REstoration COordination and VERification (RECOVER)
Evaluation Team, Regional Evaluation Report

TRANSMITTAL LETTER

June 7, 2005

Project Managers and Planning Technical Leads
Acme Basin B Discharge Project
Comprehensive Everglades Restoration Plan

Dear Project Team Managers and Planning Technical Leads,

RECOVER has completed its regional evaluation of the Acme Basin B Discharge Project (ABBDP) alternative plans and our final report is attached.

RECOVER's evaluation of project alternatives fulfills the following requirements as prescribed by the Programmatic Regulations:

1. Support project teams to achieve consistency with the CERP's goals and objectives;
2. Document the performance of the project alternative plans using RECOVER approved system-wide performance measures, project performance measures (when appropriate), and best professional judgment. RECOVER determines the ability of each alternative plan to meet the targets established for each performance measure and describes the resulting effects upon the natural system. When appropriate, RECOVER evaluations include a qualitative analysis on how the project fulfills CERP goals and objectives;
3. Suggest improvements to the project, which if pursued could improve project performance or enhance benefits to the natural system;
4. Provide insight, if possible, and alert the project teams of any inconsistent modeling assumptions for the project as originally modeled in the CERP.

Recommendations discussed within the RECOVER regional evaluation report generally fall into one of three categories:

1. Recommendations that can easily be incorporated into the plan formulation process;
2. Recommendations that are more conceptual in nature, which the Project Team may select to incorporate into preliminary designs to improve project performance; and
3. Recommendations that are crucial to the project, but cannot be addressed prior to the AFB meeting.

Concerning the latter category, RECOVER significantly expedited its regional evaluation to satisfy the need for timely reporting, while bringing forward as much science as possible. As a result, this report may not constitute the entirety of RECOVER's review as specified in the Programmatic Regulations. Therefore, RECOVER may provide additional information supporting and refining the original regional evaluation, with the expectation that those additional evaluation comments be considered by the project team.

Best regards,

Evaluation Team Chairs
(Orlando Ramos-Ginés, Brenda Mills, Kim Jacobs, Steve Gilbert)

Acme Basin B Discharge Project (ABBDP)
Regional Evaluation Report 06/02/05
Prepared by RECOVER

1.0 Introduction and Purpose of the Evaluation

The ABBDP Project Team has completed the plan formulation phase and requested that RECOVER prepare a Regional Evaluation of the project's alternative plans. RECOVER is an interagency and interdisciplinary scientific and technical team charged, among other things, with developing and using performance measures (PMs) for evaluating alternative plans developed for Project Implementation Reports. The purpose of RECOVER regional evaluations is to ensure that alternative plans are consistent with the goals and purposes of the Comprehensive Everglades Restoration Plan (CERP) (USACE, 1999). For this purpose, RECOVER has developed a suite of approximately 40 ecological and 8 water supply and flood protection PMs. Simulation results from the South Florida Water Management Model (SFWMM), which is the primary hydrologic simulation model for the CERP, were used to evaluate the PMs. The SFWMM is a regional scale model that provides simulations of hydrologic conditions at a 2-mile by 2-mile spatial resolution. Because of this large-scale resolution and the relatively small hydrologic influence of some CERP projects, RECOVER PMs may not always reveal differences in system-wide performance of project alternative plans. In these cases, RECOVER uses other scientific information to evaluate the potential performance of project alternative plans on the system.

2.0 Project Background

Acme Basin B is one of two surface water drainage basins that comprise the Village of Wellington's (VOW) Acme Improvement District (AID). Acme Basin A is part of the Western C-51 Basin allowing stormwater discharges to the C-51 Canal (part of the C&SF project). Acme Basin B is not part of the western C-51 Basin and is served by two flood control pumps that currently discharge directly into the A.R.M. Loxahatchee National Wildlife Refuge (LNWR; Water Conservation Area 1 (WCA-1)).

Acme Basin B is part of the CERP as authorized by the Water Resources Development Act (WRDA) 2000 (U.S. Congress, 2000). The purpose of this project, as identified in the CERP, is to provide water quality (WQ) treatment and attenuation of runoff from Acme Basin B prior to discharge to the WCA-1. If WQ treatment criteria are not met, runoff will be discharged to the Palm Beach County Agricultural Reserve Reservoir (component VV of the CERP) or the combination above-ground and in-ground reservoir area located adjacent to the L-8 Borrow Canal and north of the C-51 Canal (component GGG of the CERP). Excess available-water would have the potential to be used to meet water supply demands in central and southern Palm Beach County.

After being included in the CERP, Acme Basin B was included into the 2001 Water Preserve Areas (WPA) Feasibility Study, which began in 1998. The WPA Feasibility Study evaluated the combination of an impoundment and treatment area for Acme Basin B, but this was found to be unfeasible due to cost and reduced flows to the natural system. It was then recommended that a PIR be prepared for Acme Basin B to evaluate alternative plans that could provide similar benefits to the natural system as those identified in the CERP.

3.0 Evaluation

3.1 Project Goals and Objectives

The draft ABBDP Alternatives Formulation Briefing (AFB) Report (2005) states that the primary objectives of the ABBDP are to: "(1) provide water to Water Conservation Area (WCA)-1 and other parts of the Everglades Protection Area (EPA); and (2) improve the Lake Worth Lagoon estuarine habitat". Increased water deliveries are intended to be timed to optimize environmental benefits, as per the CERP goal to "improve habitat and functional quality". The AFB Report also identifies the following constraints for the ABBDP:

(1) The project must have no impacts on the WQ or the conveyance capacity of the C-51 Canal according to the C-51 Basin Rule;
(2) Performance of Stormwater Treatment Area (STA)-1E should indicate that STA-1E will treat the phosphorus loading from Acme Basin B;
(3) The project must maintain existing levels of service for flood damage reduction pursuant to the "Savings Clause" provision in WRDA 2000 and the Programmatic Regulations (November 12, 2003); and
(4) The project must enhance the ecological communities within these areas in a manner that meet existing Federal and State WQ standards.

The CERP conceptual design for the ABBDP called for the construction of a feature to provide WQ treatment and storm water attenuation of runoff from Acme Basin B prior to discharge to the LNWR or alternative locations. The parcel of land known as Section 34, originally envisioned to provide the necessary area for an STA, is no longer available; therefore, the ABBDP is not able to provide an on-site WQ treatment component. The ABBDP Team investigated the use of STA-1E to fulfill the project WQ need. Additionally, the project team investigated inclusion of an approximately 365-acre feature, a portion of Section 24, to temporarily store some Acme Basin B runoff prior to discharge to the LNWR, and to meet the constraint of maintaining the level of service for flood protection. RECOVER notes that recent information indicates that the portion of Section 24 will be slightly smaller than the originally envisioned 410 acres.

Although the project's primary objective has changed from that presented in the CERP, RECOVER has verified and stated that "In essence, both the Comprehensive Plan stated objective for the project and the PDT objective-strategy recognize the water-quality treatment need of the water before it is discharged to the Refuge." (RECOVER, 2003).

3.2 Alternative Plans Description

The ABBDP used screening criteria to identify three project alternative plans. All alternative plans were generally consistent with the modified conceptual design outlined above. Alternative plans being considered are:

Alternative Plan 1

Under this alternative plan, Acme Basin B runoff would be routed through the C-1 canal on the western boundary of the VOW and discharged into C-51. A portion of the Basin B runoff would be back-pumped into Section 24, which would be developed into a wetland area with temporary flood storage.

Alternative Plan 2

This alternative plan requires Acme Basin B runoff to be routed through Basin A to C-51 using the existing canals. The discharge to C-51 would be back-pumped into the STA-1E distribution cell using the existing STA-1E pump station S-319. New culvert structures would be required along Pierson Road (Acme Structure Nos. 40, 42, 43, 44, 45 and 72) to increase conveyance capacity between Acme Basins A and B. A portion of the Basin B runoff would be back-pumped into Section 24, which would be developed into a wetland area with temporary flood storage. The back-pumping rate into Section 24 is 200 cubic feet per second (cfs), which is 96% of the flows from the 31-year period of record.

