

# Quality Assessment Report for Water Quality Monitoring

October - December 2006



**Submitted to the  
Technical Oversight Committee (TOC)  
on  
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## Introduction

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This report assesses the South Florida Water Management District (SFWMD) laboratory analysis and field sampling for total phosphorus (TP) monitoring during the fourth quarter of 2006, primarily for the following projects/stations:

- Conservation Area Inflow and Outflows (CAMB) S12A, S12B, S12C, S12D and S333
- Everglades National Park (ENP) Inflow Monitoring S174, S176, S177, S18C and S332D
- Everglades Protection Area (EVPA) LOX3 to LOX16
- Non-Everglades Construction Project (NECP) S334

Because the SFWMD laboratory collects Quality Control (QC) field samples during trips that include multiple-project samples for specific stations, this report may also cover information on stations or projects other than those listed above.

Because stations S175 and S332 are not included in the list of compliance stations for the Technical Oversight Committee (TOC), these stations are not included in the *Field Sampling Quality Assessment* section in this report.

The SFWMD *Field Sampling Quality Manual* specifies the minimum requirements for field sample collection. The SFWMD *Laboratory Quality Manual* specifies the minimum requirements for laboratory sample preparation and analysis, as well as data verification and validation. The *Field Sampling Quality Assessment* and *Laboratory Analysis Quality Assessment* sections in this report contain the results of laboratory and field QC during this quarter.

This report includes a one-year analysis of the SFWMD laboratory's performance on split and inter-laboratory studies with The Florida Department of Environmental Protection (FDEP) and other laboratories for three selected projects (EVPA, C111 and Everglades TP Round Robins). The report also includes the results of the U.S. Geological Survey Analytical Evaluation Program for Standard Reference Samples and National Proficiency Testing.

## Field Sampling Quality Assessment

### PROCEDURE UPDATES

The SFWMD did not update any major procedures related to TP collection during the fourth quarter of 2006.

### FIELD AUDIT

The SFWMD did not conduct any field audits on TOC related projects during the fourth quarter of 2006.

### MISSING DATA

**Table 1** lists missing data for the reporting period from 10/1/06 to 12/31/06. Missing data may not be available due to collection problems in the field or sample submission to the laboratory. Out of 22 missing data, 20 were not collected due to either lack of flow, structure maintenance or shallow water depth. The laboratory cancelled analyses for two samples collected at S333 and S332D because of improper sample preservation.

**Table 1.** Missing Data for the Period 10/1/06 to 12/31/06.

Project	Collection Date	Station	Comments
CAMB	10/10/2006	S333	Sample cancelled by the laboratory because of improper preservation.
ENP	10/11/2006	S174	No flow, no sample collected.
ENP	10/11/2006	S176	No flow, no sample collected.
C111D	10/11/2006	S332D	No flow, no sample collected.
ENP	10/18/2006	S174	No flow, no sample collected.
C111D	10/18/2006	S332D	No flow, no sample collected.
NECP	10/24/2006	S334	No flow, no sample collected.
ENP	10/30/2006	S18C	No flow, no sample collected.
C111D	11/8/2006	S332D	Sample cancelled by the laboratory because of improper preservation.
ENP	11/15/2006	S174	No flow, no sample collected.
ENP	11/27/2006	S18C	No flow, no sample collected.
CAMB	11/28/2006	S12A	No flow, no sample collected.
CAMB	11/28/2006	S12B	No flow, no sample collected.
EVPA	12/11/2006	LOX3	Total depth less than 0.10m. No sample collected.
EVPA	12/11/2006	LOX4	Total depth less than 0.10m. No sample collected.
EVPA	12/11/2006	LOX5	Total depth less than 0.10m. No sample collected.
ENP	12/13/2006	S174	No flow, no sample collected.
ENP	12/18/2006	S18C	No flow, no sample collected.
NECP	12/19/2006	S334	No flow, no sample collected.
ENP	12/20/2006	S174	No flow, no sample collected.
CAMB	12/27/2006	S12A	No flow, no sample collected.
CAMB	12/27/2006	S12B	No flow, no sample collected.

## QUALITY CONTROL

Field QC measurements consist of Equipment Blanks (EB), Field-Cleaned Equipment Blanks (FCEB), Field Blanks (FB), Split Samples (SS) and Replicate Samples (RS). **Table 2** summarizes EB, FB and FCEB results for all projects pertaining to the TOC. No blanks associated with samples for stations listed in the *Introduction* were outside the acceptance criterion. **Table 3** summarizes field precision results. Field sampling precision was acceptable. FDEP data qualifier codes flag data that does not meet the criteria set for blanks, field precision or sampling protocols.

