

Operational Monitoring Plan
For
Everglades National Park Inflows East
(PIE)

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

SFWMD-FIELD-MP-035-03

Table of Contents

1.0	Glossary	4
2.0	Project Organization	5
3.0	Project Description	5
3.1	Introduction and Background	5
3.2	Active Mandates and Permits	5
3.3	Project Objectives	5
3.4	Duration	5
3.4.1	Initiation Conditions.....	5
3.4.2	Modification or Termination Conditions	5
4.0	Geographic Location	6
4.1	Regional Area	6
4.2	Sampling Locations.....	6
4.3	Access and Authority	6
5.0	Field Activities.....	10
5.1	Monitoring Frequencies by Site and Parameters	10
5.2	Project Specific Guidelines.....	12
5.3	Grab Sampling Procedures.....	12
5.4	Field Testing Procedures.....	12
5.5	Field Quality Control Requirements.....	13
5.6	Autosamplers.....	13
5.7	Sample Submission	13
6.0	Data Quality Objectives	13
6.1	Data Uses.....	13
6.2	Data Quality	13
6.3	Completeness Targets.....	14
7.0	Data and Records Management	14
7.1	Data Deliverables	14
7.2	Data Storage	14
8.0	Revisions and Modifications	14
	References.....	16
	Signature Page.....	17

Figures

Figure 1: PIE Monitoring Stations.....	7
Figure 2: PIE Monitoring Stations, East Central Side of ENP	8
Figure 3: PIE Monitoring Stations, Southeast Side of ENP	9

Tables

Table 1: PIE Water Quality Monitoring Sites and GPS Coordinates	10
Table 2: PIE Grab Sample Parameter ACODES and Frequency	11
Table 3: Field Analytical Parameters Collection	12
Table 4: PIE Autosampler Parameters and Frequency	13

Appendices

Appendix 1: Monitoring Requirements by Mandate	18
Appendix 2: Monitoring Plan for Mercury and other Toxicants.....	20

1.0 Glossary

ACODES	Analytical Parameter Abbreviations
ACF	Autosampler Composited Flow
ADT	Autosampler Discrete Time
CERP	Comprehensive Everglades Restoration Plan
CERPRA	Comprehensive Everglades Restoration Plan Regulation Act
CLQM	Clinical Laboratory Quality Manual
DBHYDRO	South Florida Water Management District Environmental Database
DQOs	Data Quality Objectives
ENP	Everglades National Park
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FSQM	Field Sampling Quality Manual
GPS	Global Positioning System
LIMS	Laboratory Information Management System
NECP	Non-Everglades Construction Project
PIE	Everglades National Park Inflows East
SFWMD	South Florida Water Management District
TOC	Technical Oversight Committee

2.0 Project Organization

Overall project organization and responsibilities are detailed in the South Florida Water Management District (SFWMD or District) Water Quality Bureau (WQB) Quality Management Plan (QMP). Field activity responsibilities are detailed in the District's Field Sampling Quality Manual (FSQM). Laboratory analysis and data validation responsibilities are detailed in the District's Chemistry Laboratory Quality Manual (CLQM). These documents define the procedures used by SFWMD personnel to meet the Florida Department of Environmental Protection's (FDEP) Quality Assurance Rule, Florida Administrative Code (F.A.C.) 62-160. Refer to these documents for details on key personnel and relevant responsibilities.

3.0 Project Description

3.1 Introduction and Background

This document serves as a reference for Project PIE (Park Inflows East), which monitors surface water quality in Everglades National Park (ENP). Approved by the Technical Oversight Committee (TOC) in 2006, Project PIE is a comprehensive surface water monitoring plan for the eastern edge of Everglades National Park from the S331 structure south to the S197 structure. The creation of a comprehensive monitoring plan for the area was made necessary by the existence of multiple overlapping projects with duplicative or conflicting requirements.

3.2 Active Mandates and Permits

Project PIE fulfills mandated monitoring required under the Non-Everglades Construction Project Permit (NECP), the Settlement Agreement, and the Army Corps of Engineers' C111D Emergency Order. In August of 2009, the requirements of the CERPRA permit for the C111 Western Features Project were added to this document. There is significant overlap of stations involved in these mandates that is addressed in Appendix 1.

3.3 Project Objectives

The primary purpose for creating Project PIE was to meet the varied mandated monitoring requirements in a cost effective manner by reducing redundant monitoring. A secondary objective of Project PIE is to provide a framework that will incorporate the monitoring associated with future infrastructure changes planned under various Comprehensive Everglades Restoration Plan (CERP) and Expedited (formerly Acceler8) projects.

3.4 Duration

3.4.1 Initiation Conditions

This project was initiated in early 2007 with a phased transition that was designed to be completed by late 2007.

3.4.2 Modification or Termination Conditions

The mandated monitoring described in this document will be continued indefinitely in response to the Settlement Agreement, the Non-Everglades Construction Project (NECP) permit, the C111D Emergency Order and the CERPRA permit.

4.0 Geographic Location

4.1 Regional Area

Project PIE is located on the eastern edge of Everglades National Park in the western portion of Miami-Dade County. Project boundaries include structure S331 in the north and structure S197 in the south.

4.2 Sampling Locations

Sixteen (16) monitoring stations are included in this plan. Their locations are depicted in Figures 1 and 2 with exact locations described in Table 1.

4.3 Access and Authority

All sites are located outside the boundaries of Everglades National Park. Entry and sample collection are not regulated. Access requires the appropriate SFWMD gate key.

