Appendix 3-2: Annual Permit Compliance Monitoring Report for Non-ECP Discharge Structures

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INTRODUCTION

The non-Everglades Construction Project (non-ECP) permit [Florida Department of Environmental Protection (FDEP) No. 06,502590709] authorizes the South Florida Water Management District (District or SFWMD) to operate and maintain structures (currently 38 structures), in compliance with the reporting requirements stated in Specific Conditions 5 and 12 of the non-ECP permit.

METHODS

WATER QUALITY AND HYDROLOGIC DATA

The water quality and hydrologic data evaluated in this appendix were retrieved from the South Florida Water Management District's DBHYDRO database. Before water quality data are entered into the database, the District follows strict quality assurance/quality control (QA/QC) procedures outlined in the South Florida Water Management District Chemistry Laboratory Manual and Field Sampling Quality Manuals (SFWMD, 2004). The Laboratory Manual was developed in accordance with the National Laboratory Accreditation Conference (NELAC) requirements and the Field Manual in accordance with Florida Department of Environmental Protection Quality Assurance Rule [Chapter 62-160, Florida Administrative Code (F.A.C.)]. The quality manuals provide assurances that the water quality monitoring program is providing accurate data and that sufficient progress is being made toward achieving water quality standards.

The standards used to evaluate ratings' accuracy are consistent with SFWMD Standard Operating Procedures (SOP) for Flow Data Management in the District Hydrologic Data base (2003) and USGS approach as outlined by Novak (1985). Four accuracy classifications are adopted to assess a rating's accuracy. The rating is classified as "excellent" when about 95 of the predicted flow rates are within +/-5 percent of the measured discharges, "good" if they are within +/-10 percent, "fair" if they are within +/-15, and "poor" when they are not within +/-15 percent.

The District has performed all sampling and analysis under the latest Laboratory Quality Assurance Manual (SFWMD, dated January 3, 2005) and a Field Quality Assurance Manual (SFWMD, dated January 3, 2005), and this report includes documentation to satisfy the

remaining monitoring requirements of the non-ECP permit. A signed copy of these statements is provided in Appendix 4-3 of this volume.

PERMIT SAMPLING SITES

In addition to authorizing the operation and maintenance of non-Everglades Construction Project (non-ECP) structures, the non-ECP permit requires a routine water quality monitoring program to characterize the quality of water discharged through District structures. Currently, the non-ECP permit requires monitoring at four additional C-111 basin structures (upstream) that are controlled by the District, two structures that are controlled by the Village of Wellington (VOW), and one structure that is controlled by the North Springs Improvement District (NSID).

The District typically collects water quality samples on the upstream side of a structure or at a nearby location representative of the quality of water flowing through a structure. Structure locations are shown in **Figure 1**. In accordance with Specific Condition 16, the District previously submitted a Monitoring Locations Report to the FDEP on July 15, 1998 that included detailed information on the specific locations for sample collection for 44 structures. On August 9, 2001, the District submitted a minor modification to the non-ECP permit to include phase I of the Western C-11 Basin Critical Restoration Project (including operation and maintenance of the S-9A pump station). The current monitoring program encompasses 38 locations that provide the representative information to characterize the quality of water discharged through the 45 structures. The structure names, representative water quality monitoring location names, and sampling frequencies of the various categories of chemical constituents and physical properties required by the monitoring schedule denoted in the permit are shown in Appendix 3-2a, Table 1.

PERMIT DATA ANALYSIS PERIODS

Specific Condition 12 requires the District to submit annual monitoring reports providing updates on water quality data and associated comparisons with state water quality standards. The water quality characterization includes an evaluation of compliance with Class III criteria for each monitoring location representative of a non-ECP structure.

Appendix 3-2 provides the annual update of the non-ECP permit monitoring program (Specific Condition 12) and a comparison of water quality data at non-ECP structures to state water quality standards from Water Year 2005 (WY2005) (May 1, 2004 to April 30, 2005), the eighth year of non-ECP data. These comparisons fulfill the non-ECP permit requirements to measure progress toward achieving and maintaining compliance with state water quality standards.

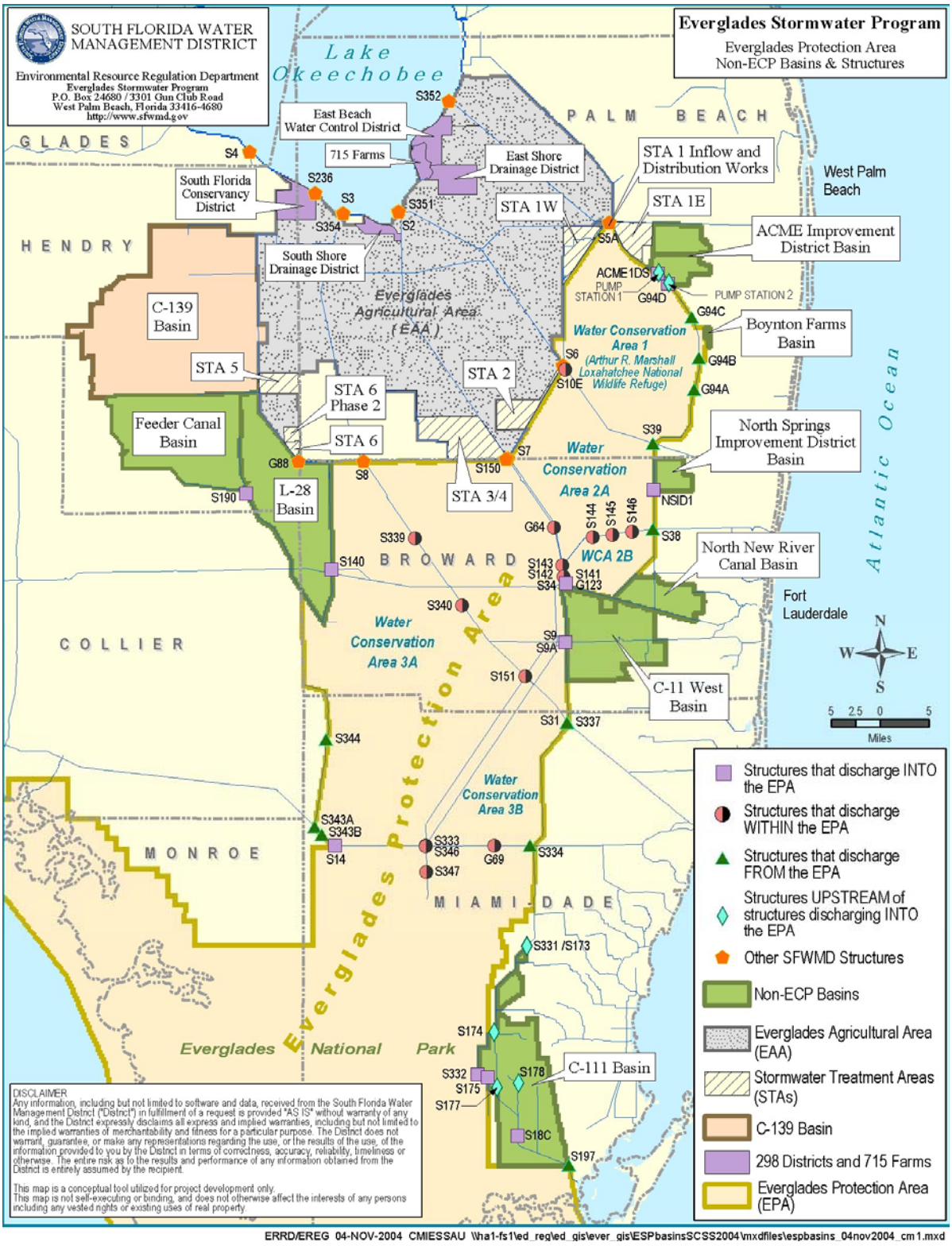


Figure 1. Non-Everglades Construction Project (non-ECP) discharge structures and additional upstream structures.

Method Detection Limits

Each water quality constituent has a method detection limit (MDL) that essentially defines the minimum concentration, or level, at which the presence of the constituent can be positively verified and is usually twice the background noise level associated with a test. The MDL does not represent a level at which an exact measurement can be determined. The practical quantitation limit (PQL) represents the lowest level at which a measurement can be considered quantifiably reliable for a constituent that is achievable among laboratories within specified limits during routine laboratory operations. Generally, the PQL is four times the MDL, although different laboratories may establish PQLs at two to five times the MDL. In this appendix, trace metal data that were reported to be less than the MDL were assigned a value equal to the MDL. Total phosphorus (TP) data that were less than the MDL of 4.0 micrograms per liter (µg/L) [or parts per billion (ppb)] were assigned a value of 4.0 ppb to provide a conservative basis for statistical analysis. For pesticide detections, concentrations greater than the PQL were considered reliable.

EXCURSION ANALYSIS FOR CLASS III CONSTITUENTS AND PESTICIDES

To evaluate compliance with water quality criteria in WY2005, constituent concentrations were compared to their respective Class III numeric criteria. If a constituent concentration exceeded its numeric criterion, then an excursion was recorded and the total number of excursions and the percent of excursions for the non-ECP structures were tabulated.

Trace Metals and Un-ionized Ammonia

The un-ionized portion of dissolved ammonia measured in a water sample was calculated and compared to the 0.02-milligram per liter (mg/L) criterion only if temperature and pH values had been recorded for that sample. For trace metals, the most recent trace metal criteria were used for evaluating the data even if the criteria had changed over time. When comparing the calculated criteria with trace metal concentrations, compliance determinations were made only for water samples where hardness values were determined from that same sample, i.e., no extrapolations were made to samples without hardness data. The equations used in this appendix for calculated criteria for trace metals and un-ionized ammonia were derived from the equations listed in Rule 62-302.503, F.A.C.