No TOC compliance TP data were qualified during the fourth quarter of 2007.

**Table 2.** Field and Equipment Blank Results<sup>1, 2, 3, 4</sup>.

Type of Blank	Project	Number of Blanks Collected	% ≤ 0.002	% > 0.002
EB	ENP	2	100	0
	EVPA	1	100	0
FCEB	C111D	7	100	0
	CAMB	7	100	0
	ENP	11	100	0
	EVPA	6	100	0
	NECP	5	100	0
FB	ENP	1	100	0

<sup>1</sup> This analysis includes only blanks from sampling events that included samples from stations listed in the *Introduction* of this report.

<sup>2</sup> Blanks for TP, which were associated with a short-term autosampler project at some TOC stations, were not included.

<sup>3</sup> FB, FCEB and EB acceptance criteria must be less than or equal to the MDL.

<sup>4</sup> When concentrations are less than five times the resulting blank values, associated samples are flagged due to possible contamination.

**Table 3.** Field Precision Summary<sup>1, 2, 3</sup>.

Project Code	Number of Triplicates	% RSD	Comments
CAMB	1	7.9	Precision criteria met.
ENP	1	8.7	Precision criteria met.
EVPA	1	7.9	Precision criteria met.

<sup>1</sup> Only replicates from sampling events that included samples from stations listed in the *Introduction* of this report were included in this analysis.

<sup>2</sup> The SFWMD Chemistry laboratory conducted all TP analyses.

<sup>3</sup> Field precision acceptance criterion of less than 20 percent applied only if sample values were greater than the Practical Quantitation Limit (PQL).

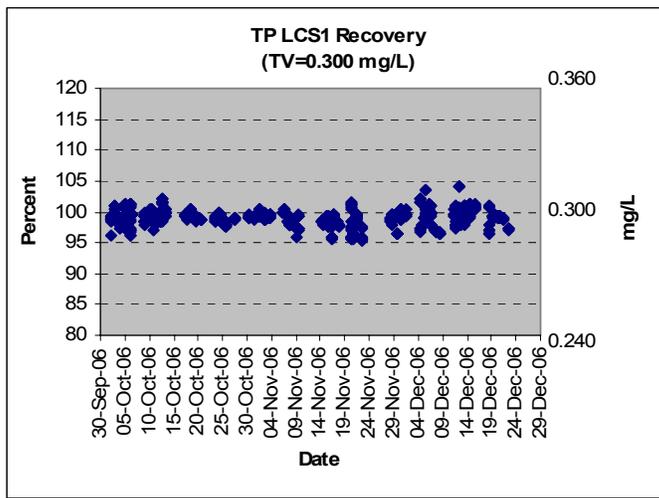
# Laboratory Analysis Quality Assessment

## PROCEDURE UPDATES

TP analytical procedure did not change during this reporting period.

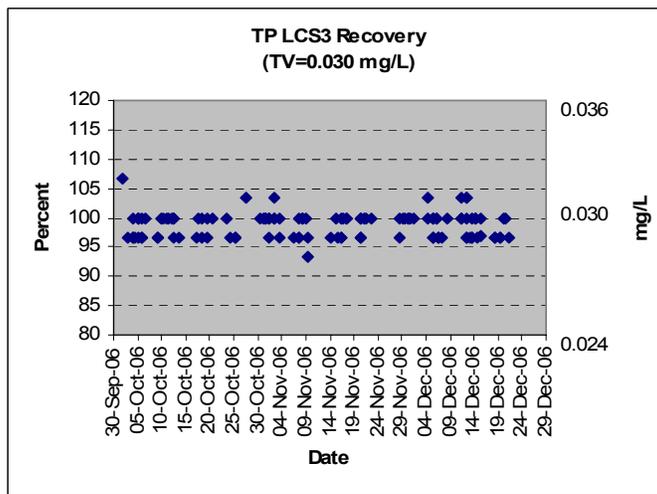
## LABORATORY QUALITY CONTROL

Routine laboratory QC samples include QC checks, matrix spikes and precision checks. **Figure 1** through **Figure 4** show recoveries from various types and levels of QC samples for the TP analysis at the SFWMD laboratory from October 1 through December 31, 2006.



