

# Supplemental Environmental Assessment and Finding of No Significant Impact

G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST  
AND S-357N REVISED OPERATIONAL STRATEGY:  
INCREMENT 1 PLUS (INCREMENT 1.1 AND 1.2)



**Miami-Dade County, Florida**



**US Army Corps  
of Engineers** ®  
Jacksonville District

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DEPARTMENT OF THE ARMY  
JACKSONVILLE DISTRICT CORPS OF ENGINEERS  
701 San Marco Boulevard  
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO  
ATTENTION OF

**FINDING OF NO SIGNIFICANT IMPACT  
G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N REVISED  
OPERATIONAL STRATEGY: INCREMENT 1 PLUS (INCREMENT 1.1 AND 1.2)  
MIAMI-DADE COUNTY, FLORIDA**

I have reviewed the Supplemental Environmental Assessment (EA) for the Proposed Action.

Operations in the project area are currently governed by Increment 1 Gage-3273 (G-3273) Constraint Relaxation/Pump Station 356 (S-356) field test and S-357N Operational Strategy which is a deviation to the 2012 Water Conservation Areas (WCAs), Everglades National Park (ENP), and ENP to South Dade Conveyance System (SDCS) Water Control Plan (hereafter referred to as the 2012 Water Control Plan). The Increment 1 field test is the first increment in a series of related, sequential efforts that will result in a comprehensive integrated water control plan, referred to as the Combined Operating Plan, for the operation of the water management infrastructure connected to the Modified Water Deliveries to ENP and Canal 111 (C-111) South Dade Projects. The Increment 1 field test maintains the stage maximum operating limit of 7.5 feet National Geodetic Vertical Datum (of 1929 NGVD) in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage into the L-31N Canal. National Environmental Policy Act (NEPA) documentation for the Increment 1 field test was completed on May 27, 2015 with signing of a Finding No Significant Impact (FONSI) incorporating an EA.

Increment 1 duration was planned for approximately two years, with a minimum duration of one year. However, implementation of the Increment 1 field test occurred from October 15, 2015 to December 1, 2015 after which the Corps began to proceed with pre-storm drawdown and flood control operations due to very strong El Niño conditions experienced in the WCAs during the 2015-2016 dry season. The pre-storm drawdown and flood control operations were conducted in accordance with the 2012 Water Control Plan, independent of the Increment 1 field test. At the request of the South Florida Water management District (SFWMD), the Corps initiated a temporary emergency deviation to the Increment 1 stage maximum operating limit of 7.5 feet, NGVD in the L-29 Canal for purposes of providing high water relief in WCA 3A on February 15, 2016 (hereafter referred to as the 2016 Temporary Emergency Deviation). The EA and FONSI for that action is dated February 12, 2016. A Supplemental EA and FONSI to provide further documentation of the environmental effects resulting from the action was signed May 10, 2016.

Upon review of monitoring data associated with Increment 1 and the 2016 Temporary Emergency Deviation, it became apparent that modifications are necessary to the Increment 1 operational strategy to maintain the Congressionally-authorized flood mitigation requirements within the 8.5 SMA and to facilitate completion of the C-111 South Dade Projects ongoing construction necessary for Increment 2 of the field test. Thus the proposed action covered in the current EA which includes additional operational flexibility within the revised operational strategy for Increment 1 Plus (hereafter referred to as Increment 1.1 and 1.2) to operate the L-29 Canal to a maximum of 7.8 feet, NGVD, subject to downstream constraints. Increment 1.1 of the operational strategy will maintain the L-29 Canal operating constraint of 7.5 feet, NGVD. Increment 1.2 will increase the L-29 Canal operating constraint up to 7.8 feet, NGVD. The Corps is also proposing to modify the Increment 1 operational strategy to address the mandated terms and conditions of the July 22, 2016 Everglades Restoration Transition Plan (ERTP) Biological Opinion (BO), which includes expanded closure periods for S-12A, S-12B, S-343A, S-343B, and S-344 as mandated by the Reasonable and Prudent Alternative identified within the BO.

The combined duration of Increment 1 and Increment 1.1 and 1.2 may extend beyond the two calendar years initially envisioned for Increment 1 to compensate for the temporary suspension of the Increment 1 field test during the 2016 Temporary Emergency Deviation and extended recovery period (February-November 2016). In addition to the 2016 Temporary Emergency Deviation, extension of the Increment 1 and Increment 1.1 and 1.2 field test duration to up to three years will allow sufficient time to complete the C-111 South Dade construction components needed to operate the Northern Detention Area during Increment 2 of the MWD Project. Increment 1 operations will extend until implementation of Increment 1.1 and 1.2 which will extend until implementation of Increment 2.

This Finding incorporates by reference all discussions and conclusions contained in the Supplemental EA enclosed hereto. Based on information analyzed in the Supplemental EA, reflecting pertinent information obtained from agencies having jurisdiction by law and/or special expertise, I conclude that the Proposed Action will not significantly affect the quality of the human environment and does not require an Environmental Impact Statement. Reasons for this conclusion are in summary:

a. The Proposed Action is in full compliance with the Endangered Species Act and the Fish and Wildlife Coordination Act. The Proposed Action would not adversely affect protected species. Measures have been incorporated into the monitoring plan to avoid or minimize adverse effects to any listed endangered, threatened, or species of special concern that may be present. The Corps agrees to maintain open and cooperative communication with the U.S. Fish and Wildlife Service and Florida Fish and Wildlife Conservation Commission during operations.

b. The Corps has coordinated a consistency determination pursuant to the Coastal Zone Management Act through the circulation of this Supplemental EA. The Corps has determined that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of Florida's approved Coastal Zone Management Program. The Florida State Clearinghouse has reviewed the Proposed Action and has stated that the Proposed Action is consistent with the Coastal Zone Management Program (CZMP). Final concurrence of consistency with the CZMP will be determined during environmental permitting processes, as applicable.

c. The Proposed Action has been coordinated with the Florida State Historic Preservation Officer and the appropriate federally recognized Tribes in accordance with the National Historic Preservation Act and consideration given under the National Environmental Policy Act. The Corps has determined that the Proposed Action will no adverse effect on historic properties eligible or potentially eligible for listing in the National Register of Historic Places.

d. The Proposed Action will not adversely affect water quality and will be in compliance with the appropriate conditions in the Everglades Forever Act Permit (File No. 0246512-10) and consistent with the Clean Water Act. Water quality monitoring is proposed in the monitoring plan.

e. The Proposed Action will maintain the authorized purposes of the Central and Southern Florida Project, which include flood control; water supply for agricultural irrigation, municipalities and industry, and ENP; regional groundwater control and prevention of saltwater intrusion; enhancement of fish and wildlife; and recreation.

In view of the above and the attached Supplemental EA, and after consideration of public and agency comments received on the project, I conclude that the Proposed Action would not result in a significant effect on the human environment. This Proposed Finding of No Significant Impact incorporates by reference all discussions and conclusions contained in the Supplemental EA enclosed herewith.

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C. David Turner  
Brigadier General, U.S. Army  
Commanding

16 Feb 17

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Date

**SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT  
ON  
G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N REVISED  
OPERATIONAL STRATEGY: INCREMENT 1 PLUS (INCREMENT 1.1 AND 1.2)  
MIAMI-DADE COUNTY, FLORIDA**

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**SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT  
ON  
G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N REVISED  
OPERATIONAL STRATEGY: INCREMENT 1 PLUS (INCREMENT 1.1 AND 1.2)  
MIAMI-DADE COUNTY, FLORIDA**

## **1.0 PROJECT PURPOSE AND NEED**

### **1.1 PROJECT AUTHORITY**

The Everglades National Park (ENP) Protection and Expansion Act, (Public Law [PL] 101-229, Section 104, 16 U.S.C. Part 410r-5 *et seq.*, December 1989), authorized the Secretary of the Army to undertake certain actions to improve water deliveries from the Central & Southern Florida (C&SF) Project to ENP.

Section 104 (a) (1)-(3) of the Act directed the U.S. Army Corps of Engineers (Corps) to address restoration of water deliveries and natural hydrological conditions. The Act states:

*(a)(1) Upon completion of a final report by the Chief of the Army Corps of Engineers, the Secretary of the Army, in consultation with the Secretary, is authorized and directed to construct modifications to the Central and Southern Florida Project to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the park.*

*(2) Such modifications shall be based upon the findings of the Secretary's experimental program authorized in Section 1302 of the 1984 Supplemental Appropriations Act (97 Stat. 1292) and generally as set forth in a General Design Memorandum to be prepared by the Jacksonville District entitled "Modified Water Deliveries to Everglades National Park". The Draft of such Memorandum and the Final Memorandum, as prepared by the Jacksonville District, shall be submitted as promptly as practicable to the Committee on Energy and Natural Resources and the Committee on Environment and Public Works of the United States Senate and the Committee on Interior and Insular Affairs and the Committee on Public Works and Transportation of the United States House of Representatives.*

*(3) Construction of project modifications authorized in this subsection and flood protection systems authorized in subsections (c) and (d) are justified by the environmental benefits to be derived by the Everglades ecosystem in general and by the park in particular and shall not require further economic justification.*

Public Law 101-229 was amended by PL 108-7 (Appropriations Act, 2003). This authorization bill identified Alternative 6D (the Selected Alternative in the July 2000 General Reevaluation Report [GRR] and Final Supplemental Environmental Impact Statement [EIS] for 8.5 Square Mile Area [8.5 SMA]) as the plan to be built, authorized relocation of residents, and other provisions (USACE 2000). Tamiami Trail Modifications are described in the Final Limited Reevaluation Report and Environmental Assessment (EA) and its addendum (USACE 2008).

## 1.2 PROJECT LOCATION

The water management operating criteria relating to the 2012 Water Conservation Areas (WCAs), ENP, and ENP to South Dade Conveyance System (SDCS) Water Control Plan affects an area within the C&SF Project located in south Florida and includes portions of several counties, as well as WCA 3, ENP, Big Cypress National Preserve (BCNP), and adjacent areas. The Modified Water Deliveries (MWD) Project is a modification of the C&SF Project. Features of the MWD Project are located in Miami-Dade County, including portions of ENP and adjacent areas (**Figure 1-1**). The 1992 MWD General Design Memorandum (GDM) and Final EIS defines the project boundary as Shark River Slough (SRS) and that portion of the C&SF Project north of structure 331 (S-331) to include WCA 3.



**FIGURE 1-1. PROJECT LOCATION AND RELEVANT C&SF PROJECT FEATURES OF THE MWD PROJECT AND C-111 PROJECTS**

### 1.3 PROJECT BACKGROUND

The C&SF Project currently functions and was originally authorized to function as a multi-purpose water management system. The authorized project purposes include flood control; water supply for agricultural irrigation, municipalities and industry, and ENP; regional groundwater control and prevention of saltwater intrusion; enhancement of fish and wildlife; and recreation.

#### 1.3.1 MODIFIED WATER DELIVERIES PROJECT

The MWD Project includes modifications to the C&SF Project to provide a system of water deliveries to ENP across the full width of the historic SRS flow way and consists of four main components: (1) conveyance and seepage control features to facilitate flow through the system from WCA 3A to WCA 3B and to limit seepage eastward from WCA 3B and ENP; (2) modifications to Tamiami Trail to facilitate flow under the road to SRS; (3) flood mitigation for the developed East Everglades area (also referred to as the 8.5 SMA); and (4) project implementation support, which includes monitoring and operational changes. The MWD GDM and Final EIS (USACE 1992) includes a discussion of the location, capacity, and environmental impacts for the proposed structural modifications, which included structures S-345A, B and C; S-349A, B and C; S-355A and B; S-334 modification, removal of the L-67 Extension Levee and borrow canal filling; and a levee and canal system for flood mitigation in 8.5 SMA. The levee and canal system included two pumping stations, S-356 and S-357 (**Figure 1-1**).

The 8.5 SMA features were constructed to provide flood mitigation to the privately-owned lands in the Las Palmas Community located east of ENP, in order to prevent impacts from higher stages within Northeast Shark River Slough (NESRS) resulting from the implementation of MWD. A GRR and Final Supplemental EIS for the 8.5 SMA were completed in July 2000 (USACE 2000). The GRR recommended Alternative 6D, consisting of a perimeter levee (Levee 357W [L-357W]), internal levees, an interior seepage collection canal (C-357), a new pump station (S-357), and a detention area that would discharge into the proposed C-111 South Dade Northern Detention Area (NDA), as part of the C-111 South Dade Project (**Figure 1-1**). A design refinement for the 8.5 SMA and EA was completed in August of 2012 (USACE 2012a). An operational test conducted in 2009 indicated that the S-357 pump station and other 8.5 SMA features may not adequately mitigate impacts from increased flows to the southwest corner of the 8.5 SMA. To ensure capability to use the S-357 pump station at maximum design capacity following completion of the NDA, new hydrologic modeling identified an additional east-west seepage collection canal (C-358) (**Figure 1-3**) was needed to properly mitigate groundwater stages in the southwest corner (east of L-357W). A gated control structure (S-357N), currently planned to be constructed by January 2017, will connect the C-358 seepage collection canal to the existing C-357 Canal, upstream of S-357. The 2012 Design Refinement for the 8.5 SMA EA did not address water management operating criteria for S-357N or C-358 and stated that all gates would be in the closed position until a new operational protocol is developed for the MWD Project (USACE 2012a).

Much of the MWD Project has been completed, including the 8.5 SMA Project, construction of S-355A and B, S-333 and S-334 modifications, S-356, Tiger Tail camp raising, removal of four miles of the L-67 Extension Levee, and Tamiami Trail modifications. However, some features originally included in the 1992 MWD GDM and Final EIS, including features to provide hydrologic connectivity between WCA 3A and WCA 3B and complete degradation of the L-67

Extension Levee and adjacent canal, have not been completed for various reasons, including operational (water levels) constraints within WCA 3B, lowered MWD maximum operational stages for the L-29 Canal (9.7 feet National Geodetic Vertical Datum 1929 (NGVD) was assumed with the 1992 MWD GDM and Final EIS), and potential water quality concerns. In coordination with the Department of the Interior (DOI) and SFWMD, the Corps has determined that the previously constructed MWD features and the MWD features currently under construction (C-358 and S-357N), along with the acquisition of remaining real estate interests and completion of a project Water Control Plan, will achieve the statutory charge to improve water deliveries into the ENP and, to the extent practicable, to restore the natural hydrological conditions within the ENP.

### 1.3.2 C-111 SOUTH DADE PROJECT

The C-111 South Dade Project is part of the C&SF Project authorized by Section 203 of the Flood Control Act of 1948, Public Law 80-858, as modified by Section 203 of the Flood Control Act of 1968, Public Law 90-483. The C-111 South Dade Integrated GRR and EIS were published in May 1994 (USACE 1994). This report described a plan to construct five pump stations and a levee-bounded retention/detention area to be built west of the L-31N Canal, between the 8.5 SMA and the Frog Pond Area (south of S-332D), to control seepage out of ENP and reduce damaging freshwater discharges to Manatee Bay/Barnes Sound while maintaining flood protection to agricultural lands east of C-111 Canal. The 1994 GRR plan also proposed a spreader canal, plugs in the C-109 and C-110 Canals, and degradation of the spoil mound south of the C-111 Canal to provide overland flow into the ENP Eastern Panhandle towards northeast Florida Bay. The existing and proposed configuration of these structural features are described in detail in the 2006 Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow (CSSS) Final Supplemental EIS (USACE 2006), the 2012 EA for the expansion of the C-111 South Dade NDA (USACE 2012b), and the 2016 EA and FONSI for modifications to the C-111 South Dade North and South Detention Areas and associated features (USACE 2016a) are depicted in **Figure 1-2**.

The remaining features of the C-111 South Dade Project currently under construction include but is not limited to: the NDA which will link the C-111 South Dade Project to the MWD Project 8.5 SMA detention area; two internal flowway berms (L-360E and L-360W) inside the 8.5 SMA Detention Cell; L-357W Levee crossing at Richmond Drive; modification of the outlet weirs (S-360E and S-360W) for the 8.5 SMA detention area. The C-111 NDA will be created by extending the existing L-315 north levee (NDA western perimeter levee) and realigning and extending the L-316 levee (NDA eastern perimeter levee), with both levees connected to the 8.5 SMA detention area perimeter levees. Earthen flowway berms would also be constructed within the interior of both the NDA (L-318) and SDA (L-321), with the intention of creating a narrow interior flow-way to maintain the hydraulic ridge during periods of limited water availability. Following completion of the C-111 South Dade NDA and modification of the outlet weirs for the 8.5 SMA detention area, the 8.5 SMA detention area will discharge directly into the NDA. While a preliminary operational plan was included with the 1994 GRR, the GRR identified a need for a refined operation plan to be developed in coordination with ENP, FWS, SFWMD and other agencies prior to completion of project construction. The future Combined Operational Plan (COP) study will result in a comprehensive integrated water control plan for the operation of the water management infrastructure associated with the MWD and C-111 South Dade Projects.

An EA and Proposed FONSI for additional modifications to the C-111 South Dade Project, other than those noted above, has completed public review and evaluates options for backfill and/or placement of plugs within the existing L-31W Canal and modifying existing features, including the gap in the L-31W levee (USACE 2016b). Water drained into the L-31W borrow canal, which is immediately adjacent to ENP, flows as groundwater and surface water to the south and east, raising groundwater and C-111 levels and impeding drainage of lands east of C-111. Fill or plugging in L-31 W, along with modifications to the L-31W levee gap, are expected to provide additional rehydration benefits to lands in eastern ENP, in addition to the expansion of the NDA and construction of flowways in both the NDA and SDA (USACE 2016a).

