exotic plant species was conducted over the past year within approximately 27 acres of the project site.

Table 4- Comparison of Percent Groundcover Vegetation within Transect S-23A

Species	Common Name	% Cover Baseline (August 27, 2010)	% Cover Average 1st Annual (Oct 2010-Sept 2011)	% Increase or Decrease
Acrostichum aureum	Leather fern	38.50%	32.12%	-6.38%
**Ardisia elliptica*	Shoebutton ardisia	8.10%	4.06%	-4.04%
**Casuarina equisetifolia*	Australian Pine	0.10%	0.02%	-0.08%
Cladium jamaicensis	sawgrass	9.40%	6.92%	-2.48%
Conocarpus erectus	buttonwood	3.20%	5.65%	2.45%
Laguncularia racemosa	White mangrove	3.50%	5.27%	1.77%
Metopium toxiferum	Poisonwood	0.10%	0.28%	0.18%
Psilotum nudum	Whisk fern	0.20%	0.27%	0.07%
Rhabdadenia biflora	Mangrove vine	0.10%	5.82%	5.72%
Rhizophora mangle	Red mangrove	20.30%	31.82%	11.52%

*Category I Invasive Exotic Plant Species on the Florida Exotic Pest Plant Council's-2009 List of Invasive Plant Species

Table 5- Comparison of Percent Canopy Vegetation within Transect S-23A

Species	Common Name	% Cover Baseline (August 27, 2010)	% Cover Average 1st Annual (Oct 2010-Sept 2011)	% Increase or Decrease
Annona glabra	Pond apple	1.50%	2.56%	1.06%
**Casuarina equisetifolia*	Australian pine	0.30%	0.34%	0.04%
Conocarpus erectus	buttonwood	38.50%	47.28%	8.78%
Encyclia tampensis	Butterfly orchid	0.30%	0.59%	0.29%
Laguncularia racemosa	White mangrove	25.20%	38.20%	13.00%
Metopium toxiferum	poisonwood	2.80%	2.19%	-0.61%
Rhabdadenia biflora	Mangrove vine	0.20%	2.76%	2.56%
Rhizophora mangle	Red mangrove	67.00%	72.33%	5.33%
Tillandsia flexuosa	Twisted airplant	0.10%	0.32%	0.22%

*Category I Invasive Exotic Plant Species on the Florida Exotic Pest Plant Council's-2009 List of Invasive Plant Species

Table 6- Comparison of Percent Groundcover Vegetation within Transect S-23D

Species	Common Name	% Cover Baseline (August 27, 2010)	% Cover Average 1st Annual (Oct 2010-Sept 2011)	% Increase or Decrease
Laguncularia racemosa	White mangrove	0.00%	0.15%	0.15%
**Panicum repens*	Torpedo grass	0.30%	0.00%	-0.30%
Rhizophora mangle	Red mangrove	80.20%	78%	-2.20%
Utricularia foliosa	Leafy bladderwort	0.00%	0.025%	0.025%

*Category I Invasive Exotic Plant Species on the Florida Exotic Pest Plant Council's-2009 List of Invasive Plant Species

Table 7- Comparison of *Rhizophora Mangle* Height (cm) within Transect S-23D*

Sampling Event	Start (5m)	Mid (50m)	End (100m)
Baseline sampling event 8/27/2010	70.10	80.90	73.60
2010-2011 Annual average height in cm	74.90	80.74	75.71
Percentage increase or decrease in height of plants	6.40%	-0.20%	2.78%

*Measured the height (cm) of ten R. mangle individuals located adjacent to each other at the above referenced locations along the 100 meter transect.

3.3 Water Level and Flow Monitoring: The L-31E culverts are passive structures intended to redirect flow from the L-31E Canal and provide hydrologic enhancement to the adjacent Biscayne Bay coastal wetlands. Beginning in August 2010, water levels were recorded on a monthly basis at the S-23A and S-23D culverts upstream, downstream, and at 100 meters downstream along the wetland transect **(Table 8)**.

Table 8- Water Stage (feet National Geodetic Vertical Datum 29, or ft NGVD29) recorded monthly for Culverts S-23A and S-23D

Date	S-23A Upstream	S-23A Downstream	S-23A Wetland (100m)	S-23D Upstream	S-23D Downstream	S-23D Wetland (100m)
8/11/2010	*	0.50	0.10	*	0.90	0.00
8/27/2010	0.55	0.58	0.70	0.48	0.28	0.20
9/30/2010	0.20	0.20	0.70	0.10	0.05	0.20
10/21/2010	0.00	0.00	0.00	0.00	0.00	0.20
11/22/2010	0.00	0.00	0.00	0.00	0.00	0.20
12/20/2010	0.00	0.00	0.00	0.00	0.00	0.00
1/24/2011	0.00	0.00	0.00	0.00	0.00	0.00
2/24/2011	0.15	0.15	0.00	0.15	0.15	0.00
3/25/2011	0.04	0.04	0.00	0.00	0.00	0.00
4/25/2011	0.00	0.00	0.00	0.00	0.00	0.00
5/26/2011	0.00	0.00	0.00	0.00	0.00	0.00
6/24/2011	0.47	0.47	0.50	0.34	0.21	0.00
7/25/2011	0.60	0.60	0.60	0.60	0.60	0.60
8/25/2011	0.68	0.64	0.70	0.37	0.20	0.20
9/14/2011	0.13	0.12	0.00	0.42	0.54	0.60

* No water to collect readings

Special condition 10(C) of the Corps permit states that "the project is anticipated to capture approximately 4% of the available water from the main conveyance canals (C-102 and C-103)". The *percent capture,* is essentially the percentage of the total *available water* which has been diverted into the four project culverts (S-23A, S-23B, S-23C, and/or S-23D) during any particular period of interest. *Available water* is limited to the water which would have historically been discharged via structures S-21A and S-20F, and is now equivalent to the sum of the discharges at S-21A, S-20F, and the four project culverts.

Because of their more frequent stage measurements (and close proximity), daily flow rates for culverts S-23A and S-23B were based on mean daily stages at Structure S-21A, while daily flow rates for culverts S-23C and S-23D were based on mean daily stages at Structure S-20F. More specifically, the mean daily flow rates at each of the four culverts were derived by manually entering the mean daily stage at the physically closest structure (S-21A or S-21F) into the design rating curve **(Attachment B)** and identifying the corresponding flow rate.

The percentage of available water diverted during the first year of monitoring is presented in **Table 9** below. As shown in the table, the 4% diversion target was reached or exceeded during five of the twelve months in which water was available for diversion. Also as shown in the table, over the entire monitoring period, the project was estimated to have diverted approximately 2.9% of all water which was available for diversion.

Table 9 – Percentage of available water diverted through the L-31E Culverts during the first annual monitoring period.

Month	Four Culvert Monthly Total Flow Volume (Acre-Feet)	Available Water (acre-feet)	% of Available Water Diverted
August 2010	1,506.2	23,999.2	**6.3%**
September 2010	908.4	41,905.5	2.2%
October 2010	41.3	37,080.5	0.1%
November 2010	0.0	25,249.9	0.0%
December 2010	0.0	11,974.9	0.0%
January 2011	0.0	16,617.8	0.0%
February 2011	0.0	6,800.6	0.0%
March 2011	0.0	0.0	None Available
April 2011	0.0	8.4	0.0%
May 2011	0.0	0.0	None Available
June 2011	42.4	42.4	**100.0%**
July 2011	1,525.8	18,059.2	**8.4%**
August 2011	1,263.5	31,615.0	**4.0%**
September 2011	1,571.5	24,831.0	**6.3%**
Entire Period	**6,859.1**	**238,184.4**	**2.9%**

3.4 Water Physiochemical Monitoring: By diverting freshwater from the L-31E Canal into the Biscayne Bay coastal wetlands, salinity concentrations should become more suitable, reduce hypersaline zones, and improve estuarine habitat. Over the last year, the District conducted monthly surface water sampling at the two monitored culverts (S-23A and S-23D) at four locations: (1) directly upstream of the culvert, (2) directly downstream of the culvert, (3) 50 meters downstream of the culvert along the monitoring transect, and (4) 100 meters downstream of the culvert along the monitoring transect. Temperature, conductivity, salinity, dissolved oxygen, and pH were recorded at each station using a calibrated YSI multi-parameter water quality monitoring instrument **(Tables 10 through 19)**. Due to extreme drought conditions experienced across South Florida, an insufficient amount of water was available to collect data within the wetland for much of this reporting period.

Table 10-Monthly Temperature (°C) at Culvert S-23A

Date	S-23A Upstream	S-23A Downstream	S-23A Wetland (50m)	S-23A Wetland (100m)
10/21/10	26.39	25.60	*	*
11/22/10	24.57	23.76	*	*
12/20/10	20.00	17.89	*	*
01/24/11	21.46	18.96	*	*
02/24/11	24.09	22.91	*	*
03/25/11	24.63	23.29	*	*
04/25/11	27.19	26.81	*	*
05/26/11	29.05	27.61	*	*
06/24/11	31.34	30.00	*	*
07/25/11	28.89	28.95	28.59	28.08
08/25/11	26.62	26.62	26.60	*
09/14/11	28.19	28.12	27.65	25.54

* No water to collect readings

Table 11-Monthly Temperature (°C) at Culvert S-23D

Date	S-23D Upstream	S-23D Downstream	S-23D Wetland (50m)	S-23D Wetland (100m)
10/21/10	26.62	26.33	27.83	26.80
11/22/10	24.57	24.49	25.69	25.30
12/20/10	19.00	18.92	*	*
01/24/11	20.13	19.48	*	*
02/24/11	24.23	24.45	*	*
03/25/11	25.04	24.13	*	*
04/25/11	27.42	27.51	*	*
05/26/11	27.01	27.54	*	*
06/24/11	31.21	30.55	*	*
07/25/11	30.00	29.79	31.78	32.47
08/25/11	28.37	28.39	27.98	27.75
09/14/11	28.64	28.50	30.18	30.40

* No water to collect readings

Table 12- Monthly Specific Conductivity (microsiemens per centimeter, or µS/cm) at Culvert S-23A

Date	S-23A Downstream	S-23A Upstream	S-23A Wetland (50m)	S-23A Wetland (100m)
10/21/10	1359	1404	*	*
11/22/10	1066	1236	*	*
12/20/10	885	784	*	*
01/24/11	877	884	*	*
02/24/11	607	598	*	*
03/25/11	617	614	*	*
04/25/11	1189	1108	*	*
05/26/11	2088	1552	*	*
06/24/11	2177	1921	*	*
07/25/11	952	913	608	1238
08/25/11	817	823	921	*
09/14/11	733	730	523	410

* No water to collect readings

Table 13-Monthly Specific Conductivity (microsiemens per centimeter, or µS/cm) at Culvert S-23D

Date	S-23D Upstream	S-23D Downstream	S-23D Wetland (50m)	S-23D Wetland (100m)
10/21/10	1256	15038	17829	21386
11/22/10	2017	27886	32907	31706
12/20/10	1245	1733	*	*
01/24/11	1100	1131	*	*
02/24/11	946	955	*	*
03/25/11	1178	1221	*	*
04/25/11	1088	1116	*	*
05/26/11	4126	4430	*	*
06/24/11	5555	7734	*	*
07/25/11	919	964	1140	1062
08/25/11	973	1017	11037	12257
09/14/11	819	819	868	1173

* No water to collect readings

Table 14- Monthly Salinity (practical salinity units, or PSU) at Culvert S-23A

Date	S-23A Upstream	S-23A Downstream	S-23A Wetland (50m)	S-23A Wetland (100m)
10/21/2010	0.68	0.70	*	*
11/22/2010	0.53	0.61	*	*
12/20/2010	0.44	0.36	*	*
1/24/2011	0.43	0.44	*	*
2/24/2011	0.29	0.29	*	*
3/25/2011	0.30	0.30	*	*
4/25/2011	0.59	0.55	*	*
5/26/2011	1.1	0.97	*	*
6/24/2011	1.06	0.78	*	*
7/25/2011	0.46	0.45	0.29	0.61
8/25/2011	0.40	0.40	0.45	*
9/14/2011	0.35	0.35	0.25	0.20

* No water to collect readings

Table 15- Monthly Salinity (practical salinity units, or PSU) at Culvert S-23D

Date	S-23D Upstream	S-23D Downstream	S-23D Wetland (50m)	S-23D Wetland (100m)
10/21/2010	0.62	8.73	10.53	12.80
11/22/2010	1.03	17.16	20.58	19.73
12/20/2010	0.62	0.88	*	*
1/24/2011	0.55	0.56	*	*
2/24/2011	0.47	0.47	*	*
3/25/2011	0.58	0.61	*	*
4/25/2011	0.54	0.55	*	*
5/26/2011	2.60	3.30	*	*
6/24/2011	2.97	4.24	*	*
7/25/2011	0.45	0.47	0.56	0.49
8/25/2011	0.48	0.50	6.24	7.09
9/14/2011	0.40	0.40	0.42	0.58

