Monitoring Plan

For

Everglades National Park Inflows North (Project PIN)

FINAL

September 12, 2006

South Florida Water Management District
Environmental Resource Assessment Department
Water Quality Monitoring Division

TABLE OF CONTENTS

2.0 Project Description

2.1 Introduction and background

This document serves as a reference for surface water quality monitoring in Miami-Dade County for the Everglades National Park (ENP) Inflows North Project (PIN). PIN was created as a comprehensive monitoring plan for inflows along the northern border of the park. This plan supersedes portions of several existing monitoring plans for the Non-Everglades Construction Project (NECP), the Tamiami Trail Culverts (TAMB) and The Conservation Area Inflows and Outflows (CAMB). The monitoring design presented in this plan is the product of consensus of several agencies including the South Florida Water Management District (SFWMD), Florida Department of Environmental Protection (FDEP), and The Department of the Interior (DOI). The guidance contained in this document will assist in maintaining consistency in sampling locations, parameter lists, and frequencies as well as providing documentation of the project scope and an ongoing historical perspective.

2.2 Active Mandates and Permits

The monitoring under this project falls under the Non-Everglades Construction Project (NECP) permit and the Settlement Agreement. Some stations have no mandates, but are monitored to provide relevant information to specific stakeholders. It is acknowledged that infrastructure in the area will be modified and this may necessitate the inclusion of new mandates and stations into this document. Such inclusions should be consistent with routine long term monitoring activities, and not associated with short term specific activities such as construction or maintenance which will require appropriate and project specific permits.

2.3 Purpose and Scope

The purpose of this project is to provide a comprehensive monitoring rationale for structures along the northern border of Everglades National Park that meets not only mandated requirements but also the needs of the agency and its partners, including federal interests and the public.

2.4 Duration

The project is specifically designed to be adaptive to changes in infrastructure and mandates. Consequently, the duration of the project is ongoing until all relative and successive mandates expire. However, given that infrastructure changes often require extensive construction activities, it is acknowledged that for reasons of safety, monitoring at specific stations may need to be suspended for extended periods of time. Similarly, extensive physical alteration or removal of infrastructure may require extensive changes to the monitoring plan.

3.0 Geographic Location

3.1 Regional Area

The project is located along Tamiami Trail from S335 to US41-25. Most stations are on or associated with the L-29 canal (Figure 1).

3.2 Sampling Locations

There are a total of 21 monitoring locations that will be used to supply data relative to this plan. Sampling stations are registered in Laboratory Information Management System (LIMS). Table 3.2 provides the GPS coordinates for each monitoring station.

Table 3.2 Surface Water Quality Monitoring Sites and GPS Coordinates

Station Name	Agency	Mandates	GPS Latitude**	GPS Longitude**
US41-25	SFWMD	NECP-Settlement Agreement	254641.213	805039.536
S12A	ACOE	Settlement Agreement	254542.367	804917.23
S12B	ACOE	Settlement Agreement	254542.365	804611.225
S12C	ACOE	Settlement Agreement	254544.678	804337.505
S12D	ACOE	Settlement Agreement	254544.364	804053.217
S333	SFWMD	NECP	254543.364	804027.216
S355A	ACOE	Future ACOE operating permit	254542.728	803527.328
G69	SFWMD	NECP	254543.388	803340.69
S355B	ACOE	Future ACOE operating permit	254542.613	803311.759
Safari	SFWMD	No mandate	254540.417	803735.521
Frog city	SFWMD	No mandate	254540.99	803548.199
Glader	SFWMD	No mandate	254539.363	803452.208
Coopertn	SFWMD	No mandate	254540.633	803340.385
Tambr6	SFWMD	No mandate	254540.655	803313.783
Tambr5	SFWMD	No mandate	254540.724	803243.59
Tambr4	SFWMD	No mandate	254540.989	803213.312
Tambr3	SFWMD	No mandate	254541.12	803132.538
Tambr2	SFWMD	No mandate	254541.203	803054.07
Tambr1	SFWMD	No mandate	254541.175	803026.267
S334-S356	ACOE	Future ACOE operating permit	254542.129	803007.878
S335	ACOE	Future ACOE operating permit	TBD	TBD

** The standard positional goal for site coordinates is ±1 meter. This standard can be obtained with a professional grade DGPS system. The coordinates are relative to NAD83 HARN horizontal datum.

