Appendix 3A-4: 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 District's Chemistry Laboratory Quality Manual and Field Sampling Quality Manual (SFWMD, 2005a and 2005b). 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 the accuracy of the rating are consistent with SFWMD Standard Operating Procedures (SOP) for Flow Data Management in the District Hydrologic Database (2003) and U.S. Geological Survey 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 SFWMD performed all sampling and analysis consistent with the District's Chemistry Laboratory Quality Manual and Field Sampling Quality Manual, 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 5-1 of this volume.

PERMIT SAMPLING SITES

In addition to authorizing the operation and maintenance of 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 3A-4a, 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.

This appendix 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 2006 (WY2006) (May 1, 2005 to April 30, 2006), the ninth 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 2.0 micrograms per liter (µg/L) [or parts per billion (ppb)] were assigned a value of 2.0 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 WY2006, 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, this appendix 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

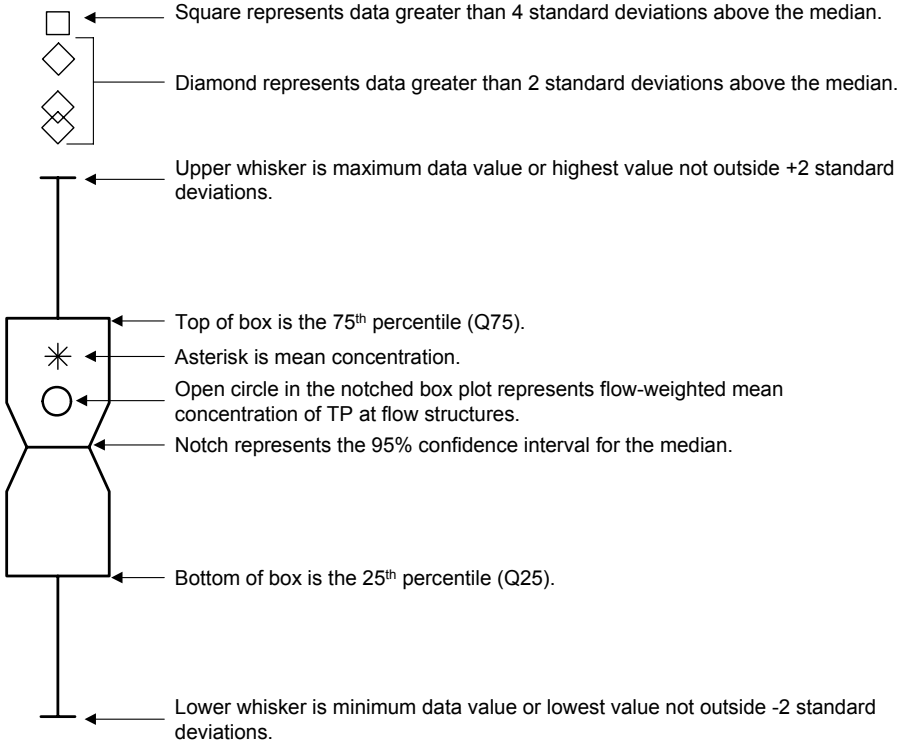
The EPA pesticide monitoring program includes non-ECP permitted structures. For purposes of this appendix, the WY2006 surface water pesticide analyses are presented in tables for the non-ECP structures only. The sediment pesticide analyses for WY2006 are presented in a separate table. Five upstream structures 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 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 WY2006 to those in previous individual permit water years (WY1998–WY2006) and previously established baseline data sets for the non-ECP discharge structures.

Table 1. Description of notched box and whisker plots used in Appendix 3A-4.



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 WY2006, the ninth 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 WY2006 (Appendix 3A-4b, 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 3A-4b, 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 (25^{th} and 75^{th}), 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 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 WY2006 and previous periods.

Parameter	Total Alkalinity	Dissolved Oxygen	Specific Conductance	pH	Turbidity	Un-Ionized Ammonia	Total Iron	Total Cadmium	Total Lead	Total Copper	Total Zinc
EFA Baseline	(1:2677)	(1694:2615)	(59:2615)	(6:2586)	(10:2637)	(12:2548)	(5:836)	(9:362)	(1:364)	(1:373)	(3:363)
Non-ECP Baseline	(0:2845)	(2177:3018)	(12:3058)	(37:3008)	(12:2842)	(10:2661)	(5:1655)	(4:785)	(2:785)	(0:779)	(2:786)
WY1998	(0:525)	(459:551)	(3:551)	(12:551)	(0:527)	(7:448)	(0:261)	(1:127)	(0:120)	(0:127)	(0:127)
WY1999	(0:502)	(485:581)	(0:589)	(10:589)	(4:504)	(20:501)	(1:244)	(0:126)	(0:112)	(0:126)	(0:125)
WY2000	(0:559)	(558:697)	(5:698)	(1:698)	(3:645)	(1:622)	(0:270)	(0:133)	(0:119)	(0:132)	(0:129)
WY2001	(0:490)	(455:637)	(2:637)	(1:637)	(1:489)	(3:485)	(1:186)	(0:101)	(0:77)	(0:101)	(0:100)
WY2002	(0:475)	(456:597)	(0:600)	(1:611)	(2:479)	(0:478)	(0:74)	(0:30)	(ND)	(0:29)	(0:25)
WY2003	(1:471)	(436:649)	(1:664)	(2:666)	(1:470)	(0:477)	(0:72)	(0:31)	(ND)	(0:35)	(0:31)
WY2004	(0:506)	(577:793)	(3:761)	(1:812)	(0:519)	(0:522)	(0:70)	(0:31)	(ND)	(0:35)	(0:31)
WY2005	(0:447)	(584:886)	(0:862)	(4:485)	(2:523)	(1:514)	(0:89)	(0:38)	(0:2)	(0:40)	(0:36)
WY2006	(0:443)	(718:905)	(1:907)	(1:919)	(0:569)	(0:562)	(0:74)	(0:32)	(ND)	(0:32)	(0:32)

First number indicates number of excursions; second number indicates total number of samples collected.

ND = no data

WY2006 (May 1, 2005 through April 30, 2006); 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 WY2006. Non-ECP annual monitoring summary tables that show the total number of excursions by individual monitoring location are presented in previous consolidated reports. **Table 2** summarizes the previously reported information and compares the results with WY2006. A summary of observed excursions from Class III criteria for individual non-ECP monitoring locations during WY2006 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 and additional upstream monitoring locations during WY2006 (May 1, 2005 through April 30, 2006).