### 1.3.3 C-111 Spreader Canal Western Project

The WRDA of 2000 Section 601(b)(1)(A) approved the Comprehensive Everglades Restoration Plan (CERP) as a framework for modifications to the C&SF Project that are needed to restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection. The C-111 Spreader Canal Western Project is one of the projects that make up the CERP. The C-111 Spreader Canal Western Project Final Integrated Project Implementation Report (PIR) and EIS were published in January 2011 (USACE 2011a). The project was authorized in the Water Resources Reform and Development Act (WRRDA) of 2014. The C-111 Spreader Canal Western Project is located in southern Miami-Dade County, in an area bounded by ENP, the Florida City-Homestead area, and Manatee Bay. Components of the project include construction of a six-mile hydraulic ridge between Taylor Slough and the C-111 Canal to reduce seepage loss from Taylor Slough and its headwaters. Implementation of the project will improve the quantity, timing and distribution of water delivered to Florida Bay via Taylor Slough; improve hydroperiods and hydropatterns in the Southern Glades and Model Lands; and return coastal salinities to historical recorded conditions through the redistribution of water that is currently discharged to the Atlantic Ocean and Gulf of Mexico. The hydraulic ridge will be created by constructing a 590 acre above ground detention area in the Frog Pond area (south of S-332D) and by installing two 225 cubic feet per second (cfs) pump stations (S-199 and S-200), and integrating other C-111 Spreader Canal Western Project features (**Figure 1-1**). The project will also begin restoration of the Southern Glades and Model Lands with an operable structure in the lower C-111 Canal (S-198), incremental operational changes to increase stages upstream of the S-18C structure, a plug just south of the location of structure S-20A within the L-31E Canal, operational changes at the S-20 structure, and construction of earthen plugs at the C-110 Canal.

The South Florida Water Management District (SFWMD) has implemented features of the C-111 Spreader Canal Western Project under the State Expedited Construction program (*i.e.* Accelerate Everglades Restoration Project [Acceler8]) for the purpose of expediting design and construction of a number of critical restoration projects consistent with the CERP. A Department of Army permit (SAJ-2005-9856 [IP-AAZ]) was issued to the SFWMD on October 14, 2009 for the construction and operation of the project. Initial construction of the C-111 Spreader Canal Western Project was completed in January 2012 with completion of the Frog Pond Detention Area, partial Aerojet Canal features, plugs in the C-110 Canal, and a plug at S-20A. Construction of the remaining two southern weirs along the Aerojet Canal began in November 2014 and was completed in early 2015. Construction of a new water control structure in the lower C-111 Canal

(i.e. S-198, which would be located south of S-18C) and incremental increases in the open/close stage triggers at S-18C have not yet been implemented.

The SFWMD initiated operation of the C-111 Spreader Canal Western Project constructed components in June 2012, in accordance with the Project Operating Manual (POM) developed with the PIR. At the request of SFWMD, a revised POM was approved in June 2016. Steps will be taken in the future to incorporate the project into the federally authorized C&SF Project once the project's consistency with the 2014 WRRDA authorized project has been documented and approved by the Corps, and a PPA between the Corps and SFWMD has been executed. Pending execution of the PPA, operation of the C-111 Spreader Canal Western Project is not included as part of the 2012 WCAs, ENP, and ENP to SDCS Water Control Plan (hereafter referred to as the 2012 Water Control Plan) (USACE 2012c). Concurrent with the MWD Increment 1 field test, the SFWMD will continue to operate their expedited C-111 Spreader Canal Western Project, and the SFWMD will continue to monitor the impacts of the project and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project as per their regulatory permit. It is presently anticipated that additional information generated from the ongoing SFWMD monitoring within the C-111 Spreader Canal Western Project area will be considered during development of the COP.

The SFWMD is currently seeking proposed modifications to the C-111 Spreader Canal Western Project which includes increasing the installed pump capacity at S-199 and S-200 by installing an additional 75 cfs electric pump in each of the existing vacant bays (1 per pump station), and connecting the C-200 Header Channel to the L-31W Canal (via culvert). Both of these modifications are intended to increase the quantity of fresh water delivered to Florida Bay via Taylor Slough. Reference **Section 2.1**.

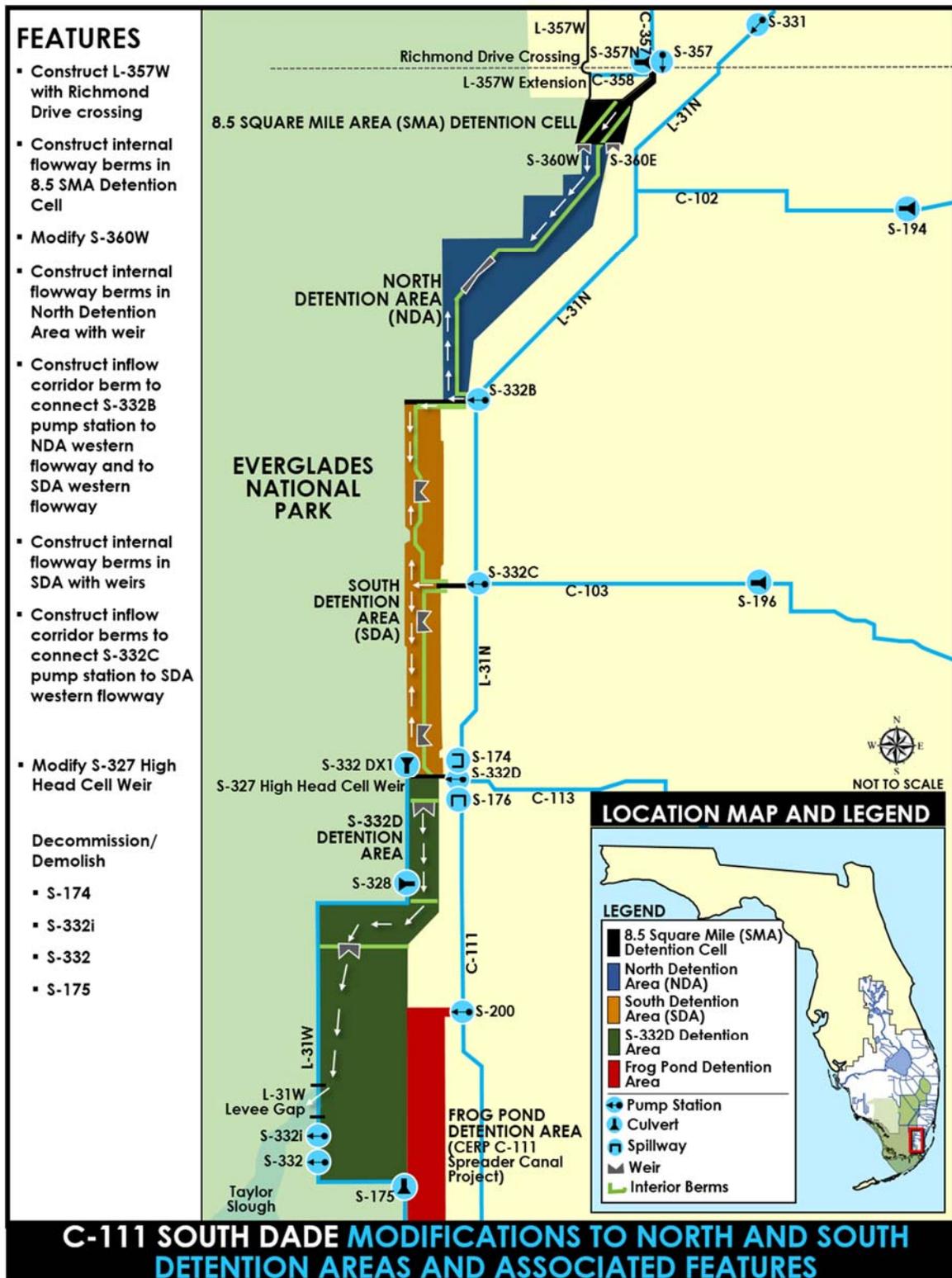


FIGURE 1-2. C-111 SOUTH DADE PROJECT FEATURES THAT ARE BUILT OR CURRENTLY UNDER CONSTRUCTION

### 1.3.4 INCREMENT 1 FIELD TEST

The Corps initiated the Increment 1 field test under the authority of the MWD Project, to evaluate raising or removing the existing G-3273 stage constraint for inflow into NESRS and operate the S-356 pump station for control of seepage into the L-31N Canal in October of 2015. The field test is the first increment in a series of related, sequential efforts that will result in a comprehensive integrated water control plan, referred to as the COP, for the operation of the water management infrastructure associated with the MWD and C-111 South Dade Projects. G-3273 lies within eastern ENP, approximately 2.5 miles west of the 8.5 SMA (**Figure 1-1**). The G-3273 constraint of 6.8 feet, NGVD was originally established as a flood protection measure. Prior to implementation of the Increment 1 field test, a stage of 6.8 feet, NGVD at this gage had been used since 1985 as a trigger to cease S-333 discharges from flowing south into NESRS as a protective measure for residential areas to the east, particularly the 8.5 SMA.

The Increment 1 field test is a planned deviation from the 2012 Water Control Plan (USACE 2012c). The 2012 Water Control Plan, which includes the WCA 3A Regulation Schedule, Rainfall Plan, and the Interim Operating Criteria for the 8.5 SMA Project continued to govern water management operations during Increment 1, with the exception of operating criteria for S-333, S-334, S-356, S-197, and S-357N (USACE 2015). Increment 1, which was initiated on October 15, 2015, maintained the 2012 Water Control Plan stage maximum operating limit of 7.5 feet, NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilized S-356 for the control of seepage to the L-31N Canal. During Increment 1, it was anticipated that the combined flows to NESRS through S-333 and S-356 would be more than what would have otherwise been discharged through S-333 under the 2012 Water Control Plan. Additionally, it was anticipated that during implementation of water management operations associated with the Increment 1 field test, under typical hydro-meteorological conditions, the combined flows through S-173 and S-331 to the C-111 Basin would be less than what would have been discharged through these features under the 2012 Water Control Plan. Increment 1 also included a testing protocol to assist in defining operating criteria for the new 8.5 SMA S-357N water control structure following completion of construction. Construction of S-357N has not yet been completed.

National Environmental Policy Act (NEPA) documentation for Increment 1 was completed on May 27, 2015 with signing of a FONSI incorporating an EA. Increment 1 duration was planned for approximately two years, with a minimum duration of one year. Implementation of Increment 1 was limited from October 15, 2015 to December 1, 2015, after which the Corps began to proceed with pre-storm drawdown and flood control operations due to very strong El Niño conditions experienced in the WCAs during the 2015-2016 dry season. The pre-storm drawdown and flood control operations were conducted in accordance with the 2012 Water Control Plan, independent of the Increment 1 field test. Regional water management operations next transitioned into a temporary emergency deviation to alleviate high water levels within WCA 3 (hereafter referred to as the 2016 Temporary Emergency Deviation). When the Increment 1 EA and FONSI was completed on May 27, 2015, completion of S-357N was anticipated by April 2015, prior to the initiation of Increment 1 operations. The Corps currently anticipates completion of S-357N by March 2017.

### 1.3.5 TEMPORARY EMERGENCY DEVIATION TO ALLEVIATE HIGH WATER LEVELS IN WATER CONSERVATION AREA 3

Due to the very strong El Niño during the 2015 to 2016 dry season, WCA 3A experienced unseasonable high water levels. The first half of the dry season (November 2015-January 2016) was the wettest for this period since record keeping began in 1932. To protect natural resources within WCA 3A in correspondence dated February 11, 2016, the Governor of Florida requested that the Corps take immediate action to relieve flooding of the Everglades WCAs by raising the level of the L-29 Canal to 8.5 feet, NGVD so that substantial volumes of water could be moved from WCA 3A to ENP through SRS. The Corps initiated a temporary emergency deviation to the stage maximum operating limit of 7.5 feet, NGVD in the L-29 Canal on February 15, 2016 at the request of the Governor, for purposes of providing high water relief in WCA 3A.

The 2016 Temporary Emergency Deviation mediated high water levels within WCA 3A by allowing for the full discharge capacity through S-333 into the L-29 Canal in addition to the use of additional WCA 3A outlets such as S-152. S-152 is located on the L-67A levee and serves as a connection between WCA 3A and WCA 3B. The 2016 Temporary Emergency Deviation also included other operational changes needed to mediate any concern with increased seepage from ENP into the SDCS. The Corps approved the SFWMD request for additional operational flexibility to increase WCA 3A discharge by raising the L-29 constraint up to 8.5 feet, NGVD with corresponding lowering of the 8.5 SMA (C-357 and C-358, **Figure 1-2**), L-31N, and C-111 Canals to compensate for the resulting higher stages and increased groundwater seepage along the eastern boundary of ENP and further expanded utilization of Column 2 operations to convey WCA 3A releases to the SDCS. The G-3273 trigger relaxation, which is a major component of the Increment 1 field test was kept throughout the 2016 Temporary Emergency Deviation. NEPA documentation to support the 2016 Temporary Emergency Deviation was completed on February 12, 2016 with signing of a FONSI, incorporating an EA (USACE 2016c). A Supplemental EA and FONSI were completed on May 10, 2016 (USACE 2016d).

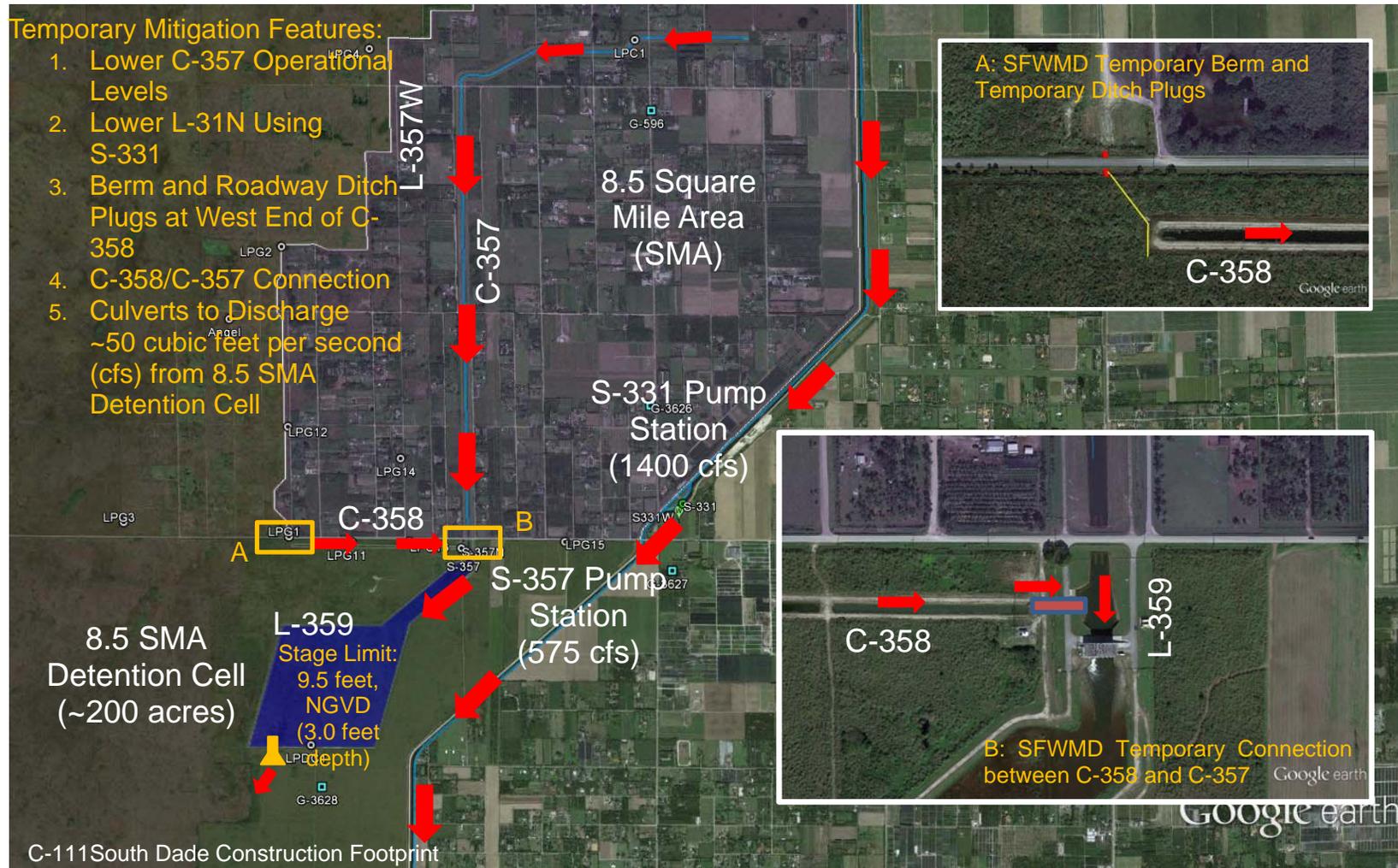
Residents within the 8.5 SMA expressed concern during implementation of the 2016 Temporary Emergency Deviation due to observed increases in ground and surface water. In response to these concerns, the South Florida Water Management District (SFWMD) constructed temporary measures including the use of temporary pumps and an open channel connection between the C-358 Canal and the C-357 Canal prior to construction of S-357N to maintain flood mitigation requirements for the 8.5 SMA; the S-357N is a gated control structure that will connect the C-358 Seepage collection canal to the existing C-357 Canal, upstream of S-357 within 8.5 SMA (**Figure 1-3**). The SFWMD also constructed temporary plugs in the drainage swales located north and south of Richmond Drive (SW 168<sup>th</sup> Street), and a berm around the western end of the C-358 Canal, consistent with design refinements associated with the C-111 South Dade Project (**Section 1.3.2**). Design refinements associated with the C-111 South Dade Project include the extension of the L-357 W Levee from the 8.5 SMA Detention Cell to the southern limits of Richmond Drive and the completion of the remaining levee segment to cross Richmond Drive, including construction of a ramp over the new levee segment to maintain western access to ENP, as currently anticipated under Contract 8 and Contract 8A of the C-111 South Dade Project. The temporary plugs were constructed to help decrease potential increases in groundwater stages adjacent to the existing LPG-1 groundwater monitoring gauge (**Figure 1-3**), which is located to the north of

Richmond Drive between SW 213<sup>th</sup> Avenue and the L-357 W Levee alignment, in the absence of the completion of the L-357W extension.

The SFWMD also installed temporary culverts in the southern levee of the 8.5 SMA Detention Cell in an area where the planned degrading of the S-360W weir will take place to connect the 8.5 SMA Detention Cell to the future C-111 South Dade NDA, as currently anticipated under modifications to the C-111 South Dade Project (USACE 2016a). This effort was undertaken by the SFWMD in order to limit the increase in water depth in the 8.5 SMA Detention Cell that may be associated with the additional S-357 pumping coincident with the connection of the C-358 Canal to the C-357 Canal. By not allowing significant water storage depths within the 8.5 SMA Detention Cell, the potential for backwater drainage effects on the southwest corner of the 8.5 SMA (LPG-1 Gage) caused by retardation of the regional groundwater flow to the southeast is reduced.

