Comprehensive Everglades Restoration Plan

Quality Assurance Oversight Team

Quality Assessment Report

for Water Years 2015 - 2016

(May 1, 2014 – April 30, 2016)

Prepared for:

CERP Design Coordination Team

Prepared by:

Quality Assurance Oversight Team

April 2017

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ACRONYMS and ABBREVIATIONS

ADaPT	Automated Data Processing Tool
ASR	aquifer storage and recovery
ASTM	American Society for Testing and Materials
BBCW	Biscayne Bay Coastal Wetlands
C111 SC	C-111 Spreader Canal
CA	Corrective Action
CERP	Comprehensive Everglades Restoration Plan
CGM	CERP Guidance Memorandum
DBHYDRO	Hydrometerologic, Water Quality, and Hydrogeologic Data Retrieval System
DCT	Design Coordination Team
DDT	4,4'-Dichlorodiphenyltrichloroethane
DPM	Decompartmentalization Physical Model
DVS	data validation and stewardship
EB	Equipment Blanks
EC	Environment and Climate Change Canada
EFGS	Eurofins Frontier Global Sciences
ERDP	Everglades Research Database Production
ESA	Environmental Site Assessment
ESU	Environmental Science Unit
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FIU	Florida International University
IDM	Information and Data Management
LCS	Laboratory Control Sample
LDC	Laboratory Data Consultants
LOASR	Lake Okeechobee Aquifer Storage & Recovery
MAP	Monitoring and Assessment Plan
NELAP	National Environmental Laboratory Accreditation Program
PAH	Polynuclear Aromatic Hydrocarbon
PDT	Project Delivery Team
PE	Performance Evaluation
PEST	Pesticide Monitoring
PI	Principle Investigator
PIA	Process Improvement Actions
PIE	Everglades National Park Inflows East

PLMP	Project-level Management Plan
PM	Project Manager
PrMP	Program Management Plan
PSRP	Picayune Strand Restoration Project
QA/QC	Quality Assurance/Quality Control
QAOT	Quality Assurance Oversight Team
QAR	Quality Assessment Report
QASR	Quality Assurance Systems Requirements
QM	Quality Manual
REC	RECOVER Executive Committee
RECOVER	Restoration Coordination and Verification
RSTA	Reservoir Stormwater Treatment Area
SAMP	Routine Sample
SERC-NAL	Southeast Environmental Research Center – Nutrients Analysis Laboratory
SFWMD	South Florida Water Management District
SM	Standard Methods
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SOW	Scope of Work
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WY	Water Year

EXECUTIVE SUMMARY

This Quality Assurance Oversight Team (QAOT) Quality Assessment Report (QAR) provides an assessment of the quality of data generated for the Comprehensive Everglades Restoration Plan (CERP) during Water Years (WYs) 2015 and 2016, May 1, 2014 and April 30, 2016, or "reporting period". The QAR identifies the processes that contribute to data quality, data quality problems and remedies, to report on the activities of the QAOT, and recommend improvements to the quality system for CERP monitoring. This QAR integrates the results of the CERP quality assessment and QAOT activities performed during this reporting period.[1]

The QAOT evaluated the quality assurance/quality control (QA/QC) procedures that could impact CERP data quality by reviewing QA/QC processes, evaluating of field monitoring activities, and assessing laboratory performance. QAOT/CERP documents were updated as part of the QA/QC review process. Two QAOT Standard Operating Procedures (SOPs) were updated by QAOT during the reporting period (Section 4.1.3); two water quality Scopes of Work and two Monitoring Plans were reviewed (Sections 4.2.1 through 4.2.4) and the 2013-2014 QAR was finalized and approved by the Design Coordination Team (DCT) (Section 4.3). Project-level data assessments were conducted for seven CERP projects (Section 4.4). The QAOT also conducted three program-level activities: (1) participated in the Florida Department of Environmental Protection (FDEP) sponsored training "Field and Laboratory Quality Assurance Training (Numeric Nutrient Criteria Audits)" (Section 4.5.1); (2) organized and gave presentations at the 6th QAOT Workshop at South Florida Water Management District (SFWMD) (Section 4.5.2); and (3) conducted two training sessions on QA/Data Management and SFWMD Hydrometerologic, Water Quality, and Hydrogeologic Data Retrieval System (DBHYDRO) (Section 4.5.3).

Field audits and/or observations were conducted to assess monitoring activities (Section 5.1). Field audits for three CERP water quality projects were conducted. Quality reviews of Hydrology (Section 5.2) and Biological/Ecological (Section 5.3) monitoring activities were not performed or reported during this time period. A summary of Restoration Coordination and Verification's (RECOVER) Monitoring and Assessment Plan (MAP) QA/QC is presented (Section 5.4).

The QAOT completed on-site quality assessments during the reporting period for five laboratories contracted to perform chemistry analyses, (Section 6.1). Findings in the chemistry laboratories included method deviations related to calibration and lack of adequate documentation/detail in SOPs. In most cases, corrective actions were undertaken by the laboratories to mitigate the findings. The QAOT provided Performance Evaluation (PE) samples to four of the five laboratories assessed. All reported results fell within the control limits. In the summers of 2014 and 2015, one inorganic water and sediment (metals only) PE sample sets were provided to laboratories that are or could potentially be used to analyze chemistry samples for CERP (Section 6.2). Some improvements in performance were found.

An assessment was conducted of CERP data quality represented by a snapshot of analytical data in SFWMD's Hydrometerologic, Water Quality, and Hydrogeologic Data Retrieval System (DBHYDRO)

[1] All QAOT reports are available in Documentum or upon request from the QAOT Co-chairs.

and Everglades Research Database Production (ERDP) databases (Section 7.1) and a summary of data from the C-44 Reservoir Stormwater Treatment Area (RSTA) project (Section 7.2), in addition to an assessment of hydrologic data for the reporting period (Section 7.3). An evaluation of analytical chemical and classical water quality data indicated that approximately 13% of the WY 2015 and WY 2016 data snapshot had qualifiers indicating that data quality could be compromised; however, these data are skewed by one project where 64% of the Nutrient data were qualified, and 100% of the General Chemistry data were qualified. For the C-44 RSTA project data, the groundwater data from the laboratory were not loaded into DBHYDRO because the data were not in the Automated Data Processing Tool (ADaPT) format (Section 7.2). For 13 hydrologic data types in DBHYDRO, 4.5% of the data were missing, 10% were estimated, and 3.3% were not processed during the reporting period (Section 7.3). These percentages are slightly higher when compared to those reported in WYs 11-14. A summary of the 18 active stations with continuous monitoring of water quality for the Picayune Strand Restoration Project (PSRP) is presented (Section 7.4). The percent of samples with quality related qualifiers dropped significantly in WYs 2015-2016.

There were no alternative procedures approved by the QAOT in this reporting period (section 8.0), although two deviations from the Quality Assurance System Requirements (QASR) were identified (Section 9.0). The deviations were in regard to format issues with the data received from the laboratories (the data could not be loaded into DBHYDRO).

The QAOT continued communication and outreach efforts (Section 10.1) and collaboration with other CERP entities (Section 10.2). Six initiatives identified in previous QARs were completed during the reporting period (Section 10.3).

QA is a continuous process improvement cycle of plan, do, check, and act. The QAOT activities to address eight recommendations identified during previous WYs are summarized in Section 10.0. Three recommendations for improvement were identified by the QAOT during this reporting period (Section 11.0) and will be part of the planning and action focus during the next QAR reporting period. These recommendations include ensuring that the QAOT is aware of when sampling events are occurring, ensuring that Project Managers are aware of when QAOT involvement is required, and developing a selection process for laboratories where National Environmental Laboratory Accreditation Program (NELAP) certification for selected analytes is not available. However, the QASR manual (Section 4.1.1), the CERP Guidance Memoranda (CGM) (Section 4.1.2) and the QAOT Facts and Information Sheet were not revised (Section 4.1.4).

1.0 INTRODUCTION

Since passage of the Water Resource Development Act in 2000, the mission of the Comprehensive Everglades Restoration Plan (CERP) has been to restore, protect, and preserve the water resources of central and southern Florida, including the Everglades. CERP Guidance Memorandum (CGM) 41.01 (South Florida Water Management District [SFWMD] and U.S. Army Corps of Engineers [USACE], 2010), establishes the Quality Assurance Oversight Team (QAOT) and its responsibility for providing guidance on and evaluation of the implementation of CERP Quality Systems through the Quality Assurance Systems Requirements (QASR) and CGMs. The QAOT develops and provides guidance on procedures, quality assurance/quality control (QA/QC) requirements and data verification and validation for CERP monitoring activities. The QAOT serves as the forum through which consistency is achieved regarding data quality and QA/QC processes among the various entities involved with hydrological, meteorological, water quality, and biological monitoring activities for CERP. CGM 41.01 further specifies that the lead QAOT agencies will produce a QA report on CERP monitoring activities on a biennial basis, evaluating whether the QASR is being implemented by CERP projects and programs and/or their contractors. This QAR has been prepared to meet that mandate.

The Office of Management and Budget was required to provide guidance for quality, objectivity, integrity, and utility of information disseminated by Federal agencies as a result of the Information Quality Act passed in 2001 (U.S. Congress 2001). Now required by the Government Performance Results Modernization Act of 2010 (U.S. Congress 2011) are agency performance plans and reports that describe how the agency ensures the reliability of the data used to measure progress toward performance goals, including how performance measures are verified and validated and if there are any limitations in the data that prevent attainment of the required level of accuracy.

It is critical that environmental monitoring and assessment data generated for the restoration of the Everglades as part of CERP provide a reliable and defensible basis upon which to formulate appropriate planning decisions. Use of data with unknown, unequal, or untraceable quality could result in decision errors or legal challenges. Therefore, to maximize the integrity of the data, programmatic data quality will be achieved by systematically incorporating QA/QC measures into every aspect of data collection.

The CERP program QASR manual defines protocols and procedures for environmental data gathering for CERP and defines quality systems to ensure data quality. The QASR establishes fundamental QA/QC procedures that, if implemented, will ensure data generated for CERP are "of acceptable and verifiable quality, generated in a consistent manner to allow sharing and utilization of data" (CERP Monitoring Program, 2004). The QASR manual incorporates, by reference, the Florida Department of Environmental Protection (FDEP) QA Rule Chapter Florida Administrative Code (F.A.C.) 62-160 and FDEP SOP-001/01. The QASR requirements are applicable to all data that will be used for CERP purposes.

The purpose of this report is to provide CERP management with an assessment of the state of data quality for CERP. The goals of the QAR are to document processes that contribute to data quality, identify data quality problems and best management practices, report on the activities of the QAOT, and recommend improvements to the quality systems for CERP monitoring. As such, when specific data quality issues are discussed in this report, it is intended to identify opportunities for continuous process improvement. As directed by the CERP Design Coordination Team (DCT), the QAR is a biennial report which integrates into one document the results of CERP quality assessment and QAOT activities performed during each

reporting period.[2] This document provides an assessment of CERP data quality and QAOT activities for the period between May 1, 2014 and April 30, 2016 based on WY 2015 and WY 2016, hereafter referred to as the *reporting period*. This is the seventh QAR developed by the QAOT.

[2] All QAOT reports are available in Documentum or upon request from the QAOT co-chairs.

