

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

CASE NO. 88-1886-CIV-MORENO

UNITED STATES OF AMERICA,

Plaintiff,

vs.

SOUTH FLORIDA WATER MANAGEMENT
DISTRICT *et al.*,

Defendants

REPORT OF THE SPECIAL MASTER (JULY 5, 2006)

On June 1, 2005, the Court issued an “Order Requiring Special Master to Hold a Hearing on the Issue of Remedies and Submit a Report to the Court” (Order on Remedies). The Order on Remedies followed evidentiary hearings held September 20-21 and December 13-14, 2004 by the Court following the filing of two motions by the Miccosukee Tribe of Indians (Tribe). The motions are styled, “Miccosukee Tribe of Indians’ Motion Seeking a Declaration of Violations in Loxahatchee National Wildlife Refuge” and “Miccosukee Tribe of Indians’ Motion Seeking a Declaration of Breach by the SFWMD Concerning STA-3/4 Deadline,” both served on April 1, 2004. The violation and breach that were the subject of these motions relate to the Consent Decree signed by the United States, the South Florida Water Management District (District), and the State of Florida Department of Environmental Protection (DEP), that was entered in 1992 following several years of litigation and lengthy negotiation sessions, and modified on April 27, 2001 upon motion by the Consent Decree signatories and after hearings before the Court.

This is the Special Master’s Report and Recommendation.

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The Court's Order on Remedies

With respect to the Loxahatchee National Wildlife Refuge (Refuge), the Court's order addressed the existence of a violation of the Consent Decree by virtue of an "exceedance" of the Interim Level¹ for phosphorus. The Consent Decree provides that an exceedance occurs if the geometric mean of the sample results at 14 Refuge sampling stations is greater than the Interim Level "two or more times in any 12 consecutive sample collections." Consent Decree, Appendix B, p. B-5. It then identifies when an exceedance constitutes a "violation":

An exceedance will constitute a violation of this Agreement and relevant water quality criteria unless the TOC² determines there is substantial evidence that it is due to error or extraordinary natural phenomena.

¹ As discussed below, the Interim Level is determined according to a formula set forth in the Consent Decree.

² "TOC" stands for Technical Oversight Committee established under Paragraph 18 of the Consent Decree.

Consent Decree, Appendix B, p. B-5. As the Court's Order on Remedies pointed out, there was no dispute that there were two times within twelve consecutive sample collections in 2001-2002 when the geometric mean of the sample results exceeded the Interim Level.³ The Court, citing TOC minutes of July 24, 2003, observed that the TOC did not make a determination that there was substantial evidence that the exceedance was due to error or extraordinary natural phenomena. Order on Remedies, p. 8. The Court's Order on Remedies then provided:

The Court finds that the settling parties have failed to present substantial evidence to show that the exceedances were excusable. Although the Court finds that the settling parties have failed to show that the exceedances were caused by error or extraordinary phenomena, the Court has not delved into the range of possible causes of the exceedances. As outlined more fully below, the Special Master can consider the issue of causation in making his Report on remedies. After such Report and Recommendation, the Court can then, if appropriate, reconsider its ruling that there has been a violation of the consent decree.

Order on Remedies, p. 8-9 (footnotes omitted). In reaching this conclusion, the Court rejected an argument that the exceedances were errors that lacked statistical significance. Order on Remedies, p. 8-9 n.9.

With respect to STA-3/4, the issue was whether this stormwater treatment area had to be "constructed" or had to be "operating" by the December 2003 deadline in the Consent Decree. The Court determined that it had to be operating by the deadline in the Consent Decree and that it was not, but that this non-compliance was a "relatively minor violation" especially given the efforts of the District and the DEP to implement enhancements to the STAs based on the

³ Order on Remedies, p. 7. Interim Level compliance data are reported in "Settlement Agreement" reports which can be found at <http://www.sfwmd.gov/org/ema/reports/settlement/>.

growing body of experience of the State parties with the STAs.⁴ The Court noted that the settling parties represented to the Court that STA-3/4 was then operational, and ordered the parties to present “proof of this” to the Special Master. Order on Remedies, p. 13. The Special Master was directed to file a report with the Court on whether any remedy is necessary if STA-3/4 is operating at full capacity.

The Court also directed the Special Master to focus on remedies for the violation associated with the exceedances in the Refuge. The Court wrote:

If the state agencies propose additional and specific remedies, the Special Master may consider those remedies as he determines what to recommend as a result of the violations of the consent decree already found by the Court. This Court’s power to enforce the consent decree is not limited to vague remedial proposals, most of which the State agencies are already bound to do, as per the consent decree.

Moreover, without specific details of what that remedy will be, the Court is not able to ensure that the Parties comply with the remedial measures. This Court cannot enforce vague assertions about what will be done in the future, or what might be done based on certain other conditions first occurring. There must be *specific acts* to be performed and specific dates by when those acts must be completed. That will ensure that everyone involved knows exactly what must be done and when it must be done. Such course of conduct increases the chances that more will be done sooner to ensure that the levels are met and that no further exceedances or other violations occur.

Order on Remedies, p. 15 (Emphasis in the original.)

The Court further directed the Special Master to hold a hearing within 90 days of the June 1 order on the issue of remedies and “if necessary, on causation.” Within 60 days after completion of the hearing, the Special Master “shall file a recommendation with the Court reporting the issues on which the Tribe and parties agree, the issues in dispute, and the proper

⁴ The Court denied a motion to modify the Consent Decree with respect to STA 3/4 deadlines without prejudice to refile of the motion “after a *Rufo* hearing is conducted by the Special Master” referring to *Rufo v. Inmates of Suffolk County Jail*, 502 U.S. 367 (1992) which sets forth standards for modification of a consent decree.

remedies that best address the violations listed by this Court. The remedies must require a party to act in some definite manner.” Order on Remedies, p. 16.

The Court further directed that the Special Master’s report “should include, but not be limited to,” these subjects:

- (1) Whether strict compliance with sampling requirements is possible?
- (2) Whether strict compliance with sampling requirements is necessary to determine the effect of diversion of water and to ensure that monthly data is most reflective of the level of P in the water so progress can be evaluated?
- (3) What can be done to ensure that the STA-1E is fully operational as soon as possible?
- (4) By what date can STA-1E be fully operating?
- (5) By what date are the CERP⁵ projects to be completed and can those projects be completed sooner?
- (6) Is it possible to complete the Acceler8 project⁶ at an earlier date?
- (7) When can all 16,660 acres of STA-3/4 be fully operational, with completed enhancements?
- (8) What are the dates of acquisition, construction, and full operation of the approximately 18,000 more acres of additional STAs proposed by the settling parties?
- (9) What is the earliest, and latest, dates by when a large scale PSTA⁷ study can be conducted by the ACOE⁸?
- (10) What should the role of the TOC be (i.e., should it include other duties)?
- (11) Whether monthly TOC meetings might help improve TOC responsiveness?
- (12) Will the Feasibility Study be completed by November 2005?

⁵ CERP is the Comprehensive Everglades Restoration Plan and consists of a large number of projects to update the Central and South Florida Project (1,000 miles of canals, 720 miles of levees, and several hundred water control structures built over several decades to provide flood protection and meet water supply needs). See Tribe Ex. 359A, 2006 South Florida Environmental Report (SFER), Chapter 7A; District Ex. 94, p. 1 (Barnett).

⁶ Acceler8 represents an initiative to speed up implementation of certain CERP projects and is discussed below.

⁷ PSTA stands for Periphyton Stormwater Treatment Area. PSTA “is defined as a constructed wetland with a sparse emergent macrophyte community that provides structure to support a dominant periphyton assemblage. PSTA is currently envisioned to be a post-STA technology that is operated at inflow TP concentrations of 50 µg/L (ppb) or less. The primary nutrient removal mechanisms in a PSTA wetland are direct phosphorus uptake by the periphyton and algal-mediated co-precipitation of phosphorus with calcium carbonate.” Tribe Ex. 359A, 2006 SFER, p. 4-107. Periphyton is defined in the report as: “the biological community of microscopic plants and animals attached to surfaces in aquatic environments. Algae are the primary component in these assemblages, which naturally reduce phosphorus levels in water and serve a key function in Stormwater Treatment Areas.” *Id.*, p. G-vi.

⁸ ACOE means the Army Corps of Engineers.

The Court concluded its Order (p. 17) by explaining:

In conclusion, in finding a violation of the consent decree, the Court is merely ordering at this time that the United States and the state agencies implement their own remedies but provide more detail and a schedule that will be met. In the absence of such, the Court, if appropriate and after the Report and Recommendation from the Special Master, may be compelled to impose its own additional specific and detailed remedies.

Proceedings Since the June 1, 2005 Order

The Special Master held hearings on July 18-20, 2005, and March 13-17, March 29, and April 26, 2006. For a number of reasons, including efforts to resolve differences among the various stakeholders through mediation and negotiation, completion of the hearing was postponed until Spring 2006 with the consent of all of the parties and the approval of the Court. The hearings were conducted pursuant to the Federal Rules of Evidence and were transcribed.

STA-3/4

The Court has determined that STA-3/4 was not operational by October 1, 2003, as the Consent Decree required. Order on Remedies, p. 13. The Court directed that the District provide proof of when STA-3/4 became operational. *Id.* The Special Master was directed to file a report with the Court on whether any remedy is necessary if STA-3/4 is operating at full capacity.

In response to this directive, the District presented witness testimony. Michael Curley was the resident engineer for STA-3/4. Tr. 87. He testified that STA-3/4 began discharging water in February 2004 (Cell 1), June 2004 (Cell 3), and September 2004 (Cell 2). Tr. 89. Cell 2 began to discharge water later than the other cells because of enhancements made in this cell. Tr. 89. Cell 3 was taken offline in October 2004 for enhancements. It was returned to service in June 2005. Tr. 90.

The Special Master accepts this testimony as sufficient proof that STA-3/4 was operational by February 2004 with all cells operational by September 2004.⁹

The “main” contractor for the work on STA-3/4 filed for bankruptcy in January 2002. Tr. 86, 97. During the hearing, the District suggested that this event satisfied the *force majeure* provisions of the Consent Decree thereby excusing the failure to have STA-3/4 operational by October 1, 2003. Tr. 85; Consent Decree, p. 29-30. In the State parties’ closing memorandum, there was no discussion of *force majeure*,¹⁰ however, and no suggestion was made by any party during the hearing that any “remedy” was necessary with respect to STA-3/4. The Court called the STA-3/4 issue a “relatively minor violation” and all of the parties appear to have moved beyond this issue. The Special Master adopts this view and, at this point, does not recommend that any further action be taken with respect to STA-3/4.¹¹

Evidentiary Issues

The State parties moved to strike portions of the testimony of Matthew Harwell, Ph.D, a witness for the United States. The United States and the Tribe moved to strike portions of the testimony of Ronald G. Marks, Ph.D., a witness for the State parties. The Special Master addresses these motions *seriatim*.

⁹ During the hearing, the Tribe took the position that until certain diversion structures were in place, STA-3/4 was not operational. Tr. 111-12; Tribe Exh. 336, p. 16 (Dr. Rice) (opining that STA-3/4 was not “100% operational” until the diversion structures were completed). The Special Master concludes, however, that once the STA went into flow-through mode it was operational.

¹⁰ The *force majeure* clause provides that if a party “is of the opinion” that a *force majeure* event has occurred, that party “has an affirmative obligation to initiate immediately the dispute resolution provision set forth in paragraph 19, as a prerequisite to seeking relief from that Party’s commitments.” That was not done here.

¹¹ This result is consistent with the history of STA construction and operation as documented in the Special Master’s Report (December 1, 2003), p. 22. STA-3/4 was in a flow through mode faster than both STA-2 and STA-5 relative to their Consent Decree deadlines, and certainly so relative to STA-1E, as is discussed further below.

Dr. Harwell's Testimony on Remedies

Dr. Harwell is a biologist who works at the Refuge for the Fish and Wildlife Service (FWS). Dr. Harwell is the designated “alternate” representative of the FWS on the TOC. In addition to serving in this role, Dr. Harwell’s duties at the Refuge include: (i) participating as a member of the Department of Interior’s Everglades Program Team, providing technical support concerning issues related to the implementation of the Consent Decree; (ii) attending TOC meetings, (iii) reviewing technical reports, publications, and scientific studies concerning water quality and other issues related to regional water management affecting the Refuge and its resources. U.S. Exh. 50, p. 2. Dr Harwell also participates regularly in interdisciplinary, multi-agency meeting forums, including the Comprehensive Everglades Restoration Plan’s Restoration, Coordination and Verification (“RECOVER”) team, which identify and examine complex local-, regional-, and landscape-scale restoration issues affecting Everglades ecology. He also serves on the Interagency Adaptive Management Planning Committee for CERP, a group “that develops approaches for incorporating adaptive management into CERP.” *Id.*

Dr. Harwell rendered an expert report in which he offered “additional remedies for further technical consideration.” He was not suggesting that the Court order these remedies. Rather, as he wrote, his list of additional remedies represents “an attempt to list reasonable potential remedies worthy of further consideration by the TOC for the Refuge.” U.S. Exh. 50, p. 12-13. Dr. Harwell based his compilation in part on information provided to him by other professionals:

Q. Now, Dr. Harwell, did you have help in preparing your expert report?

A. Yes.

Q. And who helped you form the opinions in the report?

A. The opinions in the report are mine. I consulted and examined research from a variety of sources.

Q. Okay. As far as individuals are concerned within your agency did they help you write and prepare this report?

A. They provided input as I was preparing the report.

Q. And who were those individuals?

A. There were a number of individuals. Dr. Waldon, Dr. Aumen, Dr. Walker, Dr. Kadlec.¹²

...

Q. And did you consult with the U.S. Army Corps of Engineers or the U.S. Environmental Protection Agency before you submitted this report to the court?

A. Yes.

Q. Okay. And who on behalf of the Army Corps of Engineers did you consult with?

A. The report that was submitted as U.S. Exhibit 50 was a report that was examined by all parties.

Q. When you say all parties what do you mean? How do you define parties, who were the parties?

A. The U.S. parties to this case.

Q. So it would be as defined in the Consent Decree, Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Department of Agriculture, U.S. Department of Interior? Would those be the parties as defined in the Consent Decree as comprising the United States of America?

A. The Consent Decree for the purposes of the TOC and the functions identified, the National Park Service, the Fish and Wildlife Service and the Army Corps of Engineers.

Tr. 1506-1508. Dr. Harwell later said he could not specifically identify which expert assisted him with respect to a particular remedial suggestion and he admitted he was not qualified to verify engineering observations, or STA design, size, or operational issues. Tr. 1570-73. Dr. Harwell also admitted that he was not an expert in feasibility studies, Best Management Practices (BMPs),¹³ water management operation plans, hydraulic control structures, watershed management, or non-point source pollution. Tr. 1505-06.

The State parties say that Dr. Harwell should have disclosed the bases for his opinions under F.R.Civ.P. 26(a)(2)(B) and 37(c)(1), and, based on this testimony, under *Dura v. CTS*

¹² Dr. Waldon works for the Refuge. Dr. Aumen works for Everglades National Park. Drs. Walker and Kadlec are consultants to the United States.

¹³ BMPs represent practices employed by agricultural stakeholders to reduce phosphorus run-off. See n. 71.

Corporation, 285 F.3d 609 (7th Cir. 2002), Dr. Harwell is impermissibly acting as a conduit for the expert testimony of others on matters in which he lacks expertise. They say his expert report and related testimony should be excluded as a result.

If Dr. Harwell were asking the Court to require implementation of the remedial suggestions made in his expert report, the State parties might be on firm ground in making their objections. In *Dura*, for example, an expert in hydrogeology was not permitted to testify about the conclusions reached by experts in groundwater modeling which related to “scientific issues at once crucial to the prima facie case and likely to be contested” since he was not competent to determine whether the modeling techniques employed were “appropriately chosen and applied.” 285 F.3d at 615-16.

But Dr. Harwell is not asking the Court to order implementation of the remedies he compiled. Rather he proposes that the TOC should consider the items on his list. He is competent to develop such a list for the TOC’s consideration.¹⁴ At a minimum, this testimony relates to the Court’s questions regarding the role of the TOC and the frequency of TOC meetings. Hence, *Dura* is not applicable,¹⁵ and the motion to strike portions of Dr. Harwell’s testimony relating to additional remedies is denied.

¹⁴ *Cf. Dura*, 285 F.3d at 615, where the court of appeals explained that had the hydrogeologist used the modeling report to establish the current capture zone of a wellfield, “we might well have a different case; such use might be quite routine.”

¹⁵ Rule 37(c)(1) is also not applicable. Rule 26(a)(2)(B) requires an expert to state the bases of opinions rendered by the expert in a report. Rule 37(c)(1) provides that a party “without substantial justification” that fails to disclose information required by Rule 26(a) is not permitted to use as evidence at a hearing “the information not disclosed.” In *Dura*, these procedural rules were used as the basis to strike the affidavits of four modeling experts that were filed after service of a motion to bar the hydrogeologist from testifying because he was not qualified to render the opinions of the modelers. Because these four experts’ affidavits were submitted six months after disclosure was required by the district court’s scheduling order, they were not disclosed pursuant to Rule 26(a)(2)(B) and therefore the information contained within the affidavits was barred by Rule 37(c)(1). 285 F.3d at 612, 616. The situation here is not comparable. The information argued not to have been disclosed is that Dr. Harwell spoke with other experts to compile his list, but that is not the information the State parties want barred under Rule 37(c)(1). They want a part of his list, which was disclosed, barred.

Dr. Marks' Testimony On the Rate of False Positives

In an oral ruling, the Neutral refused to consider certain portions of the expert opinions of the State parties' experts at the Hearing.¹⁶ To permit the Court to fairly review the matter, the Special Master explains his reasoning here.

In its Order on Remedies, the Court found that a "violation" of the Consent Decree existed because there was an "exceedance"--meaning, again, that the geometric mean of the 14 sampling stations' sample results was higher than the Interim Level twice within 12 consecutive sampling events--that was unaccompanied by a TOC determination that there was substantial evidence that the exceedance was due to error or extraordinary natural phenomena. However, the Court stated that the Court "has not delved into the range of possible causes of the exceedances" and that the Special Master "can consider the issue of causation in making his Report on remedies." Based on the Special Master's Report, "the Court can then, if appropriate, reconsider its ruling that there has been a violation of the consent decree." Order on Remedies, p. 9.

The State parties accepted the Court's invitation to address the issue of causation by focusing on the "error" component of Appendix B, arguing that there is substantial evidence that the exceedance--one or the other of the two sampling events whose results produced a geometric mean higher than the Interim Level--was due to "error."

In an effort to show "error," the State parties presented the expert opinion of Ronald G. Marks, Ph.D. Dr. Marks is now retired but he was a Professor in the Department of Statistics at the University of Florida for many years. District Exh. 136, Exhibit A. Dr. Marks explained that the Consent Decree utilizes an upper confidence limit of 90%, or a 10% chance of error, in developing the monthly Interim Level of phosphorus based on the stage of water for comparison

¹⁶ It follows that the opinions of other parties' experts responding to what was stricken were also not considered.

to the geometric mean of the phosphorus concentrations in the samples taken from the 14 Refuge sampling locations. District Exh. 136, p. 11. In fact, he says when applied to an exceedance, the confidence level is lower. He opined that the probability of a false positive for two “excursions,” i.e., an exceedance,¹⁷ is 34%, not 10%. *Id.* at 12. As a result, Dr. Marks opined, the “model” used in the Consent Decree to calculate the Interim Level, which has shown nine excursions, actually would have shown only two, had the Consent Decree “model” (or equation) been developed to assure no more than a 10% probability of a false positive result with respect to an “exceedance” as opposed to an “excursion.” *Id.*

To elaborate, Dr. Marks focused on the following language in the Consent Decree:

The interim levels represent the 10% rejection level of the observed 14 station interior marsh mean concentration at a given mean daily stage, adjusted to a baseline time period of June 1978-June 1979.

Consent Decree, Exhibit B, p. B-1-2. To determine the “10% rejection level,” he explained, one has to look at baseline data to determine what the phosphorus level was at various water levels. According to Dr. Marks, data collected on 14 dates from the 14 Refuge stations between 1978 and 1983 were used to predict water quality in the Refuge for the period 1978-79. These data were fitted into a “linear regression model” which became the equation used in the Consent Decree to establish the Interim Level. The model was “linear” because it is based on stage as the single predictor or variable. District Exh. 136, p. 6.

The actual equation in the Consent Decree appears at page B-6 and reads as follows:

$$C = 11.9187 - .603261S + 1.372 [7.5311-.9247S+02882758S^2]$$

¹⁷ Dr. Marks was treating each time the geometric mean was greater than the Interim Level as an “excursion” so that, in his parlance, two excursions within a “consecutive 12-month sampling period” equal an “exceedance.” District Exh. 136, p. 2.

“C” is the natural log of the geometric mean total phosphorus concentrations across the 14 Refuge sampling stations, or the Interim Level. “S” is the average stage measured at water level gauges labeled CA1-9, CA1-7, and CA1-8C. Consent Decree, Appendix B, p. B-6. The equation contains just the one variable, “S,” or stage. The fixed numbers in the equation were derived from the study of the 1979-83 phosphorus concentration data and stage and represent the numbers that would generate a 90% upper confidence limit (or a 10% rejection level).¹⁸

Each month the stage levels are plugged into the formula above, and the Interim Level is determined and compared to the geometric mean of the actual phosphorus concentrations from the 14 sampling stations. Dr. Marks opined that while the 10% rejection level used in the Consent Decree “may seem conservative” it is “just the opposite” because of the frequency of its application. The equation predicts phosphorus levels on a monthly basis but an exceedance is defined relative to twelve consecutive sampling events. Treating the definition of an “exceedance” as representing twelve consecutive “monthly” samples,¹⁹ Dr. Marks opined that the use of the linear regression equation in the Consent Decree “greatly increases the probability of an erroneous conclusion of an exceedance,” or a “false positive.” District Exh. 136, p. 11-12.

Dr. Marks offered this analysis which references exhibits to his opinion:

The probability of one or more excursions occurring by chance during any given 12-month period is considerably greater than 10%, even assuming the model is correct and the system is in

¹⁸ According to Dr. Marks, this is a “one-sided” limit; it only considers the predicted concentration that is at the 90% confidence limit. Dr. Marks explained that the use of a 90% upper confidence limit is equivalent to using an 80% standard two-sided confidence interval (where the upper limit was 90% and the lower limit was 70%). Dr. Marks then gratuitously opined that the use of an 80% confidence interval is “lower than standard statistically accepted confidence levels.” District Exh. 136, p. 11. I say “gratuitously” because even if the 10% rejection level used in the consent decree is equivalent to an 80% two-sided confidence interval, the Consent Decree signatories accepted the 10% rejection level as binding.

¹⁹ Dr. Marks referred to this as an annual test when in fact it may not be since the Interim Level is not computed if the stage is too high or too low so that 12 consecutive sampling collections may take place over 13 or 14 or even 15 months. District Exh. 136, p. 11.

balance. It is shown in Exhibit B²⁰ that the probability of no excursions above the allowed level during 12 consecutive sample collections by chance alone is 28%. This means there is a 72% chance of at least one excursion occurring simply by chance in any given 12 month sampling period when the phosphorus levels in the system are in balance. It is shown in Exhibit B that the probability of exactly one excursion in any given 12 consecutive sample collections, assuming an accurate unbiased model and no true phosphorus excess, is 38%. Thus, the probability of a false exceedance occurring in any given 12 consecutive sample collections is 34% (1 - probability of 0 or 1 false excursion). This means that on average, even with a valid and accurate model evaluating a system truly in balance, interim and long-term model results will falsely declare an exceedance one of every three annual periods of evaluation. To summarize, the probability of a false positive for an exceedance, defined as two false excursions in a 12 month sampling period, is 34%. The result is a model (both interim and long-term) that will identify false exceedances at rates well above established statistical limits.

District Exh. 136, p. 12.

The United States and the Tribe objected to Dr. Marks' testimony. The United States argued that the term "error" as used in Appendix B of the Consent Decree is "clear, and does not encompass the State parties' interpretation of 'error' as embracing 'false positives' risk inherent in the Appendix B equations." Prehearing Memorandum of the United States, p. 2 (October 18, 2005). The United States added that to challenge the Appendix B equation requires extrinsic evidence, so that the "State Parties' attempt to rely on false positive risk inherent in the Decree to avoid liability for non-compliance with the Interim Levels of Appendix B violates the parol evidence rule." Supplement to Prehearing Memorandum, p. 3 (March 2, 2006). The United States also argued that the State parties are judicially estopped from making this argument because of a prior inconsistent position taken in 1995. *Id.*, p. 3-9. The Tribe took a similar

²⁰ Exhibit B to Dr. Marks' opinion contains calculations to justify the numerical results in his opinion. His calculations are premised on two assumptions: "(1) the model is correct and unbiased in its monthly predictions, and (2) the ecological system is unchanged from the time the model was developed (1978-83) until the time it is evaluated (1999-forward)." District Exh. 136, Exhibit B.

position arguing that the State parties are attacking the Consent Decree, not trying to show causation, and seeking to introduce parole evidence when no ambiguity exists in the Decree's use of the word "error." Tribe's Pre-Hearing Memorandum, p. 4-7 (March 2, 2006).

The State parties responded by arguing that it is the United States which is trying to change the Settlement Agreement by adding the word "sampling" before the word "error" in Appendix B. State Parties' Response to United States' Prehearing Memorandum (of October 18, 2005), p. 4 (March 2, 2006). They explain:

Accordingly, the high false positive rate means that the Technical Oversight Committee ("TOC") should expect to see frequent excursions. These excursions, however, do not necessarily mean there is a water quality problem. By way of crude example, if one owns an extremely valuable car, he may want to set the car alarm at a very sensitive level. With the alarm set to go off at the slightest nudge, the owner may not get much sleep at night; however, his car will not get stolen because he will be awake on the rare occasion when a thief is actually prying open the car door. In that regard, the equation is doing exactly what it should: keeping everyone intently focused on water quality in the Refuge. The alarm is going off. But given the fact that average phosphorus concentrations are lower now than during the baseline, that inflow concentrations are lower now than during the baseline, that external loading is lower, and, so too, is the Refuge's phosphorus retention rate, there is substantial evidence that the recent exceedances are not real.

An analogy that concludes that an "alarm is going off" is an apt one for other purposes as discussed below. The Special Master believes the proper focus here is on the State parties' prior sentence: "the equation is doing exactly what it should: keeping everyone intently focused on water quality in the Refuge." This statement is consistent with the Court's already-expressed views on statistical issues. The argument made by the State parties here is similar to one advanced ten years ago in this proceeding and resurrected last year before the Court's Order on Remedies. The Court addressed the argument summarily in its Order on Remedies:

The Court also finds that the argument that the exceedances are sampling errors or false-positive readings is without merit. The State and Farm Interest Parties argue that the exceedances are errors which lack statistical significance. However, this type of “error” is a deviation that would have necessarily been contemplated by the parties and included into the terms of the agreement. The agreement allows for exceedances, but it does not allow for two exceedances in a 12 month period. In fact, the false-positive argument is inconsistent with the Parties’ representations that the Long-Term levels will be met. The error referred to in the agreement is more likely an error relating to proper sampling.