During the 2016 Temporary Emergency Deviation, temporary flowage authorizations from private land owners along the L-29 Canal were obtained by the SFWMD allowing maximum stages of 8.5 feet, NGVD. With some improvements made by the SFWMD during the 2016 Temporary Emergency Deviation, sustained stages over 8.0 feet, NGVD were implementable during the period covered by the temporary flowage authorizations. Additional existing constraints at the remaining private ownerships along the L-29 Canal limited the peak operating stage during the temporary emergency deviation to about 8.3 feet, NGVD. In addition, flows at S-331, S-176 and S-177 were significantly increased to manage seepage into the L-31N and C-111 Canals. To achieve project purposes, the C-357, L-31N and C-111 Canals were operated lower than the Column 2 stages contained in the 2012 Water Control Plan.

The Florida Department of Environmental Protection (FDEP) issued an emergency final order (Emergency Authorization for Temporary Operational Changes to Address High Water Conditions in the South Florida Region, OGC case Nos.:00-0889) on February 11, 2016 waiving the requirement for state water quality certification for the 2016 Temporary Emergency Deviation. A second order (Emergency Measures-High Water Scenarios OGC No. 16-0286) was signed on May 11, 2016 by FDEP to continue to operate structures specifically referenced in the Department's emergency final order (dated February 11, 2016) through November 30, 2016.



**FIGURE 1-3. MITIGATION MEASURES IMPLEMENTED BY THE SFWMD FOR 8.5 SMA DURING THE 2016 TEMPORARY EMERGENCY DEVIATION (REFERENCE FIGURE 1-1 AND 1-2 FOR GENERAL LOCATION OF 8.5 SMA)**

Due to the critical nature of elevated water levels in WCA 3A and in compliance with the existing request by the Governor of Florida to maximize water releases, a second emergency NEPA document was prepared to deviate from the 2012 Water Control Plan for S-344 on the L-28 Levee (USACE 2012c, **Figure 1-1**). The Corps received a deviation request from the SFWMD requesting the use of S-344 to provide additional high water relief to WCA 3A on April 1, 2016. The purpose of S-344 and associated features located along the L-28 Levee and Borrow Canal, are to restore overland flow to an area of BCNP just south of the L-28 Tieback; prevent over drainage of the eastern BCNP under dry conditions; and provide a means of making regulatory releases from WCA 3A into BCNP. The operational criteria during the deviation included full operational flexibility, subject to downstream constraints, to partially or completely open S-344, allowing up to approximately 200 cubic feet per second (cfs) to be released from WCA 3A into BCNP and the L-28 Canal. Due to concerns associated with the endangered Cape Sable seaside sparrow (CSSS), S-344 is closed as per the 2012 Water Control Plan from November 1 through July 14 annually (USACE 2012c). The deviation allowed the S-344 structure to continue to release water from WCA 3A in accordance with the approved water control plan until November 1, 2016. This deviation was fully coordinated with U.S. Fish and Wildlife Service (USFWS) and USFWS concurred with the deviation request via letter dated April 8, 2016. The EA and FONSI for that action is dated April 14, 2016 (USACE 2016e).

The 2016 Temporary Emergency Deviation included the relaxation of the L-29 Canal stage maximum operating limit of 7.5 feet, NGVD up to 8.5 feet, NGVD for a period of 90 days. The temporary emergency deviation also included a 60 day recovery period during which the water level would recede to stages typical of the recent hydrological conditions and the operational criteria under current C&SF Project operations, with the lowered operational ranges within the SDCS retained until this recovery period is completed. The 60 day recovery period was initiated on May 12, 2016 once the L-29 Canal constraint was returned to 7.5 feet, NGVD. In June of 2016, the Corps anticipated the likelihood of above average conditions/flows through most of the wet season. With flora and fauna still recovering from the high water event during the typical dry season months, it was important to prevent, to the extent practicable, another high water event during the 2016 wet season. Therefore the Corps proposed to extend the 60 day recovery period for purposes of maintaining lower canal levels along the L-31N and C-111 Canals, as well as to maintain flexibility to address potential 8.5 SMA flood mitigation issues identified during the temporary emergency deviation. The lower L-31N Canal levels, increased pumping at S-331, and reduced pumping at S-357 into the 8.5 SMA Detention Cell were also expected to benefit and facilitate the continued contractor progress with ongoing construction of the C-111 South Dade Project features following weather delays and site-related construction challenges throughout the 2015-2016 El Niño event. The 60 day recovery period was extended on July 11, 2016 and expired on November 30, 2016. A memorandum for record documenting NEPA compliance for the extension of the recovery period was completed on July 8, 2016. A USACE report which documents the first year of operations following the start of the Increment 1 field test in October 2015, with principal emphasis on the system conditions through the 2016 Temporary Emergency Deviation and subsequent recovery period, is provided as **Appendix A (Part 3)**. The report provides an overview of water management operations and C&SF system response for the October 2015 through September 2016 period, including comparison of observed precipitation to historical norms, system response summary for WCA 3A, monthly volumes delivered to NESRS compared to previous years under the 2012 Everglades Restoration Transition Plan monthly volumes

delivered to NESRS using the S-356 pump station (91% of the annual total was delivered during October through January, prior to the 2016 Temporary Emergency Deviation), operational summary for the 8.5 SMA, and operational summaries for the SDCS Canal reaches between S-334/S-335 and S-197.

A timeline for Increment 1 operations as well as temporary emergency deviations related to the L-29 Canal and S-344 structure is depicted below in **Table 1-1**.

**TABLE 1-1. TIMELINE FOR INCREMENT 1 OPERATIONS AND THE 2016 TEMPORARY EMERGENCY DEVIATION**

Action/Operation	Begin Date	End Date
Increment 1 Operations – Condition 1	October 15, 2015	December 1, 2015
Pre-Storm Drawdown & Flood Control Operations	December 1, 2015	December 22, 2015
Transitioning back to Increment 1 Operations	December 22, 2015	February 12, 2016
L-29 Canal Temporary Emergency Deviation Implementation	February 15, 2016	May 11, 2016
L-29 Canal Emergency Deviation Recovery Period	May 12, 2016	July 10, 2016
L-29 Canal Temporary Emergency Deviation Extension of Recovery Period	July 11, 2016	November 30, 2016
S-344 Temporary Emergency Deviation Implementation	May 19, 2016	July 14, 2016
Increment 1 Operations	December 1, 2016	Implementation of Increment 1.1 and 1.2

The operational strategy used during the L-29 Canal Temporary Emergency Deviation has been provided in **Appendix A (Part 4)** for reference as well as the operational strategy utilized during the extension of the recovery period in **Appendix A (Part 5)**.

### 1.3.6 EVERGLADES RESTORATION TRANSITION PLAN

On February 19, 1999, the USFWS issued a Final Biological Opinion (BO) under the provisions of the Endangered Species Act (ESA) of 1973, as amended, for actions required to assure the survival of the endangered CSSS, as affected by operation of components of the C&SF Project in Miami-Dade County. The BO required rapid implementation of structural and operational changes

to existing constructed portions of the MWD Project and the C-111 South Dade Project, which were then operating under Test 7 of the Experimental Program of Water Deliveries to ENP. The BO concluded that continuation of Test 7, Phase I operations would cause adverse modification of CSSS critical habitat (**Figure 1-4**) and would jeopardize the sparrow's continued existence. The BO presented a Reasonable and Prudent Alternative (RPA) that would avoid jeopardizing the CSSS. The RPA recommended that the following hydrological conditions be met for protection of the CSSS: (1) a minimum of 60 consecutive days of water levels at or below 6.0 feet, NGVD would have to be achieved at the NP-205 gauge (the NP-205 gauge is representative of conditions within CSSS subpopulation A; CSSS-A) between March 1 and July 15; (2) the Corps would have to ensure that 30%, 45%, and 60% of required regulatory releases crossing Tamiami Trail enter ENP east of the L-67 Extension in 2000, 2001, and 2002, respectively, or produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that meet or exceed those produced by the 30%, 45%, and 60% targets; and (3) produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that equal or exceed conditions that would be produced by implementing the exact provisions of Test 7, Phase II operations (USACE 1995), and implement the entire MWD Project no later than December 2003. Operations described within the 2002 Interim Operational Plan for Protection of the CSSS (IOP) Final Environmental Impact Statement (FEIS), 2006 IOP Final Supplemental Environmental Impact Statement (FSEIS), and the 2002 and 2006 IOP BOs were consistent with the 1999 RPA.

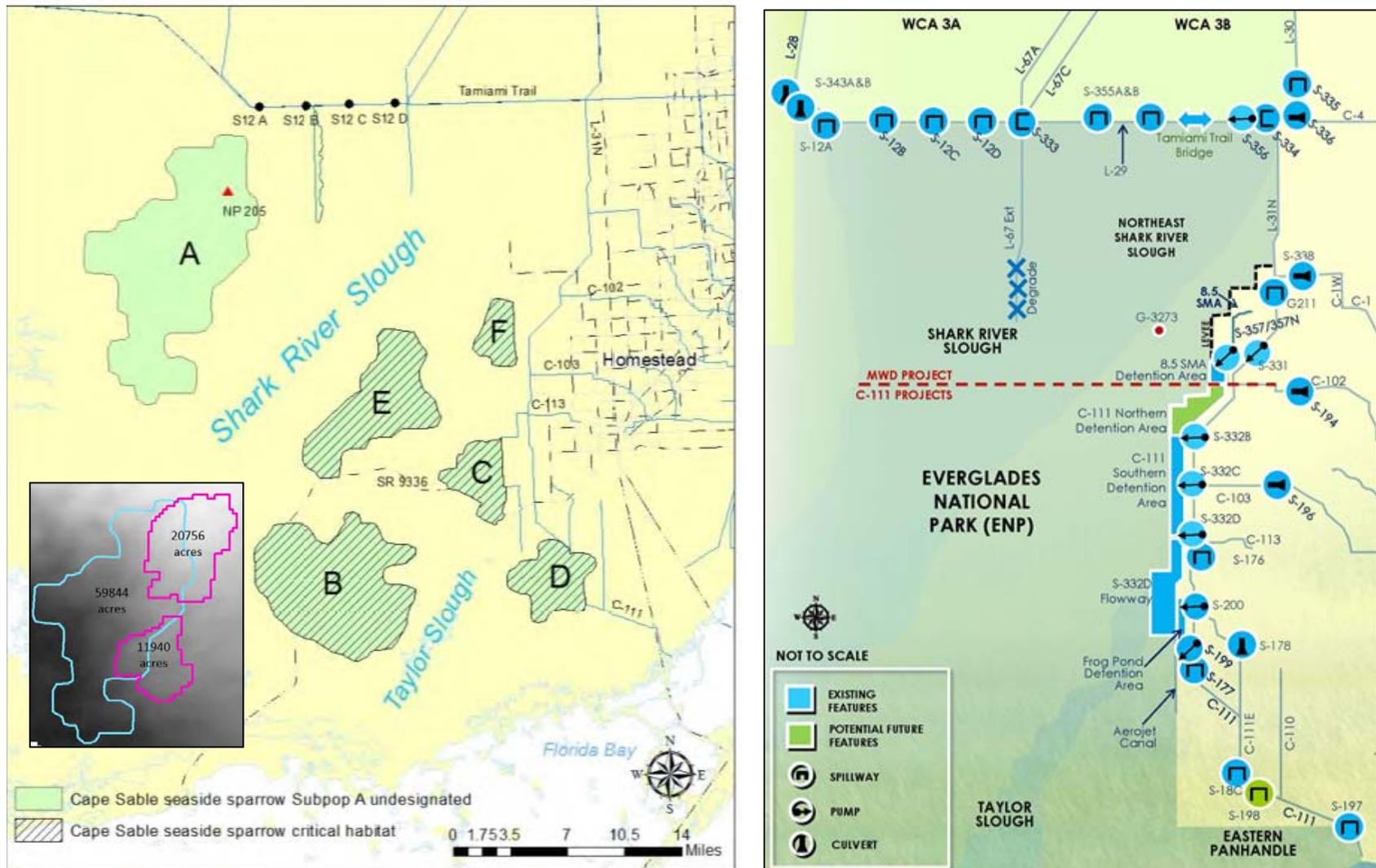
IOP was intended to be continued until the completion of MWD Project, however, MWD Project components and associated real estate acquisitions have not been fully completed and the 2006 IOP BO only covered impacts through November 2010. For these reasons, in addition to relevant new species information, the Corps initiated consultation in 2009 on the Everglades Restoration Transition Plan (ERTP). The purpose of ERTP is to define operations for the constructed features of MWD and C-111 South Dade Projects until those projects are fully completed and a COP is implemented. ERTP, which was implemented in October 2012, is a modification of IOP with operational flexibilities to provide further hydrological improvements amenable to multiple listed species. ERTP represents a paradigm shift over IOP. IOP consisted predominantly of closure periods on the S-12 structures to manage for a single endangered species, CSSS. In contrast, ERTP incorporates operational flexibility and adaptive management to better manage WCA 3A for the benefit of multiple species, including the endangered snail kite (*Rostrhamus sociabilis plumbeus*) and threatened wood stork (*Mycteria americana*). ERTP integrated consideration of new information consisting of current climatological, hydrological and species conditions, project specific performance measures and ecological targets, and Periodic Scientists Calls (PSC), along with continuation of the IOP seasonal closure periods on the S12-A and S-12B structures to maintain nesting conditions for the CSSS. Despite this groundbreaking effort in multi-species management and recovery, the CSSS has not responded as positively as the snail kite or wood stork.

The Corps reinitiated ESA consultation on ERTP on November 17, 2014 as a result of an exceedance of an Incidental Take Reinitiation Trigger from the November 17, 2010 ERTP BO for the CSSS. The 2010 ERTP BO Incidental Take Reinitiation Trigger states "If the annual CSSS population estimate falls below 2,915 sparrows [Mean population estimate 2001-2009 = 3,145 + 230]), reinitiation of consultation must occur." The Corps prepared a Supplemental Biological Assessment (BA) dated July 23, 2015 to support reinitiation of consultation on ERTP pursuant to

Section 7 of the ESA. Additionally, the 2010 ERTTP BO was set to expire on January 1, 2016. The Corps previously provided a Draft BA on ERTTP to USFWS in June 2010 and a Final BA on October 15, 2010. Based upon information contained within the BA, USFWS provided a BO November 17, 2010 concluding formal consultation on ERTTP. A subsequent BO Amendment was provided March 2, 2012. Through several extensions, the latest of which extended the expiration date until July 22, 2016, the USFWS and Corps were able to continue work on revising the ERTTP while retaining the ESA coverage afforded by the 2010 ERTTP BO.

A BO states the opinion of the USFWS as to whether a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. USFWS issued a new BO for ERTTP on July 22, 2016, developed in formal ESA consultation with the Corps. As a result of this consultation, it has been determined that current conditions within CSSS habitat, threaten the survival of the sparrow, and as a result, USFWS issued a “jeopardy” opinion, which explains that unless alternatives to current water operational practices are explored and implemented, continued implementation of ERTTP is likely to jeopardize the continued existence of the CSSS. The revised BO, issued July 22, 2016 presented a RPA that would avoid jeopardizing the CSSS. The RPA identifies operational modifications and expediting restoration initiatives for some of the structures in the southern portion of the Everglades ecosystem to provide suitable nesting habitat for the endangered CSSS. Main elements of the RPA are: habitat performance targets; actions to move water east; surveys and studies; and adaptive management. These RPA actions include additional seasonal closures to outlet structures within WCA 3A (S-12A, S-12B, S-343A, S-343B, S-344), with the flexibility to open under high water conditions between October and November, and adjustments in operations in the SDCS that will enable additional flows to Biscayne Bay during the dry season and increased flows toward eastern ENP to extend hydroperiods during the early dry season. In response to the BO, the Corps has committed to taking specific actions to comply with the BO terms and conditions and implementing the RPA. The Corps is conducting a NEPA assessment, through this EA, to analyze a set of alternatives including the proposed BO operational changes for the WCA 3A water control structures and the expanded operational ranges within the SDCS. The revised BO issued July 22, 2016 may be accessed at the following website:

<http://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/G-3273-and-S-356-Pump-Station-Field-Test/>.



**FIGURE 1-4. LOCATION OF CAPE SABLE SEASIDE SPARROW SUBPOPULATIONS IN RELATION TO MODIFIED WATER DELIVERIES AND C-111 SOUTH DADE PROJECTS. INSET ON LEFT PANEL SHOWS CSSS EXPANSION AREA (HIGHLIGHTED IN PINK)**

## 1.4 PROJECT NEED OR OPPORTUNITY

The Increment 1 EA and FONSI (dated May 27, 2015) presented that the overarching project need is to increase the availability of S-333 for water deliveries from WCA 3A to ENP through NESRS for the benefit of natural resources. A small incremental step toward achieving that goal is to reduce the number of times S-333 discharges are limited by the existing G-3273 stage constraint of 6.8 feet NGVD. The Increment 1 EA also acknowledged that water management operations to relax the G-3273 constraint may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA (USACE 2015). Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are currently constructed, Increment 1 included additional water management operating criteria for features of the SDCS to mitigate for potential risks to flood protection for areas within South Dade. Upon review of monitoring data associated with Increment 1 operations and the 2016 Temporary Emergency Deviation, it became apparent that additional modifications are necessary to the Increment 1 operational strategy to ensure flood mitigation within 8.5 SMA. During Increment 1 and the 2016 Temporary Emergency Deviation, the Corps learned information with respect to how 8.5 SMA and the SDCS respond to increased water levels in NESRS prior to the full build out of the MWD and C-111 South Dade Project features. Operational limitations of canals within 8.5 SMA, ongoing construction efforts, and remaining needed infrastructure all currently limit flowing additional water into NESRS.

Timely completion of the remaining MWD and C-111 South Dade (Contracts 8 and 8A) construction features (**Figure 1-5**) will provide further ability to raise water levels in ENP while maintaining the required water levels in the residential and agriculture areas in southeastern Miami-Dade County. Completion of Contracts 8 and 8A includes the construction of several miles of detention area levees and internal berms, and construction can be expedited with relatively dry conditions across the construction footprint. Operation of the Contract 8 and Contract 8A features along the 8.5 SMA Richmond Drive, within the 8.5 SMA Detention Cell and within the NDA are a prerequisite to raise the L-29 Canal up to 8.5 feet, NGVD.