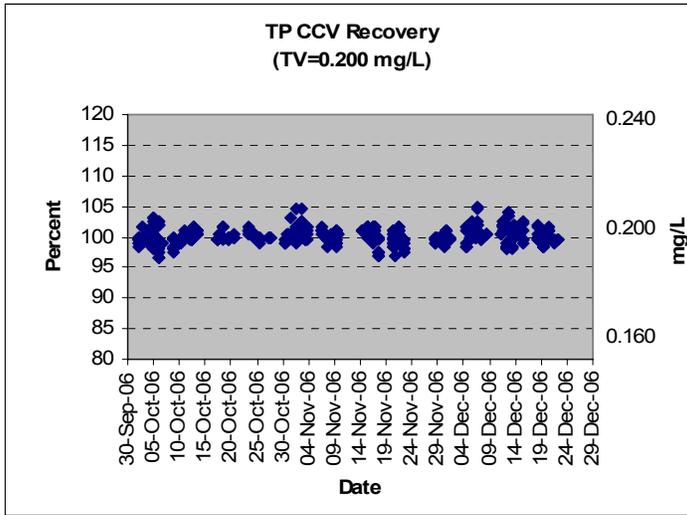
Mean = 99.0%, Max = 104.0%, Min = 95.3%

**Figure 1.** QC (Laboratory Control Solution) Sample Recoveries for TP Analysis.



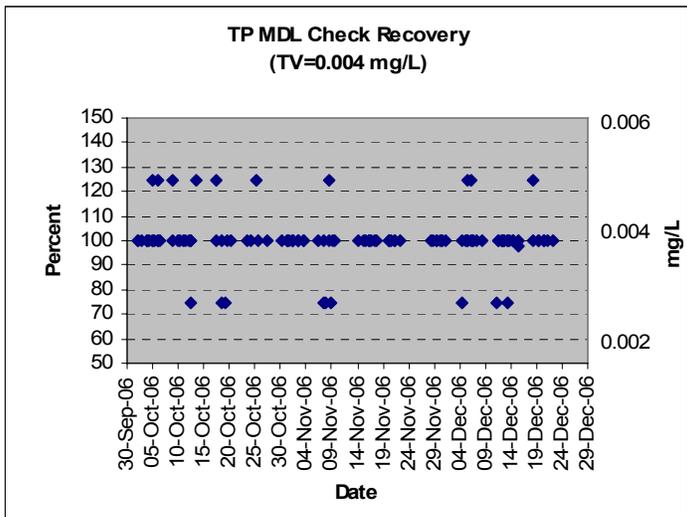
Mean = 98.8%, Max = 106.7%, Min = 93.3%

**Figure 2.** QC (Laboratory Control Solution) Sample Recoveries for TP Analysis.



Mean = 100.2%, Max = 105.0%, Min = 96.5%

**Figure 3.** QC (Continuing Calibration Verification) Sample Recoveries for TP Analysis.



Mean = 100.7%, Max = 125.0%, Min = 75.0%

**Figure 4.** QC5 (Method Detection Limit Check) Sample Recoveries for TP Analysis.

**Table 4** and **Table 5** list precision and matrix spike recoveries. If QC recoveries are outside the set limits, the SFWMD laboratory rejects an analytical batch. If any deficiencies are noted and the samples cannot be re-analyzed because they exceed the required holding times, data are flagged accordingly.

**Table 4.** TP Precision Data  
10/01/06 – 12/31/06.

Acceptance Limit	< 10%
<b>Analytical Range:</b> 0.002-0.400 mg/L	
<b>Maximum</b>	8.7
<b>Mean</b>	1.6
<b>Standard Deviation</b>	1.44
<b>3xSD</b>	4.31
<b>UCL</b>	5.9
<b>n</b>	318

**UCL** Upper Control Limit  
**n** Number of data points

**Table 5.** TP Spike Recovery Data  
10/01/06 – 12/31/06.

Acceptance Limit	90 – 110%
<b>Analytical Range:</b> 0.002-0.400 mg/L	
<b>Minimum</b>	90
<b>Maximum</b>	110
<b>Mean</b>	100
<b>Standard Deviation</b>	3.50
<b>3xSD</b>	10.5
<b>LCL</b>	89.5
<b>UCL</b>	110.5
<b>n</b>	327

**LCL** Lower Control Limit  
**UCL** Upper Control Limit  
**n** Number of data points

Recoveries for the QC samples are within +10 percent from the true value (TV), which is acceptable. The MDL check (QC5), with a true value of 0.004 mg/L, had mean recoveries of 100.2 percent. The daily MDL check results indicate the SFWMD laboratory consistently has achieved the established MDL of 0.002 mg/L.

An organic check is a solution prepared from phytic acid, a stable form of organic phosphate, to prepare matrix spikes, the mean recovery for which was 100.0 percent.