Lastly the 1978 and 1979 values are not controlling, but instead it is the interim and long-term levels set by the parties in the agreement that must be met. The language is clear as to what an exceedance is and the Court need not examine any extraneous evidence.

Order on Remedies, p. 8-9 n.9. With this “law of the case” established, the inadmissibility of the testimony of Dr. Marks and related testimony by others logically follows.

The Special Master will nonetheless add this analysis to explain why Dr. Marks’ opinion is improper in the context of the Court’s referral.

If the Special Master might restate Dr. Marks’ position, it is that *if* the parties’ agreement in 1992 was intended to have a 10% rejection level for an exceedance, the formula used in Appendix B does not do that. But the TOC has never considered, the movant did not raise, and the Court did not address, the question of whether the 10% rejection level was intended to apply to more than a single monthly sampling event. So the issue is not within the scope of the referral to the Special Master.

But even if that is an incorrect conclusion, and even if the Special Master accepts all of what Dr. Marks says, it does not follow that the parties intended that the 10% rejection level should apply to an exceedance.

Appendix B says that the Interim Level represents the 10% rejection level of “the observed 14 station interior marsh concentration at a given mean daily stage, adjusted to a baseline time period of June 1978 to June 1979.” Consent Decree, Exhibit B, p. B-1-2. No one denies that the formula used in Appendix B to determine the Interim Level in a given month does just that.²¹ And everyone agrees that the calculations that were used to determine the formula were published in the Everglades Surface Water Improvement and Management (SWIM) Plan,²² are readily available, and are easily replicated.

It is four pages later in Appendix B where an “exceedance” is defined. As noted above, an exceedance “occurs if the 14 station mean concentration is greater than the computed concentration level two or more times in any 12 consecutive sample collections.” Consent Decree, Appendix B, p. B-5. There is no mention in this part of the Consent Decree that the parties’ intent was to achieve a 10% rejection level before an “exceedance” occurred. Yet that is the fundamental premise of Dr. Marks’ opinion.

The Consent Decree could have addressed compliance in a number of ways. It might have set a fixed phosphorus concentration in a number of locations against which sampling data would be compared to determine compliance. It might have set a fixed concentration in water being discharged to the Refuge through various conveyance structures. It might have required a biological assessment of flora in pre-determined areas to evaluate whether nutrient-favored flora were displacing the oligotrophic flora of the Everglades. It might have set a 10% rejection level for an exceedance, as Dr. Marks erroneously believes was done.

²¹ The State parties view the 10% rejection level as representing an 80% confidence interval not a 90% confidence interval. State Parties’ Response to United States Prehearing Memorandum, p. 6. Unless the Special Master misunderstands Dr. Marks’ opinion, the State parties are mixing “limits” with “intervals.” What Dr. Marks said is that a 90% upper confidence *limit* was used in the Consent Decree and that this is equivalent to the upper limit of an 80% confidence *interval*. District Exh. 136, p. 11. As the Special Master understands these terms, they both represent a calculation producing a 10% rejection level.

²² Dr. Marks said that is where he found them. District Exh. 136, p. 10. Appendix E and F to the Everglades SWIM Plan appear as U.S. Exh. 76 and 77.

Instead, for a marsh consisting of 140,000 acres, the settling parties chose a method to determine an “exceedance” that is not linked to a specific statistical rejection rate. And they separately agreed upon a method to determine if an “exceedance” represented a “violation.” A statistician may be able to report that combining two “excursions” into a 12-“month” time frame represents a 34% rejection rate, but that would not stop the settling parties from agreeing to define an “exceedance” or a “violation” in the manner that they did without any reference to the rate of “false positives.” The settling parties may have wanted to be extremely conservative because they were worried that the data used to establish the Interim Level formula was limited, or that the 14 stations were not a fair surrogate for impacts in a 140,000-acre marsh,²³ or that they wanted the “alarm to go off” easily because they could not be certain whether the remedies contemplated in 1992 would actually work once they were implemented.

It does not matter why they agreed to the language that has guided the parties since compliance with the Interim Level began being tracked in February 1999. It only matters that they did agree to be bound by these constraints.

It follows then that “error” in the definition of “violation” does not contemplate rewriting the formula for an “exceedance” so that it represents a 10% rejection level instead of a 34% rejection level. Such a result would require a conclusion that parties intended much less than a 10% rejection rate to establish the Interim Level²⁴ *and* that the parties intended that an “exceedance” should be determined by reference to a 10% rejection level. The words of the Consent Decree do not permit either conclusion. They unambiguously say that the Interim Level

²³ The 14 stations were thought to be unimpacted areas of the Refuge in the late 1970s. In part, the point of continued sampling of them and comparing the results of that sampling (the monthly geometric mean) to conditions in the late 1970s (represented by the Interim Level equation) was to determine if these areas remained unimpacted.

²⁴ Dr. Marks says that a 4.5% rejection rate to establish the Interim Level would produce a 10% rejection rate for an exceedance. District Exh. 136, p. 12.

is determined by reference to a formula that represents a 10% rejection rate, and they do not tie an “exceedance” to any statistical rejection rate.

It therefore must follow that the State parties’ argument that the word “error” in the definition of “violation” can mean statistical error in the formula that is used to set the Interim Level when applied to two “excursions” in a 12-“month” time period is an impermissible collateral attack on other terms of the Consent Decree. The State parties’ burden was to show “substantial evidence” that the “exceedance” is due to “error.” Instead, they argued that there was not an “exceedance” to begin with. That argument is foreclosed by the terms of their bargain.²⁵

The State parties have a number of alternative arguments which were also the subject of a motion to strike which the Special Master denied. I now turn to those arguments.

Does the Refuge Exceedance Represent a “Violation” of the Decree?

No one argues that “extraordinary natural phenomena” were the cause of the exceedance in question. So we are left with the question of whether there was “substantial evidence” that the exceedance was due to “error.” And since no one is arguing that there was “sampling error,” the issue is even narrower: was there substantial evidence that the exceedance (two “excursions” within 12 consecutive sampling events) was due to error other than sampling error? If there was not, the Court’s determination that a violation exists should not be disturbed.

State Parties’ Arguments on Causation

The State parties attempted to answer this question by presenting statistical analyses that funnel into one primary argument: there is a weak statistical correlation between the amount of phosphorus in water that enters the Refuge and the results of the 14 interior sampling stations.

²⁵ A modification to the Consent Decree would be required to effect the interpretation sought by the State Parties.

This epiphany by the State parties' experts, Drs. Redfield and Goforth, has occurred within the past twelve to eighteen months. Tr. 1033, 1351. In this time period, these two scientists have studied the data from the past several years and attempted to correlate the "excursions" at the 14 interior stations with phosphorus loads taking into account possible lags in time for phosphorus to move into the interior of the Refuge where the sampling stations are located. They could not do so. Even during the 2004 hurricane activity when phosphorus loads to the Refuge increased significantly, they observed that the 14-station geomean remained below the Interim Level. Tr. 1043-44. Hence, they link excursions from the Interim Level primarily to "legacy" phosphorus: phosphorus already present in the sediments at the interior sampling sites and that enters the water column being sampled depending upon how dry or wet conditions are or have been before the sample is taken. Tr. 1063-64, 1067, 1262.

The United States' expert, Dr. Walker, disagrees. He says that the opinions of Drs. Redfield and Goforth are based on "too simple" a model, Tr. 1687, 1718, because the correlation that matters is between gradient and STA-effluent data. Tr. 1719. He says that when the level of water in the canals that rim the Refuge is high, water moves into interior portions of the Refuge carrying with it whatever phosphorus the water might contain, and sometime thereafter excursions have occurred. Tr. 1715-16, 1719, U.S. Exhibit 188. Mr. Erskine, an expert for the Tribe, offers additional reasons why the relationship between the rim canal water and interior phosphorus loading is more complex. Tribe Exh. 341, p. 3.

The differences between these positions are profound relative to remedies. If the quality of the water that left STA-1W²⁶ historically would not affect the concentration measured at the interior sampling stations, adding more STA treatment capacity in response to an exceedance may not improve the water quality of the Refuge (at least not in its interior), as Drs. Redfield and

²⁶ STA 1-E was not operating during the exceedance in question.

Goforth suggest. If the gradient between the rim canal and the Refuge is the issue, as Dr. Walker says, then keeping rim canal levels lower than the water in the Refuge should be a workable solution to prevent water leaving STA-1W and entering those rim canals from penetrating the interior of the Refuge (as long as the Refuge's need for water can otherwise be satisfied) or at a minimum, from causing a second excursion so as to avoid an exceedance of the Interim Level.²⁷

However, in this part of the State parties' argument we deal with causation, not remedies. To turn Drs. Goforth and Redfield's views into causation issues, one would have to conclude that interior penetration of water from the canals rimming the Refuge did not cause the excursions that make up the exceedance; that "legacy" phosphorus was the cause; and that "error" exists unless water exiting the rim canals penetrated into the interior of the Refuge and caused two violations of the Interim Level within the requisite twelve consecutive sampling collections.

But, again, that is not what the Consent Decree says. The parties drafted Appendix B to the Decree to require two excursions within 12 consecutive sample collections. They did not attempt to determine what phosphorus--legacy phosphorus, phosphorus from atmospheric deposition, phosphorus in surface water penetrating to the interior from the rim canals at some point before the excursion--caused the excursion. For whatever reasons in 1992, the parties wanted to know when the geometric mean of the sample results from the 14 interior stations exceeded the Interim Level twice within twelve consecutive sampling periods. That was the trigger for review of the "exceedance" to determine whether there was "substantial evidence" that the two excursions were due to extraordinary natural phenomena or error. If they were not, the parties agreed that additional remedies "will be taken" by the State parties with the caveat that the only obligation placed on the State parties was that whatever remedies were selected had

²⁷ Dr. Walker observed that canal levels have been lower than the Refuge's water level for the past several months and the Interim Level has consistently been met by the interior sample results. Tr. 1723-25.

to go beyond “more intensive management of the STAs.” Consent Decree, Appendix C-4. That respected scientists for the State parties today believe there is a weak correlation between inflows and interior marsh concentrations does not change the fact that their employers made a bargain based on a different standard.²⁸

That is not to say that in 1992 the parties to the Consent Decree understood the fate and transport of phosphorus in the Everglades Protection Area (EPA). That’s why the 1992 Decree provided for a research program. Paragraph 11B of the Decree explains that a “key component” of the planned research was “the development (including appropriate data collection) of models of phosphorus dynamics in the EPA.” Paragraph 11B of the Decree then cites this example as one “priority” of the research:

For example, one priority would be an understanding of the relationships between phosphorus input and water quality at the 14 interior marsh stations in the Refuge, including definition of the future role of recycling of previous excess phosphorus inputs.²⁹

Research and monitoring was to be a collaborative effort. The State parties were supposed to be “primarily responsible” for the research program but “with support from the United States.” The “National Park Service, the U.S. Fish and Wildlife Service, the USEPA and the Corps will assist in the research and monitoring.” Consent Decree, D-1. The State parties were supposed to have completed planning for the research program within six months after the settlement and the research program was then supposed to be implemented “according to a

²⁸ The State parties’ argument can be framed another way. Stage is the only variable used in the Appendix B equation to derive the Interim Level. The State parties are, in effect, saying that stage at certain water level gauges in the Refuge is not an accurate predictor of phosphorus inflows. Hence the equation generates an Interim Level that is lower than it should be, increasing the likelihood of an exceedance. But again this argument represents an attack on the Appendix B equation which is outside of the scope of the referral by the Court.

²⁹ The definition of a “violation” in Appendix B was agreed upon by the parties despite their recognition in paragraph 11B that they needed – they used the word “priority” – research to understand this relationship and the role that legacy phosphorus might play in trying to meet water quality goals. Hence, it would be anomalous for the Consent Decree’s 1992 concept of “error” to turn on the strength of the correlation between phosphorus inflows and water quality at the 14 interior marsh stations when the parties separately were directing the conduct of research on this subject.

schedule initiated by the TOC.” *Id.* All aspects of research and monitoring programs “will be directed by the TOC.” Consent Decree, p. 17.

In addition, the TOC was supposed to designate a panel of scientists to “track and evaluate compliance with all aspects of state quality standards including the phosphorus limits, concentration levels and criteria” while the “represented agencies” could “request technical assistance from others.” Consent Decree, p. B-4-5.

To date, there is not a model of phosphorus hydrodynamics in the Refuge.³⁰ Tr. 41-42. Such a model was the subject of testimony before the Special Master. Indeed, all of the experts are looking forward to utilizing such a model. Tr. 1013-1014, 1098, 1687.³¹ According to the Chair of the TOC, they will have to wait several years to do so.³² The model is being

³⁰ Paragraph 11E of the Decree provides: “An intensive program of monitoring is required to track compliance with interim and long-term concentration limits and levels, as well as the response of Everglades flora and fauna to the phosphorous levels achieved. The monitoring program will also provide data for modeling research.” It is not clear to the Special Master what historical monitoring results on the response of flora and fauna to the phosphorus levels achieved represent data being used for the model of phosphorus dynamics for the Refuge. The Special Master asked Dr. Redfield where he might look to determine if the flora and fauna of the Refuge were in better balance today than twenty years ago, and was told there was a series of studies but no integrated document. Dr. Redfield said he would talk to researchers at the District to get a “more specific answer” to this question. Tr. 1361-62. (The Special Master has not yet received this information.) There was considerable work in 1994 and 1995 in WCA-2 on the response of flora and fauna to phosphorus levels. Tr. 1363. There is a vegetation monitoring program that occurs “every few years” where the Everglades are remapped for the presence of flora like cattail. Tr. 1364. Chapter 6 of the 2006 SFER contains a discussion of the considerable research being undertaken in WCA-2 on phosphorus levels in soils as they relate to sawgrass (native) or cattails (phosphorus-related). The research was begun before STA-2 became operational to determine baseline conditions and has continued after STA-2 became operational to evaluate the hydrologic and biological changes occurring downstream of STA-2. 2006 SFER, p. 6-30-6-38. Researchers studied an east-west transect in the southern part of the Refuge in 1999 and compared it to a 1989 study made of the same transect. They reported that cattail had expanded from 0.5 km to 1 km into the marsh in this ten-year period on the western end of the transect and all sawgrass had been “extirpated” in this portion of the transect. There was no change between 1989 and 1999 on the eastern end of the transect. U.S. Exh. 84 (Childers et al. 2003). With respect to the Refuge, the focus of the TOC appears to be on getting phosphorus levels to 10 ppb (what that means is discussed below) because of the research that says this concentration will not create an imbalance of flora and fauna, rather than on physically determining with any regularity whether nutrient-favored flora are shrinking or enlarging their footprint in the Refuge. Tr. 1363-64.

³¹ Dr. Goforth’s reaction, for example, was: “I’m looking forward to the hydrodynamic model that the Refuge is developing.” Tr. 1098.

³² Dr. Redfield testified: “SPECIAL MASTER: Do you have any feeling at all as to when you as a TOC representative would be comfortable that a model will be in place that will allow you to understand better what's going on in the Refuge? THE WITNESS: It's going to be years.” Tr. 1358. Dr. Harwell testified that a version of the model for the Refuge is due in August 2006. Tr. 1489. But, if that date is met, it may be the first look at the model by the other parties and there will likely be comments that will delay achievement of a consensus on the model’s usability. Tr. 1013 (Dr. Goforth explaining that he would not be able to support the model until he saw it.)

constructed by scientists retained by the U.S. Fish and Wildlife Service³³ and will not be ready for evaluation by the TOC until sometime in the Fall of 2006 at the earliest. Tr. 1491. As best as the Special Master can determine, the TOC has not yet taken steps to ensure that there is consensus on the assumptions being made to build the model.³⁴

Nor has the TOC designated a panel of scientists to track and evaluate compliance.³⁵

In other words, one reading of the Consent Decree is that the parties in 1992 knew (a) what the Interim Level was based on, (b) that the Interim Level would not take effect for several more years, and (c) what constituted a “violation.” They anticipated that research would be conducted beginning no later than in 1993 to understand the relationship between phosphorus inputs and the results at the 14 interior sampling stations and to define the role of “legacy” phosphorus. And they envisioned a panel of scientists to track and evaluate compliance with phosphorus limits, concentration levels and criteria, presumably with the benefit of the results of the research. It was within this framework that the Consent Decree provided that an exceedance

³³ U.S. Exh. 52 (p. 1) (A.R.M. Loxahatchee National Wildlife Refuge Enhanced Water Quality Monitoring and Modeling Interim Report) explains that Congress appropriated funds in 2004 to “develop an enhanced water quality monitoring network and hydrodynamic and water quality models” for the Refuge.

³⁴ Counsel for the DEP explained in the hearing that the model being developed by the U.S. Fish and Wildlife Service has to be presented to the TOC and discussed with the TOC and that is “one thing the TOC should be doing this year.” Tr. 2245. The Special Master does not underestimate the challenge of developing a reasonably-calibrated model of the Refuge that will be acceptable to all stakeholders and urged the parties to consider giving input into model assumptions now, where feasible or practicable, instead of waiting until the model is first published for review in whatever form it may exist later this year, as is the current hope. Tr. 2249-50. Cf. Tr. 1356-57 (The Everglades Landscape Model (see <http://www.sfwmd.gov/org/wrp/elm/>), which looks at the landscape responses to different water management scenarios in South Florida, has been in development for eight or nine years and its development has proven “far harder than we thought it was going to be,” according to Dr. Redfield. The District’s regional simulation model is apparently going to have a water quality component but this model will cover all of South Florida, and not just the Refuge or Everglades National Park, and its availability for this purpose is at least three years away, Dr. Redfield said.)

³⁵ The Special Master made this statement during the hearing, Tr. 822, and at an earlier hearing with counsel, and no one advised the Special Master that such a panel had been designated. The 2006 South Florida Environmental Report, Tribe Ex. 359A, discusses “STA Performance, Compliance and Optimization” in Chapter 4. There is no reference in this chapter to a panel of scientists. The Special Master has attended TOC meetings for over two years and has yet to hear of a panel of scientists as appeared to have been contemplated in the “Compliance Review” section of Appendix B to the Consent Decree, p. B-4. Dr. Redfield testified that neither he nor the State’s TOC representative nor anyone else has advocated the appointment of a panel of scientists to evaluate the Appendix B model. Tr. 1235.

would constitute a violation unless the TOC determined there was substantial evidence that one or both of the geometric means that constituted the exceedance was due to error or extraordinary natural phenomena.

The role of the research and the panel of scientists to avoid future disputes is magnified when one considers the structure of the TOC. It is made up of three federal parties and two state parties. Technical-based recommendations require “consensus” which is defined as “4 out of 5 majority.” Consent Decree, p. 26-27. With two dissents, an “impasse” results. The impasse then must be reported to what the parties call the “Principals” (the heads of the Park, the Refuge, the DEP, the District, and the ACOE’s Jacksonville District) for resolution. If the Principals do not agree, they can invoke mediation and failing that, the party seeking relief can apply to the Court for a judicial resolution of the impasse.

Hence, based on the structure of the Consent Decree, it appears that in 1992 the parties further envisioned that the results of the research and the views of the panel of scientists would be available (a) to the TOC to avoid an impasse over technical recommendations, and, (b) if necessary, to the Principals or the Court to address the impasse.³⁶

Without the benefits of such research³⁷ and the views of a panel of scientists apparently contemplated by the parties in 1992 to aid them in the application of the Consent Decree, the

³⁶ This conclusion is bolstered by the Consent Decree’s reference to the same “panel of scientists” in its discussion of compliance with the Interim Level for Shark River Slough in Appendix A of the Consent Decree. As with the Interim Level for the Refuge, a “panel of scientists designated by the TOC will track and evaluate compliance with all aspects of state water quality standards including the phosphorus limits, concentration levels and criteria” and again the “represented agencies may request technical assistance from others.” Consent Decree, p. A-3. In the case of Shark River Slough an exceedance occurs if the relevant phosphorus concentration “for the water year ending September 30” exceeds the Interim or Long Term Limit. The Consent Decree then provides (emphasis added): “Based upon review trends for flow-weighted means, trends for the frequencies of samples exceeding 10 ppb, and other information found relevant by the panel, the TOC members will forward their opinions and recommendations to their respective agencies for appropriate action. Consent Decree, p. A-4 (Emphasis added.). The panel appears to have been envisioned as a neutral body to offer independent technical opinions to the TOC to avoid impasse.

³⁷ In talking about a particular research task that is not yet completed, the Special Master is quick to acknowledge that an enormous amount of research has been done with regard to many areas and aspects of the Everglades and Stormwater Treatment Areas, among other examples, and that such research is continuing, as documented throughout the 2006 SFER. Tribe Exh. 359A.

parties' experts today are offering their differing opinions while awaiting development of a model to attempt to answer the questions they have about phosphorus fate and transport mechanisms in the Refuge over wet and dry periods and during rising and falling stage. They have their hypotheses but there is no consensus on conclusions—the very problem the parties in 1992 appear to have sought to solve.

In the context of determining what caused a particular historical excursion, the absence of answers to the parties' 1992 questions and their 2006 experts' conflicting hypotheses creates too large a hurdle for the State parties' to overcome in their effort to produce “substantial evidence” that the exceedance in question was due to “error.”

State Parties' Arguments on Existence of “Error”

The State parties' experts made a number of arguments about how to define error.

Dr. Marks suggested that the Interim Level equation is “likely biased” to produce false excursions in the fall months. Tr. 878. He said that the Interim Level equation has no adequate mechanism to account for rapid changes in stage and the consequences that might be expected from such a change in stage do not appear to be consistent. Tr. 850-53. He opines that the Refuge's ecological system has changed with respect to stage and inflow points relative to the stage and inflow points in use when the Interim Level equation was calculated. District Exh. 136, p. 16. His statistical conclusion is that these changes make the Interim Level equation inappropriate for use without adjustment for the changes “to the system.” *Id.*

Dr. Marks does not suggest that the Appendix B equation was improperly solved each month that there was an excursion. He also does not suggest that the sampling data generated from the 14 interior sampling stations was used to calculate an inaccurate geometric mean. Nor does he say that the geometric mean computed was higher than the Interim Level computed.

Instead, he is arguing that the Appendix B equation is “biased” and decision makers need to understand these biases before they reach a conclusion about the nonexistence of “error.” Tr. 899-900.

The Appendix B equation may be biased but, if it is, the parties apparently intended it to be biased. They apparently sought what the State parties now regard as a test that over predicts excursions. They planned for research on many of the issues that Dr. Marks raises but that research has yet to be completed. Hence, Dr. Marks’ views notwithstanding, the parties made their bargain and must live by it until it is modified.

Dr. Redfield elected to develop his own definition of “error.” He defines “error” as “any factor or phenomenon that would cause phosphorus levels in the Refuge that are consistent with the 1978-79 baseline period to be deemed an exceedance” of the Interim Level in the Consent Decree.³⁸ District Exh. 134, p. 1. Dr. Redfield then argues that the geometric mean water quality data for the period 1978-79 was 9.4 ug/L and this concentration level compares favorably to the geometric mean water quality for the period 1999-2005 which, he calculated, was 9.1 ug/L. *Id.*

Dr. Redfield’s definition of “error” has a surface appeal but, it too is inconsistent with the terms of the Consent Decree. Dr. Redfield is, in effect, urging that an excursion should be ignored if overall geometric means for a period of time before and after an excursion compare favorably to the levels derived in 1978-79. That would have been very easy for the parties to say. They knew the 1978-79 data and presumably could have calculated an average

³⁸ This concept of error has not been presented to the TOC for consideration. Dr. Redfield testified the State parties had requested of the Principals that the TOC obtain some guidance on the meaning of “error,” but there was never a response and the matter was not made the subject of dispute resolution: “THE WITNESS: Having further analysis of error has been brought up as a potential agenda item and there simply has not been a consensus to move forward with that, we haven’t done it. SPECIAL MASTER: This is not something that’s been taken to dispute resolution either I take it? THE WITNESS: No, just up to the principals. That’s as far as it got.” Tr. 1353.

concentration or a geometric mean of what data were available in 1992 and could have easily said that the result would be compared to the average of the geomeans of the 14 interior stations, and only when that average was lower than the 1978-79 average would the TOC have to evaluate the existence of a “violation.” But the Consent Decree does not say this. To ignore an excursion on this basis is to use the word “error” at page B-5 of the Consent Decree to modify the definition of a “violation” rather than to represent a factual inquiry into the cause of an exceedance. Such a usage of “error” would also eliminate the Interim Level from consideration. Both consequences represent an impermissible effort to change the terms of the parties’ agreement.³⁹

Dr. Redfield repeats Dr. Marks when he writes that the Refuge “overall” is being “held deeper now” than it was in 1979-80. He relates this change to a change in the regulation schedule⁴⁰ in 1995 which slowed the recession rate of water in the Refuge in the spring, raised the minimum stage and the maximum stage in the Refuge, and allowed greater depth of water in the Refuge during the dry season. District Exh. 134, p. 2.

He also says that inflows to the Refuge have changed over time. As of 2000, water entering the Refuge through the S-6 pump station⁴¹ now goes to WCA-2 through STA-2 and no longer goes to the Refuge. As of 2001, a significant portion of water from the basin that flows

³⁹ Whether Dr. Redfield’s comparison is appropriate was hotly debated by the parties. The United States argued that sampling techniques in the 1978-79 time period were crude and had they been as refined as they are today, the results in 1978-79 would have been much lower than derived by Dr. Redfield. It also argued that water levels were different in 1978-79 than they have been in the past few years and data gaps in the 1978-79 period exist that do not permit this type of comparison to be made. United States’ Closing Memorandum, p. 11. The Special Master regards Dr. Redfield’s attack as a legal one not a factual one. However, it would be inappropriate to give Dr. Redfield’s factual interpretation the force of law when legitimate questions can be raised about comparability in light of differences in the type of sampling, the number of sample results available, and the conditions at the time of sampling.

⁴⁰ The “regulation schedule” is discussed below but it describes scenarios which guide water managers in moving water through the system of canals, structures, levees, and gates which make up the flood control system in South Florida. Decision making under the regulation schedule for the Refuge is dictated by stage, or water level (e.g., if the stage is too high, water is to be released).

⁴¹ This pump station is located generally in the southwest corner of WCA-1 where the canal along the L-7 levee meets the canal along the L-39 levee. See Figure 1 at page 33.

through the S-5A pump station⁴² now reaches the Refuge at a point seven miles south of the original inflow point. STA-1E has created a new inflow point into the Refuge as well. *Id.* at 2-3.

Dr. Redfield adds that since the phosphorus control program in the Consent Decree was not scheduled to be completely in effect for 15 years after the 1978-79 time period, high levels of phosphorus entered the Refuge in the interim and “had the potential of altering the background phosphorus levels prior to the initiation of compliance monitoring.”⁴³ He adds that given a change in the regulation schedule in 1995, the number of days in which canal water could move into the Refuge “approximately doubled.” He can’t say how much “new” phosphorus was added to the Refuge in this time period, but suggests that the “background” phosphorus levels relative to the 1978-79 levels have been altered. *Id.* at 3.

