# Appendix 1-5: Final Report of the Peer-Review Panel for the Draft *2009 South Florida Environmental Report –Volume I*

This final report, dated October 24, 2008, was prepared by the *2009 South Florida Environmental Report* Peer-Review Panel under purchase order to the South Florida Water Management District. This appendix was not edited or spellchecked by the SFER production staff and appears verbatim as posted on the District's WebBoard (http://www.sfwmd.gov/sfer).

# FINAL REPORT

## *of the Peer Review Panel Concerning the*

## *2009 South Florida Environmental Report*

Review panel:
Jeffrey L. Jordan, Chair, University of Georgia
Neal E. Armstrong, The University of Texas at Austin
Joanna Burger, Rutgers University
JoAnn Burkholder, North Carolina State University
Richard Meganck, United Nations University for Water Education
Otto R. Stein, Montana State University
Ellen van Donk, NIOO-Center for Limnology
Robert Ward, Colorado State University (emeritus)

Submitted October 24, 2008

## INTRODUCTION

The 2009 SFER review continues to use a tri-level process focusing on accountability, technical and integrative reviews. Readers of previous panel reports will notice that for the 2009 SFER review we have considerably reduced and streamlined our comments. Prior to the public workshop, the panel posted lengthy and detailed comments and questions to the chapter authors. These postings and the author response remain on the web board and are a part of the public record of the SFER. They will not be repeated in this report. Rather, we will focus on the levels of review as well as recommendations to chapter authors that seek to strengthen future SFERs. In addition, the panel was asked to provide comments on future refinements to the peer-review process as well as recommendations on panel makeup and rotation in response to report maturation.

### Public Workshop

At this year's public workshop the formal presentation of the chapters was deleted, as was the past practice of author responses to the questions posted on the web board. Instead, the public workshop presented an opportunity for the panel and authors to discuss issues associated with the chapters. The panel found this approach to greatly increase our ability to understand and comment on the material in the SFER. Eliminating the individual PowerPoint presentations provided sufficient time for in-depth discussions between the panel and chapter authors. While the order of chapter presentations can be further refined, we suggest using the level of review as the organizing principle. Thus chapters that are primarily technical in nature can be discussed in one section of the workshop, while accountability and integrative chapters can be set together. The key to this year's successful public workshop was the timely and detailed response of the authors to the panel's initial set of comments as posted on the web board. In future years, after reviewer comments are posted on the web board, authors should focus energy on responses to reviewer comments and de-emphasize presentation development. PowerPoint presentations should be limited to additional figures, tables or other visuals required to better address reviewer comments. Author responses should be posted on the web board by the Wednesday prior to the public workshop.

The panel suggests beginning the public workshop with one PowerPoint presentation that would provide an update on the "current state of the Everglades." This would provide a summary of where things stand in terms of the health of the Everglades and any policy or legal changes that may have occurred during the preceding year.

The panel would also like to encourage authors to stay for the session with authors from other chapters that relate directly to their subject. Also, the panel would like to have authors be prepared to discuss the main issues they see for the future (not just a report of past activities). Where do they see their work going, and how does it relate to management and the recovery mission?

### Recommendations on Future Reports

While integration among the chapters is improving, additional efforts are needed in some topics. It has increasingly been recognized that nitrogen, as well as phosphorus, should be carefully

considered in restoration efforts. Nitrogen cross-cuts the South Florida ecosystems from the upper Kissimmee basin to the Southern Estuaries. Invasive exotic species, both plants and animals, should also be more strongly integrated into other chapters (Chapters 6, 10, 11, 12) because they can fundamentally block or negate recovery efforts (hydrology, performance measures, etc.). Effects of mercury on ecosystem function and on recovery efforts also should be better integrated.

The panel recommends that each of these three topics (nitrogen, invasive species, and mercury) should be addressed, one per year for the next few years, in a cross-cut chapter of the SFER, as exemplified by the excellent previous cross-cut chapter on phosphorus across the South Florida ecosystems. White papers exploring weight of evidence in some issues would also be helpful, such as the relationship between sulfur and mercury, and approaches for evaluating future impacts of invasive species of concern that have not yet caused major problems.

## *CHAPTER 1: INTRODUCTION TO THE 2009 SOUTH FLORIDA ENVIRONMENTAL REPORT-VOLUME 1*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

As this chapter has evolved, its primary task is to communicate and introduce the contents of the SFER. As evidenced by the numerous awards the SFER has received and the recognition it has garnered, the SFER is an extremely effective communication device.

**Accountability**

The objective of the chapter is to highlight the governmental, scientific, and legal context of the SFER. This chapter both complies with its intent but provides a useful road map to better understand the full report.

**Integrative**

The chapter provides a useful integration of the entire report by organizing the discussion into the Northern and Southern Everglades along watershed lines. The tables and figures assist the reader in gaining a general understanding of the issues involved as well as the main institutional responsibilities that are part of the SFER. The summary of the System-Wide Challenges and Initiatives is excellent and clearly indicates the integrative nature of management decisions affecting the South Florida region.

The water quality monitoring reengineering effort is closely watched by the panel due to implications to the consistency and comparability of water quality data over time as well as across space – i.e. all of South Florida. Such consistency should foster a sound science integration of water quality data and information in future SFERs and permit system-wide accounting of phosphorus and other contaminants needed to achieve water quality goals.

## *CHAPTER 2: HYDROLOGY OF THE SOUTH FLORIDA ENVIRONMENT*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

How well the District has met the water demands, has managed available water resources in times of drought and handled flood conditions are all accountability matters. That water

management affects all areas represented within the SFER from water supply needs to constituent loadings to Lake Okeechobee, the STAs, and the WCAs is emblematic of its integrative nature and hence the integrative review. Thus, the accountability and integrative review designations are appropriate.

**Accountability**

A significant enhancement to this chapter would be to tie hydrology more strongly to water management goals and objectives. The District's response to this suggestion is to suggest that the complexity of the system due to natural variability, project purpose changes over time, and other things will make measuring success difficult. Still, the District is evaluated by its stakeholders in how well it meets its water management objectives and some ways of measuring achievement of those objectives have likely been developed, but perhaps not.

The hydrologic system is immensely complex. The chapter is still replete with facts about those factors that influence water sources, storage, flows, etc., and it still assigns little meaning to the facts. Thus, the reader is left with a staggering amount of information with little sense of its consequence unless the reader is intimately familiar with the system.

Modifications have been made to the chapter organization so that it now includes an overview of selected hydrologic components (the "20,000 ft" level description of the hydrologic system), detailed description of the state of the system hydrology in WY2008, and the hydrologic feature of the water year – the 2006-08 drought. This arrangement and content serve very well to introduce readers to the water resources mission and the water management system of the SFWMD while highlighting current water resource challenges facing South Florida. Even with the high level (broad approach) overview, the content of the chapter, except for the challenges being faced, is becoming routine. Even the challenges can be viewed as drought or flooding.

**Integrative**

The chapter could benefit from closer links to management goals and objectives as expressed in Chapter 3A: Water Quality, Chapter 5: Stormwater Treatment Areas, Chapter 10: Lake Okeechobee, the Chapter 11: Kissimmee Basin, Chapter 12: Coastal Ecosystems, and the role that water management has on these areas and the role that management of these areas has on water management. Clearly, the hydrologic system has great impact on water quality, stormwater treatment areas, water conservation areas, restoration and management of Lake Okeechobee, the Kissimmee Basin, the Everglades National Park, and coastal estuaries.

