

**THE PERIPHYTON STA FIELD TEST IN STA-1E
SHOULD BE COMPLETED AS PLANNED**

*Considerations of Science, Everglades Restoration,
and Public Integrity Require Completing the Mission*

EXHIBITS

Dexter Lehtinen, Special Assistant for Everglades Restoration
Miccosukee Tribe of Indians of Florida
April 19, 2010

Periphyton-based Stormwater Treatment Area (PSTA) Technology

December 2003

PLAINTIFF'S EXHIBIT

Background

The Everglades ecosystem is unique in many ways. One important characteristic of the ecosystem is that it is "oligotrophic." That is, the Everglades is characterized by unusually low levels of nutrients such as phosphorus.

The delicate balance of the Everglades ecosystem is dramatically altered by the introduction of nutrients. One of these nutrients, phosphorus, is a pollutant that has been introduced in high levels from farms and urban areas.

Much research has been conducted to identify ways to reduce the concentrations of phosphorus to levels that will not damage the Everglades. The Florida Environmental Regulatory Commission recently set the long-term standard for phosphorus entering the Everglades at 10 parts per billion (ppb).

Research done to date by others

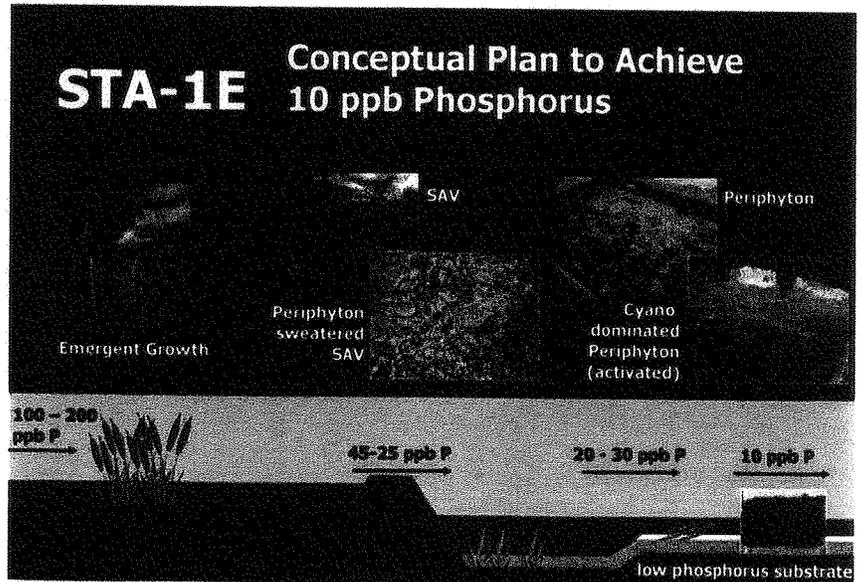
The South Florida Water Management District has conducted extensive investigations of water treatment technologies. The options originally considered covered a broad range of technologies including chemical addition and solids separation, microfiltration, submerged aquatic vegetation (SAV) and periphyton-based stormwater treatment areas (PSTA). Evaluation of results based on performance, cost and feasibility have focused current and future investigations on the use of SAV and PSTA.

Corps PSTA design efforts

The PSTA technology was proposed in 1996 to the U.S. Army Corps of Engineers by Dr. Ron Jones, former Director of the Southeastern Environmental Research Program at Florida International University. The design proposal suggested that in

order to reduce levels of phosphorus to 10 ppb in stormwater treatment areas, the phosphorus containing peat floor of the treatment areas would have to be replaced by or covered with a calcium-based substance such as lime rock or sand. Furthermore, a mat-like assemblage of microorganisms called periphyton would have to be a dominant component of the stormwater treatment areas.

The Corps' design team, led by Dr. Ron Jones, utilized a group of four test cells. The test cells were designed and constructed and were fully operational by November



Corps PSTA design efforts (Continued from page 1)

2002. Four 10-foot by 100-foot cells were tested. The floor of each cell was lined with a different substance. The substrates used were lime rock, riviera sand, lime rock over peat and peat.

The testing strategy was to create a calcareous periphyton mat similar to periphyton found in the natural Everglades marsh. After establishment of the periphyton mat, a process that took six to eight weeks

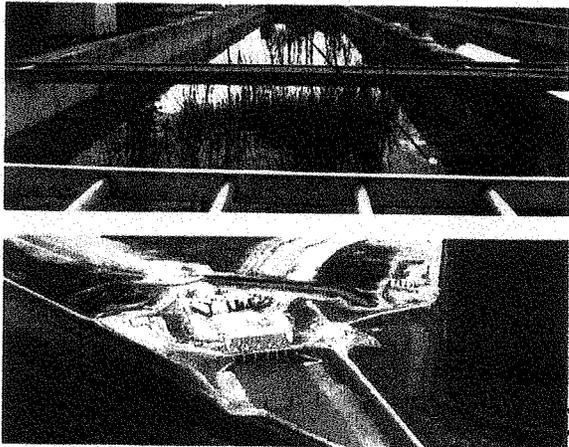
to complete, the testing of phosphorus reducing capability of the cells was begun.

The Corps' studies have shown that phosphorus can be reduced from 80 ppb to less than 10 ppb within a flow distance of 100 feet and a retention time of seven. The results are 20 to 30 percent lower than those achieved by researchers of other technologies.

The role of PSTA in Everglades restoration

The Comprehensive Everglades Restoration Plan contains a fundamental principle - the process of restoring the Everglades must be flexible and able to adapt to new scientific information and unanticipated responses from the ecosystem. As it now appears, based on design and testing, PSTA may be a critical component of the Everglades restoration program.

Advancing to the next step in PSTA technology



The promising small-scale test results led the Corps and the South Florida Water Management District to agree on investigating ways to test the technology in a larger scale field test. The Corps designed a proposal for proceeding with

a test at Stormwater Treatment Area-1 E, which will discharge water to the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The proposal was submitted to the Assistant Secretary of the Army (Civil Works) for approval.

It was approved by Assistant Secretary John Paul Woodley in November, 2003. As described in the proposal, the estimated cost of the field test would be \$5 million, an amount that would be fully funded by the federal government.



The Journey to Restore America's Everglades

A partnership of the U.S. Army Corps of Engineers, South Florida Water Management District and many other federal, state, local and tribal partners.

For more information, please contact:

Paul Moczynski, Project Manager
U.S. Army Corps of Engineers
Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-0019
904-232-3846

paul.p.moczynski@saj02.usace.army.mil

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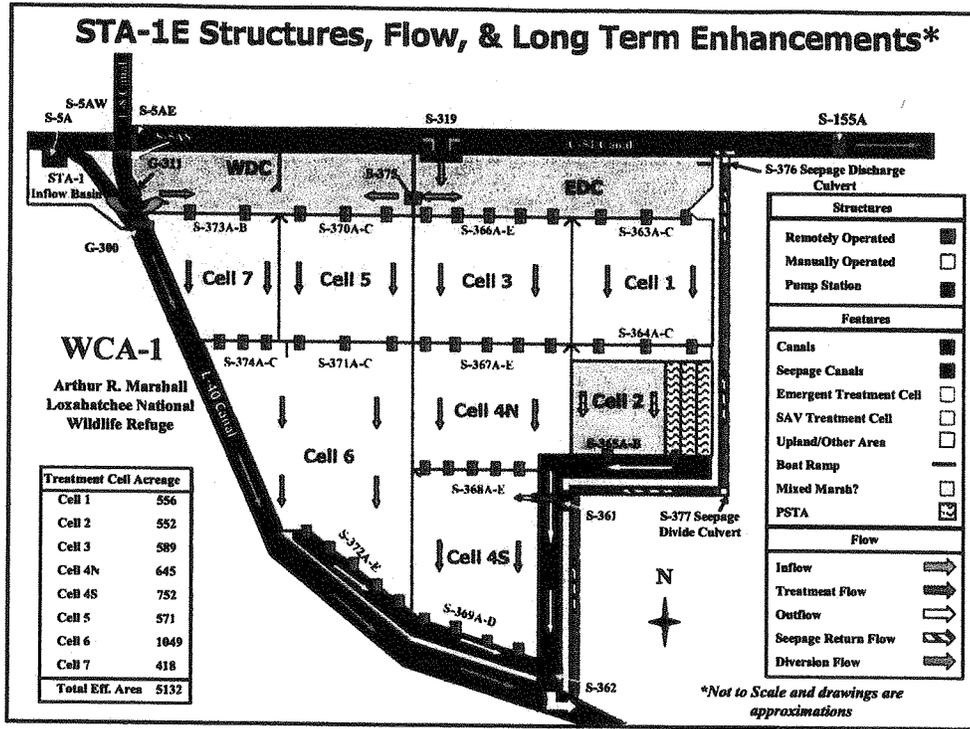
For more information about Jacksonville District's activities, visit our web site at: <http://www.saj.usace.army.mil>



West Basin. In December 2006, Acme Basin B runoff was diverted from the Loxahatchee National Wildlife Refuge to STA-1E.