Dr. Redfield also opines that the Interim Level equation does not accommodate sharp changes in stage in the Refuge. *Id.* at 8-9.

In the view of the Special Master, all of these opinions relate to a Consent Decree modification of the Appendix B compliance test which the TOC has never addressed,⁴⁴ and do not represent “substantial evidence” that the exceedance in question was due to “error.” As noted above, in a section of Appendix B entitled “Compliance Review,” the Consent Decree provided in 1992 that a panel of scientists “designated by the TOC will track and evaluate compliance with all aspects of state water quality standards including the phosphorus limits, concentration levels and criteria.” Had such a panel been formed and performed the independent role apparently contemplated for it by the Consent Decree and had the research program

⁴² This pump station is located at the top of the Refuge. See Figure 2 on page 35.

⁴³ The Special Master would note that this opinion might be regarded as inconsistent with his opinion that there is a weak correlation between inflow and interior phosphorus concentrations.

⁴⁴ There have been five exceedances since 1999 and the TOC has never squarely faced the issue of whether the Interim Level equation merits an adjustment for the reasons expressed by Dr. Redfield. Referring to himself and Frank Nearhoof, the DEP’s representative on the TOC, Dr. Redfield testified: “Q. Have either of you ever advocated that the TOC appoint a panel of scientists to evaluate what the State now perceives as a structural flaw in the Appendix B models? A. No, and to my knowledge no one has.” Tr. 1235.

contemplated in 1992 by the Consent Decree relative to phosphorus hydrodynamics in the Refuge been undertaken by the State Parties and the United States as the Consent Decree provided, perhaps the parties would have an objective, independent framework within which to evaluate the results of the Appendix B equation and the parties' experts would not be having this debate. But the panel was not formed. The research is not completed. And the issue of modifying the Appendix B Interim Level equation is not before the Special Master.

Conclusion on the Existence of a Violation

The Special Master has considered all of the State parties' other arguments and, in the context of this referral, finds them unpersuasive. On this record, the State parties have not proven that there is "substantial evidence" that the exceedance was due to "error." Hence, the Special Master recommends that the Court sustain its determination of the existence of a "violation" as that term is used at page B-5 of the Consent Decree.

The Nature and Geography of Remedies

A "violation" of this Consent Decree is unlike a violation of other consent decrees. There are no penalties, fines, or forfeitures as a result of a "violation." Rather, if a "limit" or "level" is "violated," this Consent Decree contains a self-executing remedial clause at page C-4 with considerable flexibility built into it:

if the Park or Refuge phosphorus limits or concentration levels are violated, then additional remedies will be taken, *such as* expansion of STAs, more intensive management of STAs, a more stringent EAA Regulatory Program, or a combination of the above. The State Parties shall not implement more intensive management of the STAs as the sole additional remedy.

Consent Decree, Appendix C, p. C-4 (Emphasis added.) In other words, this Consent Decree is designed not to punish, but to succeed.

Under the Consent Decree, the phosphorus problem at the Refuge is manifested by an exceedance that is not explained by extraordinary natural phenomena or error. In the oligotrophic, or naturally nutrient-poor, world of the Refuge, the flora and fauna view phosphorus from a different perspective. If the flora and fauna could speak, they would be grateful for the efforts to date to reduce phosphorus inflows but would still be making this plea, “We have received too much phosphorus for too long. Please don’t allow any more in.” The State parties may not be able to do much to prevent atmospheric deposition of phosphorus. And they can’t easily remove the phosphorus that is already in the sediments and water column of the Refuge, a marsh representing 140,000 acres. So the challenge lies in minimizing the amount of phosphorus in water that enters the Refuge.

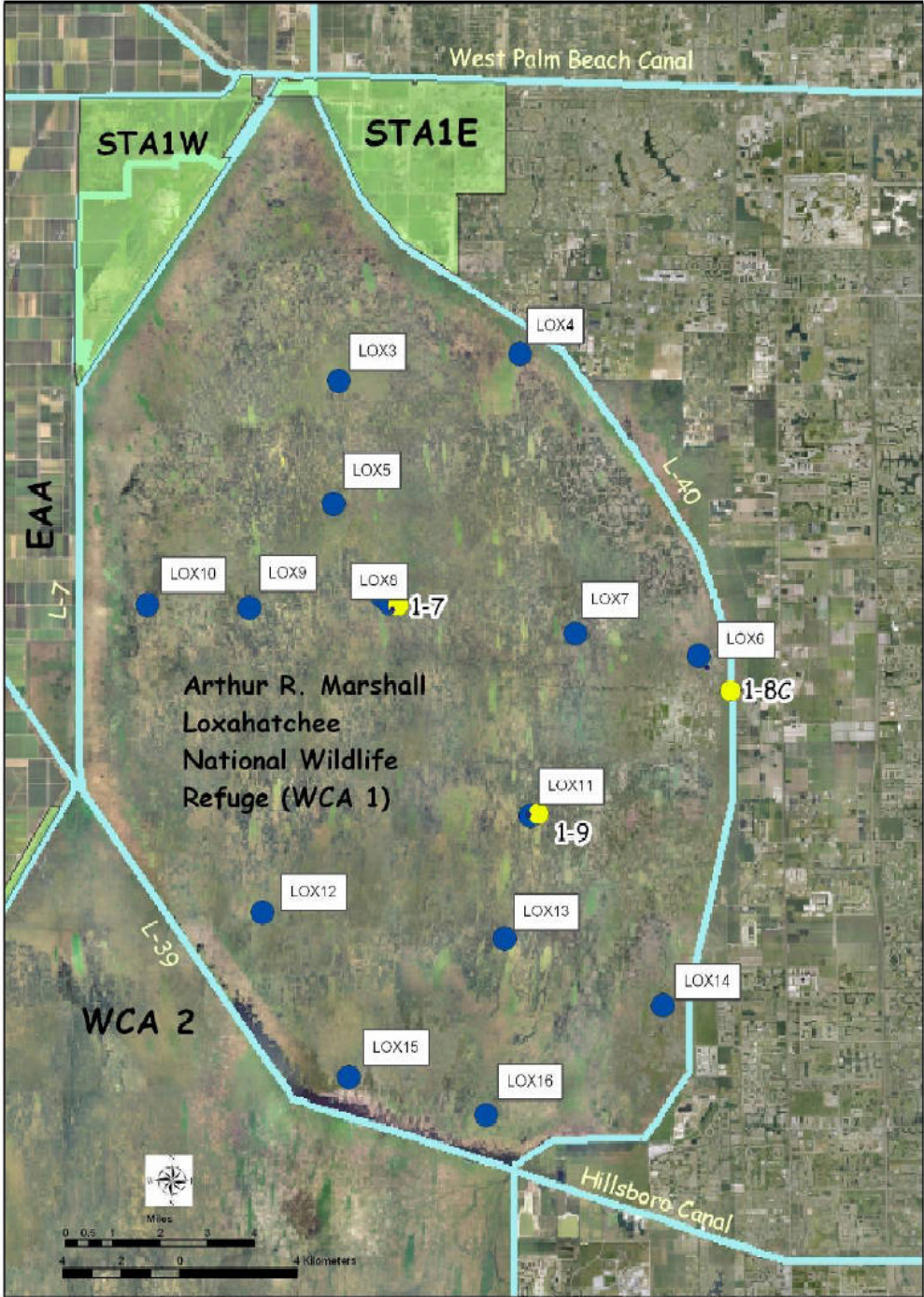
Because the Refuge also needs water and because the phosphorus in water available to water managers has to be accounted for, this is not an easy task. To put this task into context requires an understanding of (a) the geography of the Refuge; (b) a primer on where the water comes from, i.e., the source basins; (c) a discussion of STA-1W and STA-1E, the primary guardians of the quality of the water entering the Refuge; (d) an understanding of the phosphorus and water levels in Lake Okeechobee and what happens to the water in the Lake when it must be pumped for regulatory release or water supply purposes⁴⁵; and (e) as part of all of these, a number of structures (“S”), gates (“G”), canals (“C”), and levees (“L”) through which water is moved in the labyrinth of conduits managed by the District or the ACOE to keep South Florida from flooding and which now are being used as part of the system to treat phosphorus-contaminated water or minimize the impacts of such water in the EPA and other estuaries.

⁴⁵ As noted earlier, a regulatory release is required by a “schedule” that requires that water be “let out” of “this structure, that structure” because the levels are too high. Tr. 2114 (Dr. Rice). The ACOE establishes the regulatory schedule. A water supply release is used, e.g., to address low water levels in South Florida so as to minimize salt water intrusion during dry periods. This is a District function. *Id.*

The Refuge's Location Relative to STAs-1W and 1E

Figure 1 comes from a Settlement Agreement Report. It depicts the Refuge in relation to STA-1W and STA-1E.

Figure 1



When the experts discuss the “rim canal” and how water can enter the Refuge from the rim canal, they are referring to the L-7 or L-39 canal along the western edge and the L-40 canal along the eastern edge of the Refuge, both shown in Figure 1. Figure 1 also shows the 14 interior sampling locations (LOX 3-16) and the three stations (1-7, 1-8C and 1-9) where water levels are measured for input into the equation used to determine the Interim Level each month. While not labeled, the Ocean Canal runs from west to east along the northern edge of STA-1W and connects to the West Palm Beach Canal which runs from Lake Okeechobee to the STA-1W treatment works and then east. (See Figure 12, p. 94). The canal that intersects the STA-1W treatment works from the north is the canal that runs along the L-8 levee. (See Figure 12.)

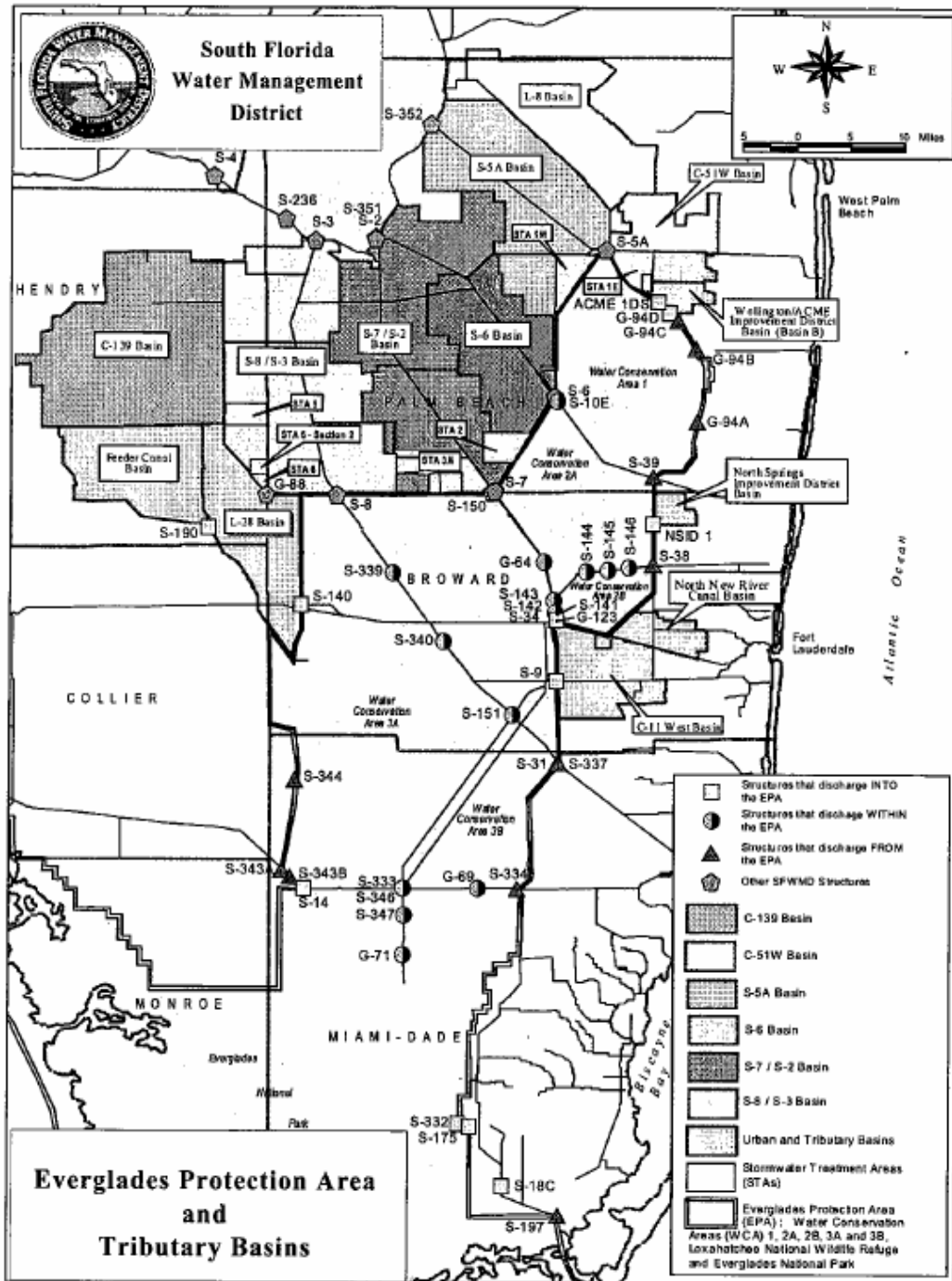
A Primer on Source Basins

The Everglades Agricultural Area is referred to by basin numbers. Figure 2 is Figure 8-1 from the 2006 South Florida Environmental Report (SFER), p. 8-4, Tribe Exh. 359A.⁴⁶ The S-5A basin rests northwest of STA-1W. The line that intersects the words “S-5A Basin” on Figure 2 represents the West Palm Beach Canal that runs along the L-10/12 levees. Water from the S-5A basin goes through the S-5A pump station and is treated in STA-1W although a small portion of it will be treated in STA-1E. District Exh. 131, p. 3.

The “L-8” basin is due north of the Refuge. Stormwater is collected in the canal along the L-8 levee which is the boundary between the L-8 basin and the S-5A basin on Figure 2. (See Figure 12, page 94). The water is moved south to the C-51 canal (or the eastern portion of the

⁴⁶ Tribe Exhibit 359A will hereafter be referred to as the 2006 SFER. The 2006 SFER contains a CD that also contains the 2005 SFER and the 2000-2004 Everglades Consolidated Reports. For convenience, any reference to these reports is a reference to Tribe Exhibit 359A. However, portions of these reports were made exhibits by the District (see, e.g., District Exh. 104-127, containing excerpts from the 2000-2005 reports, as well as in Exh. 123 and 124, CDs containing the 2004 and 2005 reports respectively).

Figure 2



West Palm Beach Canal). In the past, this water has in part been routed east to the St. Lucie Estuary, an unpopular solution for reasons discussed below. L-8 basin runoff has also been

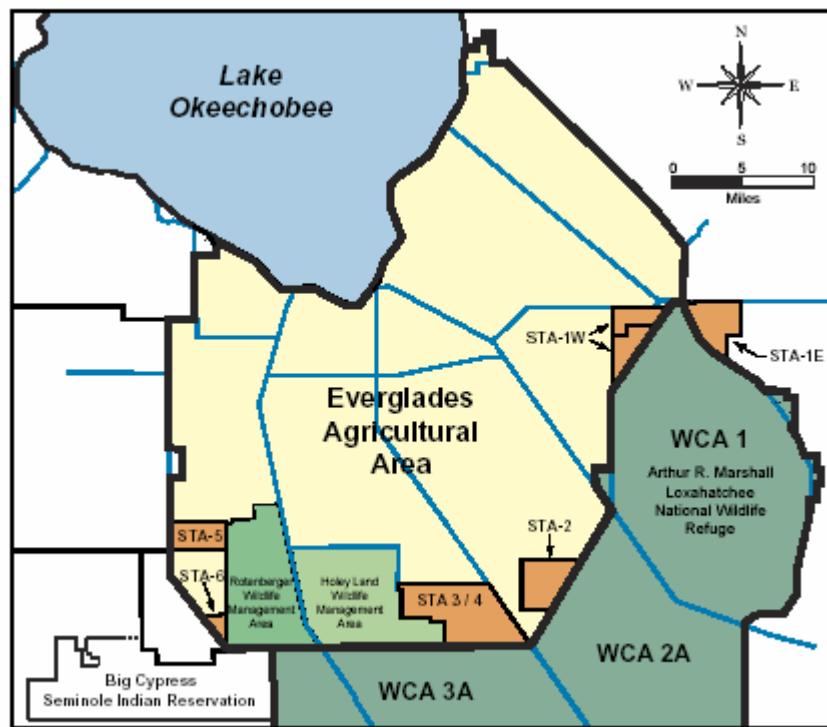
routed to STA-1W or directly to the Refuge without treatment. District Exh. 131, p. 4,⁴⁷ District Exh. 135, p. 11. Diverting the L-8 water from STA-1W and 1E is an important component of the Refuge remedy as discussed below.

The C-51 basin is northeast of STA-1E and along with some S-5A basin water is treated in STA-1E, now that this STA is online. District Exh. 131, p. 2-3. Acme Basin B is east of STA-1E. Its runoff currently enters the Refuge untreated. District Exh. 131, p. 1. As discussed below, handling its runoff is a feature of the Refuge remedy picture as well.

STA-1W

The stormwater treatment areas are shown in Figure 3 (Figure 4.1 from the 2006 SFER).

Figure 3



⁴⁷ “Presently about 50,000 (acre-feet/year) of runoff from the L-8 Basin is being discharged into the Refuge, either after treatment in STA-1W (contributing to its overloading) or untreated through G-300/G-301. In addition, about 100-150,000 AF/yr is discharged to tide through the C-51 Canal.” District Exhibit 131 (Goforth, “Preliminary Estimates of Loads to the Refuge After STA-1E is in Operation – Draft May 12, 2005.”) One acre-foot of water equals 325,851 gallons. (District Exh. 135, p. 28 says 325,872 gallons but 43,560 sq. ft/acre x 1 ft. x 7.48051945 gal./cu. ft = 325,851 gallons.)

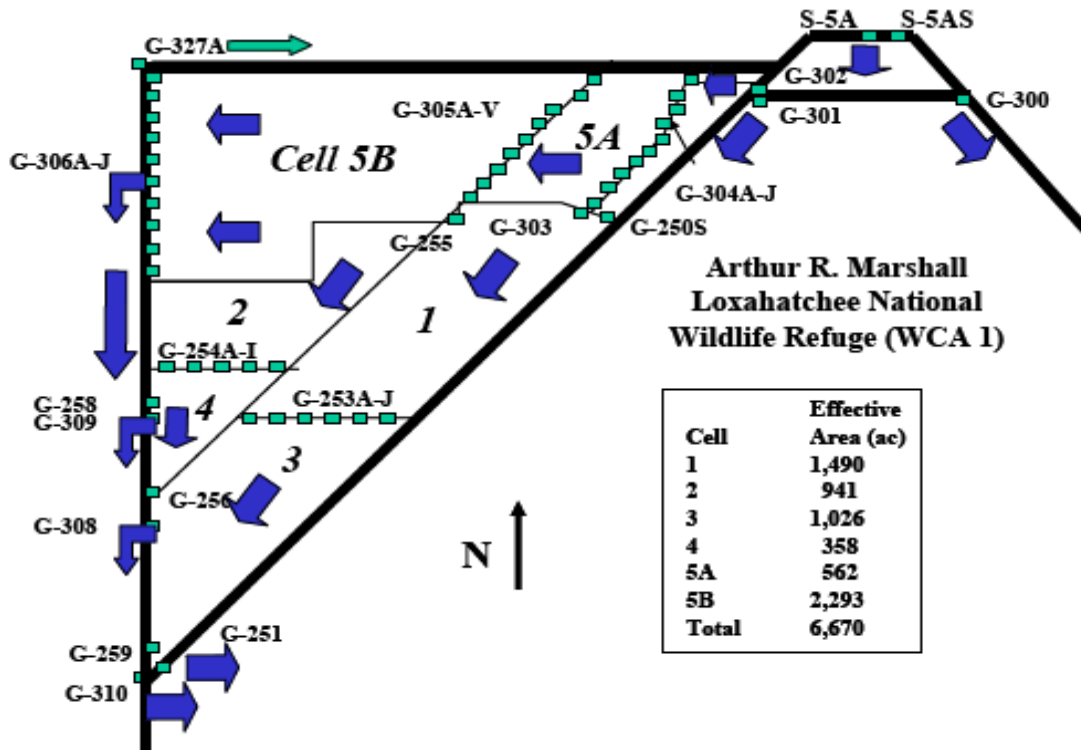
Figure 3 canals are not labeled. The first canal in the northeast corner that connects the Lake to the STA-1E treatment works travels along the L-8 levee. (See Figure 12, p. 94) The second canal that connects the Lake to STA-1W treatment works is, again, the West Palm Beach Canal which runs along the L-10/12 levees and then east across the top of STA-1E (see Figures 1 and 12). The next canal to the south that connects the Lake to the divide between WCA-1 and WCA-2 is the Hillsboro Canal. It runs along the L-14 and L-15 levees (parallel to the West Palm Beach Canal). (See Figure 12). Again, the Ocean Canal runs along the northern edge of STA-1W and connects the West Palm Beach Canal to the Hillsboro Canal along the L-13 levee.

STA-1W and STA-1E are the critical components of the restoration strategy of the Refuge. The key to any discussion of “remedies” in connection with the Refuge must focus on these two stormwater treatment areas.

STA-1W consists of 6,670 acres. 2006 SFER, p. 4-13. It has had all of its treatment cells in operation since July 2000. *Id.* Figure 4 represents a schematic of STA-1W. 2006 SFER, p. 4-13 (Figure 4-3).

Inflows come to STA-1W through the S-5A structure from the S-5A Basin and are directed into STA-1W via the G-302 structure. Flow then moves into the northern flow-way, Cell 5, through the G-302 and G-304A–J structures and into Cells 1 through 4 through the G-303 structure. *Id.*

Figure 4



In the past, STA-1W has received agricultural runoff and discharges from the S-5A basin, discharges from certain Chapter 298 drainage districts diverted from Lake Okeechobee,⁴⁸ and stormwater runoff from the L-8 basin, and may have received supplemental irrigation water from the Lake and water supply releases from the Lake. District Exh. 128, p. 2-14.

During the period in which “excursions” have occurred at the interior sampling stations at the Refuge, STA-1W has received more water and more phosphorus than it was designed to receive. The following table reflects design parameters for STA-1W compared to the actual water quantity and quality routed to this STA in water years 2005, 2004, and 2003 (May 1 – April 30) and for the average of water years 2001-2005.

⁴⁸ “There are five Chapter 298 drainage, special drainage districts, that are kind of located around the lake. As a part of the Everglades Construction Project, we basically retooled those special drainage districts. Where they don't discharge to the lake, we capture again that water to go to the Everglades.” Tr. 337-38 (Mr. Nearhoof).

	<i>Average Annual Inflow (acre-feet)</i>	<i>Nutrient Loading Rate (grams/m²/yr)</i>	<i>Flow Weighted Mean Concentration of Total Phosphorus (ppb)</i>	<i>Average Annual TP Loading (kg)</i>
Long-Term Average Design	159,985	1.01	139	27.4
WY 2005 ⁴⁹	341,094	3.85	247	103.8
WY 2004	262,690	1.90	141	50.7
WY 2003	591,845	4.16	154	112.1
WY 2001-2005	319,661	2.66	170	67.1

Sources: 2006 SFER, p. 4-8; 2005 SFER, p. 4-3; 2004 ECR, p. 4A-2

As shown above, in WY2003-2005, STA-1W has received two to nearly four times its long-term design average annual inflow, and the water contained more phosphorus than anticipated.

STA-1W has been plagued with performance problems because of its overloading. 2006 SFER, p. 4-15-16. When water levels in Lake Okeechobee had to be reduced in 2002-03, STA-1W bore the brunt of those releases until February 2003 when it became apparent that STA-1W was being overwhelmed by phosphorus levels beyond its design. 2006 SFER, p. 4-15.

While the Lake releases could be stopped,⁵⁰ the same can not be said for hurricanes. The 2004 and 2005 hurricanes also damaged STA-1W. 2006 SFER, p. 4-16. Cell 5 was under restricted flow beginning in November 2004 for plant rehabilitation, was taken offline in March 2005 for other repairs, and then was operated under restricted flow again to improve vegetation growth. 2006 SFER, p. 4-20. STA-1W remains in a rehabilitative mode. *Id.* Cells 4 and 5 are both being enhanced and Cell 5 will be offline in 2006 to allow for SAV (submerged aquatic vegetation) re-growth. SFWMD Exh. 195.

In addition, because the treatment works for diversion of L-8 water are not yet completed, that basin's water has complicated the job of water managers trying to improve STA-1W's

⁴⁹ In WY 2005, STA's phosphorus load reduction percentage was 55% and its outflow phosphorus concentration was 98 ppb compared to 81% and 20 ppb achieved by STA-2, 88% and 13 ppb by STA-3/4, and 84% and 19 ppb by STA-6. Only STA-5, at 50% and 81 ppb, was a comparably poor performer and that relates to high phosphorus loads coming out of the C-139 basin (see Figure 2 and n. 90). 2006 SFER, p. 4-3.

⁵⁰ The District expedited flow through operations at STA-3/4 in part to address regulatory releases from the Lake. 2005 SFER, p. 4-10.

performance. Dr. Walker reported in his testimony that runoff from the L-8 basin “was a significant component of the flows entering STA1W distribution works” during the 2004 hurricanes. To complicate water distribution dilemmas, after the 2004 hurricanes, L-8 water had to be put into STA-1W in the late fall of 2004 “even though water depths in some cells exceeded design ranges for maintenance of vegetation and levees” because the stage in the Refuge and inflow distribution works was too high to put it anywhere else. U.S. Exh. 57, p. 32.

Dr. Walker produced a table that showed that L-8 basin runoff in the past has accounted for a significant portion of the total inflow into the S-5A distribution works when runoff from the S-5A basin is also high. U.S. Exh. 74. When this occurs, “risks of untreated bypass to the Refuge, impaired STA performance, STA vegetation damage caused by high water levels, and intrusion of phosphorus loads into the Refuge marsh are also highest.” U.S. Exh. 57, p. 33.

The original design of STA-1W and 1E contemplated that L-8 basin flows would be diverted elsewhere prior to the operation of STA-1W and 1E. U.S. Exh. 57, p. 33. The diversion of L-8 basin flows is not scheduled for completion until 2014 with portions of the diversion scheduled for completion by “around 2010.” Tr. 1016-17.