2.0 SCOPE AND APPLICATION

The scope of this QAR is to describe the state of CERP data quality being generated for CERP for the reporting period between May 1, 2014 and April 30, 2016. The report focuses on CERP environmental monitoring activities from: (1) Restoration Coordination and Verification (RECOVER) system-wide monitoring efforts (i.e., Monitoring and Assessment Plan [MAP]); (2) project-level operational monitoring; and (3) permit-driven regulatory monitoring. The QAOT employed a variety of methods to evaluate the QA/QC procedures implemented for CERP that potentially impact data quality.

This report assesses CERP data quality directly through reviews of field and laboratory data quality indicators, results of Performance Evaluation (PE) sample analyses, assessments of monitoring and analytical procedures, and reviews of field and laboratory audits. Indirect assessments of data quality were accomplished by reviewing monitoring plans, standard operating procedures (SOPs), data, and/or project reports.

3.0 LIST OF KEY PARTICIPANTS AND ORGANIZATIONS

The preparation of this report was supported by the major contributions of QAOT members who provided audit reports, data, contact names, guidance, oversight, and comments. Table 3-1 lists the people who contributed text to this document, including those who provided supporting documentation and review comments.

Table 3-1. Contributors to the WY 2015 - 2016 QAOT Quality Assessment Report

Name of Participant	Organization
Paul Julian	FDEP
Cindy Lee Westergard	HSW Engineering, Inc. (SFWMD contractor)
Ming Chen	SFWMD
Tom Dreschel	SFWMD
Julianne LaRock	SFWMD
John Moorman	SFWMD
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April Patterson	USACE
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4.0 CURRENT QA/QC PROCESSES

This section summarizes QAOT activities conducted to improve or assess current QA/QC processes implemented across CERP. These processes, defined in the QASR and QAOT SOPs, constitute the CERP quality system. Whenever possible, the QAOT is pro-active and focused on preventive actions. During the reporting period, the QAOT focused efforts on the following processes:

- Documents were prepared or revised to provide acceptable QA/QC requirements to Principal Investigators (PIs) – section 4.1
- Monitoring Plans were reviewed to assess the implementation of QA/QC procedures for CERP – section 4.2
- The approved 2013-2014 QAR documented QAOT activities during the previous reporting period – section 4.3
- The implementation of the CERP quality system was assessed for seven CERP projects – section 4.4 and Table 4-2
- Three outreach activities were initiated to improve the quality of data by informing the CERP community of appropriate QA/QC practices – section 4.5

4.1 QAOT Document Updates

4.1.1 Review of the QASR

There were no updates to the QASR during the reporting period.

4.1.2 CERP Guidance Memoranda

There were no updates to CGMs during the reporting period.

4.1.3 QAOT Standard Operating Procedures

The QAOT has developed five SOPs that define QAOT responsibilities and procedures. SOPs ensure that activities are performed consistently and systematically over time. These SOPs are "living documents" that are revised to reflect procedural changes. The QAOT currently has five approved SOPs:

- SOP-001 Format for SOPs and Document Control Procedures
- SOP-002 Quality Assurance Activities and Responsibilities
- SOP-003 Preparation of the Quality Assessment Report
- SOP-004 Review of Project Monitoring Plans & Scopes of Work
- SOP-005 Administering and Reporting Analytical Performance Evaluation Studies.

During the reporting period, SOP-004 and SOP-005 were revised.

<u>QAOT SOP-004 Review of Project Monitoring Plans & Scopes of Work</u>

The purpose of this SOP is to establish the procedures for QAOT reviews of CERP Project Level Monitoring Plans (PLMP) and all SOWs arising from the PLMP. The QAOT reviews the QA/QC elements of PLMPs/SOW for compliance with the QASR manual. Results of the review are summarized on a

checklist and provided to the author of the PLMP/SOW. The PLMP/SOW author responds to the issues identified and revises the PLMP to ensure that it meets the QASR manual requirements. Revision 2.0 was updated to include checklists for hydrology and ecology, along with revision to water quality. These checklists will now cover all three categories of CERP monitoring according to the updated CGM 40.02 – Project Level Monitoring and Assessment (effective April 2, 2012). The updated checklists will be used as a standard form assisting the QAOT in reviewing all CERP PLMPs and/or SOWs. This SOP was revised on December 1, 2015.

QAOT SOP-005 Administering and Reporting Analytical Performance Evaluation Studies

This SOP describes the PE program administered by the QAOT for inorganic parameters in water. The SOP outlines: the selection of laboratories for participation; responsibilities for administering the program; selection of a PE provider; compound classes for inclusion in the study; communication, scheduling and reporting. Revision 2.0 included additional details added to the text, and the attachments were revised to improve clarity and flexibility. This SOP was revised on March 31, 2015.

4.2 Monitoring Plan/Scope of Work Reviews

4.2.1 Scope of Work – Modification #04 – Architect-Engineer Services for Groundwater Monitoring During Construction: C-44 Reservoir and Stormwater Treatment Area (RSTA) Contract 1, Martin County, FL

QAOT members collectively conducted a thorough review of the C-44 RSTA SOW titled "Architect-Engineer Services for Groundwater Monitoring During Construction: C-44 RSTA Contract 1" (Contract No. W912EP-10-D-0010 Task Order 003, Modification #04) in December 2014 using the updated CGM 40 checklist. Comments were forwarded to the project team for implementation.

4.2.2 Scope of Work – C44 STA Groundwater Boundary Monitoring Project, C-44 Reservoir and Stormwater Treatment Area, Martin County, FL

SFWMD staff who were also QAOT members reviewed the C-44 RSTA SOW (Contract No. 460000xxxx – C-44 STA Groundwater Boundary Monitoring) in September 2015. Comments were incorporated into the SOW.

4.2.3 Monitoring Plan – C-111 Spreader Canal Western Project (C111 SC)

A permit modification to the C111 SC Monitoring Plans dated October 14, 2009 was issued by the USACE (Jacksonville District) on February 22, 2016. The modification replaced the original monitoring plans with updated plans, specifically the Water Quality Monitoring Plan dated February 9, 2016; the Hydrometerological Monitoring Plan dated February 2016; and the Ecological Monitoring Plan dated January 25, 2016. Since the QAOT had previously reviewed the original monitoring plans (see QAR2010, section 4.4.1), the QAOT only performed a cursory review to ensure the QA recommendations were included in the 2016 monitoring plans.

4.2.4 Monitoring Plan – Picayune Strand Restoration Project (PSRP)

Both USACE and SFWMD reviewed the Monitoring Plan in August 2015. All required QA/QC elements were acceptable by both QAOT reviewers.

Table 4-1. Results of QAOT Water Quality Monitoring Statement of Work (SOW)/Monitoring Plan Reviews

SOW/MP Element	C44[a]	C44[b]	PSRP[c]
1. Title Page	U		
• Contains project title, revision, and date	A	U	A
• Contains QA Manager/QA Officer signature	U	U	A
2. Distribution List	U		
Recipients of Monitoring Plan/Quality Assurance Project Plan listed	A	U	NA
3. Project Organization and Responsibilities	A	A	A
4. Data Assessment Organizations and Responsibilities	U	A	A
5. Data Quality Objectives	U		
• Data use background: defines project specific data needs; describes media and analyses required to meet the data needs	U	A	A
• Measurements of quality objectives: required reporting limits, precision, accuracy, comparability, and acceptance criteria	U	U	A
• Description of Field Activities Quality System with appropriate references to the QA Rule (62-160 F.A.C.) and the FDEP SOPs (FDEP-SOP-001/01) in their entirety. (This should include a reference to requiring the field organization's Quality Manual as a deliverable prior to sampling.)	U	NA	NA
6. Sample Receipt, Custody, and Holding Time Requirements	A	NA	A
7. Analytical Procedures	A		
• Preventative maintenance	U	U	A
• Calibration procedures and frequency	U	U	A
• Laboratory certification requirements and QC procedures: type and frequency of internal QC measures	A	NA	A
• Performance and system audits	U	U	A
• Nonconformance/corrective actions for field and laboratory	U	U	A
• Data reduction/calculation of data quality indicators: describes bias, accuracy, limits of detection, and precision calculations	A	U	A

8. Report Documentation: Defines Report Format and Data Archival Requirements	A	A	A
9. Data Assessment Procedures	A		
• Data verification	A	U	A
• Data validation	A	U	A
TOTAL U (% Unacceptable)	52%	73%	0%
TOTAL A (% Acceptable)	48%	27%	100%

Review Codes: A (Acceptable), U (Unacceptable), NA (Not applicable)

[a]: Modification #04 – Architect-Engineer Services for Groundwater Monitoring During Construction: C-44 Reservoir and Stormwater Treatment Area Contract 1, Martin County, FL. (SOW)

[b]:C-44 Groundwater Boundary Monitoring Project, Reservoir and Stormwater Treatment Area, Martin County, FL. (SOW)

[c]:Picayune Strand Restoration Project (SFWMD-Field-MP-062-04, dated July 23, 2015).

4.3 Quality Assessment Report for WY 2013-2014

The 2013-2014 QAR (QAR2014) presented CERP data quality and project performance; QAOT guidance documents, audits and outreach; and recommendations for future data quality improvements during WYs 2013 and 2014. The time period for QAR2014 was between May 1, 2012 and April 30, 2014. QAR2014 was approved by the DCT on April 28, 2015.

4.4 CERP Project Assessment Summary

The QAOT assessed the quality of CERP monitoring plans and program and project level data streams by reviewing PLMPs, performing project-specific field/laboratory assessments, and reviewing CERP data quality (Table 4-2). The table provides a summary of CERP projects assessed by the QAOT during the reporting period.

Table 4-2. CERP Projects Assessed by the QAOT during the Reporting Period

Project	QA/QC Processes (Section 4)	Field/Lab Assessments (Sections 5/6)	Data (Section 7)
Biscayne Bay Coastal Wetlands (BBCW)		X	X
C-44 Reservoir and Stormwater Treatment Area (RSTA)	X		X
C111 Spreader Canal	X		X
Decompartmentalization Physical Model (DPM)		X	X
Everglades National Park Inflows East (PIE)			X
Pesticides Monitoring (PEST)			X
Picayune Strand Restoration Project (PSRP)	X	X	X

4.5 QAOT Initiatives

4.5.1 Outreach: QAOT Participation in FDEP Training

QAOT members participated in the FDEP sponsored training "Field and Laboratory Quality Assurance Training (Numeric Nutrient Criteria Audits)" on February 16, 2015. The QAOT contacted others associated with CERP projects to inform them of the training. The training provided an introduction on how FDEP auditors conduct certain types of audits of sampling and analytical procedures used to generate environmental data used by FDEP. The instructors used the example of surface water sample data audited for monitoring or compliance associated with numeric nutrient criteria to illustrate audit concepts and data usability requirements. Although examples of records for numeric nutrient criteria data were discussed, the topics presented generally apply to other analytes and other sample matrices.

4.5.2 Outreach: 6th QAOT Workshop at SFWMD – November 2015

The QAOT hosted a workshop at SFWMD on November 4, 2015. The title of the workshop was "CERP/RECOVER Monitoring Projects: Planning and Process." The purpose of this workshop was to inform Project Managers, Technical Leads, and those directly associated with CERP on how QAOT involvement can enhance overall success of their project. Goals of the workshop included:

- Communication:
    1. CERP QA/QC requirements.
    2. Purpose of QA (and consequences if not employed).
    3. Provide examples of existing issues with collecting, analyzing, and storing data.
    4. Knowledge-sharing and networking.
- Seek QA "buy in" from Project Managers:
    1. Illustrate need for QA.
    2. Understand long-term CERP goals for data validity.
    3. Encourage ownership of project and program objectives.