3.3 Access and Authority

Many areas border Everglades National Park and access requires a Dade County key.

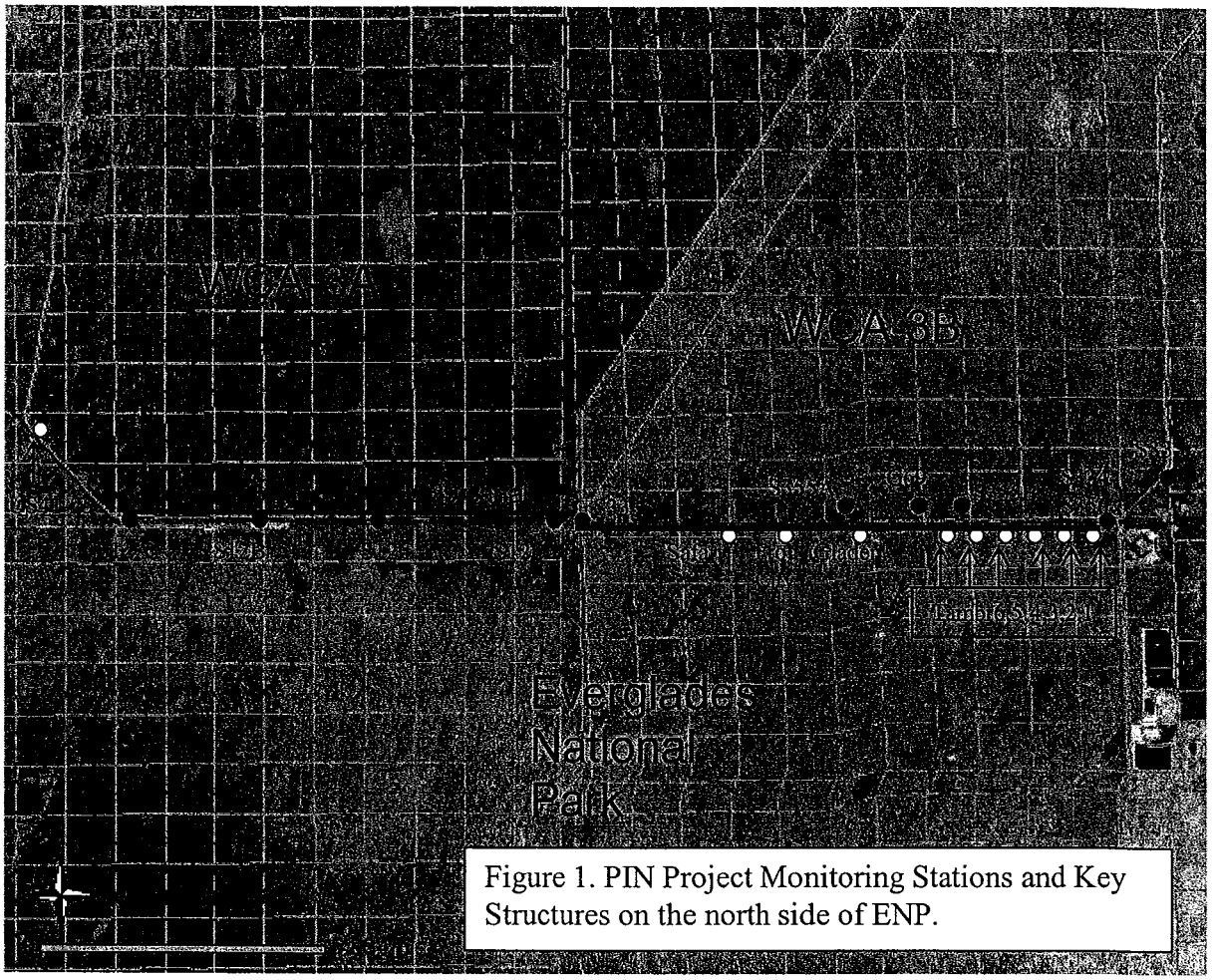

Figure 1. PIN Project Monitoring Stations and Key Structures on the north side of ENP.

4.0 Data Quality Objectives

4.1 Data Uses, Resolutions, and Conclusions

The data is used to fulfill the purposes listed in Section 2.3.