* No water to collect readings

Table 16- Monthly Dissolved Oxygen (mg/L) at Culvert S-23A

Date	S-23A Upstream	S-23A Downstream	S-23A Wetland (50m)	S-23A Wetland (100m)
10/21/10	5.58	4.99	*	*
11/22/10	6.12	5.12	*	*
12/20/10	6.35	6.35	*	*
01/24/11	6.37	6.55	*	*
02/24/11	8.72	7.30	*	*
03/25/11	8.93	7.55	*	*
04/25/11	7.48	6.90	*	*
05/26/11	7.27	3.92	*	*
06/24/11	6.22	2.95	*	*
07/25/11	4.80	3.98	2.59	1.98
08/25/11	4.82	5.10	3.70	*
09/14/11	5.38	5.65	3.71	3.17

* No water to collect readings

Table 17- Monthly Dissolved Oxygen (mg/L) at Culvert S-23D

Date	S-23D Upstream	S-23D Downstream	S-23D Wetland (50m)	S-23D Wetland (100m)
10/21/10	7.9	3.95	3.4	4.57
11/22/10	6.37	3.52	2.6	4.98
12/20/10	2.74	7.95	*	*
01/24/11	4.9	5.24	*	*
02/24/11	9.58	8.52	*	*
03/25/11	8.49	7.75	*	*
04/25/11	6.54	5.64	*	*
05/26/11	5.18	4.44	*	*
06/24/11	6.71	3.65	*	*
07/25/11	5.15	4.75	6.61	9.2
08/25/11	4.32	4.69	3.29	2.44
09/14/11	4.22	3.78	7.19	7.6

* No water to collect readings

Table 18- Monthly pH at Culvert S-23A

Date	S-23A Upstream	S-23A Downstream	S-23A Wetland (50m)	S-23A Wetland (100m)
10/21/10	7.43	7.34	*	*
11/22/10	7.55	7.4	*	*
12/20/10	7.96	7.76	*	*
01/24/11	7.71	7.52	*	*
02/24/11	7.67	7.59	*	*
03/25/11	7.77	7.73	*	*
04/25/11	7.86	7.74	*	*
05/26/11	7.73	7.57	*	*
06/24/11	8:30	7.86	7.61	*
07/25/11	7.38	7.22	7.2	7.28
08/25/11	7.53	7.44	7.24	*
09/14/11	7.75	7.65	7.38	7.64

* No water to collect readings

Table 19-Monthly pH at Culvert S-23D

DATE	S-23D Upstream	S-23D Downstream	S-23D Wetland (50m)	S-23D Wetland (100m)
10/21/10	7.67	7.28	7.39	*
11/22/10	7.36	7.27	7.52	7.41
12/20/10	7.07	7.38	0	*
01/24/11	7.47	7.35	0	*
01/24/11	7.47	7.35	0	*
02/24/11	7.88	7.79	0	*
03/25/11	7.99	7.82	0	*
04/25/11	7.78	7.64	0	*
05/26/11	7.2	7.11	0	*
06/24/11	7.82	7.61	0	*
07/25/11	7.23	7.28	7.44	7.81
08/25/11	7.66	7.52	7.13	7.15
09/14/11	7.55	7.44	7.69	7.6

* No water to collect readings

4.0 Maps

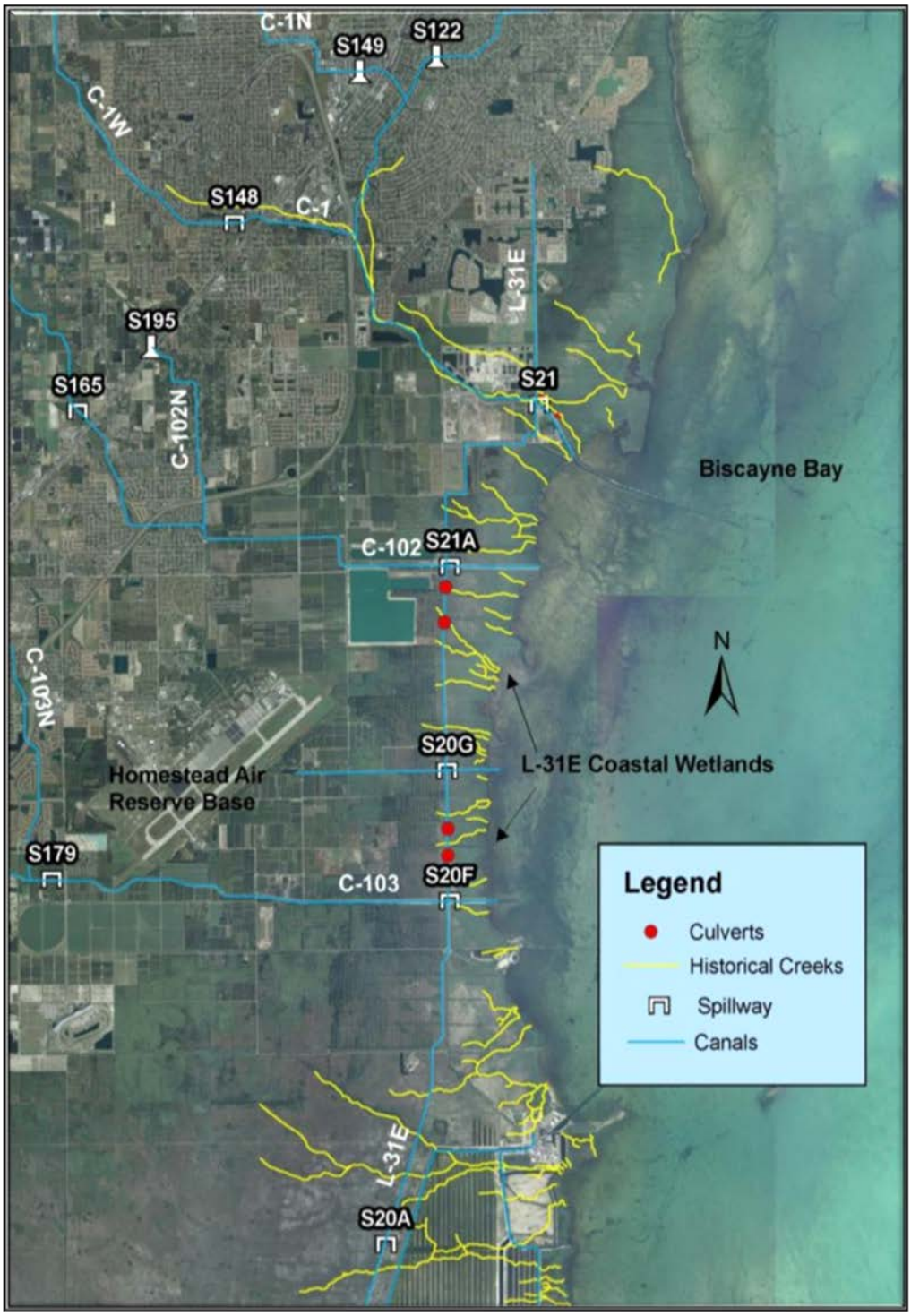


Figure 1- Location of L-31E Culverts and the Biscayne Bay Coastal Wetlands in Miami-Dade County. The L-31E culverts are east of the levee and between the C-102 and C-103 canals.

Figure 2-Biscayne Bay Coastal Wetland, L-31E Culverts Project

Figure 3- Biscayne Bay Coastal Wetlands, L -31E Culverts Project area (green pattern) and monitoring structures.

Figure 4- Location of 100m transects east of the levee at culverts S23-A (top) and S-23D (bottom).

5.0 Conclusions

The L-31E Culverts are passive, flap-gated structures designed to divert available freshwater from the L-31E Canal into the adjacent coastal wetlands. Ecological monitoring has been conducted over the last year to document project benefits and performance. The project is anticipated to provide improvements to salinity concentrations, water stages, wetland vegetation, and algal composition within the wetland area affected by culvert water deliveries.

During the first annual reporting period, South Florida experienced extreme drought conditions. Beginning in October 2010, water levels along the transect downstream of the Culvert S-23A fell below the minimum level required for sampling and remained at or below this level through June 2011. From December 2010 through June 2011, water levels along the transect downstream of the Culvert S-23D fell below the minimum level required for sampling. Once water began to flow in July 2011 through September 2011, inundations were observed along the entire length of the transects with water depths approximately 12”-24”; however, no periphyton communities were observed. During this reporting period various species of birds, amphibians, Invertebrates, fish, and reptiles were observed within vicinity of Culverts S-23A and S-23D.

Based on review of the monitoring data collected during the first year of ecological monitoring and comparison to baseline data, there has not been a significant change in the composition and coverage of vascular plants downstream of the S-23A and S-23D culverts. Comparison of baseline vegetation data collected in August 2010 and annual average of vegetation data indicates that there was no significant change in *Rhizophora mangle* height (cm) within Transect S-23D. The percent coverage of Category I and Category II invasive plant species, based on the Florida Exotic Pest Plant Council’s-2009 List of Invasive Plant Species, was less than five (5) percent within the mitigation enhancement areas. Additionally, chemical and mechanical treatment of exotic plant species was conducted within approximately 27 acres of the project area.

As described in Section 3.3, the project was able to meet or exceed its 4% diversion target during four of the twelve months in which water was available for diversion, but only able to divert a total 2.9% of all water which was available for diversion over the entire monitoring period. Although the 4% overall target was not reached, it is important to recognize that almost 6,900 acre feet of valuable freshwater was estimated to have been diverted to the Biscayne Bay Coastal Wetlands as a result of the L-31E Culvert Project.

Overall, following the first year of monitoring the project is trending towards success by diverting approximately 2.9% of available water to the Biscayne Bay Coastal Wetlands, and having no more than 5% exotic vegetation within the mitigation enhancement area. Due to extreme drought conditions, water physiochemical data was limited within the wetland areas affected by culvert water deliveries during the first annual monitoring period. Once additional monitoring efforts are completed during the second annual monitoring period, comparison data and project performance can be better evaluated.

Attachment A: Photographs

Figure 5- Biscayne Bay Coastal Wetlands, L-31E Culverts Project Staff Gauge Upstream of Culvert S-23A

Figure 6- Biscayne Bay Coastal Wetlands, L-31E Culverts Project Staff Gauge Downstream of Culvert S-23A

Figure 7- BBCW, L-31E Culvert S-23A vegetation transect at 50 meters downstream and looking northwest.

Figure 8- BBCW, L-31E Culvert S-23A vegetation transect at 100 meters downstream and looking northwest.

Figure 9- BBCW, L-31E Culvert S-23D upstream staff gauge.

