CERP Guidance Memorandum 040.02

South Florida Water Management District – Jacksonville District, U.S. Army Corps of Engineers

CGM NUMBER-REVISION: 040.02

EFFECTIVE DATE: 2 APR 2012

CATEGORY: Data Management

SUBJECT: **Project Level Monitoring and Assessment**

1.0 DESCRIPTION AND BACKGROUND

This memorandum provides guidance to the staff of the Jacksonville District, U.S. Army Corps of Engineers (USACE), the South Florida Water Management District (SFWMD) and other members of Project Delivery Teams (PDTs) on how to address and incorporate monitoring and assessment activities in planning, design, and implementation documents for projects covered under the Comprehensive Everglades Restoration Plan (CERP). Monitoring and assessment are central elements for management of CERP projects. The collection and analysis of environmental data is critical for assessing project area conditions and for evaluating project performance and/or compliance with project-related permits. Monitoring programs should be established to enable the tracking of environmental conditions from baseline conditions to after project completion. These activities provide a technical basis for alternative design decisions, adaptive management, monitoring of operations, and evaluation of progress toward restoration goals.

This CERP Guidance Memorandum (CGM) and the CERP Quality Assurance System Requirements (QASR) manual are provided to ensure consistency in addressing monitoring and assessment activities from project to project, and from project to system-wide monitoring. Environmental data generated from various projects must be comparable so that performance, scale-sensitive or synergistic benefits, and compliance can be systematically assessed. Comparability is achieved through consistency in monitoring approaches and methodologies. A well-conceived monitoring plan/program should minimize operational problems and long-term additional costs. Quality Assurance (QA) principles and Quality Control (QC) procedures are critical elements of monitoring and assessment activities. It is imperative that strict QA/QC protocols for sampling and laboratory analyses, data management, and data evaluation be followed for all CERP data. The QA/QC criteria defined in the QASR should be applied consistently from project to project, and between project-level monitoring and system-wide level monitoring, so that data are comparable and stand up to scientific scrutiny.

This CGM focuses on observing and recording water quality, hydro-meteorological/hydraulic parameters and biological/ecological conditions. For the purposes of this document, water quality monitoring may include any of the following matrices: water, tissue, or sediment. Hydrometeorological monitoring may include any of the following: wind speed and direction, rainfall, evapotranspiration, hydrologic surface or groundwater stage or flow. Biological/Ecological monitoring may include any measurements that do not fall into the former two categories, such as species counts, sea grass densities or heights, enzyme decomposition and

biomarkers. Specific guidance for the monitoring activities described in this CGM is provided in the following documents, which should be referenced during development of the monitoring plan:

- The CERP Monitoring and Assessment Plan (MAP)
- CGM 23: Water Quality Considerations for the Project Implementation Report Phase
- CGM 28: Technical Specifications for CERP Geographic Information System (GIS) Data.
- CGM 42: Toxic Substances Screening Process - Mercury and Pesticides
- CGM 56: Guidance for Integration of Adaptive Management (AM) into Comprehensive Everglades Restoration Plan (CERP) Program and Project Management
- CERP Adaptive Management Integration Guide http://www.evergladesplan.org/pm/pm_docs/adaptive_mgmt/062811_am_guide_final.pdf
- Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration
- Comprehensive Everglades Restoration Plan (CERP) - Requirements for Project Implementation Reports (PIRs) and Other Implementation Documents
- Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) - Mitigation for Fish and Wildlife and Wetlands Losses
- USACE Engineering Manual (EM) 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans*, http://140.194.76.129/publications/
- SFWMD QS-SOP-004-01
- U. S. Environmental *Protection Agency (EPA) QA/G5, Guidance for Quality Assurance Project Plans*, http://www.epa.gov/quality/qs-docs/g5-final.pdf
- Quality Assurance System Requirements (QASR) manual http://www.evergladesplan.org/pm/program_docs/qasr.aspx

The QASR manual serves as the basis for the quality assurance program for all monitoring activities conducted in implementing the CERP. All agencies that will provide data during the implementation of CERP should use this manual.

1.1 System-wide vs. Project-level Monitoring

1.1.1 System-wide Monitoring

The REstoration COordination and VERification (RECOVER) program is responsible for developing and implementing the system-wide monitoring program for CERP to track and measure cumulative responses and the overall performance of the CERP. RECOVER has developed the CERP Monitoring and Assessment Plan (MAP) as the framework for measuring and understanding system responses. The MAP is based on a set of system-wide hypotheses designed to allow stakeholders to determine how well CERP is meeting its goals and objectives, and to identify opportunities for continual improvement, where needed. The MAP identifies regional environmental performance measures associated with system-wide hypotheses and the methods used to quantify these measures, including water quality, hydro-meteorological/hydraulic and biological/ecological (bio/eco) parameters.

1.1.2 Project-level Monitoring

Project-level monitoring is focused on a smaller scale than program-level monitoring to ensure that projects meet their operational, environmental, and ecological goals stated in the project management plan and implementation report, and to ensure permit and contract compliance. The project managers, with assistance from the PDT, are responsible for identifying the need for, cost-effectiveness, and implementation of any required project-level monitoring and assessment activities. Common themes in a monitoring plan are:

1) monitoring water quality if water quality is an objective or part of a permit condition,
2) monitoring hydrology/hydraulics if hydrology/hydraulics is an objective or part of a permit condition,
3) monitoring ecology or biology with the duration clearly defined if ecology/biology is an objective or part of a permit condition. This includes but is not limited to:
    - monitoring the creation or restoration of on-site and/or project area of influence on ecological features or processes
    - monitoring the requirements of the Endangered Species Act or some other environmental regulation.

The Project-Level Monitoring Plan (PLMP) should include itemized activities, costs, and the corresponding budget in the Work Break-down Structure (WBS) for:

1) clearly defined durations, activities, and costs associated with development, coordination, and review of the monitoring and assessment plan during the PIR phase; and
2) activities and costs associated with monitoring implementation, such as monitoring implementation contracts and contract management, data management, QA/QC tasks, assessment tasks (data synthesis and reporting), and management coordination (showing linkages to other functional area plans, i.e., design [pilots/physical models], construction [pre-construction baselines, operational testing, permit required], and post-construction monitoring for permitting, operations and maintenance, and verifying restoration success).

It is recommended that the PLMP be presented in two parts: (1) an overall introduction of the entire project, and (2) plans for operational monitoring of hydrometeorological, water quality, bio/eco parameters required for permits for documenting restoration impacts and validating adaptive management actions identified in a project's adaptive management plan.