**Recommendations**

1. To reduce the need to repeat the drought/flooding history in each SFER, a concise, readable, description of drought/flooding patterns in South Florida should be prepared as an appendix.
2. It is strongly recommended that this chapter have an emphasis on water flows through the system and water flows to meet water supply needs. The water year section should be a description of how well drought or flood conditions, as the case may be, were handled during the year, and how well water supply needs were met. The details of water flowing from water body A through structure B to canal C, regulation schedules with actual water levels, and so forth can be moved to an appendix.
3. The District should consider developing a set of "dashboard" metrics that describes how the hydrologic system has been operated and managed in the past water year and in a historical context so the reader has a quick grasp of the "state of the hydrologic system"

in space and time. The District's response to this suggestion notes the kinds of problems that would have to be taken into account if such a system were developed, and those problems are appreciated but can be overcome. It is strongly suggested that the District look at this opportunity again.

## *CHAPTER 3A: STATUS OF WATER QUALTIY IN THE EVERGLADES PROTECTION AREA*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

Accountability review is appropriate due to the routine reporting on water quality standards compliance in the Everglades Protection Area (EPA). An integrative review is necessary since water quality conditions in the EPA are subject to water quality conditions in Lake Okeechobee and the Kissimmee Basin and, in turn, impact water quality conditions in Everglades National Park and some coastal estuaries.

**Accountability**

The phosphorus criterion achievement section of the Chapter has not reached the point wherein the monitoring network is able to support a complete assessment (several criteria require five years of data before a final assessment can be made). The Cape Sable Seaside Sparrow section represents the fifth annual report, but only the first time that results have been included in the SFER. Thus, the Panel is not comfortable considering this subsection routine.

The monitoring system reengineering currently underway presents a potential change in the methods used to generate the water quality assessments presented in Chapter 3A. This is a concern to the panel. In theory, this change should not affect the reporting process in Chapter 3A, but it could change the data available to support the assessment. Data available to support Chapter 3A have been of concern to the panel for a number of years. For example, data used for the assessment are drawn from DBHYDRO via a data screening process. In other words, the data are not designed to support the water quality assessment in Chapter 3A – they are collected for a variety of projects and programs which are coordinated with the water quality assessment staff. If the monitoring system reengineering helps collect data consistently over the long term and in the amount called from by use of the binomial hypothesis (28 samples per year), then Chapter 3A will have stronger scientific foundation and the consistency needed to produce comparable information for management over the long term.

As Chapter 3 matures for its stated purpose (annual assessment of water quality standard compliance in the Everglades Protection Area), there is a growing need to examine the EPA's ability to achieve standard compliance given its location at the lower end of a highly impacted, complex hydrologic and ecologic system.

Also, as Chapter 3A matures there may be a need to review how water quality information for South Florida is presented. Currently, this chapter is 50 to 100 pages in length – a format designed to support an annual scientific peer review. If the peer review is redirected to a five-year methods review, then the information reporting goal of Chapter 3A could take on a more public accounting for achieving water quality criteria in the EPA and, eventually, all of South Florida. In other words, the peer review is contained in the methods behind the production of

water quality information, not in the presentation of water quality information itself. This would require a major shift in the nature of Chapter 3A – perhaps moving more toward a situation similar to that faced by drinking water providers in the mid 1990s. The 1996 Safe Drinking Water Act required drinking water providers to distribute a one-page summary of their water quality conditions each year via a 'Consumer Confidence Report'. The format and content of these one-page summaries have been evolving, as most drinking water consumers have observed over the years. Perhaps the next step in SFER reporting, where methods have become rather standard, is to consider extending the simplification of reporting directly to the public. By placing the standard methods documentation (including reporting to the public) in a document (reviewed every five years), the SFER many be appreciably reduced in size while greatly increasing its effectiveness in informing the public about South Florida water quality conditions.

**Integrative**

In many ways, the remaining research component of Chapter 3A is how to integrate water quality reporting, not only across the Everglades Protection Area (now addressed by the Chapter), but across all South Florida. Chapter 3A is not as mature in its reporting as Chapter 2 since Chapter 2 currently describes the hydrology of all of South Florida, not just the EPA. The addition of the phosphorus and Cape Sable Seaside Sparrow sections to Chapter 3A (along with the Non-ECP section which has been included for several years), while highly desirable in presenting a larger water quality picture, needs additional integration into the chapter.

Bringing new water quality results into Chapter 3A, however, will require careful structuring of the expanded Chapter as well as careful editing for a common reporting style and format. To illustrate Chapter structuring, one possible ordering of material could present the core water standard/criteria compliance first, followed by the special emphasis on phosphorus. Such requirements are applicable to broad areas of the EPA and/or South Florida. Likewise, water quality constituents important to the entire EPA/South Florida, for which there are no criteria at present (sulfur), could follow the standard/criteria compliance section. Finally, the chapter could end with a sequence of sections addressing water quality assessments associated with more narrow projects, such as the Non-ECP, Cape Sable Seaside Sparrow, and others as appropriate.

**Recommendations**

1. As the reporting of water quality standard compliance in the Everglades Protection Area in Chapter 3A becomes more routine, it should be possible to streamline EPA standard compliance accounting, thus reducing the size of Chapter 3A. The Safe Drinking Water Act's Consumer Confidence Report experience is suggested as an example of what may be possible in this regard.
2. As Chapter 3A expands its consideration of water quality standard compliance to other, closely related, areas of South Florida (e.g. the Cape Sable Seaside Sparrow that was added this year), there is a need to rethink Chapter 3A's organization of topics and develop a common reporting style.
3. More broadly, given the inter-related nature of water quality conditions across South Florida, assessment of water quality standard compliance in the Everglades Protection Area should be enhanced by discussing related standard compliance 'upstream' (in the Kissimmee Basin, Lake Okeechobee, the Everglades Agricultural Area, and the STAs) and 'downstream' (Everglades National Park and some coastal estuaries and bays).
4. Beyond standard compliance and in concert with the current monitoring program reengineering effort, there is a need to consider expanding the scope of Chapter 3 to include a 'system-wide accounting of phosphorus and other contaminants' for all of South Florida (quote

taken from the 2008 National Research Council's Progress Toward Restoring the Everglades: Second Biennial Review). Such an over view of water quality conditions would be consistent with the system-wide hydrologic overview presented in Chapter 2.

### *CHAPTER 3B: MERCURY AND SULFUR MONITORING, RESEARCH, AND ENVIRONMENTAL ASSESSMENT IN SOUTH FLORIDA*

Assigned Levels of Review: Primary – Technical; Secondary – Integrative

The level of review for this chapter is primarily technical because there still are considerable scientific issues dealing with several aspects of the mercury problem, including temporal and spatial patterns, causes of hot spots, high levels in fish that pose a problem for breeding birds, fish-consuming people, and other high trophic level consumers, relationship of sulfur to methylation, and interaction of phosphorus, sulfur, and mercury levels. These issues require both independent study and synthesis, as well as technical scrutiny. Further, there are several ongoing studies examining the effect of mercury on wading birds which may influence both management (nesting could be dissuaded in some places by water levels) and overall use of wading birds as indicators of Everglades recovery. Secondary review should be with respect to integration of mercury and sulfur issues in other chapters, including water quality, biological studies, and the chapters on regions of the system (such as the Kissimmee).

**Technical**

The technical review included a wide range of suggestions and comments (see web board for full comments). It was difficult to perform an in-depth technical review when the chapter itself is mainly a review of existing information and studies. The studies are not described in enough detail to evaluate, and the overview lacks a regional context. This leads to overall questions of a longer time span than simply a one-year report. For example, how does the MeHg in fish tissue problem in the WCA and ENP compare to other non-impacted sites in Florida and other Southeast US locations? Is it typical for the median level to exceed human ingestion standards? Recent levels are much lower than in the 1990s and the observed median levels outside of ENP are “close” to the standard. Have such trends been observed elsewhere?