AREA	STRUCTURE	SAMPLING SITE	PARAMETERS										
			Alkalinity	DO	Specific Conductance	pH	Turbidity	Un-Ionized Ammonia	Iron	Cadmium	Lead	Copper	Zinc
INTO	ACME1DS	ACME1DS	(0 : 15)	**(7 : 14)**	(0 : 15)	(0 : 15)	(0 : 15)	(0 : 15)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	ACME1 (Upstream of ACME1DS)	VOW1	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	G-94D	G94D	(0 : 16)	**(11 : 15)**	(0 : 16)	(0 : 16)	(0 : 16)	(0 : 16)	(0 : 5)	(0 : 2)	.	(0 : 2)	(0 : 2)
	ACME2 (Upstream of G94D)	VOW2	-ND-	-ND-	-ND-	-ND-	-ND-	(0 : 0)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-123	G123	(0 : 12)	**(47 : 50)**	(0 : 51)	**(1 : 50)**	(0 : 12)	(0 : 11)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-9	S9	(0 : 13)	**(49 : 51)**	(0 : 51)	(0 : 51)	(0 : 13)	(0 : 13)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-9A	S9A	(0 : 5)	**(48 : 50)**	(0 : 50)	(0 : 50)	(0 : 15)	(0 : 15)			.		
	S-18C	S18C	(0 : 19)	**(31 : 51)**	(0 : 49)	(0 : 51)	(0 : 20)	(0 : 20)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-174	S174	-ND-	**(12 : 12)**	(0 : 12)	(0 : 12)		(0 : 0)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-332D	S332D	(0 : 5)	**(46 : 49)**	(0 : 50)	(0 : 51)	(0 : 26)	(0 : 24)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-140	S140	(0 : 20)	**(33 : 50)**	(0 : 51)	(0 : 50)	(0 : 20)	(0 : 20)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-190	S190	(0 : 18)	**(10 : 20)**	(0 : 20)	(0 : 20)	(0 : 18)	(0 : 18)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	NSID1	S38B	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
		NSIDSP01		**(0 : 27)**	(0 : 26)	(0 : 31)		(0 : 0)			.		
WITHIN	G-64	G64	No Data (Structure Closed)										
	G-69	G69	No Data (Structure Closed)										
	S-346, S-347	S12D	(0 : 21)	**(20 : 22)**	(0 : 22)	(0 : 23)	(0 : 21)	(0 : 21)	(0 : 4)		.		
	S-141	S34	Same as Data for S34 Shown Below										
	S-142	S142	(0 : 22)	**(17 : 22)**	(0 : 22)	(0 : 21)	(0 : 22)	(0 : 20)			.		
	S-143	S11A	(0 : 24)	**(12 : 24)**	(0 : 24)	(0 : 23)	(0 : 24)	(0 : 22)			.		
	S-144	S144	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-145	S145	(0 : 15)	**(8 : 15)**	(0 : 15)	(0 : 14)	(0 : 15)	(0 : 13)			.		
	S-146	S146	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-151	S151	(0 : 16)	**(14 : 16)**	(0 : 16)	(0 : 16)	(0 : 16)	(0 : 15)			.		
	S-333	S333	(0 : 20)	**(23 : 26)**	(0 : 27)	(0 : 28)	(0 : 20)	(0 : 26)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-339, S-340	C123SR84	(0 : 17)	**(12 : 17)**	(0 : 17)	(0 : 16)	(0 : 17)	(0 : 16)			.		
	S-175	S175	(0 : 6)	**(13 : 16)**	(0 : 15)	(0 : 16)	(0 : 7)	(0 : 7)	(0 : 2)	(0 : 1)	.	(0 : 1)	(0 : 1)
	S-332	S332	(0 : 5)	**(14 : 16)**	(0 : 15)	(0 : 16)	(0 : 6)	(0 : 6)	(0 : 2)	(0 : 1)	.	(0 : 1)	(0 : 1)
	BERMB3	BERMB3	(0 : 3)	**(9 : 10)**	(0 : 9)	(0 : 10)	(0 : 10)	(0 : 10)	(0 : 2)	(0 : 1)	.	(0 : 1)	(0 : 1)
FROM	G-94A, G-94B, G-94C	G94B	(0 : 13)	**(9 : 12)**	(0 : 13)	(0 : 13)	(0 : 13)	(0 : 13)	(0 : 1)		.		
	S-31, S-337	S31	(0 : 14)	**(12 : 14)**	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 14)			.		
	S-34	S34	(0 : 21)	**(14 : 21)**	(0 : 21)	(0 : 20)	(0 : 21)	(0 : 19)			.		
	S-38	S38	(0 : 22)	**(20 : 22)**	(0 : 22)	(0 : 21)	(0 : 22)	(0 : 20)			.		
	S-39	S39	(0 : 13)	**(6 : 11)**	(0 : 13)	(0 : 13)	(0 : 13)	(0 : 13)			.		
	S-197	S197	(0 : 3)	**(2 : 4)**	**(1 : 4)**	(0 : 5)	(0 : 5)	(0 : 4)			.		
	S-334	S334	(0 : 3)	**(10 : 20)**	(0 : 20)	(0 : 22)	(0 : 21)	(0 : 14)	(0 : 3)		.		
	S-343A, S-343B	US41-25	(0 : 19)	**(28 : 28)**	(0 : 28)	(0 : 27)	(0 : 19)	(0 : 18)			.		
	S-344	S344	(0 : 2)	**(3 : 4)**	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 2)	(0 : 2)		.		
C111 Basin	S-176	S176	(0 : 11)	**(20 : 22)**	(0 : 23)	(0 : 23)	(0 : 14)	(0 : 19)	(0 : 5)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-177	S177	(0 : 21)	**(21 : 32)**	(0 : 30)	(0 : 32)	(0 : 22)	(0 : 25)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-178	S178	(0 : 13)	**(11 : 15)**	(0 : 13)	(0 : 15)	(0 : 13)	(0 : 13)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-331, S-173	S331-173	(0 : 6)	**(32 : 32)**	(0 : 32)	(0 : 33)	(0 : 26)	(0 : 32)			.		
	S-332B	S332B	(0 : 5)	**(47 : 47)**	(0 : 48)	(0 : 48)	(0 : 24)	(0 : 24)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-332C	S332C	(0 : 5)	**(47 : 48)**	(0 : 49)	(0 : 49)	(0 : 25)	(0 : 24)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
Totals			(0 : 443)	**(718:905)**	**(1 : 907)**	**(1 : 919)**	(0 : 569)	(0 : 562)	(0 : 74)	(0 : 32)	.	(0 : 32)	(0 : 32)

1st number in parenthesis indicates number of excursions. 2nd number in parenthesis indicates total number of samples collected. Bold numbers indicate excursions from state class III criteria. -ND- indicates that no data was collected.