Total Phosphorus

The data for total phosphorus (TP) are presented in this appendix in time series plots and statistical box plots. For TP, any site with data > 50 ppb would be viewed as a “concern,” any site with data > 10 ppb would be viewed as a “potential concern,” and any site with data < 10 ppb would be viewed as “no concern.” This approach is consistent with the federal Settlement Agreement (i.e., Settlement Agreement dated July 26, 1991, entered in Case No. 88-1886-Civ-Hoeveler, U.S. District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001). The Settlement Agreement indicates that the District’s Stormwater Treatment Areas (STAs) are located and sized to deliver a uniform, long-term, annual flow-weighted mean TP concentration of 50 ppb or less at each inflow point to the Everglades Protection Area (EPA). Additionally, the Everglades Forever Act (EFA) mandated that the default TP criterion shall be 10 ppb in the EPA in the event that the FDEP did not adopt by rule such a criterion by December 31, 2003. Because final agency action by the FDEP did not occur prior to December 31, 2003 as a result of unresolved administrative

challenges, a default TP criterion of 10 µg/L became effective as specified by the EFA. The default criterion was superseded by the FDEP's criterion when it was filed with the Florida Secretary of State on June 25, 2004.

There are additional TP concentration compliance limits for inflows to the Everglades National Park (ENP or Park) by way of Shark River Slough (S-12S and S-333), Taylor Slough (S-332 and S-175), and the coastal basin (S-18C) outlined in Appendix A of the Settlement Agreement. However, Appendix 3-2 does not track compliance with the interim or long-term TP concentration limits set forth in the Settlement Agreement.

The District's categories of "concern," "potential concern," and "no concern" are based on a common-sense understanding of water resources protection. These terms, however, are not intended to be interpretations of state water quality standards or state water quality law. The FDEP, not the District, is responsible for interpreting whether a given constituent violates the numeric criterion, the narrative criterion, a water body's designated uses, or the anti-degradation policy.

Pesticides

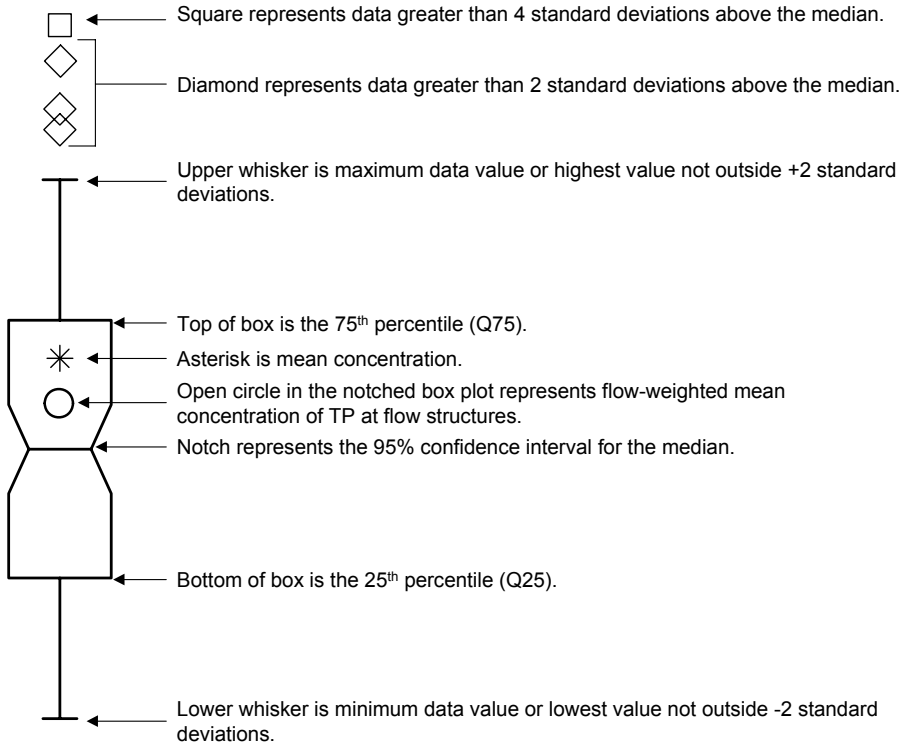
The Everglades Protection Area pesticide monitoring program includes non-ECP permitted structures. For purposes of this appendix, the WY2005 surface water pesticide analyses are presented in tables for the non-ECP structures only. The sediment pesticide analyses for WY2005 are presented in a separate table. Five upstream structures in the C-111 basin are included in the pesticide monitoring program and represent potential warning sites for pesticides that might be discharged into the Park.

DESCRIPTION OF NOTCHED BOX AND WHISKER PLOTS

Notched box and whisker plots were created to summarize data for each constituent that exceeded its numeric criteria. These plots also summarize the TP data collected at all monitoring locations. A notched box and whisker plot summarizes selected statistical properties of the data sets. Notched box and whisker plots can be used to test for statistical significance between data sets at roughly a 95-percent confidence interval (95% C.I.) to detect changes in constituent concentration variability over time and to determine if trends exist. The notched box and whisker plots used for these summaries are based on McGill et al. (1978) (**Table 1**).

It is recognized that using notched box and whisker plots to determine differences between data sets with large differences in sample size may cause apparently significant findings that are artifacts of the number of samples and the amount of variation in the data sets. The objective of providing the plots was to compare data from WY2005 to those in previous individual permit water years (WY1998–WY2004) and previously established baseline data sets for the non-ECP discharge structures.

Table 1. Description of notched box and whisker plots used in Appendix 3-2.



1. Notches surrounding the medians provide a measure of the significance of differences between notched box plots. If the notches about two medians do not overlap, then the medians are significantly different at about a 95 percent confidence level.
2. At times, the variability in a data set may be quite high. When highly variable data are presented in a notched box and whisker plot, the width of the notch may be greater than the 25th or 75th percentile. When this occurs, the box plot appears as if it is folded from the end of the notch back towards the median. This is done automatically by the statistics program to save space within the figure being presented.
3. Notches are calculated using the following equation:

$$Notch = Median \pm \frac{1.58(Q75 - Q25)}{\sqrt{n}}$$

Where n = number of data points

RESULTS: WATER QUALITY EVALUATION AND EXCURSION ANALYSIS

In accordance with Specific Conditions 5 and 12(h) of the non-ECP permit, this section presents an update of constituent concentrations and physical properties measured during WY2005 (May 1, 2004 through April 30, 2005), the eighth year of non-ECP permit monitoring. For standards with numeric criteria, the data from the structures were assessed for compliance with those standards using the procedures in Rule 62-4.246, F.A.C. For parameters that have narrative water quality criteria, the concentrations obtained at each structure were reported using plots and summary statistics.

MONITORING OF PHYSICAL PARAMETERS, NUTRIENTS, MAJOR IONS, AND TRACE METALS

Descriptive Statistics

A summary of the data begins with a presentation of descriptive statistics for all water quality constituent concentrations and physical properties (excluding pesticides and priority pollutants) measured for non-ECP monitoring locations during WY2005 (Appendix 3-2b, Table 2). The descriptive statistics (summary tables) are presented by monitoring location for each water quality parameter collected for the site. A reference is also provided in Appendix 3-2b, Table 1, reflecting current state Class III criteria.

The statistical summary tables report the range of constituent concentrations, median values, the number of sample observations, selected data percentiles (25th and 75th), and flag parameters exhibiting excursions from Class III numeric criteria. Concentrations observed to be less than the lower limit of the analytical method (MDL) were set equal to the MDL for statistical analysis.

For parameters such as nutrients that have only narrative criteria, the tables provide basic information to assist with identifying water quality constituents that might be of concern. TP is the nutrient deemed to be of particular concern for the non-ECP structures. Additional discussion on this topic is provided in this section.

Excursions from Class III Criteria (Numeric)

Further analysis of excursions from Class III criteria was accomplished by summarizing the excursions, plotting the data for parameters exhibiting the excursions, discussing the parameters, and noting which ones are a concern. The excursion analysis is based on 11 water quality parameters (with a numeric criteria), shown in **Table 2**, that were collected for the non-ECP monitoring program and can be compared with applicable Class III water quality criteria listed in Rule 62-302.530, F.A.C.

Table 2. Summary of total number of excursions from state Class III criteria for all non-ECP monitoring sites during WY2005 and previous periods.

Parameter	WY2005	WY2004	WY2003	WY2002	WY2001	WY2000	WY1999	WY1998	Non-ECP Baseline	EFA Baseline
Total Alkalinity	0 : 445	0 : 506	1:471	0:475	0:490	0:559	0:502	0:525	0:2845	1:2677
Dissolved Oxygen	582 : 882	577 : 793	436:649	456:597	455:637	558:697	485:581	459:551	2177:3018	1694:2615
Specific Conductance	0 : 858	3 : 761	1:664	0:600	2:637	5:698	0:589	3:551	12:3058	59:2615
pH	4 : 891	1 : 812	2:666	1:611	1:637	1:698	10:589	12:551	37:3008	6:2586
Turbidity	2 : 520	0 : 519	1:470	2:479	1:489	3:645	4:504	0:527	12:2842	10:2637
Un-Ionized Ammonia	1 : 512	0 : 522	0:477	0:478	3:485	1:622	20:501	7:448	10:2661	12:2548
Total Iron	0 : 89	0 : 70	0:72	0:74	1:186	0:270	1:244	0:261	5:1655	5:836
Total Cadmium	0 : 38	0 : 31	0:31	0:30	0:101	0:133	0:126	1:127	4:785	9:362
Total Lead	0 : 2	ND	ND	ND	0:77	0:119	0:112	0:120	2:785	1:364
Total Copper	0 : 39	0 : 35	0:35	0:29	0:101	0:132	0:126	0:127	0:779	1:373
Total Zinc	0 : 36	0 : 31	0:31	0:25	0:100	0:129	0:125	0:127	2:786	3:363

1st number indicates number of excursions; 2nd number indicates total number of samples collected.