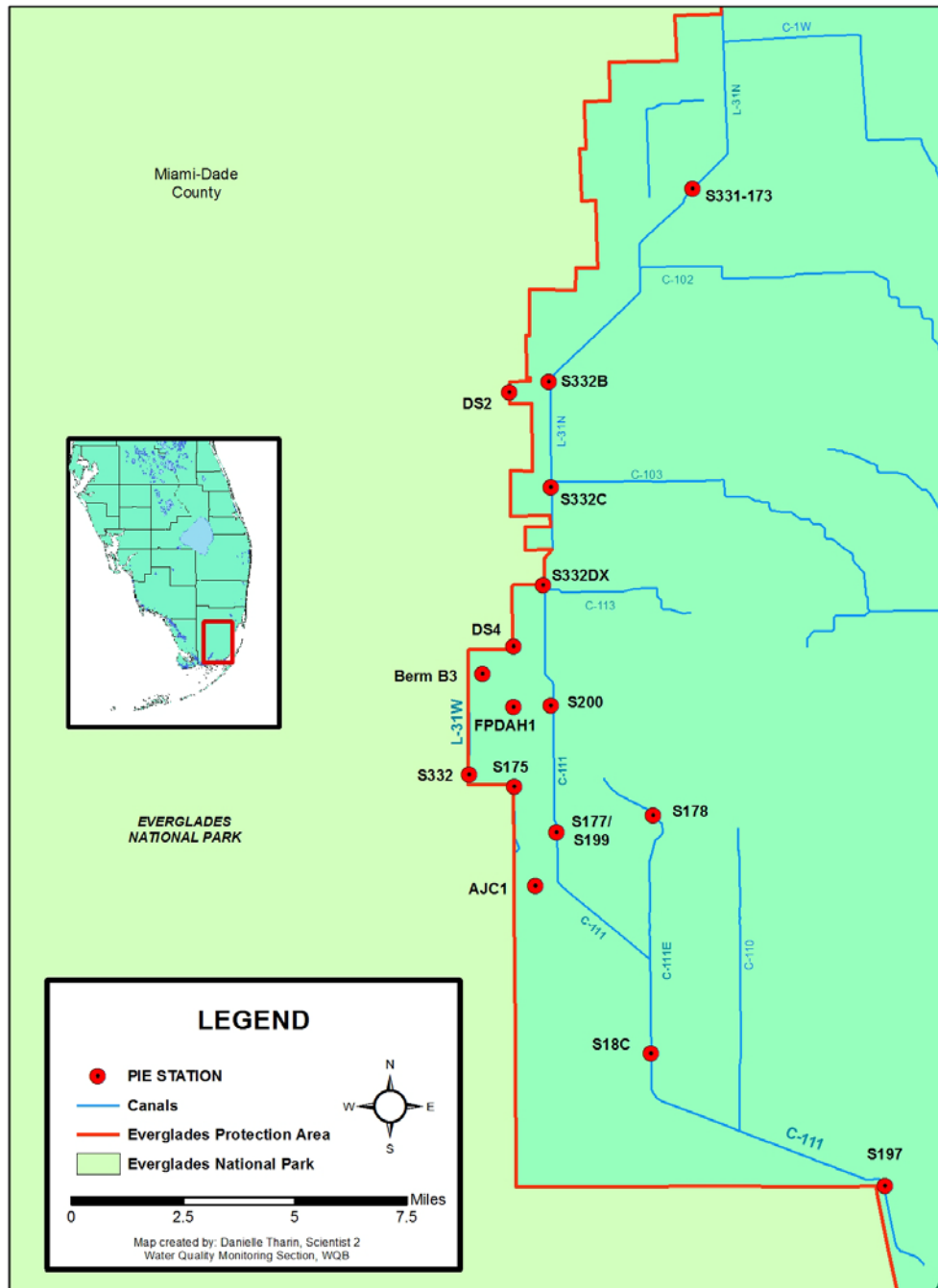
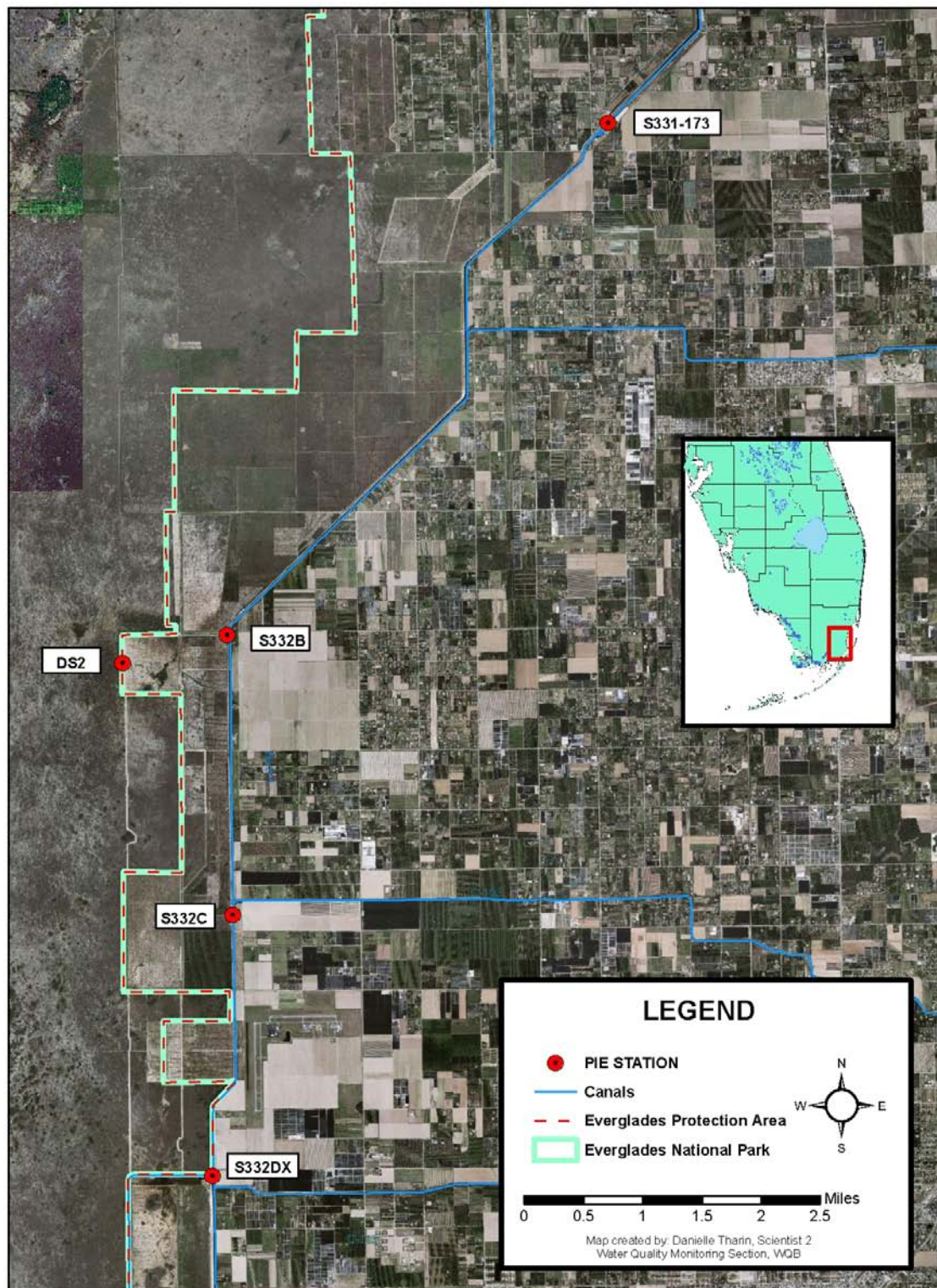