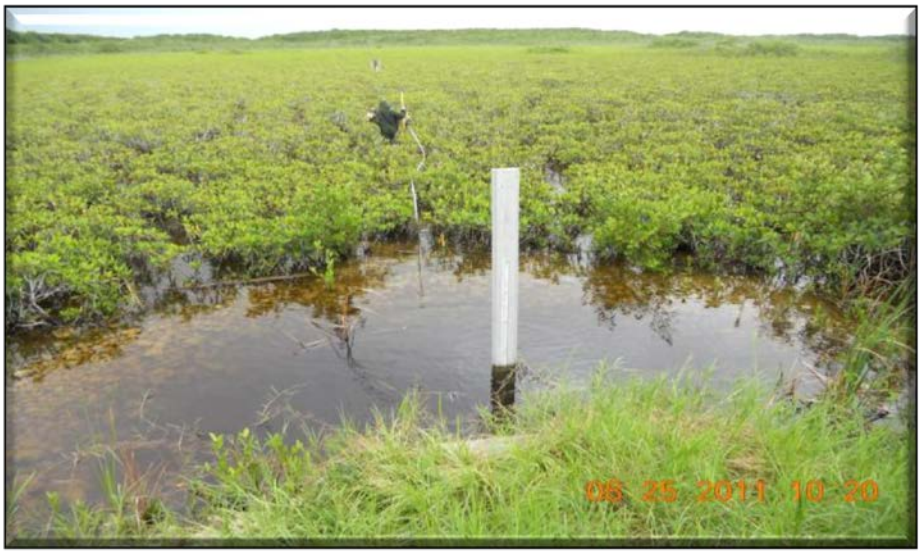


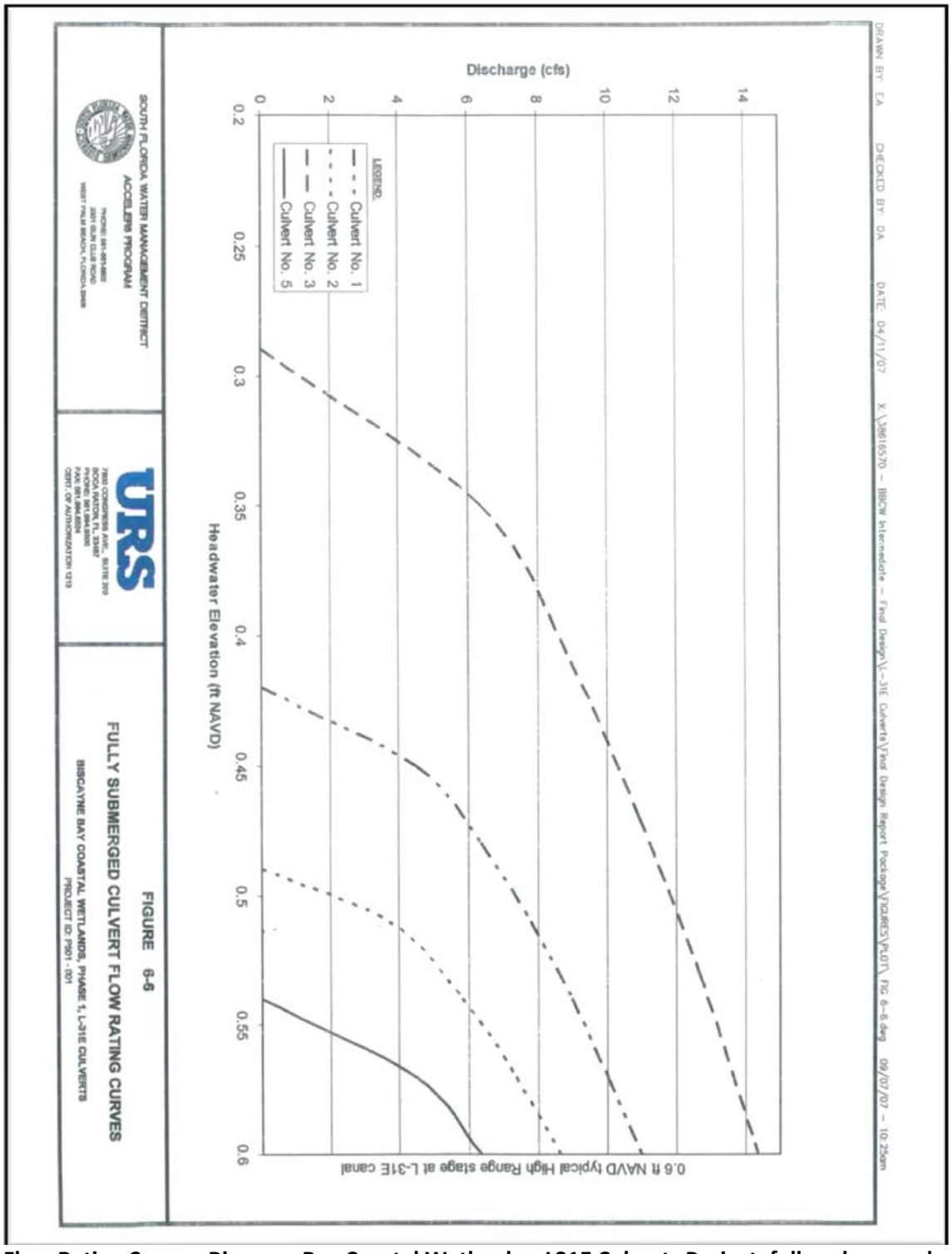
Figure 10- BBCW, L-31E Culvert S-23D downstream staff gauge.

Figure 11- BBCW, L-31E Culvert S-23D vegetation transect at 50 meters downstream and looking west.

Figure 12- BBCW, L-31E Culvert S-23D vegetation transect at 0 meters downstream and looking east.

Figure 13- Cold weather damaged mangroves from the winter of 2010 within the BBCW, L-31E Culverts Project Area.

Attachment B: L-31E Culverts Flow Rating Curve



Flow Rating Curves: Biscayne Bay Coastal Wetlands – L31E Culverts Project, fully submerged culvert flow curves [headwater elevation (ft NGVD29) from structures S-21A, S-20G, S-20F utilized to calculate discharges (cfs) for Culverts S-23A, S-23B, S-23C, and S-23D] (Source: URS, 2007).

Attachment F:
BBCW Deering Estate Flow-way Baseline Mitigation Monitoring Report

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Ref. No. 03222012-02

March 22, 2012

Mr. Robert Kirby
Enforcement Section
U.S. Army Corps of Engineers
9900 SW 107th Ave, Suite 203
Miami, FL 33176

Dear Mr. Kirby:

Subject: Biscayne Bay Coastal Wetland Project - Deering Estate Flow-Way
Permit No. SAJ-2007-139 (IP-AAZ) - Baseline Mitigation Monitoring Report

The U.S. Army Corps of Engineers issued the above referenced permit to the South Florida Water Management District on December 17, 2009, for the Deering Estate Flow-Way Project, a component of the Biscayne Bay Coastal Wetlands. In accordance with Special Condition 13(b), please find enclosed the Baseline Mitigation Monitoring Report for Biscayne Bay Coastal Wetlands, Deering Estates Flow-Way.

If you have questions or need additional information, please contact Leslye Waugh at (561) 682-6483 or via email at lwaugh@sfwmd.gov.

Sincerely,

Jayne Bergstrom

Jayne Bergstrom
Section Administrator
Permit Acquisition & Compliance
Office of Everglades Policy & Coordination

JB/am
Enclosure

c: Bahram Charkhian, SFWMD
Jorge Jaramillo, SFWMD
Nimmy Jeyakumar, SFWMD
Leslye Waugh, SFWMD
Alisa Zarbo, USACE

Baseline Mitigation Monitoring Report for the Biscayne Bay Coastal Wetlands, Deering Estate Flow-Way Project

USACE Permit Number: SAJ-2007-139 (IP-AAZ)

Submitted to:

U. S. Army Corps of Engineers
Enforcement Section
P.O. Box 4970
Jacksonville, FL 33401

Submitted by:

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

Prepared by: Bahram Charkhian and Leslye Waugh
March 21, 2012

Table 1- Key permit-related information

USACE Permit	
Project Name	BBCW, Deering Estate Flow-Way
Permit Number	SAJ-2007-139 (IP-AAZ)
Issue Date	December 17, 2009
Expiration Date for Construction	December 16, 2014
Project Phase	Operations
Relevant Permit Conditions	Special Conditions 11 and 12
Relevant Period of Record	Baseline Monitoring
Report Generator	Bahram Charkhian 561-682-2284 bcharkh@sfwmd.gov
Permit Coordinator	Leslye Waugh 561-682-6483 lwaugh@sfwmd.gov
Permittee's Consultant	Miami-Dade County Permitting, Environmental and Regulatory Affairs (PERA) Stephen Blair and Josh Mahoney Miami-Dade County Park & Natural Areas Management and Open Spaces Dallas Hazelton
Directions to Project Site	Deering Estate at Cutler, 16701 SW, 72nd Ave., Miami, Florida 33157. Take the Exit onto FL-826S toward Kendall, turn left on to SW 128st, turn right on to SW 82nd Ave., turn left on SW 168th St./ Richmond, turn right on to SW 72nd Ave.
Project Commencement	July 26, 2010
Project Completion	March 26, 2012

Table of Contents

Table 2- Attachments included with this report

Attachment A	Data from groundwater monitoring wells, Station 2 and 5.
Attachment B	Photographs

1.0 Project Overview

The U.S. Army Corps of Engineers (Corps or USACE) issued Permit No. SAJ-2007-139 (IP-AAZ) on December 17, 2009, to the South Florida Water Management District (District or SFWMD) for the Deering Estate Flow-Way Project. The permit authorized the District to construct a five hundred (500)-foot extension of the C-100A Canal, a one hundred (100) cubic feet per second (CFS) pump station (S-700) to withdraw water from C-100A Spur Canal, installation of five hundred thirty eight (538) linear feet of sixty (60) inch pipe downstream of the pump station S-700, and construction of a spreader structure for discharges to the coastal wetlands located within Deering Estate **(Figures 1 and 2).** The Deering Estate Flow-Way is an early work element of the Biscayne Bay Coastal Wetlands (BBCW) Project, a component of the Comprehensive Everglades Restoration Plan (CERP).

The project is located at 16,500 SW. 74th Avenue, Section 26, Township 55 South, and Range 40East, in Miami-Dade County, Florida. The Deering Estate Flow-Way Project would link surface waters of C-100A Spur Canal with waters of the United States, including Cutler Creek.

Geographic Location:
Latitude: 25.622903 North
Longitude: -80.311708 West

The project is located in southeastern Miami-Dade County on State and County owned lands, adjacent to Biscayne Bay Aquatic Preserve and Biscayne National Park. The Deering Estate Flow-Way is intended to re-direct freshwater from the C-100 Canal basin, which is currently being discharged to the Bay at a coastal outfall structure, back into the historic "Cutler Creek" located on the Deering Estate property. This is accomplished by extending the C-100A Spur Canal to the Powers Addition parcel, and pumping available freshwater under Old Cutler Road to a concrete spreader structure that will discharge to the creek **(Figures 1, 2, and 16).**

The monitoring described in this document will utilize existing Miami-Dade County monitoring stations to satisfy the requirements of the Corps permit. This monitoring is being undertaken to evaluate the performance of the Deering Estate Flow-Way Project and to offset 444-cubic yards of impacts as a result of the C-100A Spur Canal extension. The impacts are anticipated to be offset by project benefits which include rehydration of 37.12 acres of wetlands within the Deering Estate.

Construction for the Deering Estate Flow-Way Project began on July 26, 2010, and will be completed on March 26, 2012. Hydrological monitoring commenced within 60 days of completion of the Deering Estate Flow-Way Project in accordance with Special Conditions 11 and 12 and the approved Ecological Monitoring Plan for Deering Estate Flow-Way Project dated February 07, 2010. Baseline monitoring events were conducted by District and Miami-Dade County's Permitting, Environmental and Regulatory Affairs (PERA) staff. Water physiochemical data (temperature, pH, conductivity, dissolved oxygen, salinity, and stage) at two (2) existing wetland staff

gauges and two (2) existing groundwater monitoring stations within the rehydration area were monitored **(Figure 2).** Data collected between July 18, 2011-October 24, 2011, is summarized in this report.

2.0 Permit Requirements

In accordance with Special Conditions 11 and 12 of Corps Permit No. SAJ-2007-139 (IP-AAZ) and the Ecological Monitoring Plan for Deering Estate Flow-Way Project dated February 07, 2010, the District completed the baseline monitoring event on October 24, 2011. Implementation of the Deering Estate Flow-Way Project is anticipated to result in higher water levels in Cutler Creek within Deering Estate.

2.1 Hydrologic Performance

The areas affected by water deliveries will be monitored for hydrologic changes downstream of the project area at two (2) existing wetland staff gauges, and two (2) existing groundwater monitoring stations **(Table 3)**. Monitoring will be conducted for at least three (3) years after completion of construction and annual reports will be submitted to the Corps.

To evaluate project performance, baseline data for water quality and physicochemical data were collected within the rehydration area. At Station 1 and Station 3, surface water grab samples were collected monthly and analyzed for specific conductance, dissolved oxygen, pH, temperature, and [calculated] salinity. Water levels were recorded from the staff gauges in NGVD. The data is summarized in Section 4.1 and 4.2.

At Station 2 and Station 5, groundwater was monitored *in situ* for specific conductance, temperature, salinity, and groundwater level using YSI data sondes every 15 minutes. The data was averaged daily and summarized in Section 4.3 and Appendix A.

Once additional monitoring efforts are complete, which will allow for data comparison, project performance will be evaluated and included in subsequent annual reports.