ND = no data

WY2005 (May 1, 2004 through April 30, 2005); WY2004 (May 1, 2003 through April 30, 2004); WY2003 (May 1, 2002 through April 30, 2003); WY2002 (May 1, 2001 through April 30, 2002); WY2001 (May 1, 2000 through April 30, 2001); WY2000 (May 1, 1999 through April 30, 2000); WY1999 (May 1, 1998 through April 30, 1999); WY1998 (May 1, 1997 through April 30, 1998); non-ECP Baseline (October 1, 1988 through April 30, 1997); and EFA Baseline (October 1, 1978 through September 30, 1988).

Of the 11 parameters listed in **Table 2**, dissolved oxygen (DO), pH, and specific conductance exhibited excursions at one or more locations during WY2005. Previous non-ECP annual monitoring reports provided summary tables showing the total number of excursions by individual monitoring location (SFWMD 2005, 2004, 2003, 2002, 2001, 2000, 1999a, and 1999b). **Table 2** summarizes the previously reported information and compares the results with WY2005. A summary of observed excursions from Class III criteria for individual non-ECP monitoring locations during WY2005 is presented in **Table 3**. The monitoring locations are categorized in the table as either “into,” “within,” “from,” or “C-111 basin” locations as defined by the non-ECP permit.

Calculated criteria for the parameters were derived from the equations listed in Rule 62-302.530, F.A.C. When comparing the calculated criteria with trace metal or major ion concentrations, the only samples used were those in which hardness values were determined in the same sample as that of the trace metal or major ion.

Table 3. Summary of excursions from state Class III surface water criteria for individual non-ECP monitoring sites during WY2005 (May 1, 2004 through April 30, 2005).

AREA	STRUCTURE	SAMPLING SITE	PARAMETERS										
			Alkalinity	DO	Specific Conductance	pH	Turbidity	Un-Ionized Ammonia	Iron	Cadmium	Lead	Copper	Zinc
INTO	ACME1DS	ACME1DS	(0 : 12)	**(2 : 12)**	(0 : 11)	(0 : 12)	(0 : 12)	(0 : 11)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	ACME1 (Upstream of ACME1DS)	VOW1	-ND-	**(8 : 15)**	(0 : 6)	(0 : 15)	-ND-	(0 : 0)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-94D	G94D	(0 : 13)	**(4 : 13)**	(0 : 12)	(0 : 13)	(0 : 13)	(0 : 12)	(0 : 4)	(0 : 2)		(0 : 1)	(0 : 2)
	ACME2 (Upstream of G94D)	VOW2	-ND-	**(12 : 17)**	(0 : 6)	(0 : 17)	-ND-	(0 : 0)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-123	G123	(0 : 11)	**(30 : 48)**	(0 : 52)	(0 : 52)	(0 : 11)	(1 : 12)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-9	S9	(0 : 14)	**(48 : 50)**	(0 : 51)	(0 : 51)	(0 : 13)	(0 : 14)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-9A	S9A	(0 : 4)	**(46 : 51)**	(0 : 52)	(0 : 52)	(0 : 12)	(0 : 12)	(0 : 1)	-ND-	-ND-	-ND-	-ND-
	S-14	S14	-ND-	-ND-	-ND-	-ND-	-ND-	(0 : 0)	-ND-	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-18C	S18C	(0 : 17)	**(15 : 50)**	(0 : 49)	(0 : 50)	(0 : 16)	(0 : 17)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-140	S140	(0 : 17)	**(22 : 49)**	(0 : 52)	(0 : 52)	(0 : 16)	(0 : 17)	(0 : 6)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-175	S175	(0 : 13)	**(15 : 26)**	(0 : 25)	(0 : 26)	(0 : 13)	(0 : 13)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-190	S190	(0 : 14)	**(9 : 22)**	(0 : 22)	(0 : 22)	(0 : 15)	(0 : 14)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-332	S332	(0 : 11)	**(17 : 26)**	(0 : 25)	(0 : 26)	(0 : 11)	(0 : 12)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	NSID1	S38B	(0 : 2)	**(2 : 2)**	(0 : 2)	(0 : 2)	(0 : 2)	(0 : 2)	(0 : 2)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
		NSIDSP01	(0 : 3)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 3)	(0 : 3)	-ND-	-ND-	-ND-	(0 : 3)	-ND-
WITHIN	G-64	G64	(0 : 3)	**(1 : 3)**	(0 : 3)	(0 : 3)	(0 : 3)	(0 : 2)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-69	G69	No Data (Structure Closed)										
	G-71, S-346, S-347	S12D	(0 : 18)	**(17 : 22)**	(0 : 21)	(0 : 22)	(0 : 18)	(0 : 17)	(0 : 4)	-ND-	-ND-	-ND-	-ND-
	S-10E	S10E	(0 : 9)	**(4 : 9)**	(0 : 9)	(0 : 9)	(1 : 9)	(0 : 8)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-141	S34	Same as Data for S34 Shown Below										
	S-142	S142	(0 : 23)	**(16 : 23)**	(0 : 23)	(0 : 23)	(0 : 23)	(0 : 20)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-143	S11A	(0 : 14)	**(3 : 14)**	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 12)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-144	S144	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-145	S145	(0 : 17)	**(11 : 18)**	(0 : 18)	(0 : 18)	(0 : 17)	(0 : 14)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-146	S146	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-151	S151	(0 : 15)	**(12 : 14)**	(0 : 15)	(0 : 15)	(0 : 14)	(0 : 14)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-333	S333	(0 : 19)	**(19 : 24)**	(0 : 23)	(0 : 24)	(0 : 19)	(0 : 18)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-339, S-340	C123SR84	(0 : 15)	**(8 : 16)**	(0 : 17)	(0 : 17)	(0 : 15)	(0 : 16)	-ND-	-ND-	-ND-	-ND-	-ND-
FROM	G-94A, G-94B, G-94C	G94B	(0 : 12)	**(10 : 12)**	(0 : 11)	(0 : 12)	(0 : 11)	(0 : 12)	(0 : 2)	-ND-	-ND-	-ND-	-ND-
	S-31, S-337	S31	(0 : 10)	**(8 : 10)**	(0 : 10)	(0 : 10)	(0 : 9)	(0 : 10)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-34	S34	(0 : 18)	**(13 : 18)**	(0 : 18)	(0 : 18)	(0 : 18)	(0 : 17)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-38	S38	(0 : 20)	**(12 : 20)**	(0 : 20)	(0 : 20)	(0 : 20)	(0 : 17)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-39	S39	(0 : 12)	**(4 : 12)**	(0 : 11)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 1)	-ND-	-ND-	-ND-	-ND-
	S-197	S197	(0 : 1)	(0 : 1)	(0 : 1)	(0 : 1)	-ND-	(0 : 1)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-334	S334	(0 : 12)	**(10 : 18)**	(0 : 17)	(0 : 18)	(0 : 18)	(0 : 18)	(0 : 3)	(0 : 1)	(0 : 1)	(0 : 1)	-ND-
	S-343A, S-343B	US41-25	(0 : 17)	**(25 : 25)**	(0 : 24)	(0 : 25)	(0 : 17)	(0 : 17)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-344	S344	(0 : 3)	**(1 : 2)**	(0 : 3)	(0 : 3)	(0 : 3)	(0 : 3)	(0 : 3)	-ND-	-ND-	-ND-	-ND-
C-111 BASIN	S-174	S176	(0 : 16)	**(14 : 17)**	(0 : 17)	(0 : 17)	(0 : 17)	(0 : 17)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-177	S177	(0 : 20)	**(15 : 24)**	(0 : 24)	(0 : 24)	(0 : 21)	(0 : 21)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-178	S178	(0 : 12)	**(14 : 31)**	(0 : 30)	(4 : 31)	(1 : 12)	(0 : 13)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-331, S-173	S331-173	(0 : 14)	**(21 : 23)**	(0 : 22)	(0 : 22)	(0 : 21)	(0 : 21)	(0 : 1)	(0 : 1)	(0 : 1)	(0 : 1)	-ND-
	S-332B	S332B	(0 : 4)	**(38 : 41)**	(0 : 40)	(0 : 40)	(0 : 23)	(0 : 23)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-332C	S332C	(0 : 4)	**(40 : 46)**	(0 : 45)	(0 : 45)	(0 : 23)	(0 : 24)	(0 : 4)	(0 : 2)	-ND-	(0 : 1)	(0 : 2)
	S-332D	S332D	(0 : 6)	**(36 : 46)**	(0 : 45)	(0 : 46)	(0 : 26)	(0 : 26)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
Totals			(0 : 445)	**582 : 882**	(0 : 858)	**(4 : 891)**	**(2 : 520)**	**(1 : 512)**	(0 : 89)	(0 : 38)	(0 : 2)	(0 : 39)	(0 : 36)

For parameters that exceeded Class III criteria during WY2005, time series plots and box whisker plots are provided in Appendix 3-2c. These plots report the range of the data and the magnitude of the excursions and assist with detecting whether there are any increasing or decreasing trends observed in the data. To assess how far a physical parameter, major ion, or trace metal deviated above or below a Class III numeric criterion, a percent-departure line was added to the time series plots and box and whisker plots. These departure lines indicate whether a parameter value ranges more than 1, 10, or 100 percent beyond the numeric criteria. The physical parameters appear as horizontal lines across the plots. For the major ions and trace metals, the criteria change from sample to sample because the criteria for each parameter for a particular sample were calculated based on the hardness data calculated from the same sample. For data that show an excursion, the percentage departure is annotated on the plot above the value.

DISSOLVED OXYGEN

Dissolved oxygen (DO) concentrations exhibited consistent excursions from Class III criteria during WY2005 (**Table 3**). About 66 percent (582 out of 882 samples) of DO concentrations measured at the non-ECP monitoring locations were less than the minimum criterion of 5 mg/L. The DO concentrations measured for WY2005 are consistent with the concentration levels and the frequency of excursions observed in previous water years, and there is a slight improvement (66 percent versus 73 percent) for DO excursions in WY2005 compared with WY2004. The DO excursions occurred at all locations. The DO time series and box and whisker plots are shown in Appendix 3-2c.