2.0 GUIDANCE

During development of the Monitoring Plan, the following guidance should be considered:

- **RECOVER Coordination:** In this case, the monitoring should be clearly justified in the PLMP. PLMPs must be coordinated closely with the system-wide monitoring led by RECOVER to ensure performance measures and targets selected by the project teams are consistent with the system-wide performance measures. In evaluating indicators of ecosystem response to management measures as part of a project, monitoring will utilize existing system monitoring and Standard Operating Procedures. Duplication of monitoring activities will be avoided. However, in some cases, project-level monitoring may need to fill temporal or spatial gaps for parameters monitored in the MAP in order to

evaluate project-level effects. The PDT is responsible for coordinating with RECOVER and providing the PLMP for review and approval by RECOVER. This is to ensure consistency with the CERP programmatic goals and objectives and to avoid redundancy with RECOVER monitoring efforts. Any changes proposed by RECOVER must be justified and cost effective.

- **Quality Assurance Oversight Team (QAOT) Coordination:** The PLMP must identify how observation, measurement, sampling, and analysis will be conducted to achieve the Data Quality Objectives (DQOs). The PDT is responsible for coordinating with the QAOT on questions related to QA/QC, and providing the PLMP for review and approval by the QAOT. The QAOT review ensures that the PLMP has defined and justified sampling locations, parameters, matrices, methods, frequency, and appropriate standard operating procedures (SOPs) that will be utilized during execution of the monitoring plan. For additional information about QA and the role of the QAOT see CGM 41.
- **Reviews and Approval:** Prior to the Alternatives Formulation Briefing (AFB), the PDT shall coordinate the drafting of the PMLP with RECOVER and the QAOT. Prior to implementation of the PLMP, the final PLMP must be reviewed and approved by RECOVER and the QAOT. The appropriateness of a monitoring plan will be reviewed as part of the decision document review including agency technical review (ATR) and independent external peer review (IEPR), as necessary. Any scopes of work (SOW) for execution of the monitoring plan should also be provided to the QAOT for review and approval.
- **USACE Ecosystem Restoration Requirements:** Project-level monitoring must include the rationale for monitoring, including key project specific parameters to be evaluated and how the parameters relate to achieving the project goals, permit requirements, or make decisions about adjusting project operations, project implementation, or the next phase of the project, as outlined in the project's adaptive management plan. PLMPs should focus on directly measurable parameters such as those associated with volume of water stored, canal stage, volume of water released and compliance with water quality standards. It may also require monitoring of an ecological or biological endpoint, such as pre, during, and post-construction surveys for listed species, vegetation monitoring, and possibly exotic vegetation control. These indirect metrics can be subject to influences other than project actions. The use of monitored control sites should help to evaluate the impact of the project from exogenous influences (i.e., climate, anthropogenic impacts, natural variability).
- **SFWMD Environmental Monitoring Review Process Requirements:** The SFWMD Leadership requires all new monitoring projects conducted by SFWMD be reviewed by the District Chief's Advisory Team and the Leadership Team. An Environmental Monitoring Review form needs to be thoroughly completed and a concise PowerPoint presentation given at the Environmental Monitoring Review meetings to address questions related to 1) purpose of monitoring, 2) duration of monitoring, 3) project planning, and 4) project budgeting. The Environmental Monitoring Review form needs to be submitted at least one week prior to the meetings. Unbudgeted monitoring requests will also be required to follow the Environmental Monitoring Process prior to submitting a change control request.

- **Costs:** Monitoring and assessment activities prior to and during construction should include costs for sampling, project (contract) management and associated QA/QC costs, analysis, documentation, reporting, and entry of data into approved data storage. Any cost of monitoring performed during the period of construction shall be included in project construction costs and any cost of monitoring performed after the period of construction shall be included in project Operations, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) costs. Every effort should be taken and documented to minimize monitoring costs over the life of the project. Project-level monitoring costs must be clearly identified in the PIR to ensure they are authorized by Congress. Monitoring costs for ecosystem restoration cannot be cost-shared longer than 10 years post-construction of a particular component. If required to be maintained beyond 10 years for a particular component, it will be 100% non-Federal.
- **Monitoring Plan Development Guidance:** Detailed guidance on the development of sampling and analysis plans, as part of the monitoring plan, is available from the USACE Engineering Manual (EM) 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans*, http://140.194.76.129/publications/ the SFWMD QS-SOP-004-01, and U. S. Environmental Protection Agency (EPA) QA/G5, *Guidance for Quality Assurance Project Plans*, http://www.epa.gov/quality/qs-docs/g5-final.pdf. Additional guidance for monitoring plan criteria is part of USACE guidance on implementation for WRDA 2007 section 2039 for ecosystem restoration projects and section 2006 for mitigation. The QAOT has developed a checklist (Appendix C and Attachment 1 of the QAOT-SOP-004, *Review of Project-level Monitoring Plans and Scopes of Works*, effective December 23, 2008 or a newer version if available). Quality Assurance System Requirements Chapter 11 provides guidance on the use of secondary data.
- **Monitoring Plan Templates:** Monitoring plan templates for water quality, hydrometeorological, and biological monitoring are contained in Appendix A.
- **Existing Monitoring Data:** Conducting an inventory of existing monitoring data for the project area is a critical step that will assist in identifying monitoring needs during the PIR phase. Some data sources are listed below:
    - DBHYDRO, the SFWMD hydrometeorological and water quality database http://www.sfwmd.gov/dbhydro
    - USGS http://waterdata.usgs.gov/nwis/, http://sofia.usgs.gov/ and http://water.usgs.gov/nawqa/
    - Legacy STORET http://www.epa.gov/storet/dbtop.html (data submitted to EPA prior to 1999)
    - Florida STORET http://storet.dep.state.fl.us/ (contains all data that is loaded to modernized STORET)
    - CERP Integrated Database (CID) -accessible through EGRET on CERPZone
    - Data from counties and local governments and
    - Data from non-governmental organizations such as Lakewatch http://lakewatch.ifas.ufl.edu/
    - Florida Fish and Wildlife Research Institute http://myfwc.com/research/gis/data-maps/
    - National Atmospheric Deposition Program http://nadp.sws.uiuc.edu/

- Southeast Environmental Research Center (SERC) http://serc.fiu.edu/wqmnetwork/

2.1 Elements of a Project Level Monitoring Plan

This section details inputs for hydrometerological, water quality, and biological/ecological monitoring.