Figure 1: PIE Monitoring Stations



2010 Airexpress RGB 1 foot Natural Color aeriels and 2004 USGS 1 meter RGB DOQQs

Figure 2: PIE Monitoring Stations, East Central Side of ENP

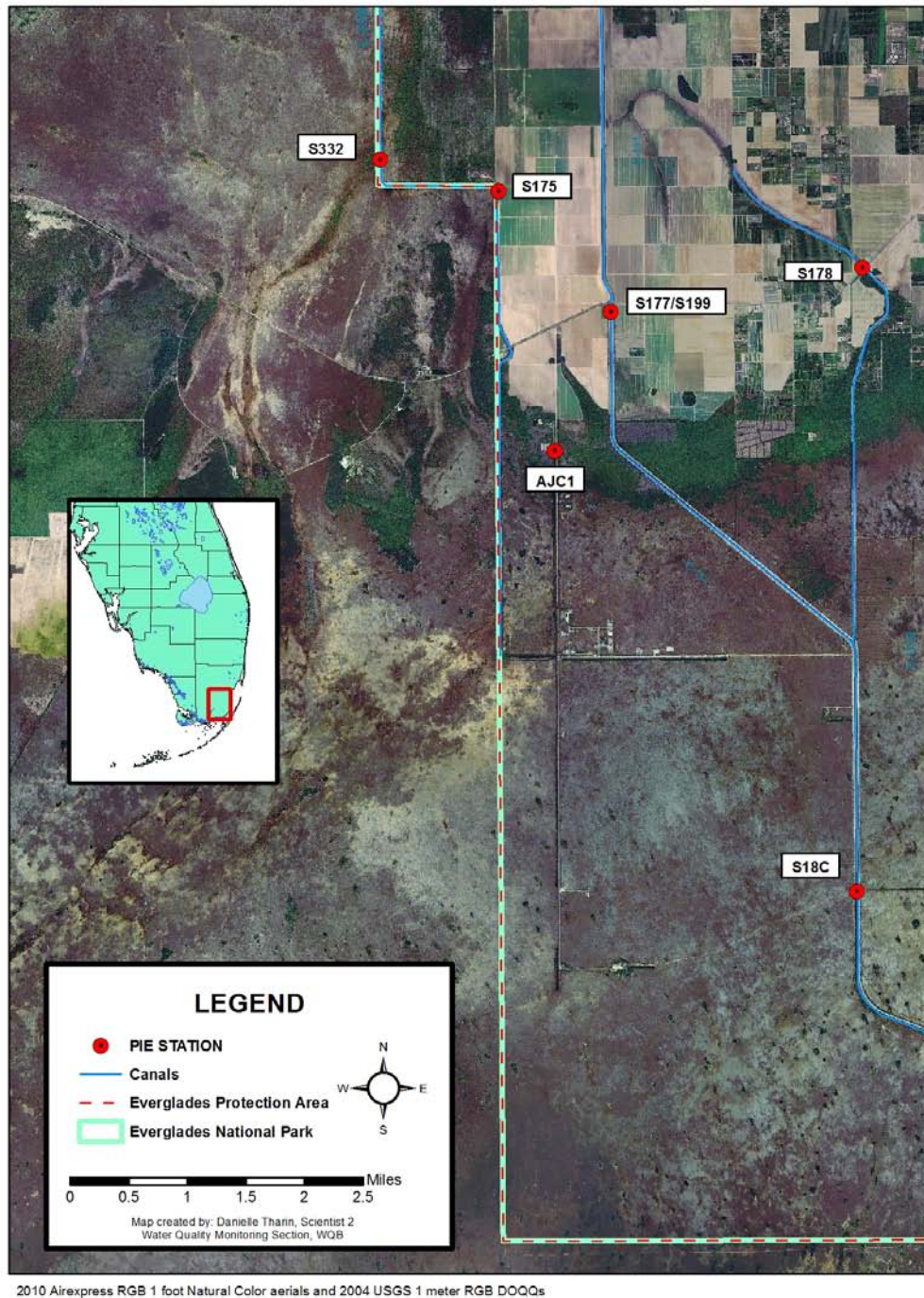


Figure 3: PIE Monitoring Stations, Southeast Side of ENP

Table 1: PIE Water Quality Monitoring Sites and GPS Coordinates

Site Name	Latitude*	Longitude*	Description
S331-173	253641.800	803032.601	At the northern end of the land between S331 and G173
S332B	253258.400	803338.229	At the S332B pump station
S332C	253054.705	803336.841	At the S332C pump station
S332DX	252859.900	803346.400	At the eastern end of the land in front of S332D
DS2	253246.197	803429.276	On the border between ENP and the detention area west of S332B
DS4	252747.777	803425.262	On the border between ENP and the detention area just north of berm B2, also known as S328
Berm B3	252716.321	803505.671	On the northwestern side of the concrete berm designated Berm B3 in the C111D detention area
S177	252410.412	803330.215	At the S177 and S199 structure
S178	252429.411	803126.212	At the S178 structure
S18C	251950.421	803130.215	At the S18C structure
S197	251714.147	802629.386	At the S197 structure
S200	252638.950	803337.270	At the S200 structure
AJC1	252236.672	803358.158	In the Aerojet Canal south of the fish farm
FPDAH1	252636.996	803425.743	In the Frog Pond Detention Area header canal
S175	25253.630	803425.840	On the L31W levee north of CR 9336
S332	252518.720	803524.820	On the L31W levee north and west of S175

*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.

5.0 Field Activities

5.1 Monitoring Frequencies by Site and Parameters

All samples required for collection by grab sampling are depicted in Table 2.

Table 2: PIE Grab Sample Parameter ACODES and Frequency

Station	Matrix	Type	Frequency	Parameter (ACODES)
S331-173 S332DX S18C	SW	Grab	Weekly if flowing, otherwise monthly	Dissolved Oxygen (DO), pH, Specific Conductivity (SCOND), Temperature (TEMP), Total Suspended Solids (TSS), Total Phosphorus (TPO ₄), Orthophosphorus (OPO ₄), Total Kjeldahl Nitrogen (TKN), Nitrate + Nitrite (NO _x), Chloride (Cl), Calcium (Ca)
			Quarterly	Turbidity (TURB), Sulfate (SO ₄), Pesticide suite, Dissolved Organic Carbon (DOC) at S331-173 and S332DX and Total Mercury (THg) and Methyl Mercury (MeHg) at S332DX
S332B S332C	SW	Grab	Weekly if flowing	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
S177/(S199) S178	SW	Grab	Weekly if flowing, otherwise monthly	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca, NH ₄
			Quarterly	TURB, SO ₄ , Pesticide suite
Berm B3	SW	Grab	Biweekly if flowing, otherwise monthly	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
			Quarterly	TURB, SO ₄
S197	SW	Grab	Biweekly if flowing, otherwise quarterly	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
			Quarterly	TURB, SO ₄
DS2 (decommissioned) DS4 (aka S328)	SW	Grab	Event driven. Sampled only when a discharge event has occurred.	DO, pH, SCOND, TEMP, TSS, TDS, TOC, DOC, Alkalinity (ALK), TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca, SO ₄ , NH ₄ , TURB, Pesticide suite