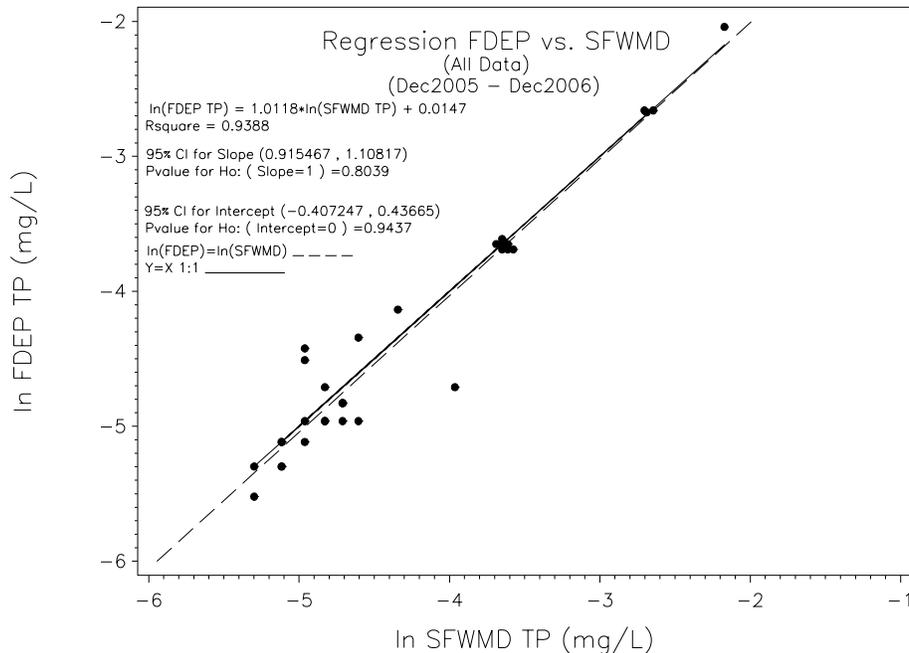
## INTER-LABORATORY QUALITY CONTROL ASSESSMENT

### Split Studies with FDEP Laboratory

To assess comparability of results continuously, the SFWMD routinely sends split samples to other laboratories. From December 2005 through December 2006, data from split studies between FDEP and SFWMD laboratories were used in this analysis for the following programs: EVPA Quarterly Splits (EVPA) and Everglades TP Round Robin (ERR) (**Appendix A**). **Figure 5** through **Figure 7** show regression analysis of the data and **Table 6** shows summary statistics for the data pairs.

#### ALL DATA

**Figure 5** shows that the intercept is not statistically different from 0 (zero) and the slope is not statistically different from 1 (one) for all TP data from both laboratories. The  $r^2$  value is 0.9388. This indicates that the results from the two laboratories have a high degree of agreement (close to 1:1 correlation).

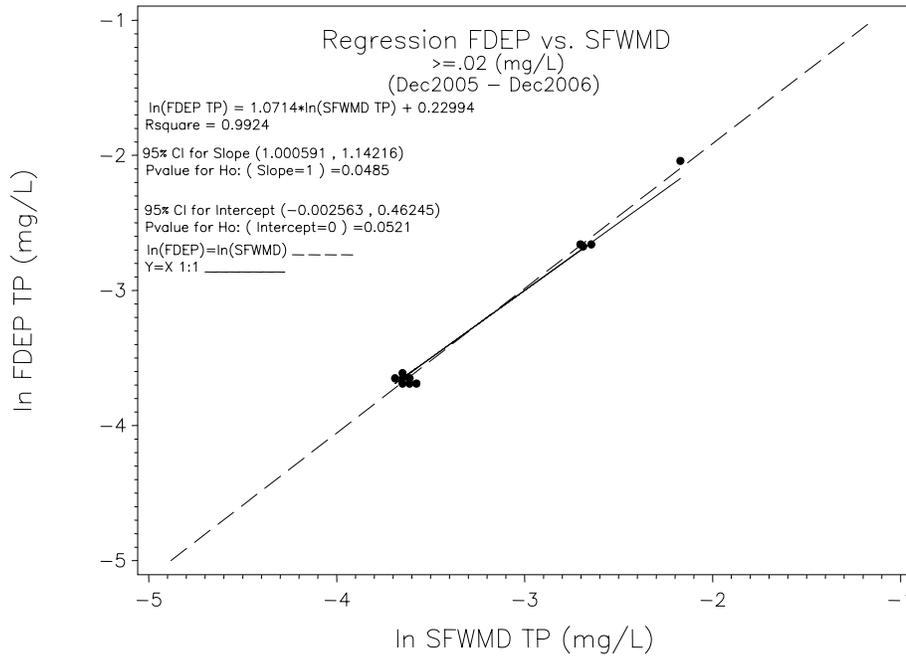


**Figure 5.** Regression Analysis for TP All Data.

The mean difference (-0.0002) and median difference (0.001) were not statistically significant. The observed differences are below the PQL of 0.008 mg/L. The paired t-test and signed-rank test returned p-values of 0.786 and 0.4805, respectively.