For parameters that exceeded Class III criteria during WY2006, time series plots and box whisker plots are provided in Appendix 3A-4c. 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

DO concentrations exhibited consistent excursions from Class III criteria during WY2006 (**Table 3**). About 79 percent (718 out of 905 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 WY2006 are consistent with the concentration levels and the frequency of excursions observed in previous water years, and there is a slight increase for DO excursions in WY2006 compared with WY2005 (that is, 79 percent versus 66 percent). The DO excursions occurred at most locations, and the DO time series and box and whisker plots are shown in Appendix 3A-4c.

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 907 samples collected from the monitoring sites. Of these samples, Less than one percent (1 sample out of 907) exhibited an excursion exceeding the Class III criteria for specific conductance at S-197 [1,999 microhms per centimeter (µmhos/cm)]. The criteria for Class III waters requires that specific conductance not exceed a level greater than 50 percent above background, or 1,275 µmhos/cm, whichever is greater. The specific conductance data for S-197 are plotted in Appendix 3A-4c.

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 WY2006, excursions from the pH criterion occurred in less than 1 percent (1 sample out of 907) of the samples collected. As shown in **Table 3**, only one excursions with a pH greater than 8.5 units were observed at the G-123 (pH = 8.7) site. The pH data for G-123 are plotted in Appendix 3A-4c.

ALKALINITY

The criterion for Class III waters requires that alkalinity not measure below 20 mg/L. Alkalinity was measured in 443 samples taken during WY2006. None of these samples were 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 569 samples collected during WY2006. The majority of the data are characterized by low turbidity values. None of the 569 samples were flagged as a potential excursion. Turbidity does not appear to be a parameter of concern because no excursion had occurred among all station.

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. None of the 562 samples analyzed for un-ionized ammonia at all locations during WY2006 had concentrations that exceeded its criterion of 0.02 mg/L. In previous non-ECP monitoring reports, this parameter was occasionally identified as a potential concern.

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 WY2006 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 3A-4a 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 WY2006, auto-samplers collected TP samples at the ACME1, ACME2, S-9, S-9A, S-18C, S-190, S-140, NSID1 (NSIDSP01), S-332D, and G-123 pump structures. The samples collected at the G-123 station and NSID1 were not associated with flow, as there was no flow at these stations in WY2006. 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 S-332B and S-332C 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 WY2006 (the ninth year of non-ECP permit monitoring) are plotted in time series and notched box and whisker plots in Appendix 3A-4d. The plots are designed to provide a comparison of TP concentration data between WY2006 and previous periods (WY2005, 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 WY2006, 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 3A-4b, Table 3. (Grab and auto-sampler data are reported separately.) A discussion of the TP concentration data observed during WY2006 is provided below.

"INTO" STRUCTURES

Some of the highest TP concentrations for non-ECP structures discharging directly to the EPA during WY2006 were observed for the monitoring locations at Feeder Canal (S-190) and the ACME Improvement District (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).

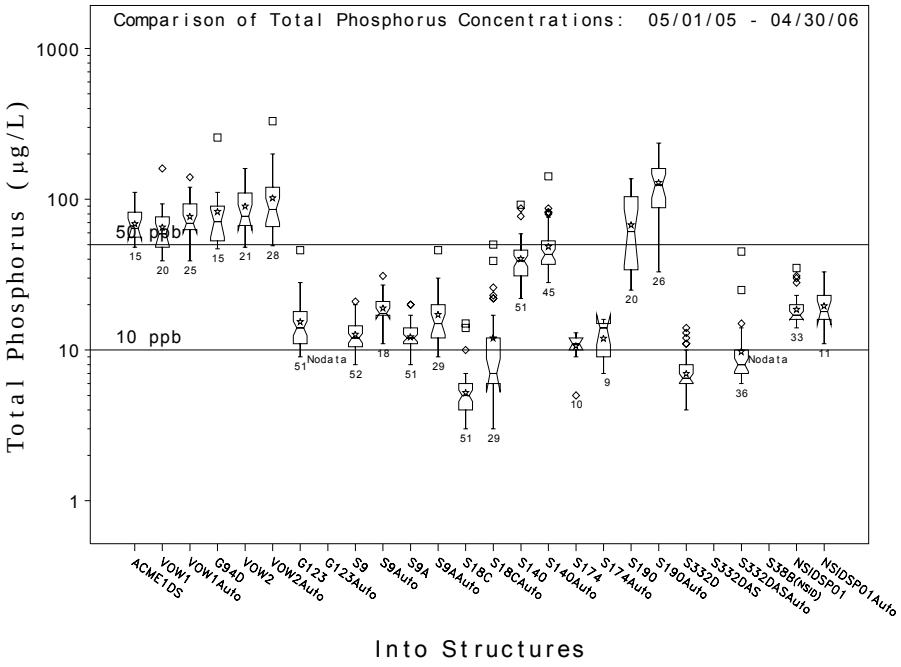


Figure 2a. Comparison of TP concentrations for "into" structures during WY2006.

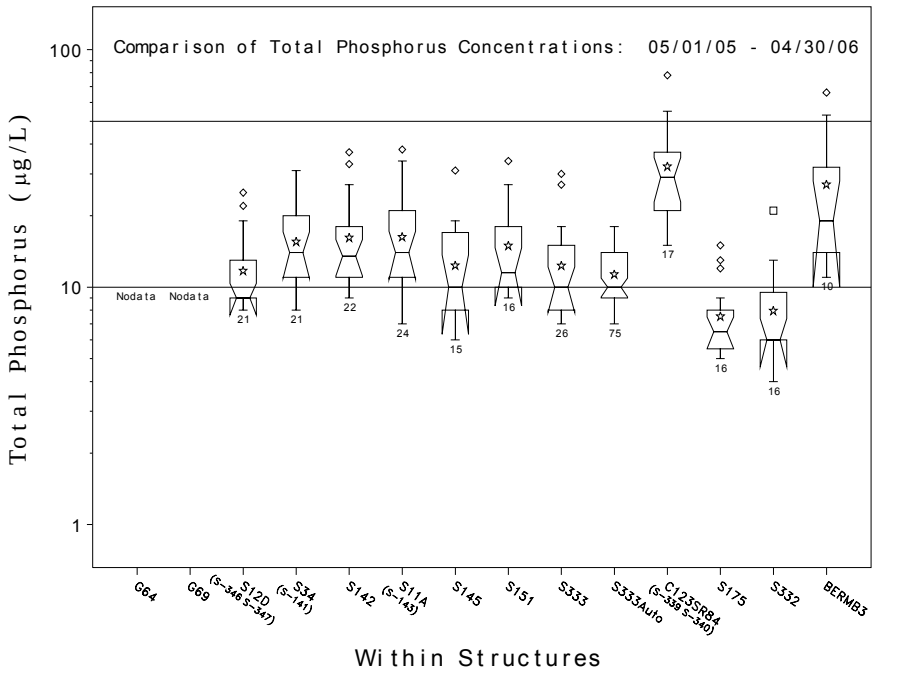


Figure 2b. Comparison of TP concentrations for "within" structures during WY2006.