**Integrative**

Mercury and sulfur dynamics within the Everglades is an issue that cross-cuts several different chapters, including Status of Water Quality (3A), Ecology of the Everglades (6), and Invasive Exotic Species (9), since in the later case, species are differentially affected by mercury. Mercury and sulfur issues should be integrated among the chapters, and within chapter 3B. Further, the mercury chapter should provide an overview of how the data being collected, and the mercury cycling information that is accumulating, relate to overall restoration and management within the Everglades, as well as to specific regulations and acts or laws.

**Recommendations**

1. The chapter could be improved by having one map (with accompanying table) that shows overall mercury levels throughout the everglades (with EPA mercury exceedances for fish clearly indicated). A similar map for sulfur is also needed.
2. Make clearer the objectives, time frame, and effects of developing a TMDL for the Everglades.

3. Clearly lay out the management and recovery goals for mercury (and sulfur) in the Everglades that are reasonable and that can be accomplished.
4. Relate mercury and sulfur levels (generally, and for specific hot spots) to the overall management and restoration goals for the Everglades.
5. Develop a mass balance for sulfur.
6. Convene a panel (or use some other method) to examine the relationship between sulfur and methylation using a weight of evidence approach that would be acceptable to a wide range of stakeholders.
7. Requisition a white paper on the biogeochemistry of mercury/sulfur interactions.
8. Identify the five major issues or problems surrounding mercury and sulfur in the Everglades, and address these major issues, using the peer-reviewed literature, as well as the studies conducted in the Everglades.

Recommendations 1, 2, and 3 should be addressed in the current report while the rest of the recommendations should be considered for future reports.

### *CHAPTER 4: PHOSPHORUS SOURCE CONTROLS FOR THE SOUTH FLORIDA ENVIRONMENT*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

This chapter is in a state of transition "in that it combines all source controls programs for all watersheds to give a comprehensive presentation of existing, evolving, and future nutrient source control programs." Further, the chapter focuses not only on the watersheds south of Lake Okeechobee but those north as well, which are currently covered in Chapters 10, 11, and 12. This results in phosphorus inputs to Lake Okeechobee being presented and discussed in one chapter, which will help the understanding of phosphorus loading, sources of phosphorus, and the effectiveness of BMPs and of regulatory activities. While accountability is still the primary level of review, and integration is necessary for subsequent chapters, there remains substantial technical material to review as research into how to design and evaluate BMPs for the Northern Everglades evolves.

In terms of accountability the chapter does a good job of aligning management goals and objectives to the work on phosphorous controls. The compliance issues are clearly stated, and the proposed analyses, studies, and contracted research to address those issues are well thought out and appear to be on target to gather the information needed. The integration is a bit difficult to achieve at this point, as is any technical review.

### *CHAPTER 5: STA PERFORMANCE, COMPLIANCE AND OPTIMIZATION*

Assigned Levels of Review**:** Primary – Accountability; Secondary - Technical

Chapter 5 was assigned to an Accountability Review, with Technical as the secondary review. Chapter 5 has significant accountability and technical aspects. Because discharge standards for phosphorus have been set for the STAs, it is logical to conclude that reporting in this chapter is about the success in meeting these standards and/or reasons why the standards were not met.

However, none of the STAs are in the Routine Operations Phase of the new TBEL requirements, so there is still an expectation that operations will be adjusted (either by the district or by time) to meet ultimate discharge standards. Additionally, various reconditioning projects and several new research experiments were ongoing or initiated this year.

Consequently, the panel feels that the appropriate level of review is Technical and Accountability, in that order. When all STAs are operated under the Routine Operations Phase, the levels of review may reverse, but this appears to be at least several years in the future. As with all chapters, integration is a component of the review, but for Chapter 5, integration is not as significant as in some others. Nevertheless, the panel also recommends more integration of Chapter 5 with other chapters describing District activities (see below).

**Technical**

The findings and conclusions in this chapter were generally well supported by "best available information", and interpretations generally were sound. However, the descriptions of several ongoing and newly initiated experiments designed to address continuing questions about STA performance did not adequately describe the specific problems, goals, objectives, methods and anticipated timelines or results. For the analysis of outflow TP versus the rate constant *k* and TP loading rate (Figure 5-24), the criteria used to select specific flow-ways and/or cells were not clearly explained.

**Accountability**

Chapter 5 draft presents a defensible scientific account of data and findings for the areas addressed. The findings, in general, are clearly linked to management goals and objectives. In addition, the chapter explains the technology-based effluent limitation (TBEL) requirement for all STAs (except STA-3/4), and an analysis showing that the STAs were all in compliance with NPDES permits and TBEL requirements in WY2008. Missing from the writing, though, was a clear explanation of how accountability will be evaluated as restoration efforts continue.

**Recommendations**

1. Add information about newly initiated studies to examine STA performance, including clear identification of the problem addressed, goals, objectives, methods, and anticipated timelines or results.
2. For studies completed in the water year, include detailed presentation of the results and discussion of their significance, including assessment of how well the study addressed the original goals and objectives.
3. Add a link to Chapter 3A that describes how the District determines whether an STA is contributing to violations of Class III water quality standards.
4. Add explanation about future plans for operation of the demonstration periphyton STA, and about what is planned next in the sawgrass mesocosm assessment.
5. Strengthen integration with other chapters covering District activities, for example, integration of exotic species management strategies (Chapter 9) into evaluation of STA performance, and integration of information on mercury concentrations in fish with Chapter 3B. Integration should include evaluation of how STA performance in reducing/ not reducing total nitrogen is affecting downstream ecosystems. For example, STA-5 had statistically higher N concentrations at the outflows for more than a third of the samples.

## *CHAPTER 6: ECOLOGY OF THE EVERGLADES PROTECTION AREA*

Assigned Levels of Review**:** Primary – Technical; Secondary – Integrative

The level of review for Chapter 6 is primarily technical because its emphasis is on research. The secondary review as integrative is also appropriate, since the ecology of the EPA affects or is affected by many of the other units (Lake Okeechobee and, indirectly, the Kissimmee basin, STAs, some of the Southern Estuaries, etc.). The overall nature of the chapter is not expected to change within the next five to ten years because many basic research questions about the ecology of the Everglades ecosystem remain to be answered.

**Technical**

The findings and interpretations related in Chapter 6 are sound, and supported by the best available information. The technical review included many suggestions and comments (see web board) because some studies were not described in sufficient detail to evaluate. The panel's detailed comments all were carefully considered and addressed by the authors, and the helpful information contained in the responses is to be included in the final chapter.

**Integrative**

The large research programs addressing the ecology of the EPA were presented so that overall goals were both clear and linked to descriptions across the chapter. With few exceptions, the projects were presented so that the overall goals were also clearly linked to management and restoration goals. Table 6-1 provided an excellent overview framework, and the hydrological setup section also integrated key processes. However, there was little cross-referencing to other chapters, and little by way of integrative data summaries and analyses bridging projects.

**Recommendations**

1. Chapter 6 should be more strongly integrated with other efforts by including more cross-referencing to other chapters; it should also be more internally integrated across the EPA research projects.
2. The Summary should briefly convey how the various subsections are being integrated to examine all of the levels of biological organization being studied in the EPA.
3. An overall "Conclusions" section should be added to integrate the major findings and interpret how they will guide future efforts.
4. The Plant Ecology section should include an introductory description of the integration of the various subsections, and clearer rationale for these studies as related to management and evaluation of restoration efforts.
5. Chapter 6 in future SFERs should include the level of detail indicated in the panel's detailed comments to facilitate evaluation of technical merit.
6. The Algal Polysaccharides section should be strengthened by clarifying the significance of the findings, and by explaining how water levels directly affect differences in periphyton composition and structure.

