Operational Project Monitoring Plan

For

Lake Okeechobee Inflow/Outflow Monitoring Program

(Project X)

06/30/2022

7/5/2022

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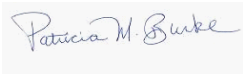
X 

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SFWMD-FIELD-OMP-037-12

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1.0 Project Organization

The following documents define the procedures used by South Florida Water Management District (SFWMD or District) Water Quality Monitoring (WQM) Section personnel to meet the Florida Department of Environmental Protection's (FDEP or Department) Quality Assurance (QA) Rule, Florida Administrative Code (F.A.C.) 62-160, and should be referred to for details on key personnel and relevant responsibilities.

- Overall project organization and responsibilities -
  - SFWMD Water Quality Bureau (WQB) and Applied Sciences Bureau (ASB) Quality Management Plan (QMP).
- Field activity and data validation responsibilities -
  - SFWMD Water Quality Monitoring Section's (WQM) Quality Manual (QM), Field Sampling Manual (FSM), and applicable Standard Operating Procedures (SOP).
- Laboratory analysis and data validation responsibilities –
  - SFWMD Analytical Service's (AS) Chemistry Laboratory Quality Manual (CLQM) and applicable SOPs.

2.0 Project Description

2.1 Project Introduction and Background

This document serves as a reference for surface water quality monitoring for Lake Okeechobee Inflow/Outflow Monitoring Program (PROJECT X). The operational plan for this project contains detailed structure specifications including brief descriptions of the mandate and/ or permit and mission driven required monitoring at (36) stations.

Lake Okeechobee is the most dominant hydrologic feature of southern Florida. The lake is surrounded by a 140-mile levee system intercepted by a network of canals that are entirely controlled (with the exception of Fisheating Creek) by a system of pump stations and spillways. The canals can function as inflows and outflows to the lake depending upon lake stage, gate openings, irrigation needs, or flood control requirements. The major structures are either operated by the District or the U.S. Army Corps of Engineers (USACE). This system allows for the lake's hydrologic regulation and dictates flood control management in the southern portion of the state.

Lake Okeechobee is a Class 1 primary drinking water source for cities around the lake, as well as a secondary source for the southeastern coast. It sustains prominent commercial and recreational fisheries and it is essential to the irrigation of crop industries in south Florida. It is also the primary source of fresh water for the St. Lucie and Caloosahatchee River estuaries.

Project X was originally established to provide a water quality database to measure the chemical loadings from discharges of major inflows to and outflows from the lake. Over the last three decades, this program has emerged as a pivotal source of information that

is vital to lake research initiativies and supplies data that are utilized to uphold District directives concerning Lake Okeechobee. These include:

- Development of water quality management strategies for the watershed;
- Calculation of the phosphorus "load to the lake" model;
- Trend detection of potential water quality problems;
- Establishment of nutrient budgets for Lake Okeechobee;
- Validation and development of water quality models;
- Information dissemination to the regulated communities and to public inquiries on basin water quality;
- Lake Okeechobee status and trend assessment;
- Evaluating the Kissimmee River Restoration Project's efforts to improve discharges to the lake;
- Ancillary information for in-lake ecological studies;
- Evaluating any impacts from basin land use changes;
- Measuring water quality effects of discharges to estuarine systems;
- Establishment of TMDLs; and
- Assessment of adherence to the BMAP requirements for Lake Okeechobee.

In response to the Governor's Executive Order 19-12 (signed January 10, 2019) to expedite nutrient reductions in the Northern Everglades, the District' Applied Sciences Bureau and Everglades and Estuaries Protection Bureau (EEP) recommended an expansion of the District's water quality monitoring network. As part of the executive order, two sites (S308C & S77) were included for additional frequencies and samples to be collected for Phytoplankton and Algal ID. These additional frequencies and parameters will be collected during the project X sampling events but are not part of the project itself. Samples from S-308C will be collected by the Okeechobee water quality staff while S-77 samples will be collected by the West Palm Beach water quality staff as part of the CRFW project sampling events. Additional sampling at S308C began March 1, 2020 and S77 began May 1, 2020.

2.2 Sampling Mandates

Station locations, sampling frequencies, and parameters are dictated by the mandate and/or permits governing this project (Appendix 1). Appendix 2 details the mercury and other toxicants monitoring program as required by Permit. The Compliance Monitoring Plan (CMP) associated with this project is SFWMD-FIELD-CMP-043.

The X Project is required by the Lake Okeechobee Operating Permit (LOOP), Permit #0174552-012-GL and the Everglades Agricultural Area Regulatory Program (EAARP) (Chapter 40E-63).

The X Project is mandated by the Northern Everglades and Estuaries Protection Program (NEEPP) 373.4595(3)(a)2, whose primary goal is to improve and protect the water quality

(specifically phosphorus load reductions) and quantity in the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds (NEEPP, 373.4595, Florida Statutes). Under NEEPP, the District in partnership with FDEP and FDACS has established Research and Water Quality Monitoring Programs (RWQMP) for each watershed to evaluate water quality to the estuaries. Among other requirements, the Program directs the coordinating agencies to (NEEPP, 373.4595(2) (a)-(g), Florida Statutes):

Analyze all available existing water quality data regarding total phosphorus in the watershed:

- Conduct an assessment of the water volumes and timing from the watershed and the timing and volume of water delivered to the estuaries;
- Determine the relative contribution of phosphorus from all identifiable sources and all primary and secondary land use;
- Develop a water quality baseline to represent existing conditions for total phosphorus;
- Develop a water quality model that reasonably represents the phosphorus dynamics of the watershed and incorporates an uncertainty analysis associated with model predictions;
- Evaluate the feasibility of alternative nutrient reduction technologies (including sediment traps, canal and ditch maintenance, aquaculture, bioenergy conversion processes, and algal or other biological treatment technologies);
- Monitor long-term ecological changes; and
- Measure compliance with water quality standards for total phosphorus.

The level of monitoring required for the RWQMP is not specified in NEEPP; projects, stations, frequencies, and parameters collected are at the discretion of the District and are based upon the needs of the data end-users and available funding. An additional component of NEEPP are Basin Management Action Plans (BMAP), which are intended to be a “blueprint” for restoring impaired waters by reducing pollutant loadings to meet the allowable loadings established in a Total Maximum Daily Load (TMDL). A BMAP represents a comprehensive set of strategies, for example, permit limits on wastewater facilities, urban and agricultural Best Management Practices (BMPs), conservation programs, financial assistance and revenue generating activities, etc., designed to implement pollutant reductions established by the TMDL. These broad-based plans are developed with local stakeholders and rely on local input and local commitment are adopted by Secretarial Order to be enforceable. The District, in coorperation with the agencies and local governments, continues to implement research and water quality monitoring programs for the Lake Okeechobee BMAP through an interagency Agreement (4600003632) which involves the monitoring of some water quality sites included in this plan.

To expedite nutrient reductions in the Northern Everglades, the District's Applied Sciences Bureau (ASB) and Everglades & Estuaries Protection Bureau (EEP) recommended an expansion of the District's water quality monitoring network. Specifically, the Bureau's recommendations are intended to:

- Measure progress of individual restoration projects toward attaining specific goals and maintaining compliance with FDEP and USACE permit requirements;
- Monitor non-point source contributions to assess long-term trends in water quality;
- Evaluate necessary modifications to the Watershed Construction Projects to help achive water quality standards;
- Support FDEP with system wide monitoring to measure compliance with water quality standards (i.e., TMDLs) and progress toward achieving nutrient load goals in BMAPs; and
- Support science-based recommendations for hydrologic and ecologic improvements.

