

Chapter 5A: Restoration Strategies – Design and Construction Status of Water Quality Improvement Projects

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SUMMARY

To address water quality concerns associated with existing flows to the Everglades Protection Area (EPA), the South Florida Water Management District (SFWMD or District), Florida Department of Environmental Protection (FDEP), and United States Environmental Protection Agency (USEPA) engaged in technical discussions starting in 2010, which resulted in an interagency Framework Agreement (FDEP and USEPA 2012). The primary objectives were to establish a water quality based effluent limit (WQBEL) that would achieve compliance with the State of Florida's numeric total phosphorus (TP) criterion in the EPA and to identify a suite of additional water quality improvement projects to work in conjunction with the existing Everglades Stormwater Treatment Areas (STAs) to meet the WQBEL (SFWMD 2012a). Based on this collaborative effort, a suite of projects (**Figure 5A-1**) has been identified that would achieve the WQBEL, as documented in the Restoration Strategies Regional Water Quality Plan (SFWMD 2012b).

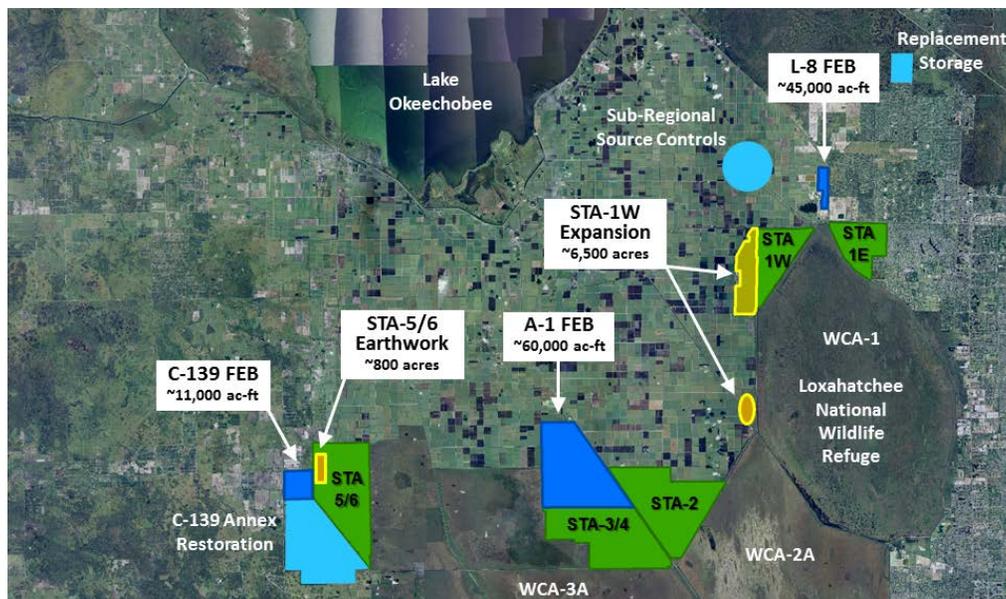


Figure 5A-1. Key projects for the Restoration Strategies Regional Water Quality Plan.

On September 10, 2012, FDEP issued SFWMD an Everglades Forever Act (EFA) Watershed Permit (0311207) (FDEP 2012a) and a National Pollutant Discharge Elimination System (NPDES) Watershed Permit (FL0778451) (FDEP 2012b) along with associated Consent Orders Office of General Counsel (OGC) Number 12-1149 (EFA) and OGC Number 12-1148 (NPDES) for operations of the Everglades STAs and to outline the additional facilities and structures required to achieve the WQBEL. The consent orders contain associated milestones for each project identified in the Restoration Strategies Regional Water Quality Plan and include deadlines when key project activities must be met. In addition, the consent orders recognize that Everglades STA discharges are not anticipated to meet the WQBEL until all the consent order activities are complete and sufficient discharge data exists to assess WQBEL compliance.