In general, the PLMP should:

1. Reference standardized procedures and guidelines that will be utilized rather than providing in-depth descriptions(i.e., Field quality manual, SOP for reviewing monitoring plans)
2. Include an organizational chart or table with lines of authority and responsibility
3. Provide a work schedule with critical milestones and a start and completion date
4. Justify design strategy and sampling locations
5. Discuss resource and time constraints
6. Include document revision numbers and dates
7. Discuss DQOs for representativeness, completeness, comparability, detection limits, precision, and accuracy of the plan
8. List minimum qualifications and special training for personnel
9. Describe and justify required non-standard analytical or sampling methods
10. Define maximum holding times by parameter and method
11. Define methods for sample processing (homogenization, filtration, splitting or compositing)
12. Identify chain of custody procedures
13. Include all relevant field forms, including sample custody forms
14. Identify the data repository including procedures for archiving
15. Detail the corrective action procedures for control limit exceedances.

Monitoring Plan (outlined as provided in the template)

The monitoring plan template will include at least two sections: one general introduction section and then sections that provide specifics of hydrometeorological, water quality, and/or bio/eco monitoring. Detail is provided in the actual template as guidance on what to put into each section.

1.0 INTRODUCTION
1.1 Project Description
1.2 Project Objectives
1.3 Active Mandates and Permits
1.4 Monitoring Components
- Project Baseline Monitoring
- Construction Monitoring
- Post-Construction Monitoring (Effectiveness Monitoring)
- Inventory of Existing Monitoring Networks
- Integration of Monitoring Components

1.5 Duration
- Project Initiation
- Modification or Termination Conditions

1.6 Monitoring/Sampling Locations and Naming Convention
- Geographic Location of Monitoring Stations
- Access and Authority

1.7 Project Reporting
- Frequency
- Content and Format
- Report Recipients and Broader Distribution
- Revisions and Modifications

1.8 Administration and Implementation of the Monitoring Plan
- Organization Structure and Responsibilities
- Program Implementation
- Partnerships
- Program and Protocol Review

1.9 Cost Estimates

2.0 HYDROMETEOROLOGICAL MONITORING

2.1 Data quality objectives

2.2 Monitoring Data Elements/Indicators
- Procedures and Methods
- Laboratory Qualifications
- Rationale for indicator selection
- Sampling frequency and duration
- Assessment Process and Decision Criteria (triggers and thresholds)

2.3 Data Collection
- Sample/Data Collection Standards and Ethics
- Sample Submission
- Chain of Custody
- Quality Control Samples
- Data Validation
- Raw Data
- Data Processing
- Data Storage and Archiving

2.4 Documentation
- Field Notes
- Field Instrument Calibration Documentation
- Corrections

2.5 Quality Assurance and Quality Control
- System for assessing data quality attributes
- Data quality qualifiers
- Field Audits

2.6 Data Analyses and Records Management
- Data Quality Evaluation and Assessment

2.7 Adaptive Management Considerations

3.0 WATER QUALITY (3.1 to 3.7 will match up with 2.1 to 2.7 above)
4.0 BIOLOGICAL/ECOLOGICAL (4.1 to 4.7 will match up with 2.1 to 2.7 above)
5.0 REFERENCES

2.2 Contracting Monitoring and Assessment Activities

Contracting of monitoring and assessment operations should be accomplished with the same requirements as work performed "in-house" by the sponsor agencies to ensure that all DQOs are met and consistency is maintained. Statements of work (SOW) should detail these requirements. Project managers should utilize technical expertise from both SFWMD and USACE monitoring units in reviewing SOWs. When practical, these units should serve as contract managers for monitoring and testing services.

The SOW should be accessible to and written for both technical and non-technical readers during the contracting solicitation, award and administration phases. SOWs for laboratory analysis should be reviewed by people who are familiar with laboratory analysis to avoid errors or omissions that could result in ineffective contracting and/or loss of data. SOWs should specify what SOP will be used to collect the necessary monitoring data and the SOP should be approved by the project manager and QAOT. The QASR Chapter 4 provides guidance on the development of a SOW.

Contractual support is used for many projects to provide technical analyses and other professional services. It is important that the contractor understand the requirements for permit and assessment reporting. Any SOW that addresses monitoring by a contractor should conform to all applicable CERP CGMs and agency procurement policies.

3.0 Application

Effective the date of this memorandum, all projects managed under the CERP Program should use this guidance for monitoring and assessment. For projects that have already initiated monitoring activities or have entered into contracts for these services, the project manager, to the extent possible, should incorporate the intent of this guidance into those contracts and projects.

For questions or clarification regarding this guidance, contact one of the QAOT co-chairs.

APPROVALS:

Thomas M. Teets, AICP
Bureau Chief, Office of Everglades
Policy and Coordination
South Florida Water Management District

DATE: 2 April 2012

Howard Gonzales, Jr.
Chief, Ecosystem Branch
Programs and Project Management Division
Jacksonville District
U.S. Army Corps of Engineers

DATE: 27 March 2012

Appendix A

Project Level Monitoring Plan Template

Template for Developing Project-level Monitoring Plans: Hydrometeorological, Water Quality, and Biological/Ecological Monitoring

For

[Project Name]

[Date]
(Approval date for
Recover
QAOT
EMCT)

_____

Authoring Organization's Representative **Date**
(Monitoring plan coordinator)

_____

Lead USACE Project Manager **Date**

_____

Lead SFWMD Project Manager **Date**

_____

Representative, Local Sponsor (Monitoring Organization) **Date**

_____

Representative, Federal Sponsor (Monitoring Organization) **Date**

_____

Project Quality Assurance Officer **Date**

Distribution List
[Include the names of those who will/should receive a copy of this plan once it is finalized and any subsequent revisions.]

Table of Contents

[*This section should contain lists of document sections included in this document]*

List of Tables

[*This section should contain lists of tables included in this document]*

List of Figures

[*This section should contain lists of figures included in this document]*

Appendixes

[*This section should contain lists of the appendixes included in this document]*

Executive Summary

[*This section should contain the executive summary of the Project-Level Monitoring Plan]*

Acknowledgments

[*This section should contain individuals and/or organizations that assisted in the preparation of this document]*

Glossary/Acronyms

[This section should contain a list of any acronyms used in the document as well as any words not found in common usage, usually those specific to monitoring techniques and monitored parameters, e.g. matrix, quantification limit, etc.]

Table of Contents

1.0 INTRODUCTION

[A general project introduction will begin each type of monitoring plan.]