Table 3. Locations of Monitoring Stations for the Deering Estate Flow-Way Project

Monitoring Station name	Latitude Approx. X Coordinates	Longitude Approx. Y Coordinates	Function and/or Description	Monitoring Well Information	
				Top of Casting Elevation (FT) NAVD	RIM (FT)
Station 1	885124.742	469012.886	Staff Gauge Upstream of Weir	N/A	N/A
Station 3	885363.133	468759.938	Staff Gauge Downstream of Weir	N/A	N/A
Station 5	885729.49	468718.07	Monitoring Well Upstream of Weir	8.53	8.78
Station 2	883587.85	469241.68	Monitoring Well Upstream of Weir	10.3	10.61

3.0 Maps

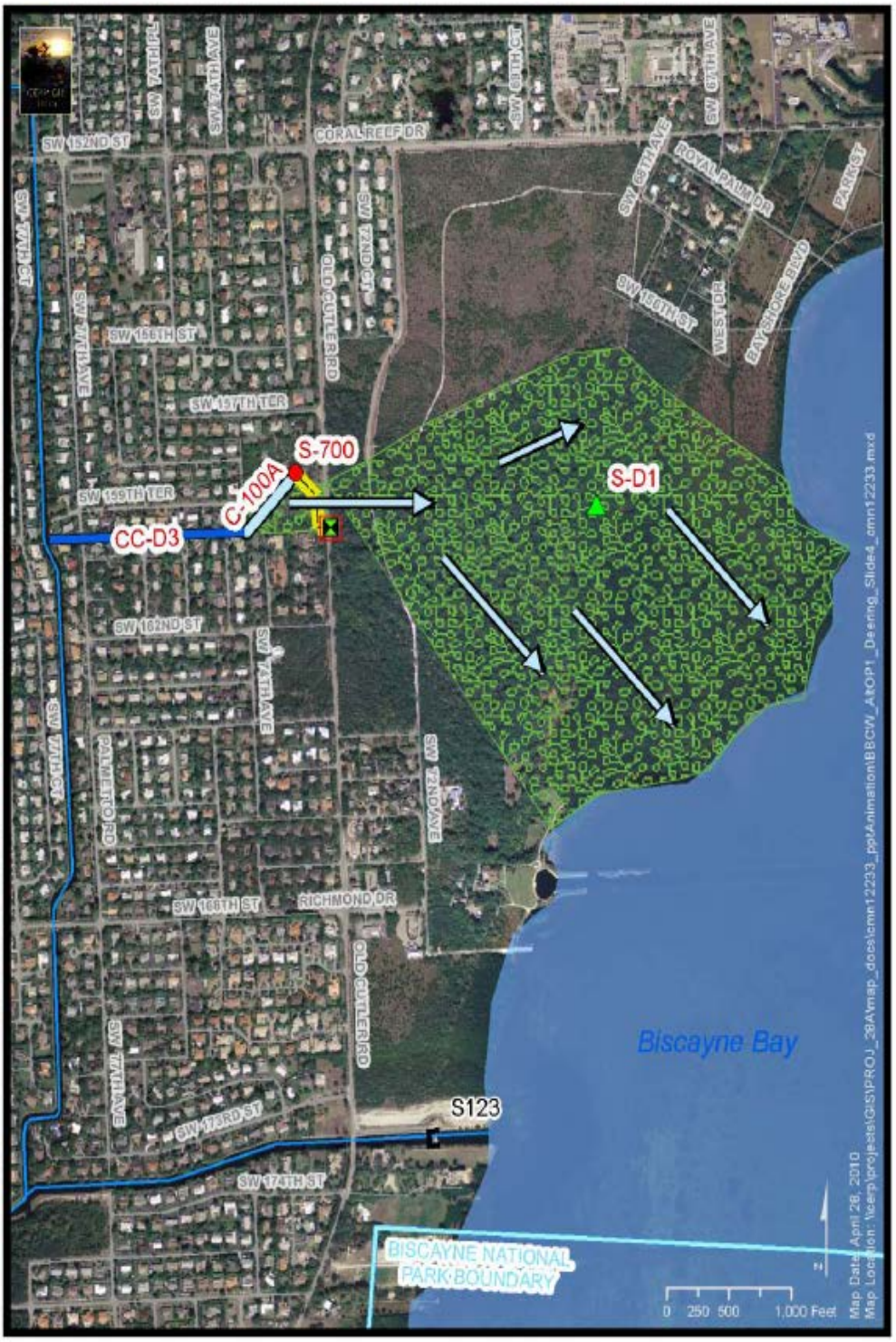


Figure 1. Biscayne Bay Coastal Wetlands; Deering Estate Flow-Way Features

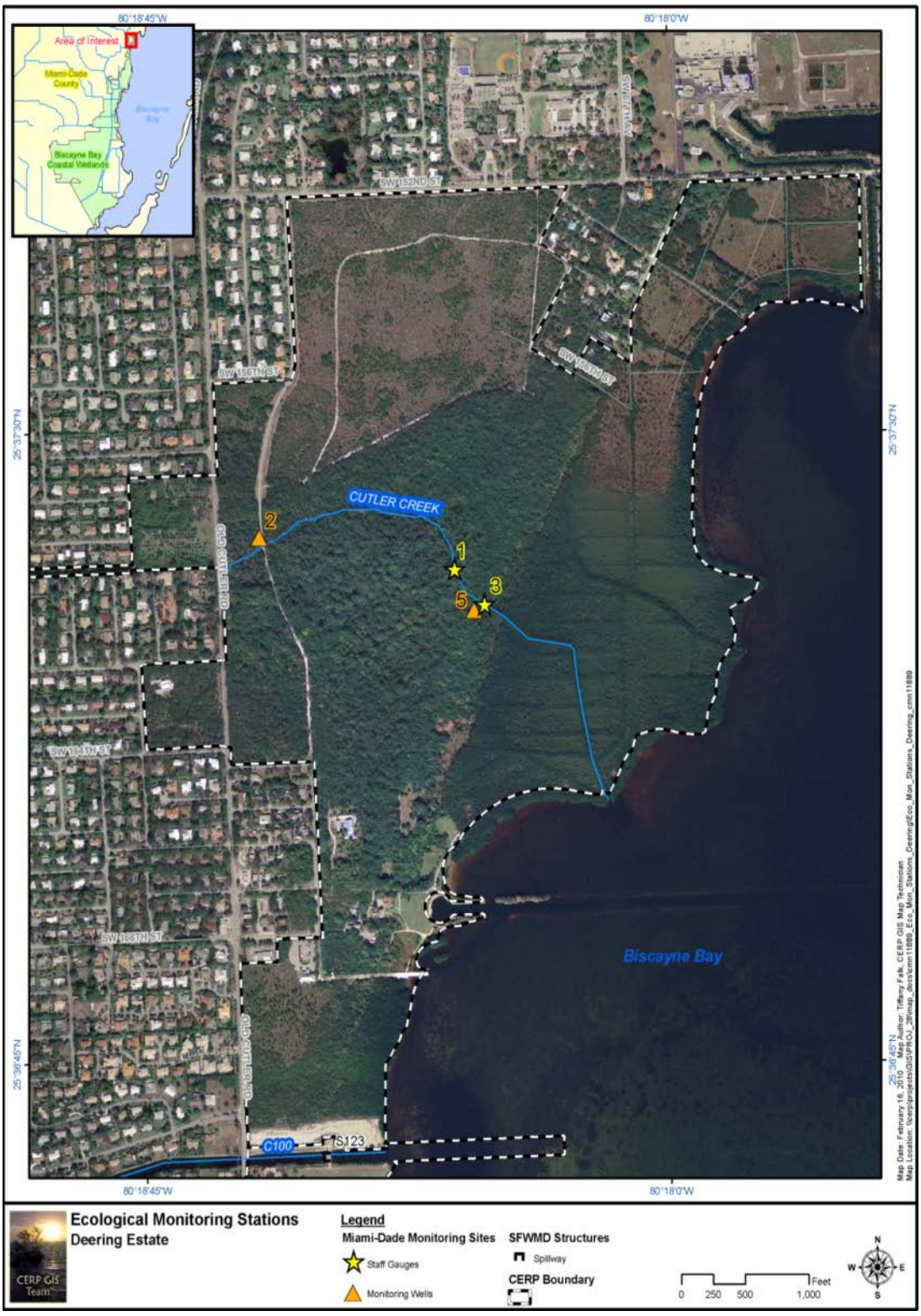


Figure 2- Location of Hydrological Monitoring Stations for Deering Estate Flow-Way

4.0 Summary Data

4.1-Water quality and physiochemical data (specific conductance, dissolved oxygen, pH, temperature, and [calculated] salinity) collected at two (2) existing wetland staff gauges, Station 1 and Station 3. All data met QA/QC requirements (**Figures 3-7 and Tables 4-13**).

Table 4-Salinity Concentration (PPT) at Stations 1 and 3

Date	Station 1 Salinity (PSU)	Station 3 Salinity (PSU)
08/24/11	0.49	5.57
09/21/11	0.45	12.35
10/26/11	0.41	5.18

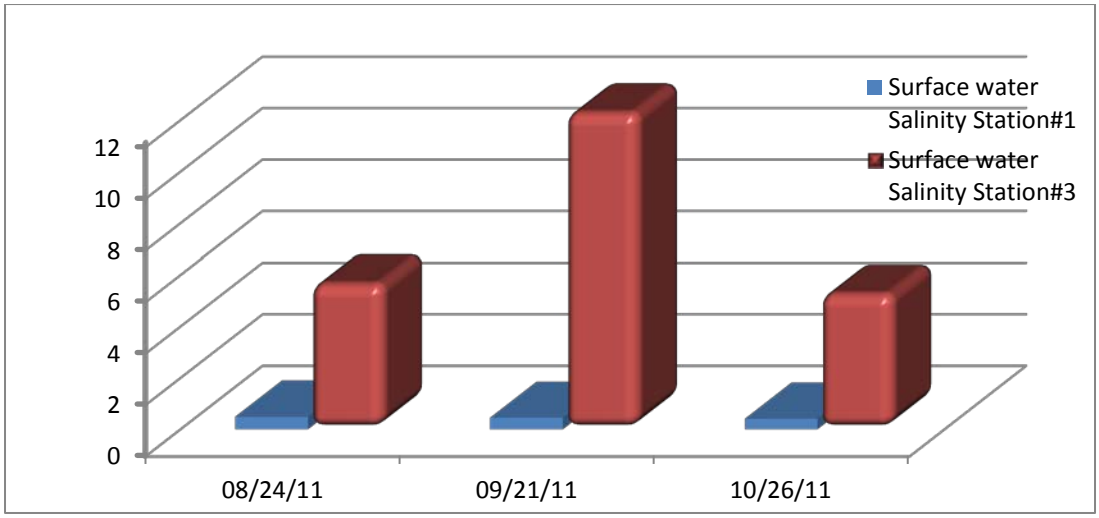


Figure 3- Comparison of Salinity Concentration (PSU) at Stations 1 and 3

Table 5-Summary of Statistical Analysis for Salinity Concentration (PSU) at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	0.450	0.0231	0.0400	0.41	0.417	0.450	0.35 to 0.55	0.483	0.49
Station 3	3	7.700	2.3277	4.0317	5.18	5.245	5.570	-2.32 to 17.72	11.220	12.35

Table 6-Temperature (℃) at Stations 1 and 3

Date	Station 1 (°C)	Station 3 (°C)
08/24/11	25.74	25.11
09/21/11	26.44	26.8
10/26/11	22.66	23.52

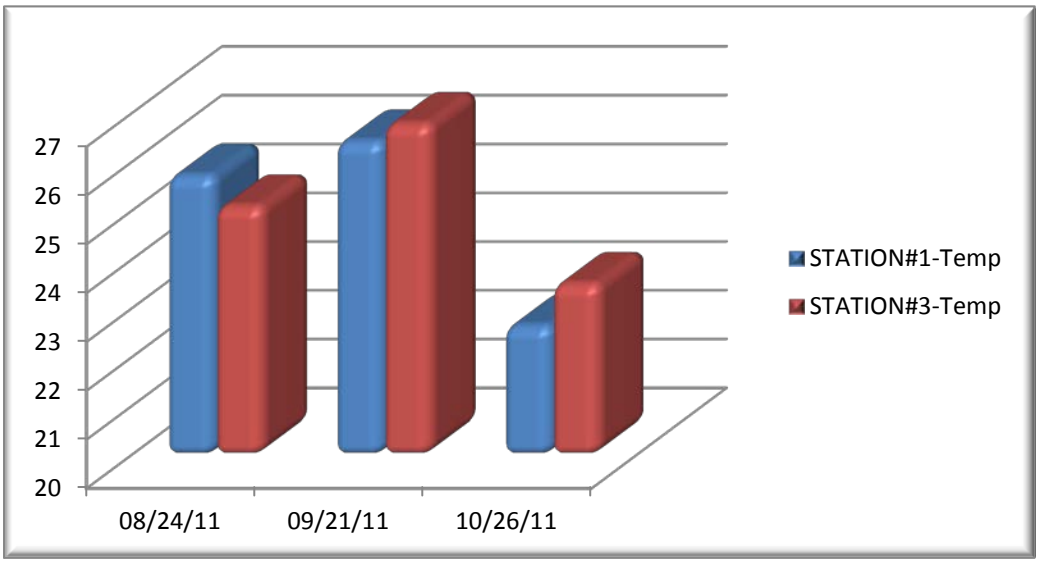


Figure 4- Comparison of Temperature (℃) at Stations 1 and 3

Table 7- Summary of Statistical Analysis for Temperature (℃) at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	24.95	1.161	2.011	22.66	23.17	25.74	19.95 to 29.94	26.32	26.44
Station 3	3	25.14	0.947	1.640	23.52	23.78	25.110	21.07 to 29.22	26.51	26.80