It should be noted that even unimpacted areas of the Everglades commonly have DO concentrations that are below the 5-mg/L standard as part of the natural water conditions found in South Florida. Because natural levels commonly fall below the existing standard, the FDEP has recently adopted a site-specific alternative criterion (SSAC) for DO in the EPA that better reflects naturally occurring conditions.

SPECIFIC CONDUCTANCE

Specific conductance was measured in 858 samples collected from the monitoring sites. Of these samples, no detected values exhibited an excursion exceeding the Class III criteria for specific conductance. The criteria for Class III waters requires that specific conductance not exceed a level greater than 50 percent above background, or 1,275 microhms per centimeter (µmhos/cm), whichever is greater. Specific conductance is not a parameter of concern for the non-ECP monitoring locations.

PH

The pH of a solution is defined as the negative base-10 logarithm of the hydrogen ion activity and can range from 0 (very acidic) to 14 (very alkaline). For freshwater systems, the Class III criterion for pH ranges from 6.0 to 8.5 units. For WY2005, excursions from the pH criterion occurred in less than 1 percent (4 out of 891) of the samples collected. As shown in **Table 3**, only four excursions with a pH greater than 8.5 units were observed at the S-178 site. The pH data for S-178 are plotted in Appendix 3-2c.

ALKALINITY

The criterion for Class III waters requires that alkalinity not measure below 20 mg/L. Alkalinity was measured in 445 samples taken during WY2005. Of these samples, no sample value was flagged as a potential excursion. Alkalinity does not appear to be a parameter of concern, since excursions have only occurred once during the past several water years.

TURBIDITY

The criterion for Class III waters requires that turbidity not exceed 29 nephelometric turbidity units (NTU) above natural background conditions. In general, the median value can be used to determine the average background levels on a site-to-site basis for the non-ECP monitoring locations to compare the measured turbidity at a site with Class III criteria. For instance, if background levels at a particular location indicate a median turbidity level of approximately 3 NTU and a turbidity measurement of 30 NTU was measured, then this would indicate that the measurement is 27 NTU above background levels. This measurement would not be considered an excursion, although the 30-NTU measurement might be construed as exceeding the criterion in the absence of sufficient background data to calculate a median value for comparison.

Turbidity was measured in 520 samples collected during WY2005. The majority of the data are characterized by low turbidity values. Out of 520 samples, two samples (S178 and S10E) were flagged as a potential excursion. Turbidity does not appear to be a parameter of concern because excursions have only occurred on a few occasions during the past several water years.

UN-IONIZED AMMONIA

The Class III surface water quality criterion for ammonia was established for the un-ionized portion of dissolved ammonia. The un-ionized portion of dissolved ammonia measured in a water sample can be calculated and compared to the Class III criterion only if temperature and pH have been recorded for that sample. One (G123) of the 512 samples analyzed for un-ionized ammonia at all locations during WY2005 had concentrations that exceeded its criterion of 0.02 mg/L. During WY2001, the results for un-ionized ammonia in 3 out of 30 samples collected at S-142 exceeded this criterion. The situation improved in WY2002 and WY2003, and no excursions for un-ionized ammonia were observed in the surface waters discharging to the Park through non-ECP structures. In previous non-ECP monitoring reports, this parameter was identified as a potential concern for structures discharging “into” the Park and the upstream structures in the C-111 basin. There was only one excursion (G123) for un-ionized ammonia data in WY2005.

TRACE METALS AND TOTAL IRON

Quarterly monitoring for total iron and the trace metals cadmium, copper, and zinc is conducted in accordance with the monitoring requirements of the non-ECP permit. There were no observed iron or trace metal concentrations in WY2005 that exceeded their respective Class III criteria. These metals are not parameters of concern for the non-ECP monitoring locations.

Evaluation of Total Phosphorus

The non-ECP permit established the monitoring schedule shown in Appendix 3-2a for the collection of TP at non-ECP structures. Sample collection is accomplished mainly through a grab-sample collection program. Grab samples are collected biweekly for a majority of the structures when flow is occurring at the structure; otherwise, collection is conducted at least once a month. A few exceptions exist for some non-ECP structures, where sampling is conducted biweekly only during flow events. Nutrients are the most frequently sampled parameters in the non-ECP monitoring program.

During WY2005, auto-samplers collected TP samples at the ACME1, ACME2, S-9, S-9A, S-18C, S-190, S-140, NSID1 (NSIDSP01), and G-123 pump structures. Deployment of the auto-samplers at these locations was previously identified as an improvement in the monitoring program for collecting TP data at "into" structures. Auto-samplers also collected samples at the S332B, S332C and S-332D structures located in the C-111 basin that discharges water into the detention areas east of the Park.

The TP concentration data collected for all monitoring locations during WY2005 (the eighth year of non-ECP permit monitoring) are plotted in time series and notched box and whisker plots in Appendix 3-2d. The plots are designed to provide a comparison of TP concentration data between WY2005 and previous periods (WY2004, WY2003, WY2002, WY2001, WY2000, WY1999, WY1998, EFA baseline, and non-ECP baseline) to detect changes and trends in TP concentrations at non-ECP monitoring locations. To assist with evaluation of the TP concentration data for a particular location discharging "into," "within," or "from" the EPA, horizontal lines representing the 10-ppb and 50-ppb concentration levels were added to the TP time series and notched box and whisker plots. TP concentrations are reported in ppb (or µg/L), unless otherwise noted.

For WY2005, a statistical comparison of TP concentration data for all monitoring locations is presented as notched box and whisker plots in **Figures 2a** through **2d**. The figures represent "into" (**Figure 2a**), "within" (**Figure 2b**), and "from" (**Figure 2c**) monitoring locations. Additionally, notched box and whisker plots were constructed for TP concentration data for the upstream C-111 basin monitoring locations (**Figure 2d**). Summary statistics of TP data collected for all monitoring locations are presented separately as Appendix 3-2b, Table 3 (grab and auto-sampler data are reported separately). A discussion of the TP concentration data observed during WY2005 is provided below.

"INTO" STRUCTURES

Some of the highest TP concentrations for non-ECP structures discharging directly to the EPA during WY2005 were observed for the monitoring locations at the ACME1DS, G-94D culverts and the upstream pump stations (VOW2, VOW2Auto, VOW1, VOW1Auto) (**Figure 2a**). Weekly auto-sampler collection and biweekly grab samples at the respective upstream monitoring locations VOW1 (ACME pump station 1) and VOW2 (ACME pump station 2) were initiated in July 2000 based on a monitoring agreement between the District and the Village of Wellington (VOW).

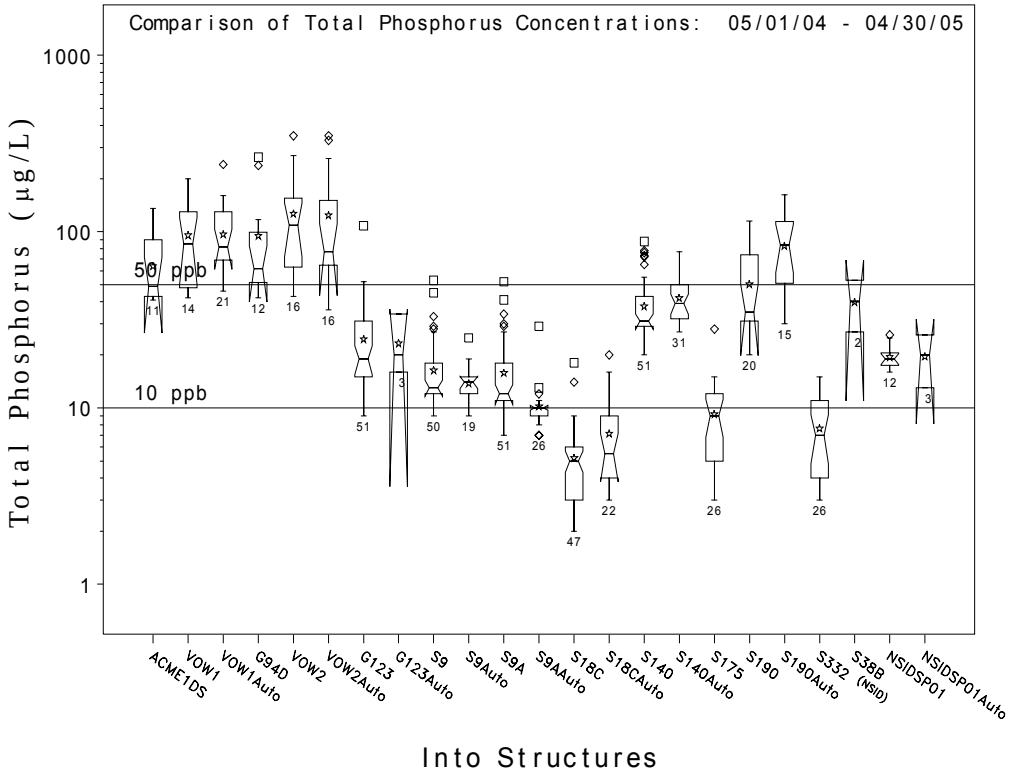


Figure 2a. Comparison of TP concentrations for "into" structures during WY2005.