Figure 2-1. Schematic of STA-1E

PSTA
140-150
acres



STA-1-E
5,132
acres

Runoff from the C-51 West Basin is introduced to STA-1E through Pumping Station S-319. Another source of inflow is a portion of the runoff from the S-5A Basin which is introduced to STA-1E through the G-311 gated spillway located on the eastern boundary of the STA-1 Inflow Basin. An additional source of inflow to STA-1E is runoff from the Rustic Ranches subdivision; runoff from that area is introduced to STA-1E through Pumping Station S-361, which also serves to return seepage to the STA. Discharges from STA-1E are directed to WCA-1 through Pumping Station S-362.

The STA-1 Inflow Basin and associated water control structures permit the diversion and redirection of inflows between STA-1E, STA-1W, the WCA-1 and the L-8 Canal to the north. The synchronized operation of STA-1W, STA-1E and the structures in the STA-1 Inflow Basin allows redirection of flows in order to balance the phosphorus loading rate among the STAs, and also whenever the discharge from Pumping Station S-5A exceeds



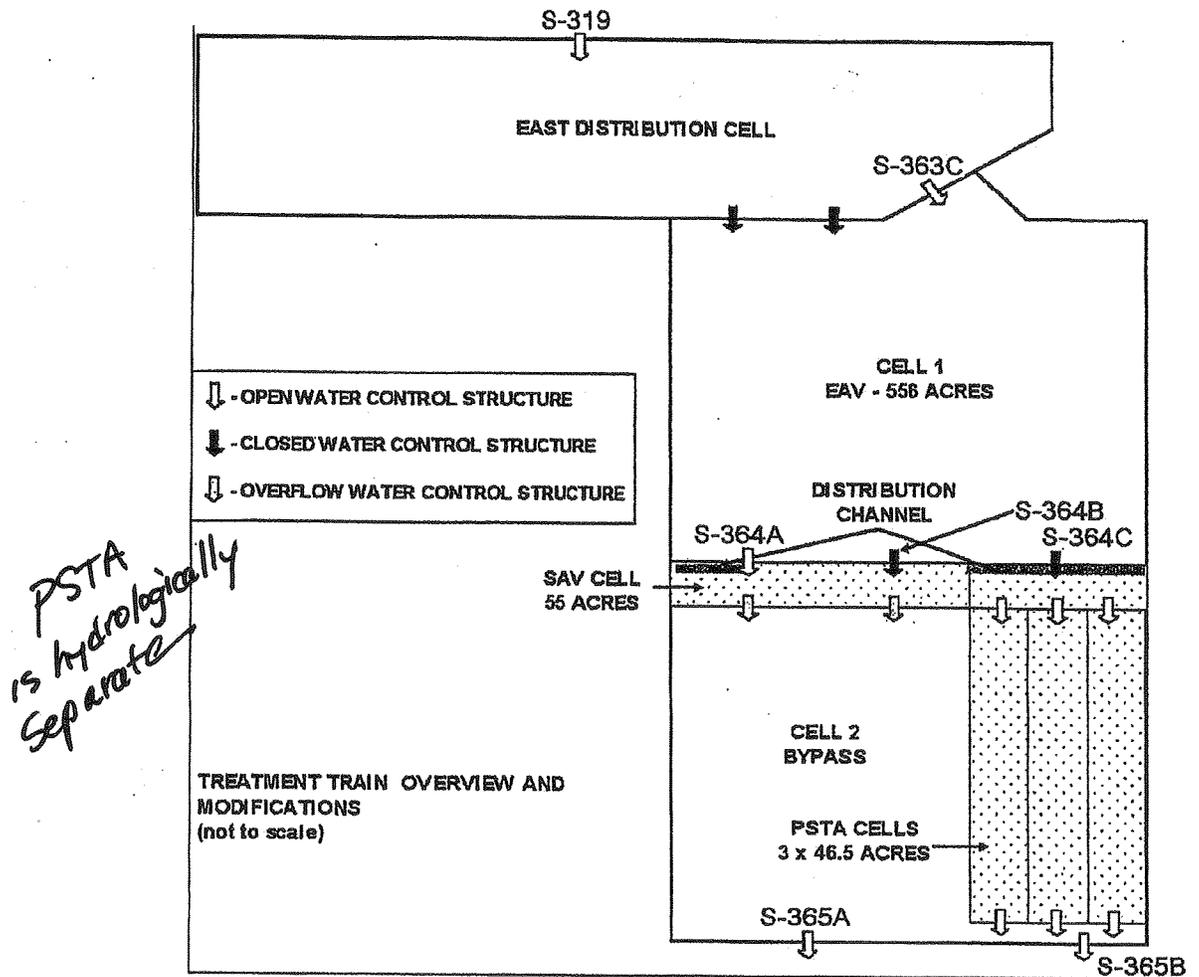


FIGURE 1: FLOW DIAGRAM FOR THE STA-1E PSTA/SAV FIELD SCALE DEMONSTRATION PROJECT

2.2 Field-Scale Demonstration Project

Portland State University shall provide field support to operate, monitor, and maintain Cell 2 of STA-1E during the FSD Project. Field support shall include such items as:

- a. Operating Cell 2 structures: PSU shall operate Cell 2 in accordance with the Operations Plan, email dated 7 July 2008. Much of this effort shall be the placement/removal of stop logs in the three (3) test cells and the Cell 2 bypass. The field support staff shall record the daily effort in operating these stop logs in a log book.

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PLAINTIFF'S EXHIBIT
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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

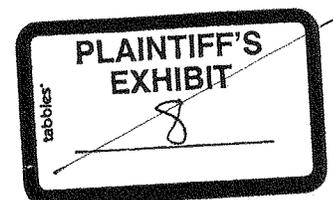
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REPORT OF THE SPECIAL MASTER (JULY 5, 2006)

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 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

PSTA

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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)

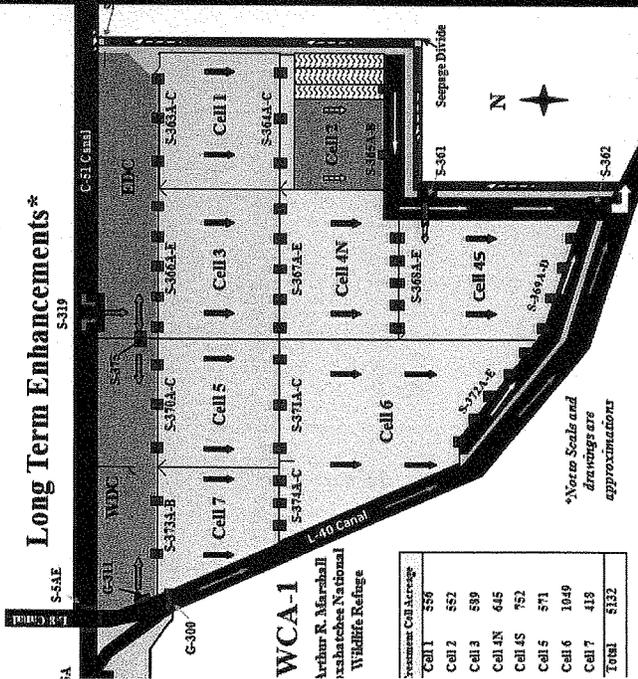
⁶³ As alluded to earlier, a "regulation schedule" represents "guidance to water resource managers for regulating the inflow and outflow of water through water control structures. It is subject to change based on changing conditions of demand, supply, and public interests. The objective is to maximize 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.