The workshop included teleconference capability for those unable to participate in person. Thirty (30) participants attended this workshop, including those attendees that participated via the webinar. The workshop consisted of the following presentations:

- Quality Assurance Overview: QAOT authorized by CGM 41.01 to provide quality assurance (QA) guidance at the program level to ensure data quality. QASR manual for chapter 3 (water quality sampling procedures, chapter 4 (chemical analysis), chapter 5 (verification and validation of analytical chemistry data) and chapter 10 (information and data management) provide the backbone for CERP QA practices.

- Client Services: Created to enhance coordination between PMs, District and Contract Laboratories, QA, Data Stewards and End Users by working closely with all entities ensuring project objectives are achieved from sample collection to analysis to validation to reporting to data storage.

- Field Quality System: All collected data have errors; however, a Quality System seeks balance based on risk (in today's world of lower funding levels, decreasing resources/time can lead to increasing uncertainty/risk). The key concepts used to assure the validity of a long term data set are Representativeness and Consistency. The Quality System assures data collection consistency over-time and between sample collectors.

- Laboratory Assessments: How the QAOT Can Help Your Project be More Successful: Purpose is to assess, at the bench level, the proficiency that the laboratory has to perform chemical analysis and to ensure that the analytical chemistry laboratories meet the QA/QC requirements as defined in the U.S. Environmental Protection Agency (USEPA) methods that are required for the project. The desired outcome of the assessment is to enhance assurance that the laboratories are producing defensible data for CERP samples by following the analytical methods required for the project.

- Data Validation: The goals of data validation are to ensure that data meet QASR and project requirements and to ensure that data are reliable, defensible, and comparable among sources. For laboratory analytical chemistry data, an electronic data deliverable is generated by the laboratory which is then evaluated by the Automated Data Processing Tool (ADaPT). For validation of continuous monitoring data, the deployed sonde (which collects data every 15 minutes) is retrieved from the field and a continuing calibration verification is performed. Data are submitted, the validator reviews calibration data, the data are plotted in graphical verification analysis, then the

appropriate data qualifiers applied, the narrative finalized and then the data can be uploaded into DBHYDRO.

- DBHYDRO: The environmental database stores hydrologic, meteorologic, hydrogeologic and water quality data. This database is the source of historical and up-to-date environmental data for the 16-county region covered by SFWMD. Since DBHYDRO can be searched, using one or more criteria, to generate a summary of the data from the available period of record, it is imperative that the Project Delivery Team (PDT) contacts the data steward to make sure all parties are in agreement as to what metadata are needed prior to the collection of samples.

Workshop evaluations completed by the attendees, along with verbal feedback, were positive. Copies of the presentations were sent to those who requested them.

4.5.3 Outreach: External DBHYDRO Training

A DBHYDRO Environmental Database User's training course is offered by SFWMD to scientists, engineers and other interested parties who utilize access to DBHYDRO data through the SFWMD website. QAOT members provided input into the development and implementation of this training program. During WY 2015 and WY 2016, 51 individual training sessions were conducted. During WY 2015, 121 SFWMD staff members and 173 trainees from outside the SFWMD completed the DBHYDRO training course. During WY 2016, 105 SFWMD staff members and 236 trainees from outside the SFWMD completed the DBHYDRO training course. These training sessions were conducted via a traditional classroom learning environment as well as through a web based application and are also being offered at outside locations including United States Geological Survey field offices and at Florida Atlantic University.

5.0 EVALUATION OF FIELD MONITORING

This section summarizes QAOT activities to assess the quality of CERP field monitoring. Assessment input for field data quality may consist of field audits of water quality monitoring, hydrometeorological monitoring, and ecological field observations.

5.1 Water Quality Monitoring Activities

This section summarizes QAOT activities to assess CERP field monitoring activities. Field audits for two CERP projects were conducted during the reporting period. The following identifies required course of action for issues identified in an audit:

A deficiency is defined as a method, process or product that does not meet the specifications in the listed quality system requirements.

Recommendations were included as suggestions that may improve the overall quality of the data or efficiency in sample collection.

A process improvement is defined as a deficiency that does not result in the qualification of data or affect the quality of a sample and/or field data. This includes deficiencies where the auditor was not confident the auditee understood the requirement because the requirement was not sufficiently clear and the audit resulted in clarification of the requirement. Process improvements must be addressed in the written response.

A corrective action / quality improvement is defined as a deficiency that results in the qualification of data or a deficiency may have affected the quality of a sample directly and/or field data collected. This includes the representativeness of a sample or any QC samples collected. Corrective actions must be addressed in the written response. These deficiencies are in conflict with the current FDEP SOPs, contract requirements, the agency's Quality Manual (QM) or Quality Assurance Project Plan, the Sampling and Analysis Plan.

5.1.1 Marsh Ecology Unit

On February 9, 2015, a field audit was conducted to evaluate the sampling and field data collection procedures performed by the Marsh Ecology Unit of the Everglades Systems Assessment Section of SFWMD for the Decompartmentalization Physical Model (DPM) project. The sample collection methods audited were grab pump and field testing. The auditors conducted a review of relevant documentation, including SOPs, prior to the on-site audit and as a part of the on-site audit. Five corrective actions and five process improvements deficiencies were reported in the field audit report and are listed below.

Calibration:

- Three of the specific conductance data were not bracketed with a higher standard. These data were qualified with a ‘J’ qualifier.

Quality control:

- Strainer (reusable filter cartridge) was not included in the equipment blank.
- Nitric acid and sulfuric acid preservation bottles were not kept in separate containers to prevent cross-contamination.
- The time to rinse the tubing for the field collected equipment blank was two-times greater than

the average time for the collection of the samples.

Sample collection procedures:

- Samples collected at Station DPML67ACA were not placed in ice until after arrival at Station UB1 (49 minutes later). This was documented in the field notes. The sample data for the non-metal parameters were qualified with a 'Y' qualifier.

Documentation:

- Field notes did not include comments concerning weather throughout the day. Specifically, rain at Station RS1 during sampling was not documented.
- The cleaning of Strainers (reusable filter cartridge) and the reused tubing was not documented.
- The use of the pump and the identification number for the pump were not documented in the field notes.
- The total depth was documented on the prelogin summary report, but the sampling depth was not.
- The instrument maintenance log did not include the initials or the signature of the person performing the maintenance. The field notes were not initialed or signed by the person recording the notes.

5.1.2 SFWMD Field Operation Sampling Logistics Unit #4421

On September 15, 2015, a field audit was conducted to evaluate the sampling and field data collection procedures performed by the SFWMD Field Operation Sampling Logistics Unit #4421 for the Biscayne Bay Coastal Wetlands (BBCW) project. The sample collection methods audited were surface water grab sample collection and field testing. The auditor conducted a review of relevant documentation prior to the on-site audit and as a part of the on-site audit. A review of quality system related documentation was conducted prior to, and as part of the on-site audit. Documentation review after the on-site audit was conducted and included, but may not have been limited to selected SOPs, sampling event documentation, training records for the auditees, equipment cleaning and/or maintenance documentation. One process improvement deficiency was reported in the field audit report.

Documentation:

- Auditee had a printed copy of the BBCW Monitoring Plan version #4 in the trip binder. The current version is #6. The Auditee did, however, successfully locate the current version on the OneDrive.

An additional audit of the same sampling unit was conducted on March 23, 2016. The project audited was the PSRP. There were no deficiencies, quality improvements, process improvements or recommendations reported.

5.1.3 Florida International University (FIU)

Two sampling groups from FIU were audited on 12/8/15 and 12/21/15. The sample collection methods audited were Autosampler sample collection, surface water grab sample collection, and field testing. The audit conducted on 12/8/15 resulted in 12 Corrective Actions and 7 Process Improvements.

Quality Control:

- The temperature verification of the field instrument has not been performed.

Sample collection procedures:

- Gloves were not changed between sampling stations
- The grab sample collection bottle was not submerged neck first
- The Magenta bottle (for total phosphorus and total nitrogen) was rinsed with water passed through the syringe which is not a part of the sampling train for total samples.
- A gloved finger was allowed to come into contact with the sample by placing a finger over the tip of the syringe during processing of the filtered subsamples
- An incorrect filter size (0.7µm) was used to filter the samples. All filtered samples were qualified for the project as a result of this finding.
- Preservation acid dropper bottles were not labeled with the opening date or the initials of the person that opened the container.
- The depth of the tubing for one of the autosamplers was not defined and it was not clear to which depth the tubing was deployed because it was not attached to the platform
- The autosampler samples were not homogenized prior to processing the sample into the sample bottles.
- Tubing for the autosamplers had not been changed in at least the last three months. The tubing was fouled with biological growth.
- Salinity was measured and recorded in the pre-preserved autosampler bottles. The values were recorded on the field records.
- The acid used to pre-preserve the autosampler bottles, which was from a different source than the preservation acids used for the grab samples, was not being assessed with a blank.

Documentation:

- The cleaning of reusable equipment and the associated cleaning information (e.g. procedure used, soap used, etc.) for this collection was not documented.
- The field notes for the event from which recorded information was transferred, was not submitted with the records for the event to the laboratory.
- The lot numbers for the preservation acids used during the event were not recorded.

The audit conducted on the second sampling group on 12/21/15 resulted in 12 corrective actions and 11 process improvements. Some of the findings are the same as the audit above, however these are separate sampling groups collecting for the same project.

Quality Control:

- The temperature verification using two temperatures to bracket the range of values has not been performed on the instrument used on this date.

Sample collection procedures:

- A gloved finger was allowed to come into contact with the sample by placing a finger over the tip of the syringe during processing of the filtered subsamples
- The marsh sample collected at Station C111N1 contained significant amounts of detritus and periphyton material from the surrounding plants. The sample was not homogenized prior to pouring into the sample bottles.
- Salinity was measured in the autosampler discrete bottles after the samples were processed.
- The 2 liter Nalgene bottles used for compositing the autosampler samples are not included in the QC blank collection process. Therefore this is an unassessed source of potential contamination.

- The acid used to pre-preserve the autosampler bottles was not included in the blank process. This is a possible source of contamination that is not being assessed with a field QC blank.
- An incorrect filter size (0.7um) was used to filter the samples. All filtered samples were qualified for the project as a result of this finding.
- The grab sample collected at N1 was not completely preserved and placed in ice until 23 minutes after collection. The grab samples must be processed and placed in ice within 15 minutes of collection.
- In the field notes for sample P81874-6 there is a comment "possible caddis fly". This comment was not transferred to the Prelogin Summary Report. This sample should have been rejected in the field.
- Autosampler delivery volume was not checked by pumping a grab sample into either a graduated cylinder or another calibrated container.
- Autosampler maintenance not performed within the last quarter. The intake tubing had not been tested by collecting equipment blanks on the tubing or a representative length.
- The analyte free water used for this event was not documented in the field records.
- The intermediate bottle used to collect the grab sample at Station C111 N2 was not submerged, neck opening first into the water. The bottle was submerged into the water with the bottle on its side such that the bottle filled with water from the surface and not at the required sampling depth.