1.1 PROJECT DESCRIPTION

[The guidance contained in this document should assist in maintaining consistency in sampling locations, parameter lists and sampling frequencies as well as providing documentation of the project scope and an ongoing historical perspective. The following items should be included in the project description section:

- *A brief project description and general location information, including projects associated with or impacting this project.*
- *A brief project background or history.*
- *A description of basins or geographic areas affected.*
- *Purpose of project.*
- *Reason monitoring will be performed.*
- *A project location map.]*

1.2 PROJECT OBJECTIVES

[Describe the rationale of the monitoring program. Use specific language when stating objectives (if unknown, speak with Program Managers). How will this data be used (reports, publications, regulating agency assurance, legislative review, etc.)? For measured parameters or indicators, what do you hope to be able to resolve? Do not go into great detail on each parameter, but rather focus on general classes such as macronutrients, micronutrients, metals, pesticides, submerged aquatic vegetation, fish communities, etc. Reference other documents that show the linkages between the system components. Identify sources of natural variability and bias and how those variables will be reconciled.]

1.3 ACTIVE MANDATES AND PERMITS

The mandates, permits or agreements that govern the sampling requirements of this project are as follows: *[INSERT appropriate information]*

- *FDEP permit #****, initiated xx/xx/xxxx and expires on xx/xx/xxxx*
- *Settlement Agreement, xx/xx/xxxx*
- *Biological Opinion from the United State Fish and Wildlife Service*

[All mandates, Biological Opinions, and permits needed for the project will be included in this section of the plan. Discuss any state or Federal collections permits required for threatened/endangered species.]

1.4 MONITORING COMPONENTS

[The focus of the Project-level Monitoring Plan (PLMP) is primarily post-construction monitoring, in some vernaculars known as "Effectiveness Monitoring". However, other monitoring components are inextricably linked to the project and the interpretation of data indicative of the effectiveness of the restoration activities.]

Project Baseline Monitoring

[Describe any baseline monitoring associated with the project and how it will be used to interpret the monitoring data gathered as part of this monitoring plan.]

Construction Monitoring

[Before one can know that the response of the system is due to a restoration activity it must be determined that the project construction was indeed carried out to specifications. This is also referred to as "Implementation Monitoring". Document implementation monitoring, criteria for determining successful implementation, and how data will be used in the interpretation of effectiveness.]

Post-Construction Monitoring (Effectiveness Monitoring)

[Insert a brief description of effectiveness monitoring; categories of parameters or indicators, general performance measures and targets, etc. If it is determined that the monitoring component is trending towards demonstration of project goals and objectives, briefly describe how reductions in monitoring frequency, duration, locations, or parameters can be implemented as applicable. Since the remainder of the monitoring plan is devoted to this monitoring component, this section only serves as a short overview.]

Inventory of Existing Monitoring Networks

[In south Florida, an extensive monitoring system exists for purposes like operations and environmental assessment. Review of existing monitoring networks, especially around the proposed project area or its larger area of influence, will help decide how much the existing monitoring efforts can be used for the proposed project and how much new monitoring is needed.]

Integration of Monitoring Components

[Explain how the various monitoring components are or will be linked together in an adaptive management framework to determine whether the project is providing the intended response in the system.]

1.5 DURATION

[Define the project life-cycle. Specific monitoring dates and durations will be included in each specified type of monitoring (i.e., water quality, hydrometerological, bio/eco) and each monitoring component (i.e. baseline, construction, post-construction). Project-level monitoring may be initiated prior to project construction to establish appropriate baselines. The PLMP should identify how long each parameter should continue through the project life-cycle (design, construction, operations, and maintenance), and what decision criteria would trigger its

termination or refinement. For example, field tests may require more effort and higher initial monitoring costs, followed by reduced effort and costs after the field tests. As project-induced ecological responses become better understood, monitoring should be refined and narrowed in scope, to the extent possible, to more directly focus only on those parameters that are absolutely necessary to evaluate restoration performance. Information should be included on how project-level restoration performance monitoring will be reduced or eliminated if desired goals and objectives have been achieved, or at 10 years post-construction, whichever comes first. After 10 years, monitoring is generally no longer cost shareable. Information should be included on how project-level hydro-meterologic monitoring will fluctuate with the duration of operational tests and what is required for operating the project during the operations and maintenance (O&M) phase. Information on the time period for monitoring required by permit or consultations should be included as well.]

Project Initiation

The monitoring described in this document will be *[or was]* initiated on xx/xx/xxxx in response to *[INSERT description of construction, ecological, or other triggers.]*.

Modification or Termination Conditions

The monitoring described in this document will be *[modified or terminated]* on xx/xx/xxxx in response to *[construction, ecological response, or other triggers. Simple modifications can be placed here. Complex phased or tiered changes should be attached as separate plans and referenced. Describe how the monitoring plan may be modified based on unexpected/undesirable outcomes, fully successful restoration, funding constraints, etc. Project-level restoration performance monitoring will be reduced or eliminated if desired goals and objectives have been achieved, or at 10 years post-construction, whichever comes first. After 10 years, monitoring is generally no longer cost shareable. Project-level hydrometerological monitoring will fluctuate with the duration of operational tests and what is required for operating the project during O&M phase. Monitoring required by permit or consultations will occur for the time specified in those agreements.]*

1.6 MONITORING/SAMPLING LOCATIONS AND NAMING CONVENTION

[Selection of representative sampling locations is critical to the effectiveness of a monitoring plan in achieving its objectives. Locations should take into account flow, structure characteristics and use, instrument type, sampling technique, equipment needs, communications, safety, equipment maintenance, etc. Sampling locations should be defined as part of the Data Quality Objectives (DQO) process. Logistics (accessibility by vehicle, boat or helicopter,; travel time, power availability, security, sample shipping, etc.) also need to be considered based on the frequency of collection, sample holding time and the number of locations to be sampled on a specific sampling trip. Existing monitoring locations should be leveraged wherever possible. New locations should supplement those in the REstoration COordination and VERification *(RECOVER) Monitoring and Assessment Plan (MAP) so that information can be used to refine the system-wide hypotheses and models for adaptive assessment.]*

[If a new monitoring station is created, naming should be unique and consistent with the current nomenclature. If sampling is conducted to meet permit requirements, the project and its monitoring stations should be registered following the location nomenclature and registration protocols for new stations. Sampling stations will be registered in the Laboratory Information Management System (LIMS) (if applicable).]

There are a total of *[number of stations]* monitoring locations that will be used to supply data relative to this plan. *[Here you would insert general descriptions of sampling locations including the official station ID (could be in parenthesis or bold or a separate column). If hydrometeorological, water quality, and bio/eco sites are not co-located, the different types of monitoring sites should be shown on the same map using appropriate symbology for each type of site. The descriptions should be specific enough to allow the field team to reference them in combination with the map and lat/long.]* Monitoring locations will be registered in the LIMS where appropriate. The locations will be presented in figures along with a table including lat/long and a description of the type of monitoring.