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Funding & Expenditures

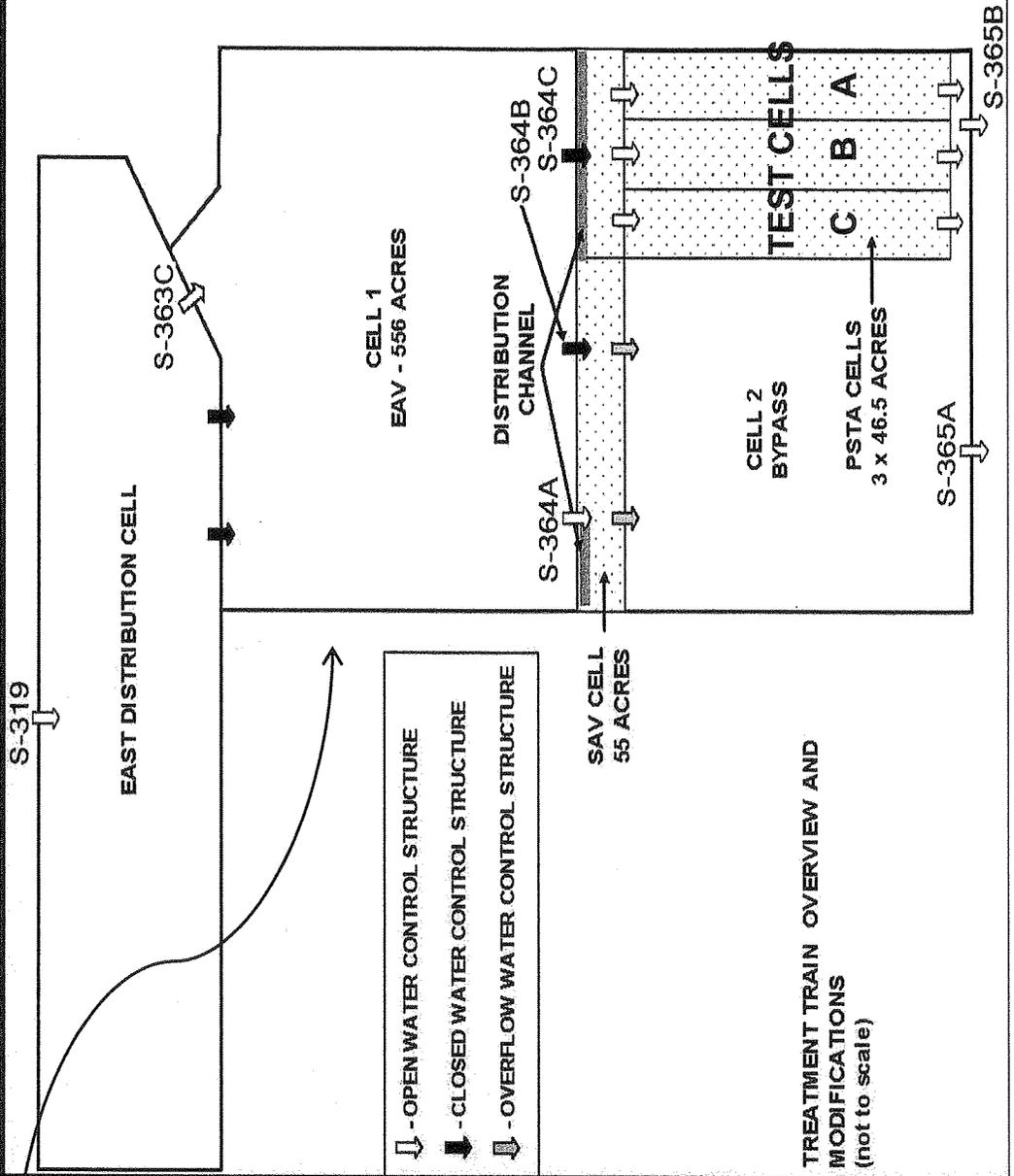
- Cost to date - \$13M vs. original cost estimate of \$5M
- Current cost per year - \$2M
- Original construction of PSTA cells - \$4.3M

STA-1E Structures, Flow, & Long Term Enhancements*



Seepage Cell	Acres
Cell 1	556
Cell 2	522
Cell 3	539
Cell 4N	645
Cell 4S	752
Cell 5	571
Cell 6	1049
Cell 7	418
Total	5132

PSTA Location



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Portland State University
Office of Research and Sponsored Projects

MEMORANDUM

DATE: December 17, 2009

TO: Ronald Jones
BIO

Sam Lowry
SCC

Research Accounting
BO/RA

FROM: Karen Thomson
Contract Officer
ORSP
5-5240

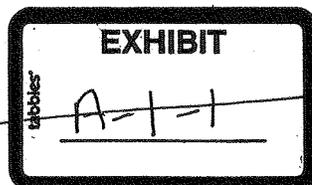
RE: Dept of the Army, Cooperative Agreement No. DACW17-03-2-0001, Amendment #9
"Periphyton Design and Analysis for the C-51 (STA 1-East) Project"

PIAF#: 030765

INDEX#: 251280

Enclosed is a fully-executed copy of the above-referenced agreement. One copy has been sent to Research Accounting, and one has been retained in the ORSP office for our files.

Thank you for your assistance.



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AMENDMENT NINTH
TO
COOPERATIVE AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND

THE STATE OF OREGON ACTING BY AND THROUGH THE BOARD OF HIGHER
EDUCATION ON BEHALF OF PORTLAND STATE UNIVERSITY FOR
PERIPHYTON DESIGN AND ANALYSIS FOR THE C-51 (STA 1-EAST) PROJECT

This AMENDMENT NINTH TO THE COOPERATIVE AGREEMENT
BETWEEN THE DEPARTMENT OF THE ARMY AND THE STATE OF OREGON
ACTING BY AND THROUGH THE BOARD OF HIGHER EDUCATION ON
BEHALF OF PORTLAND STATE UNIVERSITY FOR PERIPHYTON DESIGN AND
ANALYSIS FOR THE C-51 (STA 1-EAST) PROJECT (hereinafter referred to as
"Amendment 9"), entered into this 14th day of December, 2009, by and between
the Department of the Army, U.S. Army Corps of Engineers, Jacksonville District
(hereinafter referred to as the "Corps"), and Portland State University (hereinafter
referred to as the "Recipient").

WITNESSETH THAT:

WHEREAS, the Government and the Recipient entered into a Cooperative
Agreement for data collection and analysis and cooperation in preparation of the plans of
improvement of the C-51 (STA 1-East) Project on 26 November 2003 (hereinafter
referred to as the "Agreement");

WHEREAS, on 26 September 2005, the Agreement was modified to extend its
term to 30 December 2005;

WHEREAS, on 16 December 2005, the Agreement was modified to extend its
term until 30 September 2006;

WHEREAS on 30 September 2006, the Agreement was modified to extend its
term until December 31, 2006 and to increase the total amount of the Agreement to a not
to exceed amount of \$1,370,853.20;

WHEREAS on 20 December 2006, the Agreement was modified to extend its
term until December 31, 2007 and to increase the total amount of the Agreement to a not
to exceed amount of \$2,321,006.20;

WHEREAS the Corps added additional funds in the amount of \$114,832.00 for
additional work under the Cooperative Agreement, and the Government's financial
obligation shall not exceed \$2,435,838.20;

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WHEREAS on 18 December 2007, the Agreement was modified to increase the total amount of the Agreement by \$750,559.00, and the Government's financial obligation to a not to exceed amount of \$2,435,838.20;

WHEREAS on 18 December 2007, the Agreement was modified to extend its term until December 31, 2008;

WHEREAS the Corps added additional funds in the amount of \$750,559.00 for additional work under the Cooperative Agreement, and the Government's financial obligation shall not exceed \$3,186,397.20;

WHEREAS on 17 December 2008, the Agreement was modified to extend its term until December 31, 2009;

WHEREAS the new Scope of Work is for the C-51 PSTA Test Facility and PSTA Cell 2 Field Scale Demo Project for the amount of \$646,903.00. There is no need to obligate additional funds based on the fact, that some of the funds previously obligated, were not used; the Government's financial obligation shall not exceed \$3,186,397.20; and

WHEREAS on 14 December 2009, the Agreement was modified to extend its term until December 31, 2010;

WHEREAS the new Scope of Work is for the C-51 PSTA Test Facility and PSTA Field Scale Demo Project for the amount of \$696,720.00. There is no need to obligate the full amount of funds, due to the fact, that some of the funds previously obligated were not used; the amount obligated is \$694,200.00; the Government's financial obligation shall not exceed \$3,880,697.20;

WHEREAS the Recipient shall not incur costs exceeding the Federal Contribution.

NOW, THEREFORE, THE PARTIES AGREE AS FOLLOWS:

The following revisions are hereby made to the Agreement:

1. The first sentence of Article 2 of the Agreement is deleted and replaced with the following:

"The term of this Agreement shall be from the date of last signature through December 31, 2010."

2. All other terms of the Agreement remain in full force and effect.

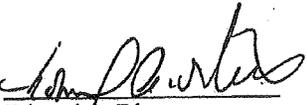
IN WITNESS WHEREOF, the parties have executed this Amendment Ninth as of the day and year first above written.