Documentation:

- The preservation acids used to preserve the grab samples and the separate acid used to pre-preserve the autosampler discrete bottles was not recorded in the field notes for the event.
- Some of the information recorded on the "Field Instrument calibration sheet" and on the "IC/ICV Solution Set ID Record" were recorded using pencil.
- Training of the sample collection personnel was not documented.
- The lot numbers for the preservation acids used to preserve the grab samples and the separate acid used to acidify the autosampler discrete bottles was not recorded in the field notes for the event.
- Some corrections in the field notes were done by obliterating the error. Corrections made to the PSR and FTR were made by crossing out with a single line and initialing and dating.
- The equipment cleaning logbook did not cite the procedure used to clean the equipment. The soap and acid lot numbers, manufacturer, etc not recorded for equipment cleaning process.

5.2 Hydrology Monitoring Activities

Quality reviews of Hydrology monitoring activities were not performed or reported during this time period on specific CERP projects.

5.3 Biological/Ecological Monitoring Activities

Quality reviews of Biological/Ecological monitoring activities were not performed or reported during this time period due to remote locations of the projects.

5.4 RECOVER Monitoring and Assessment Program QA/QC

RECOVER is the arm of CERP responsible for linking science and the tools of science to a set of system-wide planning, evaluation and assessment tasks. RECOVER's role is to organize and apply scientific and technical information in ways that are most effective in supporting CERP objectives, and to ensure that CERP system-wide goals and purposes are achieved. RECOVER's objectives are to (1) evaluate and assess CERP performance; (2) refine and improve the design and operation of the plan during implementation; and (3) ensure that a system-wide perspective is maintained.

RECOVER is responsible for carrying out the tasks necessary to successfully accomplish its missions through the processes of evaluation, assessment, and planning at both the program and project levels. At the program level, RECOVER maintains a system-wide focus as it evaluates and assesses the CERP performance, develops refinements and improvements in the design and operations of the plan, and reviews the effects that other projects may have on the performance of the CERP. RECOVER works with the PDTs to relate system-wide goals and objectives to project design and performance and incorporate information obtained during project plan formulation into the CERP and its evaluation. RECOVER is the primary means to link achievements at the project level to the overall success of the CERP in meeting the goals and objectives as stated in the plan. RECOVER will continue to function throughout the entire duration of the restoration process, continuously seeking ways to improve the plan as responses measured by a system-wide monitoring program are used to direct the adaptive management process. One of the main documents that guides this process is the MAP.

Implementation of the MAP requires rigorous QA/QC. The RECOVER Executive Committee oversees the implementation of QA/QC protocols for the MAP in coordination with the QAOT. The MAP follows the established QA/QC Program, as outlined in the QASR manual, which is designed to meet the following requirements:

- Withstand scientific review and legal scrutiny.
- Be used to develop and support scientific and technical consensus.
- Be fully integrated into CERP.
- Standardize procedures - ensure the consistency and comparability of data using SOPs across agencies or organizations. There were no additions or changes to ongoing monitoring components during the reporting period.
- Provide data quality criteria - provide guidance to those involved in the CERP monitoring activities to establish accuracy, precision and other quality criteria (method detection limits, uncertainty, for example) for each data type. There were no changes to data quality criteria during the reporting period.
- Provide a degree of confidence - provide for the efficient and effective analysis of data collected by the various organizations in South Florida and provide users of these data with known degree of confidence level and uncertainty that the data were collected with similar data quality standards across agencies. RECOVER developed performance measures during the reporting period that provided a degree of confidence with regard to data collected from the program.

- Provide guidance for new monitoring - provide guidance on accuracy and precision requirements to agencies and organization involved with establishing new monitoring. RECOVER and QAOT coordinate PLMP reviews and share comments and findings. During the reporting period RECOVER and QAOT reviewed the PSRP PLMP.

The QASR lays out the protocols and procedures for environmental data gathering activities for the implementation of CERP and is periodically updated and refined in an effort to strengthen the QA/QC program for CERP. The QASR manual covers the details of the QA/QC program required during the implementation of the MAP, including establishing or defining the data quality objectives, SOPs for various QA/QC activities, data quality assessment criteria, and data handling procedures, and describes some of the expected data types and associated elements and standards necessary to produce quality data that are consistent and comparable. No additions to the QASR were made during the reporting period.

RECOVER is responsible for the coordination and application of an Applied Science Strategy during CERP implementation. This strategy outlines a process for organizing current scientific understanding of wetland and estuarine ecosystems into interrelated components that can effectively support restoration efforts. The major components of the Applied Science Strategy are the development of regional and total system conceptual ecological models, identification of performance measures and restoration targets, development and implementation of a system-wide monitoring program, and development of an assessment strategy.

This guidance recommends that the following issues be included and addressed explicitly in all MAP assessments:

- A clear and unambiguous statement of goals and objectives that include explicit statements of the target population of interest and the environmental variables to be monitored.

- A description of how inferences are to be made about the target population from the sampling design, what types of data will be used and how representative the sampling sites are.

- Random sampling is required for design- or probability- based inferences about the entire target population; however, complete random sampling, where each location has an equal probability of being included in the sample, is the simplest but the least powerful for a given sampling effort.

- Stratification and other more general forms of multi-stage sampling are useful for leveraging ancillary data to provide more powerful estimates of variability but random sampling within strata or sampling units is still required.

- If causation is important (e.g., linking the causal pathways from the conceptual ecological model), the monitoring design should incorporate supplemental experimental work to address specific hypotheses about causation.

- It is crucial that the sampling design be able to accommodate change as objectives change over time. However, finely-tuned designs while being the most powerful to detect specific a priori responses, greatly reduce the ability of the design to capture unforeseen responses and limit the ability to subsequently restructure the monitoring program in response to modified objectives or resource levels. These considerations are particularly important to successfully implementing the adaptive management strategy which is critical to CERP.

The RECOVER sampling design, ecological monitoring SOPs, RECOVER reviews (at multiple levels including public reviews), and adoption of data for use in performance measures and tools for continued application and review of data quality, demonstrate the quality of MAP data collection and assessment. No changes were made to these process during the reporting period.

6.0 LABORATORY ASSESSMENTS

This section summarizes QAOT activities to assess the quality of laboratories that may generate data for CERP under existing SOWs or contracts with the SFWMD or USACE. Section 6.1 summarizes laboratory assessments performed during the reporting period. Table 6-6 summarizes laboratory assessment activities, including participation in PE studies. Section 6.7 summarizes results from the QAOT sponsored PE Studies, and Table 6-2 summarizes the evaluation of the laboratory results. Table 6-8 summarizes the overall categorization for the three years that laboratories have been analyzing Environment and Climate Change Canada (EC) PE samples provided by the QAOT.

The QAOT completed assessments of five contract laboratories performing organic and/or inorganic chemical sample analyses during the reporting period. The purpose of a laboratory assessment is to evaluate, at the bench-level, a laboratory's analytical proficiency and to ensure that it meets the QA/QC requirements defined in USEPA methods specified in the project's documents. The primary focus of the QAOT assessment program is to provide a mechanism to verify, document, and improve, the analytical procedures used by the laboratory that generate measurement data. The desired outcome is to enhance assurance that laboratories are producing defensible data for CERP samples by following the analytical methods requested for the project.

The assessment process consisted of three components used to evaluate laboratory performance:

- Remote Desk Assessment
- On-Site Assessment
- PE Samples

The remote desk assessment includes a review of the laboratory's documentation (SOPs, QM, control charts, method detection limits, standard data package, and previous NELAP PE sample results). The on-site assessment entails in-depth review of analytical procedures used by the laboratory with emphasis on the review of bench-level data including detailed discussion with the analysts. The PE samples are provided by commercial vendors (purchased by the QAOT) and the laboratories' results are compared to the vendors quality control limits generated by NELAP protocols. Previous QAOT and the most recent NELAP audit reports and laboratory responses were reviewed to identify findings applicable to the methods under review. During the audit, the auditor verified implementation of any previous audit-based corrective actions pertaining to the methods being assessed.

For both the remote and on-site assessments, the findings are characterized as:

- Observations: No impact on data quality (e.g., typographical errors in SOPs).
- Recommendations: Deviations from method requirements that could impact data quality (e.g., not calibrating volumetric glassware).
- Deficiencies: Deviations from method requirements that will impact data quality (e.g., analyte response factors not evaluated properly resulting in not reporting analytes at low levels [false negatives]).

6.1 Laboratory Assessment Summaries

The following sections summarize the assessments for five laboratories evaluated during the reporting period. Note that not all findings are listed in the following summary section.

6.1.1 Accutest Laboratories Southeast, Orlando, FL

Accutest Laboratories Southeast of Orlando, FL was assessed for the following USEPA methods: low level polycyclic aromatic hydrocarbons by 8270D, and organochlorine pesticides by 8081B. The Florida Residue Petroleum Method was also assessed. The draft Desk Assessment Report was sent to the laboratory on January 16, 2014 and the on-site assessment was conducted on February 20, 2014. PE samples were sent to the laboratory on December 17, 2013. The Final Report was issued on June 5, 2014.

Table 6-1. Findings and Corrective Action for Accutest Laboratories Southeast

Assessment		Finding	Corrective Action
Desk	1	Marginal exceedances for laboratory control spike recoveries are policy of the lab, but not allowed in most methods.	Project specific requirement will be followed for CERP samples.
	2	Reprocessing the low level standard against the new initial calibration curve is not being performed.	Will follow this procedure when required by the method.
	3	Extraction SOP and analytical SOP were in conflict for the addition of silica gel.	Will edit analytical SOP to match the method requirement as stated in the extraction SOP.
On-Site	1	In a batch randomly chosen for review, a DDT peak in a field sample, which was detected and confirmed on a second column, was deleted by the analyst when it should not have been.	Review Quality Systems; retrain analysts and second level reviewers.
PE Sample	1	Lab successfully analyzed the QAOT supplied PE samples for the tests assessed.	None

6.1.2 Pace Analytical Services – Florida, Ormond Beach, FL

Pace Analytical Services - Florida of Ormond Beach, FL was assessed for the following USEPA methods: low level polycyclic aromatic hydrocarbons (PAHs) by 8270C, and metals by 6020A. The Florida Residue Petroleum Method was also assessed. The methods were assessed for water samples, and PAHs were also assessed for soil/sediment matrix. The draft Desk Assessment Report was sent to the laboratory on August

8, 2014 and the on-site assessment was conducted on September 10, 2014. PE samples were received by the laboratory on August 13, 2014. The Final Report was issued on March 26, 2015.

Table 6-2. Findings and Corrective Action for Pace Analytical Services – Florida

Assessment		Finding	Corrective Action
Desk	1	The selective ion monitoring procedure for PAHs was interwoven in the full-scan SOP for method 8270C making it difficult to evaluate the PAH procedure.	Will write a stand-alone SOP for PAHs only.
	2	The checklist used by the analyst did not comply with method 8270D requirements.	Will write a new checklist containing requirements for the method implemented.
On-Site	1	DDT breakdown was not being evaluated for the PAH procedure.	Will implement the method requirement.
	2	The spiking solvent is not compatible with the sample matrix leading to recoveries that may not be indicative of true recovery of target analytes.	Lab will switch to a compatible solvent.
PE Sample	1	Lab successfully analyzed the QAOT supplied PE samples for the tests assessed.	None.