Apart from L-8 basin water containing phosphorus, STA-1W’s current overloading problem is not going away anytime soon because of anticipated flows and loads from the S-5A basin. The District’s October 2003 Long Term Plan was amended in November 2004 and discussed the design assumptions on phosphorus loading of STA-1W. District Exh. 128, p. 2-14. The authors of the amendment explain that “flows and phosphorus loads leaving the S-5A basin will be considerably more than anticipated during the development of the October 27, 2003 version of the Long-Term Plan, possibly as much as twice the earlier estimates.” *Id.*⁵¹

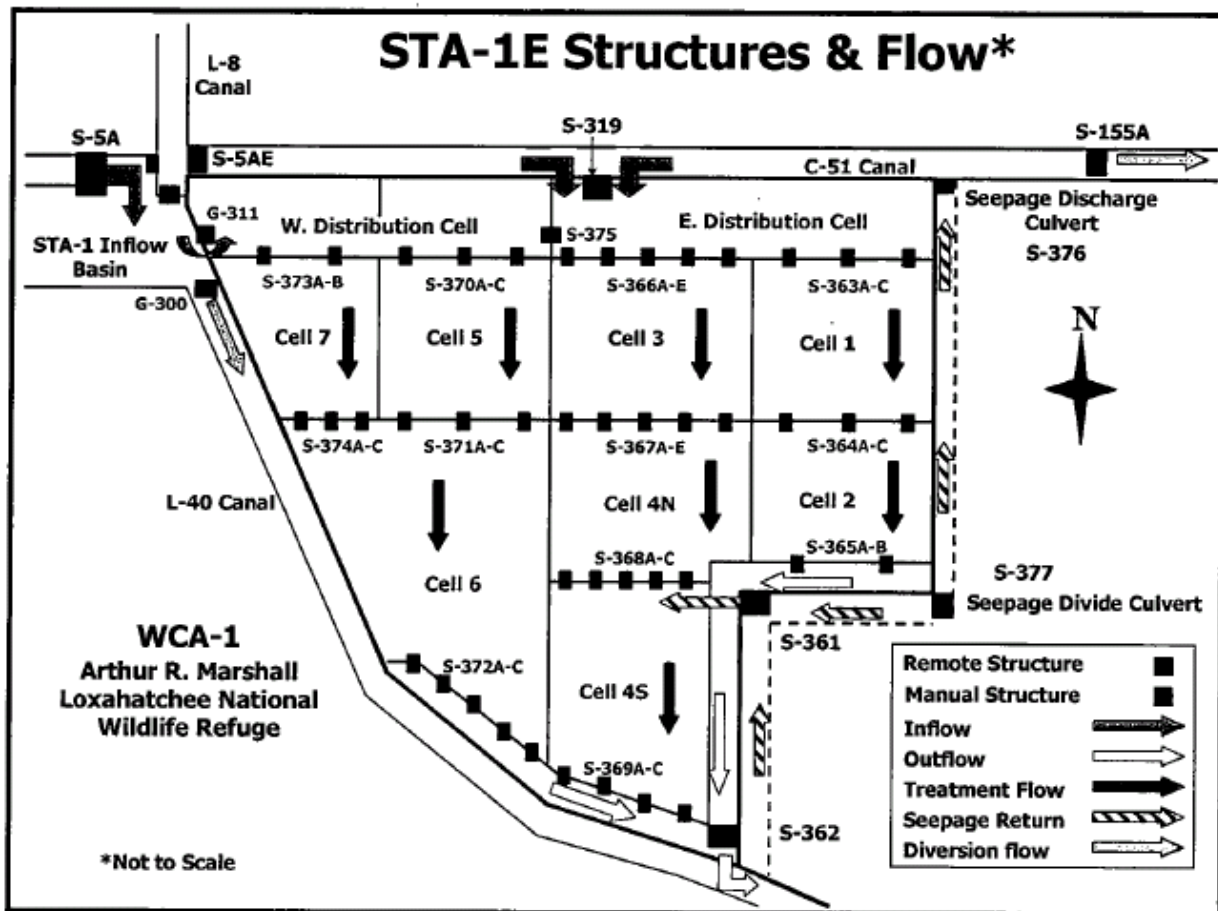
⁵¹ This recognition resulted in the decision by the District to look at alternatives to divert water from STA-1W and to construct additional stormwater treatment areas to reduce flows and loads to STA-1W. District Exh. 128, p. 2-14. I

In short, apart from the rehabilitation and enhancement work at the STA-1W, the future performance of STA-1W will depend upon eliminating L-8 basin water; eliminating or reducing Lake Okeechobee releases and their accompanying phosphorus loads from STA-1W; and managing flows and loads from the S-5A basin to keep STA-1W within its design capacity, all of which are discussed further below. Until late 2005, getting STA-1E online was also on this list.

STA-1E

A schematic of STA-1E taken from the U.S. Exh. 109 (Figure 2) appears in Figure 5.

Figure 5



discuss these projects below. The record is filled with different projections of flows and loads to STA-1W but Mother Nature will likely have the largest say in what the actual flows and loads will be.

The C-51, or West Palm Beach Canal, runs along the northern border of STA-1E. S-319, S-361, and S-362 represent pump stations. The eastern flow-way, Cells 1 and 2, are currently offline because the PSTA demonstration project referenced in the Court's question 9 (discussed below) is being constructed in this flow-way. The central flow-way (Cells 3, 4N, and 4S) is currently online. The western flow-way is currently on-line but the submerged aquatic vegetation has not grown as well as it has in the central flow-way so remedial efforts may need to be undertaken. District Exh. 195.

STA-1E has 5,132 treatment acres. 2006 SFER, p. 4-10. It is designed to receive water for treatment from the "C-51 West basin" (94,000 acre-feet) and the "S-5A basin" (31,000 acre-feet). 2006 SFER, p. 4-10. Untreated stormwater from Acme Basin B that enters into the Refuge will be diverted to STA-1E by sometime in 2007 based on current planning. *Id.*

STA-1E was allowed by the DEP to engage in flow-through operations on September 20, 2005. U.S. Exh. 111-114; 2006 SFER, p. 4-10. STA-1E was not available for use at the time any prior Refuge exceedance has occurred.

Lake Okeechobee

Lake Okeechobee water plays an important role in the Refuge remedy picture. If the Lake levels are too high, as a flood protection measure, "regulatory" releases must occur. That water has to go somewhere. If water levels are low in South Florida, and the Lake has enough water, "water supply" releases can occur and that water has to follow a path through the WCAs.

In addition to handling the quantity of Lake water involved in regulatory and water supply releases, there is also a water quality issue: Lake Okeechobee water contains high concentrations of phosphorus. If the flora and fauna of the Lake could talk, they would be

shouting: “No more delays! Please stop the phosphorus.” Their anthropogenic friends would cite the 2006 SFER to support this plea.

Lake Okeechobee’s Unique Role in South Florida

Lake Okeechobee represents “multitasking” in nature. This is how the 2006 SFER described the Lake’s importance to South Florida:

Lake Okeechobee is probably at the extreme end of the continuum in terms of the number of services it provides, the diversity of users, and the tremendous economic interest in its health and fate. The lake provides water supply to urban areas, agriculture, and downstream ecosystems; it supports a multimillion-dollar sport fishery (Furse and Fox, 1994), a commercial fishery, various recreational activities, and provides habitat for migratory waterfowl, wading birds, alligators, and the Everglade Snail Kite (Aumen, 1995). The lake is also used for flood control during the summer wet season.

2006 SFER, p. 10-14.

Surface Water Improvement and Management Act (1987)

In 1987, just before this action was brought, the Florida legislature adopted the Surface Water Improvement and Management Act (SWIM), §373.451-459, Fla. Stat., which set a goal of a 40 percent reduction in phosphorus loading to Lake Okeechobee.⁵² In 1989, or two years later, while this litigation was ongoing, the District produced a SWIM plan for the Lake. 2006 SFER, p. 10-53.

While the Consent Decree was being implemented to protect the EPA (STAs were being planned and designed), regulatory and voluntary actions were implemented to improve

⁵² This goal of forty percent was derived from research reported six years earlier by the District. Federico et al., *Lake Okeechobee Water Quality Studies and Eutrophication Assessment*, SFWMD Technical Pub. 81-2 (DRE-128) (May 1981), p. 264 (“On the average, the phosphorus...loads to the lake from 1973 to 1979 were 40 percent...above the excessive levels” set by a modified model used by the authors to make this evaluation); §373.4595(f), Fla. Stat. (“The Legislature finds that the Lake Okeechobee phosphorus loads set forth in the South Florida Water Management District's Technical Publication 81-2 represent an appropriate basis for the initial phase of phosphorus load reductions to Lake Okeechobee...”)

conditions in the Lake. They did not work. According to the 2006 SFER (p. 10-53), between 1991 and 2000, the Lake received an average of 497 metric tons of phosphorus⁵³ from the various basins that drain into the Lake.⁵⁴ The 2006 SFER starkly explained:

Although there is a long history of regulatory and voluntary incentive-based programs to control phosphorus inputs to Lake Okeechobee, there has not been any substantial reduction in loading during the last decade. Consequently, the lake continues to exhibit signs of hyper-eutrophication, including blooms of noxious blue-green algae (cyanobacteria), loss of benthic invertebrate diversity, and spread of cattail (*Typha spp.*) in shoreline areas.

2006 SFER, p. 10-2.

Lake Okeechobee Protection Act (2000)

In 2000, just after the Interim Level for the Refuge went into effect, the Legislature tried another approach. It adopted the Lake Okeechobee Protection Act (LOPA), §373.4595, Fla. Stat., which mandated that by the year 2015, regulators achieve the Total Maximum Daily Load, or TMDL, for the Lake. 2006 SFER, p. 10-2. The creation of a TMDL is a requirement of the Clean Water Act that applies to waters in a State that do not meet a state's water quality standards. The Lake falls into that category. Specifically, Section 303(d)(1)(C) of the CWA defines the TMDL, as "the load . . . necessary to implement the applicable water quality standards with seasonal variability and a margin of safety . . ."⁵⁵

⁵³ On average, the phosphorus load in 1991-2000 was the same as the average phosphorus load of 498 mt/year for the period 1973-1999. Final Report, Estimation of a Phosphorus TMDL for Lake Okeechobee December 27, 2000, p. 1 (prepared for the Florida DEP and the U.S. Department of the Interior by Dr. William W. Walker, Jr., Ph.D.). See http://www.walker.net/okee/okee_tmdl_report_www_final_dec2000.pdf. A metric ton is 1,000 kg.

⁵⁴ The sources of phosphorus to Lake Okeechobee are listed in Table 10-4 of the 2006 SFER (p. 10-52). The major phosphorus sources by land use are: improved pasture (32.8%); citrus (14.52%); residential, including mobile homes and low, moderate and high density areas (a total of 18.12%); sugarcane (7.06%); "wetlands" (5.45%); "other urban" (5.09%); sod farms (3.63%); and "abandoned dairy" (2.38%).

⁵⁵ TMDLs were included as a requirement in Section 303(d) of the CWA in 1972. A state had to prepare a list of impaired waters before TMDLs could be developed. Florida's list, which included Lake Okeechobee, was submitted to EPA on September 17, 1998 and approved by EPA on November 24, 1998. <http://www.dep.state.fl.us/water/tmdl/303drule.htm>. The TMDL for Lake Okeechobee was initially proposed by EPA on December 31, 1999 following entry of a consent decree requiring development of the TMDL for the Lake. *Florida Wildlife Federation et al v. Carol Browner et al.*, Case No. 98-356-CIV (N.D. Fla.). Florida's final Lake

The TMDL for Lake Okeechobee is 140 metric tons, representing 105 tons from land sources and 35 tons from atmospheric deposition. 2006 SFER, p. 10-47. In other words, the TMDL is 28% of the average of 497 metric tons released into the Lake in 1991-2000. The Lake's TMDL also equates to an average water column phosphorus concentration of 40 ppb. 2006 SFER, p. 10-21.

Despite the adoption of LOPA, phosphorus loading in the Lake has not materially improved. According to the 2006 SFER, the five-year rolling average of phosphorus loads to the Lake for water years 2001 through 2005 was 580 mt, or about 83 tons *higher* than the 1991-2000 figure of 497 mt. The 2004 hurricanes contributed to an increase in phosphorus discharges to Lake Okeechobee in water year 2005 (May 1, 2004 to April 30, 2005). The total phosphorus load to the Lake in that water year alone was 950 mt.⁵⁶

However, the 2004 hurricanes are not the sole reason for increased phosphorus loading to the Lake. The hurricane-related loading increased the five-year rolling average of phosphorus loads to Lake Okeechobee by about ten percent. The pre-hurricanes' 2000-2004 five-year rolling average of phosphorus loads to the Lake was 528 mt, or still greater than the 1991-2000 average by about 31 tons. 2005 SFER, p. 10-1.⁵⁷

Given this historic pattern, it should not be surprising that sediments in the Lake contain large amounts of phosphorus. In 2000, EPA reported:

TMDL became effective October 16, 2001. See: http://oaspub.epa.gov/waters/waters_list.tmdls?state=FL. Florida's "Total Maximum Daily Load for Total Phosphorus Lake Okeechobee, Florida" p. 2 (FDEP August 2001) appears at: (http://www.dep.state.fl.us/water/tmdl/docs/tmdls/draft/Lake_O_TMDL_Final.pdf).

⁵⁶ Almost 82 percent of the loading "occurred in the months of August through October as a result of hurricanes Charley, Frances, and Jeanne." 2006 SFER, p. 10-47.

⁵⁷ Following the passage of LOPA, the District promulgated the Lake Okeechobee Protection Plan (LOPP) in 2004. The LOPP identifies load reduction goals associated with a number of projects. While the LOPP estimates percentage load reductions compared to its baseline (the 10-year average from 1991-2000), the actual load reductions "as measured at the lake inflow structures, may be delayed due to phosphorus that has accumulated in soils and tributaries over time." 2006 SFER, p. 10-53. On the assumption that phosphorus loading to the Lake must improve at the sources for phosphorus to the Lake to comply with the TMDL, "legacy" phosphorus—in this case deposited in pathways to the Lake—has already been identified as possibly creating delays in compliance.

[P]hosphorus rich sediments have accumulated in the Lake over the past 60 years. The current estimate is that the upper 18 inches of sediment contains approximately 30,000 metric tons of phosphorus.⁵⁸

The level of phosphorus in the Lake's sediments prompted the authors of Chapter 10 in the 2006 SFER to look at the ratio of sediment accumulation of phosphorus to average Lake phosphorus mass, which is referred to as the "net sedimentation coefficient." This coefficient has been declining in recent years prompting the authors to conclude ominously: "It appears that Lake Okeechobee is losing its capacity to assimilate phosphorus." 2006 SFER, p. 10-26.

Given the phosphorus levels in the Lake's sediments and the persistent loading to the Lake despite the SWIM Act and LOPA, it is not surprising that the average Lake-wide water column phosphorus concentration has been rising for 30 years. U.S. Exh. 72, 106, Tr. 1740-41. From 1973 to 2003 the 12-month rolling average of monthly samples at eight Lake sampling stations rose from about 50 ppb to more than 100 ppb. U.S. Exh. 72, 106. For the water year ending April 30, 2005, it reached 237 ppb. *Id.* The WY 2005 rolling average concentration was caused in part by the effects of the 2004 hurricanes on Lake bottoms which were stirred up and became resuspended in the water column.⁵⁹ These concentrations are obviously higher than 40 ppb, the concentration on which the TMDL was premised, and have been consistently trending in the wrong direction.

Where Lake Water Can Go When It Must Be Released

When the Lake's water level is too high, water must be "released" from the Lake to protect the levees surrounding the Lake. The water can be directed south, east, or west. If it is

⁵⁸ Overview of Total Phosphorus TMDL Lake Okeechobee, Florida, January 3, 2000, which can be found at http://www.epa.gov/region04/water/tmdl/florida/lake_o/okee_phos.pdf. As noted earlier, a metric ton is 1,000 kg. A kg equals 2.2 lbs. Hence, if this estimate is accurate, 30,000 metric tons would represent 66 million pounds of phosphorus in Lake sediments.

⁵⁹ Following the 2004 hurricanes, which stirred the Lake sediments, Lake water concentrations averaged 442 ppb in December 2004. 2006 SFER, p. 10-2.

moved south, it ends up in the EPA generally via one of the STAs. If it is moved east, it ends up at the St. Lucie Estuary. If it is moved west, it ends up in the Caloosahatchee Estuary.

None is a great option. Changes in salinity and phosphorus-loading are concerns for the Caloosahatchee River and St. Lucie Estuary. The 2006 SFER explains that Lake releases “combined with stormwater runoff from drainage basins can result in discharges high enough to turn some systems entirely oligohaline,⁶⁰ resulting in significant mortality and changes in species composition.” 2006 SFER, p. 12-4 (citation omitted). Eutrophication is also quite harmful:

Estuarine water quality can determine the viability of estuarine biological communities (Dennison et al., 1993; Stevenson et al., 1993). Perhaps the severest threat to estuarine water quality is eutrophication by nutrient inputs from wastewater treatment facilities, urban and agricultural runoff, and other sources (Gray, 1982; 1992; Cloern, 2001). Eutrophication results in altered species composition, reductions in macrophytes, and ultimately anaerobic conditions and mass mortality. Both the St. Lucie and Caloosahatchee estuaries have shown signs of eutrophication (Graves and Strom, 1992; Baker, 1990).

2006 SFER, p. 12-4-5.

As noted above, STA-1W received considerable Lake releases in 2002-2003 that overloaded the STA beyond its ability to remove phosphorus. The 2005 SFER described the problem:

Extraordinarily high water levels in Lake Okeechobee during summer 2002 required the District and the USACE to institute extreme operational measures to protect the lake ecosystem and the integrity of the surrounding levee. Operational activities were directed by the federally authorized regulation schedule, referred to as Water Supply and Environment (WSE). In order to minimize the harmful freshwater releases to the St. Lucie and Caloosahatchee estuaries, WSE calls for movement of lake water to the Everglades in the maximum extent practicable without causing environmental harm. Thus, from July 2002 through February 2003, deliveries to WCA-1 were passed through STA-1W for treatment prior to discharge to the Refuge. This resulted in

⁶⁰ “Oligohaline” means low salinity.

the inadvertent overload of flow and phosphorus loads to the STA. Immediate management activities were implemented to minimize the long-term adverse impacts of this overload event, which produced significantly positive results.⁶¹

The high phosphorus levels in the Lake; the need to satisfy regulatory release and water supply requirements; the need to protect the St. Lucie Estuary, the Caloosahatchee Estuary, and the Refuge; the need to divert L-8 basin water; the need to give STA-1W the opportunity to rehabilitate; the startup of STA-1E; and the increased flows and loads from the EAA that have to be accounted for in treatment capacity, provide the context for the remedial discussion which follows.

Remedies Being Implemented by the State Parties

What prompted the referral to the Special Master was a determination that an exceedance in the Refuge was not explained by extraordinary natural phenomena or error. While there may be debate about the reason for an exceedance, this Consent Decree cares more about the future than the past. It uses the concept of a “violation” as an “alarm” to require the State parties to evaluate operations, systems, rules, practices—everything that is going on—to determine what “additional remedies” should be undertaken with one caveat: they cannot be limited to “more intensive management of the STAs as the sole additional remedy.” Consent Decree, p. C-4.

The remedies that have been discussed with the Special Master were not generated solely because of an exceedance in the Refuge. The State parties have recognized for some time that

⁶¹ As a result of operational changes, STA-1W “received less than half of the (phosphorus) load for the 12-month period ending in April 2004, compared to the 12-month period ending in April 2003.” 2005 SFER, p. 4-12. Outflow phosphorus concentrations dropped from 120 ppb in February 2003, when Lake releases ceased, to 25 ppb in March 2004. *Id.* The 2005 SFER continued with this hope: “Continued improvement is anticipated, and if the favorable trend of declining concentrations continues, then the 12-month outflow concentration should return to those levels seen prior to July 2002 by summer or fall 2004. However, it is not presently possible to accurately predict when the levels will recover completely.” As we now know, the 2005 hurricanes caused damage to STA-1W and as of February 2006, the outflow levels were 112 ppb for WY 2006. District Exh. 195.

the challenges of satisfying the long term levels in the Consent Decree would require more storage, better conveyance capacity, and more treatment areas.

As was cataloged in the Special Master's May 4, 2005 report, there is remarkable agreement among the parties and the Tribe on remedies. The questions surrounding remedies are not so much "what," but "when." Presumably, that's why the Court wrote in its Order on Remedies (p. 17), "the Court is merely ordering at this time that the United States and the state agencies implement their own remedies but provide more detail and a schedule that will be met." As a precaution, however, the Court added, "In the absence of such, the Court, if appropriate and after the Report and Recommendation from the Special Master, may be compelled to impose its own additional specific and detailed remedies." *Id.*

The District had described its remedial program to the Court in its Closing Argument Memorandum, p. 20-22. The remedial program broke down like this:

STA Enhancements: This includes conversion of cattail treatment cells to submerged aquatic vegetation; construction of additional levees and water control structures to improve the flow and phosphorus removal within the treatment cells; and refinements to the operations of the STAs to optimize phosphorus removal.

PSTA Field Projects: Large PSTA demonstration field study projects are underway.

Operational Improvements: This includes lowering the water elevation in the Refuge's perimeter rim canal to prevent penetration into the marsh's interior.

Refuge Monitoring and Modeling: The FWS is conducting an enhanced monitoring and modeling program in the Refuge.

Completion of Projects Outside the Consent Decree: Certain projects outside of the Consent Decree are being expedited to reduce loads to the Refuge including one that provides treatment to water being discharged into the Refuge from Acme Basin B.

Implementation of the Acceler8 Program: This involves construction of 18,000 acres of additional treatment areas in the Everglades Agricultural Area and additional storage capacity.

Completion of a Feasibility Study: The study would determine "how much of the water and associated phosphorus loads currently entering the Refuge should be transferred to these additional

treatment areas, and to determine what improvements are necessary to regional distribution system in order to facilitate this re-allocation.”

I will address these one at a time.

STA Enhancements

As the District learns more about the operation of stormwater treatment areas, it is applying that knowledge to improve the performance of the STAs. With respect to the Refuge, the District is making improvements in STA-1W and STA-1E. Tr. 133; District Exh. 195; 2006 SFER, p. 4-12, 4-30. For example, a new levee in cell 2 of STA-1W has been constructed. District Exh. 195. Initiating and facilitating the growth of submerged aquatic vegetation in STA-1E cells 4N, 4S, and 6 represents another enhancement. 2006 SFER, p. 4-12. The District is in the best position to evaluate STA enhancements. Other than with respect to PSTA, no party presented evidence that the District’s approach to STA enhancements should be disturbed. Hence, on this record and in the context of this referral, the Special Master regards STA enhancements as a remedial tool in the District’s toolbox that the District should have flexibility to use as it sees fit as the growing body of science on STA performance dictates.

PSTA Technology

There is a consensus that PSTA technology holds great promise for improving the performance of STAs. Tr. 315; Tribe Ex. 326, p. 5 (Dr. Jones). But there also appears to be a consensus that full scale implementation of PSTA by the District must await completion of field studies. That is certainly the view of the State parties, Tr. 2221, and the United States is doing the pilot study. The Tribe’s counsel, albeit perhaps reluctantly, appears to go along. Tr. 2328 (“I don’t think until the STA-1 East test is done can PSTA per se be implemented elsewhere”).

The Special Master answers below the Court's question (9) regarding the completion of the ACOE's PSTA pilot project in STA-1E. It is unlikely to produce a result until March 2008 at the earliest. Because there is a cost to implement PSTA, the Special Master is persuaded that the implementation of PSTA in STA-1W or in the other STAs should not occur until the pilot PSTA cell in STA-1E begins to generate data on a field scale level that supports the investment in PSTA in other STAs. District Exh. 135, p. 19-21 (Goforth).

The Special Master expects that the District will be working closely with the Corps to monitor the PSTA pilot cell's operation⁶² and that the TOC will receive timely updates on the progress of the PSTA pilot. The Special Master in turn will monitor the Corps' progress and can report to the Court should there be delays that might push the completion of the PSTA project beyond March 2008. At this juncture, the Special Master does not see a basis to recommend anything more with respect to the incorporation of PSTA technology in STA-1W to benefit the Refuge.

Operational Improvements

As noted above, it will behoove the recovery of STA-1W and the Refuge to minimize the amount of Lake water both have to receive. However, despite the Lake water's increased phosphorus levels, *by regulation*, the District is required under certain circumstances to add Lake water to the Refuge. The Refuge's, or WCA-1's, "regulation schedule"⁶³ that governs water levels in the Refuge dictates that if water in the Refuge is needed to meet water supply needs in WCA-2 or WCA-3, Everglades National Park, or the Lake Worth Drainage District, that water

⁶² The District is itself operating a PSTA project in Cell 2B of STA-3/4. 2006 SFER, p. 4-58. It will consist of a 100-acre PSTA cell and 300 acres of submerged aquatic vegetation. District Exh. 135, p. 23 (Goforth)

⁶³ As alluded to earlier, a "regulation schedule" represents "guidance to water resource managers for regulating the inflow and outflow of water through water control structures. It is subject to change based on changing conditions of demand, supply, and public interests. The objective is to maximize benefits for the various, often competing interests in water use." Environmental Assessment, Modification of the Water Regulation Schedule for Water Conservation Area No. 1, March 16, 1995, District Exh. 160, p. EA-1.

can be released from the Refuge but the release has to be preceded by delivery of an equivalent volume of inflow, or replacement water, from Lake Okeechobee.

In January 2005, the District requested a temporary deviation from the Refuge's Regulation Schedule. U.S. Exh. 120. The District wished to avoid sending highly phosphorus-concentrated Lake Okeechobee water through a damaged STA-1W and then to the Refuge for fear that the stage of the water in the Refuge would increase penetration of phosphorus-laden water to the interior of the marsh. Apparently, when the Refuge's stage is above 14-14.5 ft, there is a higher likelihood of penetration of water into the interior of the Refuge. *Id.*, District Exh. 131, p. 5. Hence, where the stage in the Refuge is above 14-14.5 ft, the District asked the ACOE to permit water supply releases from the Refuge without replacing the water from the Lake. *Id.* The request was granted on April 22, 2005. U.S. Exh. 121.⁶⁴ (At the June 16, 2006 TOC meeting, it was reported that the temporary deviation has not yet had to be used and that efforts are underway to seek to extend it a bit longer to give the parties more flexibility in deciding when to add water to the Refuge when there is a water supply release from the Refuge.)

As noted above, when Lake water has to be released for regulatory purposes, the District has also made a conscious effort to keep it out of STA-1W to allow STA-1W to recover from both overloading and hurricane damage.⁶⁵

The District also planned to construct the G-341 divide structure in the Ocean Canal along the L-13 levee which forms a bridge between the West Palm Beach Canal and the Hillsboro Canal. (See Figures 1 and 3 and the accompanying discussion). District Exh. 91, p. 4. The G-341 structure is located in the northwest corner of STA-1W. District 141, p. 5-2. The

⁶⁴ U.S. Exh. 121 also contains the ACOE's Environmental Assessment and Finding of No Significant Impact.

⁶⁵ The Lake water has been routed to STA-3/4. At the June 16, 2006 TOC meeting it was reported that STA-3/4 may be unable to receive additional Lake water for some period of time because of concerns about maintaining the design envelope for this STA with respect to phosphorus loading.

Ocean Canal was an open connection allowing water intended for STA-2 to go to STA-1W. District Exh. 91, p. 4. The G-341 structure will prohibit this water from going to STA-1W and will direct it to STA-2. It was anticipated that this structure would be built by the end of 2005.⁶⁶

The Special Master does not believe that the Consent Decree should be utilized to hamstring the operational flexibility of water managers who are cognizant of the Consent Decree's requirements even as they deal with water, such as Lake water, not directly governed by the Consent Decree. If they make mistakes, and they well might in this complex regime, and those mistakes manifest themselves in an exceedance, the Consent Decree response mechanisms will be triggered. In the context of this referral, that is a sufficient check and balance on operational decisions in the view of the Special Master.