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DEPARTMENT OF THE ARMY

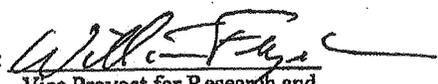
PORTLAND STATE UNIVERSITY

BY: 
Edward A. Dias
Grants Officer
Jacksonville District

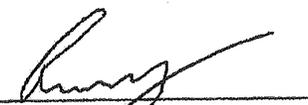
BY: 
Contract Officer

DATE: 15 Dec 09

DATE: 12-15-09

BY: 
Vice Provost for Research and
Dean of Graduate Studies

DATE: 12-15-09

BY: 
Dr. Ronald D. Jones
Professor
Department of Biology

DATE: 14 Dec 2009

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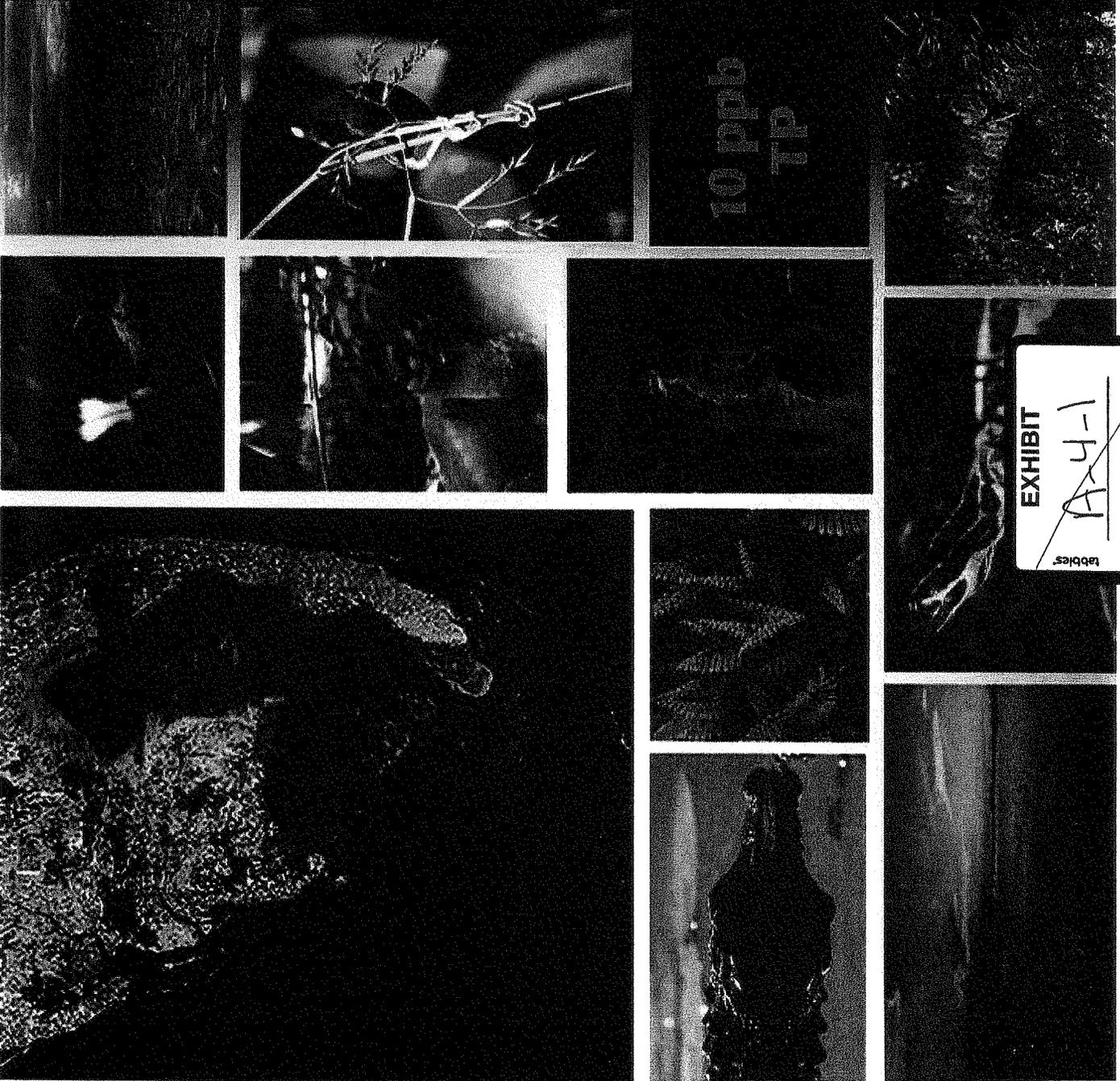


Portland State UNIVERSITY

Periphyton Stormwater Treatment Area (PSTA) Studies - STA-1E

Palm Beach County, FL
June 30, 2009

Dr. Ronald D. Jones
Portland State University
Email: jonesrd1@verizon.net
Phone: (971) 322-8078



10 ppb
TP

EXHIBIT
~~A4-1~~
labbles

PSTA Field-Scale Test Cells

C-51

CELL 1

PLUG SAV CELL

SEEPAGE CANAL

A

1" PALM BEACH
LIME SLUDGE OVER
NATIVE SAND

B

6" ONSITE
LIMESTONE

C

6" ONSITE
LIMESTONE

CELL 2 BYPASS

A-4-9

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PERIPHYTON-BASED STORMWATER TREATMENT AREA IMPLEMENTATION PROJECT

The Periphyton-Based Stormwater Treatment Area (PSTA) Implementation Project comprises a 400-acre portion of STA-3/4, Cell 2B, that was isolated by the construction of levees to form an upstream 200-acre cell (Upper SAV Cell) and two adjacent downstream 100-acre cells (Lower SAV and PSTA cells) (Figure 5-87). All cells have been managed to promote an SAV community and its associated periphyton through repeated herbicide applications to suppress emergent aquatic plants.

The primary difference in the construction of the PSTA versus the SAV cells is that the peat substrate in the PSTA Cell was removed down to caprock level, while the soil in the Upper and Lower SAV cells was not disturbed. Consequently, the floor elevation of the PSTA Cell is approximately 1.8 feet (54 cm) lower than the adjacent SAV cells. Peat was removed from the PSTA Cell because it provided a rooting medium for emergent plants and was a potential source of phosphorus that would flux back into the water column and reduce treatment efficiency. The two 100 cfs (244,658 cubic meters per day) pumps in the project's outflow pump station (G-388) are activated by a float switch and maintain the PSTA Cell at a depth of approximately 1.9 ± 0.25 foot (58 ± 8 cm). Surface inflow to the PSTA Cell through its two inflow gates (G-390A and B) is managed to operate this cell at a nominal hydraulic retention time (HRT) of approximately five days.

The function of the Upper SAV Cell was to provide the SAV component of an emergent aquatic vegetation (Cell 2A) SAV treatment train and deliver low TP concentration water to the Lower SAV and PSTA cells. The original objective of this project was to compare treatment performance, i.e., TP removal, of the PSTA Cell versus the Lower SAV Cell; however, comparison between the two cells is not technically appropriate, as described below. Therefore, the treatment performance of Cell 2B was added to this year's report to provide another point of reference to compare against the PSTA Cell. The history of the PSTA Project, design considerations, project layout, and the project's operating plan are discussed in previous SFRs.

Water quality was monitored at all seven water control structures in the PSTA Project during WY2009 (Figure 5-87). Water temperature, dissolved oxygen, conductivity, and pH were measured in situ in conjunction with the collection of water samples. Soluble reactive phosphorus, TP, and total dissolved phosphorus (TDP) were monitored weekly; nitrite + nitrate-nitrogen, ammonium-nitrogen, TKN, calcium, chloride, and TSS were monitored monthly; and sodium, potassium, magnesium, sulfate, hardness, and alkalinity were monitored quarterly. Samples (single replicates) were collected at the upstream side of each structure. TP was collected by both grab and auto-sampler; all other parameters were collected only with grab samples. A quarterly sampling program was initiated in October 2008 to document the pattern of downstream changes in TP, TDP, and SRP concentrations within the PSTA Cell; grab samples were collected at paired locations along two longitudinal transects in the cell.

The SAV community in the PSTA Project was surveyed on two dates during WY2009 (August 2008 and February 2009) using a geo-referenced grid of regularly spaced sampling stations in each cell: 104 sites in the Upper SAV Cell and 48 sites in both the Lower SAV and PSTA cells. The areal coverage of all SAV taxa combined and each SAV taxon individually at all sites was categorized as low (up to one-third coverage), medium (one-third to two-thirds coverage), or high (greater than two-thirds coverage).