Stations to be monitored for this project have been and/or are being monitored as part of another project as indicated in Table 2. Station S77 is collected under project (CRFW) by staff out of the Field Operations Center (FOC).

2.3 Project Objectives

The primary objective of this monitoring project is the estimation of long-term phosphorus loading to Lake Okeechobee and the identification of trends in total phosphorus and other water quality variables entering and leaving the lake over time. The WQ data obtained under this program will be used to satisfy requirements for premium water quality data as it applies to compliance, load calculations, and management plans within the Lake Okeechobee watershed.

2.3.1 Modification or Termination Conditions

The monitoring described herein will continue as required by the mandates listed in Section 2.2 and Appendix 1. Conditions for modification or termination of the project are detailed in the mandates specifying the conditions of the project.

3.0 Geographic Location

3.1 Regional Area

Project X includes sites located within Okeechobee, Highlands, Martin, Palm Beach, Hendry and Glades counties Florida surrounding Lake Okeechobee (Figure 1).

3.2 Station Location and Access

Monitoring stations are depicted in Figure 1 with locations described in Table 1.

The gates on roadways into Project X are secured with a District Okeechobee ("O") key lock and USACE locks. The lock requires a Alpha Numeric ID ("O") key, which can be obtained through a request made through the Field Project Manager (FPM) and/or Science Technician Supervisor.

Appendix 2 provides station descriptions, hydrologic information, and site access and authority. This project spans several counties and access to sites is determined by right of way ownership for each station's specific geographic location. The following stations are sampled on a weekly, biweekly RF (recorded flow) and/or monthly basis.

Table 1: Project X Surface Water Monitoring Stations and GPS Coordinates

Station	Latitude (ddmmss.sss)	Longitude (ddmmss.sss)	Description
C38W (S265 (G33))	271237.740	805612.890	Gated culverts on west end of C-38 canal. 3 miles downstream of S-65E.
CULV10A (S271)	265502.294	803646.300	Gated culverts at the intersection of Levee-8 and U.S.Hwy 441 at Sand Cut, P.B. County.
CULV5 (S282)	265510.208	810718.234	Gated culverts, W side of Lk Okee. on SR78, S of Fisheating Ck, upstream of structure.
CULV5A	265306.214	810719.235	Gated culverts, 3 Miles south of Sportman Village boat ramp on SR78.
FECSR78	265748.073	810714.127	Bridge span over Fisheating Creek at SR78.
G207	270200.191	810416.228	Pump downstream of S-71 on canal C-41 at Lake Okeechobee.
G208	270534.181	810020.223	Pump downstream of S-72 on canal C-40 at Lake Okeechobee.
INDUSCAN	264423.730	805508.280	Bridge span over Industrial Canal at Co. Rd. 832, Clewiston.
L59E (S266 (G34))	271120.370	805420.080	Gated culverts from L-59 Canal into C-38 canal.
L59W (S291 (G74))	270626.179	805957.222	Gated culverts located at the west end of L-59 canal downstream of S-72. Flows into C-40 canal.
L60E (S290 (G75))	270505.183	810127.224	Gated culverts at the east end of L-60 canal downstream of S-72. Flows into C-40 canal.
L60W (S285 (G76))	270158.190	810309.227	Gated culverts located at the west end of L-60 canal downstream of S-71. Flows into C-41 canal.
L61E	270158.230	8 0419.320	Gated culverts at east end of L-61 downstream of S-71. Flows into C-41 canal.
S127	270721.280	805345.540	Pump station along Rim Canal. Sample taken on the upstream side of S127.
S77	265026.820	810500.680	S-77 Spillway & Lock on Caloosahatchee River at Lake Okeechobee. Water quality sampling from platform northeast (upstream) of structure.
S84	271257.060	805825.230	Spillway on canal C-41A at Lake Okeechobee. Downstream of S65E. Flows into C-38 canal.
S154	271242.300	805508.740	Gated culvert structure located on the east side of the C-38 Canal. About four miles downstream of S65E.
S154C	271238.880	805512.080	Gated culvert on the east side of C-38 canal directly northwest of S-154.

Station	Latitude (ddmmss.sss)	Longitude (ddmmss.sss)	Description
S169	264545.487	805522.009	Gated culverts at Wayside Park in Clewiston. Next to boat ramp. West of S-310 boat locks.
S191	271131.168	804545.201	Gated spillway at terminus of C-59 canal and Lake Okeechobee.
S2	264202.08	804257.630	Large Pump Station located at the intersection of North New River Canal and Hillsboro Canal. Autosampler on platform 150 ft southeast (upstream) of pump station.
S236	264340.415	805110.124	Conservancy Pump Station olong Herbert Hover Dike. Northwest of S-3.
S3	264154.510	804826.460	Large Pump station located at the western terminus of the Miami Canal in Lake Harbor. Autosampler on platform 140 ft south (upstream) of pump station.
S308C	265905.610	803717.140	Large gated spillway located along Herbert Hoover Dike at the western terminus of the C44 canal.
S351	264203.480	804254.970	Gated spillway located next to S-2 pump station. Discharges water from Lake Okeechobee to the Everglades Agricultural Area.
S352	265150.640	803756.550	Gated spillway located at intersection of Herbert Hoover Dike and WPB canal in Canal Point.
S354	264154.810	804823.950	Gated spillway located next to S-3 pump station. Discharges water from Lake Okeechobee to the Everglades Agricultural Area.
S4	264723.290	805743.170	Large pump station along Herbert Hoover Dike near Moore Haven.
S65E	271331.164	805745.217	Large spillway along C-38 canal at north west side of Lake Okeechobee.
S71	270203.190	810415.228	Gated spillway on canal C-41 at Lake Okeechobee.
C41H78	265951.520	810405.910	Mid canal platform along C-41 canal, 0.5 miles south of SR78 bridge.
S72	270535.181	810021.223	Gated spillway on canal C-40 at Lake Okeechobee.
S129	270148.190	810005.223	Pump station located along Herbert Hoover Dike on the northwest side of Lake Okeechobee between Harney Pond (C41) and Indian Prairie Canal (C40).
S131	265845.220	810525.030	Pump station located along Herbert Hoover Dike on the west side of Lake Okeechobee between Fisheating Creek and Harney Pond (C41).
S133	271223.280	804803.670	Pump station located along Herbert Hoover Dike, on the north side of Lake Okeechobee. Immediately west of Taylor Creek and Lock S193. Off USHwy 441.
S135	270511.880	803940.160	Pump station located along Herbert Hoover Dike, on the northeast side of Lake Okeechobee. Along SW Conner Hwy (CR15/USHwy 441).

The standard positional goal for station coordinates is detailed in the Establishing & Verifying Water Quality Monitoring Station Registration SOP (SFWMD-FIELD-SOP-031). The coordinates are relative to NAD83 HARN horizontal datum.