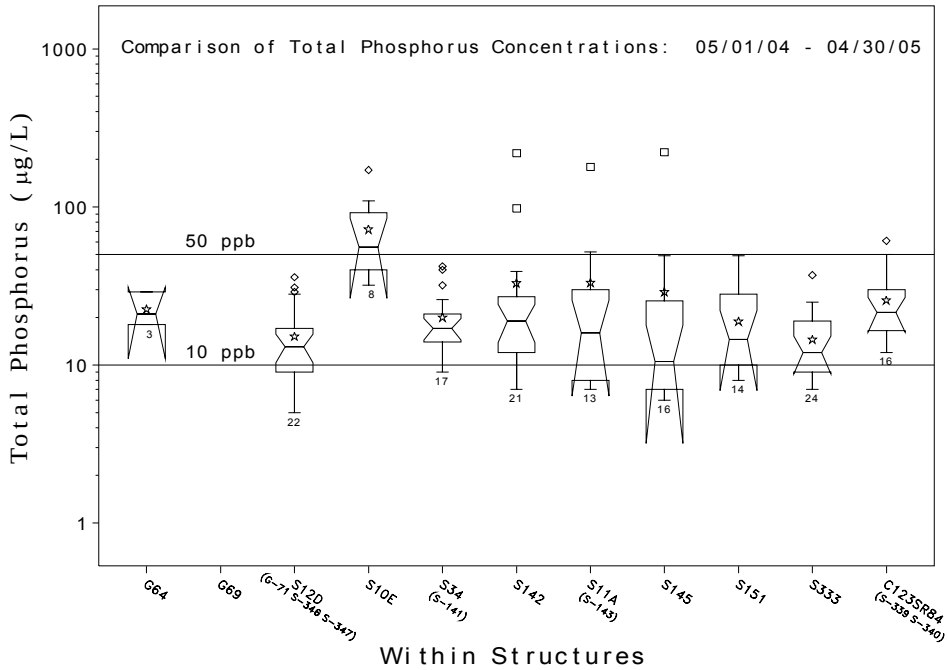


Figure 2b. Comparison of TP concentrations for "within" structures during WY2005.

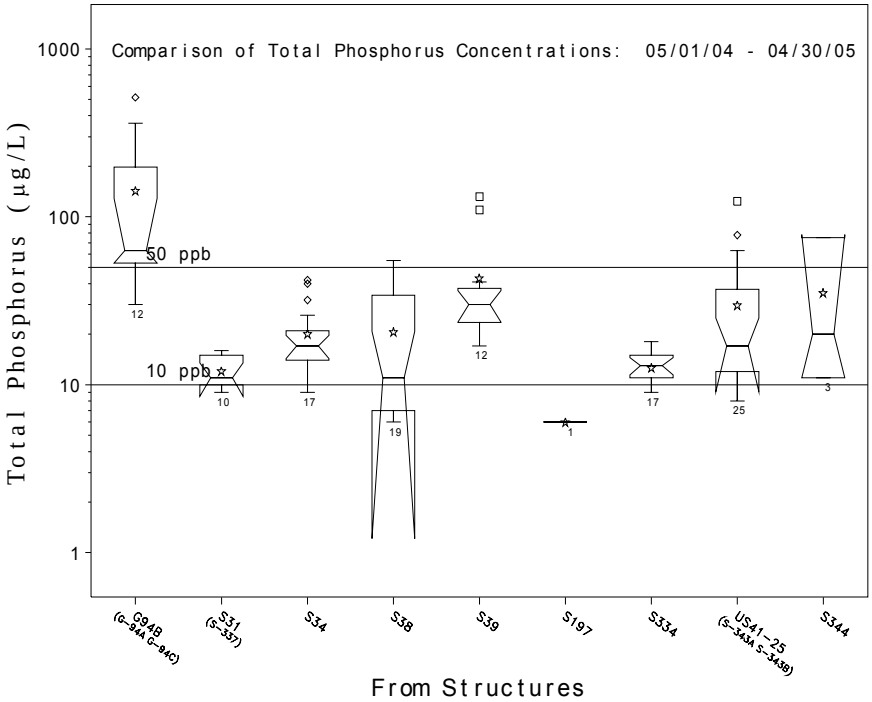


Figure 2c. Comparison of TP concentrations for "from" structures during WY2005.

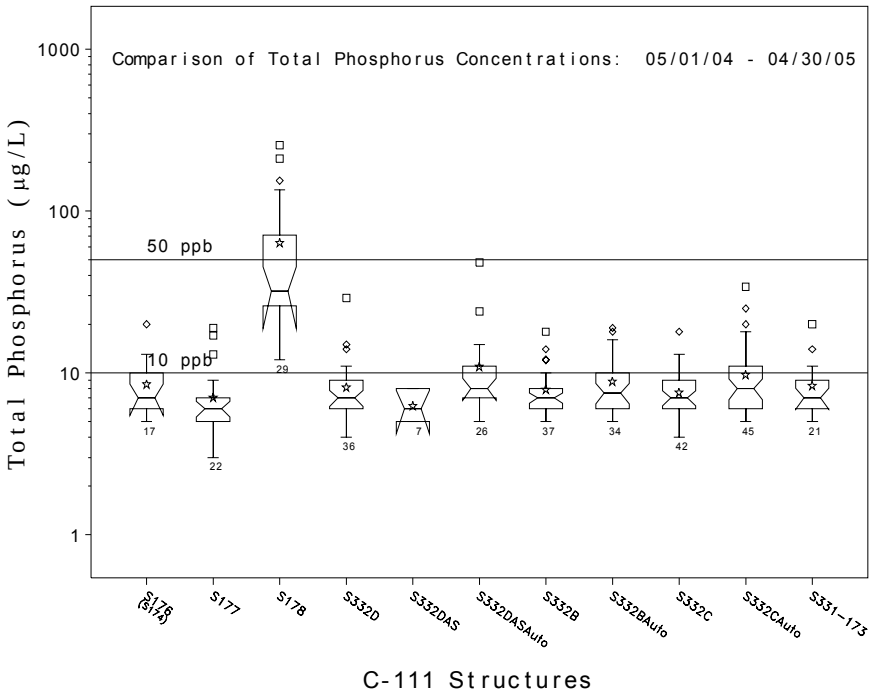


Figure 2d. Comparison of TP concentrations for C111 structures during WY2005.

The ACME1DS and G-94D culverts, operated by the VOW, remain open at all times and discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) when upstream pump stations ACME1 or ACME2 are operating. Eleven District data collection trips to the culvert ACME1DS monitoring locations resulted in only two sampled flow events. Twelve District data collection trips to the culvert G94D monitoring locations resulted in only four sampled flow events. The monitoring agreement with VOW resulted in a sufficient number of samples (35 at VOW1 and 32 at VOW2) collected by both grab and auto-sampler techniques upstream of the pump stations to cover a broad range of flows (25 samples at VOW1 and 23 samples at VOW2) observed during pumping events, and adequately characterize the TP concentrations.

More than 75 percent of the data collected at the upstream VOW1 monitoring sites were below 130 ppb for both grab and auto samplers, with median TP values ranging between 85 ppb (grab) and 82 ppb (auto). More than 75 percent of the data collected at the upstream VOW2 monitoring sites were below 155 ppb (grab) and 150 ppb (auto), with median TP values ranging between 109 ppb (grab) and 77 ppb (auto). Discharge data were not available for the ACEM1DS and G-94D culverts, although discharge data from the upstream pump stations during WY2005 [12,317 acre-feet (ac-ft) for ACME1, and 11,246 ac-ft for ACME2, respectively] can be used as an indication of the magnitude and occurrence of flow through the downstream culverts.

Additionally, high TP concentrations were observed for structures S-190 (feeder canal basin) and S-140 (L-28 basin), with median TP concentrations of 35 ppb (grab) and 84 ppb (auto) at S-190; 31 ppb (grab) and 39 ppb (auto) at S-140. During WY2005, structure S-190 discharged 94,581 ac-ft, and S-140 discharged 137,976 ac-ft into the western portion of Water Conservation Area 3A (WCA-3A).

The lowest TP concentrations were observed at structures in the C-111 basin at S-18C, S-174, S-177, S-331, S-173, and S-332D. These structures discharge to the southeastern portion of the Park by way of the C-111 canal and Taylor Slough. The TP data for these monitoring locations had median concentrations of 5 ppb (grab) and 6 ppb (auto) for S-18C, 9 ppb for S-175, and 7 ppb for S-332, with 75 percent of the samples having concentrations below 6 ppb (grab) and 9 ppb (auto) for S-18C, 12 ppb (grab) for S-175, and 11 ppb for S-332. During WY2005, the S-175 and S-332 structures were operated infrequently, discharging only 374 ac-ft for S-175 and 577 ac-ft for S-332 to the Park. The S-18C structure discharged approximately 100,689 ac-ft to the lower C-111 canal, which was significantly reduced from last year (158,813 ac-ft). S-178 had median concentration of 32 ppb for the grab samples and 66 ppb from the auto samplers, the highest TP concentration in the C-111 basin, with discharge of 2,615 ac-ft.

Structures S-9 (C-11 West basin) and G-123 (North New River basin) discharge directly to the eastern side of WCA-3A. The notched box and whisker plot for S-9, which is based on grab-sample data, indicates a TP concentration of less than 18 ppb for 75 percent of the data, a median concentration of 13 ppb, and a maximum concentration of 53 ppb (**Figure 2a**). On the other hand, 75 percent of the data collected by the auto-sampler at S-9 is below 15 ppb, with a median concentration of 14 ppb and a maximum concentration of 25 ppb. G-123 exhibits a maximum concentration of 108 ppb for grab samples and 34 ppb from autosamplers. The monitoring schedule for structure G-123 requires biweekly grab sampling during flow events; otherwise, the samples are collected monthly. An auto-sampler collected samples every 7 days, resulting in 3 auto-samples and 51 grab samples collected during this period. During WY2005, procedures were also instituted to allow the determination of the volume of water discharged from the North New River Canal into the EPA. The structure did not discharge water over the entire period. The auto-sampler and grab sample TP values at G-123 were similar and had a

median concentration of 20 ppb for auto-samples and 19 ppb for grab samples. Seventy-five percent of the data ranged from 34 ppb (auto) to 31 ppb (grab), with a maximum concentration of 108 ppb for grab samples and 34 ppb for auto-samples.