4.2 Data Quality

Surface water samples and field quality control samples are collected in accordance with the FDEP Quality Assurance Rule, 62-160.200 and 62-160.320, F.A.C. and the *District Field Sampling Quality Manual* (FSQM). Applicable sections of the FSQM include groundwater collection methods, decontamination, field test methods and quality control procedures. Data is qualified in accordance with the *District Chemistry Laboratory Quality Manual*. Data not meeting the quality objectives is qualified using standard FDEP qualifier codes (F.A.C. 62-160).

Data for this project will be coded as monitoring in LIMS and DBHYDRO.

Table 4.1 Measures of Data Quality and Their Target Limits

QC Measure	Description	Target Limits
Method Blank	Laboratory analytical and preparation blank.	<MDL
Equipment blank	Equipment blank prepared and handled as routine field sample, to assess effectiveness of decontamination, preservation, processing, and handling of samples (once)	<MDL
Laboratory precision	Laboratory duplicates, analyzed for every batch of 20 samples or less	10%
Laboratory accuracy	Laboratory control spike (LCS) and matrix spike (MS), analyzed for every batch of 20 samples or less	90-110%
Field precision	Field replicates (once)	20%

4.3 Parameter and Frequency Rationale

Parameters and frequencies were selected based on: 1) water quality information that has been collected in the general area for a number of years and 2) relevance to ecological and agency goals and objectives.

5.0 Instrumentation

Three autosamplers are required for this project and are located at S12A, S333, and S356. These autosamplers will be set for time dependent sampling; therefore not requiring Moscads or flow calculations.

6.0 Monitoring Parameters, Detection Limits, and Completeness Targets

Monitoring parameters and frequencies are registered in LIMS. This process aids in the creation of header sheet templates, quality assurance and determining completeness.

Table 6.2 Additional Surface Water Sample Parameters and Detection Limits				
Parameter	Preferred Method	Preferred Detection Limit	Preferred Precision (% RPD)	Preferred Accuracy (% Recovered)
SO_4	300	0.02 mg/L	0-10	90
THg	1630	0.3 ug/L	0-10	90
MeHg	SM3120B	0.01 mg/L	0-10	90
Turbidity	SM2130B	0.1 NTU	0-10	90
Pesticide Group AA	Multiple	Multiple	0-10	90

6.1.2 In situ measurements

Simultaneous to the collection of water quality grab samples, in-situ physical parameters are measured with a multi-parameter measurement instrument following methods documented in the FSQM. All field measurement data are directly read from the instruments or stored and uploaded directly into a Laboratory Information Management System (LIMS). These measurements include pH, specific conductance, dissolved oxygen, temperature, and depth. The data are automatically temperature-compensated for pH, specific conductance, and dissolved oxygen. The cell constant for specific conductance is determined by the manufacturer. The field technician does not perform any calculations on field data.

6.1.2.1 Parameters

Table 6.3 lists the project parameters, matrices, preferred methods, detection limits, precisions, and accuracies.

Table 6.3 Surface Water Physical Parameters and Detection Limits				
Parameter/Matrix	**Preferred Method**	**Preferred Detection Limit**	**Preferred Precision**	**Preferred Accuracy**
Depth/Water	meter stick	NA	0.01	0.01
Temperature/Water	SM2550B	NA	0.01	± 0.5 ° C *
pH/Water	SM4500H^+ B	NA	0.01	± 0.2 pH units
Dissolved Oxygen/Water	SM4500-O G	NA	0.01	± 0.3 mg/L
Specific Conductivity/Water	SM2510B	NA	0 .1	± 5 %

* Value is from the FSQM and deviates from the FDEP SOP preferred accuracy ± 0.2 ° C

Completeness targets, meaning the number of samples successfully collected and analyzed, are set at 95% annually for this project.

Samples are collected in accordance with the FDEP Quality Assurance Rule, 62-160.200 and 62-160.320, F.A.C. and the Field Sampling Quality Manual (FSQM). Applicable sections of the FSQM include the method for surface water grab collection (5.13.2), decontamination (4.2.1, 4.2.3), field test methods (6.0) and quality control procedures (7.0).

6.1 Surface Water

Samples should be representative of the site as a whole, requiring the collector to make some use of professional judgment. For the purposes of sampling, the collection site should be contiguous with the rest of the water body. In general, a water depth of less than 10 cm is not considered sufficient to sample.