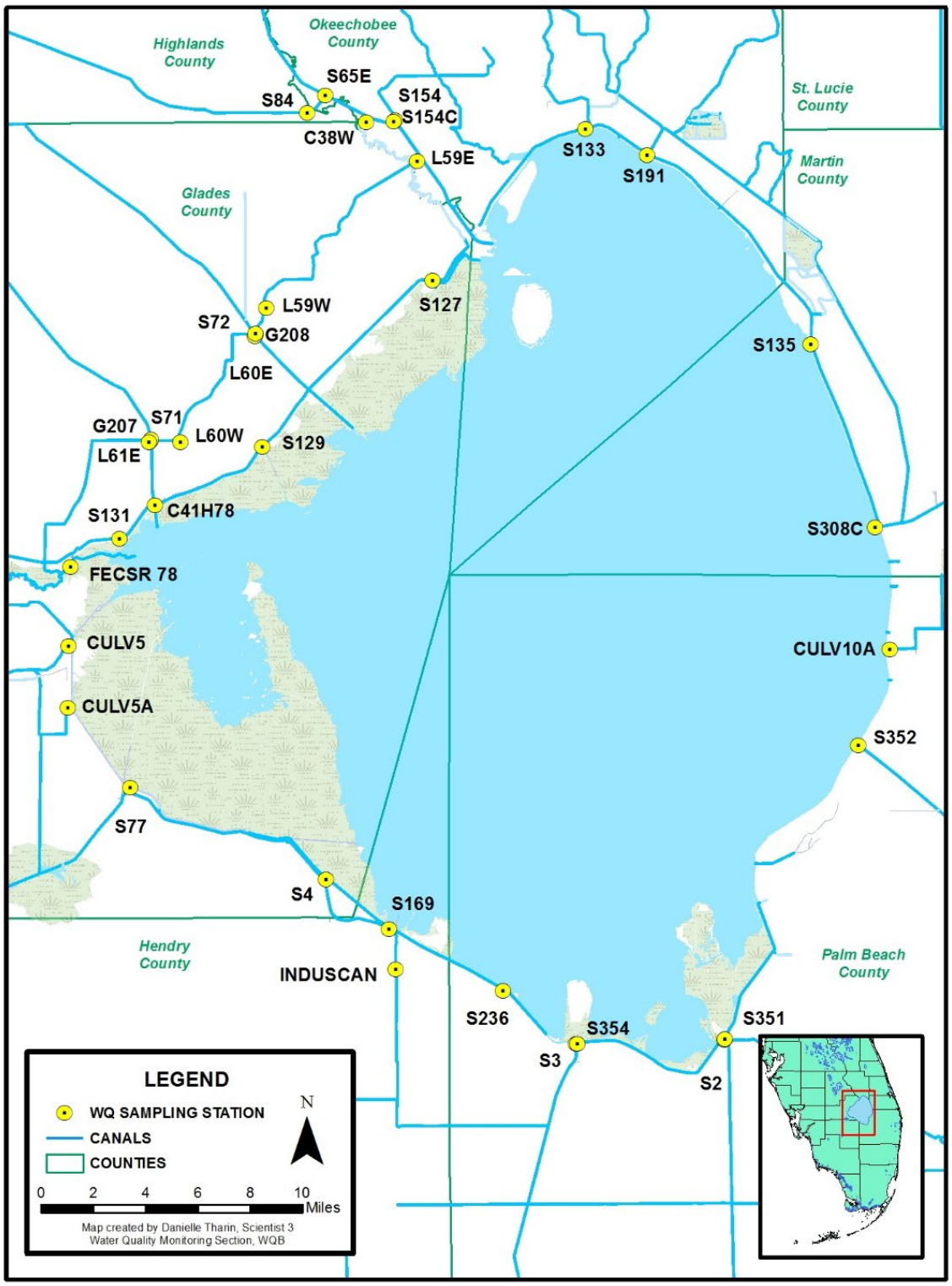

Figure 1: Project X Station Locations

4.0 Field Activities

4.1 Monitoring Frequencies and Parameters Collected

All monitoring parameters, frequencies of collection and locations are listed in Table 2. Some analytes may be reported by the lab that are not requested by the project.

Stations collected on a frequency determined by recorded flow are sampled following the SOP outlined in the Sampling Flow-Related Stations SOP (SFWMD-Field-SOP-027). If no flow (i.e., no operations) is recorded during the prescribed time period, the station is designated as a No Bottle (NOB) sample and the structure is not visited unless other parameters (i.e., TP) are required to be collected regardless of flow. Diversion Structures are only monitored if flowing, NOBs are not assigned during nonflow periods.

Sites S65E and S84 flow determination is made by evaluating both the main structures and their auxiliary structures S65EX1 and S84X. Sample collection will be made at either the main structure or its auxiliary structure based off the flow determination. All water quality data are collected using the permitted structures' registered station names (i.e. S65E and S84) since flow data is combined under these station names, as well.

Table 2: PROJECT X Station Frequency and Parameter TESTS

Station	Collection Method	Frequency	Parameter TESTS
C38W, CULV10A, CULV5, CULV5A, FECSR78, INDUSCAN, L59E, L59W, L60E, L60W, S127, S129, L61E, S131, S133, S135, S154, S154C, S191, S2, S236, S3, S352, S84, S169	Grab	Bi-weekly Recorded Flow, otherwise monthly (BWRF/M)	Alkalinity (ALKA), Ammonia (NH4), Ortho Phosphate (OPO4), Nitrate+Nitrite (NOX), Total Nitrogen (TN), Total Phosphorus (TP), Total Suspended Solids (TSS), Turbidity (TURB)
	In-situ Grab	BWRF/M	Dissolved Oxygen (DO), pH, Specific Conductance (SCOND), Temperature (TEMP)
	Grab	Quarterly (Q)	Calcium (CA), Chloride (CL), Sulfate (SO4), Total Iron (TOTFE)
C41H78	Grab	BW	ALKA, NH4, OPO4, NOX, TN, TP, TSS, TURB
	In-situ Grab		DO, pH, SCOND, TEMP
	Grab	Q	CA, CL, SO4, TOTFE
S65E	Grab	BWRF/M	ALKA, NH4, CL, Chlorophyll a (CHL-N), COLOR, Dissolved Organic Carbon (DOC), Nirtrite (NO2), NOX, OPO4, Silica (SIO2), SO4, TN, Total Organic Carbon (TOC), TP, TSS, TURB
	In-situ Grab	BWRF/M	DO, pH, SCOND, TEMP

Station	Collection Method	Frequency	Parameter TESTS
	Grab	Q	CA, Potassium (K), Magnesium (Mg), Sodium (Na), TOTFE
S354, S351 S352, S4 S71, S72, S2, S3	Flow Composite Autosampler (ACF)	Weekly Recorded Flow (WRF)	TN, TP
S308C	Grab	M (November – April) BW (May – October)	Quantitative Phytoplankton Identification and enumeration, Dominate Algal ID, Algal Toxins
S77[1]	Grab	BW (May - October)	Toxins Simple Algal ID (Dominant Species)
S71, S72, S4	Grab	Weekly recorded flow (WRF)	TN, TP
	In-situ Grab	BWRF/M	DO, pH, SCOND, TEMP
	Grab		ALKA, NH4, NOX, OPO4, TN, TP, TSS, TURB
		Q	CA, CL, SO4, TOTFE
S308C, S77[1]	Grab	BWRF/M	ALKA, CHL-N, NH4, NOX, OPO4, TOC, TN, TP, TSS, TURB
		Q	CA, CL, SO4, TOTFE
G207, G208, S351, S352, S354	Grab	WRF	TN, TP
S2, S3	ACF	Event Duration (Backpumping)	TN, TP
	Grab	Event <72 hours, collect within 24 hours of pumping initiation	ALKA, NH4, NOX, OPO4, TN, TP, TSS, TURB
	In Situ Grab		DO, pH, SCOND, TEMP
	Grab	Event >72 hours collect within 24 hours of pumping initiation, collect one sample every 24 hours	ALKA, NH4, NOX, OPO4, TN, TP, TSS, TURB
	In Situ Grab		DO, pH, SCOND, TEMP

[1]S77 – is collected under project (CRFW) by WPB staff.