Refuge Monitoring and Modeling

This is another task that provoked no controversy during the hearing. All participants in the hearing process support the FWS's efforts to improve everyone's understanding of the quality of the Refuge's water and sediment and how phosphorus moves in the Refuge, and the development of predictive tools to assist the parties in facilitating, if not expediting, the natural balancing of flora and fauna in the Refuge and the maintenance of appropriate water levels throughout this very large marsh. The United States provided details of this work. U.S. Exh. 52, 59.

The Special Master has a concern that, ostensibly at least, the Refuge's modeling effort is not being coordinated with all stakeholders. Intuitively, a model that hopes to reasonably mimic phosphorus fate and transport in the Refuge will depend on accepted data and sufficient experience to say with confidence that the model is accurately predicting what is happening in

⁶⁶ According to information presented at the June 16, 2006 TOC meeting, this structure is now in operation.

the Refuge. That is a hugely difficult undertaking that necessarily will involve a number of assumptions subject to challenge. It would be unfortunate if the parties fail to create opportunities to receive input on model development at the front end that results in the need to make changes in the model in the later evaluation and application stages. The goal should be to try to get it right in the first try.

The Special Master is assuming that the funding is in place to complete this work, which seems critical in light of the statement in the 1992 Consent Decree that one priority of research “would be an understanding of the relationships between phosphorus input and water quality at the 14 interior marsh stations in the Refuge, including definition of the future role of recycling of previous excess phosphorus inputs.” Consent Decree, Para. 11B. The Special Master, or the parties, are in a position to report to the Court on the status of this very important research, its continued funding, coordination among the parties with respect to the results of this work, and the schedule for its completion, and recommends below that the Court be kept so apprized.

Projects “Outside” the Consent Decree

There are three sources of water containing phosphorus that involve projects “outside” the Consent Decree. First, untreated water enters the Refuge from Wellington (see Figure 2) or what is referred to as ACME Basin B. ACME Basin B is located just to the east of the Refuge. Second, until it is diverted, L-8 basin water might enter the Refuge. Finally, Lake Okeechobee water has the potential to enter the Refuge. In particular, both diversion of L-8 water and meaningful progress in implementing the TMDL for Lake Okeechobee can affect the parties’ ability to meet design criteria for STA-1W and 1E. Tr. 240-41, 318-20, 335-36.

Acme Basin B

Acme Basin B refers to an area east of the Refuge from which stormwater is discharged directly into the Refuge. (See Figure 2, p. 35.) The stormwater contains phosphorus. Tr. 158; 2006 SFER, p. 3-53-55. According to District reports, ACME Basin B has contributed the following amounts of phosphorus to the Refuge untreated in the following water years:

<i>Water Year</i>	<i>Phosphorus Load (mt)⁶⁷</i>	<i>Source</i>
2005	4.969	2006 SFER, p. 2C-24
2004	2.117	2005 SFER, p. 2C-20
2003	2.226	2004 ECR, p. 8A-15
2002	5.006	2003 ECR, p. 8A-14

Under the Acceler8 program, the District plans to add the capacity to move the water from this basin north to the C-51, or West Palm Beach, Canal. (See Figure 2, p. 35, Figure 5, p. 41). A reservoir will also be built to collect stormwater. Tr. 158, 165; District Exh. 75. The water will then be treated in STA-1E before being discharged to the Refuge. District Exh. 91; U.S. Exh. 109, p. 4.

The District is currently projecting an “early” construction completion date for this project of December 2007 with a “late” date of mid-2009. District Exh. 74 (Appendix A).

This project is not one governed by the Consent Decree but may have some impact on the future operation of STA-1E depending upon the volume of water and phosphorus concentrations in the water that eventually will be treated in STA-1E.

⁶⁷ To put these loads into perspective, as the Special Master understands the tables in the SFERs and ECRs (they are not easily interpreted), WCA-1 received in total from all sources 86.1 mt in WY 2005, 22.3 mt in WY 2004, 43.4 mt in WY 2003, and 18.8. mt in WY 2002, based on the sources set forth in the table.

Diversion of L-8 Basin Water

Diverting the L-8 basin water away from the Refuge is a CERP⁶⁸ project. 2006 SFER, p. 7A-62-63. Some progress is being made to develop storage capability to hold water from this basin instead of having to send it to the STA-1 complex or sending it east to the ocean:

Q. With regard to the CERP projects, are there other CERP projects out there which were not included in the Acceler8 process which would have the potential to affect water quality in the Refuge albeit indirectly or directly?

A. There's one project that was in the restudy plan, the Comprehensive Everglades Restoration Plan, that in fact will have some water quality benefits, and that is the L 8 reservoir. The good news is we have expedited completion of that project and are now in the 4th year of a 6-year construction schedule to put an additional 40,000 acre feet of water in the L 8 basin to attenuate some of these high flows in the basin prior to it being discharged into either STA 1 East, STA 1 West, or discharged out in the C 51 canal.

A. It was not included in Acceler8 because it was fully funded. It's roughly 170 million dollar project funded by State appropriations done over 6 years in installments and I believe we're in the 4th year of installment payments. And therefore no need to include it in Acceler8 because it was fully funded and already on its way to being completed.

Q. You mentioned that L 8 reservoir is a CERP project. What is the time line involved in when that is likely to be constructed?

A. It is already -- it's constructed into phases. We are utilizing it as construction moves forward. So as each I believe it's in about 10,000 acre foot increments come on line due to the -- it's a mining activity, and as the facility is constructed we are able to use that project feature.

So it is already being utilized by the District in its operations. I believe there's about 20,000 of the 40,000 acres currently on line and the rest of it I believe would be completed by 2007.

Tr. 234-35, 239-40 (Barnett).

⁶⁸ CERP includes more than 60 projects. It will take more than 30 years to construct at a cost of an estimated \$8.4 billion. The plan will be cost-shared 50/50 between the state and federal governments. Through the Water Resources Development Act of 2000, Congress authorized an initial \$1.4 billion package of projects to begin CERP. District Exh. 94, p. 2. (Barnett).

While this storage capability is being developed in stages, it does not appear that any meaningful diversion of L-8 can occur until 2010 when “certain features” of this project will occur, or perhaps 2014, when all aspects of this CERP project are now scheduled to be completed. Tr. 335, 1016-17, 1627. On behalf of the District, Dr. Goforth testified:

Q. What is the L 8 diversion project?

A. The L 8 diversion project is a CERP project, a Comprehensive Everglades Restoration Plan project, that will actually capture water that currently moves south near and into the STA 1 complex. And so the project itself will actually capture that water and divert it north away from the STA 1 complex, that's STA 1 East and 1 West, and actually move the water north to help with the Loxahatchee River hydroperiod restoration project.

So that project, the last schedule I saw there would be an intermediate completion of around 2010 for certain features, and then sometime in the time frame of 2014 for the balance of the features that would serve to divert that water away from the STA 1 complex.

Tr. 1016-17. Dr. Goforth then explicated his answers by saying that he understood that 90 to 100 percent diversion would occur by 2014, and some lesser percentage diversion would be accomplished by the treatment works constructed by 2010. Tr. 1017-1018.

Between now and 2010, the District is going to try to minimize L-8 basin water entering the STA-1 treatment works through an operations plan for STA-1E. U.S. Exh. 109. To the extent practicable,⁶⁹ the District is going to attempt to determine how much water is entering the STA-1 treatment works from the L-8 basin and then will attempt to route an “equivalent” amount of water east to “tide” (i.e., the ocean) to attempt to keep the STA-1 treatment works within their design capacity. *Id.* at 7; Tr. 1017, 1019-20.

This CERP project was identified by the State parties as part of the remedy for avoiding future exceedances in the Refuge. In the context of this referral, the Special Master recommends

⁶⁹ If there is more water than the system can handle, the operations managers will have little discretion to move L-8 water elsewhere. Tr. 1020-21.

that the efficacy of STA-1E and the success of the operations plan designed to keep STA-1E within its design envelope should be monitored, and that the Court consider if it wishes to be kept informed periodically of progress on the L-8 diversion project.

Lake Okeechobee TMDL and Lake Release-Related Projects

The Lake's woes have been with us for a while and, if history is a guide, they are not going away any time soon. Because of the Lake's critical role to protect South Florida's water supply (among its other functions) and because we are an interdependent population, everyone in Florida has a stake in the success of the Lake's phosphorus TMDL program. Based on past Lake water quality data, success has been elusive to non-existent. Until meaningful progress to achieve the TMDL is made, and Lake phosphorus levels are significantly reduced, water managers will continue to be faced with unattractive choices on where to direct Lake releases.

In addition, there was a hint in the hearing that in a post-Katrina environment Lake levels will be regulated more rigidly to protect Lake Okeechobee levees. Tr. 336. If that turns out to be the case, when the Lake stage is high, the volume of water that these water managers must move--along with the phosphorus it contains--will increase.

This is why at least two of the experts who testified before the Special Master raised concerns about Lake water in relation to the Refuge and more broadly, the EPA. An expert for the Tribe, Dr. Rice, described the Lake as a "big challenge":

About 56 percent of the water in high years goes down the Caloosahatchee and St. Lucie canals or rivers. And that water is causing great havoc in the St. Lucie estuary and the Indian River Lagoon and the Caloosahatchee estuary.

And as a result of that, there's great political pressure on the management of the Water Management District not to do that. The only other place that water is going to be able to go, if it doesn't go down those canals, rivers, is south, into the EAA, into the Everglades, hopefully by-passing in some cases the situation.

But it's a major, major issue. And there's no assurance that all that extra water that's out there that's got to go somewhere is not going to eventually start coming into the Everglades and cause some more problems. So the Lake Okeechobee challenge is a big one that we've really got to be able to deal with.

Tr. 1628. An expert for the United States reached a similar conclusion after describing the rising phosphorus levels in the Lake for the past 30 years:

And then there's sort of another bigger, you know, concern about the problem of, given the quality of the water and all the controversy and difficulty of managing the Lake, where should the water be discharged given all the valuable resources that it may impact.

Tr. 1741.

The District appreciates these concerns. The 2006 SFER provides:

Independent of the extraordinary events of September 2004, the SFWMD and USACE are in the process of refining the operating schedule for the lake, developing release rules that will be more favorable to maintaining its long-term ecological health, reducing large discharges to downstream ecosystems while also reducing the impact on water supply. Until there are large alternative storage projects, this will be a difficult balancing act, because the lake receives water from a large watershed, it provides the main source of irrigation water in drought, and its major outlets are to estuarine systems that are impacted by large releases of fresh water.

2006 SFER, p. 10-3-4.

There are two projects in the Acceler8 program to attempt to give water managers that “alternative storage” to the west and to the east of the Lake. To the west, the C-43 West Storage Reservoir “will capture and store stormwater runoff and freshwater releases from Lake Okeechobee to protect coastal estuaries. The 160,000 acre-feet reservoir will also provide a reliable supply of water for the Caloosahatchee Estuary along with nearby farms and residential area.” District Exh. 94, p. 4 (Barnett). Tr. 155. To the east, the C-44 Reservoir/Stormwater Treatment Area “will capture and treat excess stormwater runoff before it enters the St. Lucie

Estuary and Indian River Lagoon. The project includes construction of 4,000 acres of treatment marsh along with a 4,000 acre, 10 foot deep aboveground reservoir.” District Exh. 94, p. 4 (Barnett); Tr. 155. Currently, the District is projecting completion of these projects by 2010,⁷⁰ meaning that water managers will have at least four more years to juggle the “where-do-we-send-the-water-today-to-create-the-least-amount-of-adverse-impact” balls that they have in the air many days each water year.

Enforcement of the Lake’s TMDL and completion of these Acceler8 projects are outside the scope of the Consent Decree. However, because the successful implementation of these endeavors is vitally important to water quality in the Refuge and, more broadly, the EPA, the Court might wish to be kept informed of their status from time to time.

There are other Acceler8 projects which bear more directly on water quality in the Refuge.

Implementation of the Acceler8 Program Vis-à-vis the EAA

As discussed above, flows to STA-1 have been greater than it was designed to handle for the past several years and future flows and loads are projected to be greater than STA-1W is designed to handle. Currently, Lake releases cannot be sent east or west all of the time because of the adverse impacts to the Caloosahatchee and St. Lucie estuaries. Hence, the District has recognized for some time that storage, conveyance, and treatment capacities must be increased to minimize the impacts of EAA runoff.⁷¹

⁷⁰https://my.sfwmd.gov/portal/page?_pageid=54,926211&_dad=portal&_schema=PORTAL&navpage=projects.

The geographic location of these projects appears on District Exh. 73 and this website.

⁷¹ BMPs are not discussed here. As noted above, Best Management Practices, or BMPs, relate to the efforts of agricultural operators to use phosphorus more efficiently and to keep as much of the phosphorus on the farms as can be accomplished. A “more stringent EAA Regulatory Program” is a permitted response by the State parties to a “violation” under the Consent Decree. Consent Decree, p. C-4. The Florida Audubon Society sought to make BMPs a remedial issue during the remedy hearing. However, the Special Master was reluctant to enter that evidentiary arena since the TOC’s actions on remedies did not include a discussion of BMPs and no Consent Decree signatory suggested to the Court “a more stringent EAA Regulatory Program” as a remedy. In the planning to

As a result, the Acceler8 program contains a number of features to give water managers many more options in dealing with EAA basin outflows.

Everglades Agricultural Area Reservoir Phase 1/Bolles and Cross Canals

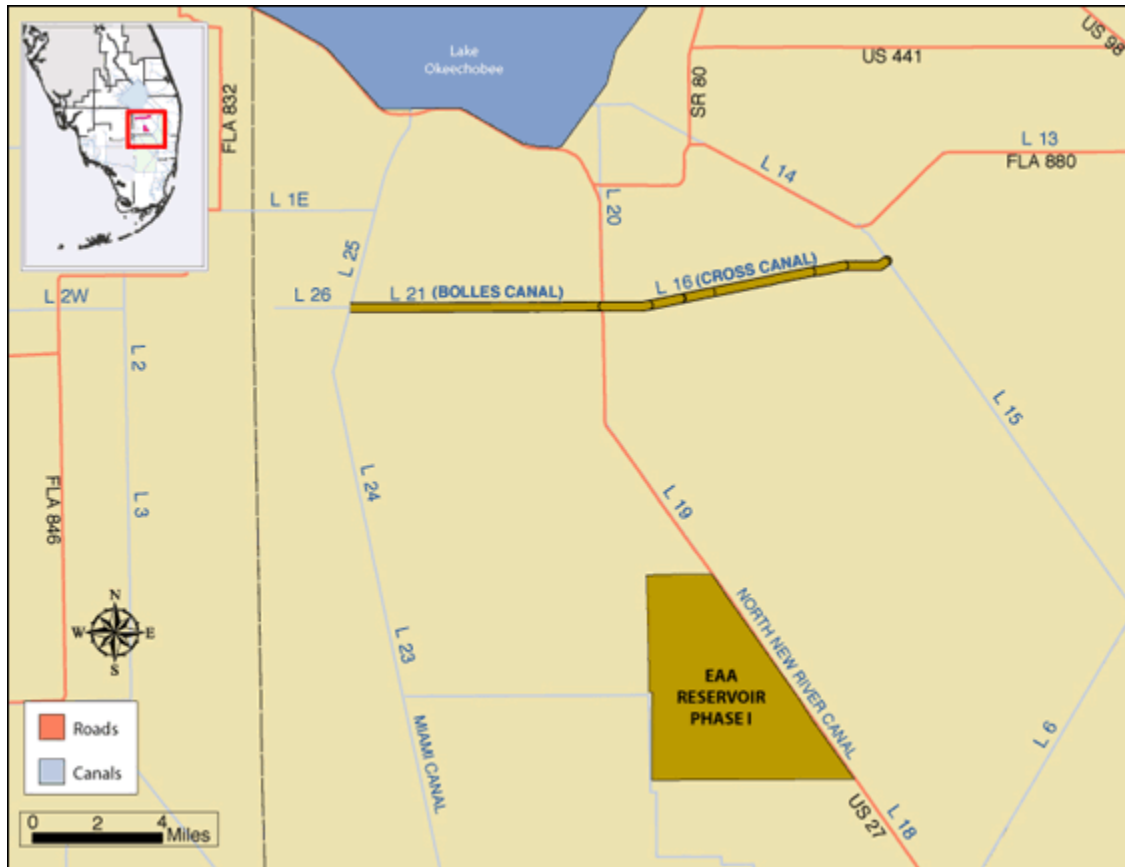
This project will protect coastal estuaries and reduce the flow of nutrient into the Everglades by capturing and storing freshwater releases from Lake Okeechobee, along with agricultural stormwater runoff, in a 190,000 acre-feet aboveground reservoir. District Exh. 94, p. 5 (Barnett). The 2006 SFER (p. 7A-41) says that the project will,

capture, move, and store regulatory releases from Lake Okeechobee, thereby reducing the number and volume of harmful discharges to coastal estuaries. This project will capture, move and store agricultural stormwater runoff, which will reduce the need for emergency flood control backpumping into the Lake. Project benefits include providing additional water to meet Everglades and agricultural water demands and lessening water supply dependency on Lake Okeechobee. This project will improve the District's operational flexibility to move water within the EAA, including flow equalization and optimization of STA performance to further reduce phosphorus inflows to the Everglades.

Figure 6 (District Exh. 75) depicts the EAA storage reservoir and Bolles and Cross Canals whose conveyance capacities will be increased as part of the project.

implement the Consent Decree, BMPs were expected to reduce EAA runoff by 20% and that has not happened. District Exh. 135, p. 13 (Goforth). On the other hand, BMPs have effected a 50% reduction in phosphorus levels in the EAA basin since the implementation of BMPs 10 years ago, more than the 25% projected in the Consent Decree. 2006 SFER, p. 3-5. Was that projection sufficiently demanding? Is a bigger issue historic phosphorus loading already present in sediments in EAA canals? Should all farms be able to achieve the same level of phosphorus outflow reduction as the best performing farm? Can much more benefit be extracted from BMPs relative to the cost of attempting to do so? If further reductions could be made, what level of reduction would result in a meaningfully-improved operation of STA-1W and -1E? Other questions are raised by the "Closing Memorandum for Special Master" submitted by the Florida Audubon Society. These questions presumably are being aired within the District and by agricultural stakeholders, but they have not been the focus of discussion at TOC meetings attended by the Special Master. In lieu of tackling this issue at the hearing without a TOC predicate, the Special Master asked the TOC parties to make sufficient time available to explore the existing BMP program so that the TOC can evaluate whether its current status is a model to be emulated or has room for meaningful improvement relative to Consent Decree goals and obligations.

Figure 6



For orientation, the Ocean Canal along the L-13 levee carries water to STA-1W through the S-5A structure. (See Figures 1-3 and Figure 12, p. 94.)

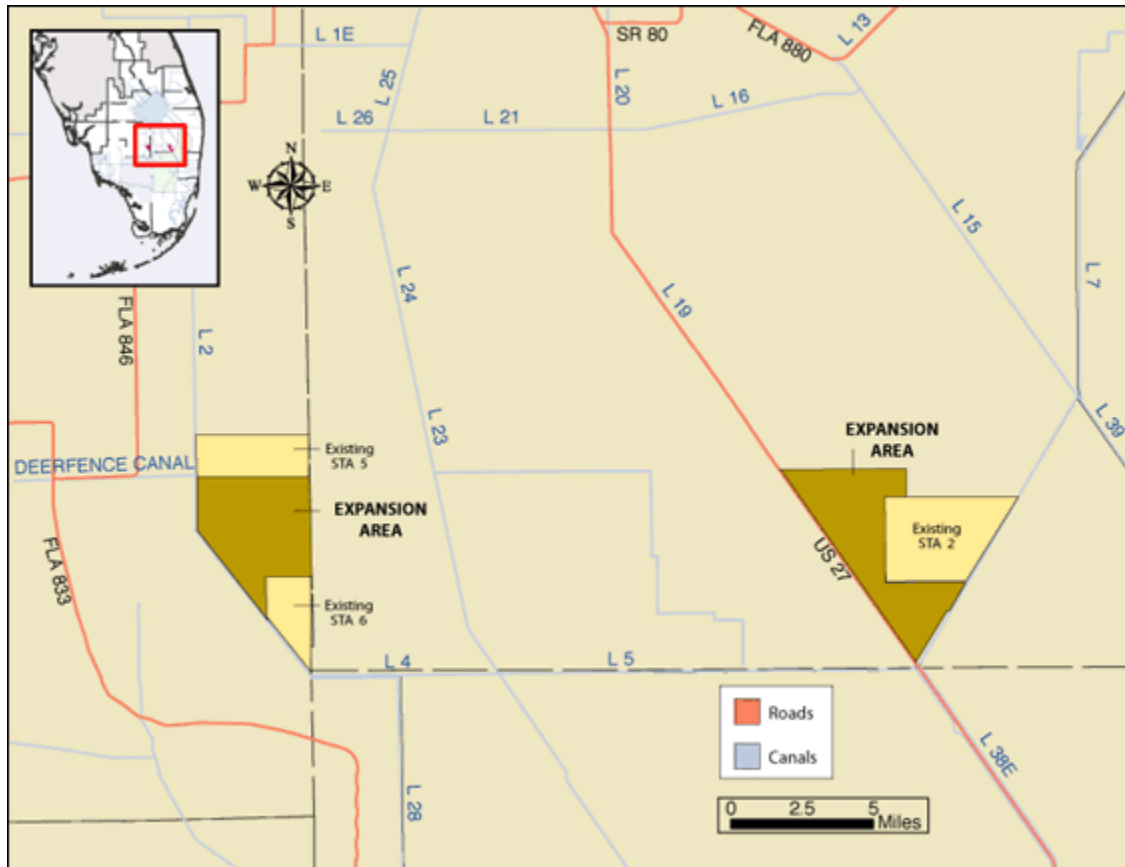
This is a \$350 million project. The land required for this project is “99% acquired.” The project is scheduled for completion by sometime before December 31, 2009.⁷²

Everglades Agricultural Area Stormwater Treatment Area Expansion

The District also advised the Court that it would be expanding STAs and adding STAs in the coming months and years. Figure 6 shows the planned areas of expansions of STA-2, STA-5, and STA-6.

⁷² https://my.sfwmd.gov/portal/page?_pageid=54,926252&_dad=portal&_schema=PORTAL; District Exh. 94, p. 6.

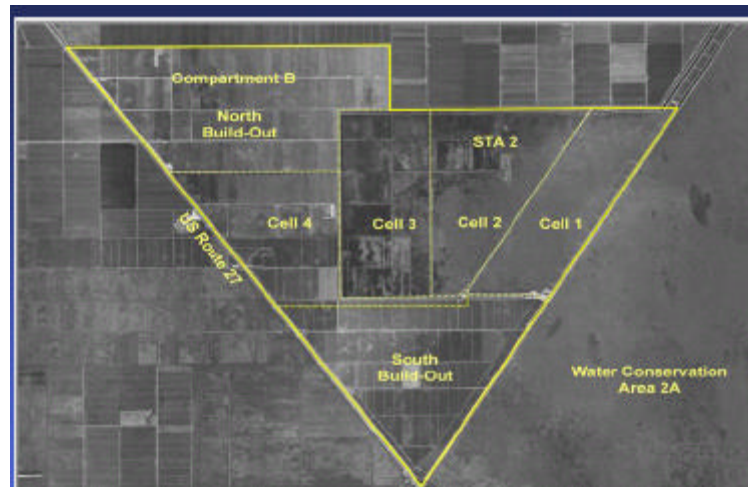
Figure 7



STA-2 lies to the east of the new EAA storage reservoir (Figure 6). The initial expansion of STA-2 consists of a new treatment cell 4 that is being constructed immediately to the west of existing STA-2 which has three treatment cells (1, 2 and 3), as shown in Figure 8. New cell 4 is 1,813 acres in size. The District is projecting that new cell 4 will be “flow capable”⁷³ by December 31, 2006. District Exh. 195; Tr. 166. Given the possibility of permitting or construction delays, the District adds a caveat that flow capability could be delayed until September 2008. District Exh. 74, Tr. 173.

⁷³ Thomas Stowd, the District’s program director for Acceler8, explained this term: “A. Flow capable, I guess it’s a little bit of a term of art. But my understanding of it is you can physically bring water into the system and move it through the system and discharge it. Q. It does not include permitting restrictions? A. The project may not be completely constructed. The gates would be able to operate to let water in. They’d be able to operate and let water out. It might be manual as opposed to having the power systems in place or telemetry or anything like that. But the structures could be physically operated to allow the movement of water and the levees would be of sufficient height to facilitate that.” Tr. 173-74.

Figure 8



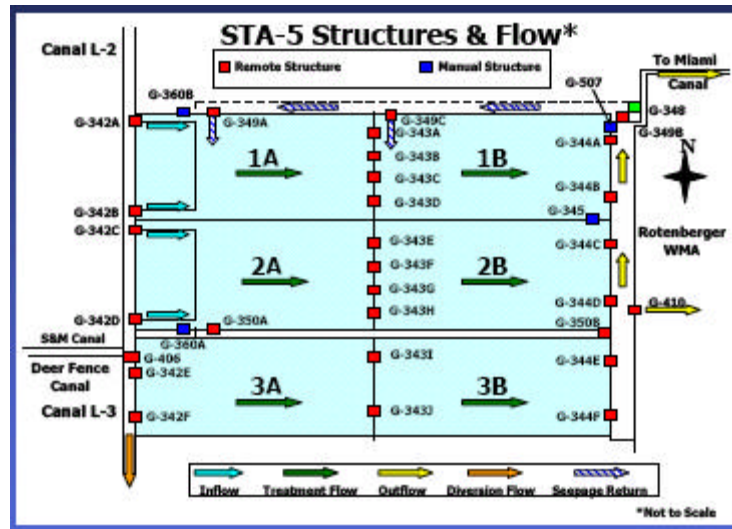
What is referred to as “Compartiment B” in District documents consists of a “north build out” and a “south build out” of STA-2, meaning the area to the north of new cell 4 and the area to the south of the existing STA-2 and new cell 4, as shown in Figure 8 taken from District Exh. 195.

The north and south build-outs are scheduled to be constructed by sometime in mid-2009 with the possibility that matters outside of the control of the District⁷⁴ could move the construction completion date to mid-2010. District Exh. 74 (Appendix A hereto). All of the land for this project is owned by the District.

STA-5 will be expanded by 2,448 acres (District Exh. 94, p. 5) or 2,560 acres (2006 SFER, p. 4-72). Figure 9 (from District Exh. 195) shows existing flow ways 1 and 2 and new flow way 3.

⁷⁴ Having to address endangered species issues, wetlands mitigation, and preservation of cultural resources are among the issues that could affect permitting and thereby delay the start of construction. Tr. 170-71.