Alternative Plan 3

This alternative is the conveyance combination of Alternatives 1 and 2. Minimum conveyance improvements of C-1 would include a new 220 cfs Pump Station No. 7 to direct discharge from C-1 to C-51. In addition, Basin B runoff is routed through Basin A into C-51. All the Pierson Road culverts would have a 72” corrugated metal plate (CMP) culvert with a weir drop structure on the Basin B side of Pierson Road. A portion of the Basin B runoff would be back-pumped into Section 24, which would be developed into a wetland area with temporary flood storage. The back-pumping rate into Section 24 is 200 cfs, which is 96% of the flows from the 31-year record. This alternative is an initial attempt at optimizing existing infrastructure, looking for a more cost-effective alternative plan than alternative plans 1 and 2, and at the same time improving system performance to handle storm runoff events.

The VOW would construct the following capital improvement features in order to be consistent with any of the Acme Basin B alternative plans and to be in compliance with the Everglades Forever Act (EFA) standards (Florida Statute, Section 373.4592, 1994):

- Pump Station No. 8
- Water Control Structures 40, 42, 43, 44, and 45
- Water Control Structures 123, 108, 144, 52, 95, and 66; and
- Modifications to existing pump stations Nos. 3, 4, and 6.

3.3 Technical Information Considered

This section outlines the modeling and technical information considered by RECOVER to evaluate the potential system-wide effects of ABBDP alternative plans. Because no differences in regional benefits were detected between the three alternative plans described above, RECOVER evaluated two alternative scenarios, the future with project (FWP) and future without project (FWO).

RECOVER analyses of the information presented and implications to the system are presented in later sections of this report.

Hydrologic Modeling

RECOVER evaluated hydrologic model output from the SFWMM v5.4 for two model scenarios:

- Future with project (FWP) model simulation: 50ACMEB
- Future without project (FWO) model simulation: 2050B2

Hydrologic PMs from LO (LO-E1, E2, E3, and E4), NE (NE-E1, E2, and E3), GE (GE-E1, E2, and E3), and SE (SE-E1 and E2) were used to evaluate these model runs.

All PM results from this modeling are presented in Attachment A, while those PMs which demonstrated differences between the FWO and FWP are highlighted in the body of the text. Additional regional modeling information can be found in the AFB document Tab 9 - Annex A and at the CERP System-Wide Modeling website: http://modeling.cerpzone.org/cerp_recover/pmviewer/pmviewer.jsp.

Ecological/Biological Modeling

While RECOVER has developed a suite of ecologic PMs for the GE region, few of these PMs have been accepted for use in conducting regional evaluations. The GE sub-team has proposed a series of Habitat Suitability Indices (HSIs) (GE-E11 through GE-E16) and ATLSS based PMs (GE-E19 through GE-E23), but these PMs have not yet been approved for use in performing regional evaluations. RECOVER has approved the use of draft PMs GE-E17 and GE-E18, for apple snail reproduction and snail kite foraging habitat, respectively. These PMs were also used to conduct evaluations for the ICU.

Water Quality Modeling

RECOVER WQ PMs for the GE (GE-E7 through GE-E10) do not currently have an approved predictive tool to evaluate PM targets. Consequently, RECOVER evaluated WQ PMs using additional technical information such as the results of DMSTA simulations presented by Burns and McDonnell (2002), and considered recent STA flow and loading estimates as presented by Burns and McDonnell (2005). RECOVER also considered the design capacity of STA-1E when evaluating increased flows to the STA. The technical information that RECOVER used to conduct its evaluation of WQ parameters is outlined below.

Everglades Protection Project, Palm Beach County, Florida: STA-1E Conceptual Design

Based on information contained in the Everglades Protection Project Conceptual Design (Burns and McDonnell 1994), the design of STA-1E was based on the following:

Table 1. Design Criteria for STA-1E.

Drainage Area	Volume, in kacre-ft/year	Total Phosphorus Load, in 10^3 kg/year
C-51 Basin	105.4	24
STA-1W Diversion	-11.5	-2.6
S-5A Basin Runoff	31	8
Net	124.9	29.5

Basin-Specific Feasibility Studies, EPA Tributary Basins, Evaluation of Alternatives for the Everglades Construction Project Basins

The ABBDP Team used the Burns and McDonnell (2002) study on the Everglades Construction Projects (ECP) basins to analyze effects on WQ. In that study, the DMSTA model was used to analyze TP concentrations associated with discharging all Acme Basin B flows to a modified STA-1E. The conclusion reached was that the optimized STA could theoretically achieve a 16 ppb flow weighted average concentration and a 10 ppb geometric mean concentration (Burns and McDonnell, 2002). STAs performance over the long-term has not yet reached 10 ppb geometric mean concentration and model forecasts need to be considered accordingly.

EPA Tributary Basins Supplemental Analysis

Based on the Everglades Protection Area (EPA) Tributary Basins Supplemental Analysis (Burns and McDonnell, 2005), it is presently anticipated that the flows and loads entering the STAs, including STA-1E, will be considerably greater than projected during development of the October 27, 2003 Long-Term Plan and the 2002 Burns & McDonnell study.

The data presented in Table 2 represents the estimated loading to STA-1E both with and without diversions from STA-1W and L-8 Basin runoff from structure S-5AS as stated in both the 2002 and 2005 Burns and McDonnell reports.

Table 2. Comparison of Predicted Hydraulic and Nutrient Loading to STA-1E.

	Volume to STA-1E, in kacre-ft/year		Total Phosphorus, in 10^3 kg/yr	
Drainage Area	Burns and McDonnell 2002	Burns and McDonnell 2005	Burns and McDonnell 2002	Burns and McDonnell 2005
C-51 Basin	110.1	137.9[1]	25.1	26.5[1]
S-5A Basin Runoff	22.6	0	3.7	0
Acme Basin B Discharge	31.5	33.7	2.7	4.95
Lake Okeechobee	0.6	0	0.1	0
STA-1W Diversion	---	22.5	---	3.83
L-8 Basin S-5AS	---	14.5	---	1.56
Net without STA-1W & L-8	164.8	171.6	31.6	31.5
Net with STA-1W & L-8	---	208.6	---	36.9

[1] 1998-2005. Data from Water Year (WY) 2001 was omitted because the impact of significant drought in WY 2001 may disproportionately affect average annual estimates for such a short period or record (POR). The runoff total was also adjusted for runoff from the Indian Trails Water Control District and conversion of approximately 6,560 acres to STA-1E.

Updated information and assumptions contained in the 2005 Burns and McDonnell report are outlined below:

- Flows from STA-1W would need to be diverted to STA-1E because of hydraulic limitations (Burns & McDonnell, 2005, Section 4.2). Although the study did not recommend this course of action, it would be reasonable to expect that STA-1E would be receiving these flows until STA-1W is able to divert flows to other STAs. STA-1E and STA-1W were designed to be operated together and there is no short-term location for STA-1W diversions other than STA-1E.

- L-8 Basin runoff flows from structure S-5AS are not expected to be delivered to the STAs; however, Burns & McDonnell (2005, Section 4.2) recommends they be included in flows to STA-1E. RECOVER notes that recent communication from the SFWMD to the USACE management has concluded that a portion of L-8 water will be delivered to STA-1E. L-8 Basin Runoff is not scheduled to be diverted to another CERP project (North Palm Beach) until 2010-2015.

- Hydraulic and TP loading predictions for the ABBDP were updated. Anticipated hydraulic loading from ABBDP is increased by 7% (from 31.5 kacre-ft/yr to 33.7 kacre-ft/yr); the updated nutrient loading projections for ABBDP is increased by more than 80% (from 2700 kg to 4950 kg).

ABBDP represents 8.5% TP and 19.1% hydraulic loadings to STA-1E in the 2002 Burns and McDonnell report and 13.4% TP and 16.1% hydraulic loadings to STA-1E in the 2005 Burns and McDonnell report.

4.0 System Wide Performance of the ABBDP Alternative Plans

The following sections summarize performance of the FWP and the FWO conditions for those areas within the boundaries of the SFWMM v 5.4. RECOVER system-wide performance measures were used to evaluate ABBDP alternative plans performance and, where possible, best professional judgment was applied to discuss environmental effects of hydrologic and water quality not captured by RECOVER performance measures. Because no differences in regional benefits were detected between the three alternative plans, RECOVER compared the results of the FWP and the FWO conditions. Approved RECOVER PM's were used with few exceptions. The exceptions are those PMs used in last year's ICU evaluation. Complete documentation of RECOVER performance measure output can be found in Attachment A of this report. Detailed descriptions of those areas which highlight differences between the FWP and FWO are contained in the following sections.