4.2 Project Specific Guidelines

All surface water grab samples are collected on the upstream side of any structure at a depth of 0.5 meters unless collection of a representative sample is inhibited by vegetation and/or other conditions. If an alternative sampling location is required, a consultation with a Science Technician Supervisor and/or the Field Project Manager (FPM) must take place prior to the sampling being collected; this action must be documented in the field notes.

Backpumping operations at S2 and S3 are high priority, permit mandated sample collections for autosamplers and grabs for Project X. Appendix 3 lists project-specific guidelines for backpumping sample collection.

Chlorophyll a (CHL-N) and Total Organic Carbon (TOC) are collected biweekly if flow is recorded otherwise monthly at S308C. Quantitative Phytoplankton Identification and enumeration, Dominate Algal ID, and Algal Toxins samples collected at S308C and S77 are sent to the FDEP laboratory for analysis.

4.3 Grab Sampling Procedures

Sample collection for this project follows the procedures and requirements found in the *Grab Sampling Protocol* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.4 Field Parameters

The collection of field parameters follows the procedures and requirements outlined in the *Instrument Calibration and Field Measurements* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.5 Field Quality Control Requirements

Field quality control requirements shall follow the procedures found in the *Field Quality Control Measurements and Requirements* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.6 Autosampler Collection

Autosampler samples are collected in accordance with the *Autosamplers* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2. The intake for the autosampler is affixed to a float or structure at depth.

For this project, samples are collected as flow-proportional (ACF) at stations identified in Table 2. Station-specific "trigger volumes" are established through the protocols described by Abtew and Powell (2004). Discrete bottles within each autosampler are pre-acidified and composited on a weekly basis and analyzed for TPO4. The 5 gallon carboys used in refrigerated autosamplers are not acidified.

Table 3: Project X Autosampler Station, Startup Date and Activation Frequency

Station	Autosampler Start-Up Date	Autosampler Model	Autosampler Activation Frequency[1]
S71	05/16/2002	ISCO Model 6712	4.140 MCF[1]
S72	05/16/2002		1.090 MCF[1]
S351	08/2002		6.2 MCF[1]
S352			2.5 MCF[1]

S354			2.9 MCF[1]
S2			6.2 MCF[1]
S3			2.9 MCF[1]
S4			5.2 MCF[1]

[1]MCF = Million Cubic Feet of flow required to activate autosampler

4.7 Sample Submission

If the District laboratory is to be used, samples are transported to the laboratory and submitted for analyses in accordance with the requirements specified in the WQM FSM. Samples are submitted to the laboratory on the same day as collection or via courier the following day. Sample acceptance criteria are detailed in Section 6 of the CLQM. If samples are submitted to another laboratory it must meet the contract laboratory requirements as specified in Section 5.2 below.

5.0 Data Quality Objectives (DQOs)

5.1 Data Usage and Reporting

The data from this project are compiled and are summarized in an annual report in accordance with the conditions outlined in the mandate named in Appendix 1.

5.2 Data Quality

All monitoring described herein meet the requirements conveyed in the FDEP's QA 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 CLQM.

The minimum DQOs for mercury and other toxicants, which are analyzed by contract laboratories, are covered by the list of FDEP established analytical methods, and corresponding method detection limits (MDLs) and practical quantification limits (PQLs), which is titled "Florida Department of Environmental Protection Table as Required By Rule 62-4.246(4) Guidance for the Selection of Analytical Methods and the Evaluation of MDLs and PQLs List" dated November 10, 2020.

Field parameter DQOs are described in the *Field Instrument Minimum Accuracy Requirements* table found in the *Instrument Calibration and Field Measurements* section of the FSM. The most recent version of the FSM details the specific field testing DQOs at the time of sample collection.

Samples are analyzed according to the provisions within the FDEP QA Rule, 62-160 F.A.C. and the CLQM. The most recent version of the CLQM details DQOs at the time of sample collection for each specific laboratory analysis. Data are qualified in accordance with the FSM, CLQM and applicable data validation SOPs.

Contract laboratories must be certified through the National Environmental Laboratory Accreditation Program (NELAP) for the submitted samples' analyses, and the DQOs for

those analyses must meet or exceed the District laboratory's DQOs (*sensu* CLQM). Analyses performed by contract laboratories must comply with DQOs derived with the assistance of the District Laboratory Manager and/or Data Validation Unit Section Leader and specified in this monitoring plan.

5.3 Completeness Target

The completeness target (i.e., the number of samples successfully collected and analyzed, as a percentage of those that were planned) has been 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 due to no flow or low water conditions, unsafe station conditions, equipment malfunction, site maintenance, tropical storms/hurricanes or other unforeseen problems that might affect sample collection and/or quality. If samples cannot be collected on an attempt, collectors shall document the sample as a "NOB" to indicate an attempt was made and/or the sample could not be collected for the documented reasons.

6.0 Data and Records Management

The District evaluates data in accordance with the data quality objectives stated in the District's FSM and CLQM. All data submittals shall conform to existing District guidelines. FDEP laboratory data shall be submitted to the District in the ADaPT format or other format as requested by the District.

6.1 Contract Deliverables

Contract laboratory and/or field data and documentation are submitted to the District in the ADaPT format and/or another format as requested by the District. The FDEP laboratory shall evaluate the data in accordance with the DQOs defined in the FSM and/or CLQM. FDEP field and laboratory data and documentation submittals shall conform to existing FSM, CLQM, applicable SOPs and/or other formats as requested by the District.

6.2 Data and Record Storage

After the data validation process, all data and records are maintained so that end users can retrieve and review information relative to a sampling event. Field records are maintained in accordance with the *Archive Records Storage and Retention* SOP (SFWMD-FIELD-SOP-022). All analytical data and specified metadata are sent to the DBHYDRO database 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 records of current and historical methodologies and operating procedures so that at any given time the conditions that were applied to a sampling event can be evaluated.

Field records storage protocols are outlined in the *Archive Records Storage and Retention* (SFWMD-FIELD-SOP-022). Corrections of field data or records must follow the applicable

WQM *Correction of Field Records SOP* (SFWMD-FIELD-SOP-032) and the FSM. Corrections to data in DBHYDRO must follow *Data Investigations and Corrections* (SFWMD-DVS-SOP-010).

7.0 References

Abtew, Wossenu and Barbara Powell, 2004. Water Quality Sampling Schemes for Variable Flow Canals at Remote Sites. Journal of the American Water Resources Association (JAWRA) 40(5):1197-1204.

FDEP (Florida Department of Environmental Protection). Quality Assurance Rule, 62-160 Florida Administrative Code (F.A.C.). April 16, 2018.

FDEP (Florida Department of Environmental Protection) Guidance for the Selection of Analytical Methods and the Evaluation of MDLs and PQLs List Referenced in Chapter 62-4.246(4), F.A.C. November 10, 2020.

SFWMD (South Florida Water Management District). *Archive Records Storage and Retention*, SFWMD-FIELD-SOP-022, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Chemistry Laboratory Quality Manual (CLQM)*, SFWMD-LAB-QM-2022-001 or most current effective version. Analytical Services Section.

SFWMD (South Florida Water Management District). *Correction of Field Records*, SFWMD-FIELD-SOP-032, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Field Sampling Manual (FSM)*, SFWMD-FIELD-FSM-001, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Field Quality Manual (QM)*, SFWMD-FIELD-QM-001, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Data Investigations and Corrections*, SFWMD-DVS-SOP-010, Data Validation Services Unit.