Table 8- Specific Conductivity (Field) Concentration (microsiemens per centimeter, or µS/cm) at Stations 1 and 3

Date	Station 1 (µS/cm)	Station 3 (µS/cm)
08/24/11	1000	9900
09/21/11	919	20660
10/26/11	837	8850

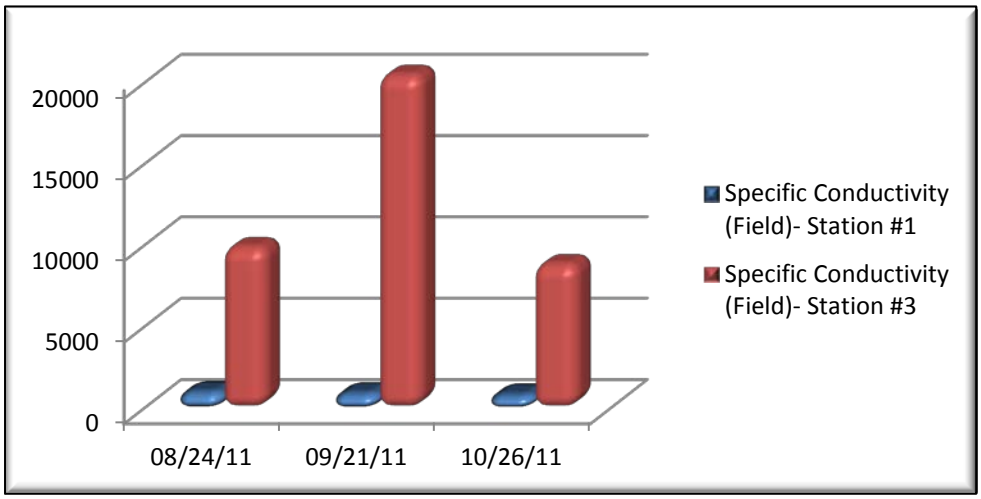


Figure 5- Comparison of Specific Conductivity (Field) (microsiemens per centimeter, or µS/cm) at Stations1 and 3

Table 9- Summary of Statistical Analysis for Specific Conductivity (Field) (microsiemens per centimeter, or µS/cm) at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	918.7	47.05	81.50	837	850.7	919.0	716.2 to1121.1	986.5	1000
Station 3	3	13136.7	3773.86	6536.52	8850	9025.0	9900.0	-3100 to 294374	18866.7	20660

Table 10- pH Concentration at Stations 1 and 3

Date	Station 1 (pH)	Station 3 (pH)
08/24/11	7.6	7.35
09/21/11	7.33	7
10/26/11	7.54	7.05

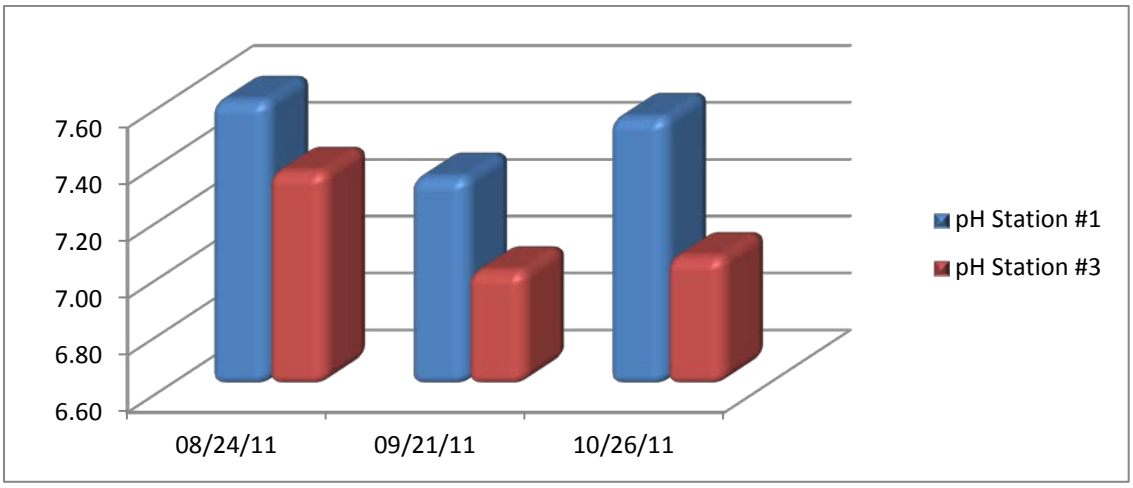


Figure 6- Comparison of pH at Stations 1 and 3

Table 11- Summary of Statistical Analysis for pH at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	7.490	0.0819	0.142	7.33	7.37	7.54	7.14 to 7.84	7.590	7.60
Station 3	3	7.133	0.1093	0.189	7.00	7.01	7.05	6.67 to 7.60	7.300	7.35

Table 12- Dissolved Oxygen (mg/L) concentration at Stations 1 and 3

Date	Station 1 (mg/L)	Station 3 (mg/L)
08/24/11	4.2	1.72
09/21/11	0.95	1.52
10/26/11	3.19	1.26

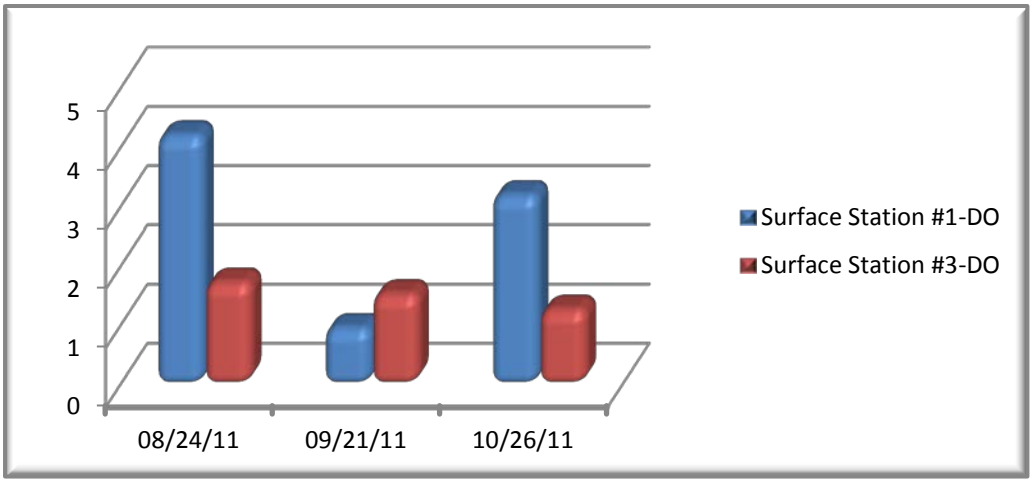


Figure 7- Comparison of Dissolved Oxygen (mg/L) at Stations 1 and 3

Table 13- Summary of Statistical Analysis for Dissolved Oxygen at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	2.78	0.960	1.663	0.95	1.32	3.19	-1.35 to 6.91	4.032	4.20
Station 3	3	1.50	0.133	0.231	1.26	1.30	1.52	0.93 to 2.07	1.687	1.72

4.2 - Surface water (wetland stage) levels recorded at two (2) existing wetlands staff gauges, Station 1 and Station 3. All data met QA/QC requirements (**Figure 8 and Tables 14 and 15**).

Table 14- Wetland Stage Evaluation (Feet) at Stations 1 and 3

Date	Station 1 Height (Feet, NGVD)	Station 3 Height (Feet, NGVD)
8/24/2011	2.36	1.68
9/21/2011	2.27	1.70
10/26/2011	2.25	2.00

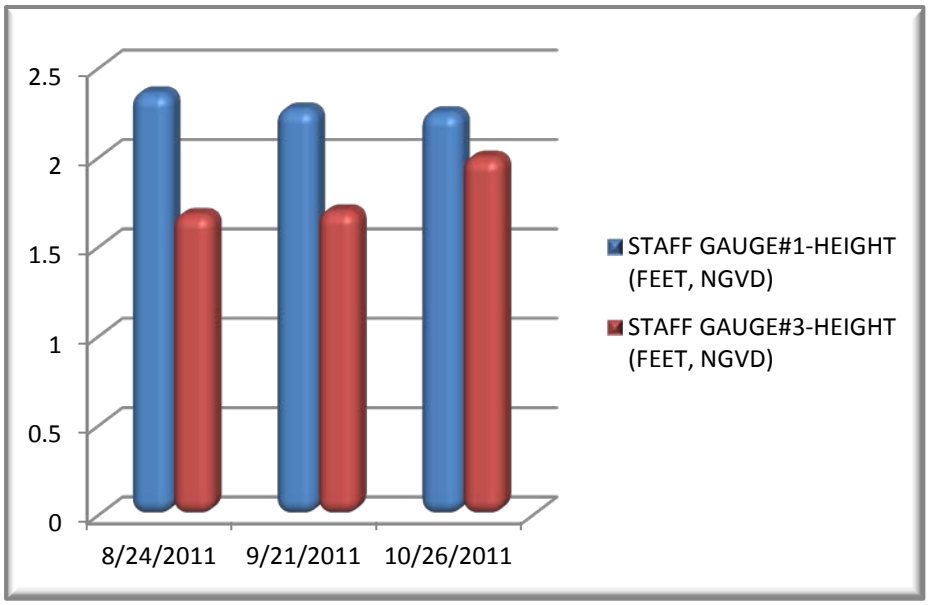


Figure 8- Comparison of Wetland Stage for Stations 1 and 3.

Table 15- Summary of Statistical Analysis for Wetland Stage at Stations 1 and 3

Station	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Station 1	3	2.293	0.034	0.06	2.25	2.25	2.27	2.15 to 2.44	2.34	2.36
Station 3	3	1.793	0.104	0.18	1.68	1.68	1.70	1.35 to 2. 24	1.95	2.00

4.3-Water quality and physiochemical data (specific conductance, temperature, and salinity), and groundwater levels recorded *in situ* at two (2) existing groundwater monitoring stations, Station 2 and Station 5. All data met QA/QC requirements (**Figures 9-10 and Tables 16-17**).

Table 16- Summary of Statistical Analysis of Various Parameters for Existing Ground Water Station 5 (Instrument deployed at depth of 8.53 Feet)

Parameter	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Temp (°C)	98	23.435	0.0248	0.2453	23.09	23.210	23.411	23.28 to 23.54	23.641	23.86
SpCond (uS/cm)	98	11083.29	439.42	4349.99	6306.93	7173.92	10957.03	7499 to 11149	13709.8	22543.25
Salinity (PSU)	98	6.344	0.2721	2.6936	3.44	3.949	6.219	4.140 to 6.34	7.921	13.60
Depth (feet)	98	5.625	0.0118	0.1170	5.32	5.567	5.611	5.602 to 5.694	5.694	5.96

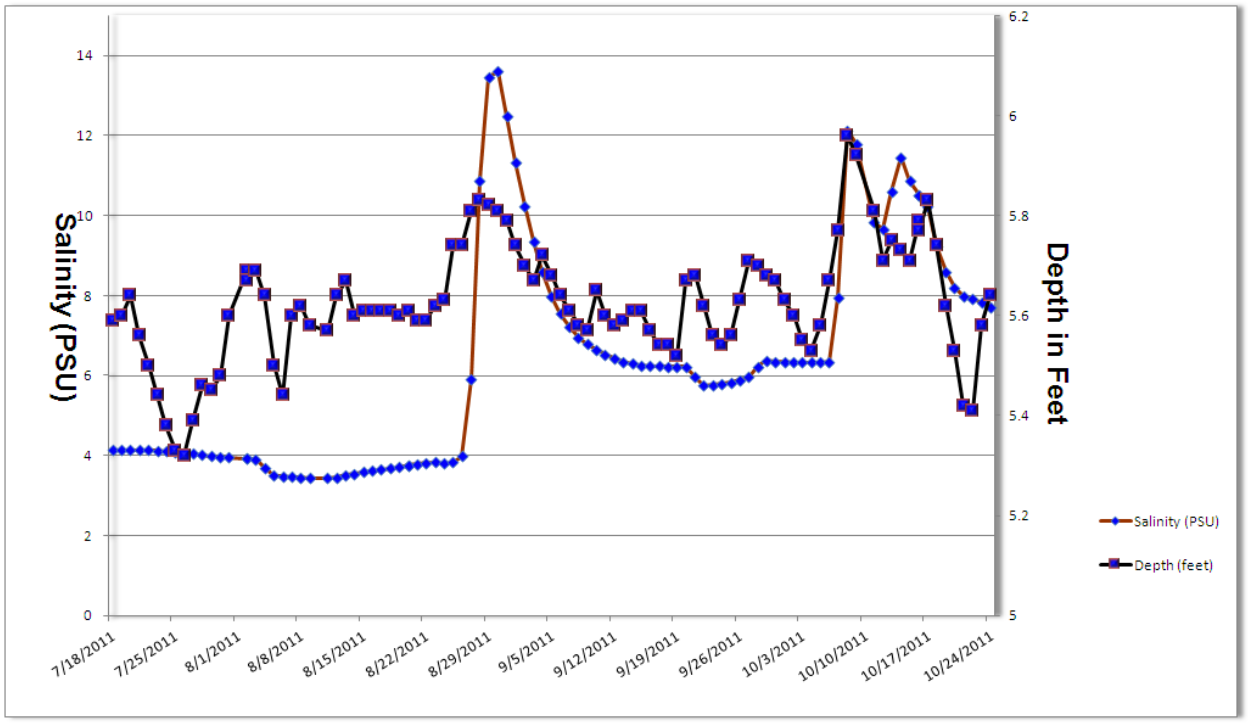


Figure 9- Comparison of Daily Average Ground Water Salinity Concentration (PSU) versus Daily Average Depth (Feet) at Station 5