S200	SW	Grab	Weekly if recorded flow	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x
AJC1	SW	Grab	Weekly if recorded flow at S199	DO, pH, SCOND, TEMP, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , NH ₄ , TDEPTH
			Quarterly	Ca, Magnesium (Mg), Zinc (Zn), Copper (Cu), TURB
FPDAH1	SW	Grab	Weekly if recorded flow at S200	Total Depth (TDEPTH)
			Quarterly if sufficient water depth to sample	Ca, Mg, Zn, Cu
S175 S332	SW	Grab	Biweekly if flowing	DO, pH, SCOND, TEMP, TSS, TP, OPO ₄ , TKN, NO _x
			Quarterly if flowing	Cl, Ca, SO ₄

5.2 Project Specific Guidelines

All surface water samples shall be collected on the upstream side of any structure at a depth of 0.5 m unless vegetation and/or other conditions inhibit the collection of a representative sample upstream. Prior to sampling an alternative site, a consultation with a Field Technician Supervisor and/or the FPM must take place; this action must be documented in the field notes.

S332DX is a sampling point that serves S332D and S176. The determination of the need for a grab sample is based on flow from any one of the three structures. The station did serve as a surrogate for S174 but that structure was demolished in 2008.

DS2 and DS4 are diversion structures that may be used for overflow out of the detention areas and directly into Everglades National Park or the L31W canal. If these structures are used, event-response monitoring is required.

With the addition of S199 adjacent to S177 sampling at the S177 station is triggered by flow from either structure.

Sampling at the FPDH1 station is predicated on the presence of sufficient quantities of water to actually collect. As guidance waters in the header canal should be both contiguous and at least 10 cm in depth.

Operations of structures S175 and S332 is limited to emergency flood conditions only. Accordingly, monitoring of these structures is only required when either is actually used. Operations are required to notify monitoring staff so that sample collection can be initiated.

5.3 Grab Sampling Procedures

Sample collection for this project shall follow the procedures and requirements found in the Field Sample Collection Procedures Section of the District's FSQM. All samples are collected on the upstream side of the structure.

5.4 Field Testing Procedures

Field testing procedures shall follow the procedures and requirements found in the Field Testing Section of the District's FSQM. The field parameters for this project are described in Table 3.

Table 3: Field Analytical Parameters Collection

Parameter	Resolution	Accuracy
DO	0.01 mg/L	0-20 mg/L, ± 0.2 mg/L
Conductivity	0.001 mS/cm	$\pm 0.5\%$ of reading ± 0.001 mS/cm
Temperature	0.01°C	$\pm 0.15^\circ\text{C}$
pH	0.01 unit	± 0.2 unit

5.5 Field Quality Control Requirements

Field quality control requirements shall follow the procedures found in the Quality Control section of the District's FSQM.