Geographic Location of Monitoring Stations

[Describe where the project is located and include a figure illustrating the project area and sample locations. Sampling location reconnaissance should be conducted and GPS location data, digital photos and maps should be obtained. A table of station IDs, lat/long of the sampling locations (or x and y coordinates with appropriate datum) and a description of the type of monitoring at each station should e included. Accurate recording of locations for monitoring should comply with CGM 28, *Technical Specifications for CERP Geographic Information System (GIS) Data*. A spatial accuracy assessment should be performed on the sampling points by plotting them on a map to determine whether they are indeed the correct locations. *Depending on the type of monitoring a project requires, templates are available for use and are outlined below.]*

Access and Authority

[Describe site access authority, whether permission is needed and by whom, preferred methods of access, required entry permits, required keys, and special contacts (names and phone numbers). Describe any hazards or additional pertinent information associated with particular sites.]

1.7 PROJECT REPORTING

[This section should be written in consultation with RECOVER, project managers, and agency reporting units in order to make sure all requirements for the project and the program will be met.

Frequency

[State the frequency at which reports will be released, the period of data to be used (i.e., water year), and the due date. In permits issued to the District, the frequency of reporting is usually annually, published in the SFER. Reporting restoration performance success will be based on timing of expected change for specific parameters.]

Content and Format

[Describe what type of information will be included in reports and what format will be used (i.e., summary tables, graphs, maps, narratives, combinations of these). All reports should be delivered electronically at a minimum. Who will review the report before it is released?]

Report Recipients and Broader Distribution

[State the intended audience(s) for project reports and purpose of reporting findings (i.e., U.S. Fish and Wildlife Service – listed species monitoring results related to biological opinion criteria, Design Coordination Team – results on restoration success and/or performance issues requiring adjustments). Will a notice be issued when the report is available and copies can be obtained upon request? Who will be the contact person for obtaining copies of the report? What are the parameters and channels for broader distribution?]

Revisions and Modifications

[This section is reserved for future changes as they are made and should be referenced throughout the document as revisions occur. Sections should be added chronologically. As revisions are made, a note should be added to the corresponding section of the plan.]

1.8 ADMINISTRATION AND IMPLEMENTATION OF THE MONITORING PLAN

Training or Certification: The Monitoring Program Manager will identify any specialized training or certifications for required project personnel who are responsible for overseeing training and determining how this training will be provided. They will determine the personnel responsible for assuring training requirements are met, determine how training is documented, and where records of training are maintained.]

Organization Structure and Responsibilities

MONITORING PROGRAM MANAGER (OR PROJECT MANAGER)

The monitoring program manager is responsible for overseeing the monitoring procedures and determining Reporting Leads. This person will make sure all Leads and Managers are following procedure.

[Insert any additional text regarding program manager and responsibilities.]

Name
Address
Telephone
Email address

MONITORING FIELD PROJECT MANAGER

The field project manager for this project is *[INSERT: name]*. The field project manager is responsible for maintaining this document and making sure that any changes are well documented and communicated to the field staff and other parties as necessary.

Name

Address
Telephone
Email address

MONITORING FIELD LEAD

[The field lead is the direct supervisor of the staff doing the actual data collection. There may be a different lead for each type of monitoring: hydrometeorological, water quality, bio/eco. Describe the responsibilities of each field lead.]

Name
Address
Telephone
Email address

ANALYTICAL LEAD/CONTRACT MANAGER

[The analytical lead/contract manager is an employee who either supervises an in-house laboratory or manages an outsourced contract]:

Name
Address
Telephone
Email address

QUALITY ASSURANCE LEAD

[Describe the QA Officer's responsibilities and independence. The quality assurance officer should be a member of a third-party, neutral entity (i.e. not part of the sampling team).]

Name
Address
Telephone
Email address

REPORTING LEAD

[The Reporting lead is the employee or contractor assigned to reporting on this project's data analysis and documentation and assigned to review reports submitted by contractors. They should be the single point of contact for questions regarding the status of reports and information on how to obtain copies of reports.]

Program Implementation

[Based on the organization structure and responsibilities presented above, explain how the monitoring plan will be implemented and how each of the various leads interact. Who reports to whom?]

Partnerships

[Describe partnerships in place or that will be put in place to execute the monitoring plan. These could be other Federal or state agencies, universities, contractors, non-governmental organizations (NGOs), etc.]

Program and Protocol Review

[List the reviews that the monitoring plan has undergone (i.e. RECOVER, QAOT) and the reviews that are expected in the future (i.e. scope of work (SOW) review by the QAOT and any Standard Operating Procedures (SOPs) that need to be reviewed by the QAOT). Additionally, technical representatives of the respective monitoring units of the Federal and local sponsor should review SOPs and SOWs. Also list if there will be any periodic reviews (annually, biannually, etc), and by whom. Items that might be considered in a periodic review:

- *Are the right parameters or indicators being monitored?*
- *Are the SOPs appropriate, do they need to be modified, or new SOPs developed?*
- *Is the project management structure working effectively or are changes in roles and responsibilities required?*
- *Do the project results demonstrate the verity of conceptual models, restoration hypotheses, and restoration techniques utilized? If not, how will findings be utilized and findings made in monitoring program review?].*

1.9 COST ESTIMATES

[Give a breakdown of costs associated with each monitoring component (i.e., hydrometeorological, water quality, bio/eco). Guidelines for developing a monitoring program suggest that approximately 30% of the budget should be allocated to information/data management, so that information is not lost, results are communicated effectively, and adequate reporting takes place in a timely manner. Costs should be projected out as far as practicable into future years. Project-level monitoring costs must clearly be identified in the PIR to ensure they are authorized as part of the total project costs to be cost shared by Congress. Monitoring costs for ecosystem restoration cannot be cost-shared longer than 10 years post-construction of a particular component. If it is still required to be maintained for a particular component, it will be 100% non-Federal. Monitoring and assessment activities prior to and during construction should include costs for all of the activities described above (sampling, project (contract) management and associated quality assurance/quality control (QA/QC) costs, data storage, analysis, documentation, and reporting). Funding for instrumentation (automatic samplers, stage recorders and flow meters, etc.) as well as the associated infrastructure such as platforms, power, and telemetry should be included in the cost estimates for monitoring. Any cost of monitoring performed during the period of construction shall be included in project construction costs and any cost of monitoring performed after the period of construction shall be included in project OMRR&R costs. Every effort should be taken and documented to minimize monitoring costs over the life of the project, and should avoid duplication with the RECOVER MAP.]