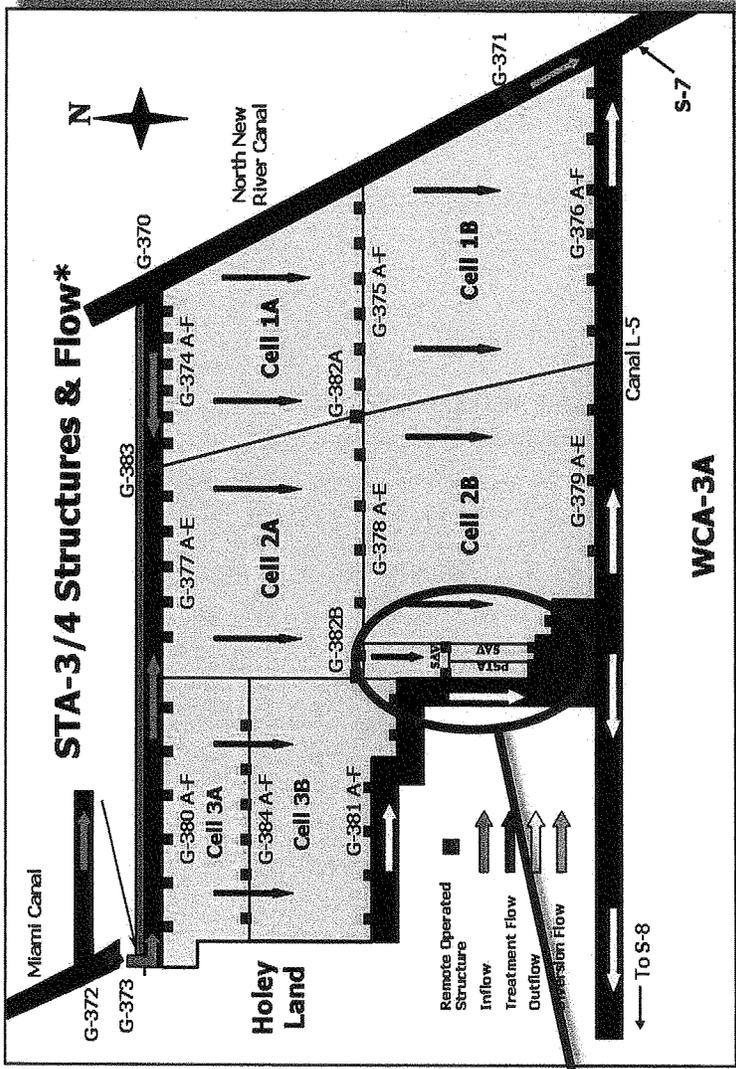
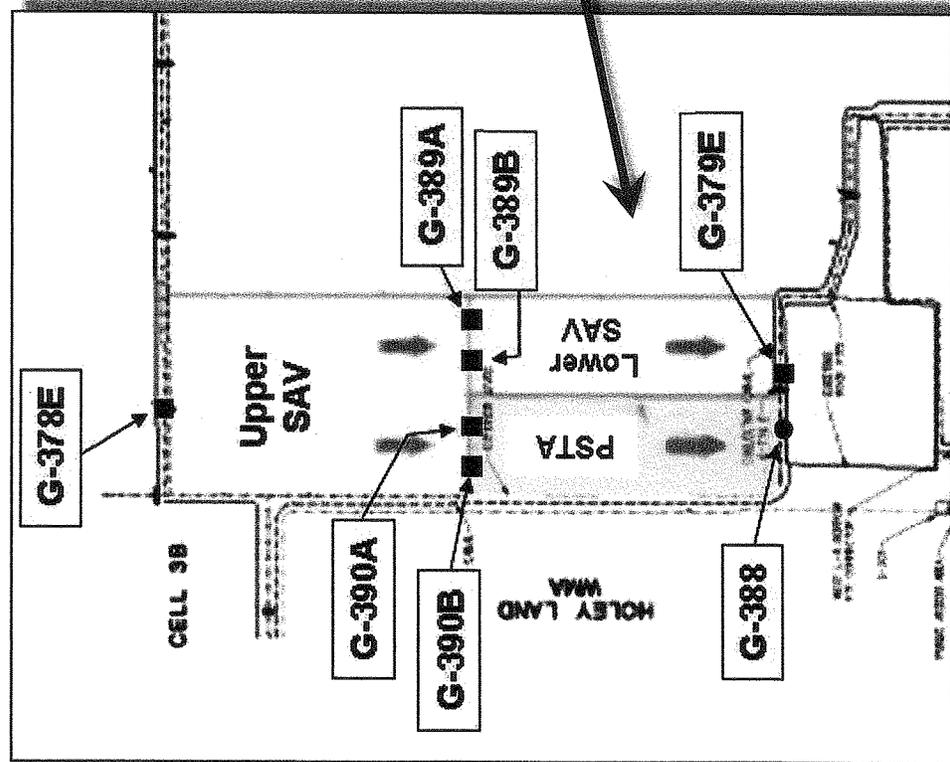
The STA-3/4 Periphyton Stormwater Treatment Facility

Presented April 20, 2010

by:

**Michael Chimney
South Florida Water
Management District**

Location of STA-3/4 PSTA Implementation Project



- Upper SAV Cell = 200 acres
- Lower SAV & PSTA Cell = 100 acres

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STA-3/4 PSTA Implementation Project

- PSTA = Periphyton-based Stormwater Treatment Area
- Periphyton = algal community attached to surfaces
- SAV = Submersed aquatic vegetation
- Project constructed in western portion of STA-3/4 Cell 2B
- Encompasses 400 acres (162 ha)
 - Upper SAV Cell = 200 acres (81 ha)
 - Adjacent Lower SAV and PSTA Cell = each 100 acres (40 ha)
- Removed soil down to caprock in the PSTA Cell, floor elevation ~ 2 feet lower in PSTA Cell => reduce P flux from old agricultural soil

(Limerock in "PSTA" cell only)

In SFNMD 3/4, "PSTA" ≡ "P-SAV STA"

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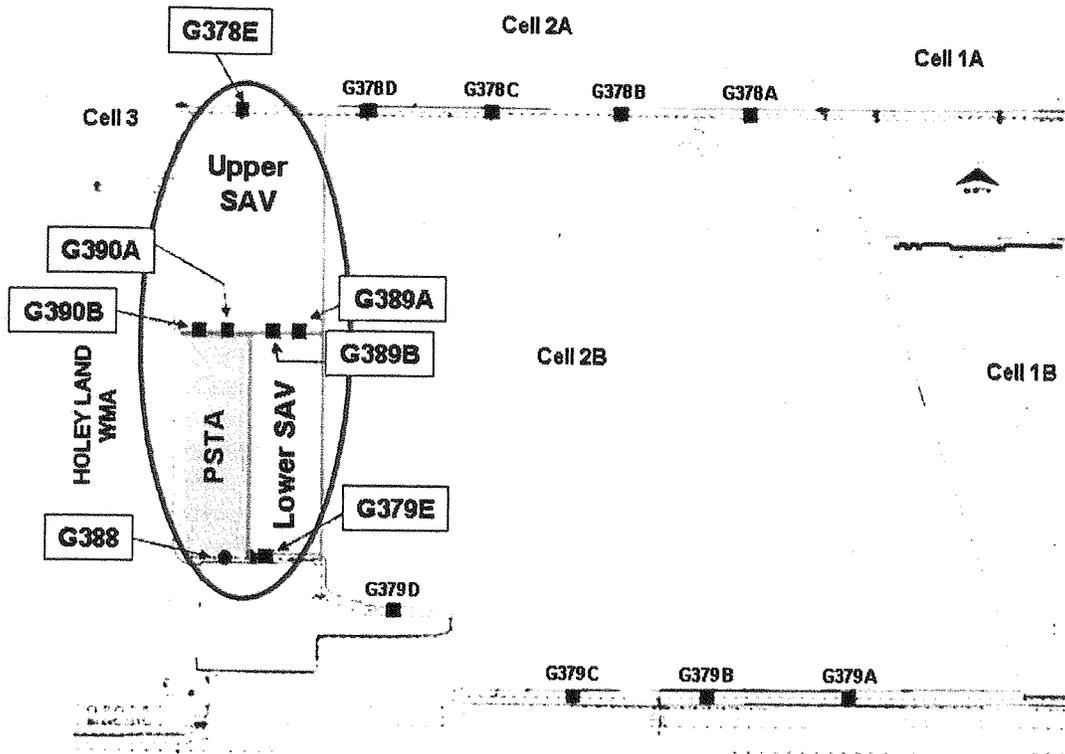


Figure 5-87. Map of the Periphyton-Based Stormwater Treatment Area (PSTA) Implementation Project showing the location of water control structures, the Upper SAV Cell, the Lower SAV Cell, and the PSTA Cell. The adjacent Cell 2B and its water control structures are also shown.