Under the Restoration Strategies Program, the projects have been divided into three flow paths—Eastern, Central, and Western—that are delineated by the source basins that are tributary to the existing Everglades STAs. The identified projects primarily consist of flow equalization basins (FEBs), STA expansions, and associated infrastructure and conveyance improvements. As described in the previous annual report (Leeds 2015), the primary purpose of FEBs is to attenuate peak stormwater flows, temporarily store stormwater runoff, and improve inflow delivery rates to downstream STAs, thereby providing enhanced operation and phosphorus treatment performance. FEBs may also be used to assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STAs. The primary purpose of STAs is to utilize biological processes to reduce phosphorus concentrations in order to achieve the WQBEL. Due to the District's limited experience operating FEBs in conjunction with STAs, an operational testing and monitoring phase is envisioned to occur upon completion of the FEBs and is intended to allow testing of a variety of subregional and project-specific operational scenarios.

The design and construction of the Restoration Strategies Program treatment and storage projects will occur in three phases with completion of all projects set for 2025. In Water Year 2015 (WY2015) (May 1, 2014–April 30, 2015), five consent order milestones were completed on five key projects (A-1 FEB, L-8 FEB, L-8 Divide Structure, S-5AS Modifications, STA-1 West (STA-1W) Expansion #1). Construction of the A-1 FEB is expected to be complete by the end of 2015. S-5AS Modifications and construction of the L-8 Divide Structure, two primary conveyance features, are ongoing. The design of STA-1W Expansion #1 will be completed in June 2015 and construction will begin by January 2016. An overview of the current Restoration Strategies projects, their status, and milestones met during the WY2015 reporting period is summarized below.

RESTORATION STRATEGIES PROJECTS

In accordance with the EFA and NPDES permits and associated consent orders, the following section reports on the WY2015 status of the current Restoration Strategies Program projects within the Eastern, Central, and Western flow paths. The projects and associated project components are provided in **Figures 5A-1** through **5A-10** in the following subsections. Specific activities and associated permit-mandated deadlines and completion dates during the WY2015 reporting period are summarized in **Table 5A-1**. Financial reporting for the Restoration Strategies Program and projects during Fiscal Year 2014-2015 (October 1, 2014–September 30, 2015) is provided in Appendix 1-5 of this volume.

Table 5A-1. Consent order corrective actions completed during WY2015.

Eastern Flow Path Corrective Actions and Deadlines		
<u>Activities</u>	<u>Deadline</u>	<u>Date Completed</u>
<i>L-8 FEB 45,000 acre-feet</i>		
Construction status report	3/1/2015	2/26/2015
<i>L-8 Divide Structure</i>		
Initiate construction	10/1/2016	9/11/2014
<i>S-5AS Modifications</i>		
Initiate construction	10/1/2014	9/11/2014
<i>STA-1W 4,700-Acre Expansion</i>		
Submit state and federal permit applications	7/30/2014	7/22/2014
Central Flow Path Corrective Actions and Deadlines		
<i>A-1 FEB 54,000 acre-feet</i>		
Construction status report	3/1/2015	2/26/2015

EASTERN FLOW PATH



Figure 5A-2. Eastern Flow Path project components: L-8 FEB, L-8 Divide Structure (G-541), S-5AS Modifications, and STA-1W Expansion #1. Points preceded with an S denote structures constructed by the United States Army Corps of Engineers, points preceded with a G denote structures constructed by the District.

[Note: WCA 1 – Water Conservation Area 1.]

L-8 FEB

The L-8 FEB is located in a 950-acre former rock mine in central Palm Beach County (Figure 5A-2) located north of STA-1 East (STA-1E) and STA-1W and adjacent to and west of the L-8 canal. The site has a unique geology and the project is capable of storing approximately 45,000 acre-feet (ac-ft) of stormwater runoff to attenuate peak flows and improve STA-1E and STA-1W inflow delivery rates. In order to fully utilize the L-8 FEB, additional project features— inflow structure, outflow pump station, embankment protection measures, and strategic dredging to completely interconnect the cells—are required. To utilize the full storage capacity of the L-8 FEB for flow attenuation of water redirected from the STA-1 Inflow Basin, the new L-8 FEB inflow structure will have a capacity of 3,000 cubic feet per second (cfs) and will be able to fill the reservoir to its maximum water level of +16.5 feet (ft) North American Vertical Datum of 1988 (NAVD88) [+18.0 ft National Geodetic Vertical Datum of 1929 (NGVD29)]. The outflow pump station has a design capacity of approximately 450 cfs for delivery of flows from the L-8 FEB to the L-8 canal. The outflow pump station will be able to drawdown the FEB to an elevation of -37.0 ft NAVD88 (-35.5 ft NGVD29), which is approximately 5 feet above the bottom of the FEB. In addition, the project design establishes additional connections among the cells and creates a configuration that maximizes the exchange of water among cells.