6.1.3 Department of Regulatory and Economic Resources, Environmental Resources Management, Miami, FL

The Department of Regulatory and Economic Resources, Environmental Resources Management laboratory of Miami, FL was assessed for the following USEPA methods: ammonia nitrogen (350.1), metals (200.7/6010C), total Kjeldahl nitrogen (351.2) and nitrate-nitrite nitrogen (353.2). Hardness (calculated) was assessed against Standard Methods 20th edition, method 2340B. The methods were assessed for water samples, except for metals which was assessed for both water and soil matrices. The draft Desk Assessment Report was sent to the laboratory on April 1, 2015 and the on-site assessment was conducted on April 15, 2015. PE samples were received by the laboratory on March 25, 2015. The Final Report was issued on September 28, 2015.

Table 6-3. Findings and Corrective Action for DRER-ERM

Assessment		Finding	Corrective Action
Desk	1	Lab was analyzing initial calibration standards in order of increasing concentration instead of decreasing concentration as stated in method 350.1	Lab will comply with the method requirement for CERP sample analysis.
	2	The laboratory is not adjusting the pH of water sample for metals analysis by method 200.7/6010C if the pH>2.	Will only qualify the data; laboratory will not adjust the pH.
On-Site	1	For methods 200.7/6010C, the metals preparation (water), the reduced volume stated by lab personnel did not match the reduced volume stated in the SOP.	Retrain analyst to follow the procedure listed in the methods and SOP.
	2	The nitrate-nitrite (method 353.2) bottle for the 0.04 mg/L standard did not contain units.	Remind analyst of proper labeling procedures.
PE Sample	1	Lab successfully analyzed the QAOT supplied PE samples for the tests assessed.	None.

6.1.4 Southeast Environmental Research Center – Nutrients Analysis Laboratory at Florida International University, Miami, FL

Southeast Environmental Research Center – Nutrients Analysis Laboratory (SERC-NAL) at FIU of Miami, FL was assessed for the following USEPA methods: ammonia nitrogen (method 350.1), nitrate-nitrite nitrogen (353.2), soluble reactive phosphorus/total phosphorus (365.1), silica (366.0). The procedures for total nitrogen (ASTM D-5176) and total organic carbon (SM 5310B) were also assessed. Total phosphorus was assessed for both water and soils/sediments matrices; the others were assessed for water matrix only. The draft Desk Assessment Report was sent to the laboratory on April 1, 2015 and the on-site assessment was conducted on April 16, 2015. PE samples were received by the laboratory on March 30, 2015. The Final Report for SERC-NAL was issued on September 23, 2015.

Table 6-4. Findings and Corrective Action for SERC-NAL

Assessment		Finding	Corrective Action
Desk	1	Acceptance Criteria for daily calibration and laboratory control samples were widened from the method requirement of 90%-110% to 85%-115%.	Lab will comply with the method requirement for CERP sample analysis.
	2	Lab was analyzing initial calibration standards in order of increasing concentration instead of decreasing concentration as stated in method 350.1	Will implement the method requirement.
	3	For the method reagent blanks, if contamination was detected, the laboratory was qualifying data and warning the tech to "closely monitor the instrument performance", whereas the methods require corrective action and reanalysis of samples.	Will implement the method requirement.
	4	Daily calibration verification samples were not evaluated as described in the methods.	Lab will comply with the method requirement for CERP sample analysis.
	5	Samples are sometimes frozen if holding times cannot be met, whereas the methods state to acidify and cool to 4ºC.	Lab will comply with the method requirement for CERP sample analysis.
On-Site	1	Desk assessment findings (deficiencies) were verified and corrective actions verified with the laboratory	See above.
PE Sample	1	Lab successfully analyzed the QAOT supplied PE samples for the tests assessed.	None.

6.1.5 Florida Department of Environmental Protection Central Laboratory, Tallahassee, FL

The Florida Department of Environmental Protection (FDEP) Central Laboratory of Tallahassee, FL was assessed for the following USEPA methods: Organochlorine Pesticides (8270D) and Low Level Mercury (1630). The methods were assessed for preparation and analysis in fish tissue samples. The draft Desk Assessment Report was sent to the laboratory on March 8, 2016 and the on-site assessment was conducted on May 4, 2016. PE samples are not available for fish tissues. The Final Report for FDEP was issued on June 21, 2016.

Table 6-5. Findings and Corrective Action for FDEP

Assessment		Finding	Corrective Action
Desk	1	The lab changed the analysis procedure they were certified for (method 8081) to a procedure they were not certified for (method 8270D).	Samples are now being analyzed at a certified laboratory
	2	The laboratory failed to include agreed upon language for the Quality Manual regarding a previously QAOT identified recommendation from the last assessment in 2011.	Incorporated
On-Site	1	Desk assessment findings (deficiencies) were verified and corrective actions verified with the laboratory	See above.
	2	Although accurate, the verbiage describing the extract concentration steps for method 8270D was confusing.	Laboratory will rewrite this section, and include a flow-diagram showing the process from start to finish.
PE Sample	1	PE samples for pesticides and mercury in fish tissue are not available.	Not Applicable

6.2 Inorganic Performance Evaluation Samples

During the reporting period, inorganic PE samples were administered to laboratories under contract with the SFWMD or the USACE that could potentially perform chemistry analysis to support CERP. The

purpose of the PE study was to assess laboratory performance on single blind samples. One PE study was conducted during the reporting period. Environment and Climate Change Canada (EC) was the PE sample provider for the study. More than 30 laboratories participated in the study, making analyses statistically robust. Five analyte classes were selected by the QAOT for the study: major ions and nutrients, trace elements, total phosphorus, and low-level mercury in water; and trace elements in sediment. The samples concentrations ranged from low to high and were consistent with values commonly found in natural environments in Canada. EC scored laboratory performance as Very Good, Good, Fair, and Poor based on their analytical results Z-score, and number of biased parameters, for each compound class. Table 6-2 summarizes the results of the PE study. The full PE reports are posted on the QAOT home page http://www.evergladesrestoration.gov/content/qaot.html

The QAOT selected 11 laboratories to participate in the WY 2015 inorganic PE study conducted in June 2014 (note: The SFWMD chemistry laboratory ordered the same PE study samples separately, and is included as the 12th QAOT evaluated laboratory). Results for 23 parameters were reported by the 12 participating laboratories: 35% were Very Good, 26% were Good, 30% were Fair, and 9% were Poor. The QAOT selected 12 laboratories to participate in the WY 2016 inorganic PE study conducted in June 2015 (note: The SFWMD chemistry laboratory ordered the same PE study samples separately, and is included as the 13th QAOT evaluated laboratory). Results for 23 parameters were reported by the 13 participating laboratories: 35% were Very Good, 22% were Good, 39% were Fair, and 4% were Poor.

EC emphasized that scoring and performance ratings are intended to provide participating laboratories with indicators of their performance when compared to other laboratories in the same field. They are not intended to convey any concept of pass or fail. Also, the scoring and performance ratings by themselves can be misleading as they are based on percentages of passing Z scores or unbiased results for each analyte class, with some analyte classes comprising several analytes (e.g., major ions and nutrients or trace metals) and others comprising only a single analyte (e.g., total phosphorus or low-level mercury). Details are provided in the full report (HSW Engineering, 2014; HSW Engineering 2015) located on the QAOT home page.

Table 6-6. Summary of Laboratory Assessment Activities during the Reporting Period

Laboratory	Organic Parameters Assessment	Inorganics Parameters Assessment	PE Sample Studies#
Accutest Laboratories Southeast Orlando, FL	✓		✓
ALS Environmental, Inc. Jacksonville, FL			✓
Brooks Applied Laboratories Bothell, WA			✓
Collier County Pollution Control and Prevention Department Laboratory Naples, FL			✓
DB Environmental Labs, Inc. Rockledge, FL			✓
Dade County Department of Regulatory and Economic Resources Lab Miami, FL		✓	✓
ENCO Labs, Inc. Orlando, FL			✓
Florida DEP Central Laboratory Tallahassee, FL	✓	✓	✓
Jupiter Laboratories Jupiter, FL			✓
Millennium Laboratories, Inc. Tampa, FL			✓
Pace Analytical Services – Florida, Ormond Beach, FL	✓	✓	✓
Southeast Environmental Research Center, Florida International University Miami, FL		✓	✓
South Florida Water Management District Laboratory West Palm Beach, FL			✓
Sunlabs/Pace Analytical Laboratories, Inc. Tampa, FL*			✓
TestAmerica Laboratories, Inc. Pensacola, FL			✓

#: PE studies include either participation in the WY 2015 or WY 2016 PE Study, or analysis of PE Samples provided by the QAOT in conjunction with the QAOT laboratory assessment.

Table 6-7. Summary of Laboratory Performance Ratings for WYs 2015/2016 PE Studies[a,b]

Laboratory	Major Ions and Nutrients		Trace Elements		Total Phosphorus		Trace Elements in Sediment	
	WY 2015	***WY 2016***	***WY 2015***	***WY 2016***	***WY 2015***	***WY 2016***	***WY 2015***	***WY 2016***
Accutest Laboratories Southeast Orlando, FL	-	-	-	-	-	-	Good	Fair
ALS Environmental, Inc. Jacksonville, FL	-	-	-	-	-	-	Good	Very Good
Brooks Applied Laboratories Bothell, WA	-	-	-	-	-	-	Very Good	Fair
Collier County Pollution Control and Prevention Department Laboratory Naples, FL	-	Fair	-	-	-	Good	-	-
DB Environmental Labs, Inc. Rockledge, FL	Fair	Fair	-	-	Very Good	Poor	-	-
Dade County Department of Regulatory and Economic Resources Lab Miami, FL	Good	-	Fair	-	Good	-	-	-
ENCO Labs, Inc. Orlando, FL	-	-	-	-	-	-	-	Good
Florida DEP Central Laboratory Tallahassee, FL	Fair	Good	Fair	Fair	Very Good	Very Good	Very Good	Very Good
Jupiter Laboratories Jupiter, FL	-	-	-	-	-	-	Very Good	Good
Millennium Laboratories, Inc. Tampa, FL	-	-	-	-	-	-	Very Good	Very Good
Southeast Environmental Research Center, Florida International University Miami, FL	Poor	Fair	-	-	Poor	Very Good	-	-
South Florida Water Management District Laboratory West Palm Beach, FL	Good	Good	Fair	Fair	Very Good	Very Good	-	-
Sunlabs/Pace Analytical Laboratories, Inc. Tampa, FL	-	-	-	-	-	-	Good	Very Good
TestAmerica Laboratories, Inc. Pensacola, FL	-	-	Fair	Fair	-	-	Fair	Fair

[a] Very Good represents the uppermost rating; Good represents a possible inaccuracy in reporting due to a random error in the analytical sequence; Fair represents analysis that fails in a significant percentage of the results provided; and Poor represents a provider that fails in almost all parameters

[b] "-" indicates that this parameter was not analyzed by the laboratory

Table 6-8. Summary of Overall Laboratory Categorization for the Three Years of Using Environment and Climate Change Canada PE Samples

Rating	Water Year 2014 (%)	Water Year 2015 (%)	Water Year 2016 (%)
Very Good	23	35	35
Good	19	26	22
Fair	31	30	39
Poor	27	9	4

7.0 QUALITY OF DATA

The QAOT conducted two types of assessments to gauge the quality of data generated for CERP: a review of data qualifiers assigned during data validation was conducted to assess data quality issues related to unacceptable QC results and a review of several data reports was conducted to assess the quality system under which the data were collected. Although these assessments were not comprehensive, they provide a measure of data quality status.