5.6 Autosamplers

Project PIE includes five autosamplers, three are set for flow proportional composite sampling and two are set for time dependent discrete sampling. Table 4 presents the details of the autosamplers.

Table 4: PIE Autosampler Parameters and Frequency

Station	Matrix	Type	Parameters	Frequency
S331-173 S332DX	SW	Time proportional discrete autosampler	TPO ₄ , TKN, NO _x	Sampler set to sample every three hours, collected weekly.
S332B S332C S18C	SW	Flow proportional composite autosampler	TPO ₄ , TKN, NO _x	Weekly

5.7 Sample Submission

Following completion of sample collection for each day, the samples are transported in coolers with wet ice at 4° Celsius to the laboratory for analysis. Samples are submitted to the laboratory on the same day as collection or via courier the following day. Samples are submitted according to the requirements outlined in the District's FSQM. If samples are submitted to a facility other than the District's in-house laboratory, the laboratory must be District approved.

6.0 Data Quality Objectives

6.1 Data Uses

The data from PIE is compiled and reported in the District's annual *South Florida Environmental Report* (SFER) and the quarterly *Settlement Agreement Report*.

6.2 Data Quality

All monitoring required by the attached permit shall meet the indicators conveyed in the FDEP's Quality Assurance Rule, 62-160 F.A.C. The District has adopted a uniform set of DQOs following criteria detailed within the "Analytical Methods and Default QA/QC Targets" table of the Chemistry Laboratory Quality Manual (CLQM).

The DQOs of the field testing parameters for this project are covered by the table entitled *Field Quality Assurance Objectives* found in the field testing section of the FSQM. This manual is updated annually, and therefore, the most recent version of the District's FSQM details the specific field testing DQOs for this project at the time of sample collection.

Samples are analyzed according to the provisions within the FDEP Rule 62-160 F.A.C. and the District's CLQM. This manual is annually updated, and therefore, the most recent

version of the District's CLQM details DQOs for this project at the time of sample collection for each specific laboratory analysis. Data are qualified in accordance with the FSQM and CLQM data validation and reporting sections.

6.3 Completeness Targets

Completeness targets (i.e., the number of samples successfully collected and analyzed) shall be set at 95% annually for this project. Sampling attempts shall be included in the completeness target. At times samples will not be able to be collected on an attempt due to no flow or low water conditions, unsafe station conditions, equipment malfunction, site maintenance, or other unforeseen problems that might affect sample collection and/or quality. If samples cannot be collected on an attempt, collectors shall document "no bottle" (NOB in DBHYDRO) to indicate and attempt was made.

7.0 Data and Records Management

The laboratory shall evaluate the data in accordance with the data quality objectives stated in the FSQM and CLQM. All data submittals shall conform to existing District guidelines.

7.1 Contract Deliverables

There are no contract deliverables for this project.

7.2 Data Storage

After the data validation process, all data are 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 into NuGenesis. All analytical data and metadata are sent to a database (DBHYDRO) for long-term storage and retrieval.

The District shall maintain master copies of field and laboratory generated records. It is the responsibility of the District 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. At least quarterly, any contractor performing work for the project shall provide all original field records to the District's WQB for permanent archival.

Records shall be maintained for the life of the project and a minimum of five years thereafter, in a manner that will protect the physical condition and/or integrity of the records. Storage shall follow the SOP for Archive Records Storage and Retention (SFWMD-FIELD-SOP-022). Corrections of data or records shall follow the applicable District SOPs and FSQM.

8.0 Revisions and Modifications

Date	Sections	Page Number(s)	Change From	Change To	Reason
9/1/2009	3, 4, 5, Appendix 1				Added CERPRA permit and monitoring requirements including stations S199, S200, FPD AH1, AJC1
2/9/12	Table 1	Page 8	TBD	GPS values for all TBD	Structures are completed and GPS coordinates were added to plan
2/9/12	Table 2	Page 9		Parameter TDEPTH added to AJC1 and FPD AH1	C111 SC permit 0293559-006
2/9/12	Appendix 2			Added	Added Appendix 2 C111 SC permit 0293559-006
8/30/12	tables	Page 9 and 16		Added footnotes and parameters for DS2 and DS4	To comply with C111D EO
12/3/12	Table2	Page 10		Added parameters and change frequency	To comply with permit C-111 Spreader Canal, minor mod. 0293559-007
4/18/13	Table 2	Page 10		Deleted all Hg from table except at S332DX (reinstated for the CERPRA permit)	On 4/18/08 FDEP issued Non-ECP permit mod 0237803-010 terminating THg and MeHg surface water monitoring. On 12/15/09 Technical Oversight Committee approved terminating THg and MeHg surface water monitoring.
4/22/13	Tables 1 and 2	Pages 9 and 10		Deleted FPD CELL3	Collection no longer required at the site

References

Abtew, Wossenu & Powell, B. Water Quality Sampling Schemes for Variable Flow Canals at Remote Sites. Journal of the American Water Resources Association. October, 2007. Pp 1197 – 1204.

FDEP (Florida Department of Environmental Protection). Quality Assurance Rule, 62-160 Florida Administrative Code (F.A.C.)

South Florida Water Management District, Chemistry Laboratory Quality Manual (CLQM), Version 1.0, October 2011 or a newer version if available.