4.1 Lake Okeechobee (LO) (LO-E1, E2, E3, and E4)

LO stages do not differ substantially except that stages greater than 17 feet (LO-E3 extreme high stage) are expected to occur at a slightly greater frequency with the FWP (50ACMEB, 6 events) than FWO (2050B2, 5 events). Overall, there may be a slight negative effect of the project on LO, due to the greater frequency of extreme high water events. The increase in the number of extreme high stage events in LO are likely due to the fact that excess water from ABBDP is directed toward LNWR in the FWP; whereas in the FWO, LO is used to supply LNWR with needed water deliveries. Published research on LO (cited in the Lake Okeechobee Conceptual Model document) indicates adverse ecological impacts associated with extreme high lake stage.

4.2 Northern Estuaries (NE)

Caloosahatchee Estuary (NE-E3) and St Lucie Estuary (SLE) (NE-E1)

No significant differences between the FWO and FWP were obtained for salinity envelopes in the SLE (NE-E1) and Caloosahatchee Estuary (NE-E3). Because of increased LO stages, there is an increased potential for occurrence of low-volume pulse releases from LO to these estuaries which will not be captured by RECOVER performance measures. These pulse releases have the potential to increase freshwater flows and nutrient loads reaching the estuaries. Maintaining the salinity envelope within the estuaries will provide more natural freshwater flow to estuaries and coral reef ecosystems, and improve and protect habitat quality, heterogeneity, and biodiversity in coastal and associated marine ecosystems.

Lake Worth Lagoon (LWL) (NE-E2)

The ABBDP (50ACMEB) is predicted to result in a 14% decrease (from 344 to 296 occurrences) in the number of times LWL salinity criteria are not met over 36 years of model run, compared to the 2050B2 FWO condition. The project would minimize large-scale canal discharges to the lagoon, improving estuarine conditions such that a more desirable salinity regime is expected. The shift in salinity regime should increase the spatial extent of estuarine habitat (seagrasses) and biota (oysters) in the lagoon.

It is important to note that if L-8 and S5A loads are included in STA-1E inflow, there will be a potential for decreased capacity in the STA, increased potential for bypass events, and increased flows to tide, thereby reducing the benefits to the LWL, which we currently see in the model results. Presumably, this would be reflected in a change in the number of times 2-day moving average flow exceeds 1000 cfs.

Table 3: RECOVER Performance Measure NE-E2 - Salinity Envelope for LWL.

NE-E2	Target	2000B2	2050B2	50ACMEB
Number of times 2−day moving average flow > 1000cfs	___	589	344	296
Number of times 7−day moving average flow = 0cfs	___	90	84	119
Number of times 7−day moving average flow > 500cfs	___	487	279	249

4.3 *Greater Everglades (GE)*

Hydrologic Performance (GE-E1 through GE-E3)

There were no major differences in the percent period of record inundated (GE-E2), number and duration of extreme high events (GE-E3), or number and duration of extreme low events (GE-E3), for the FWO and FWP conditions.

Ecological/Biological Performance

Snail Kite Prey Availability and Foraging Habitat (GE-E17 and GE-E18)

Proposed RECOVER PMs GE-E17 and GE-E18, which evaluate hydrologic conditions for snail kite prey availability and kite foraging habitat, respectively, did show some differences between FWO and FWP conditions (Table 4). An increase in average duration of inundation events was predicted for Indicator Region (IR) 110 (from 93 in FWO to 105 weeks in FWP) and IR 132 (from 94 in FWO to 106 weeks in FWP), thereby shifting these IRs from the “unsuitable” (less than 104 or more than 312 weeks of inundation) into the "marginal" (104-155 or 261-312 weeks of inundation) category for GE-E18. However, their scores for GE-E17 (more than 12 dryouts before May 1) indicate that snail reproduction would likely be insufficient to provide suitable habitat even though hydroperiods have improved. IR 125 shifts from 13 dryouts in the FWO to 12 in the FWP and from the "unsuitable” to "marginal" category for GE-E18. This could be considered a slight improvement in WCA-3B North. There was no indication the ABBDP adversely affected any IR. The lack of substantial difference in most IR and PMs is likely due to the LNWR’s Regulation Schedule, considered in the model, and consistency with the Federal Consent Decree. In the FWO condition, water previously supplied to LNWR from Acme Basin B would be supplied from LO.

Table 4. Apple Snail Reproduction and Snail Kite Habitat Performance for Select Indicator Regions.

IR#	IR description	PM #	PM name	NSM 4.6.2	2000B2	2050B2	50AcmeB
101	Central WCA1	GE-E17	Apple snail reproduction*	10	0	6	6
		GE-E18	Snail Kite Habitat**	100	372	199 O	225 O
110	WCA2A North	GE-E17	Apple snail reproduction	20	25	16	16
		GE-E18	Snail Kite Habitat	66	49	93	105 M
125	WCA3B North	GE-E17	Apple snail reproduction	17	6	13	12
		GE-E18	Snail Kite Habitat	91	179 O	94	106 M
132	S Shark Slough	GE-E17	Apple snail reproduction	5	23	14	13
		GE-E18	Snail Kite Habitat	174 O	60	98	104 M

* Number of years with dryouts prior to May 1. Target is to minimize, consistent with NSM

** Average Inundation Duration: 156 to 260 weeks = optimal (O); 104 to 155 or 261 to 312 weeks = marginal (M); other = unsuitable. Target is to maximize optimal and marginal, consistent with NSM.

Periphyton Communities in LNWR (GE-E11)

While RECOVER does not have an approved PM for periphyton communities in LWNR, RECOVER evaluators felt it was important to qualitatively outline impacts to these communities resulting under both alternatives.

The remaining softwater periphyton communities within the GE are affected by deliveries of high conductivity water from canals, STA bypasses, and even treated STA effluent. This is representative of a larger issue within the GE. Irrespective of the treatment efficiency of STA-1E, the increased flows from the STA are expected to impact periphyton communities and WQ within the LNWR. The additional 33.7 kacre-ft/yr of flow into STA-1E from the ABBDP will proportionally increase the TP loading and conductivity entering the system. These additional loads will increase the area on the eastern boundary of LNWR already affected by STA-1E.

STAs are not designed to lower conductivity. Water discharged from STA-1E will likely have high conductivity, thereby potentially affecting periphyton community structure (South Florida Environmental Report, 2005, Vol. I, Chapter 6). Similar WQ and periphyton community structure effects have been noted on the western boundary of the Refuge.

Under the FWO condition water supplied to the LNWR would be supplied by LO via the L-7 canal, which runs along the west side of the Refuge. Currently, both TP and conductivity gradients exist increasing from the interior of the marsh toward the western L-7 boundary. The eastern portion of the LNWR (affected under the FWP condition) is considered more pristine than the impacted western portion (affected under the FWO condition). Under the FWP condition an equivalent volume of water will be supplied to the LNWR by STA-1E via the L-40 canal, which runs along the east side of the Refuge. Elevation differences between the L-40 canal stage and LNWR marsh stages may lead to enrichment of the eastern boundary. Because the L-40 canal conveys substantially less water than the L-7 canal, stage differences between the L-40 canal and the marsh are expected to increase further, exacerbating the potential enrichment on the eastern boundary. A better understanding of and possible changes to the regulation schedules surrounding the LNWR may minimize these impacts on the LNWR and therefore contribute to reaching CERP expectations for the region. The ECP and Federal projects such as STA-1E will be challenged to employ remedies that involve modification of pumping schedules, widening of discharge aprons, modifications to berms and levees, to mitigate these effects.

<u>Water Quality Performance</u>

The quality of water entering and flowing through the system is of particular concern to RECOVER, as it is one of the primary components to "CERP getting the water right". It is of great concern in the GE region due to its unique and vast habitats and vegetational community sensitivity to water quality parameters (e.g. nutrients and hardness). To evaluate whether the ABBDP will impact regional WQ in the GE, RECOVER investigated the predicted impacts of the project on TP loading in the region, periphyton communities in LNWR, the number of STA bypass events, and sulfate concentrations in surface water.

Beyond examining individual structure data (as done in the ICU) RECOVER currently lacks the model tools to evaluate the WQ PMs. As outlined in Section 3.3 of this report, RECOVER used additional technical information to conduct evaluations of WQ parameters.