6.1.1 Grab Samples

Grab samples are collected to provide point measurements of parameters of interest. Samples are collected using standard techniques, processing, preservation and transport. These procedures may vary slightly depending on the analytical laboratories being used. Consequently, the sample requirements for each lab should be consulted before samples are collected. Samples should be taken at half the total depth. If the total depth exceeds 1 meter, samples should be taken at 0.5 meters.

6.1.1.1 Parameters

Table 6.1 lists the project Standard parameters, matrices, preferred methods, detection limits, precisions, and accuracies. Table 6.2 lists additional parameters matrices, preferred methods, detection limits, precisions, and accuracies

Table 6.1 Standard Surface Water Sample Parameters and Detection Limits

Parameter	Preferred Method	Preferred Detection Limit	Preferred Precision (% RPD)	Preferred Accuracy (% Recovered)
Total Phosphorus	SM4500-P F	0.002 mg/L	0-10	90-110
OPO_4	SM4500-P F	0.002 mg/L	0-10	90-110
TKN	EPA 351.2 (modified)	0.05 mg/L	0-10	90
NOX	SM4500NO_3F	0.004 mg/L	0-10	90
TSS	EPA 160.2	3 mg/L	0-10	90
Cl	300	0.02 mg/L	0-10	90
Ca	SW846-6010B	0.03 mg/L	0-10	90

7.0 Monitoring Frequencies by Site and Parameter

The sampling schedules for the referenced monitoring sites and parameters are presented in Table 7.1. Comparisons of mandate requirements with collection frequencies presented in this plan will reveal that some stations have higher sampling frequencies than mandated. However, a comprehensive review will show that stations with increased frequencies are associated with or near to, stations with autosamplers which require weekly maintenance. Conversely many of these stations have had a reduction or removal of the default frequency for non-flowing sampling. Consequently, while the frequency for examination of stations has increased, the number of sampling trips is not affected, and the overall number of non-flowing samples has decreased. However, monitoring at certain stations deviates from normal practices and thus requires specific instruction.

G69- This structure has not been used for several years and is generally considered defunct. However, there is a potential that this structure may be reactivated under emergency situations. Consequently, this structure is listed as monitored only if flowing.

S333- S333 serves as a surrogate sampling station for most of the parameters at structure S12D. Therefore if either S333 or S12D are flowing sampling will occur at S333.

S12A, S333, and S354-S356- Three structures have been designated as important stations for continued characterization of the L29 canal system: S12A, S333, and S334-S356. At these structures time dependent autosamplers collect samples every eight hours into daily samples that are analyzed discretely. This design allows for daily characterization of water quality in the L29 canal system independent of flow events, but can also be used to discern water quality conditions during short term flow events from multiple structures. This type of monitoring does not require the need for flow calculations or flow monitoring equipment.

S334-S356 has an additional modification. These two structures provide for discharge from the L29 to the L31N (S334) and from the L31N to the L29 (S356). Since these structures occupy the same location on the L-29 canal, using a single autosampler to provide data for both structures was determined to be highly effective and efficient. This single autosampler will be located on the eastern side of the structures which is functionally upstream for S356, but functionally downstream for S334. This design provides regular information on conditions in the L-31N canal, and therefore information on flows through S356 to Everglades National Park. When structure S334 is operating, the autosampler functions to collect samples on the downstream side and provide information on discharges from the L-29 canal. Flows through S334 are important, as they may be used to adjust loads to Everglades National Park for waters from S333 that do not pass through the Tamiami Trail culverts. Results obtained from the sampler when S334 is operating may be compared to discharges from S333 and the S355 structures for reasonableness. Collection of grab samples at this station during non-flow events serves to characterize the waters in the L31N basin prior to discharge through the S356 or south through the S331-173. Such information could be critical in determining the prpoper balance of waters from the L30 and eastern urban areas.