NOTE: The following is a template for all three sub-monitoring plans – the same basic outline is used for each. Section 2: Hydrometeorological, Section 3: Water Quality, and Section 4: Biological/Ecological. The template is in chronological order – the general order of the monitoring.

HYDROMETEOROLOGICAL MONITORING [3.0 Water Quality Monitoring ; 4.0 Biological/Ecological Monitoring]

2.1 DATA QUALITY OBJECTIVES

[*Formulating project data quality objectives (DQOs) brings awareness to project participants of the minimum data quality required for a project. The DQO process is a tool used to define the type, quality, and quantity of data needed to make defensible decisions for a project. This process systematically defines the requirements for any field investigation and tolerable error limits. It also identifies the intended end use of the data, including decisions that may be supported based on the results of a project.*

The DQO process has both qualitative and quantitative components. The qualitative components encourage logical and practical planning for environmental data collection activities, while the quantitative components use statistical methods to design a data collection operation that will reduce the probability of making a incorrect decisions. Although the quantitative steps of the DQO process are important, investigators and decision makers may choose not to apply statistics (Administrative Procedures Quality Assurance Systems Requirements 10 March 2009) to every environmental field investigation. In some cases, the planning team may utilize only the qualitative steps of the DQO process during the investigation planning phases to generate authoritative data that may be used to confirm site characteristics. The DQOs should be defined for specified project performance and each parameter. However, if similar DQOs are targeted for parameter groups (e.g., hydrologic, meteorologic, water quality), then provide them for the groups. Typically, there are six DQOs to consider: detection limit, precision, accuracy, representativeness, comparability, and completeness. Explain how these DQOs were established. Were they derived in consultation with decision makers and those familiar with the level of uncertainty that is acceptable for ascertaining project success? *For example, a target DQO of 95% for completeness would mean that the number of samples successfully collected and analyzed should be at least 95% of the total number of samples collected]*

[Additional guidance is provided in Guidance for the Data Quality Objective Process (EPA/600/R-96/055) and a simplified version prepared by the QAOT (Guidance in Understanding and Developing the Data Quality Objectives, effective 15 August 2005): http://www.evergladesplan.org/pm/pm_docs/qaot/081505_qaot_dqo_process.pdf.]

2.2 MONITORING DATA ELEMENTS/INDICATORS

[Project-level monitoring plans should identify and justify what monitoring data are necessary for management decisions related to permit compliance, operations and maintenance, and adaptive management. For example, the project adaptive management plans will include

decision-criteria in the management options matrices for making adaptive management decisions, which will need to link to the monitoring parameters thresholds and/or triggers identified in the monitoring plan. For more information on monitoring plans and adaptive management, please refer to the CERP Adaptive Management Integration Guide, Section 3.6 - http://www.evergladesplan.org/pm/pm_docs/adaptive_mgmt/062811_am_guide_final.pdf.
Permits and project operations plans should also include the key decisions to be made. One will also need to take into account the need for certainty (higher probability of the right answer) and precision. One can either list the laboratory and field measurements here or combine it with the collection SOPs, Laboratory Methods and frequencies into one table.]

Procedures and Methods

[List the SOPs for sample collection and the SOPs and/or laboratory method that will be used to measure each parameter. Sampling methods should follow well-defined methodologies that have been approved by Federal and state regulatory agencies. For SOPs, provide the SOP number and title if available. If an SOP is approved by an agency or established by the QAOT but an alternative SOP is being used, provide the justification. If an established SOP is not available, begin working with the QAOT regarding the SOP immediately. The Quality Assurance Systems Requirements (QASR) manual defines analytical methods as well as sample collection and field observations methods that are appropriate for most CERP projects. Once the DQOs are established, the QASR should be consulted to identify the analytical methods that will meet the project objectives. Note - Laboratories evaluating or developing new analytical methods are subject to the same requirements to the extent practicable. In these cases, the laboratories must comply with the Florida Department of Environmental Protection (FDEP) Quality Assurance (QA) Rule, and ensure that the applicable requirements (quality control, documentation, etc.) in the National Environmental Laboratory Accreditation Conference (NELAC) standards are implemented and used to evaluate the results.]

*[Describe any **field instrumentation** that will be used to collect hydrometeorologic (water quality/biological) data. Outline any programming requirements executed prior to field deployment. Describe instrumentation that will be used for samples submitted to remote analytical laboratories.]*

[Laboratories performing work under CERP are encouraged to report data using ADaPT (Automated Data Processing Tool) software, Staged Electronic Data Deliverable (SEDD)(http://www.epa.gov/fem/pdfs/sedd_adr_imp_overview.pdf) or the Automated Data Review (ADR) software. This software aids in processing analytical data, validating format and completeness, checking the data quality, and complying with the method and data quality objectives for all analytical data submitted to sponsor agencies.]

[Each discrete sample should be assigned a unique sample identification number that ensures that it can eventually be retained as a unique database record linked to a specific location. All these activities regarding a sample should be documented in a format that

ensures that the resulting data are traceable and of known, acceptable, and documentable quality.]

Laboratory Qualifications

[In general, laboratories that analyze air, water quality, and soil/sediment samples for CERP must be certified by the Florida Department of Health Environmental Laboratory Certification Program (FDOH ELCP). Certification should be for the test method, analytes/parameters and matrix that are reported for the project. As specified by QASR Chapter 4.0, laboratories used for analysis of CERP environmental samples shall be pre-approved and subjected to comparative testing if available, such as the performance evaluations overseen by the QAOT. These requirements shall be defined in the laboratory's contract or work order with the contracting agency.]

Rationale for indicator selection

[This section should describe why specific parameters and frequencies were selected. Do not go into detail on each parameter, but rather focus on general parameter classes such as macronutrients, micronutrients, metals, pesticides, submerged aquatic vegetation, etc. Rationales can include compliance issues, Clean Water Act, etc, but should also explain how they relate to restoration activities (include conceptual diagrams if needed).]