The Corps is proposing to modify the operational strategy, currently defined in the Increment 1 EA and FONSI (dated May 27, 2015) to ensure flood mitigation within 8.5 SMA and to be able to continue working towards the construction of MWD and C-111 Project features, to achieve the needed capacity to deliver restoration flows to NESRS in ENP. The G-3273 Constraint Relaxation/S-356 Field Test and S-357N Revised Operational Strategy or Increment 1 Plus (hereafter referred to as Increment 1.1 and 1.2) is an update to the Increment 1 field test. This updated strategy seeks to increase flow to NESRS while providing operational flexibility needed to:

- A) maintain operating limits in the L-29 Canal that does not cause adverse impacts to the remaining private ownership along the L-29 Canal with their current limitations (pending future acquisition/improvements of real estate interests along Tamiami Trail including Florida Department of Transportation (FDOT) channel and flowage easements for the bridge and roadway);
- B) facilitate MWD to ENP Project construction for the deepening of the C-358 Canal and installation of S-357N;

- C) facilitate the construction of the C-111 South Dade Contract 8 and Contract 8A;
- D) maintain authorized flood mitigation for 8.5 SMA;
- E) maintain pre-existing flood protection along the L-31N and C-111 Canals; and
- F) provide supplemental flows to Taylor Slough to help facilitate the recovery of Florida Bay from the 2015 extreme hyper-salinity event.

Increment 1.1 of the operational strategy will maintain the L-29 Canal operating constraint of 7.5 feet, NGVD. Increment 1.2 will include the relaxation of the L-29 Canal operating constraint up to 7.8 feet, NGVD.

The operational strategy for Increment 1 was developed between July 2014 and February 2015. When the EA and FONSI for Increment 1 was completed in May 27, 2015 the construction contracts for completion of the C-111 South Dade Project had not yet been awarded and construction schedules were therefore not available. Hence operational flexibility to facilitate the construction of the associated features of the C-111 South Dade Project was not included within the Increment 1 operational strategy. Furthermore, at the time, a typical wet season was anticipated for 2015, not the extended drought conditions which delayed the initiation of Increment 1 until October 2015, which was then followed by a very strong El Niño during the 2015 to 2016 dry season in which WCA 3A experienced unseasonable high water levels.

The 2016 Temporary Emergency Deviation provided additional operational flexibility to increase WCA 3A discharge by raising the L-29 Canal constraint up to 8.5 feet, NGVD with corresponding lowering of the 8.5 SMA (C-357 and C-358), L-31N, and C-111 Canals to compensate for the resulting higher stages and increased groundwater seepage along the eastern boundary of ENP and further expanded utilization of Column 2 operations to convey WCA 3A releases to the SDGS (Reference **Section 1.3.5**). During the 2016 Temporary Emergency Deviation, residents within 8.5 SMA expressed concern due to observed increases in ground and surface water. In response to these concerns, the SFWMD installed several mitigation measures to address conditions related to the deviation (**Figure 1-3**). Experience with sustained lower operational ranges from pre-storm operations during Increment 1 and the recent 2016 Temporary Emergency Deviation and extended recovery period which followed, has shown that with the existing infrastructure, additional operational constraints are necessary to continue increased inflows to ENP while maintaining the authorized flood mitigation for the 8.5 SMA and to facilitate ongoing construction efforts.

Furthermore, the Corps has received continued support from Federal and state agencies and members of the general public to continue planning to raise the L-29 Canal above 7.5 feet, NGVD and to expeditiously move restoration efforts forward. The Corps is proposing to include additional operational flexibility within Increment 1.1 and 1.2 to operate the L-29 Canal to a maximum of 7.8 feet, NGVD subject to downstream constraints. This action is consistent with the 1992 MWD GDM and Final EIS (USACE 1992) to raise the maximum operating limit in the L-29 Canal level above 7.5 feet, NGVD, up to a maximum of 8.5 feet, NGVD. This additional

capacity will increase deliveries to NESRS and also assist efforts to lower WCA 3A during periods of high stages as experienced during 2016.

As stated in **Section 1.3.4**, Increment 1 is a planned deviation from the 2012 Water Control Plan. The 2012 Water Control Plan continued to govern water management operations during Increment 1 with the exception of operating criteria for S-333, S-334, S-356, S-197, and S-357N (USACE 2015). Structural closings for S-12A, S-12B, S-343A, S-343B, and S-344 under ERTTP were retained under Increment 1. The Corps is proposing to modify the Increment 1 operational strategy to address the mandated RPA of the July 22, 2016 ERTTP BO, which includes expanded closure periods for the S-12A, S-12B, S-343A, S-343B, and S-344 structures (**Section 1.3.6**).

ERTTP was implemented in October 2012 through utilization of the 2012 Water Control Plan. Under ERTTP, the utilization of the S-12 structures and the seasonal sequential closure periods beginning from the west at S-12A (November 1 – July 15) and S-12B (January 1 – July 15) is meant to move water from WCA 3A into SRS while providing conditions for CSSS subpopulation-A (CSSS-A) nesting and breeding. The 2016 ERTTP BO states that the S-12A/S-12B and associated structures currently direct water flows to the north of CSSS-A (**Figure 1-4**), resulting in increased hydroperiods within this area. A delay in opening and implementing early closure of the S-12A, S-12B, S-343A, S-343B, and S-344 structures beyond their current restrictions is needed to limit flow into western SRS and provide drier conditions for this region.

Information and operational criteria identified from Increment 1 and Increment 1.1 and 1.2 will continue to be used to develop an expanded set of operations and monitoring criteria for a subsequent operational field test (Increment 2) that will raise the maximum operating limit in the L-29 Canal level up to a maximum of 8.5 feet, NGVD, as outlined in the 1992 MWD GDM and Final EIS (USACE 1992). Operational changes based on Increment 2 are planned to be incorporated into the 2012 Water Control Plan prior to implementing the third increment which is development of the COP. The COP will incorporate constructed features of the MWD and C-111 South Dade Projects into the 2012 Water Control Plan. Increment 3, development of the COP, will be informed by Increment 1, Increment 1.1 and 1.2 and Increment 2. The incremental approach to the development of the COP will: (1) allow interim benefits towards restoration of the natural systems; (2) reduce uncertainty of operating the components of the MWD and C-111 South Dade Projects; and (3) provide information to complete the COP efficiently. The 2016 ERTTP BO acknowledges the above planning efforts by the Corps to increase flows into NESRS under the MWD Project and requires the Corps to proceed as scheduled, and as allowable by law, for completing NEPA analysis on Increment 1 Plus (*i.e.* Increment 1.2) prior to March 1, 2017, Increment 2 prior to March 1 2018, and COP in 2019.

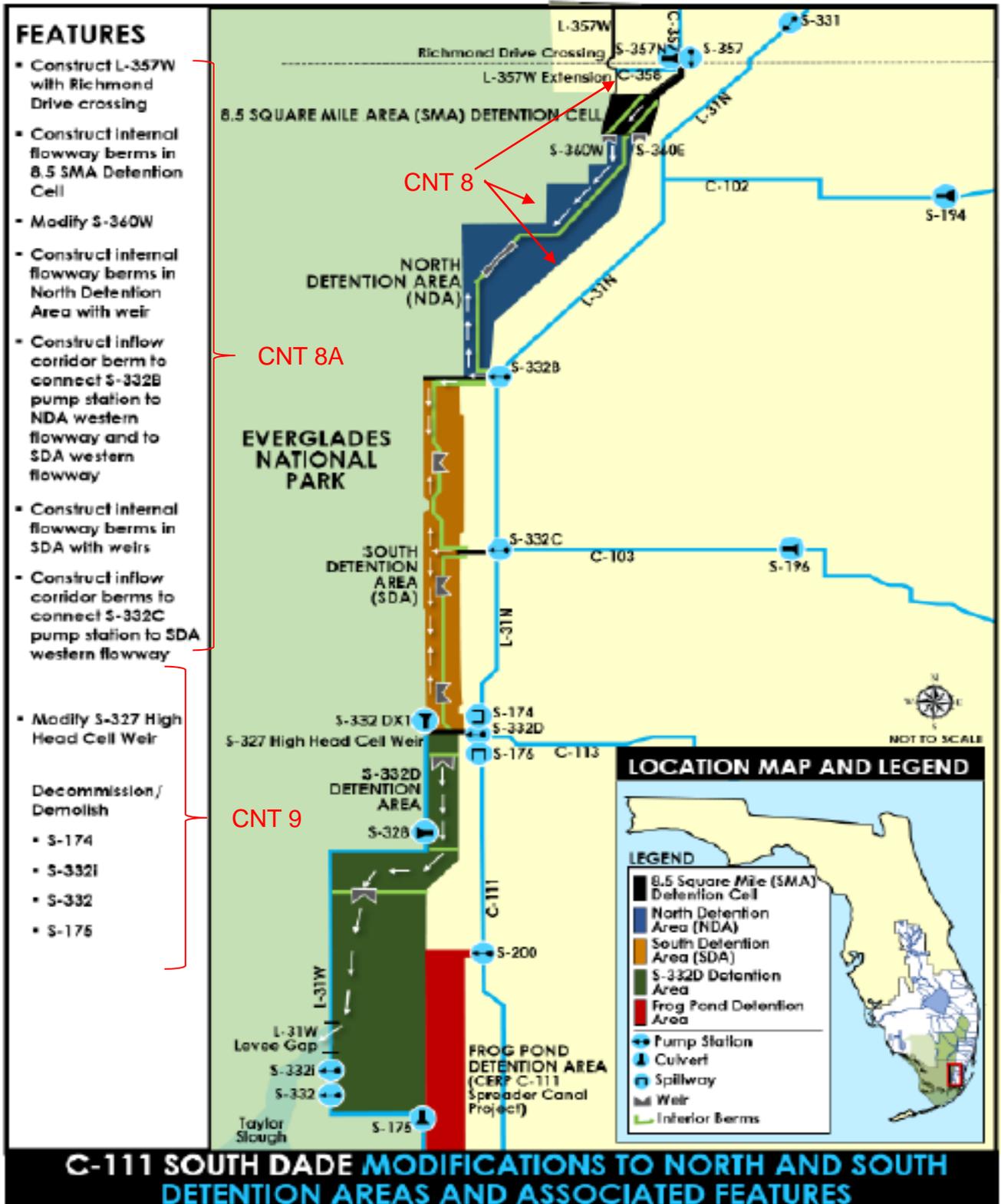


FIGURE 1-5. C-111 SOUTH DADE PROJECT FEATURES (CONTRACTS 8, 8A, 9).

## 1.5 AGENCY GOALS AND OBJECTIVES

Objectives of the Proposed Action remain consistent with those defined in the Increment 1 EA and FONSI (dated May 27, 2015):

- A. Improve hydrological conditions in NESRS through the relaxation of the G-3273 stage constraint to increase water deliveries from WCA 3A to NESRS, while maintaining other C&SF Project authorized purposes.
- B. Use the S-356 pump station to manage seepage from NESRS to the L-31N Canal resulting from the relaxation of the G-3273 stage constraint on S-333, in conjunction with increased flows through the S-333 spillway to NESRS via the L-29 Canal.
- C. Improve hydrological conditions in NESRS by maximizing the flexibility and efficiency of the existing infrastructure, including use of seepage management (e.g., S-356) to complement inflows to NESRS from WCA 3A.
- D. Gather and analyze infrastructure performance, ecologic, hydrologic and water quality data sufficient to support Increment 2, resulting in the following:
  - i. Data gathering sufficient to support water quality certification
  - ii. Refined operational criteria for the MWD and C-111 South Dade Projects
  - iii. Updates to the 2012 Water Control Plan

As stated in **Section 1.3.4**, the Corps is proposing to modify the Increment 1 operational strategy to address the mandated RPA of the July 22, 2016 ERTF BO, which includes expanded closure periods for the S-12A, S-12B, S-343A, S-343B, and S-344 structures. Operational modifications were also considered to provide supplemental flows to Taylor Slough to help facilitate the recovery of Florida Bay from the 2015 extreme hyper-salinity event.

## 1.6 OPERATIONAL CONSTRAINTS

Operational constraints as defined in the Increment 1 EA and FONSI (dated May 27, 2015) are as follows:

- A. L-29 Canal maximum operating limit of 7.5 feet, NGVD, pending future acquisition of real estate interests along Tamiami Trail and additional NEPA documentation.
- B. Maintain the authorized purposes of the C&SF Project modified to include:
  - i. MWD Project
  - ii. C-111 South Dade Project
  - iii. CERP
- C. No reduction in current flood protection or mitigation

- D. Maintain the current multi-species objectives of the 2012 Water Control Plan and comply with the requirements of the applicable BO from USFWS, to include the E RTP and the CERP C-111 Spreader Canal Western Project.

Operational constraints of the Proposed Action remain consistent with those defined in the Increment 1 EA and FONSI (dated May 27, 2015) except for item A. The Proposed Action has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon the following conditions: (1) acquisition of required real estate interest and any associated improvements for the private ownership along Tamiami Trail including receipt of Tamiami Trail Bridge and roadway channel and flowage easements from the FDOT; (2) completion of the C-358 Canal (Richmond Drive Seepage Collection Canal) and installation of S-357N (C-358 control structure); and (3) completion of sufficient portions of Contracts 8 (construction of the C-111 NDA L-315 western levee and the L-357W Extension Levee between Richmond Drive and the 8.5 SMA Detention Cell) and completion of the Contract 8A berms inside the 8.5 SMA Detention Cell. Real estate acquisition is ongoing and is expected to be complete by October 2017. Based on the current construction schedule for C-111 South Dade Contract 8, the earliest opportunity to consider incremental raising of the L-29 Canal above 7.5 feet, NGVD is expected between July and October 2017, coincident with the 2017 wet season. Following completion of the C-111 South Dade NDA, the Corps anticipates that the L-29 Canal stage maximum operating limit will be further raised up to 8.5 feet, NGVD under Increment 2.

## 1.7 RELATED ENVIRONMENTAL DOCUMENTS

The Corps has documented a number of environmental documents relevant to the Proposed Action:

- *General Design Memorandum and Environmental Impact Statement, Modified Water Deliveries to Everglades National Park*, U.S. Army Corps of Engineers, Jacksonville District, June 1992
- *C-111, Central and Southern Florida Project for Flood Control and Other Purposes, Final General Reevaluation Report and Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District 1994
- *1998 Emergency Deviation from Test 7 of the Environmental Program of Water Deliveries to Everglades National Park to Protect the Cape Sable Seaside Sparrow, Central and Southern Florida Project for Flood Control and Other Purposes, Final Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, 1999
- *Jeopardy and Adverse Modification Biological Opinion on the Modified Water Delivery to Everglades National Park Experimental Program to Everglades National Park and Canal-111 South Dade Projects*, U.S. Fish and Wildlife Service, Vero Beach, Florida 1999
- *Comprehensive Review Study of the Central and Southern Florida Project, Comprehensive Everglades Restoration Plan Final Integrated Feasibility Report and Programmatic Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District 1999
- *General Reevaluation Report and Final Supplemental Environmental Impact Statement, 8.5 Square Mile Area*, U.S. Army Corps of Engineers, Jacksonville District, July 2000
- *Central and Southern Florida Project for Flood Control and Other Purposes, Interim Structural and Operational Plan, Emergency Deviation from Test 7 of the Experimental*

*Program of Water Deliveries to Everglades National Park for Protection of the Cape Sable Seaside Sparrow Final Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, 2000

- *Interim Operating Plan for the Protection of the Cape Sable Seaside Sparrow Final Supplemental Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, 2002
- *Biological Opinion, Final Interim Operating Plan*, U.S. Fish and Wildlife Service, Vero Beach, Florida, November 17, 2006
- *Interim Operational Plan for the Protection of the Cape Sable Seaside Sparrow Final Supplemental Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, December 2006
- *C-111 Engineering Documentation Report*, U.S. Army Corps of Engineers, Jacksonville District, May 2007
- *Draft Environmental Assessment; Design Modifications for the Canal 111 Project*, U.S. Army Corps of Engineers, Jacksonville District, June 2007
- *Modified Water Deliveries to Everglades National Park Tamiami Trail Modifications Final Limited Reevaluation Report and Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, June 2008
- *Draft Environmental Assessment; Proposed Interim Operating Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, November 2008
- *Revised Draft Environmental Assessment; Proposed Interim Operating Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, April 2009
- *Canal-111 Spreader Canal Project Implementation Report*, U.S. Army Corps of Engineers, Jacksonville District, 2009
- *Biological Opinion, Canal-111 Spreader Canal*, U.S. Fish and Wildlife Service, Vero Beach, Florida, August 25, 2009
- *Biological Opinion, Everglades Restoration Transition Plan*, U.S. Fish and Wildlife Service, Vero Beach, Florida, November 17, 2010
- *Central and Southern Florida Project Comprehensive Everglades Restoration Plan C-111 Spreader Canal Western Project Final Integrated Project Implementation Report and Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, January 2011
- *Environmental Assessment; Proposed Interim Operation Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, June 2011
- *Environmental Assessment; Design Refinement for the 8.5 Square Mile Area*, U.S. Army Corps of Engineers, Jacksonville District, August 2012
- *Environmental Assessment for Expansion of C-111 Detention Area and Associated Features South Miami-Dade County*, U.S. Army Corps of Engineers, Jacksonville District, May 2012
- *Everglades Restoration Transition Plan Final Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, October 19, 2012
- *Environmental Assessment; G-3273 Constraint Relaxation/S-356 Field Test and S-357N Operational Strategy*, U.S. Army Corps of Engineers, Jacksonville District, May 2015.

- *Environmental Assessment and Finding of No Significant Impact; Modifications to the C-111 South Dade North and South Detention Areas and Associated Features*, U.S. Army Corps of Engineers, Jacksonville District, December 2016.
- *Environmental Assessment and Proposed Finding of No Significant Impact; Modifications to the C-111 South Dade Project, L-31W*, U.S. Army Corps of Engineers, Jacksonville District, July 2016.
- *Environmental Assessment; L-29 Canal and South Dade Conveyance System Temporary Emergency Deviation to Affect Relief of High Water Levels within Water Conservation Area 3A*, U.S. Army Corps of Engineers, Jacksonville District, February 2016
- *Supplemental Environmental Assessment; L-29 Canal and South Dade Conveyance System Temporary Emergency Deviation to Alleviate High Water Levels in Water Conservation Area 3A*, U.S. Army Corps of Engineers, Jacksonville District, May 2016.
- *Environmental Assessment Temporary Emergency Deviation to Alleviate High Water Levels in Water Conservation Area 3A (S-344 Deviation)*, U.S. Army Corps of Engineers, Jacksonville District, April 2016.