Table 7.1 Monitoring Parameters and Frequencies

Station	Matrix	Collection Method	Frequency	Parameters (all include physical measurements)[1]
US41-25	Water	Grab	BWF/M[2]	Standard Set
			Quarterly	Pesticides, SO4, Turbidity
S12A	Water	ADT[3]	Weekly	TPO4, TKN, NOX
		Grab	WF/M[4]	Standard Set
		Grab	Quarterly	SO4, THg, MeHg, Pesticides, Turbidity
S12B	Water	Grab	WF[5]	Standard Set
S12C	Water	Grab	WF	Standard Set
S12D	Water	Grab	WF	TPO4
S333 (surrogate for S12D)	Water	ADT	Weekly	TPO4, TKN, NOX
		Grab	WF/M	Standard Set
		Grab	Quarterly	SO4, THg, MeHg, Pesticides, Turbidity
S355A	Water	Grab	WF/M	Standard Set
			Quarterly	SO4, Turbidity
S355B	Water	Grab	WF/M	Standard Set
			Quarterly	SO4, Turbidity
G69	Water	Grab	BWF[6]	Standard Set
			Quarterly if flowing	SO4, Turbidity
Safari	Water	Grab	BWF	TP
Frog City	Water	Grab	BWF	TP
Glader	Water	Grab	BWF	TP
Coopertn	Water	Grab	BWF	TP
Tambr6	Water	Grab	BWF	TP
Tambr5	Water	Grab	BWF	TP
Tambr4	Water	Grab	BWF	TP
Tambr3	Water	Grab	BWF	TP
Tambr2	Water	Grab	BWF	TP
Tambr1	Water	Grab	BWF	TP
S335	Water	Grab	BWF/M	Standard Set
S334-S356	Water	ADT	Weekly	TPO4, TKN, NOX
		Grab	WF/M	Standard Set
		Grab	Quarterly	SO4, THg, MeHg, Pesticides, Turbidity

[1] See Table 6.1 for Standard Set Parameters
[2] BWF/M = Sampled biweekly if flowing, otherwise monthly
[3] ADT = Time-proportional autosampler analyzed as discrete samples
[4] WF/M = Sampled weekly if flowing, otherwise monthly
[5] WF = Sampled weekly if flowing
[6] BWF = Sampled biweekly if flowing