**TP  $\geq$  0.020 mg/L**

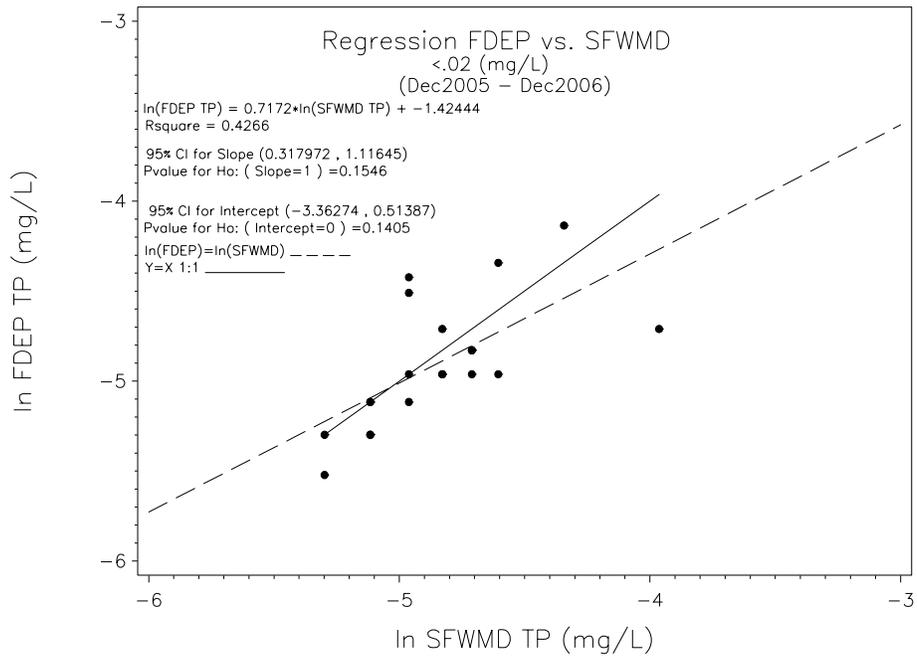
**Figure 6** shows that the intercept is not statistically different from 0 (zero) and the slope is not statistically different from 1 (one) for samples with TP greater than or equal to 0.020 mg/L. The  $r^2$  value is 0.9924. The Mean difference (-0.0013) and Median difference (0.0000) were not statistically significant. The differences are below the PQL for the two laboratories. The paired t-test and signed-rank test returned p-values of 0.4323 and 0.9961 respectively.



**Figure 6.** Regression Analysis for TP Greater than or Equal to 0.020 mg/L.

**TP < 0.020 mg/L**

**Figure 7** shows that the intercept is not significantly different from 0 (zero) and slope is not significantly different from 1 (one) for samples with TP less than 0.020 mg/L. The  $r^2$  value is 0.4266. At this low level, the data sets do not agree very well, as expected, due to the relatively high variability within each laboratory and between the two laboratories.



**Figure 7.** Regression Analysis for TP Less than 0.020 mg/L.

At this concentration level (less than 0.020 mg/L), the mean difference (0.0004) and median difference (0.001) are not statistically significant. P-values for the paired t-test and signed-rank test were 0.5660 and 0.4503 respectively (see **Table 6**).

**Table 6.** Comparison of SFWMD and FDEP Split Phosphorus Samples (12/2005 – 12/2006)<sup>1, 2</sup>

All Data	Summary Statistics				
	Lab	N	Mean	Median	
	FDEP	32	0.0214	0.009	
	SFWMD	32	0.0212	0.009	
	Statistical Test of Hypotheses				
	Summary of Paired Differences		Hypothesis	Test	P-value
	Mean of Differences	-0.0002	Mean of Differences = 0	Student's t	0.786
Median of Differences	0.0010	Median of Differences = 0	Signed Rank	0.4805	
≥ 0.020 mg/L	Summary Statistics				
	Lab	N	Mean	Median	
	FDEP	11	0.0472	0.026	
	SFWMD	11	0.0459	0.027	
	Statistical Test of Hypotheses				
	Summary of Paired Differences		Hypothesis	Test	P-value
	Mean of Differences	-0.0013	Mean of Differences = 0	Student's t	0.4323
Median of Differences	0.0000	Median of Differences = 0	Signed Rank	0.9961	
< 0.020 mg/L	Summary Statistics				
	Lab	N	Mean	Median	
	FDEP	21	0.0079	0.007	
	SFWMD	21	0.0083	0.008	
	Statistical Test of Hypotheses				
	Summary of Paired Differences		Hypothesis	Test	P-value
	Mean of Differences	0.0004	Mean of Differences = 0	Student's t	0.566
Median of Differences	0.0010	Mean of Differences = 0	Signed Rank	0.4503	

<sup>1</sup> Differences were calculated as SFWMD TP – FDEP TP. The mean and median differences for all concentration levels are at or below the PQL.