The North Springs Improvement District (NSID) operates several pumps at two pump stations to remove excess runoff from the basin. The flow-proportional auto-sampler, headwater pressure sensor, and calibrated flow monitoring equipment with telemetry that monitor the NSID's pump station discharges into WCA-2A are functioning for the NSID basin. The surface water quality monitoring program has continued at the water quality monitoring station S-38B, downstream of the NSID Pump Station 1, although there was small amount of flow (354 ac-ft) at NSID into WCA-2A during WY2005. Results from S-38B and upstream data from NSIDSP01 are reported in Chapter 3 of the 2005 South Florida Environmental Report – Volume I (see Table 3-2) A more complete presentation of the results from these stations can be found in Appendix 2A-2b, Table 3, and Appendix 2A-2e. Pump curves were developed and programmed into the equipment. All systems are now operational and have flow-weighted autosamplers in place. TP could not be calculated at the NSID structure because no TP data were available during flow in WY2005. During WY2005, the TP concentrations for the two samples collected at S38B ranged from 27 ppb to 53 ppb. TP concentration for grab samples at the NSIDSP01 site during WY2005 varied between 16 ppb and 26 ppb and TP concentration for autosamplers at the NSIDSP01 site during WY2005 varied between 13 ppb and 26 ppb.

The remaining structure, S-14, is in the northwest corner of Shark River Slough in the Park. The structure is situated a short distance to the west of the S-12A structure. According to operational records, the S-14 structure has been closed since 1986 and has remained closed during WY2005. Therefore, routine sampling for TP was not conducted at this location in accordance with the "biweekly if flowing" sampling schedule required by the permit. In the event that this structure was operated, it would convey some of the discharge from WCA-3A outflow structures S-343A and S-343B, and some overland runoff from the southeastern portion of Big Cypress National Preserve to the Park.

During WY2005, no water quality data was collected in the Boynton Farm basin. The Refuge headquarters property is owned and operated by the U.S. Fish and Wildlife Service (USFWS) and is bordered by several farms immediately east of the property boundary that discharge onto the property. The headquarters property is identified in the EFA as being within the EPA boundary, but the property is east of the protective levee, has no connection to discharge westward to WCA-1, and stands alone as an isolated parcel. The following water quality monitoring sites each relate to a pump station operated by the farm operators: BFBAFCP, BFBAFNP, BFBAFSP, BFBDFCP, BFBDFNP, BFBDFSP, BFBDFWP, BFBMFCP, BFBMFSP, and BFBMFNP. In WY2004, the TP data consist of event-driven grab samples that have no associated flow measurements. Although access limitations and other boundary issues still exist, surface water quality samples for most of the identified "into" structures have been obtained during times of flow. Recently, the Williams Nursery pump on the north side of the Refuge was voluntarily removed. The data are provided in **Table 4.** During the previous year, this site showed extremely high TP concentrations (mean concentrations of 973 ppb for the 16 samples collected). As part of the expansion work for State Road 7 to the east of the remaining farm properties, a limited number of culverts were provided to aid flow to the east and away from the Refuge. The Lake Worth Drainage District (LWDD) is continuing its efforts to provide sufficient capacity to allow all discharges from the remaining farms to flow east, and the District is conducting an evaluation of alternatives to reduce or eliminate discharge of elevated levels of nutrients from the Boynton Farms basin to the EPA.

Table 4. Annual flow-weighted mean TP concentrations for WY2005.

Hydrologic Basin	Structure	Water Quality Station ID	Total Flow Volume (acre-feet)	Number of Days with Positive Flow	Sample Type	Sample Size (Grab)	Arithmetic Average (Grab)(ppb)	Sample Size (Comp)	Flow-Weighted [1] Mean Concentration (ppb)	Flow-Weighted [2] Mean Concentration (ppb)	TP Load (kg)
ACME Improvement District	ACME1DS	ACME1DS	12,317 [3]	63 [3]	Grab [4]	11	64	0	119 [6]	126	1,919
	ACME1	VOW1	12,317	63	Auto [5] & Grab [4]	14	96	21	126	133	2,021
	G94D	G94D	11,246 [3]	79 [3]	Grab [4]	12	95	0	207 [6]	213	2,950
	ACME2	VOW2	11,246	79	Auto [5] & Grab [4]	16	127	16	138	212	2,948
North Springs Improvement District	NSID1	NSIDSP01	354	1	Auto [5] & Grab [4]	12	20	3	20	20	9
		S-38B (WCA-2A near NSID1)	354 [7]	1 [7]	Grab [4]	2	40	0	NDF[8]	NDF[8]	17 [9]
North New River	G-123	G123	0	0	Auto [5] & Grab [4]	51	25	3	N/F[10]	N/F[10]	0
C-11 West	S-9	S9	93,403	86	Auto [5] & Grab [4]	50	16	19	18	19	2,140
	S-9A	S9A	56,584	205	Auto [5] & Grab [4]	51	16	26	10	12	832
C-111	S-175	S175	374	24	Grab [4]	26	9	0	5	5	2
	S-332	S332	577	8	Grab [4]	26	8	0	NDF[8]	NDF[8]	6 [9]
	S-18C	S18C	100,689	211	Auto [5] & Grab [4]	47	5	22	8	8	988
L-28	S-140	S140	137,976	203	Auto [5] & Grab [4]	51	38	31	42	42	7,215
Feeder Canal	S-190	S190	94,581	168	Auto [5] & Grab [4]	20	51	15	101	97	11,288
Boynton Farms	Various[11]	Various[11]	N/D[12]	N/D[12]	Grab [4]	0	N/D[12]	N/D[12]	N/D[12]	N/D[12]	N/D[12]

Notes:

1) Flow-weighted mean concentration based on days of flow and monitored TP data only.

2) Flow-weighted mean concentration based on estimation algorithm to determine TP concentration on non monitored days combined with monitored days.

3) Flow data from upstream pump structures, ACME1 and ACME2, is representative of the flow through the ACMD1DS and G94D culverts, respectively.

4) Grab indicates samples collected by grab sampling methodology.

5) Auto indicates that samples were collected by automatic composite samples.

6) Flow-weighted mean concentrations were calculated using the flow data at upstream structures.

7) Flow data from upstream structure NSIDSP01; flow data from the pump structure NSIDSP01 is representative of flow into the EPA at S-38B.

8) NDF no data with flow available.

9) Calculated with annual flow and Arithmetic Average Concentration

10) N/F no flow.

11) Sites include BFBAFCP, BFBAFNP, BFBAFSP, BFBDFCP, BFBDFNP, BFBDFSP, BFBDFWP, BFBMFCP, BFBMFSP, BFBMFNP. These sites are pumps that have no flow recording devices attributed to them.

12) N/D no data available

"WITHIN" STRUCTURES

For structures discharging "within" the EPA during WY2005, low TP concentrations were observed for structures S-12D and S-333, which convey discharges from WCA-3A to the Park (**Figure 2b**). The monitoring location for S-12D serves as a surrogate monitoring location for the non-ECP permit structures G-71, S-346, and S-347. The median TP concentrations at these monitoring locations were 7 ppb and 6 ppb at S-12D and S-333, respectively, with 75 percent of the data below 9 ppb for S-12D and 10 ppb for S-333. The maximum concentration observed was 11 ppb for S-12D and 12 ppb at S-333, respectively. The discharge volumes for the period were 222,510 ac-ft for S-12D, and 183,327 ac-ft for S-333.

Higher concentrations were observed at structures S-145 which convey discharges from WCA-2A to WCA-2B. The structures usually operate simultaneously. Maximum concentration was 222 ppb, median value was 11 ppb, and 75 percent of the data (14 samples) were below 26 ppb at S-145. Discharge volumes ranged from 25,567 ac-ft at S-146, to 39,611 ac-ft at S-145.

In addition to monitoring the water quality at structure S-34, the data from the location are representative of the water quality conditions for structure S-141, which conveys discharges from WCA-2B to the North New River Canal just upstream of S-34. The TP concentrations from the S-34 location ranged from 9 ppb to 42 ppb, with a median value of 17 ppb.

The highest TP concentrations were observed at structures S-10E and S-151 and at the monitoring site C123SR84, the surrogate location for structures S-339 and S-340. The S-10E structure conveys discharges from the Refuge to the northern portion of WCA-2A downstream of pump station S-6. Sampling at the S-10E location occurs upstream of the structure and is near the western rim canal in the Refuge. During WY2005, the S-10E structure remained closed (Appendix 3-2a, Table 2). The TP concentrations (non-flow event) for S-10E ranged from 32 ppb to 171 ppb, with a median concentration of 56 ppb. Structure S-151 discharged approximately 197,321 ac-ft during WY2005. TP concentrations ranged from 8 ppb to 49 ppb, with a median value of 15 ppb. Structures S-339 and S-340, located upstream of S-151 in the Miami Canal, discharged about 96,863 ac-ft at S-339 and 150,002 ac-ft at S-340. TP concentrations at C123SR84 ranged from 12 ppb to 61 ppb, with a median value of 22 ppb.

"FROM" STRUCTURES

The TP concentrations collected during WY2005 for the structures classified as "from" are summarized in the box and whisker plot shown in **Figure 2c**. Structure G-94B exhibited the highest TP concentrations, which ranged from 30 ppb to 515 ppb. The median TP concentration at this structure was 63 ppb, with 75 percent of the data below 198 ppb. G-94B is also the surrogate sampling site for structures G-94A and G-94C. All three structures, which are owned and maintained by the District but operated by the LWDD, are located in the L-40 levee on the eastern side of the Refuge and provide water supply releases from the Refuge to the LWDD. The G-94A, G-94B and G-94C structures, when open, allow interior LWDD canals to fill. The direction of flow always has been toward the LWDD canal system.

The G-94C structure was used intermittently for water supply purposes. The total discharge from the Refuge to the LWDD system was approximately 18,614 ac-ft (Appendix 3-2a, Table 2). Water supply releases to LWDD canals during WY2005 were 28,439 ac-ft at G-94A and 2,910 at G-94B respectively.

The next highest TP concentrations were observed at S-39, with TP concentrations ranging from 17 ppb to 132 ppb, with a median value of 38 ppb. The structure discharged approximately 51,828 ac-ft during WY2005. During that period, 25 samples were collected at S-334. The TP concentrations ranged from 9 ppb to 18 ppb and the median concentration for the 25 samples was 13 ppb.

For the remainder of the "from" structure monitoring locations (S-31, S-34, S-38, S-334, S-337, S-343A, and S-343B), 75 percent of the observed TP concentrations were below 37 ppb, with median values ranging from 11 ppb to 17 ppb.