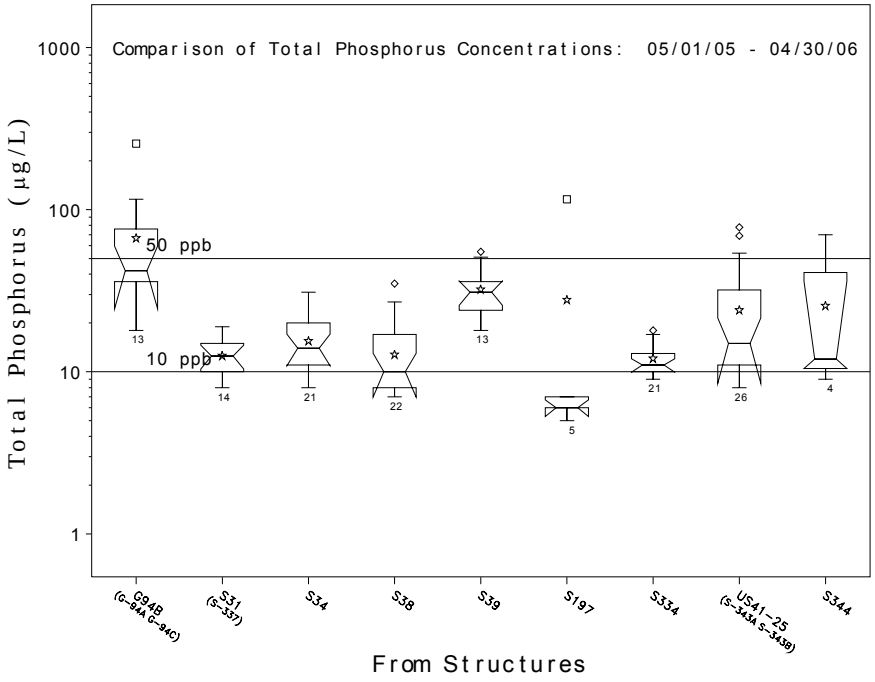


Figure 2c. Comparison of TP concentrations for "from" structures during WY2006.

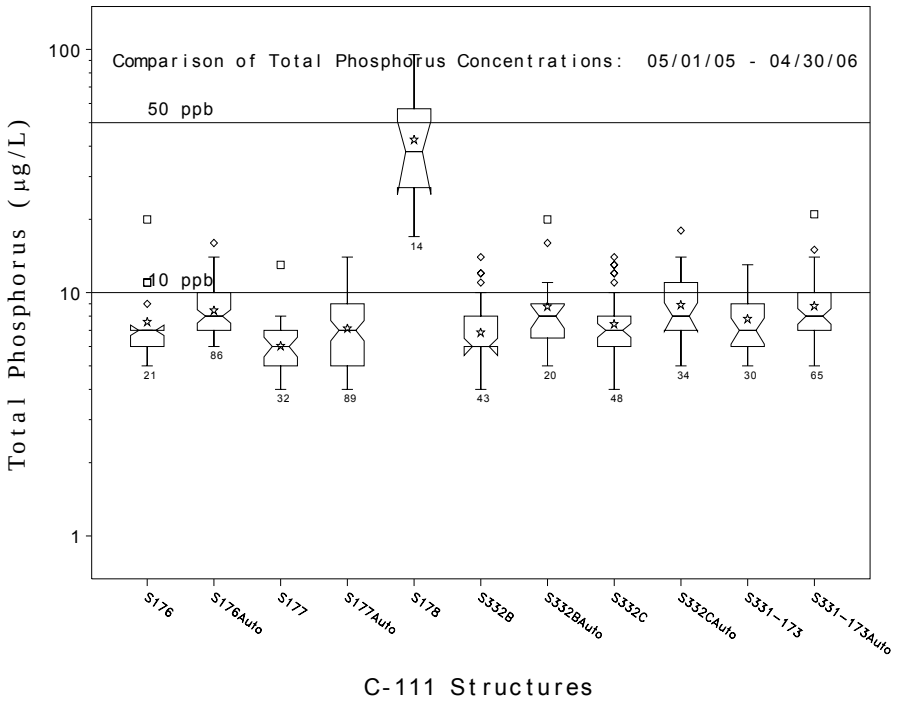


Figure 2d. Comparison of TP concentrations for C-111 structures during WY2006.

The ACME1DS and G-94D culverts, operated by 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. Fifteen District data collection trips to the ACME1DS and G-94D monitoring locations resulted in nine sampled flow events at both culverts. The monitoring agreement with VOW resulted in a sufficient number of samples (45 at VOW1 and 49 at VOW2) collected by both grab and auto-sampler techniques upstream of the pump stations to cover a broad range of flows (43 samples at VOW1 and 48 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 77 ppb for grab and 93 ppb for auto-samplers, with median TP values ranging between 59 ppb (grab) and 69 ppb (auto). More than 75 percent of the data collected at the upstream VOW2 monitoring sites were below 105 ppb (grab) and 67 ppb (auto), with median TP values ranging between 77 ppb (grab) and 67 ppb (auto). Discharge data were not available for the ACEM1DS and G-94D culverts, although discharge data from the upstream pump stations during WY2006 [14,161 acre-feet (ac-ft) for ACME1, and 12,767 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 61 ppb (grab) and 125 ppb (auto) at S-190, and 39 ppb (grab) and 43 ppb (auto) at S-140. During WY2006, structure S-190 discharged 150,359 ac-ft, and S-140 discharged 203,575 ac-ft into the western portion of Water Conservation Area 3A (WCA-3A).