## *CHAPTER 7A: EVERGLADES RESTORATION UPDATE*

Assigned Levels of Review: Primary – Accountability; Secondary - Integrative

This chapter requires an accountability level review as it is primarily reporting on the status of ongoing and planned restoration activities. It also has an integrative aspect because restoration is an end product of a management decision based on the results of several research activities.

**Accountability**

The past year has been significant in terms of the goals of CERP. Measuring the effectiveness of implementing CERP continues to be a cornerstone to the combined efforts of several agencies in securing the ecological and economic viability of the Northern and Southern Everglades. Renaming the chapter reflects the overall objective of this effort. Reorganizing the reporting framework into the Northern and Southern Everglades helps clarify both the activities/results relationship and the integrated nature of this massive project. The panel therefore supports these changes as reflecting the ongoing effort on the part of the District to keep the public informed and involved, and to "embrace a more holistic approach to ecosystem restoration through advancement of the Northern and Southern Everglades initiatives."

**Integrative**

CERP can be considered as the point where the science/management integration continuum plays out at both the watershed and landscape levels. Reorganizing the reporting framework emanating from the Greater Everglades Ecosystem into the North and South Everglades should allow more direct comparisons as well as greater integration at the management level.

The way this chapter is organized helps the reader understand the relationship of ecological programs to CERP activities, and also leads to logical conclusions as to the pace and status of the overall restoration effort. However, as has been noted in the 2008 SFER public review, the panel continues to feel that the point should be made explicitly that, even after implementation, adaptations to future plans will be forthcoming - because the results of the ongoing monitoring programs, referred-to as the overall CERP implementation process, will continue to influence future research and management activities.

The panel also strongly supports the overall goals and organization of the watershed research and water quality monitoring program for both the St. Lucie and Caloosahatchee watersheds. The panel is particularly supportive of the input of all new information gained into the adaptive management process.

**Recommendations**

1. The long-term vision of interaction between environmental flows, generated as part of all CERP restoration projects, and the water flows for water supply and flood control in South Florida should be clarified.
2. The update for each project should include a brief explanation of the water level/flow benefits as well as related water quality and ecologic benefits. For example, the Ten Mile Creek project is completed, but it has not been put to beneficial use. Clarification of what was it designed to achieve, but has not yet achieved would help the reader understand the complexity of the problems being addressed.

## *CHAPTER 7B: RECOVER ACTIVITIES UPDATE*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

This chapter fulfills the reporting requirements as specified in the SOW. It requires an accountability level review as it is primarily reporting on the status of ongoing and planned restoration activities. It also has an integrative aspect because restoration is an end product of a management decision based on the results of several research activities.

**Accountability**
The panel supports the concise manner in which this chapter is organized and presented. The concepts underlying the RECOVER program, including organizing and applying scientific and technical information in ways that are most effective in supporting CERP activities, are the basis for the Adaptive Management strategy. The Monitoring and Assessment Program helps link science and management in a system-wide planning, evaluation, and assessment process that will keep CERP and its related programs at the fore of the restoration effort for both the Northern and Southern Everglades.

**Integrative**
The panel continues to support the logic that the RECOVER program is essential to any assessment of the overall ecological health of the South Florida region (physical, biological, chemical parameters), particularly in terms of measuring the impact of CERP initiatives. The Adaptive Management Program is precisely what the panel had in mind in terms of further integrating the results of a number of related research activities into the overall management of the region and the preparation of the SFER.

Perhaps one of the most fundamentally important sections of this chapter is the "Desired Restoration Condition." The panel strongly supports the concepts presented here as being logical and underlying the ability of science to better manage the Everglades *toward* a number of management goals. Science may be able to indicate the precise species composition of a given area at a given point in time, but what is realistic given the permanent alterations that have occurred to the landscape dictates a management context that supports economy in spending public funds without redundancy.

The suite of restoration metrics seems logical to the panel but should be closely monitored as to cost and impact in understanding the success of CERP implementation. The panel repeats its contention that measuring natural variability is a very inexact science at best, incremental in nature and can only influence the general direction of future research and restoration efforts.

**Recommendations**

1. Clarification about how the hypothesis (the 'why' questions) will be tested should be included in the chapter.
2. The concepts presented in the section on Desired Restoration Condition are important to understand the reality of CERP and what it can help attain in the mid- to long-term in South Florida. These concepts should be incorporated into other parts of the SFER in future years.
3. If the hypotheses underlying restoration are to be statistically tested, there is a possibility that, as the number of samples increase over time, 'n' in the statistical equations will increase to the point where the hypotheses are statistically significant, but not ecologically significant. This issue should be clarified.

## *CHAPTER 8: IMPLEMENTATION OF THE LONG-TERM PLAN FOR ACHIEVING WATER QUALITY GOALS IN THE EVERGLADES PROTECTION AREA*

Assigned Levels of Review: Primary – Accountability; Secondary – Integrative

This chapter fulfills the reporting requirements as specified in the SOW. It requires an accountability level review as it is primarily reporting on activities aimed at achieving water quality in the EPA, a principle objective in the overall Everglades restoration program. It also has an integrative aspect because achieving water quality standards implies inputs from several scientific disciplines as well as management that take into account important aspects of many stakeholders.

**Accountability**

The panel notes that the logic of this chapter as a stand-alone component to be more obvious given the direct relationship between actions undertaken and results being measured, but suggests that it be read together with chapter 3A, and cross-referenced with the results presented in chapters 4, 5, and 7A.

**Integrative**

The panel notes the overall progress realized in reducing TP levels into areas south of Lake Okeechobee through the implementation of a variety of actions. The panel continues to be aware of the impacts of the low Lake levels on the measured TP levels in recent years in all areas south of the Lake. The panel is also interested to know if a pulse of downstream P resulted in 2009 with the return of above average water levels in the Lake (above the 4% level of contribution that is currently recorded). While TP remains the most notable indicator of water quality, it is clear that a number of other criteria, such as sulfur, will influence water quality and must be taken into account in defining acceptable water quality overtime.

**Recommendations**

1. The panel notes the efforts to consolidate data collection strategies and parameters of the many mandates to which the District is responding. The panel supports development of a ‘core’ set of parameters that should be maintained overtime as well as opening a discussion with the regulatory agencies to revise the parameters considered fundamental to comply with any particular mandate.
2. The panel concurs with the recommendation to continue the transect monitoring at sites that will augment those being incorporated into the long-term compliance permit for STA-2 as noted in lines 379-382 for a period of three years, particularly given the positive results of the first phase of this project noted to date and the neutral budget impact implicit in this recommendation.
3. The panel also supports the recommendation to extend the life of the “Determine the Relationship” project. It is the understanding of the panel that many CERP projects are still in the early planning or implementation stages and therefore unclear as to how they will impact water quality. A coordinated water quality monitoring and reporting plan will obviously have to be put in place in order to be able to make specific recommendations for long-term water quality policies and to manage the expanding administrative reporting costs of so many agencies and programs.

## *CHAPTER 9: STATUS OF NONINDIGENOUS SPECIES IN THE SOUTH FLORIDA ENVIRONMENT*

Assigned Levels of Review: Primary – Accountability; Secondary – Technical

Currently this chapter has been assigned an Accountability Review, with Technical as the secondary review. Instead, the panel feels that Chapter 9 should be assigned technical as the primary review, followed by integration. The issues and problems with invasive species are in their infancy, particularly with respect to animals. While the plant invasive species have been examined in detail, and there are several control programs, there is considerable description (delineation of the problem), research, management and synthesis that must be addressed before this topic can be relegated to an accountability review.