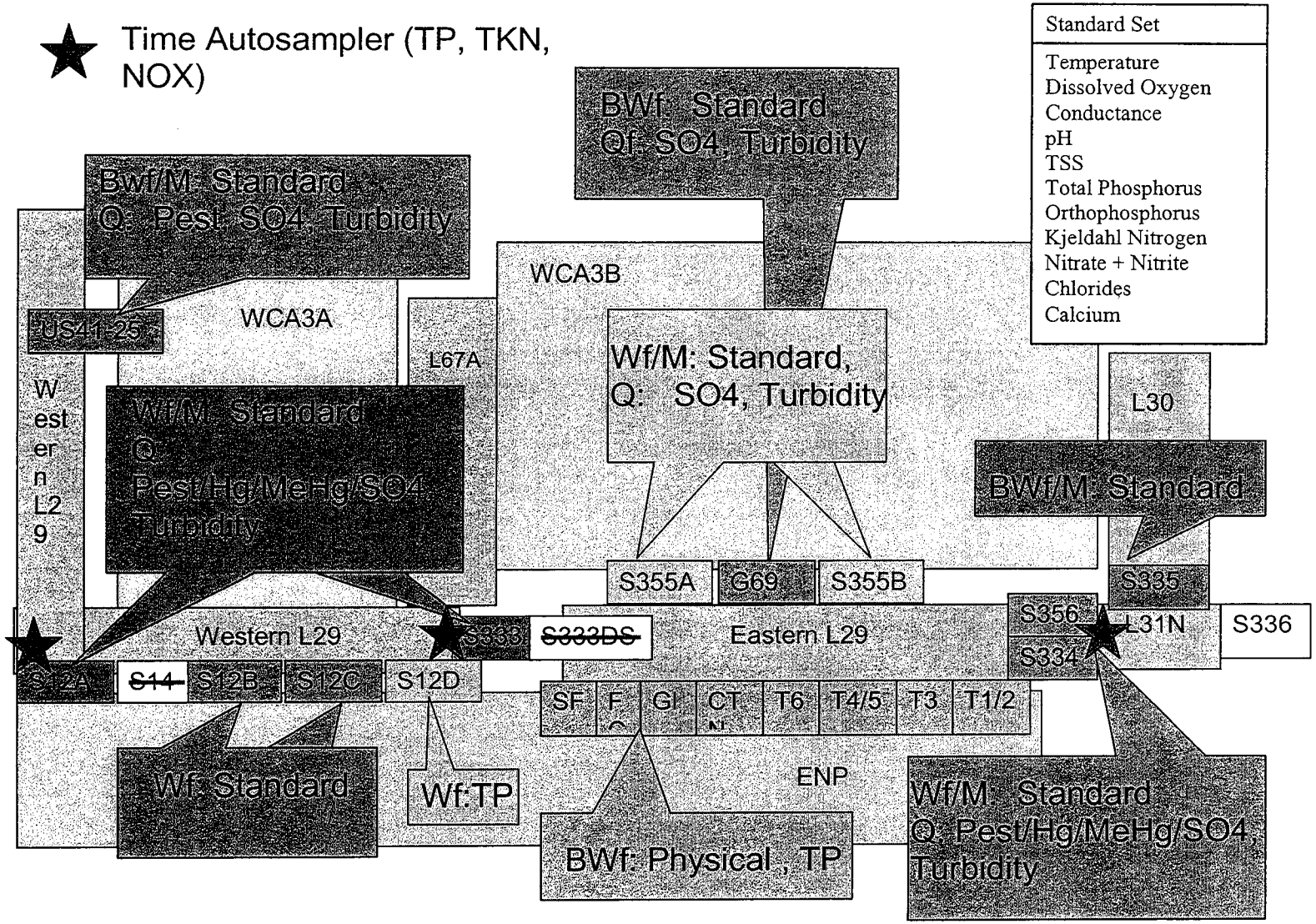

Figure 2. Conceptual diagram of monitoring in Project PIE

8.0 Quality Control and Custody

8.1 Ethics

Every individual participant performing field sampling must commit to ethical and data integrity responsibilities. Field and laboratory personnel are expected to be trained on ethical practices and how to maintain data integrity, prior to performing any monitoring work and annually, thereafter. The lead agency (i.e., SFWMD) or designated party is responsible for verifying this during project audits.

8.2 Quality Control Samples

For each sample collection trip, a field cleaned equipment blank (FCEB) must be collected. One equipment blank (EB) and two replicates samples (RS) are required annually. These quality control terms are defined as follows:

Equipment Blank (EB) - A sample composed of de-ionized water (one liter or enough to fill one set of all containers) that is used to rinse all sampling equipment at the first field site before a field sample is taken. One EB is required annually. Equipment blanks are prepared by pouring de-ionized water into the sample collection container and through each piece of sampling equipment. The equipment blank for grab samples is filtered, preserved and handled as a routine sample.

Replicate Sample (RS) - Two distinct samples collected nearly simultaneously from the same sampling site. Two RS samples will be collected annually for this project. Note: RS is collected for grab samples only.

Field Cleaned Equipment Blank (FCEB) – Field cleaned equipment blanks are prepared by pouring de-ionized water through each piece of field cleaned sampling equipment and into the sample container. The field-cleaned equipment blank for grab samples is filtered, preserved and handled as a routine sample. The field-cleaned equipment blank for the autosampler samples (pre-acidified) is run through a laboratory cleaned sample bottle and preserved and handled as a routine sample.

8.3 Documentation

This section contains the minimum guidelines and requirements for field documentation. This section is written for the purpose of standardizing the field reportable data and dialogue so that the intermediate-users and end-users can more readily access, comprehend and utilize that data. Field documentation must be sufficient and clear to allow history tracking for any sample collected or any measurement performed. Accuracy, consistency and legibility are key factors that will enhance the utilization of the field data. For all documents the following standards should apply:

- Print text, do not use cursive.
- Dates should be recorded as MM/DD/YYYY.
- Time should be recorded in 24 hour format using local time.
- Logs and notes should be recorded on site and at the time of collection.

- Entries are to be made in waterproof ink.
- Corrections must be done using a single strike through the incorrect entry, initialing and dating the corrections and writing the correct information next to the previous entry.
- Samplers must be registered in the appropriate database.

For more details see the FSQM Chapter 8.

8.3.1 Header Sheet

The header sheet (also know as pre-login summary report, chemistry field data log, or contract laboratory chain of custody form) serves as a chain of custody and must accompany all samples submitted to the District or external laboratories. This sheet must be legible, accurate and complete. The header sheet is the primary source for the minimum data required to uniquely identify samples for the analytical laboratory and database. Header sheets should identify project, collectors, collection agency, sample identification number, sample site, sample date, sample time, sample type, collection method, discharge and orientation status, weather, sample depth, matrix code, collection span and in situ measurements. Also on the header sheet are the frequency of collection, the parameters to be analyzed, and the number of bottles submitted to the laboratory. This document must be signed by the collector before it is relinquished to the laboratory.