Sampling frequency and duration

[Frequency of sampling has significant impacts on data representativeness and cost. This section should describe why certain sampling frequencies and durations were selected for the parameters. It may not be necessary to go into detail on each parameter, but rather focus on general parameter classes such as hydrologic and meteorologic. Sampling frequency should be defined as part of the DQO process and be reflected in project permit requirements. Sample frequency should be selected so that data are representative of actual conditions including extreme values, capture natural variability, estimate temporal changes, and provide sufficient information for the detection of changes or differences of management concern, thus meeting the project's DQOs. The goal is to select a sampling frequency that yields estimates of important statistical parameters (i.e., mean, variance, frequency) within prescribed degrees of accuracy, precision, and reliability. The selection of sampling frequencies should balance these considerations so that generated data are sufficient to meet project objectives and remain cost-effective, i.e., "biweekly if flowing, otherwise monthly". Sampling that has been previously completed or ongoing within the project area shall be considered when determining monitoring sites, duration, and frequency. The goal is to optimize monitoring, therefore, if existing information is available, building upon existing information is important in the overall goal of monitoring for CERP projects. If previous monitoring sites are available, the project shall use these to avoid duplicative monitoring data. Specific guidance for determining appropriate sampling frequencies is given in the QASR.]

Assessment Process and Decision Criteria (triggers and thresholds)

[How often will assessments take place and for what purpose? Are there any trigger levels that would cause the agency or others concern, or would require a response? For example, cite state or federal water quality standards. For assessments related to Adaptive Manager refer to guidance on project assessments found in the CERP Adaptive Management Integration Guide - section 3.7 http://www.evergladesplan.org/pm/pm_docs/adaptive_mgmt/062811_am_guide_final.pd]

2.3 DATA COLLECTION

Sample/Data Collection Standards and Ethics

Every person performing field sampling must commit to following project specific requirements, field SOPs, QASR requirements, and other instructions as issued, to ensure that samples collected are of acceptable quality and are legally defensible.

Sample Submission

[Hydrometeorological – is unlikely to have this section, but will have the data processing section below.]

Water Quality –

Requirements for sample handling, custody and analysis holding times are detailed in the *SFWMD's Chemistry Laboratory Quality Manual or FDEP SOP-001/01 [or identify another reference]*.

Samples are submitted according the requirements outlined in the *[SFWMD's Field Sampling Quality Manual or identify another reference]*.

Biological/Ecological: Outline how samples will be submitted.]

Chain of Custody

[The header sheet, also called a Chain of Custody (COC) must accompany all samples submitted to internal or external laboratories. A COC form documents the possession of the samples from the time of collection to receipt in the laboratory. A COC form will be utilized and must be signed by the collector before it is relinquished to the laboratory. This form will identify: project, the number and types of containers, the mode of collection, the collector, time of collection, preservation, requested analyses, collection agency, sample identification number, sample site, sample date, sample time, sample type, weather, sample depth, matrix code, collection span, and in situ measurements. The form must be legible, accurate and complete. If a COC form will not be utilized explain why. More information on COC, its importance, and sample forms can be found at http://www.epa.gov/apti/coc/.]

Quality Control Samples

Quality control samples will comply with Section 5.8 of the QASR manual, Florida Department of Environmental Protection (FDEP) requirements (DEP-SOP-001/01, DEP-SOP-002/01), and those developed in the DQO process. *[INSERT frequency and quantity of samples for field blank (FB), pre-cleaned*

equipment blank (EB), field cleaned equipment blank (FCEB), trip blank (TB), field duplicates (FD) or replicate sample (RS) and split sample (SS).]

All requirements in the FDEP's Quality Assurance Rule should also be followed.

Data Validation

[Describe the procedures used for assuring that raw data are validated. Are range checks used to test for outliers? Are locations plotted on maps to make sure the correct coordinates were collected? The use of ADaPT, SEDD, ADR or other verification software should be noted here. The use of these systems will also ensure that the qualifiers make it into electronic data storage. The QASR chapter relating to the type of monitoring being performed (i.e. hydrometeorological) will have additional information and guidance on verification and validation.]

Data validation will occur in the field as well in the laboratory as outlined below.

Responsibilities of the Field Project Manager
The field project manager will review header sheets, field notes, and calibration documentation as well as the entry of these items into the database. The field project manager will approve the electronic version of the data. The field project manager will ensure the field notes were filled out according to protocol and ensure they are stored properly in Documentum.]

Responsibilities of the Sampling Team
[The validation procedures for field collected data differ from those used for "standard" analytical laboratory parameters due to the use of different instruments and techniques, but the principles are the same: data are evaluated against the QC criteria and DQOs defined in the QASR and/or the monitoring plan. SOWs *for collecting data should require data submitted by contractors be validated, meet the DQOs and QA/QC procedures and be in a format that is readily incorporated into a shared data environment.]*

The sample team will review and validate the sampling data collected during the course of the sampling event. This includes header sheets, field notes, and calibration sheets. Data that are deficient are qualified to indicate that the data should be used with caution. The sample taker's signature indicates that the data have been reviewed and validated.

Responsibilities of the Laboratory
[If the laboratory enters field data into the database, then the laboratory will review the data for completeness and accuracy.]

Raw Data

[For the purposes of this section, raw data are defined as any of the parameters that have been collected from a field location and have not been processed or undergone any QA/QC. Note what will be done with these raw data files – will they be kept?]

Data Processing

[Some field and laboratory instruments produce electronic data streams that must be processed to generate final data. Data processing procedures may include the use of specific manufacturer calibration factors and formulae. Data processing procedures and formulae should be defined and documented in equipment protocols, organizational manuals, and/or organizational SOPs. Biological, meteorological, hydrologic, hydraulic, and remote sensing data should undergo data processing and QA/QC procedures outlined in the QASR prior to storage in the shared data environment (i.e., DBHYDRO and/or CERP Zone database). If gaps in meteorological, hydrologic and hydraulic data are filled, established procedures should be used and documented for generating data estimates.]

Water Quality: Prior to data validation, the laboratory will provide electronic data using ADaPT EDD, ADR or SEDD software [*identify any other software required for the project*]. After the data validation process, all data are archived in DBHYDRO *[or CID/EGRET]* and maintained so that it can be retrieved and all information relative to a sampling event reviewed. [*The SFWMD DBHYDRO database should be the repository for all water quality, hydrologic, well construction, geophysical, and lithologic data. The CERP Integrated Database (CID) on CERPZone should be the repository for all other data.*]

Data Storage and Archiving

[Long-term maintenance and management of digital information are vital to all PLMPs. Maintaining and managing digital data, documents, and objects that result from projects and activities is the responsibility of all parties involved. Following CGM54 will help ensure the continued availability of crucial project information and permit a broad range of users to obtain, share, and properly interpret that information.]

Data will be entered into DBHydro. If data are not suitable for DBHydro they will be entered into the CERP Integrated Database (CID) on CERPZone through the Morpho interface.