Project Status: In construction (nearing completion).

WY2015 Update: Construction of the L-8 FEB is ongoing and a construction status report was submitted to FDEP in February 2015, in accordance with the consent orders (**Table 5A-1**). The levee revetment work, which consists of armoring the interior levee to prevent erosion, is nearing completion. Construction of the inflow works (**Figure 5A-3**), outflow pump station (**Figure 5A-4**), and cell connection improvements is ongoing and nearing completion.



Figure 5A-3. L-8 FEB inflow works (photo by SFWMD, May 2015).



Figure 5A-4. L-8 FEB outflow pump station (close-up on top; overview on bottom) (photos by SFWMD, May 2015).

L-8 Divide Structure (G-541)

The L-8 Divide Structure or G-541 is a fully automated, reinforced concrete water control structure located within the L-8 canal, east of the L-8 FEB (**Figure 5A-2**). G-541 enables the efficient transfer of water to the L-8 FEB from the STA-1 Inflow Basin, allows for efficient L-8 FEB outflow operations and enables L-8 FEB water to flow south to STA-1E and STA-1W. When closed, G-541 allows for L-8 canal stages south of G-541 to be raised and held but remain within the maximum operating ranges of the L-8 canal during L-8 FEB inflow and outflow operations. When fully open, G-541 is designed to have minimal head loss through the structure so as to make it as hydraulically invisible as economically feasible and have no impact on L-8 canal operations.

Project Status: In construction.

WY2015 Update: Construction was initiated in September 2014, approximately two years ahead of the consent order deadline (**Table 5A-1**). A bypass channel has been completed to allow for flows around the structure during construction, sheet piling has been installed, and concrete has been poured. Construction is ahead of schedule (**Figure 5A-5**) and anticipated to be completed well before the December 2018 consent order deadline.



Figure 5A-5. L-8 Divide Structure
(photo by SFWMD, May 2015).

S-5AS Modifications

The existing S-5AS structure is located at the southern terminus of the L-8 canal, where it connects to the STA-1 Inflow Basin (**Figure 5A-2**). The two cable-operated vertical lift gates, which have been automated, are remotely controlled in accordance with operational criteria. Under the Restoration Strategies Regional Water Quality Plan (SFWMD 2012b), a majority of S-5A basin and C-51 West basin runoff will be directed north through S-5AS to the L-8 FEB. As such, the use of S-5AS will increase and therefore needs to be upgraded. Upgrades include replacing the existing steel gates with stainless steel gates, implementing a concrete flow deflector at the north end of the

structure apron, and excavating the canal just north of the structure to create a larger basin in order to reduce the erosional effects of anticipated increases in flow velocities.

Project Status: In construction.

WY2015 Update: Construction was initiated in September 2014, approximately one month ahead of the consent order deadline (**Table 5A-1**); this project is currently ahead of schedule and is anticipated to be completed before the September 2016 consent order deadline (**Figure 5A-6**).



Figure 5A-6. S-5AS Modifications including canal bank armoring (photos by SFWMD, March and April 2015, respectively).

STA-1W Expansion #1

The STA-1W Expansion project consists of approximately 6,500 acres of additional treatment wetlands that will work in conjunction with the existing STA-1W and enable the new Eastern Flow Path projects to perform consistent with the WQBEL. The STA-1W Expansion project is being designed and constructed in two phases. Expansion #1 (**Figure 5A-7**) will provide approximately 4,200 acres of effective treatment area and Expansion #2 is anticipated to provide at least 1,700 acres of effective treatment area. Both expansions were conceptualized during the design of Expansion #1, but each expansion will be planned, permitted, designed, and constructed separately.