Operations and Performance

South Florida experienced drought conditions during the last three water years, which reduced stormwater runoff into STA-3/4, especially during each year's dry season (winter and spring). The need to maintain minimum water levels in the STA necessitated that all outflow structures be closed for much of each dry season. These conservation efforts, in turn, curtailed operation of the PSTA Project. The dates when there was sufficient water in the STA to operate the PSTA Cell define the PSTA Project's operational period for that water year. The operational periods were from June–October (115 days) in WY2007, July–December (161 days) in WY2008, and July–December (168 days) in WY2009 (see Figure 5-88, panel A). G-388 was shut down at the end of each operational period to help conserve water in the STA. The discussion of PSTA Project operation and data analyses presented below are limited to the operational period in each water year unless noted otherwise.

The PSTA Cell inflow gates (G-390A and B; Figure 5-87) were not operable during WY2007, therefore no surface water entered the cell. Water discharged from G-388 during this year was primarily groundwater seepage from the adjacent Upper and Lower SAV cells (Figure 5-88, panel A). The G-390A and B gates were operated in WY2008 and WY2009; G-388 discharge in these years included surface water inflow plus seepage. Monthly PSTA Cell outflow during WY2008 and WY2009 was 17 to 115 percent greater than the corresponding inflow. This relationship (outflow > inflow) is reflected in the monthly inflow-outflow regression line, which

had a slope greater than one (slope = 1.48) (Figure 5-88, panel B). Mean monthly outflow exceeded inflow during WY2008 and WY2009 by 56 percent and 57 percent, respectively.

The original intent of this study was to operate the PSTA and Lower SAV cells such that each cell received half of the inflow compared with the Upper SAV Cell (i.e., equal hydraulic loading to each cell) to facilitate a comparison of the treatment efficiency of the PSTA versus SAV technologies. Unfortunately, this plan proved unworkable and the two cells have been operated very differently. Inflow to the PSTA Cell was regulated to achieve a target HRT, while inflow to the Upper and Lower SAV cells was dependent upon storm events that delivered water to STA-3/4. The PSTA Cell had surface-water hydraulic loading rates (HLRs) during the last two years [2.5 and 2.8 inches per day (in./d)] substantially lower than HLRs in the Lower SAV Cell (5.1 and 8.5 in./d) but higher than those for the Cell 2B (0.4 and 1.6 in./d). Nominal HRTs calculated for the PSTA Cell in WY2008 and WY2009 (5.9 and 5.2 days, respectively) were very close to the target of 5 days (Table 5-38).

Transect sampling has revealed the existence of well-defined downstream phosphorus gradients in the STA treatment cells (e.g., Figure 5-27 in the 2009 SFER). However, similar gradients were not evident in the PSTA Cell for TP or SRP (Figure 5-89). A small gradient was observed for TDP. Note that most of the SRP samples were at the method detection limit of 2 ppb.

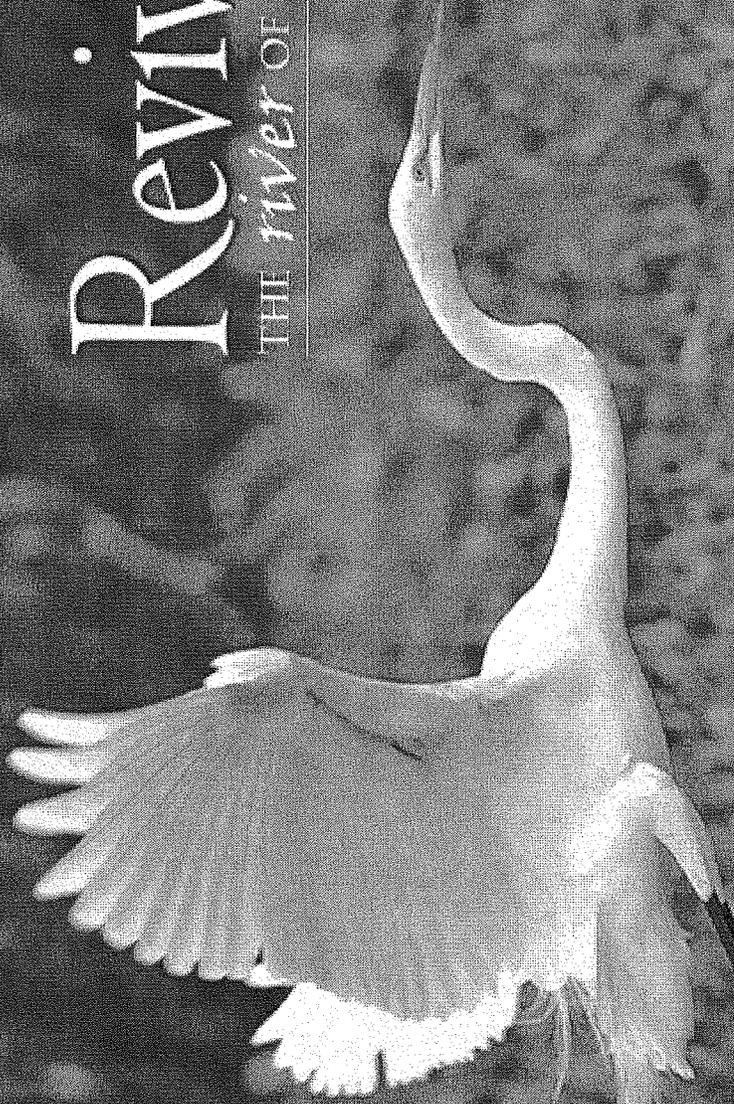
Summary statistics for water quality parameters monitored at all PSTA Project sampling stations throughout WY2009 and during the WY2009 operational period are presented in Appendix 5-11. Based on comparison of FWM outflow TP concentrations, the PSTA Cell exhibited better treatment performance than either the Lower SAV Cell or Cell 2B in each water year (Table 5-38). The PSTA Cell had a FWM outflow TP concentration of 8 ppb in WY2009; all monthly outflow FWM TP concentrations during the year were less than 10 ppb (Figure 5-88, panel C). This performance was achieved at a surface-water TP loading rate of 0.368 g/m²/yr. In contrast, the PSTA Cell outflow FWM TP concentration and surface-water TP loading rate in WY2008 were 12 ppb and 0.630 g/m²/yr, respectively. Monthly outflow FWM TP concentrations exhibited a moderate linear relationship ($r^2 = 0.50$) with monthly inflow concentrations (Figure 5-88, panel D).

SAV was widespread throughout the PSTA Project in WY2009 (Figure 5-90). Six SAV taxa were observed over the two sampling dates: hydrilla, musk grass, pondweed, red ludwigia (*Ludwigia repens*), southern naiad, and spiny naiad (*Najas marinas*) (Appendix 5-12) compared to 11 taxa found in WY2007 and 10 taxa in WY2008. The most frequently encountered taxa in WY2009 were musk grass and southern naiad as in previous years. No importance is given to the status of fewer uncommon taxa recorded in WY2009 compared to previous years. The distribution of hydrilla continued to be restricted primarily to the Upper SAV Cell.

The PSTA monitoring program will continue in FY2010.