<sup>2</sup> Data were not used if FDEP value was less than 0.004 (FDEP laboratory's MDL).

### National Proficiency Testing Results

For laboratory certification, the SFWMD's laboratory semiannually performs required PT testing on environmental samples. A vendor approved by the National Institute of Science and Technology as PT provider for National Environmental Laboratory Accreditation Conference administers this study. **Table 7** provides the results of the October – November 2006 study (WP-141).

**Table 7.** National Proficiency Testing TP Results.

Assigned Value, mg/L	4.57
Reported Value, mg/L	4.60
Performance Evaluation	% Recovery 100.7, Acceptable

### U.S. Geological Survey Analytical Evaluation Program

The SFWMD's laboratory voluntarily participates in a semiannual U.S. Geological Survey (USGS) on environmental samples as an inter-laboratory comparison. The Laboratory uses the survey results to monitor performance. Evaluation of the results is based on the deviation (z-value) from the median and percent difference. Following usual practices, a z-value less than  $\pm 2$  is considered satisfactory. **Table 8** provides the results of the October – November 2006 study.

**Table 8.** USGS Fall (October - November) 2006 SRS TP Results.

Most Probable Value, mg/L	0.062
Reported Value, mg/L	0.061
Performance Evaluation	Z-value = - 0.14, % difference = - 1.61

### Total

### Phosphorus Everglades Round Robin Inter-laboratory Comparison Program

**Appendix B** contains the results of the Everglades Round Robin 17 compared with other participating laboratories. Evaluation of the study results indicates that the SFWMD laboratory is at or around the central tendency and acceptable precision at all levels. An FDEP contractor is performing a statistical evaluation of this study.

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## Glossary

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**Accuracy** The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random-error (precision) and systematic-error (bias) components due to sampling and analytical operations. For SFWMD application, accuracy assessment is done using percent recoveries from QC check samples and spikes.

**Equipment Blank (EB)** A general term used for analyte-free water, which is processed on site through all sampling equipment used in routine sample processing. It may be an assessment of effectiveness of laboratory decontamination or on-site (field) decontamination (FCEB).

**Field Blank (FB)** Analyte-free water that is poured directly into the sample container on site during routine collection, preserved and kept open until sample collection completes for the routine sample at that site. FB values are indicative of environmental contamination on site.

**Field Cleaned Equipment Blank (FCEB)** Analyte-free water processed on site, after the first sampling site, through all sampling equipment used in routine sample processing. EB values are indicative of the effectiveness of the decontamination process.

**Method Detection Limit (MDL)** The lowest concentration of an analyte of interest that can be measured and reported with 99 percent confidence. The MDL is determined by the protocol defined in section 40 CFR Part 136, Appendix B as established by the EPA.

**Practical Quantitation Limit (PQL)** The lowest concentration of an analyte of interest that can be quantitatively reported with a specific degree of confidence. Usually, the PQL is 12 times the standard deviation derived from the procedure used to determine the MDL, or the PQL can be assumed to be four times the MDL.

**Precision** A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending on the "prescribed similar conditions." Precision is calculated from the results of replicate determinations.

**Relative Percent Difference (RPD)** A measure of precision, used when comparing two values. It is calculated as percent  $RPD = [Value1 - Value2] / Mean * 100$ .

**Relative Standard Deviation (RSD)** A measurement of precision, used when comparing more than two results. It is calculated as percent  $RSD = [Std. Deviation / Mean] * 100$

**Replicate Sample (RS)** Samples that have been collected during the same sampling event from the same source (field replicates) or aliquots of the same sample that are prepared and analyzed at the same time (laboratory replicates). Duplicate samples are one type of RS. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample is below detectable limits, Duplicate Spike Samples may be used to determine precision. Blind Replicates (Duplicates) are replicates that have been collected (field replicate) or prepared

(laboratory replicate) and are submitted and analyzed as separate samples (analyst does not know they are replicates). Field Split samples are replicate samples that are taken from the same sample collection, or one container into which multiple collections are composited.