The design of the existing STA-1W was constrained by the available land and the need to maximize the effective treatment area while maintaining the necessary hydraulics to move water through the wetland system for both water quality treatment and flood control purposes. During the design of STA-1W Expansion #1, the integration of the existing STA-1W with STA-1W Expansion #1 and the associated infrastructure, configuration, and operational protocols needed to utilize both facilities in series to optimize performance was incorporated. The final design also incorporated the best available information to ensure appropriate vegetation partitioning and water depths.

Project Status: In design. Final design will be complete in June 2015.

WY2015 Update: State and federal permit applications for construction and operations were submitted by SFWMD by July 2014 and the final design will be completed in June 2015, approximately one month ahead of the consent order deadline (**Table 5A-1**). Construction will begin by January 2016.

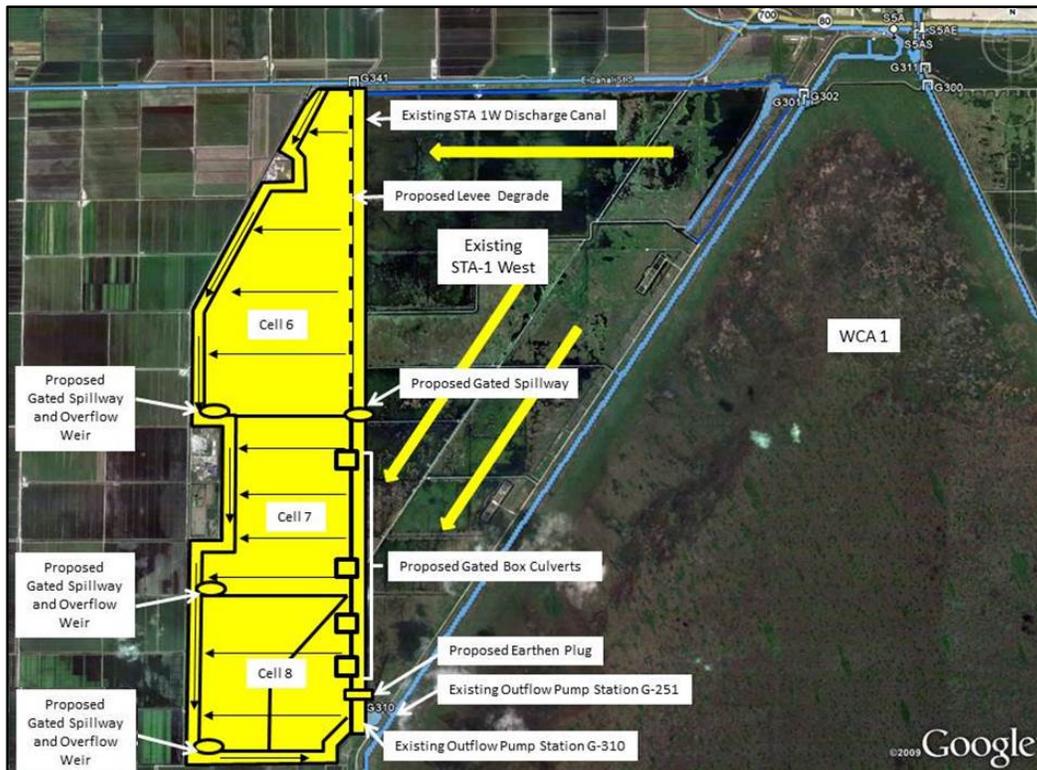


Figure 5A-7. STA-1W Expansion #1 schematic.

[Note: WCA 1 – Water Conservation Area 1.]