Information contained within the previous NEPA documents listed above, as well as others described later, is incorporated by reference into this EA.

## **1.8 DECISIONS TO BE MADE**

The adoption of the Preferred Alternative is the primary decision that must be made. Please reference **Section 1.5** for agency goals and objectives.

## **1.9 SCOPING AND ISSUES**

Please reference Appendix D of the Increment 1 EA and FONSI (dated May 27, 2015) for pertinent correspondence related to the relaxation of the G-3273 constraint.

## **1.10 PERMITS, LICENSES, AND ENTITLEMENTS**

Information regarding Increment 1 has been submitted to FDEP per specific condition 18 of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit number 0246512-003. FDEP has issued a testing approval for a one year extension to Increment 1 testing operations associated with the S-356 pump station under the test authorization provision (specific condition no. 22 of CEPRAs permit number 0246512-003).

Coastal Zone Management Act coordination may involve modifications to the following:

1. Modification to File No. 0306639-003, S-197 Control Structure Project, Environmental Resource Permit: SFWMD permit
2. Modification to File No. 0246512-0003 and test authorization, Modified Water Deliveries to the Everglades National Park Project, CERPRA permit: Corps permit
3. Modification to File No. 0317442-003, 8.5 SMA S-357 Pump Station Project, CERPRA permit: SFWMD permit
4. Modification to File No. 0246512-012, C-111 South Dade and Modified Water Deliveries to Everglades National Park Project: Corps permit

5. Modification, if deemed necessary by FDEP for revised operations to S-333 S-335, S-337, S-343A, S-343B and S-344 to the Non Everglades Construction Everglades Forever Act Permit File No. 0237803-001: SFWMD permit
6. Modification to the C-111 South Dade Emergency Order No. 9 may be required to adjust the operations for S-332B/C/D and S-328. Under evaluation by FDEP. Acquisition of the required FDEP authorization for the EO 9 structures is not expected to delay implementation of Increment 1 Plus.
7. A gated control structure (S-357N), currently planned to be constructed by January 2017, will connect the C-358 seepage collection canal to the existing C 357 Canal, upstream of S-357. FDEP authorization will need to be obtained prior to operation of this structure. The FDEP operational authorization is to be obtained by the SFWMD.

The Corps has coordinated a consistency determination pursuant to the Coastal Zone Management Act through the circulation of the Supplemental EA. The Florida State Clearinghouse has reviewed the Proposed Action and has stated that it is consistent with the Coastal Zone Management Program (CZMP). Final concurrence of consistency with the CZMP will be determined during environmental permitting processes, as applicable.

## 2.0 ALTERNATIVES

### 2.1 DESCRIPTION OF ALTERNATIVES

Each of the following alternatives described below in **Sections 2.1.2** through **2.1.6** were considered and evaluated as the operational strategy for Increment 1.1 and 1.2 was developed. Alternatives differ based on: (1) the degree of relaxation of the G-3273 constraint; (2) operational modifications to ensure flood mitigation within 8.5 SMA; (3) the degree of relaxation of the L-29 Canal stage maximum operating limit; (4) operational criteria to facilitate construction of the MWD and C-111 South Dade Projects; (5) operational modifications to provide flows favorable to Florida Bay to continue to recover from the 2015 extreme hyper-salinity event; and (6) inclusion of operational modifications as required per the RPA identified within the 2016 ERTTP BO (Reference **Section 1.3.5**).

During development of the operational strategy for Increment 1.1 and 1.2, operational modifications to provide supplemental flows to Taylor Slough were suggested to help facilitate the recovery of Florida Bay from the 2015 extreme hyper-salinity event. In 2015, Florida Bay experienced a severe localized drought with significantly lower rainfall than average which resulted in hyper salinity followed by extensive seagrass die-off in parts of the Bay, especially the central and nearshore areas. Recognizing the significance of this event the SFWMD sought to identify actions that could be pursued expeditiously to enhance and help protect Florida Bay. The resulting plan, presented at the July 14, 2016 SFWMD Governing Board meeting is expected to increase the flow of water directly into Taylor Slough in ENP, a major source of fresh water for the bay. Components of this plan include, but are not limited to, sending additional water through the S-328 water control structure into the L-31 West Canal to reach Taylor Slough. The SFWMD's South Dade Investigation Workshops (October 2015 through February 2016) was the vehicle that developed key elements of this plan. The effort was initiated to provide a forum for integrating stakeholder perspectives on the hydrology in the south Miami-Dade County area, identifying options to reduce flood risks in urban and agricultural areas and to provide much-needed water to natural areas.

SDCS operational modifications developed under the SFWMD's South Dade Investigation Workshop were considered during ESA consultation for ERTTP and informed the Action Alternatives described below. Please reference the SFWMD website for additional information on the South Dade Investigation Workshops (<https://www.sfwmd.gov/our-work/south-dade-study>) and SFWMD's Plan for Florida Bay (<https://www.sfwmd.gov/our-work/florida-bay>).

Conceptual alternatives considered during ESA consultation for ERTTP are summarized in **Section 2.1.1** as this information is pertinent to understanding the seasonal closure periods for S-12A and S-12B which are required as part of the 2016 ERTTP BO and RPA. An overview of alternative descriptions is provided in **Table 2-1**.

**TABLE 2-1. ALTERNATIVE DESCRIPTIONS**

ALTERNATIVE	G-3273 STAGE CONSTRAINT	L-29 CANAL CONSTRAINT	C&SF OPERATIONAL CHANGES RELATIVE TO 2012 WCAs-ENP-SDCS WATER CONTROL PLAN		HIGH WATER STRATEGY FOR WCA 3A PER 2016 ERTF BO
A	NO	Up to 7.5 feet, NGVD	S-333, S-334, S-356, S-197, and S-357N	Maintain ERTF closure periods: 01 November to 15 July for S-12A, S-343A/B, and S-344, and 01 January to 15 July for S-12B.	NO
B	NO	Up to 7.5 feet, NGVD	S-333, S-334, S-356, S-197, and S-357N	S-12A, S-12B, S-343A, S-343B, S-344 Closed 01 October to 15 July	NO
C	NO	Up to 7.5 feet, NGVD	S-333, S-334, S-356, S-357N, S-197, S-338, S-332B, S-332C, S-332D, S-194, S-196, S-176, S-177	S-12A, S-12B, S-343A, S-343B, S-344 closed 1 October to 16 August	NO
D	NO	Up to 7.8 feet, NGVD	S-328, S-151, S-331, S-333, S-334, S-335, S-337, S-338, S-355A, S-355B, S-356, S-357, S-357N, S-332B, S-332C, S-332D, S-194, S-196, S-176, S-177, S-197	S-12A, S-12B, S-343A, S-343B, S-344 Closed 01 October to 15 July	YES (WCA 3A high water criteria allow conditional operation of S-12A and S-12B in October and conditional operation of S-12B in November)
E	NO	Up to 7.5 feet, NGVD	S-328, S-151, S-331, S-333, S-334, S-335, S-337, S-338, S-355A, S-355B, S-356, S-357, S-357N, S-332B, S-332C, S-332D, S-194, S-	S-12A, S-12B, S-343A, S-343B, S-344 Closed 01 October to 15 July	YES (WCA 3A high water criteria allow conditional operation of S-12A and S-12B in October and conditional operation of S-12B in November)

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			196, S-176, S-177, S-197		
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\*Alternative D has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon conditions outlined in **Section 1.6.**

### 2.1.1 ERTP ESA CONSULTATION

The Corps reinitiated consultation with USFWS under the ESA on ERTP on November 17, 2014 as a result of an exceedance of an Incidental Take Reinitiation Trigger from the November 17, 2010 ERTP BO (Reference **Section 1.3.6**). During ESA consultation, USFWS indicated that extended closure periods for the S-12A, S-12B, S-343A, S-343B and S-344 structures may be required to achieve performance targets for the CSSS. The Corps expressed reservations with the extended closure periods for S-12A and S-12B prior to completing the Baseline and Modification Model (BAMM) regional flood routing study for the WCAs, due to the concerns about levee safety and other risks in WCA 3A. ERTP operations implemented by the Corps within the 2012 Water Control Plan incorporated the 1960 WCA 3A 9.5 to 10.5 feet, NGVD Regulation Schedule as the required interim water management criteria for WCA 3A Zone A to mitigate for the observed effects of discharge limitations of the S-12 structures, while also recommending further consideration of additional opportunities to reduce the duration and frequency of WCA 3A high water events. To effectively evaluate the conflicting recommendations identified by the USFWS and the Corps, model simulations were conducted to evaluate the additional closure periods. The effort focused on refinement of the base condition model (*i.e.* ERTP) to replicate current system configuration and operational protocols, and explored potential operational scenarios to enhance system performance for the CSSS while balancing WCA 3A high water concerns. A summary of the model simulations are provided below. Further detailed information can be found in the 2016 ERTP BO: <http://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/G-3273-and-S-356-Pump-Station-Field-Test/>.

The Regional Simulation Model for the Everglades and the Lower East Coast Service Areas (RSM-GL) was used for the model simulations. RSM-GL has been advocated by the Corps as the preferred hydrologic modeling tool to evaluate future changes to the 2012 Water Control Plan, principally based on the capability to incorporate condition-based operational criteria and to maintain consistency with the hydrologic modeling analyses previously conducted in support of the Central Everglades Planning Project (CEPP). Model simulations represented a range of possible closure periods for the S-12A, S-12B, S-343A, S-343B and S-344 structures. Comparisons were made relative to the existing condition baseline model (*i.e.* ERTP [ECB16]), which was updated to include the most accurate representation of the 2012 Water Control Plan (USACE 2012c). The starting point for the updated ECB16 baseline was the existing condition baseline previously applied during the SFWMD South Dade Investigation Workshop. The ESA consultation focused on the effects of continued ERTP operations because ERTP is included in the current approved 2012 Water Control Plan; although operations were conducted in accordance with the Increment 1 field test starting on October 2015. During the existing condition baseline model updates, particular attention was given to the following considerations: (1) priority use of S-333 for WCA 3A Rainfall Plan deliveries, followed by S-12D, S-12C, S-12B, S-12A (the 2012 Water Control Plan does not use S-12A or S-12B if S-12C and S-12D can meet Rainfall Plan targets); (2) incorporation of the hydrologic effects on the L-28 Canal, BCNP, and western ENP from the L-28 Tie-back Levee gaps, including consideration of rating curve information available from ENP field measurements; (3) incorporation of the open culvert connection at the junction of the Old Tamiami Trail Borrow Canal and the ENP Tram Road (allows westerly flow from S-12C towards S-12B during periods when S-12A and S-12B are closed); (4) evaluation of the effects of S-12A and S-12B gate overtopping when headwater stages exceed 11.0 feet, NGVD during the

seasonal closure period; and (5) updates to the model application of the S-12 stage versus discharge rating curve relationships, based on further analysis of recent historical observations during ERTTP.

Model simulations were evaluated in three rounds, which were all completed within a limited schedule during May and June of 2016 which was required in order for the results to inform the BO prior to the July 22, 2016 expiration of the 2010 ERTTP BO. Round 1 identified in **Table 2-2** included additional seasonal closures to outlet structures within WCA 3A. Simulations were formulated to represent a range of seasonal closures relative to the current ERTTP closure periods. Preferred simulations as identified from the technical evaluations completed by the Corps and USFWS were carried forward and/or modified in Round 2 (**Table 2-3**). Round 1 and Round 2 simulations all assumed an L-29 Canal stage maximum operating limit of 7.5 feet, NGVD and assumed the G-3273 stage constraint of 6.8 feet, NGVD was in place consistent with ERTTP operations. Preferred simulations from the technical evaluations of Round 1 and Round 2 were then modeled in Round 3 as a sensitivity run with the inclusion of the Increment 1 operations as defined in the Increment 1 EA and FONSI (dated May 27, 2015) (**Table 2-3**), which included removal of the G-3273 constraint, operation of S-356, conditional expanded operations of S-197 and an L-29 Canal stage maximum operating limit of 7.5 feet, NGVD. Additional sensitivity simulations were also completed with Increment 2 placeholder operations (*i.e.* raising the L-29 Canal stage maximum operating limit up to 8.5 feet, NGVD) during Round 3; however, these simulations are not directly pertinent to this EA as subsequent operational strategy development, NEPA coordination, and ESA documentation will be completed to support Increment 2 operations.

It should be noted that each of the model simulations identified within **Table 2-2**, **Table 2-3**, and **Table 2-4** included the closure of the ENP Tram Road borrow canal connection, except for ECB16. Seasonal closures on the S-12A, S-12B, S-12C, S-343A, S-343B, and S-344 structures were included in the 2002 IOP in order to meet the 1999 BO RPA to avoid jeopardy for the CSSS. ERTTP maintained the IOP scheduled closure dates on all of these structures with the exception of S-12C. Under ERTTP, the S-12C seasonal closures (February 1 through July 15) were removed. Removal of the S-12C seasonal closure was recommended during ERTTP to better achieve the objective of managing water levels within WCA 3A for the protection of multiple species and their habitats while also providing additional outlet capacity to address high water concerns within WCA 3A, especially during periods when the S-333 outlet structure was constrained due to the G-3273 constraint. To further prevent westward flow of water into CSSS-A, the 2011 ERTTP FEIS included blocking of the Old Tamiami Trail Borrow Canal between S-12C and S-12B (at the junction with the Shark Valley Tram Road), along with the blocking of culverts under Shark Valley Tram Road (USACE 2011b). These modifications along the ENP Shark Valley Tram Road were to be implemented by the Department of Interior (DOI) through ENP. To date, only the Shark Valley Tram Road culverts have been blocked. The DOI initially installed inflatable culvert plugs along Shark Valley Tram Road within ENP. The Shark Valley Tram Road culvert plugs were purchased, operated and maintained by DOI, but have since been replaced by sand bags. Closure of the ENP Tram Road borrow canal was identified in 2010 by USFWS as a DOI action necessary to prevent adverse effects on CSSS-A. The borrow canal has not been closed to date, and, therefore, the ECB16 model simulation did not include the closure of the ENP Tram Road borrow canal connection. Full benefits as documented in the ERTTP modeling scenarios will not be realized until the borrow canal has been closed.

Each model simulation included a variety of post processing products including but not limited to: transect flows, canal and gauge stage duration curves, basin water budget maps, annual and period of record hydroperiod and hydroperiod difference maps, annual and period of record average stage maps and stage difference maps, average April and October stage difference maps for indicator water years (1978, 1989, 1995, and 2001) and average annual structure flow comparison tables. Simulations were primarily evaluated with respect to performance metrics for the CSSS and potential increases in high water stage and durations within WCA 3A, with the increased WCA 3A stages resulting in potential increased risk to structural and levee safety. Analysis of the simulations resulted in an RPA focused on simulation R1B (S-12 A, S-12B, S-343A, S-343B, and S-344 closure period from October 1 to July 15) accompanied by a high-water strategy for WCA 3A during the months of October and November. SDCS operations as represented in simulation R2H were also incorporated into the selected alternative that was considered in the RPA for protection of the eastern marl prairie and CSSS subpopulations. The Action Alternatives described in **Sections 2.1.3 through 2.1.6** therefore include components of R1B and R2H in order to address the RPA and mandated terms and conditions of the 2016 ERTF BO. The primary breeding season is typically considered March 1 through July 15, but may extend through August if conditions are favorable.

Further evaluation of the simulations presented in **Table 2-2**, **Table 2-3**, and **Table 2-4**, is briefly discussed below for purposes of understanding how the modeling efforts associated with the 2016 ERTF BO informed the Action Alternatives and the Increment 1.1 and 1.2 operational strategy in **Appendix A (Part 1)**. Please reference Appendix E of the 2016 ERTF BO for additional information regarding development of the RPA and the evaluation methodology that was utilized for purposes of evaluating and selecting the RPA. Operational assumptions tables for the model simulations described in **Table 2-2**, **Table 2-3**, and **Table 2-4** are also further described in Table 33 of the 2016 ERTF BO. Modeling assumptions specified for ECB16 are unchanged within the other model simulations, except where specified.

**TABLE 2-2. 2016 ERTF MODELING EFFORTS: ROUND 1**

ERTF Consultation Model Runs	Description
ECB16	S-12A, S-343A/B, S-344 Closed 1 November through 15 July; S-12B closed 1 January through 15 July; ENP Tram Road culvert open; L-29 Canal Constraint 7.5 feet NGVD and G-3273 constraint 6.8 feet NGVD)
<i>Base for ESA Consultation</i>	
R1A	Closure of the ENP Tram Road borrow canal connection, and S-12B closure period starting on 01 November (ERTF close date is 01 January).
R1B	Closure of the ENP Tram Road borrow canal connection, and closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October.
R1C	Closure of the ENP Tram Road borrow canal connection, and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August (ERTF open date is 15 July)
R1D	Closure of the ENP Tram Road borrow canal connection; closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October; and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August [combination of (b) and (c)]

R1E	Closure of the ENP Tram Road borrow canal connection, and January through December closure period for S-12A, S-12B, S-343A, S-343B, and S-344 (year round closure)
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**TABLE 2-3. 2016 ERTP BIOLOGICAL OPINION MODELING EFFORTS: ROUND 2**

ERTP Consultation Model Runs	Description
R2F	Closure of the ENP Tram Road borrow canal connection; January through December closure period for S-12A, S-343A, S-343B and S-344; closure for S-12B from 01 October through 16 August.
R2G2	Closure of the ENP Tram Road borrow canal connection and conditional closures of S-12A, S12B, S-343A, S-343B and S-344 based on antecedent conditions in WCA 3A and sparrow breeding opportunity. Default closure period for S-12A, S-12B, S-343A, S-343B, and S-344 is 01 November through 14 July. R2G2 tends to open structures as stages increase at gage 3A-28 (southern WCA 3A) and tend to close during la Nina, and neutral and weak el Niño years. R2G2 also looks for the opportunity to delivery water to BCNP during periods when it is unlikely to affect breeding opportunities for the CSSS.
R2H	<p>In wetter ending water years (October-September) with moderate or strong el Niño conditions, structures operate (possibly open, but with discharge priority still east to west) under the following conditions: S-12A open if WCA 3A three gauge average &gt; 11.30 feet, NGVD; S-12B open if WCA 3A three gauge average &gt; 11.00 feet, NGVD; S-344 open if WCA3A three gauge average &gt; 10.75 feet, NGVD; S-343A and S-343B remain closed.</p> <p>Closure of the ENP Tram Road borrow canal connection; closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October; and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August [same as R1D]</p> <p>Early dry season operations (August-December) being informed by SFWMD South Dade Investigation Workshops to promote more flow toward ENP and extend hydroperiods. R2H looks for later dry season opportunities (February -May) to move water toward Biscayne National Park and away from CSSS sub- populations and attempts to avoid water level excursions above ground surface from 1 March to 15 July due to operation of eastern infrastructure (S-332B, S-332C, S-332D, S-200, and S-199).</p> <p>Operations in the early dry season per the SFWMD South Dade Investigation Workshops included lowering canals by ~ 0.5 feet in August-December (operating S-332s, S-200 and S-199 at lower ranges) with transition to current operations by 15 February and allowed rainfall-based discharges via S-176 and S-177. Later in the dry season, flows toward Biscayne Bay were promoted via S-338, S-196 and S-194 when hydraulic capacity exists.</p>

**TABLE 2-4. 2016 ERTP BIOLOGICAL OPINION MODELING EFFORTS: ROUND 3**

ERTP Consultation Model Runs	Description
INCR1B	<i>R1B plus MWD Project Increment 1 Operations:</i> Closure of the ENP Tram Road borrow canal connection and closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October.

