2.0 TECHNICAL ASSESSMENT GUIDANCE PROCESS

2.1 Guidance Strategy and Purpose

The technical assessment guidance strategy developed for assessing measurable change(s) in system responses during and following CERP implementation is a multi-step process consisting of monitoring design, data acquisition, data analysis, interpretation, assessment, and subsequent evaluation of system-wide performance. This guidance process presents a strategy for assessing whether measured responses are consistent with the IG/IT established by the Pro Regs (Section 385.38). This strategy also addresses, but is not limited to, questions such as those listed here.

1) Has there been a measurable change in indicators from pre-CERP conditions?
2) If there has been a measurable change, has the direction and magnitude of the change been consistent with CERP goals and targets?
3) Is the change consistent with expected responses described in the CERP hypotheses?

A key part of this strategy is characterizing the variability of pre-CERP ecosystem conditions and establishing reference conditions for each of the hydrologic, water quality, and ecological indicators. This document does not provide guidance on establishing baseline conditions for water supply and flood protection, although guidance on this issue may be found in Guidance Memorandum #3 (Savings Clause Issues) and the pre-CERP baseline document at the following websites:

http://www.evergladesplan.org/pm/progr_regs_guidance_memoranda.cfm#docs
http://www.evergladesplan.org/pm/progr_regs_baseline.cfm.

Background variability and characterizing spatial patterns will be the emphasis of this effort for the first five years before the implementation of specific CERP projects that are expected to influence the ecosystem. A fundamental concept underlying the assessment strategy is the ability to detect *measurable change* of individual and aggregated performance measures. Measurable change is defined as the magnitude and direction of change of a performance measure from the pre-CERP reference condition (i.e., baseline) distinguishable from background variability.

The purpose of this document is to provide guidance to help ensure that the sampling designs and data analyses for the MAP monitoring components are adequate to detect measurable changes in hydrologic (including water supply and flood protection), water quality, and ecosystem indicators. This document is intended to:

1) Reflect the scientific methods necessary to detect and measure variability, status, and trends in individual performance measures
2) Integrate multiple performance measures at the module level

3) Combine module performance measures to provide a system-wide assessment of hypotheses regarding system responses to CERP implementation

2.2 Applied Science in RECOVER

RECOVER is responsible for the coordination and application of an Applied Science Strategy (Ogden and Davis 1999) during CERP implementation. The strategy outlines a process for organizing current scientific understanding literature on wetland and estuarine ecosystems into interrelated components that can effectively support restoration efforts. The major components of the Applied Science Strategy are the:

1) Regional and system-wide conceptual ecological models (CEMs)
2) PMs and restoration targets
3) Development and implementation of a system-wide monitoring program
4) Development of an assessment strategy

Natural and human system responses will be assessed relative to stated hypotheses regarding responses of these systems and evaluated relative to the trends or targets established for the CERP PMs and the objectives of the MAP (RECOVER 2004).

2.2.1 Conceptual Ecological Models

Conceptual ecological models are the foundation of most assessment PMs (Ogden and Davis 1999). CEMs are used to illustrate the links among societal actions, environmental stressors and ecological responses (USEPA 1998) and provide the basis for selection and testing the set of causal hypotheses that best explain how the natural systems in South Florida have been altered (Gentile et al., 2001). CEMs were also developed as a planning and design tool in ecological risk assessment analysis worldwide (Rosen *et al.* 1995; Gentile *et al.* 2001).

The CEMs were developed for eleven physiographic regions defined in the MAP (RECOVER 2004) and provide the scientific basis for the CERP system-wide monitoring design and adaptive assessment process. The CEMs are also a planning tool for translating the overall restoration goals of CERP into the specific PMs that will be used to plan, design, and assess the success of the Plan. In addition to illustrating the ecological links between the physical, chemical and biological elements in specific physiographic regions of South Florida, CEMs provide the scientific foundation for: 1) developing causal hypotheses linking the most important hydrologic and chemical stressors with the major ecological effects; 2) forming the basis for predicting responses to CERP restoration projects and other restoration efforts, and 3) identifying suites of measurable indicators (i.e., PMs for assessing how well the projects achieve the policy-level goals for the regional restoration programs.

2.2.2 Performance Measures

Performance measures consist of ecological attributes or environmental stressors such as hydrology, water quality, and habitat alteration that are indicators of conditions in natural and human systems. PMs are developed in large part from the CEMs and have been integrated into the CERP ecosystem response hypotheses at a module scale (see Section 2.2.3) and subsequently used to assess the system-wide performance of CERP. Additional PMs, including water supply and flood protection, were derived from Federal and Florida State law. Indicators of IG/IT will also be incorporated into the system-wide performance assessment.