TP Loading in the GE (GE-E7 through GE-E9)

ABBDP is expected to contribute a notable effect upon the TP loading in the GE region. The project will direct flow through STA-1E and will therefore increase both the hydraulic and TP loading for the STA and the GE region. Based on information presented by Burns and McDonnell (2005), STA-1E could experience two scenarios:

(1) Hydraulic and TP loading to STA-1E could remain virtually unchanged from those predicted in the 2002 Burns and McDonnell study if STA-1W and L-8 Basin runoff are not included.

(2) Hydraulic and TP loading to STA-1E could increase from the predictions in the 2002 Burns and McDonnell study if STA-1W diversions and L-8 Basin runoff through structure S-5AS are directed to STA-1E over the short-term. STA-1W diversions or L-8 basin runoff are problematic, because they have to be diverted to STA-1E or tide (Lake Worth Lagoon). The 2005 Burns and McDonnell study recommends the treatment of L-8 basin runoff by STA-1E. RECOVER notes that recent communication from the SFWMD to the USACE management has concluded that a portion of L-8 water will be delivered to STA-1E.

RECOVER evaluated the ABBDP using the second scenario presented. For this reason, STA-1W diversion flows are included in STA-1E flow totals as 22,500 acre-ft/yr at 138 ppb of TP and L-8 flows through the S-5AS structure are included as 14,500 acre-ft/yr at 87ppb TP. The ultimate decision of whether to treat the L-8 runoff will be made by the SFWMD. RECOVER recognizes that this recently released information was not available to the ABBDP during its screening of alternative plans. This new information needs to be reflected in future updates in design analysis and Project Implementation Report documents.

As shown in Table 5, the predicted flows and TP loads to STA-1E and STA-1W are greater than those anticipated when the STAs were first designed. RECOVER recognizes that the increased hydraulic and TP loads associated with ABBDP are one contributing factor to this increased loading, along with higher loading from the L-8 and S-5A basins. The combined effect of these flows will influence the STAs capacity to treat inflows to WQ standards for discharge to the GE region, including the LNWR and EPA. This will challenge the managers to balance increased flows between STA-1E and to tide via C-51.

The ability of STA-1E to meet WQ standards for discharge to the GE region, including LNWR and the EPA, is a concern under both the FWO and FWP conditions. As shown in Table 6, the FWO condition of STA-1E appears to also cause exceedances in the design capacity for both flow and TP loading. TP loading remains a RECOVER concern to reaching CERP expectations in the region.

Table 5: Estimated annual hydraulic and nutrient loading for ABBDP, STA-1E, and STA-1W.

	ABBDP		STA-1E		STA-1W	
	Flow, in Kacre-ft	Total phosphorus, in 10^3 kg	Flow, in Kacre-ft	Total phosphorus, in 10^3 kg	Flow, in Kacre-ft	Total phosphorus, in 10^3 kg
Conceptual Design 1994	---	---	124.9	29.5	142.9	37.7
Yellow Book 1999	---	---	124.9	29.5	142.9	37.7
Burns and McDonnell 2002	31.5		164.8	31.7	160.3	27.4
Long-Term Conceptual Plan 2003-2004	31.5	2.8	148.4/ 175	31.7	188.1	27.4
Burns and McDonnell 2005	33.7	5.0	208.6	36.8	385.0	76.7

Because the ABBDP is only one contributing factor to the larger capacity problem in the STAs, RECOVER conducted its evaluation only on the incremental difference between the FWO and FWP conditions. Table 6 shows a comparison of design and predicted loading with and without the project.

Table 6: Comparison of Design and Predicted Loading for STA-1E

	Volume, in kacre-ft/year)	Total Phosphorus, in 10^3 kg/year
Design	124.9	29.5
Predicted without project	174.9	31.8
Predicted with project	208.6	36.8

ABBDP is estimated to increase hydraulic loading to STA-1E by 33.7 kacre-ft/year and TP loading by 4,950 kg (Burns and McDonnell, 2005). This amounts to 15.6% increase over predicted TP loading and a 19.2% increase over predicted hydraulic loading to STA-1E in the FWO condition. ABBDP may contribute to the overall loading to the GE region commensurate with its proportion of flow and load. This may adversely affects the natural balance of GE flora and fauna, particularly that in the LNWR.

Although STA-1E is expected to be optimized as part of the Long-Term Conceptual Plan and ongoing Periphyton-STA research, the significant increase above design loading capacity could result in decreased performance even for an optimized STA. The ability of the ABBDP to meet Everglades Forever Act (EFA) requirements will depend upon success of the PSTA pilot and management measures within the basins that could reduce loading to the STAs.

However, the additional 33.7 kacre-ft/year of flow to STA-1E predicted from the ABBDP may contribute to provide additional wetting of STA cells during dry periods. The mitigation of dry-down events in the STA could decrease the resuspension and release of phosphorus that usually accompanies dry-down events. The amount of benefit attributable to the ABBDP is highly dependent on the timing of deliveries coincident with periods of potential dry-down.

STA Bypass Flows (GE-E10)

The ABBDP is predicted to contribute to an increase in the number of STA-1E bypass flows. The project will direct an additional 33.7 kacre-ft/year of flow through STA-1E. Flows from

Acme Basin B compete for STA-1E capacity, which might otherwise be employed for diversions from STA 1 West and L-8 basins. Based on the STA loading estimates shown in Tables 5 and 6, this amounts to a 19.2% increase of water flowing into the STA. This additional flow will result in an increase in STA bypass flows to the GE Wetlands. This increase in STA bypasses to the GE region has an associated TP load that is not captured elsewhere. One approach to enumerating this would be to examine structure flows. As this loading is primarily to LNWR (an Outstanding Florida Water Body), RECOVER identifies this increase in STA bypass as a challenge for meeting CERP expectations for the region.

Sulfate SO_4 Concentrations in Surface-water (GE-A16)

Section 24 constructed wetland impoundment will collect Acme Basin B runoff from nursery and farm areas. Because it is not optimized for WQ, there may be a net increase in sulfate loading to STA-1E. Sulfate is a conservative substance and would not be removed by STA optimization. The project documentation should discuss BMP controls for sulfate.

4.4 Southern Estuaries (SE)

Model output for 50ACMEB was compared to 2050B2 for the SE (Biscayne Bay and Florida Bay). There was very little difference in the performance of these two simulations in terms of flows. The sections below detail observable differences, primarily in overland flows.

Biscayne Bay (SE-E1, SE-E3, SE-E4, SE-E5)

There was no difference in the Simulated Mean Seasonal Structure Flows discharged into Snake Creek, North Bay, Miami River, and Barnes Sound. There was a slight increase (1,000 acre-feet) of wet season flows into Central Bay (<2%) and South Bay (<1%) with Alternative 50ACMEB and an increase (1,000 acre-feet) of dry season flow into South Bay (<2%) with Alternative 50ACMEB.

Florida Bay (SE-E2)

There was a slight increase (1,000 acre-feet) in dry season flows thru the Eastern Panhandle (7%) with Alternative 50ACMEB. This is a reflection of the slight increase in dry season flow with 50ACMEB. The data for North River indicates more water (fewer high salinity events and more low salinity events), which may affect Shark River Slough and Whitewater Bay. This slightly greater amount of water in Shark River Slough is also reflected in slightly greater overland flow across Transect 21. The 50ACMEB alternative has 7,000 acre-ft more flow across Transect 21 in the dry season and 6,000 acre-ft more flow in the wet season than 2050B2. Flow volumes across transects are not approved RECOVER PMs due to their associated levels of uncertainty and are more appropriately used to indicate direction of change rather than quantifiable flows.

Table 7: RECOVER PM SE-E2 Salinity in Florida Bay Coastal Basins – North River Mouth (based on P33; Number of months above and below the target salinity for the 36 year period of record, as indicated) [ppt, parts per thousand].