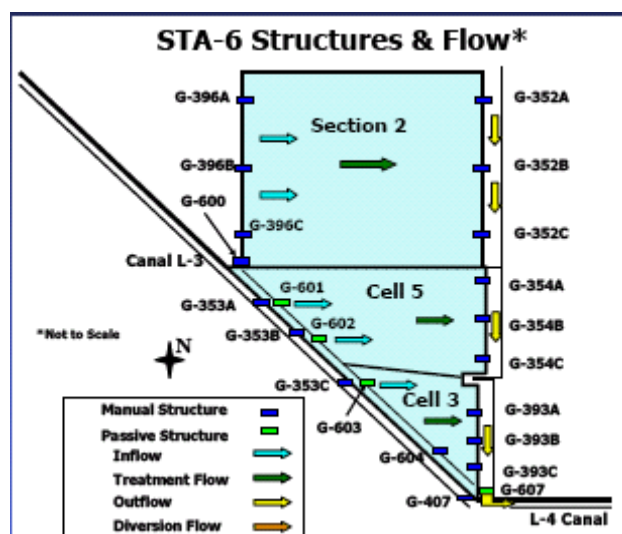
Figure 9



New flow way 3 should be constructed by March 2007, 2006 SFER, p. 4-72, or September 2007, District Exh. 74, (Appendix A) but will be flow-capable by December 31, 2006, with the same caveat that there is a potential that flow capability will be delayed until September 2007. District Exh. 74 (Appendix A), 2006 SFER p. 4-72, Tr. 174.

Concurrently, STA-6 will be expanded by about 1,400 acres as an “Everglades Construction Project” under Florida’s Everglades Forever Act. District Exh. 94, p. 3, 5 (Barnett). Figure 10 (from District Exh. 195) shows existing cells 3 and 5 and new section 2.

Figure 10



Section 2 is projected to be flow capable by December 31, 2006 (with the same caveat as above). Construction is currently scheduled to be completed by September 2007 (“early” case) or March 2008 (“late” case). District Exh. 74 (Appendix A); 2006 SFER, p. 4-84, Tr. 173.

The remainder of the “expansion area” in Figure 7 not represented by the expansion of STA-5 and STA-6 represents “Compartment C-phase 2” which the District is currently projected to have constructed by mid-2009 (best case) to mid-2010. District Exh. 74 (Appendix A).

The immediate expansion of STA-2, STA-5, and STA-6 will add about 5,660 acres in stormwater treatment area that will be “flow capable” by December 31, 2006 with full flow-through operations to begin sometime in 2007 or 2008. When the remaining expansion (the rest of Compartments B and C) is completed, what appears to be about 12,340 acres of stormwater treatment area will be added.⁷⁵

How does all of this additional storage, conveyance, and treatment capacity affect the Refuge? That question was to be answered by the Everglades Agricultural Area Feasibility Study, the last item on the State parties’ list of remedial activities.

Everglades Agricultural Area Feasibility Study

The Everglades Agricultural Area Feasibility Study (EAA FS), dated October 2005, tried to answer two questions. First, with the additional treatment capacity in STA-2, Cell 4; STA-5, flow-way 3; and STA-6, Section 2 that should be online sometime in 2007, is there any advantage to redistributing EAA flows among the various STAs to improve the reduction in phosphorus in water discharged to the WCAs?

⁷⁵ Mr. Strowd did not know how many more acres of STAs would be added by the build-out of Compartments B and C, Tr. 199-200. But based on District Exh. 94, p. 5 it appears that Compartments B and C represent 18,000 acres minus 5,660 acres for the current expansion of STA-2, -5, and -6, or about 12,340 acres.

Second, with the anticipated availability of additional treatment capacity in 2010 from Compartments B and C, is there any advantage to redistributing EAA flows among the various STAs to improve the reduction of phosphorus in water discharged to the WCAs?

The answers appear to be that the Refuge will not materially benefit from the additional treatment capacity in the period 2006-2009 but could benefit in the period 2010-14, after the L-8 basin diversion structures are in place, the EAA Storage Reservoir is constructed, the Bolles and Cross Canals have increased conveyance capacity, and Compartments B and C are built out as STAs.

I examine the results of the EAA FS with respect to each time period.

EAA FS Results for the Period 2006-2009

The EAA FS evaluated a number of alternative approaches but determined that for the 2006-2009 period, “there would be little value in attempting to redistribute inflow volumes and TP loads to the various STAs, with one exception.” District Exh. 141, p. 4-3. The exception related to redistributing inflow volumes between STA-1W and STA-1E, but this step, if taken, “would not materially change the aggregate of total phosphorus loads delivered” to the Refuge. *Id.*

During the hearing, witnesses critical of the EAA FS focused in part on an assumption made in the EAA FS that L-8 basin runoff would “not be treated by the EAA STAs but will flow through S-155A to tide.” *Id.*, p. 1-3. The EAA STAs, of course, are STA-1W and STA-1E. The “S-155A” structure rests at the eastern end of the C-51, or West Palm Beach Canal, that can be seen in Figures 1 and 5. The EAA FS concludes that the volumes and total phosphorus loads discharged to the Refuge “are materially influenced by the assumption that volumes associated

with L-8 Basin runoff will bypass both STA-1W and STA-1E....” This assumption may be invalid, the authors of the EAA FS write:

It is not apparent that sufficient hydraulic capacity presently exists in the water control structures to effect that assumption.

Id., p. 4-3.

As noted above, the District has prepared an operations plan for STA-1E that will not keep L-8 basin water out of STA-1E but is intended to move an “equivalent” volume of water east through the C-51 to the S-155A structure and out to “tide” or elsewhere if the water volumes in the system as a whole allow water managers to effect this plan successfully. U.S. Exh. 109, p. 4, 7. How big an “if” this is depends upon the amount of rain and where the rain falls. When flood avoidance receives a higher priority, the EAA FS’s assumption about L-8 water bypassing STA-1E may not be achievable. Tr. 318-19; 1020-21.

There was considerable emphasis in the hearing on projections for the period 2006-09 made in the EAA FS of how much phosphorus would be present in outflows from STA-1W and STA-1E, especially given the assumption that L-8 basin water will be diverted. District Exh. 141, p. 4-1, Table 4.1; Tr. 1118-26, 1632. These projections are not, however, meaningful to the Special Master in the context of this referral.⁷⁶ Compliance with the Consent Decree will be based on what actually happens, not on the output of modeling that was designed primarily to determine if redistribution of flows and loads among STAs would improve phosphorus removal.

⁷⁶ This referral focuses on a discrete exceedance and the question of remedies. With one caveat, the projected phosphorus inflow concentrations relate to compliance with the Long Term level that goes into effect December 31, 2006. The caveat is that the projections cover calendar year 2006 and project an outflow total phosphorus load of 4.43 metric tons and phosphorus flow-weighted mean outflow concentrations in a range of 16.7 to 25.2 ppb. It does not seem likely that the outflow concentration will get down to this level based on results thus far and the continuing effort to rehabilitate STA-1W. District Exh. 195 (showing in February 2006 that STA-1W outflow concentration was at 112 ppb through nine months of water year 2006). As discussed below, for the first three months of 2006, the geomean of the 14 interior stations has been below the Interim Level so STA-1W’s actual performance is not currently an issue with respect to this Consent Decree benchmark.

In any event, as the Special Master understands the 2006-09 conveyance structures, only STA-2 (which will have a new cell 4 flow-capable by year-end or next year) and not STA-5 or STA-6, may be able to relieve some of the loading to STA-1W and 1E. The TOC presumably will be monitoring operational decisions to redistribute flows and loads to STA-2 and away from STA-1W or 1E to allow STA-1W and 1E to operate within their design criteria and, in the context of this referral, the Special Master recommends that the Court consider whether it wishes to be kept informed of the success of such efforts.

EAA Results for the Period 2010-14

The EAA FS then looked at the potential to redistribute water volumes and their associated phosphorus loads among the STAs after the EAA Storage Reservoir is constructed and Compartments B and C are built-out. The FS considered two alternatives in relieving the workload of STA-1W and 1E: moving water west and then south through the EAA to Compartment B and STA-2 (Alternative 1), or moving water south and then west to STA-2 (Alternative 2). District Exh. 141, p. 5-1-40. As the Special Master reads the results of the EAA FS, for an expenditure of \$458 million (Alternative 1) or \$494 million (Alternative 2), both of which include the cost to construct Compartments B and C, the District will have increased conveyance, storage, and treatment options to relieve some of the burden on STA-1W and STA-1E should that become necessary in the time period 2010-14. *Id.* Alternative 1 did not include an evaluation of the effects on water levels in the Refuge *Id.*, p. 5-11. Under Alternative 2, flows to the Refuge might be reduced. *Id.*, p. 5-25-26. Hence, water levels in the Refuge would need to be more closely evaluated as part of the consideration of either of these alternatives.⁷⁷

⁷⁷ The EAA FS explains that additional analysis was going to be performed to determine the effects of EAA FS alternatives on the Refuge. “District staff and management are currently coordinating to have these additional analyses completed using the SFWMM (South Florida Water Management Model) following the completion of the

The 2010-14 discussion in the EAA FS contains a number of projections of water flow volumes and phosphorus loads that represent the output of modeling designed to attempt to determine the best configuration of flows and loads to each STA. *Id.* p. 5-7, 5-23. However, the projections for the years 2010-14 have little utility for purposes of this referral. What gives them value is that they are premised on the completion of Compartment B and C by 2010 which demonstrates a commitment by the State parties to complete these projects in the next four years.

Recommendations on Remedies

First, I summarize how we got to where we are. Then, I review compliance with the Interim Level since 2003. Next, I discuss my recommendations to the Court. Then I discuss certain additional remedial concepts raised by experts to the Tribe and the United States.

A Summary of Short-Term and Long-Term Remedies

In very practical terms, what prompted the Tribe's motion was a July 2002 exceedance that was transformed into a "violation" because the required finding of extraordinary natural phenomena or error was not made in June and July 2003 when the TOC debated this issue. Instead, the TOC decided to focus on remedies instead of causation. After the Tribe filed its April 2004 motion, there was another exceedance that represented excursions in September 2003 and August 2004. Again, the TOC decided to continue to focus on remedial action and not causation.

With respect to the Refuge, the short term remedial strategies include primarily rehabilitating STA-1W; a variety of enhancements in STA-1W and 1E; operational changes relating to water supply releases and Refuge rim canal levels and keeping STA-1W and 1E operating within their design criteria to the extent permitted by flood control needs; getting STA-

EAA Regional Feasibility Study." District Exh. 141, p. 3-12. During the hearing, there was no information presented by any party on the results of this additional analysis.

1E on line; completing the Refuge monitoring and modeling project; getting STA-2, cell 4 on line; and eliminating untreated discharge to the Refuge from ACME Basin B and treating that water in STA-1E.

The longer term strategies⁷⁸ include the build-out of, primarily, Compartment B; completing the EAA Reservoir; improving canal conveyance capacity; completing the L-8 diversion project; and, to give water managers flexibility on dealing with Lake releases, completing the C-43 West Storage Reservoir and the C-44 Reservoir/Stormwater Treatment Area. Reversing a 30-year trend of increasing phosphorus levels in Lake Okeechobee and meaningfully attending to the dire needs of the Lake are also critical to water managers trying to treat Lake releases to minimize the phosphorus loads these releases might carry into STA-1W and the Refuge or other parts of the EPA.

Compliance With the Interim Level Since 2003

Since the August 2004 exceedance, the District has made considerable progress in remaining in compliance with the Interim Level and, for about the past year, with the Long Term level (not yet in effect). The following table reflects the geometric mean concentration of the 14 interior stations, the Interim Level, the Long Term level, and the number of samples that could be retrieved. As can be seen from the table, beginning in September 2004, despite the hurricanes of 2004 that caused quite a bit of water-laden phosphorus to flow into the Refuge, Tr. 1081-82, 1133, 2006 SFER, p. 4-14, the Interim Level has not been exceeded except for two months (May and June 2005). The TOC determined that the results in those two months were due to error or

⁷⁸ All of the strategies are summarized in the TOC's February 24, 2005 memorandum to the Principals entitled "Progress Report on Remedial Measures to Control Phosphorus Loads" to the Refuge. District Exh. 91.

extraordinary natural phenomena, so they do not represent an exceedance. Tribe Exh. 357.⁷⁹

The Long-Term level, which goes into effect on December 31, 2006, has not been exceeded since July 2005.

Total Phosphorus Tracking for the Loxahatchee Wildlife Refuge - 1/03 to 3/06
(all concentrations in parts per billion or ppb)

<i>Year Month</i>	<i>Geometric Mean Concentration</i>	<i>Interim Level Effective 2/1/99</i>	<i>Long Term Level Effective 12/31/06</i>	<i>Number of Samples</i>
2003				
January	5.7	10.0	8.5	13
February	7.5	11.3	9.5	11
March	8.0	13.4	11.1	9
April	7.6	13.7	11.2	12
May	14.0	18.3	14.6	7
June	7.9	14.8	12.1	11
July	7.7	15.2	12.3	9
August	8.0	10.1	8.6	14
September	8.8	8.3	7.2	13
October	7.0	8.3	7.2	14
November	7.5	8.9	7.7	11
December	7.6	9.3	8.0	14
2004				
January	7.4	10.3	8.7	14
February	8.2	10.3	8.7	14
March	9.0	11.8	9.8	14
April	9.6	16.3	13.1	9
May	12.4	Not applicable*	Not applicable	9
June	40.0	Not applicable	Not applicable	2
July	21.0	Not applicable	Not applicable	1
August	17.5	15.4	12.5	12
September	8.5	9.9	8.4	14
October	8.9	10.0	8.5	13
November	8.3	10.6	9.0	14
December	10.4	12.1	10.1	13
2005				
January	7.9	13.9	11.4	12
February	9.4	15.1	12.3	11
March	13.4	16.6	13.4	11
April	8.6	13.9	11.4	11
May**	26.8	17.6	14.1	10
June**	18.1	13.9	11.4	14

⁷⁹ As a result of the May and June results, sampling techniques were reviewed and refinements were made by the District and the Refuge staff that were taught in workshops with samplers. Tr. 1280-81.

<i>Year Month</i>	<i>Geometric Mean Concentration</i>	<i>Interim Level Effective 2/1/99</i>	<i>Long Term Level Effective 12/31/06</i>	<i>Number of Samples</i>
July	7.4	14.9	12.1	14
August	6.5	13.9	11.4	12
September	7.5	13.0	10.8	11
October	6.5	11.4	9.6	13
November	7.8	9.9	8.4	14
December	7.6	9.6	8.2	14
2006				
January	6.3	11.5	9.7	13
February	6.4	11.7	9.8	13
March	8.1	13.1	10.8	12

*“Not applicable” means the stage was too low to compute the level or limit.

** The TOC rejected the data as being due to error or extraordinary natural phenomena. Tribe Exh. 357.

An exceedance requires two times within twelve sampling periods when the geometric mean concentration exceeds the Interim Level. The last “excursion” was more than 12 sample collections ago (August 2004). Since there are only nine months of data remaining for 2006, and since the Interim Level is no longer applicable after December 31, 2006, there cannot be another exceedance of the Interim Level in 2006.

By this measure, the short term strategies that the District has implemented have worked.

Special Master’s Recommendation on Remedies

The Court’s June 1 order directed that,

the United States and the state agencies implement their own remedies but provide more detail and a schedule that will be met. In the absence of such, the Court, if appropriate and after the Report and Recommendation from the Special Master, may be compelled to impose its own additional specific and detailed remedies.

Order on Remedies, p. 17. For their part, the State parties have provided more detail as outlined above and a schedule of completion which the Special Master has discussed above and is attached as Appendix A. The Refuge monitoring and modeling work is being done by the FWS.

The Special Master does not have a schedule for completion of this work but the details of the work have been provided by the United States.

The Special Master recommends the following:

1. *The Court enter an order (1) directing the State parties to implement the projects identified on Appendix A by the end of the “Late Construction Completion” time frames set forth on Appendix A; (2) directing the preparation by the District for presentation at each quarterly TOC meeting an addition to the Settlement Agreement Report showing the status of the projects on Appendix A in relation to the timetable set forth on Appendix A as well as the status of the EAA Storage Reservoir project and the Bolles and Cross Canals Improvements project; and (3) directing the Special Master or the parties to inform the Court through status reports of the progress made in completing these projects.*

If dates were going to be used in the Special Master’s recommendations, counsel for the District urged the usage of the end of the range of the “Late Construction Completion” dates on Exhibit 74. Tr. 2209. The Special Master has accepted this request for a number of reasons. The STA-1W enhancements are planned for completion by December 2006. STA-1E has been available for only a few months and the District ought to have the time to work with it in conjunction with STA-1W as was contemplated by the Consent Decree which originally envisioned STA-1E’s operation in 2002. The ACME Basin B flows into the Refuge are not regulated by the Consent Decree but are going to move from being untreated to treated in STA-1E as a result of the District’s decision to eliminate these waters from entering the Refuge untreated. Compartment B, Phase 1 (STA-2, Cell 4) could provide a benefit to the Refuge by taking on some flows that might otherwise go to STA-1W but, taking current conditions into account, the Special Master sees no reason to except this one project for an earlier completion

date. Issues of advancing the completion of Compartment B, Phase 2 can be addressed should there be a future violation.⁸⁰

The Special Master recognizes that the EAA Storage Reservoir project and increasing the conveyance capacity of the Bolles and Cross Canals are not projects listed on Appendix A. They are currently projected to be completed by 2010. At this time, the Special Master is recommending that the progress of this work also be monitored by the Court.

2. The Special Master further recommends that the Court be kept apprized of the results of the Refuge's monitoring and modeling work and the schedule for its completion through reports from the Special Master or the parties, as the Court may direct.

Modeling, if successful, will give the parties much-needed information on both the Refuge's water quantity needs and phosphorus fate and transport mechanisms. For the modeling effort to have any prospect of success in the short term, it will have to be funded appropriately and all stakeholders should have the opportunity to provide constructive input into model construction decisions on a schedule that minimizes the likelihood of delay in completion of an acceptable model. This is an apt occasion to apply the phrase, "if you want me in on the landing, include me in the take-off." Collaboration early will minimize criticism later.

3. The Special Master further recommends that the Court be apprized of the results of the analysis of water quantity impacts on the Refuge that may arise from the various alternative configurations of flows and loads that may be implemented as more structures and treatment areas come on line in the coming years.

⁸⁰ Appendix A reflects that STA-3/4 enhancements will be completed by December 31, 2006. Dr Goforth offered reasons why this date might not be met. They included future hurricane impacts and slower than anticipated biological response of the treatment vegetation and also a possible change of heart in converting Cell 1B from "emergent marsh" to submerged aquatic vegetation and permit delays. District Exh. 135, p. 23-24. Thomas Oliff, Asst. Exec. Director of the District, testified that funding delays could affect the schedule as well. Tr. 432. If one of these factors occurs, the District should act seasonably to inform the other parties to the Consent Decree and the Court and to seek relief as might be appropriate.

The EAA FS specifically omitted analysis of water quantity impacts on the Refuge saying that additional analyses should be conducted to determine the effects of alternatives on the Refuge and indicating that District staff and management would be coordinating “to have these additional analyses completed...following the completion of the EAA Regional Feasibility Study.” District Exh. 141, p. 3-12. It would be anomalous to effect compliance with the Interim Level by reducing water inflows to the Refuge. The Special Master is not suggesting that this is occurring or will occur, but this is a deliverable that presumably is in progress since the EAA FS was completed eight months ago. The Court can be advised of the results of this work through the Special Master, or the parties, as the Court determines.

4. The Special Master further recommends that there be a periodic report to the Court on the status and results of the PSTA project in STA-1E.

The Special Master believes that keeping the Court so informed will assist the Court in addressing PSTA-related issues if the implementation of PSTA becomes an issue of contention in the future.

In these recommendations, the Special Master has not included updates on the ongoing status of the L-8 diversion project in relation to the operation of STA-1E, progress on the Lake TMDL, the projects related to handling Lake Okeechobee releases in an environmentally sensitive manner, or efforts to operate STA-1W and 1E within their design criteria. The first three of these items are outside the scope of the Consent Decree even though the success of such projects impact compliance with the Consent Decree. However, should the Court wish to be

periodically informed of the status of these efforts, that can be accomplished through the Special Master or the parties, as the Court might direct.⁸¹

Other Remedial Issues Raised by Experts of the Tribe and United States

I explained above that there is not a lot of debate among the parties regarding remedies.⁸² But there are a number of themes in the papers filed by the United States and the Tribe which merit discussion here.

EAA FS's Projected Phosphorus Outflow Concentrations

The EAA FS projected phosphorus concentrations in STA-1W and 1E outflows in the years 2006-09 and 2010-14 that were higher than 10 ppb. District Exh. 141, Tables 4-1, 5-3 and 5-10. That number has significance because it is the State's numeric criterion for phosphorus in the Everglades Protection Area. Florida's Class III numeric criterion for phosphorus provides:

The numeric phosphorus criterion for Class III waters in the EPA shall be a long-term geometric mean of 10 ppb, but shall not be lower than the natural conditions of the EPA, and shall take into account spatial and temporal variability.

⁸¹ The South Florida Environmental Report will contain updates on all of these projects but the assimilation of information in that document can overwhelm a reader. Extracting milestone-type information neutrally may benefit the Court in its ongoing jurisdiction of this matter and might assist the public's understanding of the SFER.

⁸² As noted above, Dr. Harwell suggested that the TOC consider additional remedies. U.S. Exh. 50 at pp. 13-17. Some of them are already being addressed. Improving conveyance capacity to move EAA water south to Compartments B and C and new cells in STA-2, 5, and 6 is or will be in process. Attempting to keep L-8 water out of STA-1E is part of a District operations plan. U.S. Exh. 109. Expediting the L-8 diversion works appears to be everyone's wish. Trying to keep STA-1W within its design criteria is an articulated goal of the District. Considering additional STA acreage and upstream storage capacity presumably are always items for TOC consideration depending upon the performance of the existing STAs and the additional STA capacity and storage capacity being added. The others are ones that the FWS can put on the TOC agenda for vetting. Diverting ACME Basin B water out of the Refuge and keeping it out of STA-1E until treatment capacity is "available" in STA-1E is a subject that the TOC has considered in the past and presumably will monitor in the future. Diverting untreated water to tide through the West Palm Beach canal would appear to involve day-to-day operational decisions that may create impacts outside of the Refuge that may be unwelcome but, in any event, appear to be covered by the District's STA-1E operations plan. If the plan does not work, presumably the TOC can evaluate how to proceed. It does appear that the District is looking at the impact on the Refuge of water supply obligations and presumably the TOC will want to be kept informed on this subject. Removing sediments in the L-40 and L-7 canals and making operational changes at the S-6 bypass gate (along the southwestern edge of the Refuge) are subjects which the FWS can have put on a TOC agenda if they deem them critical.

F.A.C. 62-302.540(4)(a).

Under the Consent Decree, the State parties are required “to take such action as is necessary so that waters delivered to the Park and the Refuge achieve state water quality standards, including Class III standards, by December 31, 2006.” Consent Decree, p. 9. They are also required to meet the “Long Term Concentration” level in the Refuge by December 31, 2006. *Id.* at B-1. The Long Term level is determined in a manner similar to the derivation of the Interim Level. There are gauges at which stage is measured. Each month, the numeric stage value is plugged into an equation to determine the Long Term level. It is then compared to the geometric mean of the results of samples taken from the 14 interior stations. Consent Decree, p. B-3-4.

However, the Consent Decree permits the TOC to change the compliance approach of the Consent Decree. The Consent Decree (p. B-4) provides:

If the TOC determines that Class III total phosphorus concentration levels are lower than the long term total phosphorus concentration levels then the lower levels shall apply.⁸³

If the TOC decides that the Class III level is lower than the Long Term level, the Class III standard apparently applies to the “entire Marsh” and not to the 14 interior sampling stations. Consent Decree, p. B-1.⁸⁴

Based on the EAA FS’s projected concentrations of phosphorus in outflows from STA-1W and 1E under the alternative distribution of flows and loads that the EAA FS was considering, the Tribe said that the EAA FS “showed that the STAs will not meet the final water

⁸³ Earlier, the Consent Decree provides: “The Class III phosphorus criteria when interpreted by research will be implemented by December 31, 2006, if lower than the long-term concentration levels.” Consent Decree, p. 14.

⁸⁴ The TOC began consideration of this issue at its June 16, 2006 meeting which the Special Master attended.

quality goals” referring to the State’s numeric criterion of 10 ppb. “Closing Memorandum for Special Master Hearing of July 2005/March 2006” (Tribe’s Closing Memorandum) p. 3, 5-6.

The United States had a similar view. It explained that the EAA FS “provides little information about how the state parties are likely to achieve 10 ppb concentrations throughout the Refuge.” United States Post-Hearing Memorandum, p. 41. The United States cited a Long-Term Plan Technical Working Group memorandum, U.S. Exh. 108 (p. 2), which says that the EAA FS’s projections “indicate that additional measures are necessary to obtain a long-term geometric mean total phosphorus concentration of 10 ppb in discharges to the Everglades Protection Area.” *Id.*

With respect to the Refuge, it relied on its expert’s opinion (Dr. Walker) to the effect that STA-1W will not be discharging water at 10 ppb by December 31, 2006 and that a second phase EAA FS should be conducted to evaluate additional measures, including land acquisition for additional treatment area, if necessary, so that this “level of water quality” can be achieved. *Id.* at 41-42 (citing Tr. 1886-87). Dr. Walker later explained that the STAs were designed to meet 50 ppb as the outflow concentration, “And we’re trying to optimize them to squeeze out 10 parts per billion. And that’s an awful lot of – you’re expecting an awful lot out of the optimization. So more area or less loading.” Tr. 1889.

The Special Master does not regard these matters as within the referral of the Court. The TOC has not yet decided whether the Class III or long-term level is “lower,” and, if it is, what that means.⁸⁵ Hence, the projections in the EAA FS are not yet comparable to 10 ppb. The Consent Decree also provides that

if the lower of the Class III or long-term levels is not met by December 31, 2006, and the 50 ppb maximum annual discharge limit is being met at all inflow structures into the Refuge from the

⁸⁵ The Special Master discusses this subject below at pages 97-99.

EAA, the TOC will recommend a lower maximum annual discharge limit for the structures to be enforced by DEP. Additional actions, such as regulatory measures and increased STA acreage, as appropriate from the empirical data on performance of each program, will be required by either DEP or the District to meet the lower discharge limit.”

Consent Decree, p. B-4. Assuming STA-1W and 1E discharge below 50 ppb in the near future, the TOC has not had to face this determination because December 31, 2006 has not yet arrived.

The Special Master is by no means diminishing the concerns raised by the Tribe or the United States, but in the context of this referral, these issues are not ripe for determination.⁸⁶

Validity Of Assumptions in the EAA FS

The Tribe argued that the EAA FS makes “false assumptions that some other study or project will take care of the problem (i.e., L-8 diversion, Lake Okeechobee water). Such false assumptions are not only improper, but particularly threatening to the Everglades, now that the coastal communities have made it a serious political objective to challenge the disposal of large quantities of water to tide that harm the estuaries.” Tribe’s Closing Memorandum p. 3, 5.