(*ERTP BO RPA FOR WCA 3A 2017. RPA INCLUDES WCA 3A HIGH WATER STRATEGY).	
<p>INCR1H</p> <p>(*ERTP BO RPA FOR SDCS/EASTERN ENP 2017. RPA INCLUDES TARGETS FOR DRY NESTING DAYS AND DISCONTINUOUS HYDROPERIOD FOR CSSS SUB-POPULATIONS B THROUGH F)</p>	<p><i>R2H plus MWD Project Increment 1 Operations:</i> Closure of the ENP Tram Road borrow canal connection; closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October; and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August. Early dry season operations (August-December) being informed by SFWMD South Dade Investigation Workshops to promote more flow toward ENP and extend hydroperiods. R2H looks for later dry season opportunities (February-May) to move water toward Biscayne National Park and away from CSSS sub-populations and attempts to avoid water level excursions above ground surface from 1 March to 15 July due to operation of eastern infrastructure (S-332B, S-332C, S-332D, S-200, and S-199).</p> <p>Operations in the early dry season per the SFWMD South Dade Investigation Workshops included lowering canals by ~ 0.5 feet in August-December (operating S-332s, S-200 and S-199 at lower ranges) with transition to current operations by 15 February and allowed rainfall-based discharges via S-176 and S-177. Later in the dry season, flows toward Biscayne Bay were promoted via S-338, S-196 and S-194 when hydraulic capacity exists.</p>
<p>INCR2B</p> <p>(*ERTP BO RPA FOR SDCS/EASTERN ENP 2018)</p>	<p><i>R1B plus MWD Project Increment 2 Operations:</i> Closure of the ENP Tram Road borrow canal connection and closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October.</p>
<p>INCR2H</p> <p>(*ERTP BO RPA FOR SDCS/EASTERN ENP 2018. RPA INCLUDES TARGETS FOR DRY NESTING DAYS AND DISCONTINUOUS HYDROPERIOD FOR CSSS SUB-POPULATIONS B THROUGH F)</p>	<p><i>R2H plus MWD Project Increment 2 Operations:</i> Closure of the ENP Tram Road borrow canal connection; closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October; and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August.</p> <p>Early dry season operations (August-December) being informed by SFWMD South Dade Investigation Workshops<sup>1</sup> to promote more flow toward ENP and extend hydroperiods. R2H looks for later dry season opportunities (February-May) to move water toward Biscayne National Park and away from CSSS sub-populations and attempts to avoid water level excursions above ground surface from 1 March to 15 July due to operation of eastern infrastructure (S-332B, S-332C, S-332D, S-200, and S-199).</p> <p>Operations in the early dry season per the SFWMD South Dade Investigation Workshops included lowering canals by ~ 0.5 feet in August-December (operating S-332s, S-200 and S-199 at lower ranges) with transition to current operations by 15 February and allowed rainfall-based discharges via S-176 and S-177. Later in the dry season, flows toward Biscayne Bay were promoted via S-338, S-196 and S-194 when hydraulic capacity exists.</p>
<p>INCR2B2</p>	<p><i>R1B plus MWD Project Increment 2 Operations:</i> Closure of the ENP Tram Road borrow canal connection and closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October. Includes use of S-152 and updated SRS demand targets (<i>i.e.</i> new rainfall plan).</p>

INCR2H2	<p><i>R2Hplus MWD Project Increment 2 Operations:</i> Closure of the ENP Tram Road borrow canal connection; closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October; and open dates for S-12A, S-12B, S-343A, S-343B, and S-344 delayed to 16 August. Includes the use of S-152 and updated SRS demand targets (<i>i.e.</i> new rainfall plan).</p> <p>Early dry season operations (August-December) being informed by SFWMD South Dade Investigation Workshops<sup>1</sup> to promote more flow toward ENP and extend hydroperiods. R2H looks for later dry season opportunities (February-May) to move water toward Biscayne National Park and away from CSSS sub-populations and attempts to avoid water level excursions above ground surface from 1 March to 15 July due to operation of eastern infrastructure (S-332s, S-200s, S-199s).</p> <p>Operations in the early dry season per the SFWMD South Dade Investigation Workshops included lowering canals by ~ 0.5 feet in August-December (operating S-332s, S-200 and S-199 at lower ranges) with transition to current operations by 15 February and allowed rainfall-based discharges via S-176 and S-177. Later in the dry season, flows toward Biscayne Bay were promoted via S-338, S-196 and S-194 when hydraulic capacity exists.</p>
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Scenarios were primarily evaluated with respect to performance metrics for the CSSS and potential increases in high water stage and durations within WCA 3A, with the increased WCA 3A stages resulting in potential increased risk to structural and levee safety. Following conclusion of the Round 1 simulations (**Table 2-2**), USFWS preferred simulation R1E which included the closure of S-12A, S-12B, S-343A, S-343B and S-344 year round, as this would cease the discharge of water from these structures into the western marl prairies and CSSS-A. The Corps preferred simulation R1B as it did not result in changes to the mandatory opening date of July 15 and had a more acceptable risk for structural and levee safety in WCA 3A compared to the other simulations.

Following the conclusion of Round 2 simulations (**Table 2-3**), USFWS preferred simulation R2H as it indicated that conditions could be drier in the northern areas of CSSS-A and along the L-31N Canal in the vicinity of the eastern subpopulations and the South Dade agricultural areas. The Corps continued to prefer simulation R1B because it did not result in changes to the initial opening date of S-12A, S-12B, S-343A, S-343B, and S-344 (July 15) and had a more moderate risk increase for structural and levee safety due to WCA 3A high water conditions compared to some other scenarios in Round 1 and Round 2. The Corps acknowledged the potential benefits to the eastern sub-populations provided by the operational changes made within the SDCS as a result of simulation R2H.

Discussions between USFWS and the Corps following completion of the Round 3 sensitivity simulations led to a compromised scenario that was a hybrid of several simulations. No single model simulation incorporated the selected alternative that was considered in the RPA. Prescriptive closure of S-12A, S-12B, S-343A, S-343B, and S-344 during the October and November timeframe was not acceptable to the Corps given that water levels in the WCA 3A generally peak during October. The Corps provided recommendations to further develop a conditions based scenario that varies the opening and closing dates of the structures depending on measured conditions within the system, rather than prescriptive open and close dates during these two months at the end of the wet season.

A conditions based approach to operation of S-12A and S-12B was proposed by the Corps to allow the Corps to retain critical flexibility during WCA 3A high water conditions while also ensuring that the structures are operated optimally for CSSS habitat during normal and low water conditions.

The RPA focused on simulation R1B (S-12A, S-12B, S-343A, S-343B, and S-344 closure period from October 1 to July 15) accompanied by a high water strategy for WCA 3A during the months of October and November that was developed by the Corps to reduce potential increases in stage within WCA 3A and the resulting risk to structural and levee safety. Under this strategy, if water levels are high in WCA 3A in October, S-12A and S-12B could remain or be opened until water levels drop. If water levels are high in WCA 3A during November, S-12B could remain open or be opened until water levels drop. S-343A, S-343B and S-344 would close on October 1 regardless of water level conditions. SDCS operations as represented in simulation R2H was also incorporated into the selected alternative that was considered during development of the RPA targets for protection of the eastern marl prairie and CSSS subpopulations.

As the Corps had already initiated the incremental approach to the development of the COP with the Increment 1 field test starting in October 2015 and the 2016 Temporary Emergency Deviation during February through May of 2016, USFWS analyzed the effects of INCR1B and INCR1H, with relaxation of the G-3273 constraint (L-29 Canal stage maximum operating limit unchanged at 7.5 feet, NGVD) along with modified SDCS operations, for the 2017 CSSS nesting window and analyzed INCR2B and INCR2H, with increased L-29 Canal stages (up to 8.5 feet, NGVD) along with modified SDCS operations for the 2018 CSSS nesting window. The RPA further requires that the Corps proceed as scheduled, and as allowable by law, for completing NEPA analysis on Increment 1 Plus (*i.e.* 1.2) prior to March 1, 2017, Increment 2 prior to March 1 2018, and COP in 2019.

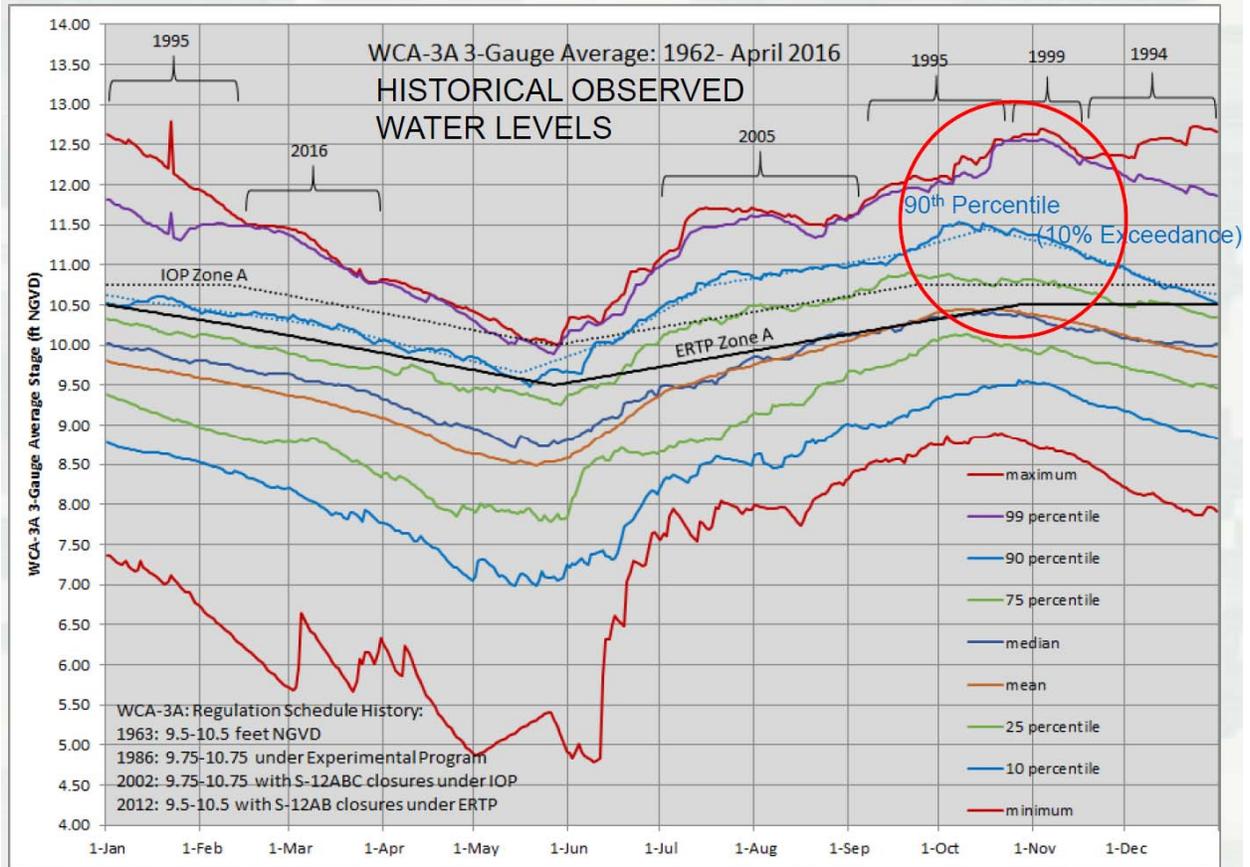
All of the Round 1 and Round 2 modeled scenarios (aside from the ECB16 existing condition run) increased the number of days where WCA 3A is above the historical 90% (10% exceedance) water level. Throughout ESA consultation, the Corps recommended that the 90<sup>th</sup> percentile historical water level for WCA 3A be used as a stage threshold or deviation action line to reduce potential for adverse impacts due to high stages. The 90<sup>th</sup> percentile stage varies seasonally and reaches a maximum water elevation of 11.5 feet, NGVD during the month of October (**Figure 2-1**). Levee safety concerns and the risk of overtopping to the perimeter levees are exacerbated with higher water levels in WCA 3A and are most vulnerable during the later parts of the wet season (July, August, September and early October), which coincides with the height of the hurricane season. **Figure 2-2** provides a comparison of the percent increase in stage durations above the historical 90<sup>th</sup> percentile for a period of record from 1965-2005 within WCA 3A. The closure of S-12A, S-12B, S-343A, S-343B, and S-344 for all 12 months of the year (R1E) produced an unacceptable level of risk due to reduced operational flexibility and outlet capacity, as indicated by the 29% increase in days above the 90% threshold. Simulations R1A (5%), R1B (10%), R1C (8%), and R1D (14%) provided less of an increase relative to ECB16 when compared to R1E. Simulations R2F, R2G2 and R2H provided a 23%, 15%, and 13% increase in days above the 90% threshold, respectively. Further evaluation of the simulation results for representative wet conditions, using intra-annual daily hydrographs generated for the 90<sup>th</sup> percentile of stages (10% of simulated daily stages were higher) for the simulated period of record (1965-2005) shown in **Figure 2-3**, demonstrated that delayed opening of S-12A, S-12B, S-343A, S-343B, and S-344 (August 16

versus July 15) results in persistent higher stages in WCA 3A throughout the wet season months and that unconditional earlier closure of S-12A, S-12B, S-343A, S-343B, and S-344 (October 1 versus November 1 and January 1, respectively) results in higher peak stages in WCA 3A during wet years.

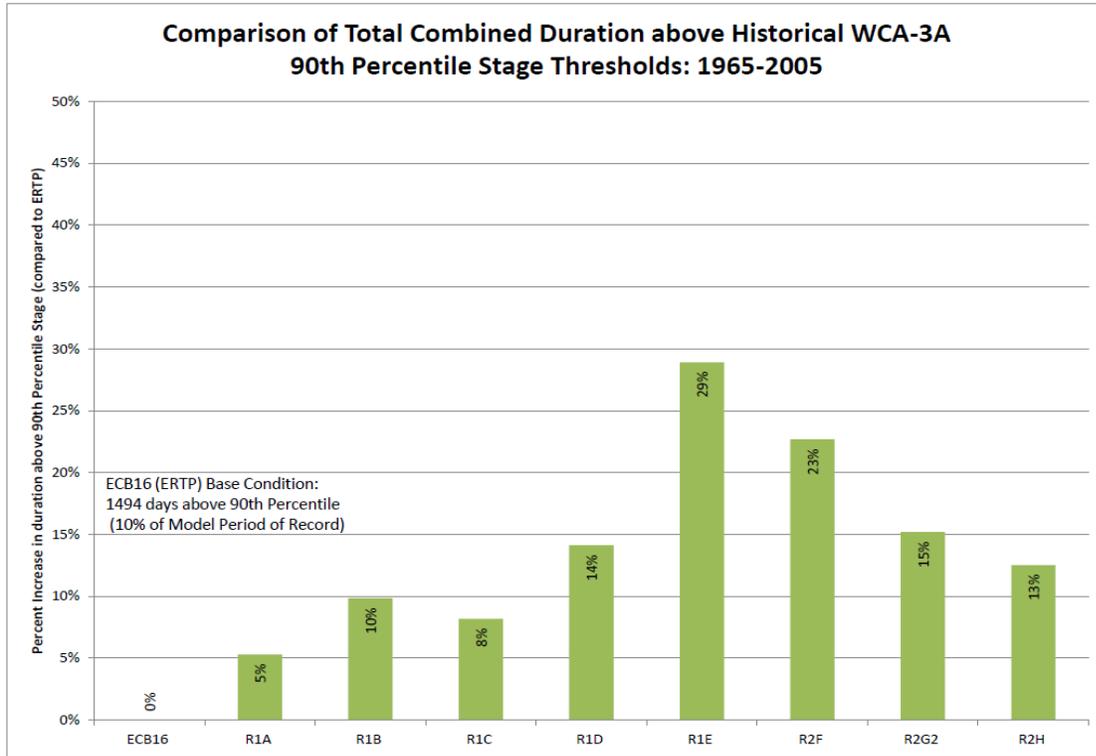
Since no single model simulation incorporated the selected alternative that was considered in the RPA, the 2016 ERTTP BO analysis of the effects of the RPA for the CSSS western subpopulation (CSSS-A) and WCA 3A were based on the evaluation of the simulation results for R1B, INCR1B (R1B updated to incorporate Increment 1 operations), and INCR2B (R1B updated to incorporate Increment 2 type operations). Intra-annual daily hydrographs generated for the 90<sup>th</sup> percentile of stages (10 percent of simulated daily stages were higher) and the 75<sup>th</sup> percentile of stages (25 percent of simulated daily stages were higher) for the simulated period of record (1965-2005) shown in **Figure 2-4** and **Figure 2-5** indicate the potential for WCA 3A stages to increase by up to 0.2 feet at the end of the wet season (compared to ECB16) due to the combined effects from the extended S-12A, S-12B, S-343A, S-343B, and S-344 closure periods identified for the RPA and utilization of NESRS storage throughout the preceding wet season months under Increment 1 (INCR1B). However, the additional NESRS storage that will be provided with further raising of the L-29 Canal constraint under Increment 2 (INCR2B) has the potential to reduce WCA 3A stages throughout the wet season months (June through October) by up to 0.2 feet, more than offsetting the effects shown under Increment 1, if no additional operational constraints for the L-29 Canal are required due the eastern CSSS subpopulations.