	NSM 4.6	2000B2	2050B2	50ACMEB
Months above 15 ppt	60	179	136	133
Months below 5 ppt	179	53	77	80

4.5 *Section 24*

The ABBDP includes the construction of an approximately 365 acre "natural area" to increase the spatial extent of wetlands, to provide partial flood storage for Acme Basin B and to serve as a retention area for STA-1E. The acreage of this component does not provide a sufficient amount of land for WQ treatment for all Acme Basin B water; however, retention of water within the impoundment has the ability to affect RECOVER performance measure GE-E8 as it will settle particulate phosphorus as a storage impoundment. Additionally, water retention within this area may allow for some level of nutrient uptake and delayed delivery of Acme Basin B water to STA-1E and LNWR. RECOVER suggests that the design of Section 24 maximize the WQ treatment potential for this natural area.

5.0 Summary

Review of the RECOVER's system-wide performance measures indicates that the project meets its goal of improving estuarine habitat within LWL. Other than a slight improvement for snail kite habitat in Northern WCA-3B (IR 125), the PMs do not provide any indication of whether the project is able to meet its goal to improve water deliveries to the EPA. The GE PMs do not generally indicate any differences in wetland habitat function between the FWO and FWP conditions. This lack of quantifiable difference is likely due to the similarity between FWP and FWO. In the FWO, water previously supplied to LNWR from Acme Basin B would now be supplied from LO, in order to meet the requirements of the LNWR Regulation Schedule and remain consistent with the Federal Consent Decree.

The quality of water entering the GE region is a concern to RECOVER in its regional evaluations. Burns and McDonnell 2005 have recently revised earlier estimates of hydraulic and TP loads to STA-1W and STA-1E. The increased hydraulic and TP loads by the ABBDP is one of several factors (including higher loading from the L-8 and S-5A basins) contributing to recent information that STA-1E capacity to treat predicted inflows adequately to WQ standards for discharge to LNWR and the EPA is challenged. This may strain the system capacity even with optimization, and is a concern under both the FWO and FWP conditions. Available model runs show a substantial increase in S-5A bypass volumes and associated nutrient load to the LNWR and the GE region that RECOVER notes is of concern.

RECOVER suggests the ABBDP investigate the use of the current DMSTA model to examine any effects of additional hydraulic and TP loading to the STA. It is important to provide adequate time to incorporate information generated by the upcoming SFWMD Regional Feasibility Study (need reference) and any new relevant information that can be appropriately integrated into this (fast-tracked Acceler8) project. Ideally, this information will be used to modify operational strategies of STA-1E and STA-1W such that the hydraulic and treatment capacity is not exceeded, while minimizing bypasses to LNWR and the Greater Everglades.

Other regions within the system were not generally affected by the project with a few general exceptions. First, the FWP condition resulted in slightly greater undesirable extreme high water events within LO. This may be due to the fact that excess water from Acme Basin B is directed toward LNWR in the FWP, whereas in the FWO the Lake is used to supply LNWR with needed water deliveries. Second, the examination of the SE PMs indicates that there is more overland flow and Shark River Slough flow in the FWP than the FWO.

RECOVER recommends that the ABBDP:

1) Include new information on TP loading in future updates of design analysis and PIR documents (incorporate the information from the ETASA report and this summer's Feasibility Study work).
2) Formulate project plans to address the timing of deliveries coincident with periods of potential dry-down since this is highly reflective of benefits attributable to the project.
3) Design Section 24 to maximize water quality treatment potential; however, RECOVER notes this may detract from other wetland benefits (i.e. habitat) for Section 24 wetlands.
4) Explore and enumerate any potential impacts to LWL which have not been quantified in this report.
5) Explore and enumerate TP load and potential impacts to the GE associated with ABBDP which have not been quantified in our report. 6) Optimize operational strategies.

RECOVER's recent adoption of the "values triangle" is a recognition of the need to balance science, timely reporting and inclusiveness. For this RECOVER evaluation, significant efforts were undertaken to satisfy the need for timely reporting while bringing forward as much science as possible. However, in completing this exercise, we recognize that most of our final recommendations are on improvements to the materials being developed for the project and not necessarily on the design of the project alternatives itself. Therefore, this report may not constitute the entirety of RECOVER's review of projects as specified in the Programmatic Regulations. RECOVER may provide the project additional information supporting and refining the original evaluation.

References

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Attachment A

Table A1.—Lake Okeechobee Performance Measure Results

		Target	2000B2	2050B2	50ACMEB
LO-E3	Number of times lake stage > 17ft	___	5	5	6
LO-E4	Number of times lake stage is above 15ft for more than 365 days:	___	3	3	3
LO-E1	Number of times lake stage is below 10ft:	___	3	4	4
LO-E2	Number of times lake stage is below 12ft for more than 365 days:	___	1	3	3

Table A2. —St. Lucie Estuary (SLE) Performance Measure Results

		Target	2000B2	2050B2	50ACMEB
NE-E1	SLE discharge 2000-3000cfs	9	45	45	45
	SLE Discharge > 3000 cfs	12	31	22	22
	Months SLE flow < 350 cfs	207	131	132	132
	Times SLE flow14-day moving avg > 2000 cfs from local basin	28	72	72	70
	Times SLE flow14-day moving avg > 2000 cfs from LOK regulatory release	0	58	45	45

Table A3.—Lake Worth Lagoon (LWL) Performance Measure Results

		Target	2000B2	2050B2	50ACMEB
NE-E2	Number of times 2−day moving average flow > 1000cfs	0	589	344	296
	Number of times 7−day moving average flow = 0cfs		90	84	119
	Number of times 7−day moving average flow > 500cfs		487	279	249

Table A4.—Caloosahatchee Estuary Performance Measure Results

		Target	2000B2	2050B2	50ACMEB
NE-E3	Caloosahatchee discharge > 2800 cfs	26	85	69	70
	Caloosahatchee Discharge > 4500 cfs	7	37	30	30
	Number of months flow < 300cfs from C−43 Basin & Lock regulatory releases during the dry season (Nov−May)	70	153	141	141

	Number of months flow > 2800cfs from C−43 Basin (Jan−Dec)	26	44	41	41
	Additional number of months flow > 2800cfs due to Lock Regulatory releases (Jan−Dec)	0	41	28	29

Table A5-A21.—Greater Everglades Wetlands Performance Measure Results
[Note: Targets presented in the following tables are referenced from the most recent version of the ICU as of April 6, 2005.]

Table A5.—LNWR

			Target	2000B2	2050B2	50ACMEB
IR100 WCA-1 North	GE-E2: Inundation Pattern	# events	19	19	24	24
		weeks/event	94	94	69	70
		% POR	95	95	88	90
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	1	1	2	2
		weeks/event	1	1	4	4
		% POR	0	0	0	0
IR102 WCA-1 Central	GE-E2: Inundation Pattern	# events	5	5	9	8
		weeks/event	372	372	199	225
		% POR	99	99	96	96
	GE-E3: High/Low Events	# high events	29	29	11	12
		weeks/event	2	2	2	2
		% POR	1	1	1	1
		# low events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
IR102 WCA-1 South	GE-E2: Inundation Pattern	# events	2	2	5	3
		weeks/event	935	935	371	620
		% POR	100	100	99	99
	GE-E3: High/Low Events	# high events	38	38	32	33
		weeks/event	17	17	14	15
		% POR	35	35	24	26
		# low events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0

Table A6.—Rotenberger WMA

			Target	2000B2	2050B2	50ACMEB
IR160 Rotenberger WMA	GE-E2: Inundation Pattern	# events	29	17	13	13
		weeks/event	52	104	137	137
		% POR	80	94	95	95
	GE-E3: High/Low Events	# high events	2	9	9	9

		weeks/event	3	2	2	2
		% POR	0	1	1	1
		# low events	12	4	3	3
		weeks/event	4	6	5	5
		% POR	3	1	1	1

Table A7.—Corbett

			Target	2000B2	2050B2	50ACMEB
IR50 Corbett West	GE-E2: Inundation Pattern	# events	37	44	47	47
		weeks/event	28	6	7	7
		% POR	56	15	17	17
IR151 Corbett East	GE-E2: Inundation Pattern	# events	58	11	12	12
		weeks/event	15	4	3	3
		% POR	46	3	2	2

Table A8.—Holey Land WMA

			Target	2000B2	2050B2	50ACMEB
IR170 Holey Land WMA	GE-E2: Inundation Pattern	# events	17	8	9	9
		weeks/event	97	224	201	201
		% POR	88	96	97	97
	GE-E3: High/Low Events	# high events	10	43	39	39
		weeks/event	7	18	23	23
		% POR	4	40	48	48
		# low events	8	4	3	3
		weeks/event	7	3	3	3
		% POR	3	1	0	0