8.3.2 Field Notes

Relevant field observations are noted in a bound waterproof notebook that is project specific. Information to be entered into the field notes include project name, frequency, trip type, date, collectors, responsibilities, weather, acids, labs being submitted to, sample id, site id, time collected, and sample type. Additional comments on observations, equipment cleaning, maintenance, and calibration should be recorded here. Field service contractors shall provide copies of all field notes to the SFWMD field project manager within one week of sample collection.

8.3.3 Calibration Sheet

Field multi-parameter probe calibrations are recorded on a supplemental page of the header sheet (or equivalent). The exact requirements of the calibration are dependent on the model of probe, the parameters measured, the range of parameters expected, and the range of parameters encountered. The field instruments used in conjunction with grab sample collection must be calibrated daily. The continuing calibration verification (CCV) standard must be read at the end of the sampling event or every 24 hours whichever is less.

8.3.4 Field Data Validation and Responsibilities

All staff associated with the project is responsible for ensuring the accuracy and completeness of data. The following sections provide a list of responsible parties:

8.3.4.1 Sampling Team

The sample team will review and validate the sampling data collected during the course of the sampling event. This includes header sheets, field notes, and calibration sheets. Signature by the samplers indicates the data has been reviewed and validated.

8.3.4.2 Laboratory

In the process of entering field data into the database, the laboratory will review the data for completeness and accuracy. Incomplete or inaccurate data may result in the inability to enter data, or may flag the data as suspect.

8.3.4.3 Field Project Manager

It is the field project manager's responsibility to review header sheets, field notes, and calibration sheets as well as the entry of these items into the database. The field project manager is required to approve the electronic version of the data. The field project manager is responsible for scanning the field notes and according to protocol, filing them in an assigned file server.

8.3.4.4 Quality Assurance

The SFWMD's QA staff is responsible fro overseeing the overall QA/QC program for this project. This is done by ensuring that there are sufficient data quality elements in the project plan, and conducting audits of the different processes, including field and laboratory activities. Data are validated by SFWMD's data validators

8.3.5 Corrections

If sample collectors, the laboratory, or the project manager discover errors in any of the field notes, header sheets, or calibration sheets, corrections may be required. Corrections to header sheets, field notes, or calibration sheets may only be made by staff who participated in the production of the document. Changes are made by striking through the error, writing the correction, initialing and dating the change. On occasion, a detailed explanation of the error may be required.

8.4 Sample Submission

Samples are transported on wet ice at 4^{o} Celsius to the laboratory for analysis. Samples are submitted to the laboratory on the same day as collection or via courier the following day. Some analyses might require delivery to the lab within a specific time frame. Samples are submitted as described in the FSQM. Laboratory staff "time stamp" the sample header (Chain of Custody) sheet and verify that all samples arrive with the required preservation (e.g. cooling and acidification) and signatures. The samples are sorted and placed in a temperature environment.

8.5 Field Audits

Annual field audits are required.

9.0 Data and Records Management

After the data validation process, all data are archived in DBHYDRO and maintained so that end users can retrieve and review all information relative to a sampling event. Field notes are maintained on an internal server either by scanning actual field note pages or by uploading narratives from field computers. All analytical data and field conditions are sent to a database designated by the sponsors for long-term storage and retrieval.

The sampling agency or contractor maintains records of field notes and copies of all records relative to the chain of custody and analytical data. It is the responsibility of each agency or contractor to maintain both current and historical method and operating procedures so that at any given time the conditions that were applied to a sampling event can be evaluated.

10.0 Project Reporting

10.1 Data from this project is reported in the quarterly TOC report and the annual South Florida Environmental Report..

11.0 Project Contacts and Responsibilities

11.1 Field Project Manager

The field project manager for this project is Peter Rawlik. The field project manager is responsible for maintaining this document and making sure that any changes are well documented and communicated to the field staff and other parties as necessary.

Peter Rawlik
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(561) 753-2400 x 4770

11.2 Analytical Lead/Contract Manager

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12.0 Revisions and Modifications

Monitoring Plan

For

Project PIN

_____ _____

XXXXXXXXXXX, Water Quality Monitoring Division Director **Date**

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XXXXXXXXXXX, Water Quality Analysis Division Director **Date**

_____ _____

XXXXXXXXXXX, Water Quality Assessment Division Director **Date**

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XXXXXXXXXXX, Field Project Manager **Date**