**Technical**

Inclusion of the stoplight approach for evaluating the present status of key nonindigenous and invasive animals is an excellent start and focuses appropriate attention on the most severe problems.

The draft chapter did not provide an appropriate overview, however, of the species that pose the greatest threat to ecosystem structure and function within the Everglades, nor of those that may do so in the future. Moreover, it did not include all nonindigenous species for which there is information – instead, readers are referred back to the 2008 SFER. Thus, while time and space constraints understandably impose some limitations, the draft chapter for the 2009 SFER fell short of its intended purpose, namely, to update readers about the status of exotic species in the South Florida ecosystems. The chapter needs to include such an update or, alternatively, the chapter should have an accompanying updated appendix that contains present information about nonindigenous species so that this important information update is presented in the SFER, and so that managers, public-policy makers, scientists and other stakeholders can find the updated information in one place.

**Integrative**

The stoplight report cards for some of the species (especially the categories, “Interagency Coordination” and “Regulatory Tools”) provide a strong integrative framework, species by species. The potential impacts of invasive species were described as an emerging, high priority for CERP planning, but there was no indication given as to how the District plans to consider exotic species, across South Florida ecosystems, in evaluating and refining performance measures based on desirable organisms or conditions that are adversely affected by them. As an example, Chapter 9 should explain how the District plans to consider the serious threat that green mussels (which went unmentioned in the draft chapter) pose to use of eastern oyster populations as valued ecosystem components in hydrologic restoration efforts in some of the Southern Estuaries.

Since there are no specific laws and regulations that relate to specific invasive species, there is no clear mandate for accountability. There is, however, a need to evaluate the role of endangered species in overall ecosystem structure and function within the Everglades, and to track the extent of damage, and to report on management. The draft Chapter 9 did not handle this aspect well in that there is no synthesis of all invasive, nonindigenous species, no table with all invasive plants and animals with their potential for disruption, no list of the worst species

(both plant and animal), and no clear description of how management of invasive species relates to direct restoration goals within the Everglades.

**Recommendations**

1. Provide some quantitative information on both the extent of concern and of management. While the stoplight approach provides an excellent overview, it does not provide specifics of the spatial and temporal problem.
2. Strengthen the Summary: This important section should clarify the major findings and achievements for the water year. It should also mention the worst exotic species problems (plant and animal), as well as some (albeit few) "success stories" in their management, control or eradication to show that, at least for some species, with concerted effort, control can be achieved that leads to restoration of the Everglades.
3. Include a flow chart of agencies/entities engaged in assessment and management of specific nonindigenous species within each module.
4. Improve emphasis on exotic animal species.
5. Include a summary of the role of invasive species control in management of aquatic ecosystems (hydrology, VECs, PMs) within the different units.
6. Relate nonindigenous species management and control to specific recovery goals, which relates to a management strategy and evaluation of the overall critical species to control. Integrate invasive species concerns in relevant chapters when a given invasive species affects ecosystem structure or function.
7. Foster and require integration of invasive species effects into all ecology studies (Chapter 6), considering that invasive species are one independent variable affecting nearly all species involved in the overall Everglades recovery effort. This integration should include examining the effects of invasive species on performance measures.
8. Develop a companion document that has the latest information on all nonindigenous species so that the public and public policy makers can find the latest information on all species. This should be accompanied by a stoplight icon for each species where information is known and quantitative information where available.
9. Integrate the presence and effects of nonindigenous species into the overall research plans, including the Everglades Research Plan and the Coastal Ecosystem Strategy (Chapter 12).
10. Consider, evaluate, and discuss methods of evaluating potential impacts before species reach such critical stages of invasive effects. This may require a synthesis of the global literature.
11. Develop a permanent document that has the stoplight approach for all species. This would entail adding new species as they are found, substituting those priority species that are updated each year, and placing all this information in one place (on a website or searchable document). This document should have a reference list associated with each species. If started now, this would be possible to achieve.

Recommendations 1 through 6 should be addressed by the SFWMD and recommendations 7 through 11 should be considered by the District and other agencies dealing with exotic species.

## *CHAPTER 10: LAKE OKEECHOBEE PROTECTION PROGRAM—STATE OF THE LAKE AND WATERSHED*

Assigned Levels of Review: Primary – Technical; Secondary – Accountability

The level of review of this chapter is primarily technical because there is still a major research component and new data are being analyzed and presented. This chapter reports methodological details and explanations of the new findings.

**Technical**

The chapter is too long and not very readable. Shortening the overall length of the chapter by providing a summary table with all the programs may improve reader understanding. Further, the watershed research and lake research-oriented sections can be integrated more closely and also linked with the results reported on other ecosystems.

As this chapter matures toward accountability status, it is time to consider refocusing the watershed-oriented sections of the chapter on nutrient loading and nutrient load controls and the lake-oriented sections to lake status only. The watershed research and lake research-oriented sections can be integrated more closely within those two major sections beginning with the 2010 SFER. The management section should also be expanded to include watershed management activities so there is a closer link between watershed management and lake management because the idea is to manage the water quality in the lake to support a range of priority uses and that goal is ultimately linked to watershed management. It is important to recognize that, although many in-lake management actions (e.g., vegetation and water-level management) are not directly related to nutrient loads or water quality, they may be indirectly related. Further, legacy sediment nutrients are likely related to historic watershed activities, and thus the long-term effects of current and future nutrient loads can be compared to historic loads and legacy nutrients in the lake.

The assessments of watershed and in-lake management activities should also include costs so that in addition to performance being measured in terms of nutrient removal, it can also be measured relative to capital and operating costs per unit nutrient removed. As BMPs in the watershed and lake will eventually be assessed in terms of nutrient removal and cost effectiveness, a pilot effort should be initiated as soon as budgetary resources permit.

**Recommendations**

1. In this chapter, a chemical treatment study to analyze whether directly adding iron, aluminum and/or calcium to the lake will reduce the internal P load is discussed. It is mentioned that this study is focused only on source control measures and that the preliminary studies discussed on page 10-49 addressing internal loading are a separate line of investigation and not included in any formal agency management plan. The panel would like to draw attention to the fact that adding iron directly to the sediment has been a successful measure to reduce the internal P load in several lake restoration projects around the world. We think that *in situ* experimental studies may be useful and we suggest including these in future research programs.

2. On page 10-54, 4$^{th}$ paragraph, the discussion about sensitivity of in-lake sulfate concentrations to surface-water inputs could be put into the context of simplified water quality models for conservative materials which would make clear the relationship of surface-water inputs to in-lake

concentrations. Figure 10-11, panel B shows that the lake is a concentrator of sulfate either through evaporation or trapping of higher sulfate waters within the lake. Plotting surface-water loading on the X-axis would produce a similar plot and be more related to the simplified model analysis. The model would provide a predictive tool that would yield in-lake concentration changes with changes in the surface-water input.

3. Information is given about the levels of mercury in the fish populations in the lake and it is stated that this is a concern. We recommend discussing which measures should be taken to lower these levels of mercury with the panel and/or other stakeholder groups.

4. A lot of research is going on concerning the effects of Submerged Aquatic Vegetation (SAV) on water quality. From the text it not clear whether the drop in the nearshore TP concentrations are mainly due to the vegetation directly or due to the associated periphyton. This issue should be clarified in the present SFER.

5. The authors mention in this chapter that lower light conditions are mainly responsible for the increased diatoms: cyanobacteria ratio. But low light conditions are more favorable for cyanobacteria. In the response to our comments it is, however, stated that mainly the higher turbulence brings the diatoms from the sediment to the open water. We therefore recommend to clarify that most probably re-suspension of the diatoms is responsible for the increased diatoms:cyanobacteria ratio.