Table A9.—Big Cypress

			Target	2000B2	2050B2	50ACMEB
IR180 NE Cypress	GE-E2: Inundation Pattern	# events	35	30	30	30
		weeks/event	25	15	15	15
		% POR	47	24	24	24
	GE-E3: High/Low Events	# high events	53	40	40	41
		weeks/event	6	2	2	2
		% POR	18	5	5	5
		# low events	42	58	58	58
		weeks/event	9	12	12	12
		% POR	20	38	37	37
IR181 Mullet Slough	GE-E2: Inundation Pattern	# events	26	36	36	36
		weeks/event	53	33	33	33
		% POR	74	63	63	63
	GE-E3: High/Low Events	# high events	45	56	56	56
		weeks/event	25	15	15	15
		% POR	60	45	45	45
		# low events	27	36	36	36
		weeks/event	8	9	9	9
		% POR	11	17	17	17
IR182 Dwarf	GE-E2: Inundation Pattern	# events	36	44	43	43
		weeks/event	33	22	21	21

			Target	2000B2	2050B2	50ACMEB
Cypress		% POR	63	51	49	49
	GE-E3: High/Low Events	# high events	73	83	77	76
		weeks/event	11	6	6	6
		% POR	43	27	25	25
		# low events	29	35	36	36
		weeks/event	10	11	11	11
		% POR	15	20	21	21
IR183 Roberts Lake Cypress Strand	GE-E2: Inundation Pattern	# events	34	40	41	41
		weeks/event	38	29	27	27
		% POR	69	62	60	60
	GE-E3: High/Low Events	# high events	60	59	61	61
		weeks/event	16	13	13	13
		% POR	52	42	41	41
		# low events	24	36	36	37
		weeks/event	10	9	9	9
		% POR	13	17	17	17

Table A10.—WCA-2A

			Target	2000B2	2050B2	50ACMEB
IR110 WCA-2A North	GE-E2: Inundation Pattern	# events	24	30	18	16
		weeks/event	66	49	93	105
		% POR	84	78	89	90
	GE-E3: High/Low Events	# high events	0	0	1	1
		weeks/event	0	0	1	1
		% POR	0	0	0	0
		# low events	6	12	7	8
		weeks/event	3	7	4	4
		% POR	1	4	2	2
IR111 WCA-2A South	GE-E2: Inundation Pattern	# events	13	15	14	14
		weeks/event	131	116	121	121
		% POR	91	93	91	91
	GE-E3: High/Low Events	# high events	0	9	8	8
		weeks/event	0	2	3	3
		% POR	0	1	1	1
		# low events	3	2	7	7
		weeks/event	3	5	4	4
		% POR	1	1	1	1

Table A11.—WCA-2B

			Target	2000B2	2050B2	50ACMEB
IR112 WCA-2B North	GE-E2: Inundation Pattern	# events	16	16	13	13
		weeks/event	107	107	127	128
		% POR	91	92	89	89
	GE-E3: High/Low Events	# high events	2	7	22	23
		weeks/event	4	4	3	3
		% POR	0	2	4	4
		# low events	2	3	5	5

		weeks/event	2	3	4	4
		% POR	0	1	1	1
IR113 WCA-2B South	GE-E2: Inundation Pattern	# events	16	11	11	11
		weeks/event	107	156	151	152
		% POR	92	91	89	89
	GE-E3: High/Low Events	# high events	5	39	24	25
		weeks/event	7	25	51	49
		% POR	2	53	65	66
		# low events	2	11	15	12
		weeks/event	2	8	8	8
		% POR	0	5	6	6

Table A12.—North WCA-3A

			Target	2000B2	2050B2	50ACMEB
IR114 WCA-3A NW Corner	GE-E2: Inundation Pattern	# events	12	22	17	17
		weeks/event	146	74	101	101
		% POR	94	86	92	92
	GE-E3: High/Low Events	# high events	0	1	1	1
		weeks/event	0	1	6	6
		% POR	0	0	0	0
		# low events	2	9	5	5
		weeks/event	6	7	6	6
		% POR	1	3	2	2
IR115 WCA-3A North	GE-E2: Inundation Pattern	# events	14	19	17	17
		weeks/event	122	88	99	99
		% POR	92	90	90	90
	GE-E3: High/Low Events	# high events	0	4	8	8
		weeks/event	0	6	6	6
		% POR	0	1	2	3
		# low events	4	11	8	8
		weeks/event	4	4	4	4
		% POR	1	2	2	2
IR116 WCA-3A NE	GE-E2: Inundation Pattern	# events	19	14	9	9
		weeks/event	86	121	199	200
		% POR	87	91	96	96
	GE-E3: High/Low Events	# high events	0	7	18	20
		weeks/event	0	9	7	7
		% POR	0	3	7	7
		# low events	6	8	1	1
		weeks/event	4	5	4	4
		% POR	1	2	0	0
IR117 WCA-3A NW	GE-E2: Inundation Pattern	# events	10	11	11	11
		weeks/event	179	161	159	159
		% POR	96	95	93	93
	GE-E3: High/Low Events	# high events	0	3	5	5
		weeks/event	0	8	6	6
		% POR	0	1	2	2
		# low events	3	2	6	7

		weeks/event	3	6	4	3
		% POR	1	1	1	1
IR190 WCA-3A Sawgrass	GE-E2: Inundation Pattern	# events	17	19	10	10
		weeks/event	97	84	182	182
		% POR	88	86	97	97
	GE-E3: High/Low Events	# high events	3	5	9	11
		weeks/event	2	9	9	8
		% POR	0	2	4	5
		# low events	10	13	1	1
		weeks/event	7	6	1	1
		% POR	4	4	0	0

Table A13.—East WCA-3A

			Target	2000B2	2050B2	50ACMEB
IR118 WCA-3A Alley North	GE-E2: Inundation Pattern	# events	14	13	16	16
		weeks/event	122	129	104	104
		% POR	91	90	89	89
	GE-E3: High/Low Events	# high events	0	10	16	17
		weeks/event	0	8	8	8
		% POR	0	4	7	7
		# low events	4	10	8	8
		weeks/event	5	4	7	7
		% POR	1	2	3	3
IR119 WCA-3A East	GE-E2: Inundation Pattern	# events	14	8	11	11
		weeks/event	122	226	158	158
		% POR	91	97	93	93
	GE-E3: High/Low Events	# high events	0	38	41	44
		weeks/event	0	26	15	14
		% POR	0	54	33	34
		# low events	3	1	7	7
		weeks/event	6	3	3	3
		% POR	1	0	1	1

Table A14.—Central WCA-3A

			Target	2000B2	2050B2	50ACMEB
IR120 WCA-3A West	GE-E2: Inundation Pattern	# events	10	15	14	14
		weeks/event	174	115	123	123
		% POR	93	92	92	92
	GE-E3: High/Low Events	# high events	0	3	3	3
		weeks/event	0	6	6	6
		% POR	0	1	1	1
		# low events	5	7	7	7
		weeks/event	5	3	4	4
		% POR	1	1	2	2
IR121 WCA-3A North Central	GE-E2: Inundation Pattern	# events	14	11	12	12
		weeks/event	124	160	145	145
		% POR	92	94	93	93
	GE-E3: High/Low Events	# high events	0	5	6	6
		weeks/event	0	10	9	9
		% POR	0	3	3	3

		# low events	6	2	5	5
		weeks/event	4	3	3	3
		% POR	1	0	1	1
IR122 WCA-3A Gap	GE-E2: Inundation Pattern	# events	12	14	17	17
		weeks/event	145	123	101	101
		% POR	93	92	92	92
	GE-E3: High/Low Events	# high events	0	5	3	3
		weeks/event	0	6	8	8
		% POR	0	2	1	1
		# low events	8	8	7	8
		weeks/event	5	5	6	5
		% POR	2	2	2	2
IR123 WCA-3A South Central	GE-E2: Inundation Pattern	# events	16	12	17	17
		weeks/event	106	145	97	97
		% POR	90	93	88	88
	GE-E3: High/Low Events	# high events	0	12	6	6
		weeks/event	0	8	10	11
		% POR	0	5	3	3
		# low events	7	4	9	9
		weeks/event	5	4	4	4
		% POR	2	1	2	2