SFWMD (South Florida Water Management District). *Sampling Flow-Related Stations*, SFWMD-FIELD-SOP-027, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Station Registration*, SFWMD-FIELD-SOP-031, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Water Quality and Applied Sciences Bureaus Quality Management Plan (QMP)*, SFWMD-QS-QM-001. Applied Sciences and Water Quality Bureaus.

8.0 Revisions and Modifications

Version	Date	Section	Page Numbers	Change From	Change To	Reason
01	07/23/2008	Figure 1	8	Old Map	New Map	C41H78 added 1/1/08 and L61W dropped 5/13/08.
		Table 2, Table 3, Table 4, Table 6	10, 16, 20, 21, 23	L61W	C41H78	C41H78 added 1/1/08 and L61W dropped 5/13/08.
	08/21/2008	Appendix 1	29, 30		TKN, TPO4, NOX	Permit only requires nutrient parameters
	06/11/2008	Table 3, Table 4	13,14, 20	NA	S351, S354 are mandatory monthly collections	LOOP permit requirements
02	01/06/2009	Section 3.1.1	7	39 sites	40 sites	Update sample site number
	04/15/2009	Table 3	13	Separate S351 and S2 as sample sites	List S351 and S2 as separate sample sites	Permit requirement
			14	Separate S354 and S3 as sample sites	List S354 and S3 as separate sample sites	Permit requirement
	09/01/2009	Table 3, Table 4	13,14, 20	Drop S351 and S354 monthly mandatory collection		LOOP permit modification
	11/02/2009	Table 4	20	CL, COLOR, NO2, TDS	Drop CL, COLOR, NO2, TDS from BW/M	LOOP permit modification
				K, MG, NA, SiO2, SO4	Drop K, MG, NA, SiO2, SO4 from Q	LOOP permit modification
	02/04/2010	Table 3	13, 14	S2, S3 t' Reverse discharge data available	Delete **t'** Reverse discharge data available	Condition no longer applicable
		Table 3	13, 14	S2, S3 American Sigma autosampler	S2, S3 ISCO autosampler	Autosampler changes
		2.0, 5.7, 6.2, 7.0, & 7.1	5,11, 12, & 13	Original	Updated QA/QC	Revised text to reflect changes in Data Validation requirements requested by Mike Wright.
	04/28/2010	Appendix 1- Backpumping Monitoring Plan	28	Original	Update sample stations and parameters	Reflect changes in LOOP Permit issued 9/27/09

Version	Date	Section	Page Numbers	Change From	Change To	Reason
	05/04/2010	Table 4	20	Original	Added TOC, CHLORO to S308C, S77.	Reflect changes in LOOP Permit issued 9/27/09
	09/28/2010	Appendix 1-Backpumping Monitoring Plan	30		Added backpumping sample requirements	Reflect changes in LOOP Permit issued 9/27/09
	05/04/2011	Table 4	20	Original	Added CULV4A to Station list.	Not listed in table.
	04/28/2010	Appendix 1-Backpumping Monitoring Plan	28	Original	Update sample stations and parameters	Reflect changes in LOOP Permit issued 9/27/09
	09/28/2010	Appendix 1-Backpumping Monitoring Plan	30		Added backpumping sample requirements	Reflect changes in LOOP Permit issued 9/27/09
	05/04/2011	Table 4	20	Original	Added CULV4A to Station list.	Not listed in table.
	05/09/2011	Updated to version 02				Updated to reflect changes to parameters and stations.
	08/31/2011	Table 4	20		Added CA to quarterly parameters	Updated to reflect changes to parameters and stations
	12/12/2011	Table 3	12	Upstream/downstream (UD) = 2 (Always)	Delete	UD Code should normally be 1 (upstream)
03	01/31/2012	Table 3 S352	12	Requires site specific USACE key to access building to reset counter for autosampler.	Delete	Access to building not required to reset counter
		Table 3 S131, S127, S129	16,17		Requires SFWMD "O" key to access.	Updated. Not in original.
		WQMP	All			Annual Review and update WP Davis
04	09/27/2012	3.4, Figure 1, Table 2, Table 3, & Table 4	7, 8, 11, 12, & 22		Delete CULV10A, CULV12, CULV12A, CULV4A	Monitoring Reduction

Version	Date	Section	Page Numbers	Change From	Change To	Reason
		4.2	7		Change # of stations from 40 to 36	Monitoring Reduction
		Appendix 1	30		Added specific procedures for backpumping collection	Clarification
	10/01/2012	Table 2, Table 3, Table 4			S77 collected by FOC staff	Monitoring Reduction
	03/11/2013	All				Monitoring Plan updated to conform to Operational WQ Monitoring Plan Template
	06/10/2013	Appendix 2	33		Added specific procedures for Equipment Blank generation and collection	Clarification for procedure. WP Davis
	07/10/2013	3.2, 3.4	5, 6		Update Mandate Descriptions	
	11/04/2013	Table 1	7	GPS for L61E, C38W, S154	Update GPS Coordinates	Match GPS table with SFWMD Google Earth
	01/13/2014	Appendix 2	33	Specific procedures for test pumping sample collection	Highlighted requirements for test pumping sample collection	Clarification for procedure. WP Davis
		Appendix 2	33	Specific procedures for Equipment Blank generation and collection	EB not required if lab clean carboy is used.	Clarification for procedure. WP Davis
	05/06/2014	Table 3 Appendix 1	16, 25		Added CL, SO4 to quarterly parameters	Updated to reflect changes to parameters at request of end user.
	02/18/2015	Table 2	9-15	USACE Key	Deleted	USACE locks changed. "O" locks only.
	05/26/2015	Table 2	9	Flow Codes CULV 10A	Flow Directions reversed	HW/TW determined flow direction
	06/18/2015	Table 3, Appendix 1	16, 25		Added FDEP parameters to S354	FDEP request

Version	Date	Section	Page Numbers	Change From	Change To	Reason
	06/06/2017	Table 3, Appendix 1, Table 3	16, 25, 29	Remove TKN at all sampling locations	Add TN at all sampling locations	FDEP Permit Modification
		Table 3, Appendix 1	16, 25	Flow Only Sampling	Recorded Flow Sampling	FDEP Permit Modification
	08/07/2017	Table 3	16	Remove autosamplers at stations G207, G208 and C41H78.		FDEP Permit Modification
	12/12/2018	All	All	Old Format	Updated Format	OMP Template Format Update

Version	Date	Section	Notes
08	04/17/2019	All	Monitoring plan updated to reflect most recent template format, including this table. Table 2 modified to reflect most recent mission driven sampling requirements.
09	07/22/2019	All	Repair of misspelling and grammatical errors in document. Included all S65E mission driven parameters formerly collected on Project V. Repair Table 3 and Appendix 1
10	09/10/2019	All	Update Monitoring Plan to conform with updated OMP Template.
11	04/28/2020	All	Update Monitoring Plan to conform with new orders from the Governor's directives 19-12 and update minor template issues.
12	06/08/2022	All	Update Monitoring Plan to conform with updated OMP Template. Updated Table 1 station descriptions. Annual Review