<http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/portlets/analytical%20services/tab2/tab5/2011%20quality%20manual.pdf>

South Florida Water Management District, Field Sampling Quality Manual (FSQM), Version 7.0, December 2011 or a newer version if available.

http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/water%20quality%20monitoring%20division/subtab%20-%20wqm%20-%20qa/tab24442257/fsqm_sfwmd-field-qm-001-07.pdf

South Florida Water Management District, Field Sampling Quality Management Plan (QMP), Version 3.0, June 2011 or a newer version if available.

http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/portlets/subtab%20-%20qaqc/tab21630104/rsd_qmp_v3_0.pdf

Signature Page

Monitoring Plan

For

Everglades National Park Inflows East

Project PIE

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Appendix 1: Monitoring Requirements by Mandate

Station	Mandate	Permit Number	Collection Method	Frequency	Parameters
S331-173	Mission Driven; Special request by ENP		ADT	Weekly	TPO ₄ , TKN, NO _x
	NECP Permit	0237803-011	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	C111D EO#9		Grab	Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
S332B S332C	C111D EO#9		ACF	Weekly	TPO ₄ , TKN, NO _x
			Grab	WF	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
S332DX (S176)	Mission Driven; Special request by ENP		ADT	Weekly	TPO ₄ , TKN, NO _x
	C111D EO#9		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	NECP Permit	0237803-011	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	CERPRA	0293559-007	Grab	Quarterly	SO ₄ , TOHg, MeHg, Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
Berm B3	C111D EO#9		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄
S200	CERPRA Permit	0293559-007	Grab	WRF	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x
FPDAH1	CERPRA Permit	0293559-007	Grab	WRF	TDEPTH
				Quarterly when sufficient depth (at least 10 cm)	Zn, Cu, Ca, Mg
DS2 (decommissioned) DS4 (aka S328)	C111D EO#9		Grab	Event	DO, pH, Conductivity, Temperature, TSS, TDS, TOC, DOC, Alkalinity, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca, SO ₄ , NH ₄ , TURB, Pesticides

Station	Mandate	Permit Number	Collection Method	Frequency	Parameters
175 S332	NECP Permit	0237803-011	Grab	BWF	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x
				QF	Cl, Ca, SO ₄
S178	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	NECP Permit	0237803-011	Grab	Quarterly	Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	Supports Florida Bay research		Grab	WF/M	NH ₄
S177/S199	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄
				Quarterly	Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	NECP Permit	0237803-011	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄
				Quarterly	Pesticides ¹ (Surface Water)
	CERPRA Permit	0293559-007	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , NH ₄
				Quarterly	Pesticides ³ (Surface Water)
AJC1	CERPRA Permit	0293559-007	Grab	WRF at S199	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , NH ₄ , TDEPTH
				Quarterly	Zn, Cu, Ca, Mg, Turbidity
S18C	Settlement Agreement		ACF	Weekly	TPO ₄ , TKN, NO _x
			Grab	WF/M	TPO ₄ , DO, pH, Conductivity, Temperature, TSS, OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	NECP Permit	0237803-011	Grab	WF/M	TPO ₄ , DO, pH, Conductivity, Temperature, TSS, OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	CERPRA Permit	0293559-007	Grab	WF/M	TPO ₄
S197	NECP Permit	0237803-011		Biweekly if flowing, otherwise Quarterly	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄

¹ Reference PEST Monitoring Plan (034)

² See Appendix 2

³ Due to its proximity S177 is used to monitor S199 water quality. S177 is currently sampled under the Non-Everglades Construction Projects (NECP) permit. These data are to be submitted or referenced as part of the Annual report for this permit.

Appendix 2: Monitoring Plan for Mercury and other Toxicants

1. Initial Start-up Monitoring

The District shall initiate start-up monitoring prior to discharge as follows:

1.1 Mosquitofish

- i) When construction of the project is complete, the District shall notify the Department and within one month of flooding collect mosquitofish from multiple locations within each the Frog Pond Detention Area Header and Aerojet Canal Impoundment (up to a total at least 100 fish; for map of collecting sites, see Figure 1) and physically composite them into one, spatially-averaged sample for each detention area and impoundment for THg analysis (note, a single aliquot should be analyzed per composite). The detention area and impoundment are not designed to discharge into receiving waters; therefore this project will not contain a downstream monitoring component.
- ii) The District shall provide the Department with the results of the first collection of mosquitofish as well as the appropriate action levels for comparison (90% upper confidence level of the basin-wide average or the 75th percentile concentration for the period of record for all basins). If tissue-concentrations from the detention area and impoundment are below the 90% upper confidence level of the basin-wide average or below the 75th percentile concentration for the period of record for all basins (if basin-specific data are lacking); after concurrence from the Department, the District may initiate routine monitoring for that detention area or impoundment.

However, if the Hg concentration in any of the mosquitofish composites from within the detention area or impoundment exceeds one of the above referenced action levels, the District shall immediately (within 14 days of receiving quality assured data from the laboratory) collect a sample(s) to confirm the exceedance(s). In addition, the District shall consult with the Department to determine the most appropriate course of action. At a minimum, the course of action will include implementation of Tier 2 Expanded Monitoring and Risk Assessment by the District (e.g. collection of monthly mosquitofish within the detention area or impoundment at a minimum), additional details on expanded monitoring are provided below and in A Protocol for Monitoring Mercury and Other Toxicants dated February 13, 2006 and subsequent revisions (hereafter referred to in this document as the "Protocol"). The recommended course of action may also include additional measures as determined to be appropriate. When results of expanded monitoring demonstrate concentrations in each detention area and impoundment has decreased to acceptable levels (below action levels referenced above), the District shall notify the Department and request that the monitoring revert back to Tier 1 routine monitoring.

Additionally, these tissue samples will be analyzed and assessed for bio-accumulative toxicants other than mercury as discussed below.

1.2 Water

Although bio-accumulative toxicants, in particular mercury, will be monitored and assessed based on tissue concentrations, because of the concern for potential acute toxicity, water will be

collected immediately upstream of the inflow station of the project (S332DX) and analyzed for toxicants other than mercury as discussed below.