The QAOT compiled analytical laboratory data for CERP projects in SFWMD databases and conducted a review of data qualifiers assigned during data validation to ascertain potential data quality issues. Although these assessments were not comprehensive, and overall data quality cannot be determined by evaluation of qualifiers independent from other factors, these assessments can provide a measure of data quality status. The District projects included in this evaluation are C111_SC, DPM, BBCW, PSRP and selected stations from Everglades National Park Inflows East (PIE) and Pesticide Monitoring (PEST).[3] Laboratory analysis of samples for C111 SC was also conducted by FIU SERC-NAL laboratory during the time period of May 2014 to June 2015, however data has not been provided to the QAOT in a usable format for evaluation.

7.1 CERP Analytical Data in SFWMD Databases

The CERP data for WYs 2015 and 2016 were downloaded from the SFWMD's corporate databases DBHYDRO and ERDP on June 21, 2016.[4] A total of 18,688 data points[5] were generated from 3,588 samples for 66 stations for these six SFWMD projects. Project PIE (7,032 records), which is part of the CERP BBCW project, was the largest data set and, followed by DPM (4,650 records), BBCW (2,338 records), C111 SC (2,302 records), PEST (also part of CERP BBCW project) (1,575 records), and PSRP (791 records). Approximately 77% of the samples collected were standard environmental samples and 23% were field QC samples (Figure 7-1). Field blanks (deionized water matrix) made up 74% of the field QCs and the other 26% were either field duplicate or replicate samples. Laboratory QC (laboratory duplicates and spikes, etc.) are not included in the databases.

[3] Data for District project PIE includes five stations (AJC1, FPDAH1, S177, S200, and S332DX) and PEST includes one station (S177). All data for station FPDAH1 were No Bottles and not included in calculations. All data for District projects PIE and PEST presented in this report are associated with the CERP BBCW project.

[4] The analysis contained herein reflects the status of the data at the time the data were downloaded and does not account for changes made to the data after June 21, 2016.

[5] Data set only includes laboratory sample results. Field data, biological metadata and No Bottle records (sampling attempted but no sample collected) were not included.

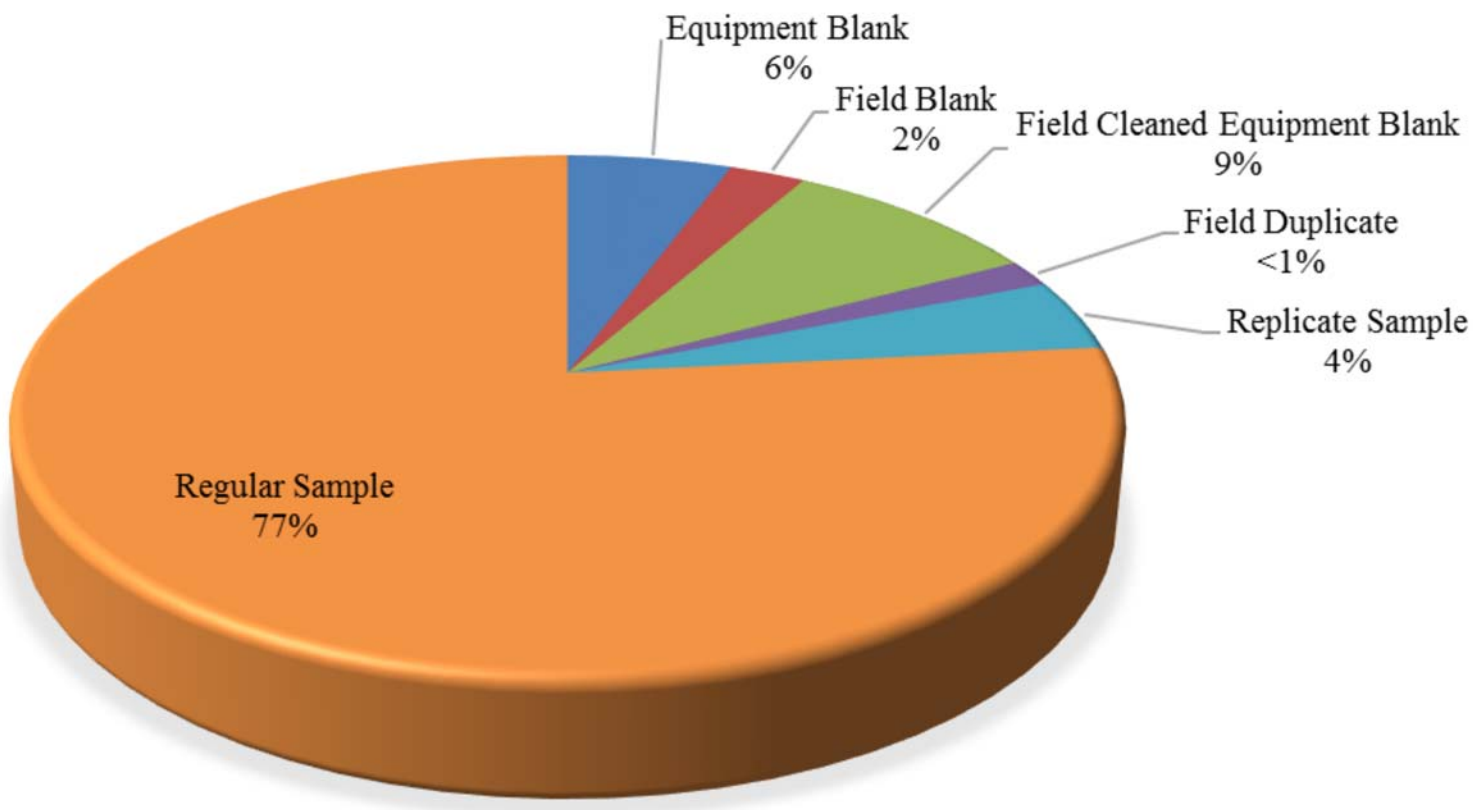

Figure 7-1. CERP WY 2015 and 2016 Water Quality Data According to Sample Type

The matrices accounted for in the data set include surface water (63% of the data), deionized water for QC samples (17%), saline water (15%), fish tissue (2%), sediment (2%), and pore water (1%). Samples were analyzed by the SFWMD's Chemistry Laboratory, FDEP's Central Laboratory, or Eurofins Frontier Global Sciences (EFGS). Eighty-eight percent of the laboratory samples were analyzed by the SFWMD Chemistry Laboratory, approximately 12% by the FDEP Central Laboratory and less than 1% by EFGS. All laboratories analyzed water samples. SFWMD and FDEP analyzed both fish tissue and sediment samples.

A total of 189 different analytical tests were performed.[6] For the purpose of data analysis, test parameters were grouped into eight categories. Table 7-1 shows the distribution of samples analyzed by project and category. Nutrients (56%), Metals/Cations (12%), General Chemistry (12%), and Organics (11%) were the largest categories. Table 7-2 shows the distribution of categories among the laboratories by matrix. The SFWMD Chemistry Laboratory analyzed all biological samples, all general chemistry water samples and some for sediment, all metal/cation samples, all nutrient samples, all physical parameters, and some of the total mercury in fish tissue. FDEP Central Laboratory performed all general chemistry analyses for sediment, all organics analyses for all matrices, all methyl mercury analyses for sediment and some for

[6] Sediment and water tests were counted as separate tests even if the target analyte was the same.

water, and all total mercury in sediment and some in fish tissue and water. EFGS analyzed a portion of the methyl mercury and total mercury water samples for project PSRP.

Table 7-1. Data Distribution by Project and Test Analysis Category.

PROJECT_CODE	NUTRIENT	METAL/CATIONS	GENERAL CHEMISTRY	ORGANIC	PHYSICAL	BIOLOGICAL	METHYL MERCURY	TOTAL MERCURY	TOTAL	% ALL RECORDS
BBCW	1,141	4	28		482	651	8	24	**2,338**	**13%**
C111SC	2,169		133						**2,302**	**12%**
DPM	2,182	1,108	1,355		5				**4,650**	**25%**
PEST			12	1,563					**1,575**	**8%**
PIE	4,802	1,096	628		470		18	18	**7,032**	**38%**
PSRP	127	9	41	472	74		18	50	**791**	**4%**
TOTAL	**10,421**	**2,217**	**2,197**	**2,035**	**1,031**	**651**	**44**	**92**	**18,688**	
% ALL RECORDS	**56%**	**12%**	**12%**	**11%**	**6%**	**3%**	**<1%**	**<1%**		

Nutrient: Ammonia, Total Kjeldahl Nitrogen, Nitrate + Nitrite, Nitrate, Nitrite, Total Nitrogen, Orthophosphate, Total Phosphate
Organic: Herbicides and pesticides
Metals/Cations: Calcium, Iron, Magnesium, Potassium, Sodium
Physical: Bulk Density, Color, Soil moisture calculation, Total Suspended Solids, Turbidity
General Chemistry: Alkalinity, Dissolved Organic Carbon, Inorganic Carbon, Organic Carbon, Total Carbon, Chloride, Sulfate, Total Sulfur, Hardness
Biological: Chlorophyll-a, Chlorophyll-b, Pheophytin-a

In addition to internal data validation conducted by the laboratory, all data collected were also subjected to a Level 2 validation by the SFWMD's Data Validation Unit. Level 2 validation includes verification of login information and presence of all parameters requested, plus additional review of field QCs, method detection limits, practical quantitation limits, and dilutions. Data not meeting certain criteria are qualified in accordance with rules set in the SFWMD Field Sampling Quality Manual, the SFWMD Chemistry Laboratory Quality Manual, and SFWMD Analytical Services Section SOPs. The data qualifier definitions table is included in Table 7-3. Although data qualification is not a direct reflection the overall quality of the data or the laboratories that provided the data, an analysis of data qualification can be used as an indicator of possible quality issues.

Of the 18,688 total data records, 52% were not qualified.[7] Another additional 35% were qualified only with a "U" (indicating a value below the method detection limit), "T" (value reported is less than the method detection limit) or "I" only (indicating a value between the method detection limit and quantification limit). These are qualifiers applied for issues not related to quality of the measurement. Thirteen percent of the total data were assigned other data qualifiers which may indicate issues related to quality of the measurement. Table 7-4 lists the data qualifiers by project and test analysis category. The areas with the highest level of qualification (not U, T or I) per category were Nutrients (20%), Organics (10%), and

[7] Project manager remark (PMR) qualifiers were removed from analysis.

General Chemistry (6%). A majority of the qualification was due to one particular project, C111 SC, for which 64% of the Nutrient data were qualified and 100% of the General Chemistry data were qualified. A vast majority of the qualification was due to improper sample field collection. For Project PIE the high qualification of Nutrients were due to unfiltered collection of Nitrate + Nitrate from a pre-preserved autosampler.

Organics were only analyzed for projects PEST and PSRP. Most "J" qualifiers for Organics were due to laboratory QC failures and "Q" qualifiers due to samples analyzed after the holding time expired. All other categories had a 2% or less data qualification for qualifiers other than "U", "T" or "I".