RECOVER has operationally defined "assessment" and "evaluation" PMs (Appendix E). CERP PMs are identified in the *CERP System-wide Performance Measures Report*, which can be accessed at: www.evergladesplan.org/pm/recover/eval_team_perf_measures.cfm. Assessment PMs are those that can be directly evaluated by implementation of MAP components and are used to track changes in the condition of the natural and human systems. In contrast, evaluation PMs are used to predict system-wide performance through simulation modeling of the Plan. As our understanding of the ecosystem increases and model development is improved, a larger number of PMs fitting both definitions is anticipated. PMs include hydrological, water quality, biological, water supply, and flood protection measures. Some PMs are related directly to the level of particular stressors, such as the rate of nutrient input, degree of alteration of salinity, and depth of water, while others are related to key attributes of the ecosystem such as fish population size, oyster health, and seagrass spatial extent. Achieving the targets (or trajectories towards restoration) of a well-selected set of PMs is expected to result in system-wide sustainable restoration.

2.2.3 MAP Modules

The MAP modules are represented by four geographic regions in South Florida, with additional modules for hydrology monitoring (to assist in evaluating water supply and flood protection performance measures) and mercury bioaccumulation. The modules are the basic organizing elements and research units of the MAP and form the basis for the scientific teams that interpret and analyze monitoring data (RECOVER 2004). These modules include:

- Greater Everglades Wetlands
- Southern Estuaries (Florida and Biscayne Bays, Southwest Florida Coast)
- Northern Estuaries (St. Lucie Estuary/Southern Indian River Lagoon, Caloosahatchee Estuary, Lake Worth Lagoon, and Loxahatchee River Estuary)
- Lake Okeechobee
- South Florida Hydrology Monitoring (Water Supply and Flood Protection)

The four geographic modules encompass one or more of the CEMs described above. Each module has its own sampling network designed by the appropriate MAP Module Group, with consideration of compatibility and efficiency that was derived from coordination with the other modules. Module Groups are teams of scientists with technical expertise in ecology, hydrology and water quality, and experience relative to the natural or human systems described in the MAP modules. Module Groups combine scientists from participating agencies participating in the development and implementation of the MAP with other scientists from outside the agencies who are recognized in their fields and actively working in South Florida ecosystems.

Each Module Group is led by a member of the RECOVER Assessment Team (AT) who is designated by the AT chairs with the concurrence of the AT membership. Qualifications for a Module Lead include a long history of experience, accomplishment and responsibility in areas of science relevant to the module. The core membership of a Module Group is determined by the Module Lead. That membership includes the Principal Investigators (PIs) for that particular module and others selected by the Module Lead. Participation between the sponsoring agencies and MAP PIs and members who are not direct participants is contractually arranged

The Module Groups and associated PIs are responsible for coordinating the implementation and quality assurance of the MAP monitoring and research projects for each of the modules. Module Groups ensure that implementation of specific monitoring components follows the overall program sequencing developed by the AT. Module Groups are also responsible for assessing non-MAP data already being collected to identify existing efforts can be incorporated or modified to meet MAP criteria.

2.3 Levels of Assessment Guidance

The RECOVER Integrative Assessment Guidance Process establishes a multi-step process for detecting and assessing changes in performance measures, assessing progress toward achieving IG/IT, and evaluating the status of module and system-wide hypotheses. The guidance includes three levels: the MAP component level (e.g., specific monitoring and supporting research projects); the module level; and the system-wide level. The assessment process, outlined in Figure 2-1, applies specifically to the natural system and can be modified, as necessary, to address water supply and flood protection.

2.3.1 MAP Component-Level Guidance

The MAP component-level guidance is directed at the Principal Investigators working within a Module Group. The assessment guidance at the MAP component-level has three parts:

1) Estimating the ability to detect change;
2) Establishing reference conditions; and
3) Measuring changes from reference condition.

At this level, the assessments focus on: 1) selecting the analysis tools necessary to measure the magnitude and direction of change in the performance measures; 2) determining whether changes are consistent with desired trends or targets and MAP hypotheses; and 3) determining if there are indications of unanticipated events that affect desired outcomes. Guidance on these issues may be found in Section 3 and Section 4 of this document.