Table 1: Initial Start-up Monitoring

Matrix	Station	Collection Method	Frequency	Parameter
Mosquito-fish	FPDA Header and AJ Canal	Net or Trap	One-time	Cis-chlordane, trans-chlordane, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, toxaphene, cis-nonachlor, trans-nonachlor, copper, zinc and THg
Surface Water	S-332DX	Grab	One-time	Chlordane, p,p'-DDD, p,p'-DDE, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, toxaphene, and copper

Selection of Toxicants Other Than Mercury

The following information sources have been reviewed for data regarding this project: URS, Limited Phase II Environmental Site Assessment Frog Pond, State Road 27, Miami-Dade County, Florida, November 16, 2006 and Ecological Risk Assessment of Frog Pond Soils, prepared by Newfields, January 2009. Based on this review, the parameters identified in Table 2 will be analyzed in each of the specified matrices.

The District shall provide the Department with the results of these analyses as well as the appropriate action levels for comparison. If the following criteria are met for a given detention area or impoundment, the District may initiate routine monitoring for that detention area or impoundment (for details on routine monitoring, see below).

- If ambient mosquitofish do not demonstrate excessive bioaccumulation that exceeds a critical tissue benchmark used to establish SQAGs or in site-specific risk assessments;
- If concentrations in sediments do not exceed an effects-based, numerical sediment quality assessment guideline (SQAGs for sediment dwelling organisms, MacDonald Environmental Sciences Ltd. and USGS, 2003);
- If concentrations in sediments do not exceed an established bio-accumulative based SQAG, if available (MacDonald Environmental Sciences Ltd. and USGS, 2003), a action level reported in the ESA or a level that was determined to be critical in a site-specific risk assessment;
- If water-column concentrations do not exceeded a WQS in Chapter 62-302, F.A.C.

Table 2: Toxicants other than mercury to be Analyzed in Specified Matrix.

Analyte	Surface Water	Fish Tissues
chlordane	✓	
cis-chlordane		✓
trans-chlordane		✓
o,p'-DDD		✓
p,p'-DDD	✓	✓
o,p'-DDE		✓
p,p'-DDE	✓	✓
o,p'-DDT		✓
p,p'-DDT	✓	✓
alpha endosulfan	✓	✓
beta endosulfan	✓	✓
endosulfan sulfate	✓	✓
toxaphene	✓	✓
cis-nonachlor		✓
trans-nonachlor		✓
copper	✓	✓
zinc	✓	✓

However, if one of the above referenced action levels are exceeded, the District shall immediately (within 14 days of receiving quality assured data from the laboratory) collect a sample(s) to confirm the exceedance(s). In addition, the District shall consult with the Department to determine the most appropriate course of action. At a minimum, the course of action will include implementation of Tier 2 Expanded Monitoring and Risk Assessment by the. The recommended course of action may also include additional measures as determined to be appropriate. When results of expanded monitoring demonstrate concentrations in each detention area or impoundment has decreased to acceptable levels (below action levels referenced above), the District shall notify the Department and request that the monitoring revert back to Tier 1 routine monitoring.

2. Monitoring During Stabilization Period

The District shall initiate monitoring after initial discharge and during the stabilization period as follows:

2.1 Tier 1: Routine Monitoring During Stabilization Period

2.1.1. Water

On a quarterly basis, an unfiltered surface water sample ($n = 1$) shall be collected in accordance with Chapter 62-160, F.A.C., at the inflow (station S332DX) (see map of project shown in Figure 1). These samples will be analyzed for THg, MeHg, and sulfate (the latter not to be duplicative if listed as a parameter under routine monitoring described elsewhere in the general monitoring plan).

Based on the discussion above regarding toxicants other than mercury, a surface water sample will be collected quarterly at the inflow (station S332DX) and analyzed for the parameters listed in Table 1 under surface water.

In addition, flow will be monitored at the inflow to allow for load estimation to the project (it should be recognized that quarterly sampling would allow for only rough estimation of loads).

Because of differences in the anticipated time frames under which sedimentary release are thought to occur (i.e., relative to MeHg that may have time lag associated with changes in biogeochemistry and microbial methylation driven by water quality, especially in sandy soils), monitoring for other toxicants would cease after one year if action levels are not exceeded within that time.

2.1.2. Fish Tissues

Samples of fish from multiple trophic levels will be collected from the detention area and impoundment (Figure 1). Specifically, mosquitofish collections will be made in a similar fashion and continue on a quarterly basis from all sites that were sampled during startup monitoring (see above; for rationale for the selection of this and other species listed below, see the Protocol). On an annual basis, bluegill (n should be greater than or equal to 5) should be collected and individually analyzed as whole-fish. Because this site contains habitat that is expected to support largemouth bass and because recreational harvesting is likely in the future, bass will also be collected (n should be greater than or equal to 5) and a fillet from each individual analyzed. For the reasons discussed in the Protocol, collections should target bluegill ranging in size from 102 to 178 mm (i.e., 4 to 7 inches) and largemouth bass ranging in size from 307 to 385 mm (i.e., 12 to 15 inches); however, other lepidomids (first priority being given to spotted sunfish) or sizes are to be collected if efforts fail to locate targeted fish. These samples will be analyzed for THg and other toxicants listed in Table 1 under tissues. Monitoring for other toxicants would cease after one year if action levels are not exceeded within that time.

Assessment

To detect and minimize any adverse effects as early as possible (and to provide a basis for identifying adaptive management options, if deemed necessary), the results of this monitoring will be assessed based on the criteria and time table described under Phase 2- Tier 1 in the Protocol (specifically, A Protocol for Monitoring Mercury and Other Toxicants and appendices, as approved at the time of the assessment). Monitoring results will be provided to the Department in accordance with the reporting requirements identified in Section 4.

Table 3: Stabilization Monitoring

Matrix	Station	Collection Method	Frequency	Parameter*
Surface Water	S332DX	Grab	Quarterly	Chlordane, p,p'-DDD, p,p'-DDE, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, toxaphene, copper, THg, zinc, MeHg, and sulfate
Mosquito-fish	FPDA Header and AJ Canal	Net or Trap	Quarterly	Cis-chlordane, trans-chlordane, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, alpha endosulfan, beta endosulfan, endosulfan sulfate, toxaphene, cis-nonachlor, trans-nonachlor, copper, zinc and THg
Sunfish and Bass (n=5 each)	FPDA Header and AJ Canal	Electro-shock or Hook and Line	Annually	

Monitoring for other toxicants shall cease after one year if action levels are not exceeded within that time.