Appendix 1: Station Requirements by Mandate

Mandate	Station	Collection Method	Frequency	Parameters TESTS
Lake Okeechobee Operating Permit (LOOP #0174552-011-GL)	C38W, CULV10A, CULV5, CULV5A, FECSR78, INDUSCAN, L59E, L59W, L60E, L60W, S127, S129, S131, S133, S135, S154, S154C, S191, S2, S236, S3, S352, S84, S71, S72, S4, S65E	Grab	Bi-weekly Recorded Flow otherwise Monthly (BWRF/M)	Ammonia (NH4), Nitrate-Nitrite (NOX), Total Nitrogen (TN), Total Suspended Solids (TSS), Total Phosphrus (TP), Turbidity (TURB)
		In-situ Grab		Dissolved Oxygen (DO), pH, Specific Conductance (SCOND), Temperature (TEMP)
		Grab	Quarterly (Q)	Total Iron (TOTFE)
	G207, G208	Grab	Weekly Recorded Flow (WRF)	TN, TP
	S351, S352, S354	ACF (Flow proportional)	WRF	TN, TP
	S308C, S77	Grab	BWRF/M	NH4, Chlorophyll-a (CHL-N), NOX, TN, TSS, TP, TURB, Total Organic Carbon (TOC)
		In-situ		DO, pH, SCOND, TEMP
		Grab	Q	TOTFE
	C41H78	Grab	BW	NH4, NOX, TN, TSS, TP, TURB
			Q	TOTFE
		In-situ Grab	BW	DO, pH, SCOND, TEMP
	S2, S3	ACF	Event Duration (Backpumping)	TN, TP
		Grab	Event <72 hours, collect within 24 hours of pumping initiation	ALKA, NH4, NOX, Ortho Phosphorus (OPO4), TN, TP, TSS, TURB
		In-situ Grab		DO, pH, SCOND, TEMP
		Grab	Event >72 hours, collect within 24	ALKA, NH4, NOX, OPO4, TN, TP, TSS, TURB
		In-Situ Grab		DO, pH, SCOND, TEMP

Mandate	Station	Collection Method	Frequency	Parameters TESTS
			hours of pumping initiation, collect one sample every 24 hours	
Lake Okeechobee Basin Management Action Plan (BMAP) Interagency Agreement (4600003632) Tier 1	All	Grab	M	TN, TP
Governor's Executive Order 19-12	S308C	Grab	M (Nov -April) BW (May – October)	Quantitative Phytoplankton Identification and enumeration, Dominate Algal ID, Algal Toxins (FDEP)
	S77		BW (May – October)	Toxins Simple Algal ID (Dominate Species)
Everglades Agricultural Area Regulatory Program (EAARP) (Chapter 40E-63)	S351, S352, S354	Grab	WRF	TP
	S236	Grab	BWRF/M	NH4, NOX, TN, TP, TSS, TURB
		In-situ Grab		DO, pH, SCOND, TEMP
Mission Driven	C38W, C41H78, CULV10A, CULV5, CULV5A, FECSR78, INDUSCAN, L59E, L59W, L60E, L60W, S127, S129, S131, S133, S135, S154, S154C, S191, S2, S3, S352, S84, S308C, S71, S72, S4, S77, S236	Grab	BWRF/M	ALKA, OPO4
			Q	CA, CL, SO4
	S65E	Grab	BWRF/M	ALKA, CHL-N, CL, COLOR, DOC, NO2, OPO4, SIO2, SO4, TOC
			Q	K, MG, NA
	S71, S72, S4	ACF	WRF	TN, TP

Mandate	Station	Collection Method	Frequency	Parameters TESTS
		Grab	WRF	TN, TP
	S169, L61E		BWRF/M	ALKA, NH4, NOX, OPO4, TN, TP, TSS, TURB
		In-situ Grab		DO, pH, SCOND, TEMP
		Grab	Q	CA, CL, SO4, TOTFE

Appendix 2: Site-Specific Sampling Location Information

Station	Description	Discharge Information	Notes
S133	A SFWMD-operated pump station located on the north side of Lake Okeechobee, immediately west of Taylor Creek and lock S193. Water can be pumped into the lake through S133 or released via gravity. Grab samples are collected from the upstream (north) side of this structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Turn south on 27th Court off US 441/98 SFWMD sign marks pump station. Requires SFWMD master key or USACOE ABLOY.
S191	A spillway gate structure located at the terminus of Nubbin Slough (L67), on the north side of Lake Okeechobee. Water is released into the lake via gravity. Grab water samples are collected on the upstream (east) side of this structure, from the U.S. Highway 98 bridge.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Entrance is off US 441/98 marked by SFWMD sign, south side of road. Requires SFWMD master key or USACOE ABLOY.
S135	A SFWMD-operated pump station and lock located on the northeast side of Lake Okeechobee. Water is pumped into the lake through S135 or released from the lake via gravity. Grab samples are collected from the upstream (east) side of this structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is off US 441/98 at J&S Fish Camp entrance, also marked SFWMD sign east side of road. Requires SFWMD master key or USACOE ABLOY.
S308C	A spillway gate structure located on the east side of Lake Okeechobee at the western terminus of the St. Lucie Canal (C44) in Port Mayaca. Water is primarily released from the lake into C44, but flow from C44 into the lake can also occur during certain stage conditions. Grab samples are collected from the upstream (west/lake side) of this structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is directly from US 441/98, east side of road. Requires SFWMD master key or USACOE abloy.
CULV10A	A culvert located on the east central side of Lake Okeechobee, at the western terminus of the L8 canal. Water flows via gravity into and from the lake, depending on stage conditions. Grab samples are collected approximately 300 feet downstream (east) of the culvert, from the SFWMD platform.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. Upstream land use has contributed to historically high conductivity values at this site. Access is directly from US 441/98, east side of road.

Station	Description	Discharge Information	Notes
S352	A spillway gate structure operated by the US Army Corps of Engineers (USACE) on the southeast side of Lake Okeechobee. Located at the western terminus of the West Palm Beach Canal at Canal Point, this structure generally releases water out of the lake and into WPB Canal for irrigation and regulatory purposes. However, water can flow into the lake from the WPB Canal during low lake levels. Grab samples are collected on the upstream (west) side of this structure, on the south wing wall next to the autosampler.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. This site is also equipped with an ISCO 3712 autosampler, located on the southern bank of the upstream side of the structure. This unit is on a flow proportional program and composite samples are collected on a weekly basis. Access is from US 441/98 at Canal Point Lions Club Park Requires SFWMD master key or USACOE ABLOY.
S2	A SFWMD operated pump station located on the south side of Lake Okeechobee near Belle Glade. It is situated at the confluence of the Hillsboro and North New River Canals and pumps canal water into Lake Okeechobee. The water samples (grab) are collected adjacent to the autosampler on a platform 150 ft southeast (upstream) of pump station.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site is also equipped with an ISCO 3712 autosampler. The intake is located on a platform upstream of the pump station and flow proportional samples are collected during periods of back-pumping. Access is from US 80. Turn north on NW 1st Ave. Requires SFWMD master key or USACOE ABLOY.
S351	This structure is a reinforced concrete, gated spillway, with three vertical lift gates, located in the perimeter dike of Lake Okeechobee, at the north end of the Hillsboro and North New River Canals. Collect sample on lakeside of spillway	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available Requires SFWMD master key or USACOE ABLOY.
S3	A SFWMD-operated pump station located on the south side of Lake Okeechobee at Lake Harbor. Water is pumped from the Miami Canal into Lake Okeechobee. Grab samples are collected adjacent to autosampler on a platform 140 ft south (upstream) of pump station.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site is also equipped with an ISCO 3712 autosampler. The intake is located on a platform upstream of the pump station and flow proportional samples are collected during periods of back-pumping.
S354	This structure is a reinforced concrete, gated spillway, with two vertical lift gates, located in the perimeter dike of Lake Okeechobee, at the north end of the Miami Canal at Lake Harbor. Collect sample on lakeside of spillway.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. Access is from US 80/27, at John Stretch Park. Requires SFWMD master key or USACOE ABLOY.