***CHAPTER 11: KISSIMMEE BASIN***

Assigned Levels of Review**:** Primary – Accountability; Secondary – Technical

Although the chapter is strong in all three review areas the panel deems it more appropriate at this stage to conduct primarily a technical review, and secondarily an integrative review. The overall nature of the chapter may change to more of an accountability emphasis after 2013 when it is projected that the Headwaters Revitalization Schedule will begin to be implemented.

**Technical**
The technical information, research approaches, and findings and interpretations contained in Chapter 11 are generally sound and supported by best available information. The technical review included many suggestions and comments (see web board) because some studies were not described in sufficient detail to evaluate. The panel's detailed comments all were carefully considered and addressed clearly and adequately by the authors.

**Integrative**
The bioaccumulation of mercury is described as a major water quality issue in the Kissimmee watershed, which includes 20 water bodies that are under some level of health advisory. However, there was no apparent integration of mercury across the Kissimmee basin and other areas of South Florida.

**Recommendations**
1. Chapter 11 in future SFERs should include the level of detail indicated in the panel's detailed comments in order to facilitate evaluation of technical merit.

2. Invasive species should be more clearly integrated into adaptive management for restoration in the Kissimmee watershed. The Kissimmee basin is not mentioned in Chapter 9 of this year's SFER, and exotic species in the Kissimmee basin were only briefly inventoried in Chapter 9 of the 2008 SFER. Thus, consistently missing in Chapter 9 and Chapter 11 is a scientific analysis of how exotic plant and animal species are affecting the Kissimmee basin and restoration efforts. The panel suggests the inclusion of such an analysis in Chapter 11 of the 2010 SFER, if it continues not to be covered in Chapter 9, because exotic species clearly are important to restoration success in the Kissimmee basin.
3. The mercury analyses (fish tissues) should be integrated with other South Florida ecosystems (Chapter 3B).
4 .Increased phosphorus levels at the southern end of Lake Kissimmee are as-yet unexplained and could confound management goals. The steps being taken to identify the sources of this elevated phosphorus should be clarified if hydrological conditions permit, and progress assessed in the 2010 SFER.

***CHAPTER 12: MANAGEMENT AND RESTORATION OF COASTAL ECOSYSTEMS***

Assigned Levels of Review: Primary: Accountability; Secondary: Integrative

This chapter was to be reviewed primarily at the accountability level, yet the status of activities and progress across the estuarine systems considered is much more at the technical level. Secondary reviews at the accountability and integrative level are appropriate because of the determination of the adequacy of freshwater inflows and appropriateness of nutrient and other constituent loads and the ubiquitous distribution of estuaries along the Florida coast as well as the integrative response of estuarine water quality and biota to the inflows of freshwater.

**Technical**

Although the findings and conclusions generally seemed to be supported by "best available information", in various places throughout the writing, it was not possible to evaluate technical merit because insufficient information was given.

SAV typically refers to submersed vascular plants. The "lumping together" of seagrasses and macroalgae, apparently done for presentation of SAV information in all of the Coastal Ecosystems except Florida Bay, conveys serious misinformation because macroalgae (including some species of *Caulerpa*, mentioned repeatedly in the chapter as "SAV") are not indicators of good ecosystem health. Instead, macroalgae can be indicators of excessive nutrient pollution, and under such conditions they commonly overgrow and kill seagrass meadows.

The nutrient bioassay study for the St. Lucie Estuary (SLE) was conducted in an abnormally dry year. There was no indication given as to whether the District plans to repeat it in a more average-precipitation year, with more normal precipitation distribution among seasons. It is likely that the phytoplankton would respond quite differently. Remarkably, the extremely important watershed trend data for the SLE were not shown. The trends were not interpreted, and clarification was not given for inclusion of the S-50 structure on the C-25 canal. Moreover, the data were not interpreted relative to other estuaries of similar size or watershed size. Water quality targets were not mentioned.

One point raised by the panel last year that was not sufficiently addressed in the 2009 SFER draft or in the authors' responses to Panel comments was the use of simplified water quality models to address immediate study needs. It was pointed out in the initial review of the 2008 SFER Appendix 12-1 draft that finite segment, mass-balance based, spreadsheet-based, steady-state models would be powerful tools useful in each one of the coastal systems the District manages. The value of using simplified models to develop an understanding of an estuarine system and to drive the determination of the dominant water quality processes should not be underestimated.

Simplified models do not diminish the ultimate importance of the sophisticated water quality models, for it is recognized that such models have great value but do take time and money to develop. But directed estuarine research and adaptive management need not wait on the development and application of sophisticated models to move forward. One may reach a point at which the simplified models may not provide enough information to decision makers and that the sophisticated models become the models to use, but the bridge from the early decisions based on reasonable understanding of the estuarine systems to later decisions based on an enhanced understanding is the simplified model. Such as been the practice in the water quality field for decades, and even water quality modeling experts who developed sophisticated water quality models early in their careers like Donald O'Connor, Robert Thomann, and Steven Chapra have supported the value of simplified models and published widely on their use.

**Accountability**

The draft of Chapter 12 unfortunately did not present a defensible account of data and findings for the areas being addressed that is complete and appropriate. The status of District activities and progress across the estuarine ecosystems is far from routine, indicated this year even by the format which represents, in some portions, a striking departure from the excellent structure of last year's chapter. A major departure from the structure of the 2008 SFERs Chapter 12 is the lack of supporting appendices for the estuaries that are highlighted (Caloosahatchee, St. Lucie Estuary-Indian River Lagoon). For example, the Watershed Trends section of Chapter 12 in the 2009 SFER described some of the best data apparently available for the highlighted system, the SLE, but none of the data were shown and there was no supporting appendix to which readers could refer for the information. Moreover, interpretation of the trends was lacking; appropriate nutrient loads for the SLE were mentioned but not given, etc. This lack of appropriate detail contrasts markedly with the information given for Florida Bay, the highlighted system in Chapter 12 of the 2008 SFER.

In addition repetition of the exact template for each of the estuaries is not very informative, especially when little or no information pertinent to the given system is provided. The chapter should instead contain a preface that contains this template information. Then, within each section, the unique information for each system should be presented (see specific examples in web board comments).

The excellent Tables 12-1 and 12-2 should be retained in the chapter as well as the format of an estuary highlighted, with sufficient information for evaluation including, if necessary, supporting appendices, and following a rotational schedule. For the highlighted system(s), there should be a strong section on progress in the system during the Water Year.

Additions and updates include a planning chart for each section that clearly presents priorities and planned milestones in the next 1-2 years; a table of major District efforts and accomplishments for the Water Year in each of the estuaries; and sufficient information included for scientific evaluation of methods for planned or in-progress studies (see specific examples in web board comments). To strengthen integration among the coastal ecosystems, a section should be added that considers linkages between them such as climate change, which has not yet been addressed in this chapter.

There are significant issues with the material presented and lack of follow-up to the presentation of the Coastal Ecosystems Division (CED) Science Plan reviewed as part of the 2008 SFER. Last year the Panel was asked to review the Division's Science Plan, and it was the Panel's first glimpse of the overarching approach being used to guide the research, management, and restoration of the District's coastal systems. It was noted that the CED had constructed an approach for coastal ecosystem management that was basically sound as a solid starting point for managing the coastal ecosystems, the waters that flow into them, and their watersheds, but it was incomplete. It was further noted that the Plan was an integration of science, engineering, and management within the District and perhaps most importantly it began to elevate the value of freshwater inflows (and their needed spatial and temporal variability) to Florida's southern estuaries to a level commensurate with municipal, industrial, and agricultural water supply. Points the Panel raised about the Alber's conceptual model, the narrow focus on salinity, and the exclusion of nutrients were addressed constructively by the CED in modifying Figure 2 of Appendix 12-1 in the 2008 SFER to reflect the inclusion of nutrients and nutrient processing. The CED discussion is continued in the 2009 SFER draft as Figure 12-3 that is intended to describe the "relationship between applied research and modeling programs, driven by adaptive management, loads, salinity envelopes, and environmental operations." In the figure, the latter three appear to be end points, not drivers; water quality is normally considered to be the end point of modeling, not the other way around; and the role of adaptive management and alternative management systems are absent. In the end, the relationship of these three approaches is confusing.