The United States argues that increasing phosphorus levels in Lake Okeechobee were not properly accounted for in the EAA FS because the Lake phosphorus concentrations used were those pre-dating the 2004 hurricanes after which Lake phosphorus concentrations nearly doubled. United States’ Post-Hearing Memorandum, p. 39 (citing U.S. Exh. 106). It also questioned the reliability of the EAA FS’s assumptions about diversion of L-8 basin water and elimination of Lake releases to STA-1W or 1E.

The Special Master shares the concerns raised by the Tribe and the United States regarding the ability of the District to satisfy environmental concerns to the west, to the east, and to the south. The Lake’s regulation schedule is intended to protect those who could be impacted

⁸⁶ By quoting Consent Decree language on the Class III level, the Special Master is not here proposing a recommended interpretation of the Consent Decree on this topic. That day may come soon, but it is not here yet.

by the failure of flood protection. If wisely crafted, coordinated, and implemented, it is a part of the solution to these concerns even though the District does not have the final say over the release of water. Whoever is responsible for giving the Lake's TMDL life—and, in a broad sense, that may be all Floridians and not just the users of the Lake and those that regulate them—are a part of the solution. Completing the L-8 diversion project sooner rather than later is a part of the solution.

But again, with respect to the Refuge, the Consent Decree speaks to meeting the Interim Level and by December 31, 2006 meeting the lower of the Class III or Long-Term level. The Interim Level has been met for more than 12 months, and the lower of the Class III or Long-Term level has not yet been determined. With respect to L-8 basin water, Dr. Walker recognized that the District has a plan in place to try to minimize the impact of L-8 basin water until the diversion works are completely built. He also acknowledged that the District is trying to eliminate or minimize Lake water in the STA-1 structures. Tr. 1745-46.

While the Tribe and the United States may turn out to be correct in their concerns, the Special Master does not believe that judgments should be made today on predicted outcomes that may not materialize. Other than adding PSTA technology now, the only other viable alternative identified by any party is the expansion of STA-1W. The District has apparently decided to try to take advantage of increased conveyance and storage capacity and the availability of Compartment B, STA-2, cell 4, and the enhanced STA-3/4 instead, to reduce the flows and loads to STA-1W. Whether the District has chosen prudently remains to be seen but it has made a choice and, in the context of this referral, the Special Master does not see a reason to disturb that choice. While the Special Master believes that additional feasibility study analysis makes sense, it may be premature to engage in it until the benchmark against which compliance is going to be

measured is decided, and the parties better understand the Refuge's water quantity needs, a topic deferred in the EAA FS to others to evaluate.

Suggestion of a Thorough Water/Phosphorus Balance Analysis

The Tribe argued that the EAA FS “in its present form is not an adequate analysis to even determine if the proposed remedies are sufficient.” *Id.* at 10. The Tribe cited the views of Dr. Rice who has been involved in Everglades restoration issues for over a decade. Tribe Exh. 336, p. 1. Dr. Rice believes that a comprehensive analysis of water volume, phosphorus loads, and treatment capacity needs to be undertaken so that adequate treatment capacity can then be designed. In his view, there does not exist

an accounting for all the water that we're going to have to deal with, all the phosphorus that we're going to have to deal with. You know, normal design, you're going to start and decide how much water you're going to have to deal with, during what design period you're going to have to deal with that water.

And in this case we haven't done that. We still don't know if we're dealing for 2 year flows, 35 year flows, 100 year flows. We just don't know that. Therefore, we can't make a decision if that's acceptable or not.

Tr. 1624-25.⁸⁷ Dr. Rice also believes that there should be a “phase 2” design of the STAs whereby the phosphorus outflow concentration of an STA is set at 10 ppb, rather than 50 ppb, and then a design process would follow to determine what would be needed to achieve this outflow phosphorus concentration. Tr. 1625-26. He is particularly interested in the number of days that water is retained in an STA, or “residence time,” saying that the STAs were initially designed for a 20-day residence time, but there has been a need on occasion to push the water

⁸⁷ Dr. Rice later explained that the STAs were designed to handle flows based on rainfall amounts from the 1979-88 time period instead of considering worst case or reasonable worst case rainfall amounts documented from prior or subsequent periods. Tr. 2063-66. If one designs for more capacity than turns out to be needed, there is, of course, a higher cost. Tr. 2063. In discussing the additional treatment capacity in Compartments B and C, Dr. Rice summarized his views: “What the debate basically is that we have started without understanding – we started this whole process without understanding what our frequency is, what's our frequency of flow we wanted to design for? We seem to be working toward greater capacity in the system, but I still don't know exactly what frequency we're designing for. It may be adequate. I just don't know.” Tr. 2065-66.

through with four-day residence time and he believes that this issue ought to be studied further as part of the phase 2 design process that he believes is necessary. Tr. 1626.

Dr. Rice also opined that a “global accounting” of the “entire issue of water surrounding the EAA, the Caloosahatchee and the St. Lucie” would be “very helpful” so that design decisions could be made in a “proper context.” Tr. 1625.

This led the Tribe to propose that a “new feasibility study should be undertaken based on comprehensive assumptions for the entire system and all projects, evaluating all sources of water and phosphorus, and appropriate treatment,” and it “should be completed by June 20, 2007.” The Tribe added that the study “should explore the options relating to implementation of additional or revision to the existing Best Management Practices.”⁸⁸ Tribe’s Closing Memorandum, p. 11.

Dr. Walker also recommended additional planning studies. Dr. Walker’s expert opinion discusses the relationship between phosphorus loading and phosphorus removal performance of each STA. Using the measure of grams per square meter of STA surface area per year as the comparison tool, he explains that the design of the STAs contemplated a load of 1.0 to 1.1 g/m²-yr based on the 2003 Long-Term Plan.⁸⁹ Where an STA has been operated within this load factor, it has had average discharge concentrations of 17 to 21 ppb phosphorus. U.S. Exh. 73. STA-1W and STA-5⁹⁰ have been operated at more than twice their design and “have had average

⁸⁸ As noted above, n. 71, the BMP issue is one which the Special Master has not considered to date because it was not considered by the TOC in its recommendations on how to address the exceedances in the Refuge. In his expert report, Dr. Harwell also recommended that the TOC consider BMP enhancement as a remedy, along with improved BMPs for the Village of Wellington (the source of ACME Basin B stormwater). U.S. Exh. 90, p. 15-16, 17.

⁸⁹ The Long Term Plan is the conceptual plan for achieving and maintaining water quality goals for all discharges to the EPA. It was created pursuant to the Everglades Forever Act, Section 373.4592(10(a) and was submitted on December 19, 2003 to the FDEP by the District as part of the District’s application for a permit modification which was needed to implement the Long Term Plan. District Exh. 128.

⁹⁰ STA-1W receives inflows from the EAA. STA-5 receives inflows from the C-139 Basin. (See Figure 12, p. 94). The C-139 basin is the “second largest tributary source to the EPA.” The flow-weighted mean phosphorus level in the water leaving the basin was 195 ppb in WY 2005 compared to 124 ppb in the water leaving the EAA 2006

discharge concentrations of 60 to 100 ppb, respectively.” U.S. Exh. 57, p. 31. Dr. Walker concludes: “Efforts to ‘optimize’ the STAs will not achieve the goal of preserving and restoring the unique flora and fauna of the Refuge until inflow volumes and loads are reduced to design ranges or additional treatment capacity is installed to accommodate the excess loads.” U.S. Exh. 57, p. 32.

In light of this and his other conclusions, Dr. Walker was asked what else he would like to see done. His answer focused not on more construction than is already planned, but, initially, on a second phase to the feasibility study:

SPECIAL MASTER: Is there anything that you would be doing today, Dr. Walker, differently from what's being done? You've heard, you've read all the things that are being done. Is there something else that you would like to see done?

THE WITNESS: Yes, I would like to see a second phase of the feasibility study. As I said, the first phase that we've been looking at basically balanced the flows and loads across the existing and the expanded STA's on lands that had already been acquired. And as I testified yesterday, I don't believe that's going to be sufficient to meet the class 3 criterion in the discharges.

So additional measures are needed. I can't specifically say what those options are. But I think there's a need for a second phase of the feasibility study to go out and look, are there other pieces of land available somewhere, notwithstanding eminent domain or whatever, to basically create a more ambitious plan to provide greater assurance that it will work, that you'll meet the goal.

SPECIAL MASTER: But rather than jump to what more needs to be done, you'd like to see a very intensive study of options that are available to improve treatment capacity or to make other steps in order to address your concerns about what's going to happen by year end?

THE WITNESS: Yes, and it was my understanding there was originally planned to be a second phase of the feasibility study that was going to do that and that hasn't been done. I don't know if it

SFER, p. 3-2, 3-3. BMPs were implemented in the C-139 basin in WY 2003 (May 1, 2002-April 30, 2003). The basin “was determined to be out of compliance for WY2003, WY2004, and WY 2005.” Hence, the “action plan” for this basin has been revised to increase and accelerate the level of BMP implementation. 2006 SFER, p. 3-3.

was just because of time or what. But I mean that's sort of what I'm recommending.⁹¹

The United States also pointed out that the EAA FS did not take into account the possible need to take STA cells offline for maintenance, United States' Post-Hearing Memorandum, p. 41, which seems to fall into the category of a design issue relative to future water volumes and phosphorus concentrations.

As noted above, the Consent Decree contains a provision for addressing STA outflow concentration under certain circumstances if the lower of the Class III or Long Term level is not met. Consent Decree, p. B-4. This provision does not apply until after December 31, 2006 at the earliest. Dr. Rice and Walker's opinions have an intuitive resonance, and they may one day be in the position to say, "I told you so." Hence, while it might be prudent to consider these views now, their recommendations may more appropriately relate to a date after the TOC determines how to apply the Consent Decree's invitation to adopt the lower of the Class III or Long Term level (and what that means), a task which the TOC has just begun to undertake.⁹²

The Special Master now turns to the questions in the Court's Order on Remedies.

Questions Posed by The Court

In its Order on Remedies, the Court posed a number of questions to be answered. The questions and the answers offered on this record follow.

⁹¹ On July 18, 2005, Mr. Strowd testified for the District and suggested that there would be consideration of additional STA acreage: "Q. Does the feasibility study with the deliverables due in October presently consider requiring additional STA acreage? A. That's currently being evaluated. The way that it was originally established was the feasibility study would look at this hydraulic optimization of flow, and then at the end of that would be a determination whether additional acreage would be required. We are currently evaluating the possibility of as an alternative looking at additional STA acreage in addition to the flow optimization that I mentioned earlier." Tr. 179-80. Dr. Goforth suggested that the EAA FS would be updated utilizing current STA nutrient removal characteristics. District Exh. 135, p. 16. However, there was no further testimony on either subject.

⁹² As noted above, the TOC began the discussion of this issue at its June 16, 2006 meeting.

(1) Whether strict compliance with sampling requirements is possible? (2) Whether strict compliance with sampling requirements is necessary to determine the effect of diversion of water and to ensure that monthly data is most reflective of the level of P in the water so progress can be evaluated?

The short answer to the Court's question (1) is that strict compliance with sampling technique is possible. The answer to question (2) is that it is important that the sampling technique reasonably reflect the actual presence of phosphorus in the water at the 14 interior stations. In other words, the sampler must take care not to stir up sediments so that the water sample can be regarded as representative of water quality and not sediment quality. Tr. 45, 47.

With respect to the Refuge, the Consent Decree requires the comparison of sample results to an Interim Level that, since January 2003, has ranged between 8.3 ppb and 17.6 ppb. District Exh. 161. A part per billion is a very small number and a fraction of a part per billion is an even smaller number.⁹³ At these low concentration levels, sampling technique can have a significant impact on analytic results. Indeed, it was because of sampling technique that the District and the DEP regarded the results of the samples of the 14 interior stations for the months of May and June 2005 as due to error. Tribe Exh. 357.

On the issue of sampling, the State parties presented the expert reports of Frank Nearhoof from the DEP and Dr. Redfield from the District.⁹⁴ District Exh. 92, 163. Mr. Nearhoof explained the development of the sampling protocol for samples collected in the EPA. *Id.* In particular, he supported the requirement of a minimum of 10 cm of water before a sample would be collected. *Id.* at 3. Dr. Redfield joined him in this regard based on work previously conducted by Dr. Walker. District Exh. 92, p. 1.

⁹³ To provide some frame of reference, a part per billion is the equivalent of one second out of 32 years, one minute out of 1,900 years, or one penny out of \$10 million. Thus .1 ppb would represent one second out of 320 years, one minute out of 19,000 years, and one penny out of \$100 million.

⁹⁴ Mr. Nearhoof was the drafter of, "A Protocol for Collecting Surface Water Samples in Marshes of the Florida Everglades," Water Qual. Tech. Series, Vol. 3, No. 25 (FDEP) (Revised May 1996). Dist. Exh. 164.

On behalf of the Tribe, Dr. Jones was critical of the 10 cm rule. He testified that a sampler could find sufficient water to collect a sample at the 14 interior stations by moving out from whatever dry areas might exist in the immediate vicinity of the sampling location (that is marked by four visible stakes several meters apart in rectangular fashion within which the sample was supposed to be taken). Tr. 745-46.

It is the Special Master's understanding that samplers are now given greater latitude to collect a sample outside of the staked area.⁹⁵ But whether or not that understanding is correct, the greater sampling concern is the avoidance of "flocculent" in the sample that is there because it was induced by the sampler's movement or a similar provocation. District Exh. 92, p. 1 (Redfield). Since a lot is at stake over what are now very small concentrations, either sampling technique⁹⁶ or even laboratory technique⁹⁷ can affect compliance issues.⁹⁸

Mr. Nearhoof endorses the FWS's model development efforts: "Ultimately, it is anticipated that the Refuge hydrodynamic and water quality model will become the tool we will use to assess potential impacts to the Refuge under various water quality and hydrodynamic regimes." District Exh. 163, p. 5. As noted above, the use of this model is not imminent. In the interim, the Consent Decree's compliance limit framework after December 31, 2006 needs to be decided upon (the lower of the Class III or Long Term level) so that the results of future

⁹⁵ That was the information presented at the June 16 TOC meeting. See Attachment 14, p. 6 of 10, for this meeting at http://www.sfwmd.gov/org/ema/toc/archives_mtg.html#2006.

⁹⁶ In a separate report, Dr. Redfield writes that the TOC has not to date completed an assessment of the Walker 1999 study on parallel sampling conducted in the Refuge to evaluate the sensitivity of outcomes to the sampling technique. This study showed that at times the geometric means derived for the same month on samples collected by different samplers differed by as much as 4 ppb which, in the world of Interim Level compliance under the Consent Decree, can dramatically affect whether an exceedance exists. "The TOC should expressly address this uncertainty in the future," he wrote. District Exh. 134, p. 14. He affirmed that view in the hearing. Tr. 1281. Dr. Redfield, as chair of the TOC, should be in a position to effect such a review.

⁹⁷ Different laboratories can and do reach different phosphorus results analyzing the same sample. Tr. 1701.

⁹⁸ This perhaps is one of the reasons why the 1992 Consent Decree envisioned a panel of scientists to assist the parties in evaluating data. From a dispute resolution perspective, the TOC's makeup (one side has three out of five votes) lends itself to the use of a neutral technical body to assist the parties to reach consensus.

sampling can be measured against this compliance limit and progress toward reducing phosphorus levels in the Refuge can then be evaluated with both STA-1W and 1E in place.

(3) What can be done to ensure that the STA-1E is fully operational as soon as possible? (4) By what date can STA-1E be fully operating (9) What is the earliest, and latest, dates by when a large scale PSTA study can be conducted by the ACOE?

STA-1E was built by the ACOE. According to the Consent Decree it was supposed to be operational by July 1, 2002. The testimony of Dennis Duke on behalf of the United States provides reasons for the delay in completion of STA-1E. U.S. Exh. 20. The Special Master was not tasked by the Court with evaluating the delay in STA-1E's operational capability.

Mr. Duke updated his original testimony to explain that the FDEP issued permits to operate STA-1E on August 30, 2005. The Corps transferred STA-1E to the District by letter dated October 19, 2005. The District is currently operating the central and western flow-ways of STA-1E (Figure 4 above). The eastern flow-way is being converted to a demonstration periphyton stormwater treatment area, or "PSTA" as it has been described throughout this Report, to test the efficacy of this phosphorus-removal biotechnology.

The testimony before the Special Master suggests that the ACOE will not complete its evaluation of PSTA for quite some time. The ACOE received bids for the PSTA field test in September 2005. U.S. Exh. 110, p. 2. The ACOE lacked the funding to award a bid at that time. Funds were later identified and on November 23, 2005, the Corps awarded a \$4.3 million contract to construct the PSTA field test. A notice to proceed was issued to the contractor on December 30, 2005. *Id.* The contractor has until September 26, 2006 to complete construction. *Id.* There is the potential that modifications will be made during construction. *Id.* The field test will begin after construction is completed, assuming funding is in place. *Id.*

Currently and subject to “extraordinary storm or hurricane events,” the ACOE is projecting completion of the field test by March 2008. U.S. Exh. 110, p. 2. The Special Master has no ability to judge the reliability of this date based on the record developed by the parties. However, the reliability of a completion date will increase once construction is completed and the field test actually begins.

The Special Matter notes Dr. Rice’s opinion that “PSTA development has been an adversarial process for reasons I simply do not fully understand.” He is confident that PSTA “will do the job if it is engineered properly,” and urges the “best scientists and engineers” to work together toward this goal. Tribe Exh. 351, p. 19. It does appear that PSTA is supported by everyone. As noted above, the Special Master accepts the need to do field-scale testing to demonstrate an ability to engineer a PSTA cell. The Special Master is comfortable that he speaks for the Court as well in saying that if the most knowledgeable scientists and engineers on PSTA are working against, instead of, with each other, the relevant stakeholders ought to reverse that dynamic forthwith.

(5) By what date are the CERP projects to be completed and can those projects be completed sooner?

The one CERP project of importance in the context of this referral and not in the Acceler8 program is the L-8 diversion project. As discussed above, it does not appear that this project will be completed prior to 2014. The testimony before the Special Master was that this project would not be completed sooner although portions of it, including a storage reservoir, will be in place in phases and completed by 2008 to 2010. Tr. 234-35, 239-40; 1016-17; 2054-56. Based on what the Special Master heard in these remedy hearings, it would seem that expediting the completion of the L-8 diversion project would relieve water managers of what historically has been a large burden of having to put water from this basin into the EPA or elsewhere without

treatment, or in STA-1W. It may be that accelerating this project is yet a remedy that will have to be addressed depending upon the success of the District's operations' plan for STA-1E and the Refuge's Consent Decree compliance status in the future.

Other CERP projects that are in the Acceler8 program are discussed below.

(6) *Is it possible to complete the Acceler8 project at an earlier date?*

The EAA Storage Reservoir, additional treatment capacity in STA-2 and Compartment B, and improved conveyance capacity are Acceler8 projects that will provide the most benefit to the Refuge because they will give water managers flexibility to redirect flows away from STA-1W so it can be operated within its design criteria. The elimination of untreated discharges from ACME Basin B into the Refuge is also an Acceler8 project that will benefit the Refuge assuming that STA-1E is not adversely impacted by the additional volume of water it must treat.

Construction of the C-43 West Storage Reservoir to benefit the Caloosahatchee Estuary and the C-44 Reservoir/Stormwater Treatment Area to benefit the St. Lucie Estuary and Indian River Lagoon will give water managers greater flexibility in addressing Lake releases thereby indirectly benefiting the Refuge.

The testimony from Mr. Barnett on behalf of the State parties was that the Acceler8 projects could not be completed earlier than currently planned because of permitting and financing issues. District Exh. 94, p. 6 Construction capacity is another issue. *Id.* at 6 (the experience with the construction of the STAs is that this work load will exceed the capacity of in-state earth moving contractors). The District's schedule for completion of most of these projects appears in Appendix A (District Exh. 74).

Thomas Oliff, Assistant Executive Director of the District, provided cost estimates for Acceler8 projects as of June 20, 2005. U.S. Exh. 90, p. 2. They were, in pertinent part:

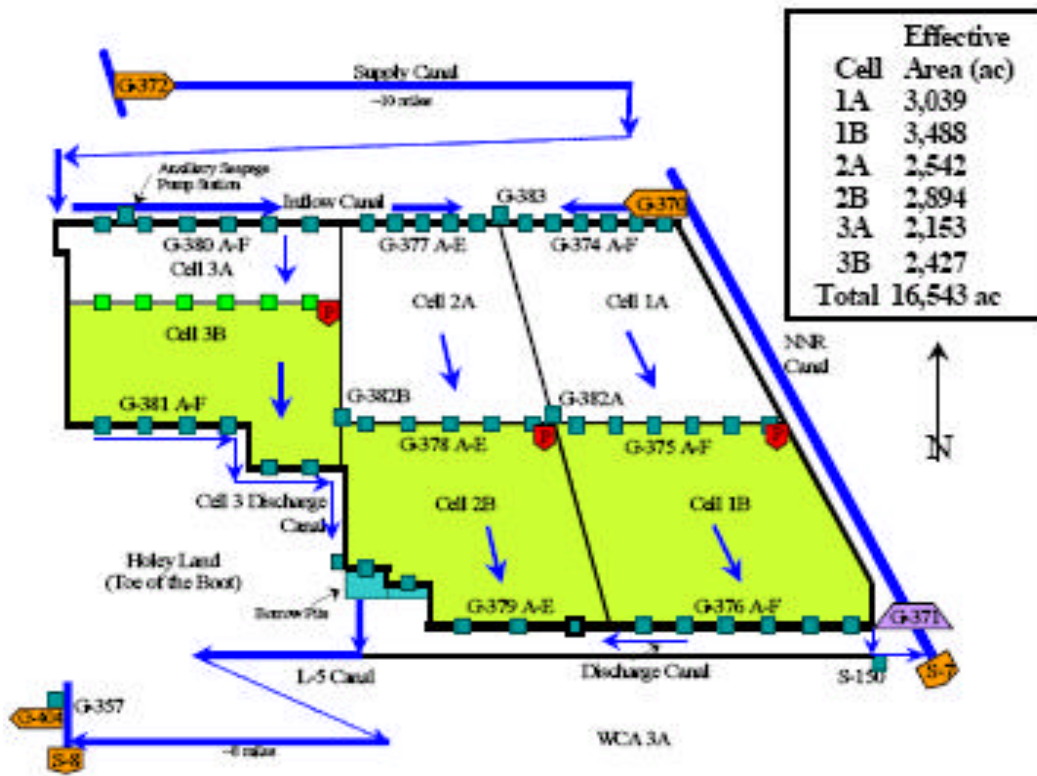
<i>Project</i>	<i>Projected Cost</i>
EAA Reservoir	\$300-340 million
Bolles & Cross Canals	\$29-33 million
C-43 Reservoir	\$340-380 million
C-44 Reservoir/STAs	\$270-300 million
EAA STA Compartment B	\$75-80 million
EAA STA Compartment C	\$68-73 million
Acme Basin B Discharge	\$15-17 million

Mr. Oliff explained that the District is going to fund these projects through “certificates of participation” issued by a not-for-profit corporation that will be formed to issue bonds for the needed funds and that will then build the projects and lease them to the District in return for lease payments that allow the not-for-profit corporation to pay off the bonds. Tr. 425-429. Delays in issuances of the certificates could delay completion of the projects, although Mr. Oliff said that the “the two sides of the house, the scientific engineering side along with finance side are working together to make sure that we can get to the market in order to be able to deliver funds for them in accordance with this particular schedule,” referring to District Exh. 74 (Appendix A).

(7) When can all 16,660 acres of STA-3/4 be fully operational, with completed enhancements?

STA-3/4 is the largest of the stormwater treatment areas. It consists of approximately 16,543 acres. STA-3/4 achieved full flow-through operation on September 16, 2004. Cells 1A and 1B have been in flow-through operation since February 2004. Cell 3 was in flow-through operation in June 2004, but was taken offline to implement enhancements. It was returned to service in June 2005. Cell 2 was in flow-through mode in September 2004. Dist. Exh. 195; 2006 SFER, p. 4-47; District Exh. 135, p. 23-25. A schematic of STA-3/4 from the 2006 SFER (Figure 4-24) is replicated below. It includes the planned enhancements to STA-3/4.

Figure 11



Cell 2B is the site of the District’s PSTA demonstration project. 2006 SFER, p. 4-47. Cells 1B and 3B will be converted to submerged aquatic vegetation in the next few years. 2006 SFER, p. 4-49. The 2006 SFER (p. 4-56) lists the following enhancements within STA-3/4 and gives the following schedule:

- Construction of approximately 3.3 miles of interior levee, subdividing Cell 3 into Cells 3A and 3B
- Construction of additional water control structures through the new levee subdividing Cell 3 into Cells 3A and 3B
- Extension of an overhead power distribution line from the intersection of Interior Levee 3 and Interior Levee 4, extending north along Interior Levee 4 to the new levee across Cell 3, and then west along the new levee across Cell 3 (total length of approximately 3.6 miles)
- Small forward-pumping stations along the interior levees between cells in series to permit withdrawal from upstream emergent marsh cells to maintain stages in the downstream SAV cells. Supplemental flows can be transferred from Cell 2A to Cell

1A through structure G-382A, and between Cell 2A and Cell 3B through structure G-382B

- Herbicide treatment of Cells 1B, 2B, and 3B for removal of emergent macrophyte vegetation to permit development of SAV
- Inoculation of SAV from STA-2 into STA-3/4 by helicopter to accelerate vegetation recruitment
- Construction of the full-scale PSTA demonstration project

During FY2005, the Cell 3 interior levee construction was substantially completed. Work on the water control structures through the new Cell 3 levee was also under way in FY2005 and is scheduled for completion in February 2006. Power distribution for the new Cell 3 levee is scheduled to be completed in mid-2006. The vegetation conversion activities were implemented in Cells 2B and 3B in FY2005. Work on the three forward-pumping stations was initiated in FY2005 and is scheduled to be completed in February 2006.