Reviving

THE RIVER OF GRASS



WRAC Issues Workshop - Phase I Planning August 4, 2009

Temperince Morgan, River of Grass Project Liaison/Northern
Everglades Program Implementation Manager

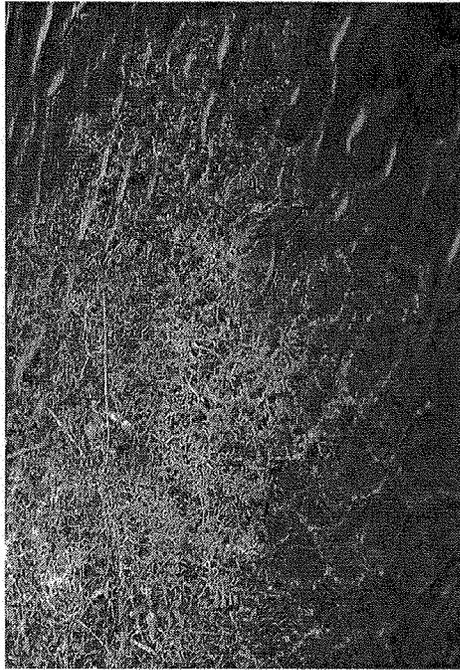
sfwmd.gov/riverofgrass

RESTORATION PLANNING

Water Quality Performance- Relationship between Management and Performance

RESTORATION PLANNING

- High management level required to achieve optimal water quality treatment performance
 - Water Level, Flow, and Vegetation
- Water quality performance is highly dependant on whether the feature is maintained in a wet condition
- Ensures viability of the highest performing treatment vegetation
- Avoids dry-out of the soil which can release TP upon rewetting
- Evaluation of configurations included best case scenario (maintaining wet conditions) and a worst case scenario (allowed to go dry such that no TP removal occurred), with a large range of results



Feature Summary- Flow-way (Wet vs. Dry)

- Maintained Wet
 - Maintained in a wetted condition (1/2 foot minimum water depth)
 - Requires supplemental water
- Allowed to go Dry
 - Flowing wetland system allowed to go dry or a floodplain with wetting only occurring during extreme weather events
 - Better at achieving downstream restoration targets than wet flow-way
 - No supplemental water required
 - When dry, impacts to ecology and habitats; potential operational restrictions

Should both wet and dry flow-way operations be tested to evaluate relative hydrologic, ecologic, and water quality benefits?



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CBCW-AG

07 NOV 1997

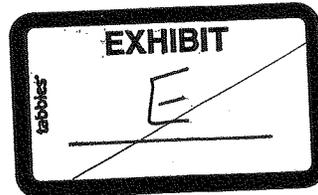
MEMORANDUM FOR COMMANDER, SOUTH ATLANTIC DIVISION

SUBJECT: Water Quality Policy for South Florida Ecosystem Restoration

1. I concur with your proposal to proceed with planning and design to meet State water quality standards for discharges from STA-1-E of the C-51 project into Loxhatchee National Wildlife Refuge. Section 528 of WRDA 96 authorizes the Secretary of the Army to consider applicable State water quality standards in carrying out the C-51 project. Your decision to proceed with these activities at complete Federal expense is consistent with this authorization and the cost sharing provisions of Section 315 of WRDA 96, which state that the storm water treatment area "shall be accomplished at Federal expense."
2. I note that the authorization to take State water quality standards into account applies to all activities contemplated under the authority of Subsection 528(b). As such, the Army may consider adding other project features to take State water quality standards into account as it proceeds with the various projects and plan contemplated in section 528. When features to improve water quality are proposed, the non-Federal sponsor shall ordinarily pay 100 percent of the cost of the feature. There is one exception to this cost-sharing rule that must be taken into account as you proceed with activities under section 528. When a water quality feature is determined by the Secretary of the Army to be "essential to Everglades restoration," that feature is to be cost shared 50 percent non-Federal, 50 percent Federal. As you proceed under section 528, we ask that you identify any water quality features that warrant 50-50 cost-sharing under this special rule.
3. My point of contact on this issue is Dr. Lloyd Saunders, (202)761-8731.

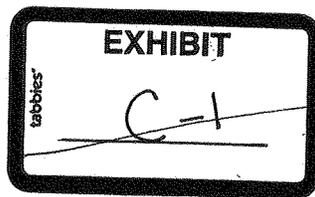
FOR THE COMMANDER:


RUSSELL L. FUHRMAN
Major General, USA
Director of Civil Works



PUBLIC LAW 104-303—OCT. 12, 1996

WATER RESOURCES DEVELOPMENT ACT OF
1996



11-1

feet to a point, N251580.00, E783520.00, thence running south 46 degrees, 16 minutes, 22.9 seconds west 318.28 feet to a point, N251360.00, E783290.00, thence running south 19 degrees, 1 minute, 32.2 seconds east 306.76 feet to a point, N251070.00, E783390.00, thence running south 45 degrees, 0 minutes, 0 seconds, east 155.56 feet to a point, N250960.00, E783500.00 on the existing western limit.

(b) **PAYMENT FOR INITIAL DREDGING.**—Any required initial dredging of the widened portions identified in subsection (a) shall be carried out at no cost to the Federal Government.

(c) **DEAUTHORIZATION.**—The portions of the turning basin that are not included in the reconfigured turning basin described in subsection (a) are not authorized after the date of the enactment of this Act.

SEC. 313. CANAVERAL HARBOR, FLORIDA.

The project for navigation, Canaveral Harbor, Florida, authorized by section 101(7) of the Water Resources Development Act of 1992 (106 Stat. 4802), is modified to authorize the Secretary to reclassify the removal and replacement of stone protection on both sides of the channel as general navigation features. The Secretary shall reimburse any costs that are incurred by the non-Federal sponsor in connection with the reclassified work and that the Secretary determines to be in excess of the non-Federal share of costs for general navigation features. The Federal and non-Federal shares of the cost of the reclassified work shall be determined in accordance with section 101 of the Water Resources Development Act of 1986 (33 U.S.C. 2211).

SEC. 314. CAPTIVA ISLAND, FLORIDA.

The project for shoreline protection, Captiva Island, Lee County, Florida, authorized pursuant to section 201 of the Flood Control Act of 1965 (42 U.S.C. 1962d-5; 79 Stat. 1073), is modified to direct the Secretary to reimburse the non-Federal interest for beach nourishment work carried out by such interest as if such work occurred after execution of the agreement entered into pursuant to section 215 of the Flood Control Act of 1968 (42 U.S.C. 1962d-5a) with respect to such project if the Secretary determines that such work is compatible with the project.

SEC. 315. CENTRAL AND SOUTHERN FLORIDA, CANAL 51.

The project for flood protection of West Palm Beach, Florida (C-51), authorized by section 203 of the Flood Control Act of 1962 (76 Stat. 1183), is modified to provide for the construction of an enlarged stormwater detention area, Storm Water Treatment Area 1 East, generally in accordance with the plan of improvements described in the February 15, 1994, report entitled "Everglades Protection Project, Palm Beach County, Florida, Conceptual Design", with such modifications as are approved by the Secretary. The additional work authorized by this section shall be accomplished at Federal expense. Operation and maintenance of the stormwater detention area shall be consistent with regulations prescribed by the Secretary for the Central and Southern Florida project, and all costs of such operation and maintenance shall be provided by non-Federal interests.

11-2 C-2

PSTA Conference Call Notes – Mar 3, 2010

The conference call started at 11:00 EST

Attendees:

Ed Brown (USACE)
Enid Gerena (USACE)
Dr. Ronald Jones (PSU)
Jeff Rhodes (Broward Aquatics)

Cell 2 Operations

1. Jeff stated the water levels at S-365A are being lowered eventually to 12.5 ft.
2. Jeff said that he still needs to collect another set of samples as part of the month of February, and then he'll ship them out.
3. Ed suggested to perform an independently study of the weirs in April (3-4 days). Dr. Jones said that they had problems with the flowmeters when they observed turbulent waters. Ed suggested renting a different type of flowmeters that are better to calibrate.

FCRTE

4. Dr. Jones said that they collected all the TP data and that will be sent to USACE in a couple of weeks.

Other

5. Earlier today Eunice announced to the team that senior management has decided to close the PSTA project because it is on the best interest of the agency. According to him SFWMD is claiming that 20% of the STA is not used due to the PSTA project, and ultimately SFWMD has the ownership of the STA-1E and they should manage it according to their priorities. Eunice will meet with SFWMD next Tuesday, March 9th, and will informed us if the closing of PSTA will be immediate or if we could still collect some more samples before they initiate the repair of the structures (culverts.) Ed is planning to attend this meeting. Eunice expressed his words of appreciation and recognized Dr. Jones efforts towards this project.

WRONG

The conference call adjourned at 11: 30 EST

*Next conf. call is scheduled for March 10, 2010 at 11:00am EST.