The lowest TP concentrations were observed in the C-111 Basin at structures S-177, S-331 S-173, S-332D, and S-174. S-174 and S-332D structures are now modified as “into” structures; S-175, S-332, and Berm B3 are modified as “within” structures. 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 7 ppb (auto) for S-18C; 11 ppb (grab) and 14 ppb (auto) for S-174; and 7 ppb (grab) and 8 ppb (auto) for S-332D. Seventy-five percent of these samples had concentrations below 6 ppb (grab) and 12 ppb (auto) for S-18C, 12 ppb (grab) and 15 ppb (auto) for S-174, and 8 ppb (grab) and 10 ppb (auto) for S-332D. During WY2006, 9,203 ac-ft was discharged for S-174 and 153,803 ac-ft for S-332D to the Park. The S-18C structure discharged approximately 188,505 ac-ft to the lower C-111 Canal, which was significantly increased from last year (100,689 ac-ft). The S-178 structure had a median concentration of 38 ppb for the grab samples, the highest TP concentration in the C-111 Basin, with discharge of 8,190 ac-ft.

Structures S-9, S-9A (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 15 ppb for 75 percent of the data, a median concentration of 12 ppb, and a maximum concentration of 21 ppb (**Figure 2a**). Conversely, 75 percent of the data collected by the auto-sampler at S-9 is below 21 ppb, with a median concentration of 18 ppb and a maximum concentration of 31 ppb. The notched box and whisker plot for S-9A, which is based on grab-sample data, indicates a TP concentration of less than 14 ppb for 75 percent of the data, a median concentration of 12 ppb, and a maximum concentration of 20 ppb (**Figure 2a**). However, 75 percent of the data collected by the auto-sampler at S-9A is below 20 ppb, with a median concentration of 15 ppb and a maximum concentration of 46 ppb. G-123 exhibits a maximum concentration of 46 ppb for grab samples. The monitoring schedule for structure G-123 requires biweekly grab sampling during flow events; otherwise, the samples are collected monthly. There was no flow during WY2006 at G-123; therefore, there was no sample collected from the auto-sampler. During WY2006, 51 grab

samples were collected. The TP values for these grab samples had a median concentration of 14 ppb. Seventy-five percent of the G-123 data with TP of 18 ppb (grab) had a maximum concentration of 46 ppb for grab samples.

The North Springs Improvement District (NSID) operates several pumps at two pump stations to remove excess runoff from the basin, but only NSID Pump Station 1 is capable of discharge to the EPA. The flow-proportional auto-sampler and data recorder monitor flow both to the EPA and the Hillsboro Canal. The surface water quality monitoring program has continued at the water quality monitoring station S-38B, downstream of the NSID Pump Station 1, there was no flow at NSID into WCA-2A during WY2006. Results from S-38B and upstream data from NSIDSP01 are reported in the Chapter 3A of this volume. A more complete presentation of the results from these stations can be found in this volume's Appendix 3A-4b, Table 3, and Appendix 3A-4e. During WY2006, there was no TP data at S-38B. TP concentration for grab samples at the NSIDSP01 site during WY2006 varied between 14 ppb and 35 ppb for grab sample and varied between 11 ppb and 33 ppb for auto-samples. The data at this pump station is representative of flow to the EPA and also to the Hillsboro Canal. Flow weighted TP concentration can not be calculated because no flow during WY2006.

During WY2006, 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 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, and BFBMFSP. In September 2005, the Gayler property pumps relating to monitoring stations BFBMFNP and BFBMFCP were voluntarily removed. Another station, BFBWNCP, was removed from the basin prior to WY2004 by the owner voluntarily relocating the pump. 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 structures discharging in or adjacent to the EPA have been obtained during times of flow. The data are provided in Appendix 3A-4e of this volume. During the previous year, this basin showed extremely high TP concentrations (mean concentrations of 973 ppb for the 16 samples collected). 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.

"WITHIN" STRUCTURES

For structures discharging "within" the EPA during WY2006, 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 S-346 and S-347. The median TP concentrations at these monitoring locations were 9 ppb and 10 ppb at S-12D and S-333, respectively, with 75 percent of the data below 13 ppb for S-12D and 15 ppb for S-333. The maximum concentration observed was 25 ppb for S-12D and 30 ppb at S-333, respectively. The discharge volumes for the period were 421,622 ac-ft for S-12D and 169,686 ac-ft for S-333.

Structures S-145 and S-146 usually operate simultaneously to convey discharges from WCA-2A to WCA-2B. Maximum concentration was 31 ppb, median value was 10 ppb, and 75 percent of the data (15 samples) were below 17 ppb at S-145. Discharge volumes ranged from 432 ac-ft at S-145 to 18,203 ac-ft at S-146.

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 8 ppb to 31 ppb, with a median value of 14 ppb.

The highest TP concentrations were observed at the monitoring site C123SR84, the surrogate location for structures S-339 and S-340. TP concentrations at C123SR84 ranged from 15 ppb to 78 ppb, with a median value of 29 ppb. Structure S-151 discharged approximately 282,289 ac-ft during WY2006. TP concentrations ranged from 9 ppb to 34 ppb, with a median value of 12 ppb. Structures S-339 and S-340, located upstream of S-151 in the Miami Canal, discharged about 104,048 ac-ft at S-339 and 180,406 ac-ft at S-340.

The lowest TP concentrations were observed at the monitoring site S-332 and S-175 and BERMB3 structures. TP concentrations at S-332 ranged from 4 ppb to 21 ppb, with a median value of 6 ppb. Structure S-332 discharged only 5 ac-ft during WY2006. TP concentrations at S-175 ranged from 5 ppb to 15 ppb, with a median value of 7 ppb. Structure S-175 discharged 2,071 ac-ft during WY2006. TP concentrations at BERMB3 ranged from 11 ppb to 66 ppb, with a median value of 19 ppb. There was no discharge at BERMB3 during WY2006.

"FROM" STRUCTURES

The TP concentrations collected during WY2006 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 18 ppb to 256 ppb. The median TP concentration at this structure was 42 ppb, with 75 percent of the data below 76 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 Lake Worth Drainage District (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 has always 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 24,179 ac-ft (Appendix 3A-4a, Table 2). Water supply releases to LWDD canals during WY2006 were 2 ac-ft at G-94A and 7,558 at G-94B.

The next highest TP concentrations were observed at S-39, with TP concentrations ranging from 18 ppb to 55 ppb, with a median value of 31 ppb. The structure discharged approximately 57,106 ac-ft during WY2006. During that period, 21 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 11 ppb.