Station	Description	Discharge Information	Notes
S236	A pump station on Lake Okeechobee between Lake Harbor and Clewiston that is operated by the SFWMD and South Florida Conservancy District. It pumps water into Lake Okeechobee or releases water from the lake via gravity. Grab water samples are collected from the upstream side of the pump station.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. Upstream land use has contributed to historically high conductivity values at this site. Access is directly off US 80/27. Requires SFWMD master key or USACOE ABLOY.
INDUSCAN	A free-flowing canal that drains a portion of the agricultural area north of the L1 canal and terminates at the Clewiston Locks (S310) at Lake Okeechobee. Grab water samples from this station are collected from the bridge over the Industrial Canal in Clewiston on County Road 832.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has no designated upstream or downstream in relation to the lake and the upstream/downstream (UD) code is left blank. Upstream land use has contributed to historically high conductivity values at this site. Access is directly from County Road 832.
S169	A spillway gate structure near the boat ramp and the S310 boat locks in Clewiston. This structure permits gravity flow in either direction between S4 and S310 via C20. Grab water samples are collected from the floating walkway ramp, located on the upstream (east) side of the structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse Discharge Data Available. Turn north on San Francisco St off US 80/27. Turn left on Hoover Dike Rd to Clewiston Recreation Area.
S4	A SFWMD-operated pump station on Lake Okeechobee that pumps water into the lake via C-20. Grab water samples are collected on the west (upstream) side of the pump station adjacent to the autosampler located on the wing wall of the structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. This site is also equipped with an ISCO autosampler. The intake is on the wing wall and flow proportional samples are collected when flowing. Turn north on State Road 720 off US 80/27.
S77	A spillway gate structure operated by the USACE that is located on Lake Okeechobee at the head of the Caloosahatchee River (C-43). This structure primarily discharges into C-43 for regulatory purposes. Grab samples are collected from the east abutment on the upstream (lake) side of the structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Reverse discharge data available. Turn off US 27 to Moore Haven Recreation Area-East. Collected by FOC staff starting 2012.

Station	Description	Discharge Information	Notes
CULV5	A culvert and flap gate located on the west side of Lake Okeechobee on State Road 78, south of Fisheating Creek. Water flows from Lake Okeechobee and vice versa depending on stage conditions.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access to levee is from Sportsman's Village directly off SR 78. Requires SFWMD master key or USACOE abloy.
CULV5A	A culvert and flap gate located on the west side of Lake Okeechobee on State Road 78, south of Fisheating Creek. Water flows from Lake Okeechobee and vice versa depending on stage conditions. Discharge from culvert is for agricultural water supply. Grab water samples are collected from upstream of the structure on the levee. Site is currently under construction and not active at this time.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access to levee is from Sportsman's Village directly off SR 78. Requires SFWMD master key or USACOE abloy. CULV5A should be documented as a NOB throughout the construction process. Once the site construction is complete regular sampling will restart.
FECSR78	Fisheating Creek is the only naturally free flowing water source that discharges into Lake Okeechobee. Water movement at this location is usually towards Lake Okeechobee or there is no flow. However, during periods of strong easterly winds or high lake levels, lake water can flow into the creek. Grab water samples are collected in the creek from the State Road 78 bridge (either side).	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has no designated upstream or downstream in relation to the lake and the UD code is left blank. Access directly from SR 78.
S131	A SFWMD-operated pump station located on the west side of Lake Okeechobee, between Fisheating Creek and Harney Pond Canal (C41). Water is pumped into the lake through S131 or is released from the lake via gravity. Grab water samples are collected from the upstream side of this structure at the trash racks.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access directly from SR 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.
L61E	A culvert located at the east end of L61, near S71, on the C41. The water generally flows from L61 into the C41, immediately below S71. Grab water samples are collected from the upstream (west) side of the culvert.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is off State Road 721 which intersects State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.

Station	Description	Discharge Information	Notes
S71	A spillway gate structure located near the northwest side of Lake Okeechobee on C41 about 1.5 miles north of State Road 78. This structure regulates the gravity fed flows from C41 into Lake Okeechobee. Grab water samples are collected from the upstream (north) side of S71.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Turn north on State Road 721 off SR 78 east of Lakeport. Requires SFWMD master key or USACOE abloy.
G207	In 1989 a pump station (G207) was built by the SFWMD to pump water from Lake Okeechobee northward via C41 to the Lake Istokpoga drainage basin. During times of back pumping, samples are taken in front of the pump station trash racks.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Turn north on State Road 721 off SR 78 east of Lakeport. Requires SFWMD master key or USACOE abloy.
C41H78	A surface water sampling platform located near the northwest side of Lake Okeechobee on C41 about 0.5 miles south of State Road 78.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has no designated upstream or downstream in relation to the lake and the UD code is left blank. Turn south off State Road 721 at SR 78 east of Lakeport. Requires SFWMD master key.
S129	A SFWMD-operated pump station located on the northwest side of Lake Okeechobee between C41 and Indian Prairie Canal (C40). Water is pumped through S129 into the lake or is released from the lake via gravity. Grab water samples are collected from the upstream (west) side of this structure at the trash racks.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.
L60E	A culvert located at the east end of L60, near S72, on the C40. Water generally flows from the L60 canal into the C40, immediately below S72. Grab water samples are collected from the upstream (west) side of the culvert.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Turn north on State Road 721 off SR 78 east of Lakeport. Requires SFWMD master key or USACOE abloy.
S72	A spillway structure located near the northwest side of Lake Okeechobee, on the C40 about two miles northwest of State Road 78. This structure regulates the gravity flows from C40 into Lake Okeechobee. Grab water samples are collected from the upstream (north) side of S72.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.

Station	Description	Discharge Information	Notes
G208	A pump station was built by the SFWMD in 1989 to pump water from Lake Okeechobee northward via C40 to the Lake Istokpoga drainage basin. . During times of back pumping, samples are taken in front of the pump station trash racks..	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. Requires SFWMD master key or USACOE abloy.
L59W	A culvert located at the west end of L59, near S72, on the Indian Prairie canal. Water generally flows from the L59 canal into C40, immediately below S72. Grab water samples are collected from the upstream (east) side of the culvert.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.
S127	A SFWMD-operated pump station located on the northwest side of Lake Okeechobee between the C40 and the C38. Water is pumped through S127 into Lake Okeechobee or is released from the lake via gravity. Grab water samples are collected from the upstream side of this structure at the trash racks.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. Requires SFWMD master key or USACOE abloy.
L59E	A gated structure located at the east end of the L59 canal where it meets the C38. Water generally flows from the L59 canal into the C38. Grab water samples are collected from the upstream (west) side of the culvert.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has historically high conductivity values. Access is from State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.
C38W	A gated structure located on the west side of the C38, three miles south of S65E. Water generally flows into the C38 canal portion of Lake Okeechobee. Grab water samples are collected from the upstream (west) side of the structure. (Site is currently under construction with water discharges diverted to the L61E structure).	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has historically high conductivity values. Access is from State Road 78. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.