Table 17- Summary of Statistical Analysis of Various Parameters for Existing Ground Water at Station 2(Instrument deployed at depth of 10.3 Feet)

Parameter	n	Mean	SE	SD	Min	1st Quartile	Median	95% CI	3rd Quartile	Max
Temp (°C)	71	27.228	0.0606	0.5110	26.38	26.850	27.164	27.05 to 27.33	27.545	28.65
SpCond (uS/cm)	71	815.995	5.1938	43.7635	696.61	789.856	827.696	814.20 to 832.60	842.449	888.87
Salinity (PSU)	71	0.397	0.0026	0.0218	0.34	0.384	0.400	0.396 to 0.410	0.410	0.43
Depth (feet)	71	9.114	0.0299	0.2522	8.50	9.010	9.162	9.11 to 9.32	9.309	9.57

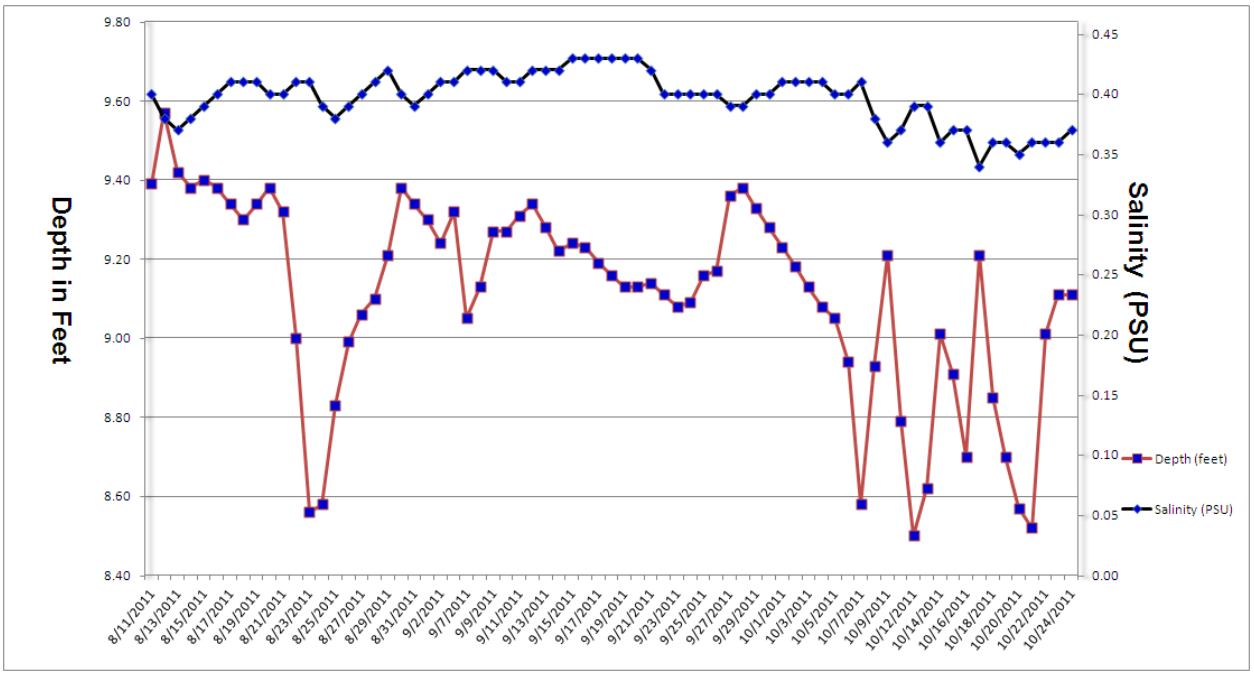


Figure 10- Comparison of Daily Average Ground water Salinity Concentration (PSU) versus Daily Average Depth (Feet) at Station 2

Attachment A –Groundwater data

Water quality samples including physiochemical data (specific conductance, temperature, and salinity) and ground water level recorded *in situ* at two (2) existing groundwater monitoring wells, Station 2 and Station 5.

Table 18 - Ground water data for Station 2 (Daily Averages)

Date	Temp (˚C)	SpCond (uS/cm)	Salinity (PSU)	Depth (feet)
8/11/2011	28.63	820.08	0.40	9.39
8/12/2011	28.65	781.62	0.38	9.57
8/13/2011	28.33	761.94	0.37	9.42
8/14/2011	27.96	789.69	0.38	9.38
8/15/2011	27.95	809.35	0.39	9.40
8/16/2011	27.87	821.17	0.40	9.38
8/17/2011	27.80	835.46	0.41	9.34
8/18/2011	27.73	843.51	0.41	9.30
8/19/2011	27.72	837.12	0.41	9.34
8/20/2011	27.70	814.20	0.40	9.38
8/21/2011	27.56	828.95	0.40	9.32
8/22/2011	27.52	836.40	0.41	9.00
8/23/2011	27.25	829.74	0.41	8.56
8/24/2011	27.13	802.38	0.39	8.58
8/25/2011	26.98	787.39	0.38	8.83
8/26/2011	26.99	798.73	0.39	8.99
8/27/2011	27.10	828.93	0.40	9.06
8/28/2011	27.17	849.65	0.41	9.10
8/29/2011	27.51	858.71	0.42	9.21
8/30/2011	27.94	819.08	0.40	9.38
8/31/2011	27.91	804.24	0.39	9.34
9/1/2011	27.84	814.56	0.40	9.30
9/2/2011	27.64	832.93	0.41	9.24
9/6/2011	27.46	846.31	0.41	9.32
9/7/2011	27.55	860.39	0.42	9.05
9/8/2011	27.34	870.21	0.42	9.13
9/9/2011	27.49	872.18	0.42	9.27
9/10/2011	27.71	834.05	0.41	9.27
9/11/2011	27.57	849.40	0.41	9.31
9/12/2011	27.55	863.12	0.42	9.34
9/13/2011	27.49	868.38	0.42	9.28
9/14/2011	27.44	863.38	0.42	9.22
9/15/2011	27.31	872.00	0.43	9.24
9/16/2011	27.26	878.05	0.43	9.23
9/17/2011	27.21	882.13	0.43	9.19

Table 18 (Cont.) - Ground water data for Station 2 (Daily Averages)

Date	Temp (˚C)	SpCond (uS/cm)	Salinity (PSU)	Depth (feet)
9/18/2011	27.16	883.76	0.43	9.16
9/19/2011	27.11	885.59	0.43	9.13
9/20/2011	27.06	888.87	0.43	9.13
9/21/2011	27.04	846.77	0.42	9.14
9/22/2011	27.05	825.02	0.40	9.11
9/23/2011	27.04	823.79	0.40	9.08
9/24/2011	27.09	826.06	0.40	9.09
9/25/2011	27.16	827.70	0.40	9.16
9/26/2011	27.15	830.24	0.40	9.17
9/27/2011	27.33	805.62	0.39	9.36
9/28/2011	27.33	802.90	0.39	9.38
9/29/2011	27.29	825.44	0.40	9.33
9/20/2011	27.20	830.75	0.40	9.28
10/1/2011	27.11	832.88	0.41	9.23
10/2/2011	27.05	833.30	0.41	9.18
10/3/2011	26.98	832.59	0.41	9.13
10/4/2011	26.92	832.00	0.41	9.08
10/5/2011	26.86	830.09	0.40	9.05
10/6/2011	26.81	829.65	0.40	8.94
10/7/2011	26.70	837.13	0.41	8.58
10/8/2011	26.78	779.07	0.38	8.93
10/9/2011	26.85	737.95	0.36	9.21
10/10/2011	26.75	764.47	0.37	8.79
10/12/2011	26.55	790.70	0.39	8.50
10/13/2011	26.51	800.67	0.39	8.62
10/14/2011	26.60	750.99	0.36	9.01
10/15/2011	26.81	760.65	0.37	8.91
10/16/2011	26.69	767.92	0.37	8.70
10/17/2011	26.38	696.61	0.34	9.21
10/18/2011	26.45	733.62	0.36	8.85
10/19/2011	26.44	737.90	0.36	8.70
10/20/2011	26.42	730.29	0.35	8.57
10/21/2011	26.41	748.19	0.36	8.52
10/22/2011	26.49	737.81	0.36	9.01
10/23/2011	26.63	744.95	0.36	9.11
10/24/2011	26.76	758.31	0.37	9.11

Table 19 - Ground water data for Station 5 (Daily Averages)

Project	Temp (°C)	SpCond (uS/cm)	Salinity (PSU)	Depth (feet)
7/18/2011	23.14	7486.79	4.13	5.59
7/19/2011	23.09	7497.86	4.14	5.60
7/20/2011	23.09	7498.66	4.14	5.64
7/21/2011	23.09	7495.60	4.14	5.56
7/22/2011	23.10	7483.52	4.13	5.50
7/23/2011	23.10	7461.68	4.12	5.44
7/24/2011	23.11	7433.79	4.10	5.38
7/25/2011	23.11	7403.60	4.08	5.33
7/26/2011	23.12	7369.70	4.06	5.32
7/27/2011	23.12	7330.58	4.04	5.39
7/28/2011	23.13	7289.09	4.02	5.46
7/29/2011	23.13	7248.19	3.99	5.45
7/30/2011	23.14	7211.02	3.97	5.48
7/31/2011	23.14	7176.48	3.95	5.60
8/2/2011	23.15	7145.85	3.93	5.69
8/2/2011	23.16	7126.93	3.92	5.67
8/3/2011	23.16	7107.83	3.91	5.69
8/4/2011	23.18	6749.63	3.70	5.64
8/5/2011	23.18	6410.51	3.50	5.50
8/6/2011	23.19	6378.49	3.48	5.44
8/7/2011	23.19	6349.93	3.47	5.60
8/8/2011	23.19	6327.30	3.45	5.62
8/9/2011	23.20	6306.93	3.44	5.58
8/11/2011	23.21	6309.68	3.44	5.57
8/12/2011	23.21	6343.39	3.46	5.64
8/13/2011	23.22	6433.03	3.51	5.67
8/14/2011	23.22	6497.54	3.55	5.60
8/15/2011	23.22	6554.37	3.59	5.61
8/16/2011	23.23	6614.73	3.62	5.61
8/17/2011	23.23	6670.07	3.65	5.61
8/18/2011	23.24	6722.12	3.68	5.61
8/19/2011	23.24	6772.84	3.71	5.60
8/20/2011	23.25	6841.08	3.75	5.61

Table 19 (Cont.) - Ground water data for Station 5 (Daily Averages)