CENTRAL FLOW PATH

A-1 FEB

The A-1 FEB (**Figure 5A-1**) is a shallow, aboveground impoundment with a capacity of approximately 60,000 ac-ft at an approximate maximum operating depth of 4 ft. The primary purpose of the A-1 FEB is to attenuate peak stormwater flows, temporarily store stormwater runoff from the central Everglades Agricultural Area (EAA), collected by the North New River and Miami canals, and improve inflow delivery rates to STA-2 (including Compartment B) and STA-3/4, thereby providing enhanced operation and phosphorus treatment performance to assist in achieving state water quality standards in the EPA. By managing basin runoff in the Central Flow Path in a more advantageous manner, the impacts of storm-driven events would be reduced at STA-2 and STA-3/4. The A-1 FEB project may also be used to assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STA-2 and STA-3/4, which will also sustain phosphorus treatment performance.

Inflows are conveyed to the A-1 FEB via two operable water control structures (**Figures 5A-8** through **5A-10**). The A-1 FEB receives stormwater runoff from the Miami Canal via existing pump station G-372, and from the North New River Canal via existing pump station G-370. After inflows are conveyed to the north end of the FEB, the water will be spread utilizing the northern scraped area to enable sheet flow from north to south. The existing STA-3/4 seepage canal will be used as a collection and conveyance canal to assist in conveying water out of the FEB. Outflows will be conveyed by operable water control structures to the North New River Canal or to the STA-3/4 inflow canal.

Project Status: In construction (nearing completion).

WY2015 Update: Construction of the A-1 FEB has been ongoing and is expected to be completed by the end of 2015. A construction status report was submitted to FDEP in February 2015, in accordance with the consent orders (**Table 5A-1**). The perimeter levees are almost complete and the internal earthwork is finished. Final construction on the inflow and outflow water control structures is on schedule. Construction of the A-1 FEB is expected to be completed ahead of the consent order deadline of July 2016.



Figure 5A-8. A-1 FEB inflow structure G-720 (photo by SFWMD, June 2015).



Figure 5A-9. A-1 FEB looking east towards pump station G-370 (photo by SFWMD, June 2015).



Figure 5A-10. One of the eleven A-1 FEB outflow structures (photo by the SFWMD, June 2015).

ADDITIONAL COMPONENTS

Subregional Source Controls

Potential projects within the S-5A Basin (**Figure 5A-1**) were considered based on a combination of factors, including water quality of farm discharges, proximity and potential impact to STA-1W, and having willing local participants.

The larger subregional source control planning and implementation effort is anticipated to begin in October 2015. An opportunity to begin a project early was presented, developed, and implemented in WY2013. The first subregional source control project is a three-year cooperative agreement between SFWMD and East Beach Water Control District near Pahokee to implement a subregional canal cleaning implementation and demonstration project within the S-5A Basin (Leeds 2015).

Project Status: Conceptual project planning and monitoring phase.

WY2015 Update: District water quality staff have continued collecting samples from the canals that are a part of the demonstration project (Leeds 2015). Monitoring will continue through September 2016, at which time an analysis and report will be completed with the results. Conceptual project planning has started, leading to a proposed feasibility study and additional canal monitoring anticipated beginning in late 2015.

Replacement Feature – Mecca Shallow Impoundment

The Mecca property (**Figure 5A-1**), referred to as the replacement storage feature, is approximately 1,920 acres of former citrus grove that was purchased by SFWMD from Palm Beach County in December 2013. The proposed conceptual plan for the site is to construct a shallow water storage feature approximately 5 ft deep that will enable the storage of excess stormwater runoff from the C-18 western basin. These flows will then be discharged back to the C-18 canal to be delivered to the Loxahatchee River when needed to support the recovery strategy for the reduction of minimum flows and levels exceedances and violations and to better meet restoration targets for this Wild and Scenic River.

Project Status: In preliminary design.

WY2015 Update: A detailed design report has been initiated for the pump stations and the interior earthwork, which will inform the preliminary through final design process.

LITERATURE CITED

- FDEP. 2012a. STA National Pollutant Discharge Elimination System (NPDES) Watershed Permit (Number FL0778451) and Associated Consent Order (OGC 12-1148). Florida Department of Environmental Protection, Tallahassee, FL. September 10, 2012.
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