Table 7-2. Distribution of Categories by Laboratory.

LABORATORY	CATEGORY	MATRIX	# DATA
SFWMD	BIOLOGICAL	Water	651
FDEP	GENERAL CHEMISTRY	Sediment	12
SFWMD	GENERAL CHEMISTRY	Sediment	21
SFWMD	GENERAL CHEMISTRY	Water	2,164
SFWMD	METAL/CATIONS	Sediment	7
SFWMD	METAL/CATIONS	Water	2,210
SFWMD	NUTRIENT	Sediment	7
SFWMD	NUTRIENT	Water	10,414
FDEP	ORGANIC	Fish Tissue	352
FDEP	ORGANIC	Sediment	302
FDEP	ORGANIC	Water	1,381
SFWMD	PHYSICAL	Sediment	14
SFWMD	PHYSICAL	Water	1,017
FDEP	METHYL MERCURY	Sediment	7
EFGS	METHYL MERCURY	Water	9
FDEP	METHYL MERCURY	Water	28
FDEP	TOTAL MERCURY	Fish Tissue	32
SFWMD	TOTAL MERCURY	Fish Tissue	16
FDEP	TOTAL MERCURY	Sediment	7
EFGS	TOTAL MERCURY	Water	9
FDEP	TOTAL MERCURY	Water	28

Table 7-3. Data Qualifier Codes and Corresponding Qualifier Comments

Code	Comments

A	Value reported is the arithmetic mean (average) of two or more determinations. This code shall be used if the results of two or more discrete and separate samples are averaged. These samples shall have been processed and analyzed (e.g., laboratory replicate samples, field duplicates, etc.) independently. Do not use this code if the data are the result of replicate analysis on the same sample aliquot, extract or digestate. Under most conditions, replicate values shall be reported as individual analyses.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
G	A "G"-qualified sample value indicates that the analyte was detected at or above the method detection limit in both the sample and the associated field blank, equipment blank, or trip blank, and the blank value was greater than 10% of the associated sample value.
L	Off-scale high. Actual value is known to be greater than value given.
J	Estimated value; value may not be accurate. This code shall be used in the following instances: 1. Surrogate recovery limits have been exceeded; 2. No known quality control criteria exist for the component; 3. The reported value failed to meet the established quality control criteria for either precision or accuracy; 4. The sample matrix interfered with the ability to make any accurate determination; or 5. The data are questionable because of improper laboratory or field protocols (e.g., composite sample was collected instead of a grab sample). 6. The field calibration verification did not meet calibration acceptance criteria. 7. Any field blanks presents contamination. Note: "J" value shall not be used if another code applies (e.g., K, L, M, T, V, Y, I).
Q	Sample held beyond the acceptable holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.
T	Value reported is less than the laboratory method detection limit. The value is reported for informational purposes only and shall not be used in statistical analysis.
U	Indicates that the compound was analyzed for, but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported (see "T" above).
Y	The laboratory analysis was from an improperly preserved sample. The data may not be accurate.
?	Data are rejected and should not be used. Some or all of the quality control data for the analyte were outside criteria, and the presence or absence of the analyte cannot be determined from the data.

Table 7-4. Total Number of Data Qualifiers by Project and Test Analysis Category.

Project Code	Category	Data Qualifier (Not U, T or I)	Count of Data Qualifier	Total (Not U, T or I)	% Qualified per Category
BBCW	BIOLOGICAL	I,J	1	11	2%
		J	1		
		U,J	9		
	GENERAL CHEMISTRY	J	1	1	4%
	NUTRIENT	G	49	56	5%
		G,J	3		
		I,J	2		
		J	2		
	PHYSICAL	G	7	10	2%
		I,G	3		
C111SC	GENERAL CHEMISTRY	G,J	17	133	100%
		I,J	12		
		J	75		
		U,J	29		
	NUTRIENT	?	3	1,391	64%
		?,J	3		
		?,Q	3		
		?,Q,J	3		
		G	28		
		G,J	13		
		I,G,J	1		
		I,J	83		
		I,Q	2		
		I,Q,G,J	1		
		I,Q,J	14		
		J	408		
		L,Q	1		
		L,Q,J	1		
		Q	278		
		Q,G	15		
		Q,J	253		
		U,J	241		
		U,Q,J	40		

DPM	GENERAL CHEMISTRY	Y	4	4	<1%
	NUTRIENT	?	7	147	7%
		G	83		
		I,G	13		
		I,J	3		
		J	30		
		U,J	3		
		U,Q	1		
		U,Y	1		
		Y	6		
PEST	GENERAL CHEMISTRY	A	1	3	25%
		J	2		
	ORGANIC	J	1	123	8%
		U,J	108		
		U,Q	14		
PIE	METAL/CATIONS	J	1	1	<1%
	NUTRIENT	G	30	463	10%
		I,G	14		
		I,Y	14		
		I,Y,G	2		
		J	2		
		U,Y	9		
		Y	383		
		Y,G	8		
		Y,J	1		
PSRP	ORGANIC	Q	1	75	16%
		U,J	40		
		U,Q	34		

Nutrient: Ammonia, Total Kjeldahl Nitrogen, Nitrate + Nitrite, Nitrate, Nitrite, Total Nitrogen, Orthophosphate, Total Phosphate
Organic: Herbicides and pesticides
Metals/Cations: Calcium, Iron, Magnesium, Potassium, Sodium
Physical: Bulk Density, Color, Soil moisture calculation, Total Suspended Solids, Turbidity
General Chemistry: Alkalinity, Dissolved Organic Carbon, Inorganic Carbon, Organic Carbon, Total Carbon, Chloride, Sulfate, Total Sulfur, Hardness
Biological: Chlorophyll-a, Chlorophyll-b, Pheophytin-a

7.2 Review of C-44 RSTA Project Data

A spreadsheet containing groundwater well construction and water level data from February through June 2014 from the C-44 RSTA were received from the USACE PM (June Mirecki) for review. Extensive communication between the PMs from USACE and SFWMD was conducted. Groundwater level data from all wells throughout the C-44 were updated in DBHYDRO in April 2015 per CGM 40 requirements. The associated groundwater data from the laboratory did have the proper chain of custody; however, the data were not loaded into DBHYDRO because the data were not in the ADaPT format.

7.3 Hydrology Data Quality

An assessment of hydrologic data in DBHYDRO was conducted for the period between May 1, 2014 and April 30, 2016. Due to the interrelated nature of hydrological field data collected at all sites throughout south Florida, it is not feasible or technically reasonable to evaluate the quality of hydrological field data that are specifically collected for, or that may be used for CERP. Therefore, all data in DBHYDRO were evaluated as an indicator of the quality of hydrometeorological field data collected for CERP projects. Thirteen data types were reviewed (Table 7-5). For each data type, the daily values data set was assessed to identify the number of missing, estimated, and not processed values vs. the total number of records in the data set. Data quality tags are assigned to these data in the database to indicate that the data should be used with caution.

Table 7-5. Summary of Hydrologic Data Qualifiers for WY 2015 and WY 2016

Data Type[a]	Number of Records	Number Missing	Percent Missing	Number Estimated	Percent Estimated	Number Not Processed	Percent Not Processed
2015							
BARO	12,775	18	0.14%	165	1.29%	79	0.62%
ETPI	9,054	22	0.24%	13	0.14%	34	0.38%
EVAP	1825	464	25.42%	0	0.00%	37	2.03%
FLOW	365,760	23,807	6.51%	48,825	13.35%	42625	11.65%
HUMI	9,784	60	0.61%	227	2.32%	62	0.63%
RADN	6,499	112	1.72%	125	1.92%	0	0.00%
RADP	9,419	109	1.16%	449	4.77%	40	0.42%
RADT	9,054	116	1.28%	267	2.95%	26	0.29%
Rain	111,092	1,256	1.13%	955	0.86%	397	0.36%
STG	398,112	6,322	1.59%	25,990	6.53%	6,484	1.63%
Well	150,187	1,975	1.32%	30,004	19.98%	2,601	1.73%
WNDG	365	2	0.55%	0	0.00%	0	0.00%
WNDS	10,220	112	1.10%	6	0.06%	49	0.48%
2015 Total	1,094,146	34,375	3.14%	107,026	9.78%	52,434	4.79%
2016							
BARO	12,738	335	2.63%	160	1.26%	53	0.42%
ETPI	8,710	382	4.39%	8	0.09%	0	0.00%
EVAP	1,935	694	35.87%	0	0.00%	26	1.34%
FLOW	494,768	54,782	11.07%	61,547	12.44%	16,541	3.34%
HUMI	9,444	487	5.16%	108	1.14%	27	0.29%
RADN	6,210	346	5.57%	70	1.13%	0	0.00%
RADP	9,078	567	6.25%	442	4.87%	0	0.00%
RADT	8,712	456	5.23%	119	1.37%	21	0.24%
RAIN	102,634	1,527	1.49%	521	0.51%	141	0.14%
STG	399,033	6,778	1.70%	29,765	7.46%	4,957	1.24%
WELL	149,853	3,402	2.27%	33,391	22.28%	2,046	1.37%
WNDG	366	1	0.27%	0	0.00%	0	0.00%
WNDS	10,176	693	6.81%	0	0.00%	26	0.26%
2016 Total	1,213,657	70,450	5.80%	126,131	10.39%	23,838	1.96%

[a] BARO (Barometric Pressure [mm Hg]); ETPI (Evaporation Potential, Computed [inches]); EVAP (Evaporation Pan, Measured [inches]); FLOW (Flow [cfs]); HUMI (Relative Humidity [%]); RADN (Net Radiation [kilowatt/M^2]); RADP (Photosynthetic Radiation [micromole/M^2/S]); RADT (Total Solar Radiation [kilowatt/M^2]); Rain (Rainfall [inches]); STG (Water Level, NGVD29 [ft NGVD29]); Well (Ground Water Level [ft NGVD29]); WNDG (Wind Gust [MPH]); WNDS (Wind Speed, Scalar [MPH])

The WY 2015 dataset contained 1,094,146 records and the WY 2016 dataset contains 1,213,657 records. The results of the analyses are presented in Table 7-6. Analysis revealed that for both years:

- Measured evaporation data sets contained the largest percentage of missing data (25% and 35%). For all data types, the overall percent missing was 4.5% for the two years' data combined.
- Ground water level data sets contained the largest percent of estimated data (approximately 20%). For all data types, the overall percent estimated was 10% for the two years' data combined.

- Percent not processed was 3.3% for all data types considered together.