For the remainder of the "from" structure monitoring locations (S-31, S-34, S-38, S-344, S-337, S-343A, and S-343B), 75 percent of the observed TP concentrations were below 41 ppb, with median values ranging from 10 ppb to 15 ppb.

C-111 BASIN UPSTREAM STRUCTURES

Structures S-176, S-177, S-178, S-332B, S-332C, and S-331/S-173, shown in **Figure 2d**, are C-111 Basin structures located upstream of "into" structures S-18C, S-332D, and S-174. Auto samplers were installed at S-176, S-177, S-178, S-331/S-173, S-332B, and S-332C sites. For S-176, S-177, and S-331/S-173, 75 percent of the TP concentration data collected for

these structures was below 10 ppb, with the median values ranging between 6 ppb and 8 ppb. The maximum TP measured at S-178 was 95 ppb, with a median TP concentration of 38 ppb for grab samples, which was significantly higher than the rest of the C-111 Basin upstream structures. S-332B discharged 137,510 ac-ft water to the detention area with median TP concentration of 6 ppb for grab samples and 8 ppb for auto-samplers. S-332C discharged 79,138 ac-ft water to the detention area, with median TP concentration of 7 ppb for grab samples and 8 ppb for auto-samplers.

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 WY2006. 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 WY2006 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 WY2006 are provided in Appendix 3A-4a, Table 2.

A more detailed analysis of the WY2006 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 same value was obtained at ACME1DS (75 ppb), VOW1 (80 ppb), and S-9 (19 ppb). Slightly different results for the G-94D site (103 ppb versus 107 ppb), VOW2 site (112 ppb versus 116 ppb), and S-190 site (153 ppb versus 155 ppb) were obtained.

Table 4 presents the results for the flow-weighted mean TP concentrations at "into" sites during WY2006. The highest flow-weighted mean TP concentration for the "into" structures during WY2006 was observed at S-190 (the Feeder Canal), ACME2, and G-94D pump stations, followed ACME1, 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-175 and S-18C 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.

Table 4. Annual flow-weighted mean TP concentrations for WY2006.

Hydrologic Basin	Structure	Water Quality Station ID	Total Flow Volume (ac-ft)	Number of Days with Positive Flow	Sample Type	Sample Size (Grab)	Arithmetic Average (Grab) (ppb)	Sample Size (Comp)	Flow-Weighted Mean[1] Concentration (ppb)	Flow-Weighted Mean[2] Concentration (ppb)	TP Load (kg)
ACME Improvement District	ACME1DS	ACME1DS	14,161[3]	93[3]	G	15	69	0	75[4]	75[4]	1,309
	ACME1	VOW1	14,161	93	A, G	20	66	25	80	80	1,403
	G-94D	G94D	12,767[3]	110[3]	G	15	83	0	103[4]	107[4]	1,679
	ACME2	VOW2	12,767	110	A, G	21	90	28	112	116	1,832
North Springs Improvement District (NSID)	NSID1	NSIDSP01	0	0	A, G	33	19	12	NDF	NDF	0
		S-38B (WCA-2A near NSID1)	0[5]	0[5]	G	0	0	0	NDF	NDF	0
North New River Canal	G-123	G123	0	0	A, G	51	15	0	N/F	N/F	0
C-11 West	S-9	S9	128,470	91	A, G	18	13	19	19	19	3,055
	S-9A	S9A	61,345	186	A, G	51	12	29	16	16	1,207
C-111	S-174	S174	9,203	50	A, G	10	11	9	14	14	156
	S-332D	S332D	153,803	279	A, G	48	7	36	10	11	2,055
	S-18C	S18C	188,505	228	A, G	51	5	29	13	14	3,298
L-28	S-140	S140	203,575	219	A, G	51	41	45	49	50	12,507
Feeder Canal	S-190	S190	150,359	212	A, G	20	68	26	153	155	28,717
Boynton Farms	Various[6]	Various[6]	N/D	N/D	G	0	N/D	N/D	N/D	N/D	N/D

1 Based on days of flow and monitored TP data only

2 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 ACME1DS and G94D culverts, respectively

4 Calculated using the flow data at upstream structures

5 Flow data from upstream structure NSIDSP01 is representative of flow into the EPA at S-38B

6 Pumps that have no flow recording devices attributed include the following: BFBAFCP, BFBAFNP, BFBAFSP, BFBDFCP, BFBDFNP, BFBDFSP, BFBDFWP, and BFBMFSP.

G Samples collected by grab sampling methodology

A Samples collected by automatic composite samples

NDF No data with flow available

N/F No flow

N/D No data available

PESTICIDE MONITORING

Pesticides in Surface Water and Sediment

The quarterly surface water and semiannual sediment pesticide sampling events at the 14 non-ECP sites (**Figure 3**) for WY2006 were conducted during May 2005, April 2005, December 2005, and January 2006. 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 of 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 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 under Section 304 (a) of the Clean Water Act, 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 WY2006. 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 WY2006. 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 bromacil were detected at several locations at levels of "potential concern."