2.2 Tier 2: Expanded Monitoring and Risk Assessment During Stabilization Period

In accordance with the Protocol, if Tier 1 data exceed the action levels identified under Phase 2 – Tier 2 Expanded Monitoring and Risk Assessment, the District shall notify the Department and after obtaining the Department's concurrence, shall expand monitoring and undertake all necessary steps consistent with the Protocol.

3. Operational Monitoring Following the Stabilization Period

The monitoring plan and associated data will be re-evaluated on a regular basis beginning after year-1 for other toxicants and after year-3 for mercury species to determine if criteria specified in the Protocol are being satisfied. Based on that assessment, and with the concurrency of the Department, monitoring and assessment efforts may be reduced (as identified in Phase 3-Tier 1 Operational monitoring of the Protocol) or eliminated all together at the project level to be subsumed by regional monitoring (as identified in Phase 3-Tier 3 Operational monitoring). However, if monitoring reveals anomalous conditions as described under Phase 3-Tier 2, the District shall expand monitoring and undertake all necessary steps under Phase 3 – Tier 2 Expanded Monitoring and Risk Assessment.

4. Reporting Requirements

The permittee shall notify the Department immediately if monitoring data indicate that any of the action levels are exceeded. In addition, the permittee shall submit to the Department, as part of the annual South Florida Environmental Report, the results of the monitoring as defined above, including the following:

- Comparison of inflow and discharge concentrations with state water quality criteria;
- Comparison of inflow and outflow loads and concentrations for total mercury, methylmercury, and other toxicants; and
- Comparison of data with appropriate action levels.

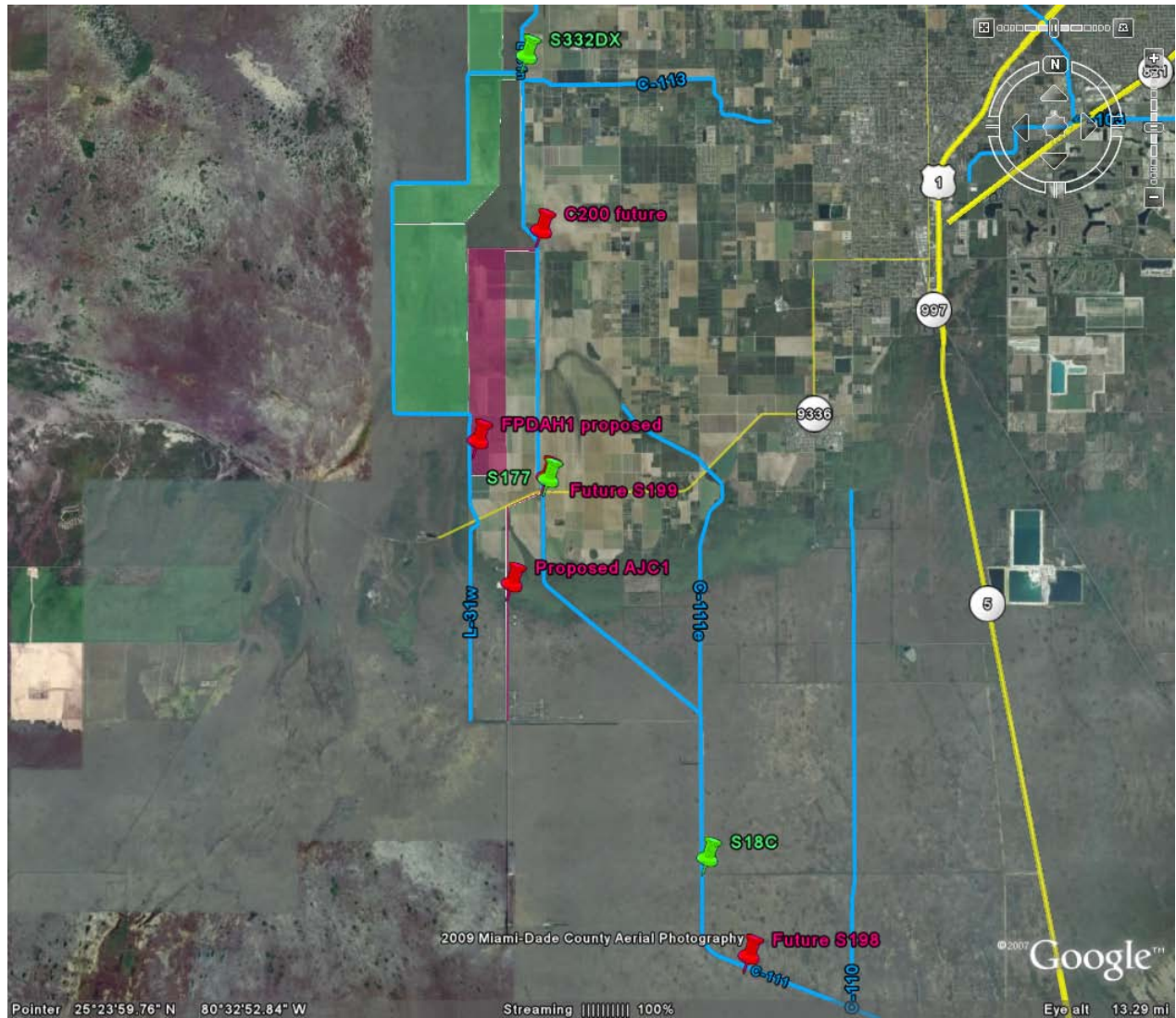


Figure 1: C111WF Sampling Locations