Project	Temp °C	SpCond (uS/cm)	Salinity (PSU)	Depth (feet)
8/20/2011	23.25	6841.08	3.75	5.61
8/21/2011	23.25	6901.88	3.79	5.59
8/22/2011	23.26	6954.27	3.82	5.59
8/23/2011	23.26	6991.32	3.84	5.62
8/24/2011	23.28	6929.28	3.80	5.63
8/25/2011	23.28	6995.60	3.84	5.74
8/26/2011	23.28	7242.78	3.99	5.74
8/27/2011	23.33	10431.09	5.92	5.81
8/28/2011	23.35	18350.80	10.88	5.83
8/29/2011	23.36	22337.90	13.47	5.82
8/30/2011	23.32	22543.25	13.60	5.81
8/31/2011	23.34	20838.43	12.48	5.79
9/1/2011	23.35	19064.18	11.33	5.74
9/2/2011	23.37	17372.00	10.24	5.70
9/3/2011	23.38	15976.13	9.35	5.67
9/4/2011	23.39	14779.60	8.59	5.72
9/5/2011	23.41	13780.87	7.97	5.68
9/6/2011	23.42	13090.55	7.54	5.64
9/7/2011	23.43	12565.05	7.21	5.61
9/8/2011	23.45	12164.95	6.96	5.58
9/9/2011	23.46	11864.36	6.78	5.57
9/10/2011	23.47	11659.17	6.65	5.65
9/11/2011	23.48	11459.38	6.53	5.60
9/12/2011	23.49	11297.23	6.43	5.58
9/13/2011	23.50	11173.71	6.35	5.59
9/14/2011	23.51	11090.72	6.30	5.61
9/15/2011	23.52	11029.72	6.26	5.61
9/16/2011	23.53	10992.37	6.24	5.57
9/17/2011	23.54	10970.08	6.23	5.54
9/18/2011	23.55	10958.58	6.22	5.54
9/19/2011	23.56	10955.48	6.22	5.52
9/20/2011	23.57	10961.97	6.22	5.67
9/21/2011	23.58	10544.96	5.97	5.68
9/22/2011	23.59	10184.80	5.75	5.62

Table 19 (Cont.) - Ground water data for Station 5 (Daily Averages)

Project	Temp °C	SpCond (uS/cm)	Salinity (PSU)	Depth (feet)
9/23/2011	23.59	10221.63	5.77	5.56
9/24/2011	23.60	10263.50	5.80	5.54
9/25/2011	23.61	10322.18	5.83	5.56
9/26/2011	23.61	10394.69	5.88	5.63
9/27/2011	23.62	10541.10	5.97	5.71
9/28/2011	23.63	10951.91	6.22	5.70
9/29/2011	23.63	11199.30	6.37	5.68
9/30/2011	23.64	11168.93	6.35	5.67
10/1/2011	23.65	11152.58	6.34	5.63
10/2/2011	23.66	11143.57	6.33	5.60
10/3/2011	23.66	11144.34	6.33	5.55
10/4/2011	23.67	11145.12	6.33	5.53
10/5/2011	23.68	11145.88	6.33	5.58
10/6/2011	23.69	11148.72	6.34	5.67
10/7/2011	23.75	13735.79	7.95	5.77
10/8/2011	23.75	20278.54	12.12	5.96
10/9/2011	23.72	19785.38	11.79	5.92
10/16/2011	23.73	17810.97	10.52	5.79
10/11/2011	23.75	16742.33	9.83	5.81
10/12/2011	23.76	16474.24	9.66	5.71
10/13/2011	23.80	17944.28	10.61	5.75
10/14/2011	23.79	19257.16	11.45	5.73
10/15/2011	23.80	18355.29	10.87	5.71
10/16/2011	23.81	17791.75	10.50	5.77
10/17/2011	23.81	17345.52	10.22	5.83
10/18/2011	23.82	15790.87	9.23	5.74
10/19/2011	23.83	14788.09	8.60	5.62
10/20/2011	23.83	14161.39	8.20	5.53
10/21/2011	23.84	13822.48	7.99	5.42
10/22/2011	23.85	13707.40	7.92	5.41
10/23/2011	23.86	13554.92	7.82	5.58
10/24/2011	23.86	13371.77	7.71	5.64

Attachment B – Photographs

Figure 11- Photo of Existing Monitoring Well Station 5 within the Rehydration Area

Figure 12- Photo of Existing Wetland Stage (Staff Gauge) Station 3 Monitoring Station within Cutler Creek downstream of the weir

Figure 13- Close up of the upstream Side of the Weir in Cutler Creek.

Figure 14- Photo of Existing Wetland Stage (Staff Gauge) Station1 Monitoring Station within Cutler Creek upstream of the weir

Figure 15- Photo of Existing Monitoring Well Station 5 within the Rehydration Area

Figure 16- Biscayne Bay Coastal Wetlands, Deering Estate Flow-Way Pump Station (S-700)

Attachment G: As-Built Certification for BBCW L-31E Culverts Maintenance Work (Inlet and Outlet Improvements)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
4400 PGA BOULEVARD, SUITE 500
PALM BEACH GARDENS, FLORIDA 33410

May 10, 2012

REPLY TO
ATTENTION OF

Regulatory Division
Palm Beach Gardens Section
SAJ-1994-01327(NW-AAZ)

South Florida Water Management District
Attn: Temperince Morgan
3301 Gun Club Road
West Palm Beach, FL 33406

Dear Ms. Morgan:

Your application for a Department of the Army permit received on May 2, 2012, has been assigned number SAJ-1994-01327(NW-AAZ). A review of the information and drawings provided shows the proposed work will install floating vegetation barriers within tidal waters of the L-31E Canal at the upstream end of Culvert 1 (S-23B), Culvert 2 (S-23A), Culvert 3 (S-23D), and Culvert 5 (S-23C). This project is located within navigable waters of the United States in the L-31E Canal east of the L-31E levee in Sections 28 and 33, Township 56 south, Range 40 east and in Sections 4, 9 and 16, Township 57 south, Range 40 east, Miami-Dade County, Florida. The locations of the culverts are as follows:

Culvert 1 (S-23B)	Latitude 25° 30' 40"	Longitude 80° 20' 50"
Culvert 2 (S-23A)	Latitude 25° 30' 59"	Longitude 80° 20' 49"
Culvert 3 (S-23D)	Latitude 25° 28' 37"	Longitude 80° 20' 48"
Culvert 5 (S-23C)	Latitude 25° 28' 51"	Longitude 80° 20' 49"

Your project, as depicted on the received drawings, is authorized by Nationwide Permit (NWP) Number 31. In addition, project specific conditions have been enclosed. This verification is valid until **May 9, 2014**. Please access the U.S. Army Corps of Engineers' (Corps) Jacksonville District's Regulatory webpage to access web links to view the Final Nationwide Permits, Federal Register Vol. 77, dated February 21, 2012, specifically pages 10270 – 10290, the Corrections to the Final Nationwide Permits, Federal Register 77, March 19, 2012, and the List of Regional Conditions. The website address is as follows:

http://www.saj.usace.army.mil/Divisions/Regulatory/sourcebook.htm.

Please be aware this web address is case sensitive and should be entered as it appears above. Once there you will need to click on "Nationwide Permits." These files contain the description of the Nationwide Permit authorization, the Nationwide Permit general conditions, and the regional conditions, which apply specifically to this verification for NWP 31. Enclosed is a list

of the six General Conditions, which apply to all Department of the Army authorizations. You must comply with all of the special and general conditions and any project specific condition of this authorization or you may be subject to enforcement action. In the event you have not completed construction of your project within the specified time limit, a separate application or re-verification may be required.

The following special conditions are included with this verification:

1. As-Builts: Within 60 days of completion of the authorized work or at the expiration of the construction window of this permit, whichever occurs first, the Permittee shall submit as-built drawings of the authorized work and a completed As-Built Certification Form (Attachment 1) to the Corps. The drawings shall be signed and sealed by a registered professional engineer and include the following:

a. A plan view drawing of the location of the authorized work footprint with an overlay of the work as constructed in the same scale as the attached permit drawings (8½-inch by 11-inch). The drawing should show all "earth disturbance," the aerial extent of disturbances, GPS coordinates on the start and termination of disturbances, including wetland impacts, water management structures, and any on-site mitigation areas.

b. List any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the As-Built Certification Form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or As-Built Certification Form does not constitute approval of any deviations by the U.S. Army Corps of Engineers.

c. The Department of the Army Permit number.

d. Include pre- and post-construction aerial photographs of the project site, if available.

Mail the As-Builts drawings to the Regulatory Division, Attn: Jose Rivera, Special Projects and Enforcement Branch, 4400 PGA Boulevard, Suite 500, Palm Beach Gardens, Florida 33410.

2. Navigation: The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the U.S. Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby,

without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

3. Cultural Resources/Historic Properties:

a. No structure or work shall adversely affect impact or disturb properties listed in the National Register of Historic Places (NRHP) or those eligible for inclusion in the NRHP.

b. If during the ground disturbing activities and construction work within the permit area, there are archaeological/cultural materials encountered which were not the subject of a previous cultural resources assessment survey (and which shall include, but not be limited to: pottery, modified shell, flora, fauna, human remains, ceramics, stone tools or metal implements, dugout canoes, evidence of structures or any other physical remains that could be associated with Native American cultures or early colonial or American settlement), the Permittee shall immediately stop all work in the vicinity and notify the Corps. The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions.

c. A cultural resources assessment may be required of the permit area, if deemed necessary by the SHPO, THPO(s), or Corps, in accordance with 36 CFR 800 or 33 CFR 325, Appendix C (5). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume on non-federal lands without written authorization from the SHPO and the Corps.

d. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work in the vicinity shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist. The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist, SHPO and the Corps.

e. In the unlikely event that human remains are encountered on federal or tribal lands, or in situations where Archaeological Resources Protection Act of 1979, or Native American Graves Protection Repatriation Act of 1990 applies, all work in the vicinity shall immediately cease and the Permittee immediately notify the Corps. The Corps shall then notify the appropriate THPO(s) and SHPO. Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. After such notification, project activities on federal lands shall not resume

without written authorization from the Corps, and/or appropriate THPO(s), SHPO, and federal manager. After such notification, project activities on tribal lands shall not resume without written authorization from the appropriate THPO(s) and the Corps.

4. **Erosion Control:** Prior to the initiation of any work authorized by this permit, the Permittee shall install erosion control measures along the perimeter of all work areas to prevent the displacement of fill material. Immediately after completion of the final grading of the land surface, all slopes, land surfaces, and filled areas adjacent to wetlands shall be stabilized using sod, degradable mats, or a combination of similar stabilizing materials to prevent erosion. The erosion control measures shall remain in place and be maintained until all authorized work has been completed and the site has been stabilized.

5. **Endangered Species:**

a. The permittee shall adhere to the attached Standard Protection Measures for the Eastern Indigo Snake dated 2004.

b. All gopher tortoise burrows, active or inactive, will be evacuated prior to site manipulation in the vicinity of the burrow. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. All holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of proposed work.

c. The Permittee shall adhere to the attached "Standard Manatee Conditions for In-Water Work" dated 2011, during any in-water activities.

d. The Permittee shall adhere to the attached "Sea Turtle and Smalltooth Sawfish Construction Conditions" dated February 21, 2006 during any in-water activities.

e. If an American crocodile is seen within 100 yards of the active daily construction or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of an American crocodile. Operation of any mechanical construction equipment shall cease immediately if an American crocodile is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

6. **Commencement of Work:** The Permittee shall provide to the Corps a written notification within 10 days from the date of commencement of the work authorized by this permit.

7. Completion Notification: Within 30 days from the date of completion of the authorized work, the Permittee shall provide to the Corps, Engineering Division documentation of work authorized by this permit. Documentation shall include a certification that the work was completed in accordance with the specifications, as-built drawings, supporting field reports, GPS readings for the limits of the work performed and the date the work was completed.

This letter of authorization does not give absolute Federal authority to perform the work as specified on your application. The proposed work may be subject to local building restrictions mandated by the National Flood Insurance Program. You should contact your local office that issues building permits to determine if your site is located in a flood-prone area, and if you must comply with the local building requirements mandated by the National Flood Insurance Program.

If you are unable to access the internet or require a hardcopy of any of the conditions, limitations, or expiration date for the above referenced NWP, please contact Alisa Zarbo by telephone at 561-472-3516.

This letter contains an approved jurisdictional determination. Enclosed you will find the approved jurisdictional determination form and a Notification of Appeal Process fact sheet and Request for Appeal (RFA) form. If you object to this determination, you may request an administrative appeal under Corps' regulations at 33 CFR Part 331. If you request to appeal this determination, you must submit a completed RFA form to the South Atlantic Division Office at the following address:

Mr. Jason Steele
South Atlantic Division
U.S. Army Corps of Engineers
CESAD-CM-CO-R, Room 9M15
60 Forsyth St., SW.
Atlanta, Georgia 30303-8801.

Mr. Steele can be reached by telephone number at 404-562-5137, or by facsimile at 404-562-5138.

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division office within 60 days of the date of the RFA. Should you decide to submit an RFA form, it must be received at the above address by 60 calendar days from the date of this letter.

Thank you for your cooperation with our permit program. The Corps Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite

you to take a few minutes to visit http://per2.nwp.usace.army.mil/survey.html and complete our automated Customer Service Survey. Your input is appreciated – favorable or otherwise. Again, please be aware this web address is case sensitive and should be entered as it appears above.