Integration among the Coastal Ecosystems, however, has not been attempted. There are also missed opportunities in Chapter 12 for integration with other South Florida ecosystems. Are there plans to measure in some fashion how well the coastal systems are managed relative to freshwater inflows, nutrient loads, etc.? As other examples, the chapter states that ~50% of the TN loads and ~30% of the TP loads to the Caloosahatchee River estuary are added by freshwater discharge, mainly from Lake Okeechobee. This is an opportunity to link to Chapter 10, and to recognize the importance of controlling N as well as P outputs from the Lake in controlling the health of downstream ecosystems. In describing roseate spoonbills in Florida Bay, no attempt is made to link to the excellent information provided in Chapter 6. On the other hand, integration is shown in the Biscayne Bay section of this chapter, where readers are referred to Chapter 7 for more information on the CERP Biscayne Bay Coastal Wetlands Project, which is designed to restore some overland freshwater flow to coastal wetlands in the southern Bay.

**Recommendations**

1. Continue to develop the Coastal Ecosystems Division's Science Plan to the point that it has a coherent, scientifically-based plan that will account for constituent loading and its effects on water quality and biota, water uses and water quality criteria to support those

uses, and management systems that can reduce loads and other perturbations on the system so that desired uses can be sustained;

2. Use this Plan to determine how the basic research, management, and restoration tenets of the Plan can be incorporated into the management of the coastal ecosystems.
3. Develop and use simplified water quality models (such as finite segment models) for all of its estuarine systems.
4. Routinely provide the following information on an annual basis to get a sense of the "state of the bay" for each of the Coastal Ecosystems:
    a. Physical characteristics such as volume at mean tide, surface area at mean tide, average depth at mean tide, measures of tidal exchange such tidal prism, major currents, major geomorphic features;
    b. Hydrologic characteristics such as annual average inflows by year for previous 20 years at least, annual average hydraulic residence times by year, average annual constituent residence times, fraction of freshwater;
    c. Water quality characteristics such as annual average and median concentrations as well as temporal variations of key constituents (salinity, dissolved oxygen, organics, and nutrients) bay-wide and spatially that convey general information about water quality conditions throughout the estuary;
    d. Biological data such as general concentrations (volumetric, areal, etc. as appropriate) of primary producers (phytoplankton, submerged aquatic vegetation) and secondary producers (zooplankton, benthic organisms, key species/VECs), and associated organisms.
5. Add an additional table that lists major District efforts and accomplishments for the WY in each of the estuaries.
6. Add a table of Performance Measures for each system.
7. Develop a realistic plan for restoration of each of the Coastal Ecosystems (establishment of MFLs, water reservations, necessary models, etc.) and for integration of their data.
8. Interact with the authors of Chapter 2 to develop measures that reflect the management effectiveness of providing the amounts of water needed to sustain the Caloosahatchee River and St. Lucie River estuaries.
9. Strengthen integration among the Coastal Ecosystems through common linkages which affect all of the estuaries beyond hydrology and water quality such as climate change. That is, what are the anticipated impacts of climate change on the estuaries?
10. Strengthen integration of the Coastal Ecosystems with inland systems such as Lake Okeechobee. In this case, it is linking Lake Okeechobee operations (aka water releases) with the freshwater inflow needs of the estuaries. In essence, what happens in the upper part of the river basins (i.e., Lake Okeechobee) needs to be integrated more strongly with what happens in the coastal systems.
11. Provide adequate information for each estuarine system to permit evaluation of technical merit throughout the chapter.
12. Present information on SAV distribution and status separately from data on macroalgae, and provide interpretations as to whether the macroalgal growth is beneficial or potentially undesirable.
13. Clarify whether the nutrient bioassay studies described in the chapter, which were conducted in an abnormally dry year, will be repeated in a more average-precipitation

year, since phytoplankton responses would be expected to differ markedly in drought versus average-precipitation years.

14. Add data and interpretations in the revised chapter on watershed trends in water quality, including water quality targets and comparisons with other estuaries of similar size/watershed area.

***REFINEMENT TO THE PEER-REVIEW PROCESS***

The panel notes that ten years ago one of the current reviewers of the 1999 Everglades Interim Report wrote the following:

> *The Everglades Interim Report is a major compilation of a wide variety of environmental data, information and plans. In my opinion, science is just beginning to develop the methodologies to present integrated environmental information over such a large scale as the Everglades Protection Area. Science has tended to break the environment into narrow disciplines with each reporting its own findings using its own terminology in its own refereed journals. The report makes a valiant effort to integrate the many studies and disciplinary findings needed to restore the sustainability of the Everglades. I commend the authors for their contribution to the emerging efforts to present environmental data and information in an integrated manner.*

Ten years and ten reviews later, it is obvious that production of the annual SFER has greatly advanced integrated environmental reporting, especially within the context of a water management organization. This does not mean that the reporting has reached an ongoing, steady state process, but it does indicate that the authors of the SFER are on the leading edge of such reporting. Ten years is a milestone where it is appropriate to ask the questions presented to the review panel in the SOW regarding scientific review of the annual SFER report.

Before answering the questions, however, the panel wants to note that peer review is most often, in the scientific community, associated with vetting research proposals for funding and assessing papers for publication in scientific journals. In other words, methods to conduct research and/or results of research are reviewed for quality before acceptance. Review of the SFER falls into the latter type of review – reviewing results. It must also be pointed out that report authors, involved in research, also participate in disciplinary peer review, thus adding to the sound science of their research methods and results in ways the SFER review panel cannot address.

The Panel's charge and focus in reviewing the SFER over the past ten years has, in some cases, changed from reviewing science being developed to support management to reviewing management's implementation of science within ongoing, routine, operations. As this shift has occurred, key water management missions (i.e. flood control and water supply) must be carefully balanced against the economic and operational limits in implementing science.

The SFER, being a blend of hydrologic and ecologic descriptions, research and planning reports, monitoring assessments, project updates, and public input, presents a review panel with a

challenge – review the science associated with protecting the environment within a context that demands the flood control and water supply needs of South Florida are met.

For each chapter of the SFER the panel suggests the following type of reviewer best suited to provide a significant contribution:

*Chapter 1*: The main purpose of this chapter is to communicate what is to follow in the SFER. Thus this chapter should be reviewed by all panel members with the Chair providing any summary comments.

*Chapter 2*: The AA reviewer for this chapter should be experienced in water resources and hydrology with particular experience in water conveyance systems in areas experiencing floods and droughts and the management of water resources for municipal and industrial water supply, irrigation agriculture, and freshwater inflows to estuaries. Familiarity with management of reservoir systems is especially desirable.

*Chapter 3A*: If the current monitoring reengineering efforts causes major changes in the data used in Chapter 3A's evaluation of standard compliance, then additional technical review may be necessary. As it stands, this chapter requires a reviewer who has significant expertise in water quality monitoring and methods to convey water quality assessments to the public.