Dr. Goforth testified that the enhancements to STA-3/4 are scheduled to be completed by December 31, 2006, subject to the impacts of hurricanes, the compliance of contractors with contractual obligations, and the slower than anticipated biological response of treatment vegetation. District Exh. 135, p. 23. Dr. Goforth also explained that the planned conversion of Cell 1B to submerged aquatic vegetation may be deferred if this cell continues its good phosphorus-removal performance. *Id.*

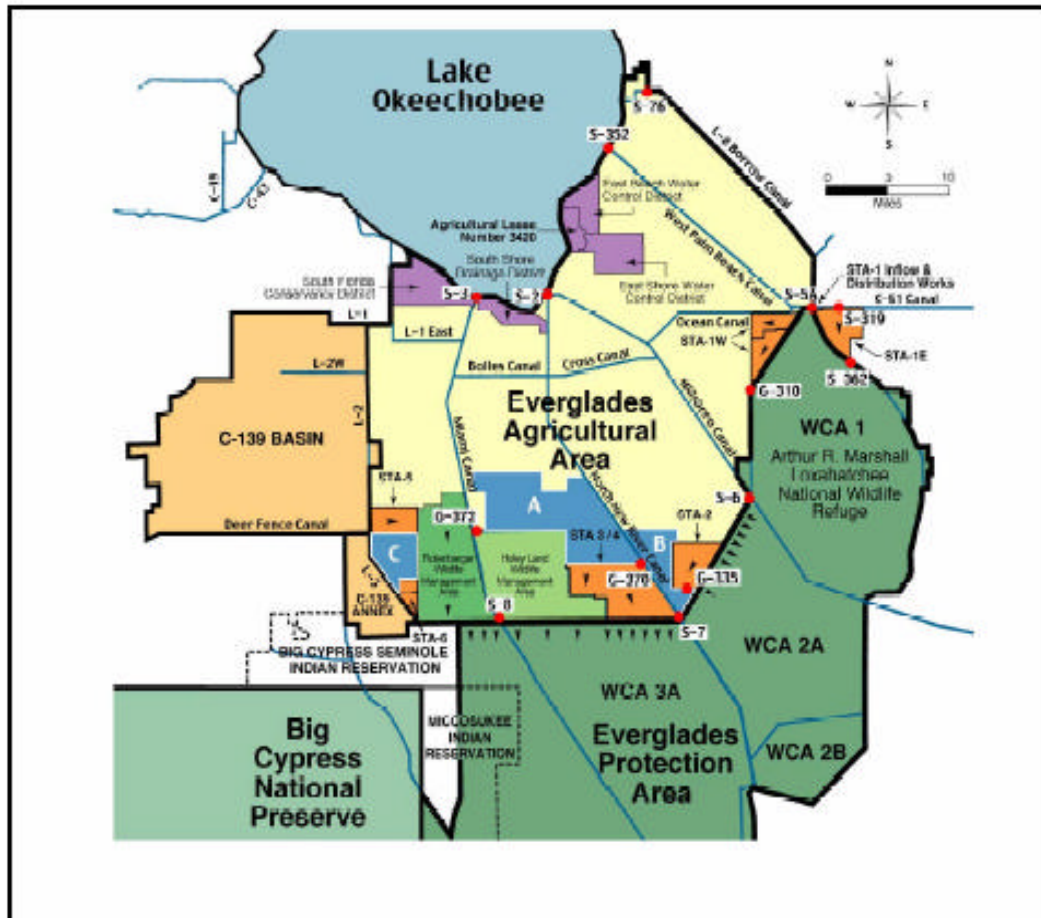
(8) What are the dates of acquisition, construction, and full operation of the approximately 18,000 more acres of additional STAs proposed by the settling parties?

The 18,000 acres are owned by the District. Figure 12 shows the relative locations of Lake Okeechobee, the three WCAs, the STAs, a number of canals, and Compartments A, B, and C. The 18,000 acres are included within Compartments B and C in Figure 12.

Originally the District believed that Compartments B and C would be needed as part of an EAA Storage Reservoir. But it was determined that Compartment A would be adequate for

the EAA Storage Reservoir. As a result, the District has decided to use Compartments B and C as additional STAs. District Exh. 141, p. 2-1.

Figure 12



District Exh. 74 (Appendix A hereto) sets forth the schedule for completion of the EAA Storage Reservoir and STA 2, cell 4 (Compartment B, phase 1), STA-5 Flow way 3, and STA-6 Section 2 (within Compartment C). This schedule is discussed in the section of this Report entitled, “Everglades Agricultural Area Stormwater Treatment Area Expansion” (p. 62-66.)

(10) What should the role of the TOC be (i.e., should it include other duties)?

The consensus of all of the participants in the hearings held by the Special Master was that the TOC’s role should be as envisioned by the Consent Decree and no more than that. If

there was a theme in the testimony, it was that the Principals for the five members of the TOC should meet more frequently because they have the power of the purse, can establish budget priorities and modify them as needed, and have the ability to allocate personnel to Consent Decree-related projects. Tr. 256-60; 2109-10.

The TOC has served an important role in Consent Decree-based Everglades restoration. It puts a very public face on restoration efforts. It provides a forum for dissemination of information to, and receipt of comments from, the public on a regular basis. It represents accountability in real time. Favorable and unfavorable data alike are presented monthly for all to see and criticize. Several participants or consultants in the TOC process have many years of experience working on Everglades restoration allowing them to provide both continuity and perspective.

As best the Special Master can tell from reading the Consent Decree, the TOC was not envisioned as a political body but, in fact, its members represent the interests of their constituents. Whatever the intention of the Consent Decree drafters, that was perhaps inevitable given the hundreds of millions of dollars involved in Everglades restoration and the fishbowl within which the TOC lives.

In the Special Master's view, the parties need to take some teenage advice and "chill out" a bit. It is unrealistic to believe that there will not be missteps from time to time in Everglades restoration. The Consent Decree anticipated the likelihood of "violations." But under this Decree, violations are not penalties for a failure to act or for a wrongful act. Rather, they are warnings that something may not be working and the parties need to take a close look to be sure that they have not missed something that ought to be done or change something that is being done. The goal should be to ensure that if mistakes are made in Everglades restoration, they are

small ones that can be easily corrected. One way to achieve that goal is to have TOC members who are well-informed and well-prepared before and at each meeting, with appropriate direction from their respective Principals in hand relative to the agenda for each meeting. Since each TOC member has a full-time job and is constrained by staff and budget limitations, that may be asking a lot. But given the complexity of the challenge of Everglades restoration, “a lot” is what is required.⁹⁹

(11) Whether monthly TOC meetings might help improve TOC responsiveness?

Monthly meetings will not help TOC responsiveness if TOC members are not better prepared for meetings. Too many times, the TOC members read complex technical documents for the first time on the day of or the day before a TOC meeting. As just noted, in the Special Master’s judgment, TOC responsiveness will be improved if documents to be discussed are made available with sufficient lead time before the TOC meeting to allow them to be thoughtfully reviewed and to permit each TOC member to be prepared to discuss them substantively, which includes prior appropriate direction from each TOC member’s Principal.

But the direct answer to the Court’s question is that it is inappropriate to establish a rigid schedule on how often the TOC should meet. This was the consensus of the witnesses. See, e.g., Tr. 260.¹⁰⁰

On the other hand, there are a number of important issues facing the TOC. One has to wonder if the TOC can meaningfully address them, while providing input to, and seeking input

⁹⁹ I note again that the Consent Decree appears to have envisioned a panel of scientists who would serve as independent experts to assist the TOC members. But such a panel has never been appointed.

¹⁰⁰ The scheduling of TOC meetings is also affected by the Florida Sunshine Act which has a 21 day-notice requirement, but practically speaking, requires 5-6 weeks of planning to get a 21-day notice published in time. Tr. 259-61.

from, the Principals, without meeting more frequently than quarterly. I will discuss some of these issues here to make my point.¹⁰¹

What Long Term Level Will Be Applicable?

As discussed earlier, the TOC has two choices. It can utilize the Long Term level established by the Consent Decree. Or it can adopt the Class III level adopted by the State of Florida if the “TOC determines” that the Class III level is “lower.” Consent Decree, p. B-4. Presumably this decision must be made by December 31, 2006 because that is when the Long Term level goes into effect.

If the TOC decides that the Class III level is lower than the Long Term level, the Class III level apparently applies to the “entire Marsh” and not to the 14 interior sampling stations. Consent Decree, p. B-1.

The State’s Class III criterion for phosphorus is 10 ppb. If adopted, how does 10 ppb apply? To fixed sampling points? To the concentration at a point of entry into the Refuge, and, if so, is it at the point water enters the rim canals from STA-1W or 1E, or is it at points along the rim canal where water levels are high enough that water moves “downhill” into other portions of the Refuge? Should data be averaged over multiple sampling periods or locations before a comparison to 10 ppb is made?

Currently, the Consent Decree says that the geometric mean of the results from the 14 interior sampling stations will be compared to the Long Term level derived under a formula set forth in Attachment II to Appendix B to the Consent Decree (p. B-7). If there is an exceedance,

¹⁰¹ These are in addition to other topics identified previously which the TOC might have to, or wish to, evaluate, particularly in relation to changes that are in place as of December 31, 2006. They include physical study of the level of restoration of the balance of the natural flora in the Refuge (n. 30); evaluating the Refuge’s water quality monitoring results and the use of the Refuge’s hydrodynamic model (see p. 25, n. 34, 53-54); monitoring the results of the PSTA pilot (see p. 50-51); BMPs (n. 71); the District’s success in implementing the STA-1E operations plan (see p. 68-69); Dr. Harwell’s list of potential remedies (n. 82); monitoring the status of the L-8 diversion and the Lake’s TMDL progress (see p. 44-46, 56-58, 80-81); evaluating the EAA FS (see p. 105); and consideration of the EAA FS and a possible second phase of the EAA FS (see p. 82-85 and n. 91).

just as with the Interim Level, the TOC must determine whether there is substantial evidence that either excursion that makes up the exceedance of the Long Term level is the result of extraordinary natural phenomena or error. Consent Decree, p. B-5. If that is not the case, there is a violation, and that triggers the obligation on the State parties to undertake additional remedies. Consent Decree, p. C-4.

If the Class III standard is adopted, is compliance still to be determined by this language?¹⁰² When would an “exceedance” occur?¹⁰³ When would a “violation” exist? What role does the State’s regulation and permits play in determining whether “additional remedies” must be taken? Taking into account all of these provisions of the Consent Decree, is the Class III level “lower” than the Long Term level?

The Consent Decree uses the words “criteria,” (p. 11, 12, 14, 15-16, A-1, B-2, B-3, C-6, D-1, D-2), “standard” (p. 9, A-1, B-1), or “levels” (p. B-4) in relation to the words “Class III” and relate one or the other to, illustratively, “waters delivered to the...Refuge,” (p. 9, Class III

¹⁰² The State’s phosphorus rule contains a “four-part” test to determine compliance. Section 62.302.540(4)(d)1, F.A.C. provides: “The water body will have achieved the criterion if the five year geometric mean averaged across all stations is less than or equal to 10 ppb. In order to provide protection against imbalances of aquatic flora or fauna, the following provisions must also be met: a. The annual geometric mean averaged across all stations is less than or equal to 10 ppb for three of five years; b. The annual geometric mean averaged across all stations is less than or equal to 11 ppb; and c. The annual geometric mean at all individual stations is less than or equal to 15 ppb. Individual station analyses are representative of only that station.” If this test could become applicable under the Consent Decree, would five years have to pass before compliance could be determined under the Consent Decree? Presumably not based on a Memorandum to the Special Master from the DEP’s Mr. Nearhoof in response to a question raised at oral argument. The memorandum was later presented to the TOC at its June 16, 2006 meeting. See http://www.sfwmd.gov/org/ema/toc/archives_mtgs.html#2006 (Attachment 11, p. 1) (“The use of existing monitoring stations will allow the Department and District to assess achievement of the criterion immediately for a large portion of the stations, rather than waiting five years as would have been required for a network consisting entirely of new stations.”) The four part test would have produced outcomes different from the Consent Decree’s Interim Level compliance testing based on an analysis presented in Mr. Nearhoof’s expert report. District Exh. 149, p. 5 “SPECIAL MASTER: [A]m I reading this correctly that I can draw that conclusion that the four-part test produces essentially no failures for the same data that the Consent Decree produced essentially -- well, 9 excursions or 4 exceedances? THE WITNESS: That's correct.” Tr. 1410.

¹⁰³ In contrast with the Consent Decree’s description of an exceedance, under the State’s phosphorus rule, “Exceedences of the provisions of this subsection shall not be considered deviations from the criterion if they are attributable to the full range of natural spatial and temporal variability, statistical variability inherent in sampling and testing procedures or higher natural background conditions.” Section 62.302-540(4)(a), F.A.C. which can be found at: <http://www.dep.state.fl.us/legal/Rules/shared/62-302.pdf>.

“standards”), “inflows to the Refuge” (p.11, Class III “criteria”), “the entire marsh” (p. B-1, Class III “standard”) or the Long Term level (p. B-4, Class III “levels”). The Class III numerical criterion is 10 ppb. The “standard” includes what are called “moderating provisions” and under the DEP rule, moderating provisions can delay enforcement until the year 2016. Tr. 1112-1114; 1134-35.¹⁰⁴ When the TOC evaluates which is “lower,” how does it account for the difference between a “standard” and a “criterion”?

These are questions that involve interpretation of the Consent Decree in light of the manner in which the DEP has actually crafted a rule that might look different than what the Consent Decree drafters imagined in 1992. They go to the very essence of the Consent Decree’s goal to establish water quality levels that will prevent the imbalance, or restore the balance, of the natural flora and fauna in the EPA. They require thoughtful evaluation and have the potential to generate differences in opinions¹⁰⁵ that do not lend themselves to resolution in quarterly four-hour meetings.

Shark River Slough

How the TOC will deal with issues relating to Shark River Slough also could affect the frequency of meetings.

¹⁰⁴ The State’s rule provides in Section 62.302-540(5)(b)(3), F.A.C.: “Discharges into the EPA shall be deemed in compliance with state water quality standards upon a demonstration that:… 3. Discharges will comply with moderating provisions as provided in this rule.” Moderating provisions are described in subsection (6) of the rule. Section 62.302-540(6)(a)1. provides: “Until December 31, 2016, discharges into or within the EPA shall be permitted using net improvement as a moderating provision upon a demonstration by the applicant that: a. The permittee will implement, or cause to be implemented, BAPRT, as defined by Section 373.4592(2)(a), F.S., and further provided in this section, which shall include a continued research and monitoring program designed to reduce outflow concentrations of phosphorus; and b. The discharge is into or within an impacted area.” BAPRT stands for Best Available Phosphorus Reduction Technology. For purposes of the rule, BAPRT is defined as the District’s Long Term Plan. Section 62.302-540(6)(a)3.

¹⁰⁵ The Tribe argued in its Closing Memorandum: “The reliance by the State on achieving water quality standards as a remedy is inadequate to protect the Everglades because of loopholes created by the moderating provisions in the State phosphorus rule.” Tribe’s Closing Memorandum, p. 11. One of the Tribe’s experts, Dr. Rice, opined that reliance on the State’s standard “will mean that the long term limits of the Settlement Agreement will never have to be met.” Tribe Exh. 351, p. 15. The Special Master’s repeats again that this discussion is not intended to reflect the appropriate interpretation of any of these provisions; he has not considered these issues.

There is a Long Term level for discharges into Everglades National Park through Shark River Slough that goes into effect on December 31, 2006. The total flow-weighted mean concentration of phosphorus for a 12-month period is compared to the Long Term level computed under the Consent Decree. The Shark River Slough inflow limit applies to the Consent Decree water year which runs from October 1 through September 30. The Shark River Slough limits apply to inflows “composited across all structures, including S-12A, S-12B, S-12C, S-12D, S-333,¹⁰⁶ and any subsequent inflow points from the WCAs established in the future.” Consent Decree, p. A-1. The Decree further provides that long term discharge limits

are the limits necessary to meet the OFW¹⁰⁷ water quality criteria as measured at the structures discharging into the Park. These limits will also apply to areas immediately downstream of in the Park and will be used to determine compliance. The adequacy of these OFW criteria to meet the State water quality standard Class III criteria (to prevent an imbalance of flora and fauna) will be verified by long term monitoring and research.

Id.

Without making any reference to the TOC, the Consent Decree provides that “if research to determine the numeric value for the Class III narrative nutrient criteria results in a more stringent Park phosphorus limit, then the more stringent inflow limit shall apply.” Consent Decree, p. A-1.

For compliance purposes, the Decree explains that, “Phosphorus limits apply to flow-weighted mean concentrations computed on an annual Water Year basis, with data reported and calculated on a monthly basis.” Consent Decree, p. 1-2. As is the case with the Refuge compliance data, for Everglades National Park, a panel of scientists was envisioned by the Consent Decree drafters to play a significant role in comprehending the data:

¹⁰⁶ These structures are located along Tamiami Trail (U.S. 41) or Southwest Eighth Street, that runs from Miami to the Florida west coast.

¹⁰⁷ OFW stands for Outstanding Florida Waters. See <http://www.dep.state.fl.us/water/wqssp/ofw.htm>.

A panel of scientists designated by the TOC will track and evaluate compliance with all aspects of state water quality standards including the phosphorus limits, concentration levels and criteria. The represented agencies may request technical assistance from others.

Consent Decree, p. A-3. The panel was supposed to be convened periodically:

After each additional sampling round at intervals of every other week, the flow-weighted mean will be calculated based upon data from the previous 12 months and compared with the limits corresponding to the previous 12-month's total flow. If the flow-weighted-mean limit is exceeded, the panel will be convened to review recent monitoring data and assess potential causes. Any agency represented on the TOC may request an official review of the monthly mean and frequency calculations for potential violations of the phosphorus limits during the water year.

Consent Decree, p. A-3.

An exceedance can also occur in the case of the inflow to Shark River Slough but it involves only one event and not two, as is the case with the Refuge. And the panel of scientists was to review trends and other information and presumably was to forward its opinions to the TOC. And unlike the Refuge's compliance formula, a Shark River Slough "exceedance" looks at data at the end of a Consent Decree water year, or September 30, meaning that the first compliance review for the Long Term level will occur after September 30, 2007.

An exceedance occurs if the flow-weighted-mean concentration for the water year ending September 30th is greater than the 10% rejection level of the computed limit (see Attachments.). Based upon review of trends for flow-weighted means, trends for the frequencies of samples exceeding 10 ppb, and other information found relevant by the panel, the TOC members will forward their opinions and recommendations to their respective agencies for appropriate action. An exceedance will constitute a violation unless the TOC determines there is substantial evidence that it is due to error or extraordinary natural phenomena. A violation of a long term limit shall constitute a violation of this Agreement....

Consent Decree, p. A-3-4.

In the table below, the Special Master identifies the Shark River Slough flow-weighted mean concentration for phosphorus and compares it to the Long Term level which goes into effect on December 31, 2006. The table covers the period April 2005-March 2006, or twelve months. At the end of the Consent Decree water year 2005 (September 30), the Long Term level, had it been in effect, would have been violated. On a monthly basis, the Long Term level would have been higher than the sample results for 11 months (May 2005 through March 2006).

<i>12 Month Period Ending on Last day of Month of</i>	<i>Flow Weighted Mean Total Phosphorus (ppb)</i>	<i>Long Term Level (effective 12/31/06)</i>
2005		
April	9.1	9.3
May	10.0	9.1
June	10.5	8.7
July	10.5	7.7
August	9.8	7.6
September	9.4	7.6
October	9.0	7.6
November	9.1	7.6
December	9.1	7.6
2006		
January	9.0	7.6
February	9.0	7.6
March	9.0	7.6

Even though the Long Term level does not go into effect until December 31, 2006 and compliance is not measured until September 30 of next year, the trend line appears to be an unfavorable one and there is no panel of scientists to review the data and render its recommendations. Whether the Class III criteria is more “stringent” is also a question that requires consideration. Hence, this is another subject that the TOC could conceivably choose to tackle in the coming months and will not likely lend itself to adequate coverage in a quarterly meeting.

Load Reduction to the Refuge and EPA

As discussed in the Special Master's December 1, 2003 Report, there is a debate among the parties regarding the obligations of the State parties on load reduction. Paragraph 8A of the Consent Decree (p. 11) provides:

Phosphorus loads discharged from the EAA will be reduced by approximately 80% to the EPA by October 1, 2003, and will be reduced by approximately 85% to the Refuge by February 1, 1999, as compared to mean levels from 1979 to 1988.

Appendix C of the Consent Decree, covering the STAs, uses a different date for the loads to the Refuge and different words on the nature of the obligation. It provides that the “control program” is “designed to achieve an 80% reduction in phosphorus loads” from the EAA to the EPA by October 1, 2003, and “greater than an 85% reduction in phosphorus loads to the Refuge by December 31, 2006” relative to “average annual loads measured in Water Years 1979 through 1988.” Consent Decree, p. C-1. At page C-3, the Consent Decree says that the STAs are “located and sized” to deliver a uniform long term annual flow-weighted mean concentration of 50 ppb or less at each inflow point to the EPA. In yet another reference to 80% and 85% load reductions, the Consent Decree then uses this language:

Accomplishment of this objective will provide an overall load reduction of approximately 80% from the EAA into the EPA and a load reduction of at least 85% from the EAA into the Refuge.

Consent Decree, p. C-3.

With respect to the Refuge, an 85% reduction translates into approximately 15.5 metric tons. 2006 SFER, p. 2C-27. At the end of water year 2005 (April 30, 2005), the Refuge received 78.5 metric tons of phosphorus from all sources and 60.6 metric tons from the EAA.¹⁰⁸ According to the analysis in the 2006 SFER, the three-year average of loads from the EAA to the

¹⁰⁸ Of this total, at least 27 metric tons were diverted to the Refuge because of insufficient hydraulic capacity in the inflow structure to STA-1W. 2006 SFER, p. 2C-27.

Refuge (WY 2003-05) was approximately 31.4 metric tons.¹⁰⁹ According to District Exh. 195, phosphorus outflow loads from STA-1W to the Refuge for WY 2006 totaled 16.5 metric tons through at least January 2006.

Whether the Consent Decree calls for or is describing a 85%, “greater than 85%,” or “at least 85%,” reduction, December 31, 2006 appears to be a trigger date of some kind. This is another subject that the TOC could consider reflecting upon in the coming months and again it may consume more time than would be allowed by quarterly meetings.

Water Quantity Needs of the Refuge

It has been discussed above already, but reducing the amount of water the Refuge receives is one way to avoid an exceedance and to meet the 85% reduction in phosphorus loading. At page 8, the Consent Decree provides that “the Parties commit themselves to guarantee water quality and water quantity needed to preserve and restore the unique flora and fauna of the Park and the Refuge.” It would appear that the TOC would want to be vigilant in determining that water quantity needs are being met in addition to meeting the Consent Decree’s water quality requirements. Intuitively, this subject is a complex one that will likely consume a considerable amount of time to comprehend.

The TOC and the Principals have a lot of work ahead of them. Quarterly meetings are unlikely to get the job done if it is to be done thoughtfully and well.

¹⁰⁹ The 2006 SFER, p. 2C-27-28, says that the 3-year average is 15.4 metric tons, but it appears that this statement was inadvertently repeated from the 2005 SFER. One derives 15.4 metric tons for a three-year period by averaging the load to the Refuge from the EAA for WY 2004 (17 mt), WY 2003 (16.6 mt) and WY 2002 (12.6 mt). Taking WY 2005 (60.6 mt), WY 2004 (17 mt), and WY 2003 (16.6 mt), the average is 31.4 metric tons. The Tribe is of the view that the District must include all loads entering the Refuge in doing the load reduction analysis so it derives a higher annual figure. Tribe Exh. 343, p. 2 (Duncan). While not discussed here, there are similar concerns expressed by the Tribe regarding the 80% load reduction question vis-à-vis the EPA. *Id.* The Special Master expresses no view here on the appropriate interpretation of these provisions of the Consent Decree.

(12) Will the Feasibility Study be completed by November 2005?

The EAA FS was completed in October 2005. SFWMD Exh. 141.

The Special Master has these additional observations on the EAA FS beyond those discussed at p. 77-85. As noted above, the EAA FS has its limitations. For example, it left for consideration by others the impact on the Refuge's water quantity needs of the alternatives for redistribution of flows and loads that were considered in the EAA FS. The TOC's "Progress Report on Remedial Measures to Control Phosphorus Loads" to the Refuge, dated February 24, 2005 and addressed to the Principals, stated that one objective of the EAA FS "is to balance the flows and loads among the STAs." The Report says, "there is one scope item that will look at enlarging the treatment area serving the Refuge if the additional 18,000 acres are not a sufficient treatment area to meet the long-term water quality goals. The study is currently scheduled for completion by the summer of 2005. This will be on the TOC Agenda for the May 2005 meeting." District Exh. 91, p. 8.

The subject of enlarging STA-1W or 1E was not considered in the EAA FS. And to the best of the Special Master's recollection, the EAA FS has not been the subject of further discussion by the TOC or further reports to the Principals.

Conclusion

The Special Master thanks the parties for their professionalism, diligence, and excellent memoranda, and thanks the witnesses, especially the many expert witnesses, whose reports he carefully read and who testified, for their thoughtful insights.

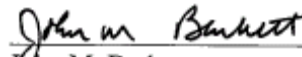
For the reasons set forth above, the Special Master:

- (1) does not believe that any additional remedy is needed to address the operational date for STA-3/4;

- (2) on this record,¹¹⁰ recommends that the determination that there was not substantial evidence that the exceedance in question was due to error or extraordinary natural phenomena should stand;
- (3) recommends that the State parties implement the remedies set forth above in “Special Master’s Recommendations on Remedies” (pages 73-77), and for remedies involving construction projects, that they do so before the end of the “late completion” date range on the schedule set forth on Appendix A.

The Special Master has also obtained answers, as set forth above, to the questions posed by the Court for the Court’s and the parties’ consideration.

Respectfully Submitted,



John M. Barkett
Special Master
July 5, 2006

Copies to Parties on the attached service list

¹¹⁰ At the June 16, 2006 TOC meeting, a report was submitted entitled, “Five Year Summary of Operations Affecting WCA-1.” See http://www.sfwmd.gov/org/ema/toc/archives_mtgs.html (June 16, 2006, Attachment 4). The author (Dr. Goforth) suggested that CA1-8C gauge (see Figure 1 at page 33 for its location) along the east side of the Refuge may be reading high. He based this suggestion on the relationship among three gauges along the L-40 canal (Figure 1) that bounds the east side of the Refuge: one at the G-300 structure which sits at the northern end of the L-40 canal (see Figures 1 and 4), the 1-8C gauge that rests about halfway down the L-40 canal (Figure 1), and the S-39 gauge which is located at southern end of the L-40 canal where it meets the L-39 canal (see Figure 1). “Intuitively,” Dr. Goforth writes, the northernmost gauge, G-300, should show a higher stage than the 1-8C which should in turn show a higher stage than at the S-39, Dr. Goforth’s report to the TOC states. According to his review of the data, the 1-8C gauge has been reading higher than the G-300 gauge consistently dating back to WY 2002 (the S-39 gauge readings are always lower than the G-300 gauge readings, he says). Hence, he recommended that the 1-8C gauge be surveyed to determine if its elevation has changed (due to, say, subsidence or other shifts in soils). On June 30, 2006, the State Parties filed with the Court a paper entitled, “State Parties Notice of Newly Discovered Evidence.” In the Notice, they indicate that surveying of the 1-8C gauge and the other gauges used to derive “S” in the Interim Level equation is going to occur to verify that the proper elevation figures are being used for these gauges. The Notice states that they will not have the results for 30 to 60 days. The Special Master does not know if survey data today have retrospective value. If they do, and if the “S” variable changes, the results of the Interim Level equation (see p. 13 above) will change. If the Interim Level were to drop as a result, that may impact one or more of the exceedances that occurred in the Refuge between 1999 and 2004. If the survey data only have prospective value, then there would be no change in the historic Interim Level computations. If there is a debate about the survey data’s retrospective value, presumably this is a subject the TOC will air and the Court, or the Special Master, as the Court might direct, can deal with to the extent it might demonstrate that there was “error” as that term is used in the Consent Decree’s determination of whether an exceedance becomes a “violation.”

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 Defenders of Wildlife
 Audubon Society of the Everglades
 The Wilderness Society
 Florida Keys Citizens Association (to be dismissed)

Environmental Defense