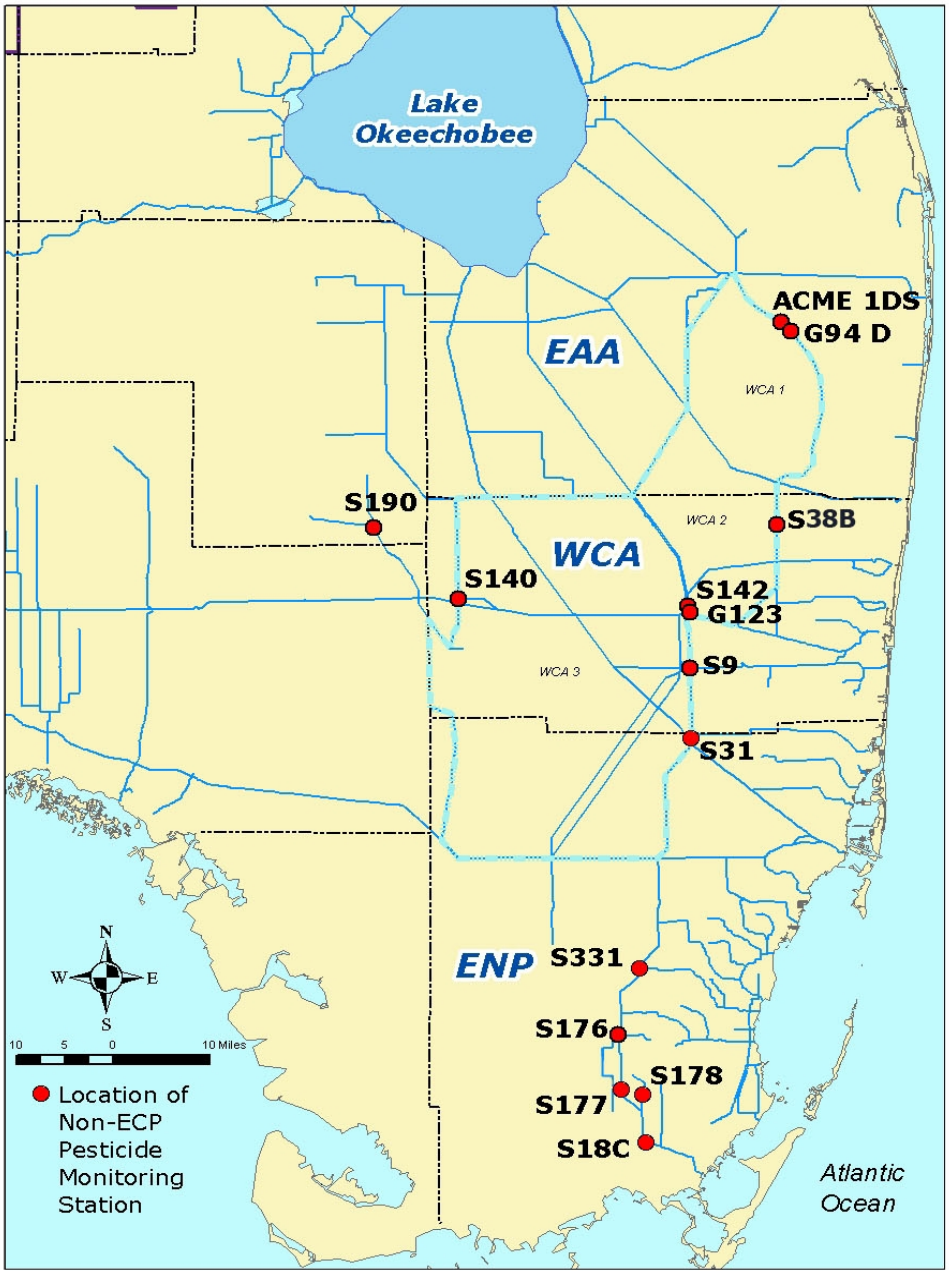


Figure 3. Pesticide monitoring network for non-ECP structures.

Table 5. Method detection limits (MDLs) and practical quantitation limits (PQLs) for pesticides determined in May 2005.

Pesticide or metabolite	Water: range of MDLs PQLs (µg/L)	Sediment: range of MDLs - PQLs (µg/Kg)	Pesticide or metabolite	Water: range of MDLs PQLs (µg/L)	Sediment: range of MDLs PQLs (µg/Kg)
2,4-D	0.2 - 0.6	8.3 - 210	endosulfan sulfate	0.0046 - 0.11	0.83 - 27
2,4,5-T	0.2 - 0.6	8.3 - 210	endrin	0.0095 - 0.04	2.1 - 68
2,4,5-TP (silvex)	0.2 - 0.6	8.3 - 210	endrin aldehyde	0.0042 - 0.018	0.83 - 27
acifluorfen	0.2 - 0.6	8.3 - 210	ethion	0.0095 - 0.04	2.1 - 68
alachlor	0.048 - 0.21	25 - 800	ethoprop	0.0095 - 0.04	2.1 - 68
aldrin	0.0019 - 0.0084	0.42 - 14	fenamiphos (nemacur)	0.038 - 0.16	8.3 - 270
ametryn	0.0095 - 0.072	2.1 - 68	fonofos (dyfonate)	0.019 - 0.084	4.2 - 140
atrazine	0.0095 - 0.19	2.1 - 68	heptachlor	0.0023 - 0.010	0.42 - 14
atrazine desethyl	0.0095 - 0.068	N/A	heptachlor epoxide	0.0019 - 0.0084	0.42 - 14
atrazine desisopropyl	0.0095 - 0.068	N/A	hexazinone	0.0095 - 0.19	2.1 - 68
azinphos methyl (guthion)	0.019 - 0.084	6.2 - 200	imidacloprid	0.2 - 0.6	N/A
α BHC (alpha)	0.0021 - 0.038	0.42 - 14	linuron	0.2 - 0.6	8.3 - 200
β BHC (beta)	0.0032 - 0.014	0.42 - 35	malathion	0.029 - 0.12	6.2 - 200
δ BHC (delta)	0.0019 - 0.0084	0.83 - 27	metalaxyl	0.048 - 0.21	N/A
γ BHC (gamma) (lindane)	0.0019 - 0.0084	0.42 - 14	methamidophos	N/A	21 - 680
bromacil	0.038 - 0.16	8.3 - 270	methoxychlor	0.0095 - 0.044	2.1 - 68
butylate	0.019 - 0.084	N/A	metolachlor	0.057 - 0.25	21 - 680
carbophenothion (trithion)	0.015 - 0.064	2.1 - 68	metribuzin	0.019 - 0.084	4.2 - 140
chlordane	0.019 - 0.084	6.2 - 200	mevinphos	0.057 - 0.25	8.3 - 270
chlorothalonil	0.015 - 0.064	2.1 - 68	mirex	0.011 - 0.048	1.7 - 56
chlorpyrifos ethyl	0.0095 - 0.04	2.1 - 68	monocrotophos (azodrin)	N/A	21 - 680
chlorpyrifos methyl	0.0095 - 0.04	4.2 - 140	naled	0.076 - 0.33	33 - 1,100
cypermethrin	0.019 - 0.084	2.1 - 68	norflurazon	0.019 - 0.084	4.2 - 140
DDD-P,P'	0.0046 - 0.020	0.83 - 27	parathion ethyl	0.019 - 0.084	6.2 - 200
DDE-P,P'	0.0038 - 0.023	0.83 - 27	parathion methyl	0.019 - 0.084	6.2 - 200
DDT-P,P'	0.0057 - 0.025	1.2 - 40	PCB	0.019 - 0.084	8.3 - 600
demeton	0.11 - 0.48	42 - 1,400	permethrin	0.015 - 0.064	2.5 - 80
diazinon	0.019 - 0.084	4.2 - 140	phorate	0.0095 - 0.04	2.1 - 68
dicofol (kelthane)	0.042 - 0.18	6.2 - 200	prometryn	0.019 - 0.084	6.2 - 200
dieldrin	0.0019 - 0.0084	0.42 - 21	prometon	0.019 - 0.084	N/A
disulfoton	0.019 - 0.084	4.2 - 140	simazine	0.0095 - 0.04	2.1 - 68
diuron	0.2 - 0.6	8.3 - 200	toxaphene	0.095 - 0.40	31 - 1,000
α endosulfan (alpha)	0.0038 - 0.016	0.42 - 24	trifluralin	0.0076 - 0.033	1.7 - 56
β endosulfan (beta)	0.0038 - 0.016	0.42 - 14			