Table A15.—South WCA-3A

			Target	2000B2	2050B2	50ACMEB
IR124 WCA-3A South	GE-E2: Inundation Pattern	# events	14	9	14	14
		weeks/event	124	202	123	123
		% POR	93	97	92	92
	GE-E3: High/Low Events	# high events	2	31	7	9
		weeks/event	1	10	10	8
		% POR	0	17	4	4
		# low events	6	2	7	7
		weeks/event	3	2	3	3
		% POR	1	0	1	1

Table A16.—WCA-3B

			Target	2000B2	2050B2	50ACMEB
IR125 WCA-3B North	GE-E2: Inundation Pattern	# events	18	10	18	16
		weeks/event	91	179	94	106
		% POR	87	95	90	91
	GE-E3: High/Low Events	# high events	1	1	26	32
		weeks/event	1	2	13	11
		% POR	0	0	18	19
		# low events	7	1	8	9
		weeks/event	7	1	6	5
		% POR	3	0	2	2
IR1263 WCA-3B West	GE-E2: Inundation Pattern	# events	10	10	16	16
		weeks/event	180	177	106	106
		% POR	96	94	90	90
	GE-E3: High/Low Events	# high events	10	1	28	27
		weeks/event	9	3	11	12
		% POR	5	0	16	17
		# low events	0	3	7	8
		weeks/event	0	1	5	4

			Target	2000B2	2050B2	50ACMEB
		% POR	0	0	2	2
IR127 Pennsuco Wetlands	GE-E2: Inundation Pattern	# events		20	21	19
		weeks/event		72	70	78
		% POR		77	79	79
	GE-E3: High/Low Events	# high events		6	20	17
		weeks/event		3	11	13
		% POR		1	11	12
		# low events		25	33	33
		weeks/event		6	5	4
		% POR		8	8	8
IR128 WCA-3B West	GE-E2: Inundation Pattern	# events	8	16	19	18
		weeks/event	226	97	81	86
		% POR	96	83	82	83
	GE-E3: High/Low Events	# high events	13	5	33	34
		weeks/event	8	3	15	15
		% POR	6	1	27	27
		# low events	0	12	18	19
		weeks/event	0	7	6	5
		% POR	0	4	5	5

Table A17.—Shark River Slough

			Target	2000B2	2050B2	50ACMEB
IR129 NE Shark Slough	GE-E1	# Dry Events	2	18	15	15
		weeks/event	10	15	16	16
	GE-E2: Inundation Pattern	# events	3	19	16	16
		weeks/event	617	85	102	102
		% POR	99	86	87	87
	GE-E3: High/Low Events	# high events	32	0	9	9
		weeks/event	10	0	6	6
		% POR	17	0	3	3
		# low events	1	13	12	12
		weeks/event	1	6	6	6
		% POR	0	4	4	4
IR130 Mid Shark Slough	GE-E1	# Dry Events	4	16	13	13
		weeks/event	23	15	15	15
	GE-E2: Inundation Pattern	# events	5	17	14	14
		weeks/event	356	96	120	120
		% POR	95	87	90	90
	GE-E3: High/Low Events	# high events	3	1	1	1
		weeks/event	3	1	1	1
		% POR	0	0	0	0
		# low events	2	12	10	10
		weeks/event	10	7	5	5
		% POR	1	4	3	3
IR131 SW Shark Slough	GE-E1	# Dry Events	7	19	15	15
		weeks/event	18	16	14	14
	GE-E2: Inundation Pattern	# events	8	20	16	16
		weeks/event	218	78	104	104
		% POR	93	84	89	89
	GE-E3: High/Low Events	# high events	1	0	0	0
		weeks/event	1	0	0	0
		% POR	0	0	0	0

			Target	2000B2	2050B2	50ACMEB
		# low events	3	15	10	10
		weeks/event	9	6	6	6
		% POR	1	5	3	3
IR132South Shark Slough	GE-E1	# Dry Events	9	25	16	15
		weeks/event	14	13	13	14
	GE-E2: Inundation Pattern	# events	10	26	17	16
		weeks/event	174	60	98	104
		% POR	93	83	89	89
	GE-E3: High/Low Events	# high events	1	0	0	0
		weeks/event	1	0	0	0
		% POR	0	0	0	0
		# low events	4	11	6	6
		weeks/event	6	5	6	6
		% POR	1	3	2	2

Table A18.—Taylor Slough

			Target	2000B2	2050B2	50ACMEB
IR133 Taylor Slough	GE-E2: Inundation Pattern	# events	25	35	30	31
		weeks/event	54	37	44	43
		% POR	72	70	70	71
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	24	26	27	26
		weeks/event	6	5	5	5
		% POR	7	8	7	7

Table A19.—Lostman's Slough

			Target	2000B2	2050B2	50ACMEB
IR134 Lostman's Slough	GE-E2: Inundation Pattern	# events	29	33	36	36
		weeks/event	48	39	31	31
		% POR	74	69	60	61
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	22	22	34	32
		weeks/event	11	13	10	11
		% POR	13	15	19	19

Table A20.—Marl Marsh

			Target	2000B2	2050B2	50ACMEB
IR141 Ochopee Marl Marsh	GE-E2: Inundation Pattern	# events	18	31	25	24
		weeks/event	87	39	56	59
		% POR	84	64	75	75
	GE-E3: High/Low Events	# high events	2	0	0	0
		weeks/event	1	0	0	0
		% POR	0	0	0	0
		# low events	12	25	18	17
		weeks/event	11	11	11	12
		% POR	7	15	11	11
IR142 Rocky	GE-E2: Inundation	# events	20	36	33	33

			Target	2000B2	2050B2	50ACMEB
Glades	Pattern	weeks/event	75	20	34	34
		% POR	80	39	60	60
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	18	44	34	32
		weeks/event	11	13	11	12
		% POR	10	31	20	20
IR143 West Perrine Marl Marsh	GE-E2: Inundation Pattern	# events	29	28	29	29
		weeks/event	13	12	12	12
		% POR	21	18	19	19
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	49	45	48	48
		weeks/event	14	18	16	16
		% POR	38	43	41	41
IR144 Craighead Basin	GE-E2: Inundation Pattern	# events	31	34	33	33
		weeks/event	28	24	24	24
		% POR	47	43	43	43
	GE-E3: High/Low Events	# high events	1	0	1	1
		weeks/event	1	0	1	1
		% POR	0	0	0	0
		# low events	28	40	37	38
		weeks/event	9	8	8	8
		% POR	13	17	16	16
IR145 East Perrine Marl Marsh	GE-E2: Inundation Pattern	# events	36	42	35	35
		weeks/event	27	20	18	18
		% POR	51	44	34	34
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	36	45	45	43
		weeks/event	10	7	7	8
		% POR	20	18	18	18
IR146 Model Lands Marl Marsh	GE-E2: Inundation Pattern	# events	41	45	41	41
		weeks/event	25	12	12	12
		% POR	56	28	26	26
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	32	47	52	51
		weeks/event	8	7	8	8
		% POR	13	17	22	22
IR147 Rocky Glades East	GE-E2: Inundation Pattern	# events	21	38	32	32
		weeks/event	70	17	33	33
		% POR	79	34	57	57
	GE-E3: High/Low Events	# high events	11	0	2	2
		weeks/event	5	0	1	1
		% POR	3	0	0	0
		# low events	26	58	43	40
		weeks/event	9	12	10	11

			Target	2000B2	2050B2	50ACMEB
		% POR	12	37	23	23
IR148 Rock Glades West	GE-E2: Inundation Pattern	# events	19	34	30	30
		weeks/event	82	28	41	41
		% POR	83	51	65	65
	GE-E3: High/Low Events	# high events	0	0	0	0
		weeks/event	0	0	0	0
		% POR	0	0	0	0
		# low events	15	39	27	26
		weeks/event	10	13	11	12
		% POR	8	27	16	16