Sincerely,

Alisa Zarbo

Alisa Zarbo
Project Manager

Enclosures

bcc:
CESAJ-RD-PE

GENERAL CONDITIONS
33 CFR PART 320-330
PUBLISHED FEDERAL REGISTER DATED 13 NOVEMBER 1986

1. The time limit for completing the work authorized ends on **date identified in the letter**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort of if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow a representative from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

DEPARTMENT OF THE ARMY PERMIT TRANSFER REQUEST

PERMIT NUMBER: SAJ- - (NW-)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. Although the construction period for works authorized by Department of the Army permits is finite, the permit itself, with its limitations, does not expire.

To validate the transfer of this permit and the associated responsibilities associated with compliance with its terms and conditions, have the transferee sign and date below and mail to the U.S. Army Corps of Engineers, Enforcement Section, Post Office Box 4970, Jacksonville, FL 32232-0019.

_____
(TRANSFEREE-SIGNATURE)

_____
(DATE)

_____
(NAME-PRINTED)

_____

_____
(MAILING ADDRESS)

_____
(CITY, STATE, ZIP CODE)

_____
(SUBDIVISION)

_____ _____
(LOT) (BLOCK)

_____
(STREET ADDRESS)

Attachment H: Excursion Analysis for Class III Constituents (BBCW L-31 East Culverts)

In accordance with specific condition 27b of the BBCW permit, this section presents an evaluation of water quality compliance with Florida Class III standards for constituent concentrations observed during WY2012. For standards with numeric criteria, the data were assessed for compliance with those standards using the procedures in Rule 62-4.246, F.A.C.

Analysis of excursions from Class III criteria was accomplished by summarizing the data, discussing the parameters, and noting the excursions. The excursion analysis is based on the water quality parameters, shown in **Table H-1**, that were collected for the BBCW monitoring program for the L-31 East Culvert structures, which were compared with applicable Class III (Marine/Brackish) water quality criteria listed in Rule 62-302.530, F.A.C.

Of the eleven water quality parameters collected, two of these (dissolved oxygen, pH, and turbidity) have Class III numeric criteria for Marine/Brackish waters. During WY2012, excursions were observed for dissolved oxygen and pH, and no excursions were observed for turbidity. Due to pre-restoration conditions and the early stage of this component of the BBCW project, it was expected that there might be some excursions from the Class III criteria.

The District has begun releasing fresh water from the main canals to the downstream receiving area. As this and related restoration efforts continue, it is expected that water quality will improve, and compliance with water quality standards will be achieved. Further discussion on the excursions observed during WY2012 is presented below.

Dissolved Oxygen

The criterion for Class III marine waters requires that the dissolved oxygen level be 4.0 mg/L or greater. During WY2012, dissolved oxygen was measured in 136 samples collected from four water quality monitoring sites (BB53, MI01, MW01, and PR01). Of these samples, 24 exhibited an excursion from the marine/brackish class III criteria for dissolved oxygen (**Table H-1**).

pH

For marine/brackish systems, the Class III criterion for pH ranges from 6.5 to 8.5 units. For WY2012, field pH was measured in 140 samples collected from the four monitoring sites (BB53, MI01, MW01, and PR01). Seven of the samples exhibited an excursion from the criteria for pH (**Table H-1**).

Table H-1. Excursion analysis for marine/brackish Class III constituents for the BBCW L-31 East Culverts (excursions in yellow).

Station	Parameter	Units	Lab Method	Marine / Brackish Class III Standard	Period of Record	N	Mean	STD	Min	Q25	Median	Q75	Max	# Below Detection Limit	Excursions	% of Excursions
BB53	Ammonia-N	mg/L	EPA 350.1	NONE	04MAY2011 to 04APRIL2012	54	0.06	0.05	0.005	0.005	0.07	0.09	0.19	22	0	0.0%
BB53	Color	PCU	EPA 110.2	NONE	04MAY2011 to 04APRIL2012	31	12	8	2.5	2.5	12	18	25	11	0	0.0%
BB53	Dissolved Oxygen	mg/L	SM18 4500-O G	>=4.0 mg/L	04MAY2011 to 04APRIL2012	30	7.1	1.4	4.15	5.95	7.455	8.17	9.14	0	3	10.0%
BB53	Nitrate+Nitrite-N	mg/L	EPA 353.2 (NOX(N)) / SM4500-NO3F (NOX(N))	NONE	04MAY2011 to 04APRIL2012	31	0.227	0.318	0.005	0.005	0.03	0.4375	1	15	0	0.0%
BB53	pH, Field	units	SM18 4500-H+ B	6.5<=ph<=8.5	04MAY2011 to 04APRIL2012	33	8.07	0.25	7.68	7.895	8.11	8.2425	8.55	0	1	3.0%
BB53	Phosphate, Total As P	mg/L	EPA 365.1 (TP)	NONE	04MAY2011 to 04APRIL2012	31	0.004	0.003	0.001	0.001	0.004	0.00575	0.012	11	0	0.0%
BB53	Salinity	PSU	SM18 2520 B	NONE	04MAY2011 to 04APRIL2012	33	23.7	8.5	13.18	17.24	20.42	30.42	40.46	0	0	0.0%
BB53	Sp Conductivity, Field	µS/cm	SM 2510A / SM18 2510 A	NONE	04MAY2011 to 04APRIL2012	33	37177	12028	21976	28017.25	32632	47107.25	60428	0	0	0.0%
BB53	Temp	°C	SM18 2550 B	NONE	04MAY2011 to 04APRIL2012	33	26.8	3.6	21.65	24.14	26.73	28.19	33.22	0	0	0.0%
BB53	Total Suspended Solids	mg/L	EPA 160.2	NONE	08JUNE2011 to 04APRIL2012	27	37.8	30.1	3	3	41	58.75	92	9	0	0.0%
BB53	Turbidity	NTU	EPA 180.1	<=29 NTU	04MAY2011 to 04APRIL2012	31	0.6	0.5	0.05	0.05	0.6	1.1	1.5	11	0	0.0%
MI01	Ammonia-N	mg/L	EPA 350.1	NONE	04MAY2011 to 04APRIL2012	12	0.10	0.04	0.05	0.055	0.11	0.13	0.16	0	0	0.0%
MI01	Color	PCU	EPA 110.2	NONE	04MAY2011 to 04APRIL2012	11	25	5	20	20	25	30	30	0	0	0.0%
MI01	Dissolved Oxygen	mg/L	SM18 4500-O G	>=4.0 mg/L	04MAY2011 to 04APRIL2012	35	5.5	1.7	0.45	4.245	5.94	6.515	7.87	0	7	20.0%
MI01	Nitrate+Nitrite-N	mg/L	EPA 353.2 (NOX(N)) / SM4500-NO3F (NOX(N))	NONE	04MAY2011 to 04APRIL2012	12	0.313	0.261	0.005	0.06	0.29	0.44	0.75	2	0	0.0%
MI01	pH, Field	units	SM18 4500-H+ B	6.5<=ph<=8.5	04MAY2011 to 04APRIL2012	35	7.93	0.32	7.16	7.6375	7.99	8.195	8.53	0	2	5.7%
MI01	Phosphate, Total As P	mg/L	EPA 365.1 (TP)	NONE	04MAY2011 to 04APRIL2012	12	0.007	0.001	0.006	0.007	0.007	0.0085	0.009	0	0	0.0%
MI01	Salinity	PSU	SM18 2520 B	NONE	04MAY2011 to 04APRIL2012	34	20.1	10.5	2.78	12.11	19.28	28.94	41.62	0	0	0.0%
MI01	Sp Conductivity, Field	µS/cm		NONE	04MAY2011 to 04APRIL2012	34	31805	15269	5191	20245	31114	45133	61980	0	0	0.0%
MI01	Temp	°C	SM18 2550 B	NONE	04MAY2011 to 04APRIL2012	34	26.8	3.6	21.31	23.58	27.495	29.3	33.69	0	0	0.0%
MI01	Total Suspended Solids	mg/L	EPA 160.2	NONE	08JUNE2011 to 04APRIL2012	9	33.6	15.2	11	21.5	34	45.5	59	0	0	0.0%
MI01	Turbidity	NTU	EPA 180.1	<=29 NTU	04MAY2011 to 04APRIL2012	12	0.9	0.2	0.5	0.65	0.85	1.05	1.2	0	0	0.0%
MW01	Ammonia-N	mg/L	EPA 350.1	NONE	04MAY2011 to 04APRIL2012	12	0.09	0.04	0.04	0.055	0.08	0.12	0.14	0	0	0.0%
MW01	Color	PCU	EPA 110.2	NONE	04MAY2011 to 04APRIL2012	11	24	7	15	17.75	25	25.75	40	0	0	0.0%
MW01	Dissolved Oxygen	mg/L	SM18 4500-O G	>=4.0 mg/L	04MAY2011 to 04APRIL2012	35	5.3	2.0	0.71	4.64	5.46	6.625	8.58	0	9	25.7%
MW01	Nitrate+Nitrite-N	mg/L	EPA 353.2 (NOX(N)) / SM4500-NO3F (NOX(N))	NONE	04MAY2011 to 04APRIL2012	12	0.307	0.310	0.005	0.035	0.175	0.635	0.76	2	0	0.0%
MW01	pH, Field	units	SM18 4500-H+ B	6.5<=ph<=8.5	04MAY2011 to 04APRIL2012	36	8.04	0.33	7.29	7.83	8.07	8.27	8.58	0	3	8.3%
MW01	Phosphate, Total As P	mg/L	EPA 365.1 (TP)	NONE	04MAY2011 to 04APRIL2012	10	0.007	0.002	0.005	0.005	0.0065	0.007	0.01	0	0	0.0%
MW01	Salinity	PSU	SM18 2520 B	NONE	04MAY2011 to 04APRIL2012	36	24.5	11.0	5.44	18.575	23.025	34.025	41.9	0	0	0.0%
MW01	Sp Conductivity, Field	µS/cm		NONE	04MAY2011 to 04APRIL2012	36	38105	15852	9675	30020	36398.5	51957	62309	0	0	0.0%
MW01	Temp	°C	SM18 2550 B	NONE	04MAY2011 to 04APRIL2012	36	26.9	3.8	20.64	24.09	26.345	28.87	33.61	0	0	0.0%
MW01	Total Suspended Solids	mg/L	EPA 160.2	NONE	08JUNE2011 to 04APRIL2012	10	48.0	19.6	20	30	52.5	68	72	0	0	0.0%
MW01	Turbidity	NTU	EPA 180.1	<=29 NTU	04MAY2011 to 04APRIL2012	12	0.7	0.2	0.4	0.5	0.6	0.75	1	0	0	0.0%
PR01	Ammonia-N	mg/L	EPA 350.1	NONE	04MAY2011 to 04APRIL2012	12	0.13	0.08	0.04	0.06	0.12	0.17	0.29	0	0	0.0%
PR01	Color	PCU	EPA 110.2	NONE	04MAY2011 to 04APRIL2012	11	16	4	10	11.25	18	20	20	0	0	0.0%
PR01	Dissolved Oxygen	mg/L	SM18 4500-O G	>=4.0 mg/L	04MAY2011 to 04APRIL2012	34	5.3	1.3	1.28	4.65	5.235	6.04	7.85	0	5	14.7%
PR01	Nitrate+Nitrite-N	mg/L	EPA 353.2 (NOX(N)) / SM4500-NO3F (NOX(N))	NONE	04MAY2011 to 04APRIL2012	12	1.638	1.613	0.005	0.085	1.435	3.215	3.57	1	0	0.0%
PR01	pH, Field	units	SM18 4500-H+ B	6.5<=ph<=8.5	04MAY2011 to 04APRIL2012	36	7.84	0.31	7	7.655	7.91	8.06	8.53	0	1	2.8%
PR01	Phosphate, Total As P	mg/L	EPA 365.1 (TP)	NONE	04MAY2011 to 04APRIL2012	12	0.008	0.002	0.005	0.006	0.0075	0.0095	0.011	0	0	0.0%
PR01	Salinity	PSU	SM18 2520 B	NONE	04MAY2011 to 04APRIL2012	36	19.1	11.6	1.8	6.85	20.055	25.955	40.39	0	0	0.0%
PR01	Sp Conductivity, Field	µS/cm		NONE	04MAY2011 to 04APRIL2012	36	30186	17150	3441	11984.5	32225.5	40803.5	60374	0	0	0.0%
PR01	Temp	°C	SM18 2550 B	NONE	04MAY2011 to 04APRIL2012	36	27.0	3.4	20.38	24.595	26.87	28.47	32.93	0	0	0.0%
PR01	Total Suspended Solids	mg/L	EPA 160.2	NONE	08JUNE2011 to 04APRIL2012	9	30.2	22.0	3	9.25	29	50.25	62	1	0	0.0%
PR01	Turbidity	NTU	EPA 180.1	<=29 NTU	04MAY2011 to 04APRIL2012	12	0.9	0.3	0.5	0.7	0.85	1.1	1.4	0	0	0.0%