Figure 1. MAP Technical Assessment Process

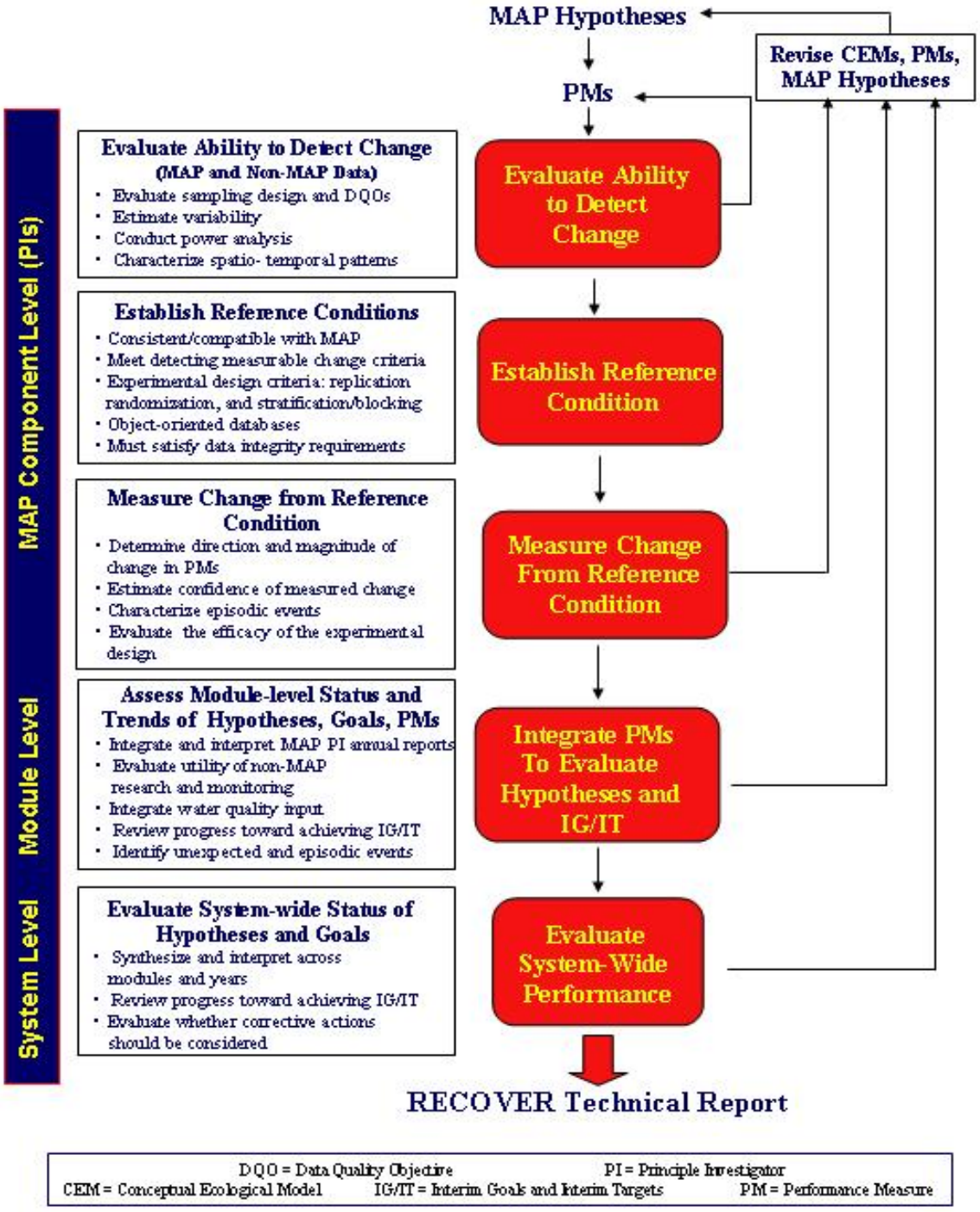

Figure 2-1: MAP Technical Assessment Process

2.3.2 MAP Module-Level Guidance

Module-level analyses focus on the integration of multiple performance measures into the assessment of specific hypotheses and are accumulated and updated annually. Module

Groups interpret the annual reports prepared by each PI, integrate relevant information into module assessments, and evaluate the relevance and utility of non-MAP research for assessment. Module-level assessments are conducted to determine the direction and magnitude of changes in the integrated PMs and to evaluate whether the changes are consistent with expected responses described for the CERP hypotheses. If the trends do not correspond to the expected responses, the Module Groups must provide plausible scientific explanations (Figure 7-1). . Finally, the Module Groups will evaluate progress toward achieving IG/IT, identify unexpected results, address episodic events, and integrate relevant information into project-level monitoring. Guidance on conducting module-level assessments and decision support tools may be found in Section 5 and 6 of this document. Further information on IG/IT may be found in Section 7.3.3 and RECOVER, 2005.

2.3.3 MAP System-Wide Guidance

The results from the system-wide analysis may require the AT and/or RECOVER to address a suite of options to correct or refine the MAP. System-wide analysis includes synthesis and interpretation of data across modules and years, evaluation of progress towards restoration goals, and identification and implementation of corrective actions that may be necessary for improvements. A fundamental assumption is that this guidance process has been applied to analyzing and integrating the performance measures within a module. Guidance on synthesizing and integrating the module-level analysis into a system-wide analysis is may be found in Sections 6 and 7 of this document.