C-111 BASIN UPSTREAM STRUCTURES

Structures S-176, S-177, S-178, S-332B, S-332C, S-332D, and S-331/S-173, shown in **Figure 2d**, are C-111 basin structures located upstream of "into" structures S-18C, S-332, and S-175. Auto samplers were installed at S-178, S-332B, S-332C and S-332D sites. Seventy-five percent of the TP concentration data collected for these structures was below 79 ppb, with the median values ranging between 6 ppb and 66 ppb. The maximum TP measured at S-178 was 255 ppb, with a median TP concentration of 32 ppb for grab samples and 66 ppb for auto-samples, which was significantly higher than the rest of the C-111 basin upstream structures. Seventy-five percent of the TP concentration data collected for rest structures were below 11 ppb with the median values ranging between 6 ppb and 8 ppb.

FLOW-WEIGHTED MEAN TOTAL PHOSPHORUS CONCENTRATIONS FOR ALL STRUCTURES

Extending the analysis from previous water years, flow-weighted mean TP concentrations were calculated for all the structures during WY2005. The non-ECP permit does not require an annual flow-weighted mean concentration to be calculated. However, the analysis is useful for determining whether additional sampling is required during flow events and provides a more accurate depiction of expected concentrations during flow events. Only those structures having sufficient TP data and available flow data for WY2005 had calculations performed for flow-weighted mean TP concentrations.

There are several common methods that can be used to calculate a flow-weighted mean. The most common method is to multiply the measured TP concentration by the flow volume on days with available flow and concentration values to obtain a daily load, add the results to obtain total daily loads, and then divide the sum by the total accumulated flow for those days. This method uses only the data that were collected and does not involve estimating concentration data for other days when flow occurred but no TP analyses are available. The annual flow-weighted mean TP concentrations and monthly and annual flow volumes for the "into," "within," "from," and C-111 basin structures during WY2005 are provided in Appendix 3-2a, Table 2.

A more detailed analysis of the WY2005 annual flow-weighted mean TP concentration data for each "into" structure is shown in **Table 4**. The calculations were based on two methods for determining flow-weighted mean concentrations. The first method calculates the flow-weighted mean TP concentration using only days of flow and associated TP data. The second method uses an estimation algorithm to determine TP concentrations on all days with positive flow for which no observed values are available.

The two calculation methods resulted in similar values for the flow-weighted mean concentration at most of the "into" structures. The differing methods yielded very big difference at VOW2 site (138 ppb versus 212 ppb), slightly different results for the ACMEDS site (119 ppb

versus 126 ppb), VOW1 site (126 ppb versus 133 ppb), G-94D site (207 ppb versus 213 ppb), and S190 site (101 ppb versus 97 ppb), but provided similar values for all other structures. **Table 4** presents the results for the flow-weighted mean TP concentrations at "into" sites during WY2005. The highest flow-weighted mean TP concentration for the "into" structures during WY2005 was observed at the G-94D and ACME2 pump station, followed ACME1, ACME1DS, S-190, and the S-140 pump stations. These sites are designated as sites of concern and potential concern for TP.

The lowest flow-weighted mean TP concentrations were observed at the S-18C and S-175 monitoring locations. These locations are the subject of interim and long-term compliance limits stipulated in the federal Settlement Agreement and therefore are viewed as sites of potential concern for TP.

PESTICIDE MONITORING

Pesticides in Surface Water and Sediment

The quarterly surface water and semiannual sediment pesticide sampling events at the 15 non-ECP sites (**Figure 3**) for WY2005 were conducted during April 2004, July 2004, November 2004, and February 2005. Representative MDLs and PQLs for the pesticide analytes are listed in **Table 5**. The Department of Environmental Protection Central Laboratory in Tallahassee, FL performed all the pesticide analyses. Refer to the Quality Assurance Evaluation section of the individual pesticide event reports for a summary of any limitations on data validity that might influence the utility of these data. The individual reports can be found online at the District's web site at http://www.sfwmd.gov/curre/pest/pestindex.htm.

To evaluate potential impacts on aquatic life resulting from intermittent pesticide exposure, the maximum observed concentration is compared to the criterion maximum concentration published by the U.S. Environmental Protection Agency (USEPA) under Section 304 (a) of the Clean Water Act (CWA), and as promulgated in Chapter 62-302, F.A.C. For compounds not specifically listed, Rule 62-302.200, F.A.C. allows for acute and chronic toxicity standards. These standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50 percent of the test organisms in 96 hours, where the 96-hour EC_{50} or LC_{50} is the lowest value determined for a species significant to the indigenous aquatic community. **Table 6** lists representative toxicity levels for selected freshwater aquatic invertebrates and fishes.

Table 7 lists the pesticides detected in surface water samples collected during WY2005. Four surface water samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than their respective Class III criteria or toxicity limits were assigned to the "concern" excursion category, whereas those higher than the PQL were assigned to the "potential concern" excursion category. None of the surface water samples where pesticides were detected were identified as sites of concern.

Table 8 lists the pesticides detected in the sediment samples collected during WY2005. Two sediment samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than the PQL were assigned to the "potential concern" excursion category. Dichlorodiphenyldichloroethylene (DDE), an environmental dehydrochlorination product of dichlorodiphenyltrichloroethane (DDT), endosulfan, endosulfan sulfate, and PCB 1242, were detected at several locations at levels of "potential concern."

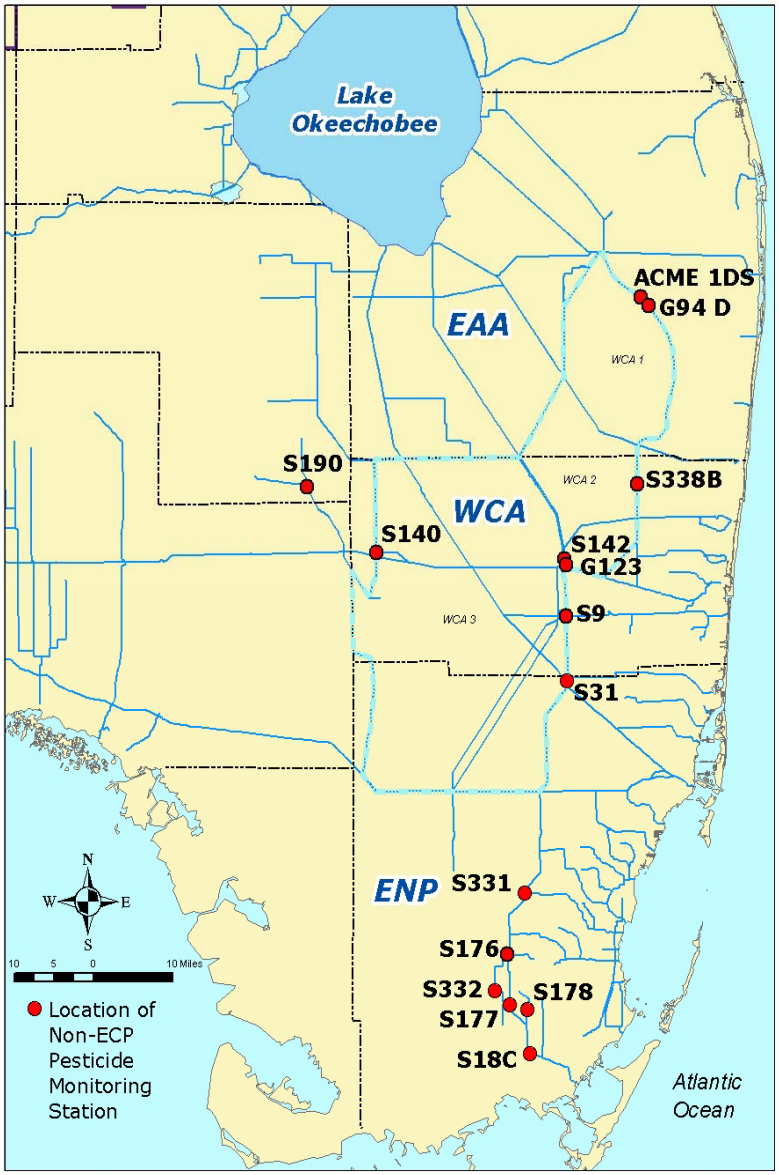


Figure 3. Pesticide monitoring network for non-ECP structures.

Table 5. Minimum detection limits (MDLs) and practical quantitation limits (PQLs) for pesticides determined in April 2004.