*Chapter 3B*: As the chapter now stands, it requires the AA reviewer to be an ecotoxicologist because the reviewer must evaluate both biochemical and biological interactions, and be able to place the mercury/sulfur problem within a context of overall Everglades degradation, functioning, and recovery. The reviewer also needs to understand trophic level interactions, as well as fate and effects of mercury within aquatic ecosystems. Because of the complex nature of the interactions of mercury (and sulfur) within the Everglades system, this reviewer should have a broad understanding of the role of mercury within both the biotic and abiotic components of the system. The ecotoxicologist will need to have either a strong ecological/biological background, or a strong toxicology background. The A reviewer should have a firm grasp of the same issues, but a different mix of disciplines. Other key expertise for the secondary reviewer includes biochemistry, biogeochemistry, and systems approaches (engineering or modeling). Since the effects of the mercury problem are primarily on top-level consumers (including humans), it would also be desirable for the A reviewer to have some experience with consumption patterns (for humans), feeding regimes (for other biota), and toxic effects on key species such as wading birds, predatory fish, and humans.

*Chapter 4*: This chapter has changed dramatically over the years. In the past it was primarily a technical chapter as the science behind the phosphorous issue was discussed. Since the phosphorous standard of 10ppm was instituted, there is less technical science needing review in this chapter. As the chapter focuses on BMPs in the Northern Everglades, there will be research presented on how to evaluate the effectiveness of new BMP's. Thus the primary reviewer should still have an agricultural background in general and an ability to understand evaluation techniques as well as policy issues.

*Chapter 5*: The primary reviewer for Chapter 5 should continue to be a civil/environmental engineer with expertise in water quality remediation and preferably with experience in the regulatory environment. The secondary reviewer should be an ecologist with knowledge of microbiology and expertise in aquatic botany. Both reviewers should be comfortable with aquatic chemistry.

*Chapter 6*: The AA and A reviewers for this chapter should be ecosystems ecologists with experience crossing from freshwaters to marine coasts. The AA reviewer should have a broad understanding about wetland/aquatic flora and fauna at the terrestrial/aquatic interface, and should also be proficient in evaluating nutrient cycling and other biogeochemical data in water and saturated soils. Expertise on the ecology and physiology of periphyton and wetland/aquatic plants would be advantageous as well. The A reviewer should be experienced in trophic-level interactions, from periphyton biofilms to fish and wading birds. It would be helpful for the B reviewer to be knowledgeable about aerial mapping/interpretation, Geographic Information Systems, and groundtruthing.

*Chapter 7A*: A generalist with a land use planning and water policy background would be appropriate for this chapter.

*Chapter 7B*: A generalist with land use planning and/or ecology background seems logical.

*Chapter 8*: A generalist with natural resource planner and land use planning/management background is appropriate.

*Chapter 9*: This chapter requires an AA reviewer with an overall ecological/biological base who has dealt with a wide range of species, both native and non-native. Experience with invasive species within complex ecosystems is also essential. Expertise in ecology/biology with invasive species experience and the ability to synthesize a broad range of information on a diversity of plants and animals is needed. The A reviewer should also have a broad knowledge of ecosystems and trophic level relationships. It would be helpful, as well, to have both terrestrial and aquatic expertise represented in the AA and A reviewers.

*Chapter 10*: As the chapter stands now, the AA reviewer should be a limnologist. Expertise in shallow lake ecosystems and nutrient dynamics would be especially helpful. The A reviewer should be an ecosystems specialist, and the B reviewer a more general ecologist.

*Chapter 11*: The AA reviewer for this chapter needs to have broad expertise in the limnology of both lotic and lentic ecosystems. The reviewer should be able to evaluate data spanning an array of topics including geomorphology, biogeochemistry, hydrology, littoral zone and flood plain functioning, and wetland plant physiological ecology. The A reviewer should have expertise on the dynamics and health of aquatic faunal assemblages and wading birds, and trophic-level relationships. It would also be helpful, based on some versions of this chapter and supporting appendices, for the B reviewer to have hydrologic modeling expertise.

*Chapter 12*: The AA reviewer for this chapter should be experienced in water quality management, particularly status and trend analysis of estuarine water quality and if possible

biota, estuarine ecosystem science, and hydrologic/water quality modeling. The A reviewer should be well versed in estuarine ecology, including broad understanding about multiple trophic levels ranging from phytoplankton (including noxious or harmful blooms), macroalgae and benthic microalgae to macroinvertebrates (VECs oysters, pink shrimp), fish, birds, and mammals. Both reviewers should also have a solid understanding about chemistry at the sediment/water interface, and the growing array of chemical environmental contaminants affecting estuarine ecosystems.

The panel was asked to address five specific questions regarding the review process. These included:

*How long should panelists serve?*

The most basic answer to this question is, "as long as the District gains value from a panelist's review." The panel recognizes, however, that an argument can be made on both sides of the issue---longevity/experience/understanding of the issues vs. new insights/points of view/criteria in the context of science being analyzed. If technical material in a specific chapter changes with time and the primary review level is technical, then bringing in a new panelist with expertise more aligned with the new material makes sense. The general trend, though, seems to be a gradual shift away from the technical review level and more toward the primary and integrative levels.

*Should participation duration be fixed or flexible?*

Flexible – the timeframe within which research produces knowledge for management implementation can vary. The decision to bring in new reviewers, in the middle of a research effort, where the context is complicated by management needs that can be difficult for a disciplinary scientist to grasp, should be a function of the value of the reviewer's comments during each review cycle. If there is a need to have set reviews of each member's contribution, fixed terms could be assigned to each new member with the possibility of renewal. Otherwise, the current system of simply changing panel members when deemed appropriate appears to be effective and efficient.

*In light of the current and expected content of the SFER, can the number of panelists be reduced?*

There are portions of the SFER where consistency is beginning to appear and a longer period between peer reviews may be scientifically justified, if legally permissible. Yet, a change in the number of panelists would be inversely related to the expected work load of the panelists. The current expectation is 60 hours per panelist, which is lower than actually invested. If the number of panelists was reduced, the expected workload would necessarily increase unless specific chapters were eliminated. In addition, fewer panelists necessarily correspond to fewer areas of expertise and a narrowing of perspectives. If anything, the number of panelists should be increased on an ad hoc basis to increase the diversity of expertise. An area of expertise lacking within the current panel makeup is a true aquatic chemist or biogeochemist to review mercury and sulfur issues.

*Are changes needed in the makeup of the panel in response to changes in report content and critical issues? What areas can be reduced and what areas need to be expanded with regard to the panel's composition?*
The list above on chapter expertise addresses this question. However, from a science perspective, the panel's past makeup has been appropriate for the topics being addressed in the SFER. As the sophistication of the reporting continues to evolve, there will come a time when the length of the report and its ability to communicate readily and correctly with the public, will become more of an issue than it is at present. Thus, SFER review could benefit from a panelist who specializes in communicating ecological and water-related scientific, technical, and management oriented information to the public. There are technical journalists who specialize in this type of reporting.

*What examples can the panel provide of the replacement process for standing panels and what aspects are expected to be particularly useful?*

The National Water Quality Monitoring Council is a standing committee under the Advisory Committee for Water Information (ACWI) that seeks more consistency and compatibility in monitoring data and information via better documentation and development of monitoring methods. Its co-chairs recommend potential members from various constituencies to the Council's executive committee for approval. Members are appointed for 4-year terms that may be renewed.

In general, the panel requires a specific kind of scientist that can both review critically, and interact in a public forum. This is a unique skill, and care should be taken to ensure that all new panel members appreciate the significance of the public aspects. Further, panel members should be able to integrate their particular expertise with that of others across a broad range of disciplines. The panel needs generalists with a firm discipline base – examples: limnologists with experience with trophic level interactions and chemical dynamics; biologists with restoration experience and ecotoxicology; engineers with an understanding of biogeochemical cycles. Panel members need to appreciate both the complexity of this extremely large system, and the dynamic nature of the science and the report itself.