Due to time constraints associated with the modeling efforts, the WCA 3A high water strategy that is contained within the RPA was not able to be included in the modeling analysis, but the high water strategy was developed to ensure no adverse effects to WCA 3A during extreme wet years. Insights to the effects on WCA 3A peak stages from the high water strategy are provided by comparison between the R1B simulation (S-12A, S-12B, S-343A, S-343B, S-344 closure period from 01 October through 15 July) and the R1A simulation (S-12A, S-12B, S-343A, S-343B, S-344 closure period from 01 November through 15 July); this comparison (**Figure 2-5**) shows that WCA 3A peak stages may be reduced by up to 0.25 feet during the wettest years within the model period of record (years with peak stages greater than 11.50 feet, NGVD), but the high water will provide more significant peak stage reductions since S-12A and S-12B operations will also be allowed during October for years when the WCA 3A stage is above 10.5 feet, NGVD on 30 September and/or the WCA 3A stage is projected to rise above 10.75 feet, NGVD.

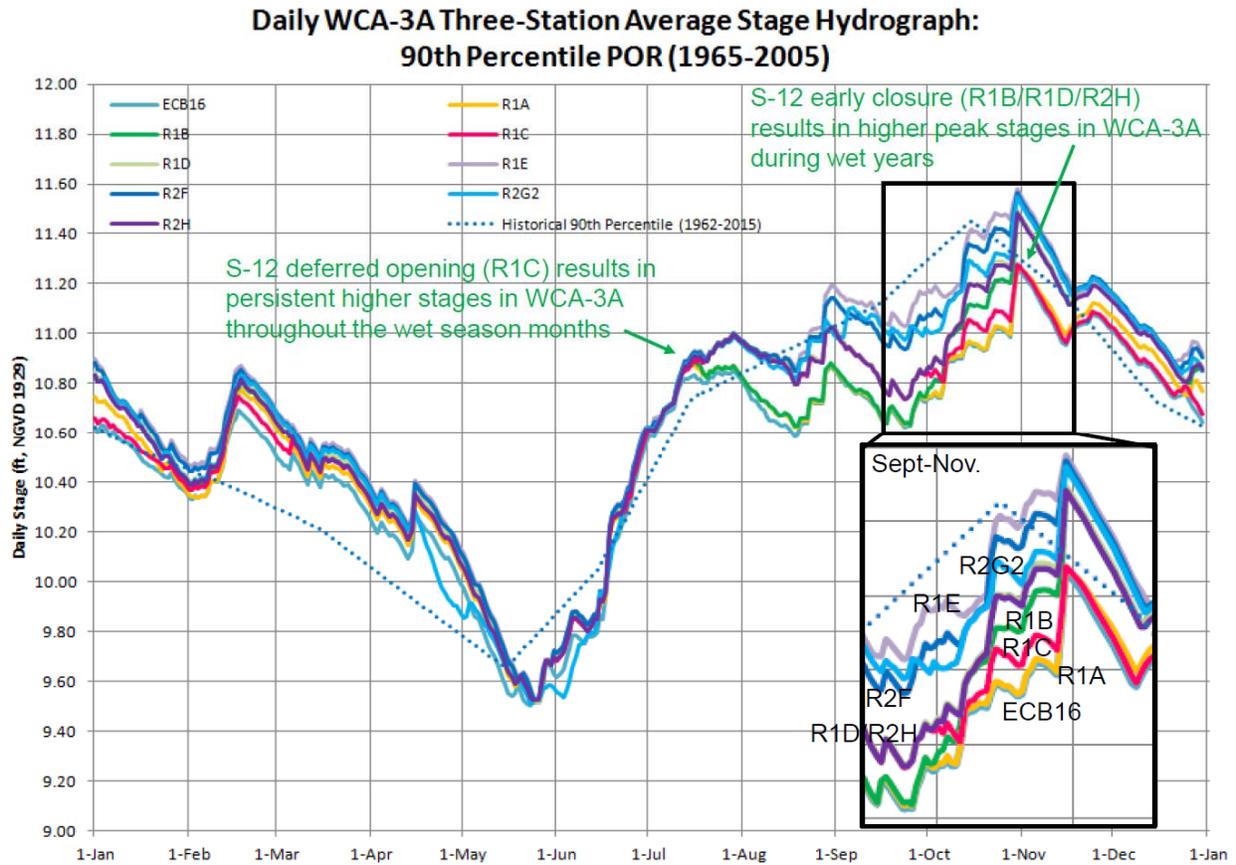
**Figure 2-6** depicts the annual exceedance probability for Zone A of the WCA 3A regulation schedule for the period of record from 1965-2005. Each of the Round 1 and Round 2 model simulations increased the probability of exceeding Zone A of the regulation schedule compared to ECB16.



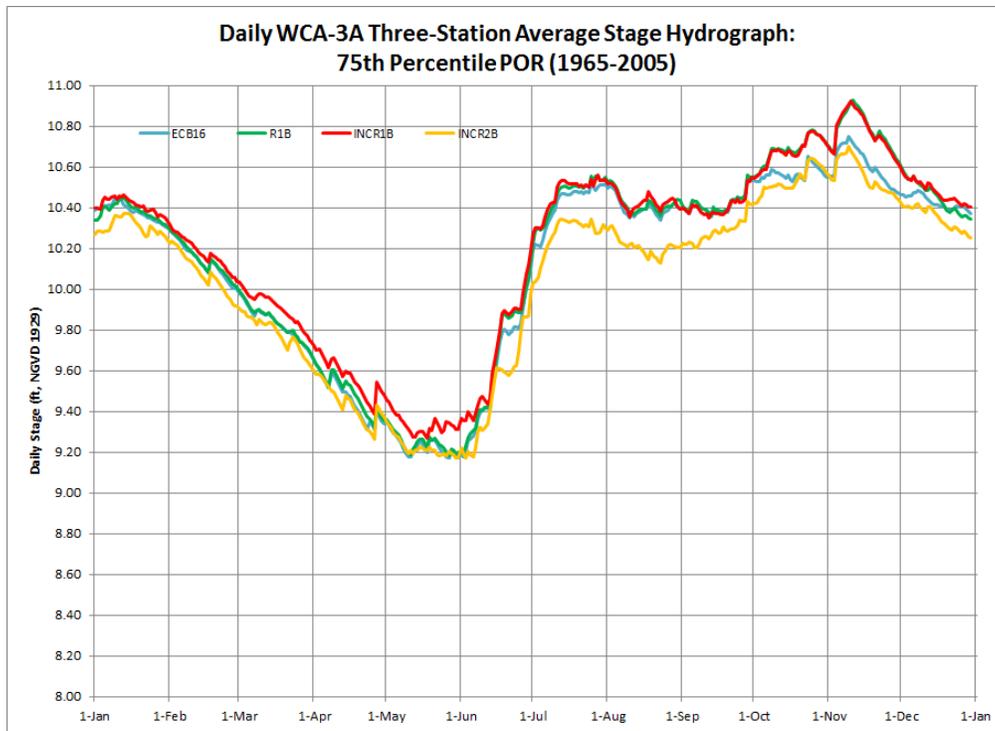
**FIGURE 2-1. INTRA-ANNUAL EXCEEDENCE HYDROGRAPH FOR WCA 3A HISTORICAL STAGES (1962-2016)**



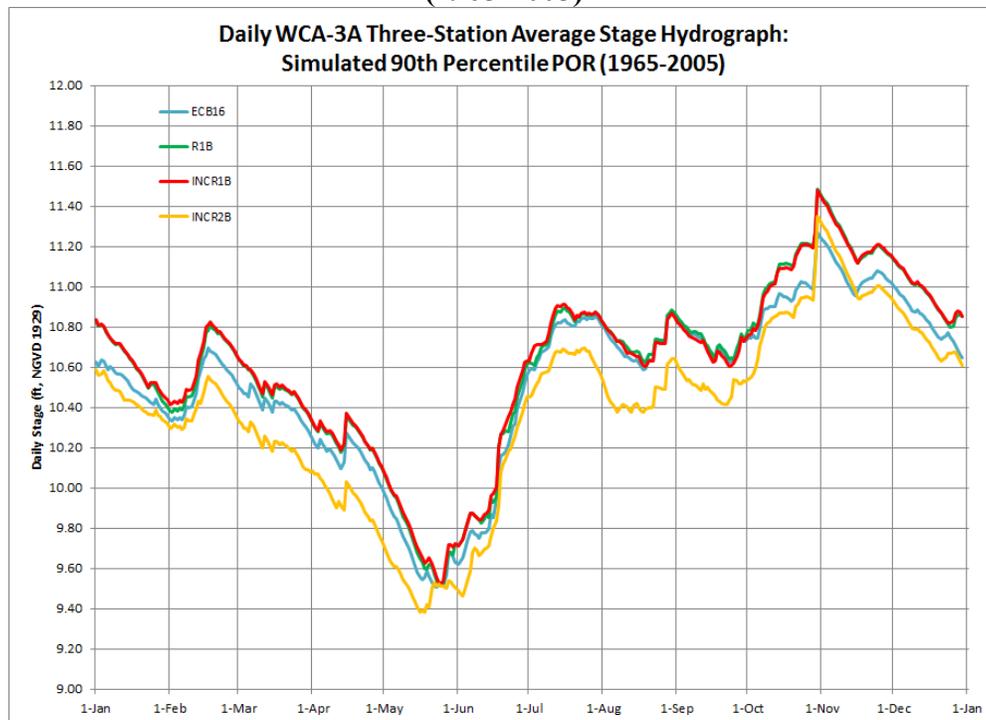
**FIGURE 2-2. COMPARISON OF TOTAL COMBINED DURATION (PERCENT OF SIMULATED PERIOD OF RECORD) WITH WCA 3A STAGES ABOVE THE HISTORICAL WCA 3A 90TH PERCENTILE STAGE THRESHOLDS (1965-2005). ROUNDS 1 AND 2**



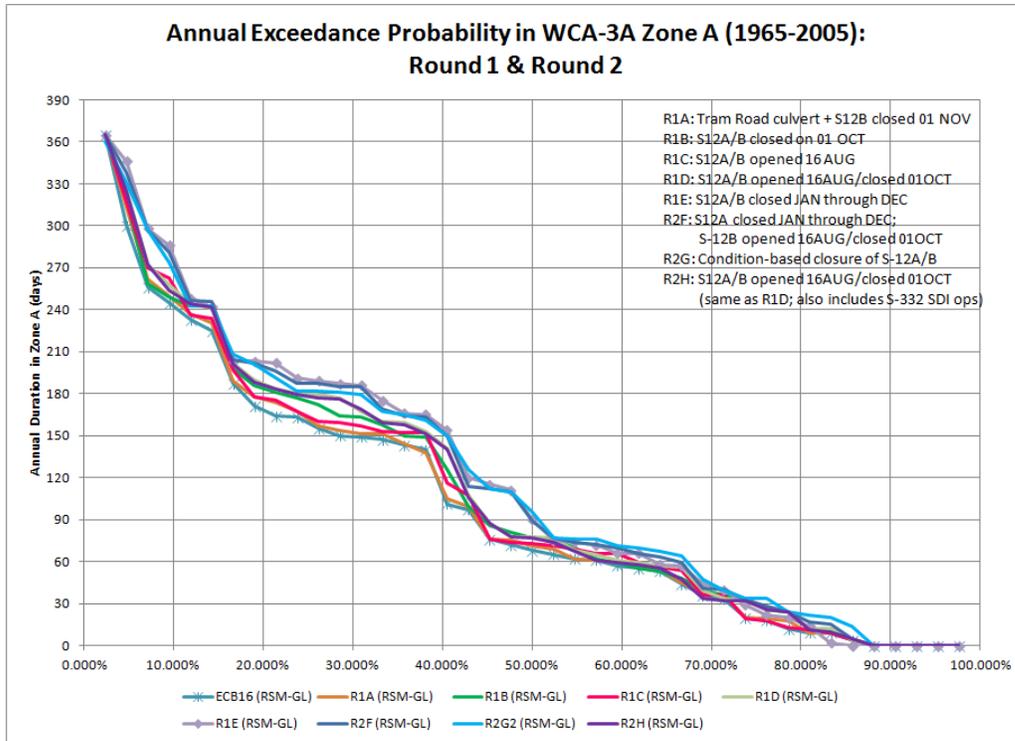
**FIGURE 2-3. WCA 3A INTRA-ANNUAL DAILY HYDROGRAPHS GENERATED FOR THE 90TH PERCENTILE OF STAGES FOR THE SIMULATED PERIOD OF RECORD (1965-2005). ROUNDS 1 AND 2**



**FIGURE 2-4. WCA 3A INTRA-ANNUAL DAILY HYDROGRAPHS GENERATED FOR THE 75TH PERCENTILE OF STAGES FOR THE SIMULATED PERIOD OF RECORD (1965-2005)**



**FIGURE 2-5. WCA 3A INTRA-ANNUAL DAILY HYDROGRAPHS GENERATED FOR THE 90TH PERCENTILE OF STAGES FOR THE SIMULATED PERIOD OF RECORD (1965-2005)**



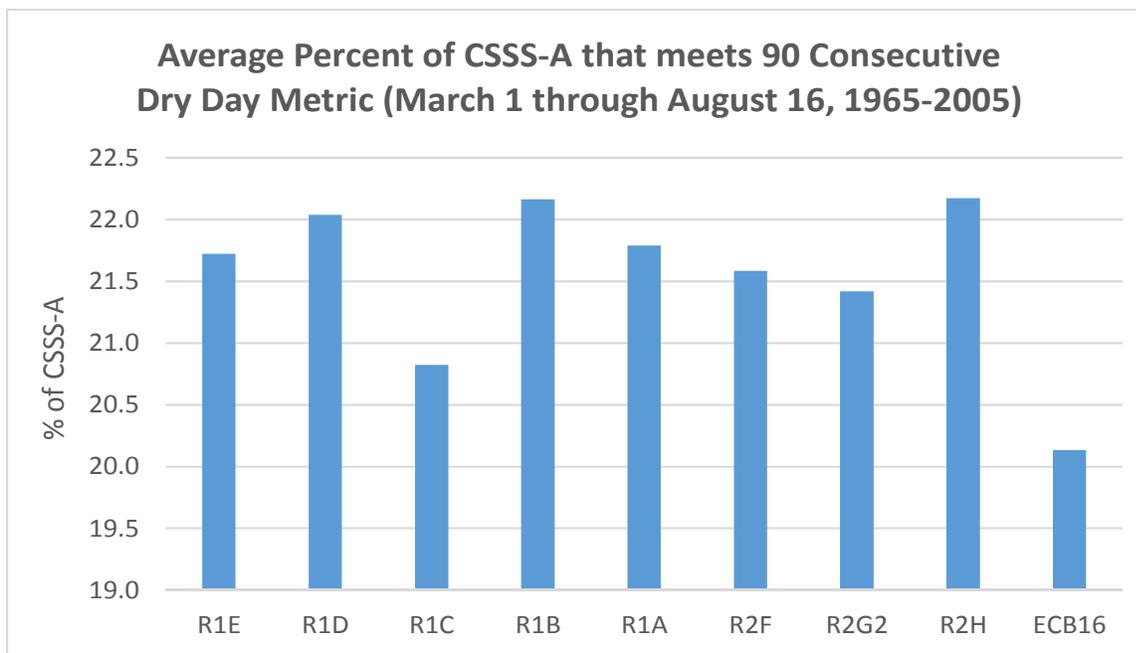
**FIGURE 2-6. SIMULATED ANNUAL EXCEEDANCE PROBABILITY IN WCA 3A ZONE A (1965-2005). ROUNDS 1 AND 2**

Similar with the analysis conducted for the CSSS-A, the effects of the RPA on the eastern subpopulations (B through F) were based on analysis of the effects of R2H, INCR1H (R2H updated to incorporate Increment 1 operations), and INCR2H (R2H updated to incorporate Increment 2 type operations).

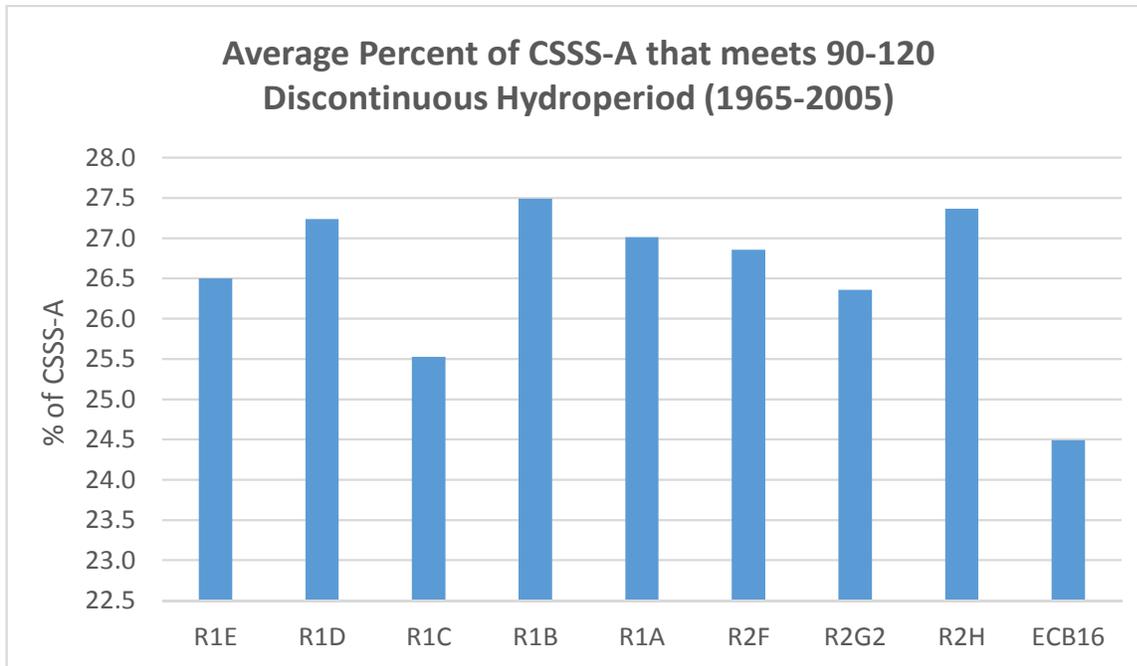
The two most critical performance metrics for maintaining and enhancing the chances for CSSS survival are the number of consecutive days during the CSSS nesting season (March 1 – July 15) when there is no surface water (*i.e.* dry nesting days) and the total number of days when there is water above ground surface during the year (*i.e.* annual discontinuous hydroperiod) (USFWS 2016). Since it takes the CSSS, a ground nesting bird (nests on average are 17 cm above ground), approximately 45 days to nest and fledge young, the 2016 ERTF BO RPA has set a target of providing at least 90 consecutive dry nesting days between March 1 and July 15, over at least 24,000 acres within and adjacent to CSSS-A, and across at least 40 percent of each of the eastern subpopulations (B-F), to allow for multiple broods during each nesting season in order to stabilize and potentially increase the population (**Figure 1-4**). Since, an average annual discontinuous hydroperiod of between 90 and 210 days, which normally occurs outside of the nesting season, is required to maintain suitable marl prairie habitat for the CSSS (USFWS 2016), the 2016 ERTF BO has set a target of providing a four year running average discontinuous hydroperiod of 90-210 days over at least 24,000 acres within and adjacent to CSSS-A, and across at least 40 percent of each of the eastern subpopulations (B-F). If the number of days with surface water is consistently more than 210 days, the habitat will convert to sawgrass. If it is consistently too dry (less than 90

days) woody vegetation encroaches on the habitat and there is an increased risk of fire and predation on CSSS from aerial predators (raptors).