Pesticide or metabolite	Water: range of MDL-PQL (µg/L)	Sediment: range of MDL - PQL (µg/Kg)	Pesticide or metabolite	Water: range of MDL-PQL (µg/L)	Sediment: range of MDL - PQL (µg/Kg)
2,4-D	0.2 - 0.6	8.3 - 200	endosulfan sulfate	0.0045 - 0.0196	0.83 - 26.7
2,4,5-T	0.2 - 0.6	8.3 - 200	endrin	0.0094 - 0.04	2.1 - 66.7
2,4,5-TP (silvex)	0.2 - 0.6	8.3 - 200	endrin aldehyde	0.0042 - 0.018	0.83 - 26.7
alachlor	0.047 - 0.208	25 - 800	ethion	0.019 - 0.084	2.1 - 68
aldrin	0.0019 - 0.0084	0.42 - 13.3	ethoprop	0.019 - 0.084	4.2 - 132
ametryn	0.0094 - 0.04	2.1 - 68	fenamiphos (nemacur)	0.028 - 0.124	17 - 520
atrazine	0.0095 - 0.38	2.1 - 68	fonofos (dyfonate)	0.019 - 0.084	4.2 - 132
atrazine desethyl	0.0094 - 0.04	N/A	heptachlor	0.0023 - 0.01	0.42 - 13.3
atrazine desisopropyl	0.0094 - 0.04	N/A	heptachlor epoxide	0.0019 - 0.0084	0.42 - 13.3
azinphos methyl (guthion)	0.019 - 0.084	2.1 - 68	hexazinone	0.019 - 0.084	8.3 - 268
α-BHC (alpha)	0.0021 - 0.0092	0.42 - 13.3	imidacloprid	0.2 - 0.6	N/A
β-BHC (beta)	0.0032 - 0.014	0.42 - 13.3	linuron	0.2 - 0.6	8.3 - 200
□-BHC (delta)	0.0019 - 0.0084	0.83 - 26.7	malathion	0.028 - 0.124	6.2 - 200
□-BHC (gamma) (lindane)	0.0019 - 0.0084	0.42 - 13.3	metalaxyl	0.047 - 0.208	N/A
bromacil	0.038 - 0.76	17 - 520	methamidophos	N/A	21 - 680
butylate	0.019 - 0.084	N/A	methoxychlor	0.0098 - 0.044	2.1 - 333
carbophenothion (trithion)	0.015 - 0.064	2.1 - 66.7	metolachlor	0.057 - 0.248	21 - 680
chlordane	0.019 - 0.084	6.2 - 200	metribuzin	0.019 - 0.084	4.2 - 132
chlorothalonil	0.015 - 0.064	2.1 - 66.7	mevinphos	0.075 - 0.328	8.3 - 268
chlorpyrifos ethyl	0.019 - 0.084	2.1 - 68	mirex	0.011 - 0.048	1.7 - 53.3
chlorpyrifos methyl	0.0094 - 0.04	4.2 - 132	monocrotophos (azodrin)	N/A	42 - 1320
cypermethrin	0.019 - 0.084	2.1 - 66.7	naled	0.075 - 0.328	34 - 1080
DDD-P,P'	0.0045 - 0.0196	0.83 - 26.7	norflurazon	0.019 - 0.38	4.2 - 132
DDE-P,P'	0.0038 - 0.0164	0.83 - 26.7	parathion ethyl	0.019 - 0.084	6.2 - 200
DDT-P,P'	0.0057 - 0.0248	1.2 - 40	parathion methyl	0.019 - 0.084	6.2 - 200
demeton	0.11 - 0.48	42 - 1320	PCB	0.019 - 0.084	8.3 - 600
diazinon	0.019 - 0.084	4.2 - 132	permethrin	0.015 - 0.064	2.5 - 80
dicofol (kelthane)	0.042 - 0.18	6.2 - 200	phorate	0.028 - 0.124	2.1 - 68
dieldrin	0.0019 - 0.0084	0.42 - 13.3	prometryn	0.019 - 0.084	6.2 - 200
disulfoton	0.019 - 0.084	4.2 - 132	prometon	0.019 - 0.084	N/A
diuron	0.2 - 0.6	8.3 - 200	simazine	0.0094 - 0.04	2.1 - 68
α-endosulfan (alpha)	0.0038 - 0.0164	0.42 - 13.3	toxaphene	0.094 - 0.4	31 - 1000
β-endosulfan (beta)	0.0038 - 0.0164	0.42 - 13.3	trifluralin	0.0075 - 0.0328	1.7 - 53.3

N/A - not analyzed

Table 6. Toxicity of pesticides (in µg/L) to selected freshwater aquatic invertebrates and fishes.

Common Name	48 hr EC50 Water flea				96 hr LC50 Fathead Minnow				96 hr LC50 Bluegill			
	Daphnia magna		acute toxicity (*)	chronic toxicity (*)	*Pimephales Promelas*		acute toxicity	chronic toxicity	*Lepomis macrochirus*		acute toxicity	chronic toxicity
ametryn	28,000	(7)	9,333	1,400	-		-	-	4,100	(4)	1,367	205
atrazine	6900	(7)	2,300	345	15,000	(7)	5,000	750	16,000	(4)	5,333	800
bromacil	-		-	-	-		-	-	127,000	(7)	42,333	6,350
chlorpyrifos ethyl	1.7	(7)	0.57	0.085	203	(7)	68	10	2.6	(4)	0.87	0.13
	0.1	(7)	0.03	0.005	-		-	- -	5.8	(7)	1.93	0.29
DDE, p,p'	-		-	-	- -		- -	- -	240	(1)	80	12
endosulfan	166	(7)	55	8	1	(1)	0.3	0.05	1	(1)	0.33	0.05
	-		-	-	-		-	-	2	(3)	0.67	0.10
	-		-	-	-		-	-	-		-	-
	-		-	-	-		-	-	-		-	-
hexazinone	151,600	(7)	50,533	7,580	274,000	(4)	91,333	13,700	100,000	(7)	33,333	5,000
metolachlor	23,500	(7)	7,833	1,175	-		-	-	15,000	(4)	5,000	750
naled	-		-	-	3,300	(1)	1,100	165	2,200	(1)	733	110
norflurazon	15,000	(7)	5,000	750	-		-	-	16,300	(7)	5,433	815
prometon	-		-	-	-		-	-	40,000	(5)	13,333	2,000
simazine	1,100	(7)	367	55	100,000	(7)	33,333	5,000	90,000	(4)	30,000	4,500

Table 6. Continued.

Common Name	96 hr LC50 Largemouth Bass *Micropterus salmoides*		acute toxicity	chronic toxicity	96 hr LC50 Rainbow Trout *Oncorhynchus mykiss*		acute toxicity	chronic toxicity	96 hr LC50 Channel Catfish *Ictalurus punctatus*		acute toxicity	chronic toxicity
ametryn	-		-	-	8,800	(4)	2,933	440	-		-	-
atrazine	-		-	-	8,800	(4)	2,933	440	7,600	(4)	2,533	380
bromacil	-		-	-	36,000	(7)	12,000	1,800	-		-	-
chlorpyrifos ethyl	-		-	-	11	(4)	3.7	0.55	280	(7)	93	14
	-		-	-	-		-	-	-		-	-
DDE, p,p'	-		-	-	32	(1)	10.7	1.6	-		-	-
endosulfan	-		-	-	1	(1)	0.33	0.050	1	(1)	0.3	0.05
	-		-	-	3	(2)	1	0.15	1.5	(7)	0.5	0.08
	-		-	-	1	(3)	0.33	0.050	-		-	-
	-		-	-	0.3	(5)	0.10	0.015	-		-	-
hexazinone	-		-	-	180,000	(7)	60,000	9,000	-		-	-
metolachlor	-		-	-	2,000	(4)	667	100	4,900	(5)	1,633	245
naled	1,900	(1)	633	95	195	(1)	65	10	710	(1)	237	36
norflurazon	-		-	-	8,100	(7)	2,700	405	>200,000	(4)	>67,000	>10,000
prometon	-		-	-	12,000	(5)	4,000	600	-		-	-
simazine	-		-	-	100,000	(7)	33,333	5,000	-		-	-

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

(#) Species is not indigenous. Information is given for comparison purposes only.

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Table 7. Pesticide detections and excursions for surface water samples collected from April 2004 to February 2005.[1]

Compound / Structure	ACME1DS	G-94D	G-123	S-9	S-18C	S-140	S-190	S-332	S-38B	S-142	S-31	S-176	S-177	S-178	S-331/S-173
simazine	0:2:0	0:2:0	---	---	---	1:0:0	2:0:0	---	1:0:0	---	---	---	---	---	---
norflurazon	---	---	---	---	---	3:1:0	4:0:0	---	---	---	---	---	---	---	---
prometon	---	---	---	---	---	---	---	---	1:0:0	---	---	---	---	---	---
naled	---	---	---	0:1:0	---	---	---	---	---	---	---	---	---	---	---
metolachlor	---	---	---	---	---	---	---	---	---	0:1:0	---	---	---	2:0:0	---
hexazinone	0:2:0	0:2:0	---	1:0:0	---	1:1:0	---	---	---	---	---	---	1:0:0	---	---
endosulfan sulfate	---	---	---	---	---	---	---	---	---	---	---	---	---	0:3:0	---
beta endosulfan	---	---	---	---	---	---	---	---	---	---	---	---	1:0:0	1:1:0	---
alpha endosulfan	---	---	---	---	2:0:0	---	---	1:0:0	---	---	---	3:0:0	3:0:0	1:2:0	1:0:0
chlorpyrifos ethyl	---	---	---	---	---	---	---	---	---	1:0:0	---	---	---	1:0:0	---
bromacil	---	---	---	---	---	---	0:1:0	---	---	---	---	---	---	---	---
atrazine desisopropyl	---	---	---	---	---	---	---	---	2:0:0	---	---	---	---	---	---
atrazine desethyl	3:0:0	2:0:0	---	1:0:0	---	1:0:0	---	---	0:4:0	2:0:0	---	---	---	1:0:0	---
atrazine	0:4:0	0:4:0	1:3:0	1:1:0	3:0:0	2:1:0	1:1:0	1:1:0	0:4:0	1:3:0	2:1:0	1:1:0	1:1:0	2:0:0	1:1:0
ametryn	3:1:0	3:1:0	4:0:0	---	---	---	---	---	4:0:0	4:0:0	1:0:0	---	---	---	---

[1] Four samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

* Number of samples < = PQL (no concern); number of samples > PQL (potential concern); and number of samples exceeding criterion or toxicity limit (concern).

Table 8. Pesticide detections and excursions for sediment samples collected in April 2004 and November 2004.[1]

Compound					
Structure	**alpha endosulfan**	**beta endosulfan**	**endosulfan sulfate**	**DDE-p,p'**	**PCB 1242**
ACME1DS	--	--	--	1:1	--
G-94D	--	--	--	1:1	--
G-123	--	--	--	1:0	--
S-9	--	--	--	--	--
S-18C	--	--	--	1:1	--
S-140	--	--	--	--	--
S-190	--	--	--	--	--
S-332	--	--	--	--	--
S-38B	--	--	--	--	--
S-142	--	--	--	1:0	--
S-31	--	--	--	2:0	0:1
S-176	--	--	--	--	--
S-177	--	1:0	--	1:1	--
S-178	0:2	0:2	0:2	0:2	--
S-331/S-173	--	--	--	1:0	--

[1] Two sediment samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

* Number of samples < PQL (no concern); and number of samples > PQL (potential concern).

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