[List where the data will be stored, who will be responsible for data entry and how soon after collection/analysis it will occur.]

2.4 DOCUMENTATION

[This section contains the minimum guidelines and requirements for field documentation. This section is written for the purpose of standardizing the field reportable data and dialogue so that the users can more readily access, comprehend, and utilize those data. Field documentation must be sufficient and clear to allow tracking of provenance and custody for any sample

collected or any measurement performed. Accuracy, consistency, and legibility are key factors that will enhance the utilization of the field data. If specific forms will be used, instead of a field notebook, then copies of the forms should be included as appendices to the PLMP.]

For all documents the following standards should apply:

- Print text, do not use cursive handwriting.
- Dates should be recorded as MM/DD/YYYY.
- Time should be recorded in 24-hour format using local time.
- Logs and notes should be recorded on site and at the time of collection.
- Entries are to be made in waterproof ink.
- Samplers should be properly trained.

[For more details see the appropriate QASR chapter.]

Field Notes

Relevant field observations will be noted in a bound waterproof notebook that is project specific. The following information will be entered into the field notes: project name, frequency, trip type, date, collectors, responsibilities, weather, preservation/acids, labs submitted to, sample ID, site ID, time collected, and sample type. Additional comments on observations, equipment cleaning, maintenance, and calibration will also be recorded.

Field Instrument Calibration Documentation

Records of field instrument calibration will be kept and FDEP, South Florida Water Management District (SFWMD) or USACE SOPs for calibration will be followed. *[Note, these are minimum requirements; the exact requirements of the calibration are dependent on the model of probe, the parameters measured, the range of parameters expected, and the range of parameters encountered.]*

Corrections

[If sample collectors, the laboratory, or the project manager discover errors in any of the field notes, header sheets, or calibration sheets, corrections may be required.]

Corrections to header sheets, field notes, or calibration sheets will only be made by staff who participated in the production of the document. Changes will be made by striking through the error, writing the correction, initialing and dating the change. On occasion a detailed explanation of the error may be required.

2.5 QUALITY ASSURANCE AND QUALITY CONTROL

System for assessing data quality attributes

[Describe all activities that will be used to assess the quality of the data and whether the DQOs are being met. These activities may include laboratory audits, use of performance evaluation materials (PEMs), National Institute for Standards and Testing (NIST)

standard reference materials, field audits, reference samples, field procedural blanks, reference sites, training, certifications, etc. If DQOs are not met, explain what corrective actions will be taken, e.g., reanalysis, resampling, flagging the data, etc.]

Data quality qualifiers

[Data quality refers to the level of uncertainty associated with a particular data point or value. This is assessed by examining the quality of collection and analysis, determining compliance to method and regulatory requirements, determining whether both field and laboratory analytical results meet the DQOs, and any other background information affecting data quality. Data not meeting the data quality objectives must be qualified using standard FDEP qualifier codes (F.A.C. 62-160) or other codes appropriate for the organization or agency.]

Field Audits

Audits will be performed according to the QASR Manual. Reports will be reviewed by the project manager. Reports will describe the frequency, type, and responsibility for conducting field and laboratory audits. The authority of the auditor to stop work will also be defined, along with how and to whom the audit findings are reported, processed and distributed.

2.6 DATA ANALYSES AND RECORDS MANAGEMENT

[*For the purposes of this PLMP, data analysis is defined as the processes by which monitoring and other observations are turned into meaningful information. We have defined "data analysis" broadly to include all evaluations of data after the data are collected and entered into an electronic file. Thus, data analysis includes quality control checks that occur during summarization and exploratory data analysis and extends through to analytical procedures leading to conclusions and interpretations of the data. Some field and laboratory instruments acquire electronic data streams that must be processed to generate final data. Data processing procedures may include the use of specific manufacturer calibration factors and formulae. Data processing procedures and formulae should be defined and documented in equipment protocols, organizational manuals, and/or organizational SOPs. Biological, meteorological, hydrologic, hydraulic, and remote sensing data should undergo data processing and QA/QC procedures outlined in the QASR prior to storage in the shared data environment (i.e., DBHydro and/or CID). If gaps in meteorological, hydrologic and hydraulic data are filled by interpolation procedures, established procedures should be used and documented for generating data estimates. NOTE: storage of data is governed by CGM 54 and the data management appendix of a project's PMP. Specific formats for the data are available on CERPZone.org or through the SFWMD for DBHydro. Questions regarding data management in general should be directed to the CERP Data Management program managers.*]

Data Quality Evaluation and Assessment

[The data quality assessment (DQA) process uses scientific and statistical data evaluation procedures to determine if the data are of the right type, quantity, and quality to support their intended use. The DQA process is discussed in the QASR Chapter 11

and detailed methods are described in EPA QA/G9R, Data Quality Assessment: A Reviewer's Guide (EPA, 2006a) http://www.epa.gov/quality/qs-docs/g9r-final.pdf.
The Science Policy Council has defined general data quality assessment factors (EPA, 2003) http://www.epa.gov/osa/spc/pdfs/assess2.pdf) that should be considered during the DQA process. These include soundness, applicability and utility, clarity and completeness, uncertainty and variability, and evaluation and review.]

[*Reporting on mercury and pesticides or other toxicants should be done under the supervision of professionals with a record of published research in these areas using approved guidance such as the QASR Manual and CGM 42 Toxic Substances Screening Process - Mercury and Pesticides*.]

2.7 ADAPTIVE MANAGEMENT CONSIDERATIONS

[*Explain how the data will be interpreted and used as feedback to determine the effectiveness of the restoration activity. Describe what corrective actions should be taken if performance measure targets are not met. What procedures will be utilized to determine whether the correct parameter is being measured, and at the right frequency and duration? How much time is expected before a change is expected to be observed in the system? Are critical thresholds, whether beneficial or negative, anticipated in system characteristics or potential restoration response? Are stochastic events or less frequent recurrence events needed to obtain desired restoration results, or could such anticipated events confound achievement of restoration targets? Discuss use of rate trends rather than absolute levels as decision criteria. What criteria must be met to declare the project a success? What is the governance structure for adaptive management and supporting monitoring decisions?]*

WATER QUALITY

[The Water Quality section will follow the same annotated outline as in Section 2 of this PLMP template for preparing the water quality monitoring section. Note that items specific to water quality are noted in Section 2.]

BIOLOGICAL/ECOLOGICAL

[The Biological/Ecological section will follow the same annotated outline as in Section 2 of this PLMP template for preparing the water quality monitoring section. Note that items specific to biological/ecological are noted in Section 2.]

REFERENCES