Table 7-6. Comparison of Hydrologic Data Qualifiers for WY11/12, WY13/14 and WY15/16

Water Year	Number of Records	Number Missing	Percent Missing	Number Estimated	Percent Estimated	Number Not Processed	Percent Not Processed
2011 Total	1,060,814	24,100	2.27%	95,851	9.04%	4,396	0.41%
2012 Total	1,010,851	18,445	1.82%	91,971	9.10%	5,467	0.54%
2013 Total	960,213	32,859	3.42%	89,806	9.35%	9,326	0.97%
2014 Total	944,587	20,008	2.12%	79,505	8.42%	7,611	0.81%
2015 Total	1,094,146	34,375	3.14%	107,026	9.78%	52,434	4.79%
2016 Total	1,213,657	70,450	5.80%	126,131	10.39%	23,838	1.96%

The SFWMD is continuing to implement process improvements to enhance operational efficiency. These differing percentages (increase in % missing, and decrease in % not processed) appear to be related to changes which took place in the new data processing techniques at the SFWMD. For FLOW data, "% missing" has increased from 6.51 to 11.07 from WY2015 to WY2016 and is related to the sub-minute data processing, which greatly increases the number of data points to be processed and at the same time populates more "missing" tags to flow data (which is a composite quantity of stage and operations). Currently, if any data point during the day is missing, the whole day will be missing. Since the District is now processing sub-minute data, the occurrence of missing data will increase. For example, if there is missing data during the course of a day, the "daily average" will now be missing. If the daily average data resides in a "preferred" DBKey, that information will later be populated as part of the QA process. In concert with these changes, there were data loading issues which were still being resolved as of August 2016. There is also a new "tag" that has been applied to partially processed data. In previous years, the partially processed data was not included with the "missing" tags in the statistics. It is anticipated that the statistics used in the next QAR will show that the issues have been resolved by separating the statistics report on partial data.

7.4 Continuous Water Quality Monitoring Data (PSRP)

There were 18 active stations with continuous monitoring of water quality for the PSRP during WYs 2015 and 2016. The water quality parameters monitored were temperature, salinity, and conductivity. The analysis, validation, and loading to DBHYDRO of these data are performed using graphical verification analysis software in accordance with processes detailed in the SFWMD's Analytical Services Section Data Validation and Stewardship (DVS) SOP (SFWMD-DVS-SOP-003). Approximately 1.25 million data points were validated for WY 2015 and WY 2016. A total of 22,266 data points were missing (1.78% of possible data) due to equipment malfunctions, telemetry issues, or due to flat lined data because of dry conditions. A total of 15,042 data points (1.2% of validated data points) were qualified as estimated (assigned a 'J' qualifier due to one or more deviations from QC requirements) and 0.39% (4,917 data points) were determined as unusable (assigned the '?' qualifier) due to erratic data because of low water conditions, instrument failure, or a significant deviation from QC requirements. The equipment was upgraded at the end of WY 2014 and qualification rates decreased significantly during this evaluation period compared to WY 2013 and WY 2014. In addition, prior to October 2013, site maintenance was completed on a quarterly or semi-annual schedule; therefore, calibration failures resulted in large amounts of 'J' (estimated) qualified

data. These sites are now maintained on a monthly schedule with a resultant reduction in 'J' qualified data. Data are summarized in Table 7-7.

Table 7-7. Summary of Water Quality-Related Qualifiers from Picayune Strand

Water Year	Total Number of Data	Number of Quality Related Qualifiers	Missing and Qualified Data			Percent Samples with Quality Related Qualifiers
			Missing	Estimated	Rejected	
2013/2014	1,239,602	454,732	13,171	436,806	17,926	36.7
2015/2016	1,246,708	19,959	22,266	15,042	4,917	1.6

8.0 ALTERNATIVE PROCEDURES APPROVED

This section identifies any alternative procedures approved during the previous two years. Between May 1, 2014 and April 30, 2016, no applications for approval of alternative procedures were submitted to the QAOT.

9.0 SUMMARY OF DEVIATIONS FROM QASR AND CORRECTIVE ACTIONS

This section summarizes any deviations from the QASR or CGMs during the reporting period and any corrective action taken to address the immediate deviation and to avoid re-occurrence.

Laboratory analysis of samples for Project C111 SC was also conducted by FIU SERC-NAL laboratory during the time period of May 2014 to June 2015; however, data has not been provided to the QAOT in a usable format for evaluation. The resolution (corrective action) for this issue is that samples are now being analyzed by the SFWMD Chemistry Laboratory.

The data from the groundwater well construction and water level for the C-44 RSTA project were not in the ADaPT format and could not be loaded into DBHYDRO.

10.0 Additional QAOT Activities

10.1 Communication and Outreach

Throughout the reporting period, the QAOT presented periodic status reports to the DCT and continued communication efforts with the PDTs. The QAOT Web site was updated to communicate workshops, presentations, and revised documents. The QAOT hosted the sixth annual Quality Assurance Workshop in November 2015 at the SFWMD offices in West Palm Beach, FL. More than 30 SFWMD and USACE employees participated in the training. With QAOT member input, the SFWMD now provides training on DBHYDRO to scientists, engineers and other interested parties. See Sections 4.5.2 through 4.5.3 of this QAR for details of these and additional training classes presented by QAOT members.

10.2 QAOT Collaboration with other CERP Entities

It is critical that QAOT members collaborate with other entities to ensure QA/QC measures for CERP are being successfully implemented at both the Program and Project levels. These activities included participation by PDTs in QAOT meetings, presenting relevant QA/QC topics at symposia, and training those who are actively involved with CERP. The QAOT/IDM/RECOVER is improving dialogue resulting in added success of projects. RECOVER data is now part of the QAR. Some of these activities are formally included in this report; however, since the QAOT members are actively involved in multiple non-QAOT-related projects, some QA review by the QAOT members merges with other workload duties and is not captured here. The following lists some of the collaboration documented during this time period.

10.2.1 QAOT/IDM/RECOVER

During this reporting period, the QAOT/IDM/RECOVER teams have improved dialogue opening the doors for better cooperation on CERP projects. The teams are actively developing flowcharts which details interactions between the three entities that will help to ensure success of their projects. RECOVER data summary is now part of the QAR. See sections 5.2.1 and 7.2 for further details.

10.2.2 QAOT Meetings

At the January 20, 2016 QAOT meeting, it was decided that a new topic, “Project-Related QAOT Activities” will be included for each meeting. The co-chairs will invite the appropriate technical or project leads for active CERP projects to present updates so that roles and responsibilities of the QAOT are incorporated into the projects per CGM 41.01. For this reporting period, project updates for C-111 SC, Caloosahatchee River West Basin Storage Reservoir, PSRP and Broward County Water Conservation Area have been presented.

10.3 Status of QAOT Action Items

Quality assurance includes the concept of continuous improvement. The areas targeted for improvement were identified in Sections 10.3 (Status of QAOT Action Items) and Section 11.0 (Recommendations for QA/QC Program Improvements) of the 2014 QAR. Table 10-1 summarizes the status of QAOT Action Items.

Table 10-1. Status of QAOT Action Items

Improvement Area	QAOT Initiatives	Status
1. QAOT Metrics (QAR2014 – Table 10-1) The QAOT should develop metrics that measure whether or not the QAOT has been effective in improving the data generated for CERP.	The PrMP will establish metrics to assess QAOT effectiveness with documentation provided in the QAR.	In Progress; see QAR2012 and QAR2014. Indirect measurements through field and lab audits cannot be quantified. The PrMP was revised in 2011 but metrics to assess QAOT effectiveness were not incorporated. The QAOT has not yet established meaningful metrics that can be quantified using the information currently available. Issue will continue to be addressed during the next revision of the PrMP slated for 2015.
2. Locating, Storing, and Assessing CERP Data (QAR2014- Table 10-1) Data for most of the projects discussed in QAR2013/2014 are not in DBHYDRO. The established process needs to be communicated to the PIs and PDTs.	Continue to work with DCT and PDTs to communicate the need to implement the procedures.	Complete.

Improvement Area	QAOT Initiatives	Status
3. Biological/Ecological Data Reviews (QAR2014 – Table 10-1) A process to review data quality tags for biological and ecological data generated by implementing biological/ecological SOPs in compliance with the revised CGM40 and QSAR Chapter 8.	Reach out to RECOVER to include an activity summary in the WY 2015/2016 QAR.	Complete.
4. Hydrologic and Hydraulic Data Reviews (QAR2014 – Table 10-1) A process to review data quality tags for CERP monitoring within the DBHYDRO and other databases should be developed so that data review is systematic and that issues are resolved in a timely manner.	Develop a procedure to pull data with quality tags routinely and establish a corrective action process to review and resolve issues.	Complete.
5. Performance Evaluation Samples – Laboratory Evaluation (QAR2014 – Table 11-1). Develop a process to evaluate laboratory results for only those analytes applicable to CERP.	Identify analytes that are critical for CERP and evaluate laboratory performance based on only those results.	Complete

Improvement Area	QAOT Initiatives	Status
6. Biological Field Evaluation with SOP (QAR2014 - Table 11-1) A process to evaluate biological field activities against standardized SOPs from QASR Chapter 8.	Develop a checklist to be used for biological field activities to determine compliance with QASR Chapter 8.	The task item is on hold.
7. Outreach (QAR2014 - Table 11-1) Continue to communicate with Project Delivery Teams to ensure they are aware of the importance of data quality to their projects.	Invite appropriate PDT members to the bimonthly QAOT meetings to enhance their understanding of the role the QAOT can play for success for their project.	Complete.
8. IDM Databases (QAR2014 - Table 11-1) Work closely with IDM to continue to reach the goal of having one database where all CERP data is stored.	QAOT Subject Matter Experts meet regularly with IDM to set goals that can be achievable within budget and time constraints.	Complete.

11.0 Recommendations for QA/QC Program Improvements

This section summarizes recommendations resulting from QAOT assessments that could improve CERP QA/QC processes and procedures. As discussed throughout this report, success in implementing the CERP QA/QC program is essential to ensure that CERP data are of consistent high quality, accurate, traceable, comparable, and legally defensible. Section 10.0 defines several recommendations identified during that past QAR cycles that are still in progress or have been completed. During the current reporting period, three specific recommendations for improvement were identified. These recommendations are summarized in Table 11-1.

Table 11-1. New Areas of Improvement Identified during the Reporting Period

Improvement Area	Proposed QAOT Initiatives
1. Project Status Listing A process to ensure the QAOT is aware of when sampling events are occurring.	Develop a spreadsheet that will be distributed to PDTs that will be updated to ensure QAOT performs field and laboratory assessments.
2. QAOT/IDM Flowchart A process to ensure Project Managers are aware of when QAOT involvement is required.	Develop a flowchart that encourages PMs to use the QAOT to ensure continued success of their projects. Distribute to PMs through outreach workshops.
3. Laboratory Selection Process A process to select a laboratory for analytes where NELAP certification is not possible.	Update QASR Chapter 4 that will document the QAOT procedure to ensure data for CERP can be used when NELAP certification is not possible.

12.0 RESOURCE NEEDS

12.1 Management Support from CERP and Participating Agencies

The QAOT was able to achieve several breakthrough accomplishments during the reporting period. The QAOT acknowledges the continual participation, direction, and support from CERP management, as well as the support and cooperation from all participating agencies, especially:

- FDEP
- SFWMD
- USACE
- USEPA
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

Continuous support from CERP management and participating agencies is the key for the continued success of the QAOT. The QAOT cannot function effectively without this essential management support. Thus, continued management support for outreach of QAOT with PDTs, PMs, and module leads is needed.

12.2 Financial Support for QA/QC Activities

Additional QAOT activities such as training workshops, laboratories audits, and QAR assistance are essential in sustaining the excellence of the quality system for CERP monitoring. The current budget from both SFWMD and USACE, however, is very limited. The QAOT will continue to hold meetings every other month; limit the scope of field and laboratory audits and the frequency of laboratory PE studies and stay on hold to conduct field audits for biological and ecological monitoring activities for CERP projects with the current budget constraints.

13.0 REFERENCES

All QAOT reports are available in Documentum or upon request from the QAOT Co-chairs.

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