12-1

AFFIDAVIT OF DR. RONALD JONES

- My name is Dr. Ronald Jones. I am making this affidavit from my own personal knowledge. This Supplemental Affidavit is filed in response to the Corrected Declaration of Alfred Pantano, executed on March 11, 2010, and supplements my affidavit executed on March 8, 2010 and filed in this case.
- In paragraph 4, Colonel Pantano states that "only three months of data has been collected." Those 3 months of data are not sufficient to evaluate PSTA nor was the system 100% operational. We only began to collect a real time series 6 weeks ago (weekly sampling at the input and output). Two years are needed to collect data, and an additional year for optimization, scale-up, and data analysis. The original operations plan agreed on by the design group was for a minimum of 2 years with an additional year of optimization. I would not use less than a 2 year data set to make my recommendation for the COE to implement PSTA in STA-1E.
- In Paragraph 5, Colonel Pantano gives some figures about how much of STA 1E the PSTA field test occupies and certain assumptions that are incorrect about operations. A levee separates the input of the PSTA cells from the Cell 2 bypass area. As such, the SFWMD could operate the remainder of Cell 2 as a functional STA treatment cell. Moreover, the SFWMD requested permission on Friday, March 12, 2010 to use Cell 2 bypass, which was granted, and the SFWMD used the Cell 2 bypass.
- The PSTA Field Demonstration uses only 2.7% of the area of STA-1E and would block only 2.3% of the flow capacity if we would allow no flow through the PSTA cells. In actuality, since PSTA is in operation, we are restricting the flow by only 2%, and in an emergency we would only block 1% of the capacity of STA-1E. PSTA is functional in the STA and water is being treated, thus we are discharging from our approximately 150 acres of Cell 1-2.
- In Paragraph 6, Colonel Pantano talks about the PSTA test in STA 3/4 being conducted by the South Florida Water Management District. There are major differences between these two field tests. The Corps PSTA Project is not redundant. The SFWMD test is a single substrate (scraped limestone) in STA 3/4. The Corps PSTA Project uses 3 different substrates over the native soils and has used a series of dry-outs and flooding to activate the periphyton mats. We are collecting data at multiple water depths and different hydraulic retention times, while the SFWMD uses 1 depth (1.9 feet) (our concept requires the water depth to be maintained at 1.5 feet or less with an optimal operating depth of 1 foot), an uncontrolled Hydraulic Retention Time, but nominally at 5 days. In reality the SFWMD's "PSTA" is a Submerged Aquatic Vegetation or "SAV" test, as all cells have been managed to promote SAV. In essence they have created a pseudo PSTA setup that cannot survive desiccation. Finally the water entering the SFWMD's "PSTA" is a mixture of pumped water and seepage water and as such the water in the cell is a mixture that cannot be determined.
- In Paragraph 9, Colonel Pantano incorrectly identifies the source of the water into the field test. PSTA is not operating off of water from the seepage canal, but the source of the water is the C-51 through S-319, like the rest of the eastern flow way.
- Colonel Pantano now admits that testing is ongoing at the Flying Cow Road Facility. To clarify, the Flying Cow Road Test Facility (FCRTF) is still in operation. We are using cells 2 and 4 and are collecting both water samples for Total Phosphorus and continuous data using the Hydrolabs. This continued project is for the purpose of demonstrating the longevity of the periphyton mat and to determine the phosphorus removal efficiencies.

I declare under penalty of perjury that the foregoing Supplemental Affidavit of Dr. Ronald D. Jones dated March 15, 2010, is true and correct.

Executed on March 15, 2010

13-1

Background and Analysis:
Periphyton Stormwater Treatment Area (PSTA)
U.S. Army Corps of Engineers Project/Test
by: Dr. Terry Rice, Col. (Ret)
April 19, 2010

- During negotiations between the United States and the State of Florida for the 1992 Settlement Agreement, DOI agreed to construct one (1) of the six (6) total Stormwater Treatment Areas (STA), i.e. STA 1 East.
- DOI, having neither authority nor appropriations to actually construct STA 1 East, entered into negotiations with the Corps. The end result was that the Corps agreed to fund and construct STA 1 East in return for DOI giving up some National Park Service land associated with the Iwo Jima Memorial to the Corps for the needed expansion of Arlington Cemetery.
- In 1995, the Settlement Agreement was amended. It now states, "... The District and the Corps commits to purchase, design, and construct STAs as set forth in Appendix C ... The Class III phosphorus criteria when interpreted by research will be implemented by December 31, 2006, if lower than the long-term concentration levels. If the Corps in fact abandons PSTA, along with completion of STA 1 East as envisioned, it could very well be in violation of the amended Settlement Agreement.
- Section 315, WRDA 96, authorized the Corps to construct STA 1 East and states the construction "shall be accomplished at Federal expense."
- In response to a Jacksonville District request for clarification regarding its STA 1 East water quality responsibilities, on November 7, 1997 the Corps Director of Civil Works stated: "Section 528 of WRDA 96 authorizes the Secretary of the Army to consider applicable State water quality standards in carrying out the C-51 project [of which STA 1 East is a part]. Your decision to proceed with these activities [of meeting applicable Water Quality Standards] at complete Federal expense is consistent with the authorization and the cost sharing provisions of Section 315 for WRDA 96 ..."
- In 1997, the Corps issued the SFWMD a 404 permit for the construction of STA 1 W, 2, 5, & 6. One of the special conditions was that: "The permittee, in coordination with the FDEP and other interested parties, shall investigate treatment technologies that may supplement the STAs for achieving the numeric phosphorus criterion [yet to be determined with a default of 10 ppb]. The investigations shall follow a sequence of studies, bench tests and pilot demonstrations ... Technologies to be investigated shall include but are not necessarily limited to: (9) Periphyton STA's." The Corps has not actively enforced this provision of its permit, and many believe that the SFWMD never fully embraced this technology, and never has given it the chance that it merits.
- The Corps decided that the most promising technology for achieving State Water Quality Standards was to incorporate PSTA into its design, and in approximately 2000 began the planning necessary to finalize a PSTA design. It was also clear, that if the Corps could achieve success, that the State would have little option but to implement PSTA.
- The Special Masters Report (Judge Moreno Court) of 2006, states that, "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 report goes on to say that progress should be monitored and reported to the Court.

- On March 31, 2010, the Special Master’s report was adopted by Judge Moreno, and will now be enforced by the Court. The expectation of the Court, as expressed by the Court-adopted Special Master’s Report, is that the field studies will be completed, then a determination of its future utility will be made.
- In early March 2010, the Corps decided to abandon PSTA field testing (then subsequently put a 75 day hold on the decision) for the following inexplicable/unsupportable reasons:
 - Water Quality is a 100% State responsibility: This position is contrary to WRDA 96, and Corps Headquarters interpretation of WRDA 96 in its November 7, 1997 guidance letter to the Jacksonville District.
 - Corps has no cost-sharing agreement: Having no cost sharing agreement is appropriate as WRDA 96 states that the storm water treatment area [STA 1 East] ‘shall be accomplished at Federal expense.’”
 - Cost is \$2.5 million annually: Given how crucial it is to achieve the requisite water quality, i.e., 10 ppb P, so that irreversible damage can be stopped and restoration started, \$2.5 million per year is an extremely small cost, especially when compared to other restoration costs that now exceed \$20 billion (the current total estimate for CERP alone exceeds \$12 billion and cannot be accomplished until the requisite water quality is achieved).
 - Corps project is taking up space that could be used for treatment ... State is getting beat up in Court: STAs, i.e. macrophyte treatment systems (cattails in this case) cannot alone bring P concentrations down to 10 ppb, which is both the Criterion and WQBEL under Judge Gold’s order, and it has always been understood that more advanced treatment systems (i.e. **Phase II technologies**) would have to be added at the end of the treatment train to meet final water quality goals. To stop PSTA work in order to allow treatment of water to levels well in excess of 10 ppb P, would be shortsighted, potentially delaying achievement of the Everglades Water Quality Standards for years, if not decades. Per the EPA’s 2005 R-EMAP report and the CISRERP (the National Academies of Science) 2008 report, this simply may be the death of the Everglades.
 - State has its own PSTA project: The State has been investigating PSTA every since the Corps 404 permit of 1997 required it, but many observers are not yet convinced that the State is fully committed to achieving success. In addition, there are different ideas about how to engineer a system to make PSTA work; the more redundancy the better when it comes to such endeavors.
 - If PSTA works, expansion to full scale production will be cost prohibitive: The cost is yet to be determined, and other, cheaper ways of achieving project conditions have not been fully explored. In addition, if the cost to implement full-scale PSTA is the only way of saving the Everglades, the powers that be will have to make the final decision.
- If the Corps decides to abandon PSTA, they may well be in violation of, among other provisions:
 - WRDA 96
 - Settlement Agreement as amended
 - Clean Water Act/Judge Gold’s Order

14-2

- Comprehensive Everglades Restoration Program (CERP) and WRDA 2000
- Judge Moreno Order/Special Master's Report

Miccosukee Tribe Florida Indian Land Claims Settlement Act of 1982 Lease Agreement

**Under the provisions of the Florida Indian
Claims Settlement Act of 1982 Lease
Agreement, the better part of WCA 3A is
perpetually leased to the Miccosukee Tribe
and is to be preserved “in its natural state
for the use and enjoyment of the
Miccosukee Tribe ...” and “fresh water
aquatic life, wildlife, and their habitat” are
to be preserved.**