Station	Description	Discharge Information	Notes
S84	A spillway gate structure on C41A, one half mile west of the C38. Water flows into the C38 canal portion of Lake Okeechobee from C41A, through S84. Grab water samples are collected from the upstream (west) side of this structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78. Requires SFWMD master key or USACOE abloy to access gate at C41A and C38 levee. Site to be sampled at either S84 or S84X depending on current flow conditions.
S65E	The southernmost spillway and lock structure on the C38, located 8.5 miles northwest of Lake Okeechobee. Water is discharged from Pool E of the C38 into Lake Okeechobee. Grab water samples are collected from the upstream (north) side of the structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Additional parameters collected at this site as requested for all Kissimmee River structures. Turn south on SW 128th Ave off State Road 70. Road is marked with SFWMD sign. Requires SFWMD master key or USACOE abloy. Site to be sampled at either S65E or S65EX1 depending on current flow conditions.
S154C	A gated structure located on the east side of C38, immediately northwest of S154. Water flows via this culvert into the C38 canal portion of Lake Okeechobee. Grab water samples are collected from the upstream side of the structure.	Document direction of flow in the comments section of individual locations if occurs while onsite.	This site has historically high conductivity values. Access is from State Road 78 or S65E. SFWMD sign marks pump station. Requires SFWMD master key or USACOE abloy.
S154	A culvert gate type structure located on the east side of the C38 about four miles south of S65E. This structure allows water to flow from the L62 canal into the C38 canal portion of Lake Okeechobee. Grab water samples are collected from the automatic sampler platform, located ~150 meters upstream of the structure, on the west side of the canal.	Document direction of flow in the comments section of individual locations if occurs while onsite.	Access is from State Road 78 or S65E. Requires SFWMD master key or USACOE abloy.

Appendix 3: Water Quality Monitoring Plan for Lake Okeechobee Backpumping

Project X

LOOP Permit No. 0174552-011

Objective:
The objective of this monitoring plan will be to quantify water quality and ecological impacts observed during emergency back-pumping events.

The specific objectives of the water quality monitoring are:

1. Estimate the Phosphorous (P) and Nitrogen (N) loads entering Lake Okeechobee during backpumping events
2. Determine compliance with Class I/III water quality standards
3. Fulfill the reporting and monitoring requirements of the LOOP (Permit #0174552-011)

Water Quality Sampling and Monitoring Plan
In order to reduce nutrient loading, the discharge of other constituents, and to protect Lake Okeechobee's function as a Class I water body; backpumping into Lake Okeechobee at Pump Stations S-2 and S-3 shall be minimized. Efforts to minimize pumping into the Lake at Pump Stations S-2 and S-3 shall include, but not be limited to, the following actions and requirements.

Backpumping will be initiated when the upstream (Headwater, HW) canal stages at the S-2 and S-3 pump stations reach **12.5 feet NGVD**. When backpumping cannot be avoided, all possible actions shall be taken to minimize the extent, duration and impacts of backpumping operations on Lake Okeechobee. During backpumping operations, the District shall operate the minimum number of pumping units and at the lowest appropriate velocity, as well as institute other appropriate best pumping practices without compromising flood protection.

The sampling approach is dependent on the frequency and duration of back-pumping events. The frequency and type of parameters were selected to augment, but not duplicate, existing sampling programs conducted by the District or other state and local agencies. The district will implement a water quality sampling and monitoring program as follows:

Back-pumping at S-2 and S-3
Water quality grab samples will be collected and analyzed for the inorganic and nutrient parameters shown in Table 2 at a frequency of once in the first 24-hour period, and then every 72 hours for the duration of the back-pumping event. Composited flow proportional automatic samples will be collected after 4 days or the duration of the back-pumping event.

Sampling Locations
The locations of sampling sites are listed with the latitude and longitude coordinates and a brief description is given in Table 1.

Table 1: Summary of Stations, Coordinates, and Descriptions

Station	Type	Latitude (ddmmss.ss)	Longitude (ddmmss.ss)	Site Description
S2	ISCO Autosampler	264202.08	804257.63	Autosampler at platform upstream of pump station
S2	Grab	264202.08	804257.63	Platform upstream of pump station.
S3	Refrigerated ISCO Autosampler	264154.51	804826.46	Autosampler at platform upstream of pump station
S3	Grab	264154.51	804826.46	Platform upstream of pump station.

Water Quality Parameters

Table 2 provides frequency and duration details of the parameters to be analyzed for each station. Due to the critical nature of this project and the desire to know the water quality for operational decisions, the data will be analyzed in a priority mode.

Table 2: Sample Sites, Event Duration, and Sample Parameters

Station	Type	Duration	Parameter TESTS
S2, S3	ACF[1]	Event duration[2]	TN, TP
S2	Grab	Event duration < 72 hours: Collect one sample for Nutrients (TN and TP) and all chemical parameters listed in Table 3 within 24 hours of initiation of pumping operations.	Analytes listed in Table 3
	In Situ Grab		Dissolved Oxygen (DO), pH, Specific conductance (SCOND), temperature (TEMP)
	Grab	Event duration >72 hours: Collect one sample during first 24 hours and then every 72 hours.	Analytes listed in Table 3
	In Situ Grab		DO, pH, SCOND, TEMP

[1]ACF- Flow-proportional composite autosampler

[2]An event is defined as continuous or intermittent pumping activity separated by a cessation of 72 hours or greater.

Water Quality Parameters

Table 3 provides details of the parameters to be analyzed for each station. Due to the critical nature of this project and the desire to know the water quality for operational decisions, the data will be analyzed in a priority mode.

Table 3 –Backpumping Sample Parameters

Parameter	Units	Type
Alkalinity (ALKA)	mg/l	Grab
Ammonia (NH4)	mg/L	Grab
Nitrate + Nitrite (NOx)	mg/l	Grab
Ortho-phosphorus (OPO4)	mg/l	Grab
Total Nitrogen (TN)	mg/L	ACF[1]/ Grab
Total Phosphorus (TPO4)	mg/l	ACF[1]/ Grab
Total Suspended Solids (TSS)	mg/l	Grab
Turbidity (TURB)	NTU	Grab
Dissolved Oxygen (DO)	mg/L	In-situ Grab
pH	SU	In-situ Grab
Specific Conductance	Umhos	In-situ Grab
Temperature	Deg C	In-situ Grab

[1]ACF- Flow-proportional composite autosampler

Specific Conditions

Pump Station Testing and Maintenance

In order to ensure operational readiness, temporary operation of the pump stations for testing and maintenance purposes is allowed for 1 to 2 hours per week to maintain mechanical integrity and is not subject to the discharge criteria of the specific conditions of this permit. However, the permittee shall include all such discharge flows and loads as a part of the monitoring requirements of this permit. A comment is required in the field notes to document the test pumping.

Any autosampler collections from test pumping that are of sufficient volume to process must be submitted for analysis.

Collection Procedure Synopsis:

- Collect a grab sample for full set of parameters in Table 3 within 24 hours of start of backpumping.
- Collect a grab sample for full set of parameters in Table 3 each 72 hours from the start of backpumping.
- Collect a grab sample for TN, and TPO4 (Magenta) every 24hrs or at each visit if flow is occurring and backpumping is taking place. Delete ACODES for remainder of parameters.
- The collection of ACF samples will be evaluated during each backpumping event based on pumping schedule and unforeseen environmental impacts.

Do not collect a grab sample if flow is not occurring and backpumping is not taking place even if autosampler has samples.

Equipment Blanks for Refrigerated Autosamplers:

Equipment blanks are not required if lab cleaned carboys are used. An EB is only required if a lab cleaned carboy is not available.