**Split Sample (SS)** Splits of the same sample volume, obtained from the same sampling device, sent to two independent laboratories for analysis or analyzed as two independent samples in the laboratory.

**Z- Value.** A measure of the deviation of the result ( $X_i$ ) from the assigned value ( $X$ ) for that determinant (calculated as  $z = (X_i - X)/\sigma$  where  $\sigma$  is a standard deviation) (EURACHEM).

## Appendix A

**Table A-1.** Results of TP Split Studies Between the SFWMD and FDEP Laboratories, EVPA Project and Everglades Round Robin (12/2005 – 12/2006).

Sample	Date	SFWMD	FDEP	% RPD/Comments
EVPA	12-Dec-05	0.114	0.130	13.1
EVPA	12-Dec-05	0.008	0.009	< PQL
EVPA	12-Dec-05	0.009	0.007	< PQL
EVPA	12-Dec-05	0.019	0.009	71.4
EVPA	3-Mar-06	0.009	< 0.004	< PQL
EVPA	3-Mar-06	0.007	< 0.004	< PQL
EVPA	3-Mar-06	0.008	< 0.004	< PQL
EVPA	3-Mar-06	0.007	< 0.004	< PQL
EVPA	13-Jun-06	0.010	0.013	26.1
EVPA	13-Jun-06	0.007	0.012	< PQL
EVPA	13-Jun-06	0.013	0.016	20.7
EVPA	13-Jun-06	0.007	0.011	< PQL
EVPA	19-Sep-06	0.006	0.005	< PQL
EVPA	19-Sep-06	0.008	0.007	< PQL
EVPA	19-Sep-06	0.007	0.007	< PQL
EVPA	19-Sep-06	0.008	0.007	< PQL
ERR-17	05-Dec-06	0.026	0.025	3.9
ERR-17	05-Dec-06	0.027	0.026	3.8
ERR-17	05-Dec-06	0.025	0.026	3.9
ERR-17	05-Dec-06	0.028	0.025	11.3
ERR-17	05-Dec-06	0.009	0.008	< PQL
ERR-17	05-Dec-06	0.009	0.008	< PQL
ERR-17	05-Dec-06	0.009	0.008	< PQL
ERR-17	05-Dec-06	0.010	0.007	< PQL
ERR-17	05-Dec-06	0.027	0.025	7.7
ERR-17	05-Dec-06	0.026	0.026	0.0
ERR-17	05-Dec-06	0.026	0.027	3.8
ERR-17	05-Dec-06	0.068	0.069	1.5
ERR-17	05-Dec-06	0.067	0.070	4.4
ERR-17	05-Dec-06	0.071	0.070	1.4
ERR-17	05-Dec-06	0.006	0.006	< PQL
ERR-17	05-Dec-06	0.007	0.006	< PQL
ERR-17	05-Dec-06	0.006	0.005	< PQL
ERR-17	05-Dec-06	0.006	0.006	< PQL
EVPA	12-Dec-06	0.005	0.004	< PQL
EVPA	12-Dec-06	0.005	0.005	< PQL