Table A21.—Snail Kite

IR#	IR description	PM #	PM name	NSM 4.6.2	2000B2	2050B2	50AcmeB
100	North WCA1	GE-E17	Apple snail reproduction*	10	15	18	17
		GE-E18	Snail Kite Habitat**	102	94	69	70
101	Central WCA1	GE-E17	Apple snail reproduction	10	0	6	6
		GE-E18	Snail Kite Habitat	100	372	199O	225O
102	South WCA1	GE-E17	Apple snail reproduction	15	0	1	1
		GE-E18	Snail Kite Habitat	91	935	371	620
110	WCA2A North	GE-E17	Apple snail reproduction	20	25	16	16
		GE-E18	Snail Kite Habitat	66	49	93	105M
111	WCA2A South	GE-E17	Apple snail reproduction	11	11	11	11
		GE-E18	Snail Kite Habitat	131M	116M	121M	121M
112	WCA2B North	GE-E17	Apple snail reproduction	12	10	11	11
		GE-E18	Snail Kite Habitat	107M	107M	127M	128M
113	WCA2B South	GE-E17	Apple snail reproduction	13	9	10	9
		GE-E18	Snail Kite Habitat	107M	156O	151M	152M
114	WCA3A NW Cnr.	GE-E17	Apple snail reproduction	10	18	13	13
		GE-E18	Snail Kite Habitat	146M	74	101	101
115	WCA3A North	GE-E17	Apple snail reproduction	12	15	14	14
		GE-E18	Snail Kite Habitat	122M	88	99	99
116	WCA3A NE	GE-E17	Apple snail reproduction	18	12	5	5
		GE-E18	Snail Kite Habitat	86	121M	199O	200O
117	WCA3A NW	GE-E17	Apple snail reproduction	8	7	10	10
		GE-E18	Snail Kite Habitat	179O	161O	159O	159O
118	WCA3A Alley N	GE-E17	Apple snail reproduction	12	11	13	13
		GE-E18	Snail Kite Habitat	122M	129M	104M	104M
119	WCA3A East	GE-E17	Apple snail reproduction	12	3	9	9
		GE-E18	Snail Kite Habitat	122M	226O	158O	158O

IR#	IR description	PM #	PM name	NSM 4.6.2	2000B 2	2050B 2	50Acme B
120	WCA3A West	GE-E17	Apple snail reproduction	8	12	12	12
		GE-E18	Snail Kite Habitat	174O	115M	123M	123M
121	WCA3A N Central	GE-E17	Apple snail reproduction	10	9	11	11
		GE-E18	Snail Kite Habitat	124M	160O	145M	145M
122	WCA3A Gap	GE-E17	Apple snail reproduction	11	11	15	15
		GE-E18	Snail Kite Habitat	145M	123M	101	101
123	WCA3A S Central	GE-E17	Apple snail reproduction	13	10	15	15
		GE-E18	Snail Kite Habitat	106	145M	97	97
124	WCA3A South	GE-E17	Apple snail reproduction	13	2	13	13
		GE-E18	Snail Kite Habitat	124M	202O	123M	123M
125	WCA3B North	GE-E17	Apple snail reproduction	17	6	13	12
		GE-E18	Snail Kite Habitat	91	179O	94	106M
126	WCA3B West	GE-E17	Apple snail reproduction	5	6	12	12
		GE-E18	Snail Kite Habitat	180O	177O	106M	106M
127	Pennsuco	GE-E17	Apple snail reproduction	4	16	16	16
		GE-E18	Snail Kite Habitat	260O	72	70	78
128	WCA3B East	GE-E17	Apple snail reproduction	5	16	15	13
		GE-E18	Snail Kite Habitat	226O	97	81	86
129	NE Shark Slough	GE-E17	Apple snail reproduction	1	16	13	13
		GE-E18	Snail Kite Habitat	617	85	102	102
130	Mid Shark Slough	GE-E17	Apple snail reproduction	2	15	10	10
		GE-E18	Snail Kite Habitat	356	96	120M	120M
131	SW Shark Slough	GE-E17	Apple snail reproduction	5	18	11	11
		GE-E18	Snail Kite Habitat	218O	78	104M	104M
132	S Shark Slough	GE-E17	Apple snail reproduction	5	23	14	13
		GE-E18	Snail Kite Habitat	174O	60	98	104M
133	Taylor Slough	GE-E17	Apple snail reproduction	25	32	28	28
		GE-E18	Snail Kite Habitat	54	37	44	43
160	Rotenberger	GE-E17	Apple snail reproduction	22	7	6	6
		GE-E18	Snail Kite Habitat	52	104M	137M	137M
170	Holeyland	GE-E17	Apple snail reproduction	13	5	5	5
		GE-E18	Snail Kite Habitat	97	224O	201O	201O

* Number of years with dryouts prior to May 1. Target is to minimize, consistent with NSM

** Average Inundation Duration: 156 to 260 weeks = optimal (O); 104 to 155 or 261 to 312 weeks = marginal (M); other = unsuitable. Target is to maximize optimal and marginal, consistent with NSM

Southern Estuaries

Table A22.—Biscayne Bay

Biscayne Bay				
SE-E1 Surface Water Discharges to Biscayne Bay				
North Bay (sum of G58, S28, and S27) (values in acre-feet)				
	CERP Target	2000B2	2050B2	50ACMEB
Dry Season (Jun-Oct)	NA	50,000	61,000	61,000
Wet Season (Nov-May)	NA	107,000	112,000	112,000
Annual	NA	157,000	173,000	173,000
Snake Creek (S29) (monthly minimum flow volume = 13,300 acre-ft X 5 month wet season and 7 month dry season) (values in acre-feet)				
	CERP Target	2000B2	2050B2	50ACMEB
Dry Season (Jun-Oct)	93,000	46,000	45,000	45,000
Wet Season (Nov-May)	67,000	118,000	114,000	114,000
Annual	160,000	164,000	159,000	159,000
Central Bay (sum of G93 and S22; + 30% for dry season target) (values in acre-feet)				
	CERP Target	2000B2	2050B2	50ACMEB
Dry Season (Jun-Oct)	48,000	37,000	36,000	36,000
Wet Season (Nov-May)	94,000	94,000	73,000	74,000
Annual	175,000	131,000	109,000	110,000
SE-E3 Freshwater Flows to Biscayne Bay from the Miami River (sum of S-26, S-25B, S-25)				
	CERP Target	2000B2	2050B2	50ACMEB
7-day summed flow % time exceeds 3,000 acre-ft	80	55	50	50
Daily flow % of time less than 50 cfs	10	10	12	12
SE-E4 Salinity patterns in, and timing of freshwater inputs to, Manatee Bay and the coastal embayments of Barnes Sound (SWEVER1 gauge elevation)				
	CERP Target	2000B2	2050B2	50ACMEB
Average gauge elevation	1.9	1.25	1.25	1.25
Lower gauge elevation	1.25	-0.75	-0.75	-0.75
Upper gauge elevation	3.2	2.75	2.75	2.75
SE-E5 South Biscayne Bay (sum of simulated daily flows of S-123, S-21, S-21A, S-20G, and S-20F) (values in acre-feet)				
	CERP Target	2000B2	2050B2	50ACMEB
Dry Season (Jun-Oct)	146,000	80,000	71,000	72,000
Wet Season (Nov-May)	321,000	158,000	136,000	137,000
Annual	467,000	238,000	207,000	209,000

Table A-23.—Florida Bay

Florida Bay				
SE-E2 Salinity in Coastal Basins Estimated from Upstream Water Stages				
Joe Bay (based on NP67) (Number of months above and below the target salinity, as indicated)				
	NSM 4.6	2000 B2	2050 B2	50ACMEB
Months above 15 ppt	203	226	222	219
Months below 5 ppt	56	49	54	55
Little Madeira Bay (based on NP67) (Number of months above and below the target salinity, as indicated)				
	NSM 4.6	2000 B2	2050 B2	50ACMEB

Months above 25 ppt	197	222	213	212
Months below 15 ppt	23	9	18	18
Terrapin Bay (based on NP67) (Number of months above and below the target salinity, as indicated)				
	NSM 4.6	2000 B2	2050 B2	50ACMEB
Months above 35 ppt	172	191	185	185
Months below 25 ppt	10	6	6	6
Garfield Bight (based on NP67) (Number of months above and below the target salinity, as indicated)				
	NSM 4.6	2000 B2	2050 B2	50ACMEB
Months above 35 ppt	182	207	196	196
Months below 25 ppt	6	1	4	4
North River Mouth (based on P33) (Number of months above and below the target salinity, as indicated)				
	NSM 4.6	2000 B2	2050 B2	50ACMEB
Months above 15 ppt	60	179	136	133
Months below 5 ppt	179	53	77	80