N/A - not analyzed

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

Common Name	48 hr EC_{50} Water flea				96 hr LC_{50} Fathead Minnow (#)				96 hr LC_{50} Bluegill			
	Daphnia magna		acute toxicity (*)	chronic toxicity (*)	*Pimephales Promelas*		acute toxicity	chronic toxicity	*Lepomis macrochirus*		acute toxicity	chronic toxicity
ametryn	28,000	(6)	9,333	1,400	-		-	-	4,100	(4)	1,367	205
atrazine	6,900	(6)	2,300	345	15,000	(6)	5,000	750	16,000	(4)	5,333	800
bromacil	-		-	-	-		-	-	127,000	(6)	42,333	6,350
DDE, p,p'	-		-	-	-		-	-	240	(1)	80	12
diuron	1,400	(6)	467	70	14,200	(6)	4,733	710	5,900	(4)	1,967	295
endosulfan	166	(6)	55	8	1	(1)	0.3	0.05	1	(1)	0.33	0.05
	-		-	-	-		-	-	2	(3)	0.67	0.10
ethoprop	93	(6)	31	4.7	-		-	-	-		-	-
hexazinone	151,600	(6)	50,533	7,580	274,000	(4)	91,333	13,700	100,000	(6)	33,333	5,000
metolachlor	23,500	(6)	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	(6)	5,000	750	-		-	-	16,300	(6)	5,433	815
simazine	1,100	(6)	367	55	100,000	(6)	33,333	5,000	90,000	(4)	30,000	4,500

(*) 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 percent of the test organisms in 96 hours, where the 96 hour LC_{50} 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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(2) U.S. Environmental Protection Agency. 1977. Silvacultural Chemicals and Protection of Water Quality. Seattle, WA. EPA-910/9-77-036.

(3) Schneider, B.A., ed. 1979. Toxicology Handbook, Mammalian and Aquatic Data, Book 1: Toxicology Data. U.S. Environmental Protection Agency. U.S. Government Printing Office. Washington, D.C. EPA-5400/9-79-003.

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Table 6. Continued.

Common Name	96 hr LC_{50} Largemouth Bass				96 hr LC_{50} Rainbow Trout (#)				96 hr LC_{50} Channel Catfish			
	Micropterus salmoides		acute toxicity	chronic toxicity	*Oncorhynchus mykiss*		acute toxicity	chronic toxicity	*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	(6)	12,000	1,800	-		-	-
DDE, p,p'	-		-	-	32	(1)	10.7	1.6	-		-	-
diuron	-		-	-	5,600	(4)	1,867	280	-		-	-
endosulfan	-		-	-	1	(1)	0.33	0.050	1	(1)	0.3	0.05
	-		-	-	3	(2)	1	0.15	1.5	(6)	0.5	0.08
	-		-	-	1	(3)	0.33	0.050	-		-	-
	-		-	-	0.3	(5)	0.10	0.015	-		-	-
ethoprop	-		-	-	13,800	(4)	4,600	690	-		-	
hexazinone	-		-	-	180,000	(6)	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	(6)	2,700	405	>200,000	(4)	>67,000	>10,000
simazine	-		-	-	100,000	(6)	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 percent of the test organisms in 96 hours, where the 96 hour LC_{50} 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.

(1) Johnson, W.W. and M.T. Finley. 1980. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. U.S. Department of the Interior, Fish and Wildlife Service Resource Publication 137. Washington, D.C.

(2) U.S. Environmental Protection Agency. 1977. Silvacultural Chemicals and Protection of Water Quality. Seattle, WA. EPA-910/9-77-036.

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(5) Montgomery, J.H. 1993. Agrochemicals Desk Reference: Environmental Data. Lewis Publishers. Chelsea, MI.

(6) U.S. Environmental Protection Agency. 1991. Pesticide Ecological Effects Database. Ecological Effects Branch, Office of Pesticide Programs. Washington, D.C.

Table 7. Pesticide detections and excursions for surface water samples collected from May 2005 to January 2006.[1]

Compound	Structure	ACME1DS	G-94D	G-123	S-9	S-18C	S-140	S-190	S-38B	S-142	S-31	S-176	S-177	S-178	S-331/S-173
ametryn		4:0:0	3:0:0	4:0:0	1:0:0	---	---	---	3:0:0	3:0:0	---	---	---	---	---
atrazine		0:4:0	1:3:0	1:3:0	1:1:0	2:1:0	2:0:0	1:0:0	0:4:0	1:2:0	1:1:0	1:2:0	2:1:0	2:0:0	1:1:0
atrazine desethyl		2:0:0	1:0:0	1:0:0	1:0:0	---	1:0:0	---	0:4:0	1:0:0	1:0:0	---	1:0:0	---	---
atrazine desisopropyl		---	---	---	---	---	---	---	2:0:0	---	---	---	---	---	---
diuron		---	1:1:0	---	---	---	---	---	---	---	---	---	---	---	---
ethoprop		---	---	---	---	---	---	---	---	---	---	---	---	1:0:0	---
alpha endosulfan		---	---	---	---	---	---	---	---	---	---	1:0:0	0:1:0	2:0:0	---
beta endosulfan		---	---	---	---	---	---	---	---	---	---	1:0:0	1:0:0	---	---
endosulfan sulfate		---	---	---	---	---	---	---	---	---	---	1:0:0	1:0:0	0:4:0	---
hexazinone		1:3:0	0:4:0	---	---	---	0:1:0	---	---	1:0:0	---	---	---	---	1:0:0
metolachlor		---	---	---	---	---	---	1:0:0	---	---	---	---	---	---	---
naled		---	1:0:0	---	---	---	---	---	---	---	---	---	---	---	---
norflurazon		---	---	---	---	---	2:2:0	3:0:0	---	---	---	---	---	---	---
simazine		---	---	---	---	---	---	---	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 May 2005 and December 2005.[1]

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

[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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