# Appendix B

**Table B-1. Round Robin TP-17 Results (µg/L).**

Laboratory	SITE																	
	E1				F4				S10C			S5A			U2			
Orange County Environmental Protection Division	33 8	30 3	30 13	30 10	13 11	12 4	12 18	14 9	28 7	28 6	28 12	68 1	70 17	70 15	8 14	8 2	8 5	9 16
IFAS Everglades Research & Education Center	24 16	31 10	20 17	28 13	8.6 U 11	6.3 U 5	9.8 U 8	4.0 U 18	27 6	21 2	25 3	63 9	66 14	61 7	8.9 U 12	2.9 U 15	5.3 U 4	2.3 U 1
Metro Dade County Environmental Resources Mgt.	29.65 15	28.78 16	28.74 18	28.49 1	12.41 14	11.96 7	12.15 10	11.82 2	28.23 4	28.38 9	28.40 5	68.02 8	68.24 17	68.39 11	8.47 3	8.95 12	8.74 13	8.34 6
US Biosystems, Inc.	27.4 10	25.4 5	26.7 11	38.8 8	12.9 14	10.7 15	11.6 2	12.3 13	29.8 7	27.9 3	28.5 12	70.6 16	69.4 18	69 9	6.9 1	7.7 4	7.8 6	7.4 17
ELAB, Inc.	26.6 10	27.7 14	25.9 12	26.2 5	14.2 2	11.1 9	14.7 1	10.9 16	28.3 7	28.5 6	28.0 17	71.9 18	70.4 13	69.8 8	9.40 3	8.90 4	7.80 11	10.3 15
STL Denver	24.1 14	20.8 5	18.7 8	24.2 9	9.17 6	6.72 4	8.82 17	6.32 7	24.5 13	21.1 1	24.1 3	63.2 10	68.1 18	75.5 16	5.74 11	4.34 2	4.65 15	5.83 12
Harbor Branch Environmental Laboratory	33.9 10	32.1 8	22.7 18	33.9 9	9.22 2	2.62 14	11.8 12	9.81 3	26.8 4	23.2 1	21.7 16	76.4 7	74.8 6	63.0 15	6.94 5	15.9 11	2.46 17	1.15 11
STL Tallahassee	22 14	27 11	22 12	24 10	8.21 4	8.11 1	7.91 3	8.51 15	23 17	23 5	24 9	58 16	57 6	61 8	5.81 2	5.01 13	5.21 7	8.3 18
Short Environmental Laboratories	26 14	26 1	24 3	28 17	81 13	91 10	81 9	81 6	25 5	25 11	27 16	68 12	70 15	66 7	51 18	51 2	61 4	61 8
TestAmerica, Inc	56.0 2	73.0 17	76.0 3	69.0 12	48.0 5	58.0 8	61.0 16	38.0 1	79.0 10	71.0 11	84.0 18	112 9	109 14	106 4	51.0 15	58.0 13	61.0 7	54.0 6
DB Environmental Laboratories, Inc.	26 9	26 17	26 2	27 1	9 10	10 8	10 11	9 4	26 5	25 7	25 16	66 18	67 3	65 6	7 15	7 10	7 12	6 13
Everglades Laboratories, Inc.	8.5 4	4 U 9	20.9 8	32.4 12	10.1 17	12.1 11	25 1	13.2 5	20.8 14	16.9 18	15.5 10	66 3	6.64 16	71.2 2	9.5 15	12.2 6	4 U 13	9.3 7
South FL Water Mgt. SFWMD	26 18	27 4	25 17	28 10	9 14	9 3	9 7	10 9	27 15	26 11	26 12	68 6	67 1	71 16	61 2	71 8	61 13	61 5
FL International University	31.93 1	27.36 13	26.92 18	31.16 8	15.54 5	13.90 4	10.49 14	14.57 12	31.61 15	31.5 9	27.28 17	70.68 3	72.03 6	70.68 10	9.15 7	9.79 2	9.81 11	8.99 16
Jupiter Environmental Laboratories, Inc.	25.0 12	27.5 3	26.1 6	25.7 14	12.4 1	9.30 10	9.22 8	9.48 16	31.5 18	34.2 4	33.0 13	81.0 15	85.5 7	84.3 9	4.47 11	6.88 2	4.63 5	4.53 17
U.S. Sugar Corp.-South Bay Laboratory	32 4	34 18	32 7	34 17	8 12	8 13	9 16	8 10	29 8	29 11	30 6	70 14	68 5	68 9	14 2	14 1	16 15	14 3
Columbia Analytical Services – Jax.	23.8 7	26.0 10	24.2 15	28.9 3	8.60 2	9.00 13	11.9 17	8.90 14	26.2 1	22.4 5	22.9 6	66.4 9	59.4 18	59.8 16	6.40 4	5.30 8	7.10 12	6.20 11
Lee County Environmental Labs	30I 11	20I 13	30I 7	30I 15	30I 5	10I 1	10I 16	10I 10	20I 17	20I 14	30I 8	60 3	60 2	60 9	10 U 12	10 U 18	10 U 4	10 U 6
UF/IFAS Wetlands Biogeochemistry Laboratory	23 11	25 6	24 5	26 16	9 7	8 2	9 10	8 17	24 12	26 4	24 14	61 15	61 18	61 9	6 13	6 3	6 1	5 8
UF/IFAS Tropical Research & Education Center	27.1 18	27.0 1	27.6 11	27.1 4	10.6 17	9.7 6	10.0 13	10.3 7	27.2 15	27.3 16	27.8 3	66.4 12	66.4 14	67.8 5	7.2 9	6.8 2	7.7 8	7.9 10
FL Dept. of Environmental Protection	25 18	26 9	26 14	25 4	8I 17	8I 2	8I 13	7I 3	25 11	26 12	27 7	69 5	70 6	70 16	61 10	61 15	51 1	61 8
Advanced Environmental Laboratories	24 12	24 5	24 18	24 8	8 13	8 3	8 16	8 10	24 6	25 17	24 4	64 14	55 2	58 9	5 11	6 1	6 15	6 7