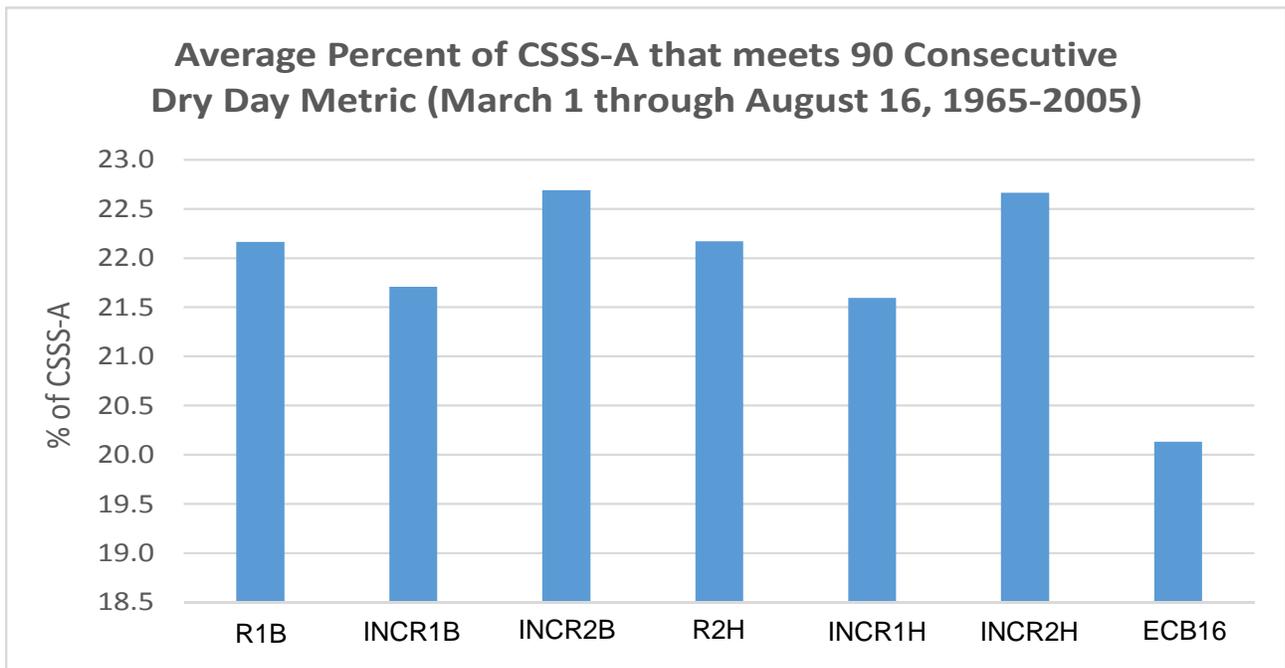
**Figure 2-7** illustrates the average percent of CSSS-A habitat that meets the 90 consecutive dry nesting day metric evaluated from March 1 through August 16 over the period of simulation (1965-2005) for Rounds 1 and 2. **Figure 2-8** illustrates the average percent of CSSS-A habitat that meets a discontinuous hydroperiod of 90-210 days over the period of simulation (1965-2005) for Rounds 1 and 2. R1B best achieved the dry nesting days and annual discontinuous hydroperiod targets for CSSS-A relative to ECB16 during Round 1 simulations. R2H best achieved the dry nesting days and annual discontinuous hydroperiod targets for CSSS-A relative to ECB16 during Round 2 simulations, illustrating an approximately 2% increase in habitat attaining the USFWS metric due to the additional closure periods. During Round 3 INCR2B AND INCR2H best met the 90 consecutive dry nesting day and discontinuous hydroperiod metrics as illustrated in **Figure 2-9** and **Figure 2-10**.



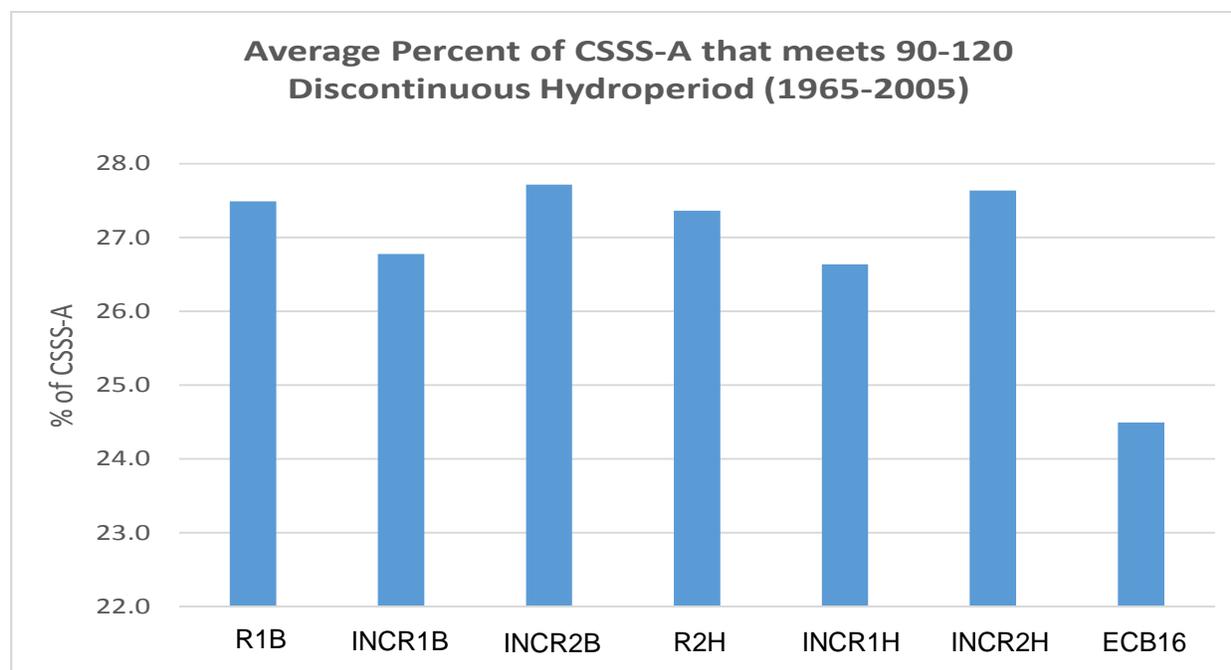
**FIGURE 2-7. AVERAGE PERCENT OF CSSS-A THAT MEETS 90 CONSECUTIVE DRY DAY METRIC (MARCH 1 THROUGH AUGUST 16 (1965-2005). ROUND 1 AND ROUND 2 MODELING**



**FIGURE 2-8. AVERAGE PERCENT OF CSSS-A THAT MEETS 90 TO 120 DISCONTINUOUS HYDROPERIOD (1965-2005). ROUND 1 MODELING**



**FIGURE 2-9. AVERAGE PERCENT OF CSSS-A THAT MEETS 90 CONSECUTIVE DRY DAY METRIC (MARCH 1 THROUGH AUGUST 16 (1965-2005)) FOR R1B, R2H, INCR1B, INCR1H, INCR2B, INCR2H AND ECB16**



**FIGURE 2-10. AVERAGE PERCENT OF CSSS-A THAT MEETS 90 TO 120 DISCONTINUOUS HYDROPERIOD (1965-2005) FOR R1B, R2H, INCR1B, INCR1H, INCR2B, INCR2H AND ECB16**

**Table 2-5** illustrates the number of years for the period of simulation (1965-2005) that the discontinuous hydroperiod target ( $\geq 40\%$  of habitat in the 90-210 day range) and the consecutive dry day target (1 March to 15 July  $\geq 40\%$  of habitat  $\geq 90$  days) is met for each subpopulation. In CSSS-A, the model simulations indicates that the proposed operations for INCR2B provide an increase in the number of years meeting the discontinuous hydroperiod target from 9 to 11 years (**Table 2-5**). In CSSS-Ax, that number is improved from 16 years in the ECB16 to 20 years under INCR2B. CSSS-Ax is known as the ‘expansion area’ and is located directly adjacent to the previously defined location for CSSS-A (**Figure 1-4**). CSSS-Ax is an area that has been identified as a possible location adjacent to CSSS-A that may contain suitable habitat and/or an area in which CSSS have been observed based on surveys. In CSSS-C, the model indicates that the proposed operations provide an increase in the number of years meeting the target compared to the existing conditions from 16 years in ECB16 to 19 years under INCR2H. Alternatively, for CSSS-F, the model indicates that the proposed operations result in a decrease in the number of years meeting the target compared to the existing condition from 22 years in ECB16 to 13 years under INCR2H. No significant changes are indicated for INCR2H from ECB16 in CSSS-B (20 years) and CSSS-D (18 years), and only a slight decrease in CSSS-E (21 years in ECB16 to 20 years under INCR2H) based on this metric.

For the consecutive dry days target (**Table 2-5**) the target criteria are met more consistently. CSSS-A and CSSS-D have the lowest number of years overall, but show improvement compared to ECB16 (+2 years, CSSS-A from 16 years in ECB16 to 18 years with INCR2B, and CSSS-D from 18 years in ECB16 to 20 years under INCR2H). CSSS-Ax shows the greatest improvement of any area for this metric (+4 years), increasing from 21 years in ECB16 to 25 years for INCR2B.

Notably CSSS-E indicates a decrease from the baseline of 30 years to 26 years with INCR2H for this metric. No significant changes are indicated for INCR2H from ECB16 in CSSS-B (37 years) and CSSS-C (36 years), and only a slight decrease in CSSS-F (from 32 years to 31 years) based on this metric.

**Table 2-6** illustrates the annual difference in acres between ECB16 and ICR2B and INCR2H in the 90-210 day discontinuous hydroperiod range for the 1965-2005 period of record for each CSSS sub-population. For discontinuous hydroperiod, the average annual change from ECB16 to modeled scenario for CSSS-Ax was an increase of 2,891 acres for INCR2B (9 years decrease and 31 years increase). Alternately, in CSSS-D, CSSS-E, and CSSS-F, the average annual change from ECB16 to modeled scenario INCR2H decreased, ranging from -308 to -968 acres for INCR2H (11 to 12 years increase and 24 to 28 years decrease). Less distinct differences were indicated for CSSS-B and CSSS-C for this metric. While the average acreage change for CSSS-B was only -127 acres, the model scenario INCR2H exhibited the number of years with decreasing values for INCR2H as 21 years, with only 17 years increasing in acreage meeting this target.

**Table 2-7** illustrates the annual difference in acres between ECB16 and INCR2B and INCR2H in the March 1 to July 15 consecutive dry day range  $\geq 90$  for the 1965 to 2005 period. For consecutive dry days, the average annual change from ECB16 to modeled scenario for CSSS-Ax was an increase of 2,203 acres for INCR2B (10 years decrease and 29 years increase). Alternately, in CSSS-B and CSSS-E, the average annual change from base to modeled scenario decreased ranging from -209 to -1,417 acres for INCR2H (1 to 6 years increase and 22 to 27 years decrease (13 years no change). This metric showed that the net average change in acreage was generally small (30 to 263 acres on average) in CSSS-C and CSSS-D, however, some improvement in the number of increasing years was indicated for INCR2H (11 years performed better in CSSS-C and 19 years in CSSS-D). While the average acreage change in CSSS-B was small (-209 acres) for INCR2H, the number of years with decreasing acreages for INCR2H was 22 years, and only 6 years increased.

The modeling assumptions for the SDCS operational changes within the simulations for R2H, INCR1H, and INCR2H were based on insights provided from the SFWMD South Dade Investigation Workshops, however, these operations were not able to be optimized for the CSSS RPA performance metrics for the eastern subpopulations due to time constraints. While notable improvements are demonstrated for the CSSS-A resultant from the RPA conditional extended closure periods for S-12A, S-12B, S-343A, S-343B and S-344, the CSSS performance metrics for the eastern subpopulations (CSSS-B through CSSS-F) demonstrate variability between a moderate performance reductions to very slight performance improvements. Since the BO RPA provides performance targets for the CSSS eastern subpopulations and does not prescribe specific SDCS operational changes, the Corps advocated to provide sufficient flexibility within the Increment 1.1 and 1.2 operational strategy to allow the Corps and SFWMD water managers to achieve the intended performance from the RPA proposed operational condition.

**TABLE 2-5. NUMBER OF YEARS FOR THE 1965-2005 PERIOD OF RECORD (41 YEARS) THAT THE DISCONTINUOUS HYDROPERIOD TARGET ( $\geq 40\%$  OF HABITAT IN THE 90-210 DAY RANGE) AND THE CONSECUTIVE DRY DAY (1 MARCH TO 15 JULY,  $\geq 40\%$  OF HABITAT  $\geq 90$  DAYS) TARGET IS MET FOR EACH SUBPOPULATION.**

Scenario	90-210 Day Disc. Hydroperiod		
	ECB16	INCR2B	INCR2H
CSSS Subpopulation			
A	9	11	10
A (Expanded)	16	20	20
B	20	20	20
C	16	18	19
D	18	18	18
E	21	19	20
F	22	14	13

Scenario	$\geq 90$ Consecutive Dry Days		
	ECB16	INCR2B	INCR2H
CSSS Subpopulation			
A	16	18	19
A (Expanded)	21	25	25
B	37	37	37
C	36	36	36
D	18	18	20
E	30	26	26
F	32	30	31

**TABLE 2-6. ANNUAL DIFFERENCE IN ACRES BETWEEN THE ECB16 (BASE) CONDITION AND INCR2B (CSSS-A, CSSS-AX) AND INCR2H (CSSS-B, CSSS-C, CSSS-D, CSSS-E, CSSS-F) MODELED SCENARIOS IN THE 90-210 DAY DISCONTINUOUS HYDROPERIOD RANGE FOR THE 1965-2005 PERIOD OF RECORD FOR EACH SUBPOPULATION.**

Year	Modelled Change From ECB16 Discontinuous Hydroperiod 90 - 210 Days						
	INCR2B-ECB16		INCR2H-ECB16				
	# Acres A	# Acres A exp.	# Acres B	# Acres C	# Acres D	# Acres E	# Acres F
1965	-197	-3,394	0	0	0	-159	0
1966	2,130	3,394	-314	-595	-587	-2,619	-495
1967	3,866	7,577	39	-119	-1,332	-1,627	572
1968	3,866	5,880	-118	-3,253	-1,097	-1,309	-1,524
1969	4,655	7,656	-196	198	-431	-2,460	-1,410
1970	1,341	2,999	-629	-1,785	-783	-2,738	-610
1971	-2,209	-3,907	-550	0	2,037	1,151	0
1972	-276	-474	-236	-278	-352	556	762
1973	-789	-2,605	-157	436	157	-278	267
1974	158	631	157	-40	940	-278	-76
1975	3,629	1,894	157	-40	940	-675	-114
1976	8,560	10,024	118	-2,301	-117	-1,429	-1,448
1977	-4,300	-6,867	314	952	392	2,579	2,134
1978	355	434	-118	-397	274	-754	-1,296
1979	2,012	2,802	-118	159	-1,175	119	-191
1980	-2,051	-1,381	-314	-159	-352	-2,143	-114
1981	0	1,223	0	0	235	833	0
1982	5,799	11,799	39	3,848	-1,292	-1,468	762
1983	1,657	2,210	-511	-1,111	-39	-992	-267
1984	2,051	4,972	-39	0	-1,919	-3,333	-1,029
1985	-3,077	-8,090	0	79	627	1,032	191
1986	4,458	7,814	-432	-555	-274	-3,016	-2,591
1987	-79	1,776	-314	0	2,702	1,587	457
1988	6,115	8,129	196	-79	-1,097	-635	-2,210
1989	-2,249	-2,999	275	0	1,175	1,706	457
1990	-197	237	39	0	0	40	0
1991	197	276	157	-476	-78	0	0
1992	2,840	6,275	118	278	-352	-3,809	-953
1993	4,655	8,327	-314	2,182	-1,097	-2,421	-1,181
1994	2,604	5,683	-1,258	3,689	-274	-2,579	-1,334
1995	0	0	-550	-198	-157	0	0
1996	1,894	3,631	-1,336	-674	-587	-1,905	-1,601
1997	5,286	9,668	314	238	-2,702	-4,722	-305
1998	2,683	4,499	118	952	-392	-556	-876
1999	2,446	3,828	-118	238	-1,410	-2,301	-838
2000	1,578	2,762	-314	5,792	-1,371	-1,786	991
2001	3,748	2,920	393	754	470	79	76
2002	4,063	6,867	-196	-79	-1,684	-3,690	-2,401
2003	276	-158	275	238	-2,546	-476	-114
2004	1,657	2,526	118	873	979	1,032	953
2005	9,981	9,708	118	0	-39	-238	-76
65-05 Ave.	1,930	2,891	-127	214	-308	-968	-376
65-05 Max.	9,981	11,799	393	5,792	2,702	2,579	2,134
65-05 Min.	-4,300	-8,090	-1,336	-3,253	-2,702	-4,722	-2,591
# yrs. Decrease	10	9	21	17	27	28	24
# yrs. Increase	29	31	17	16	12	11	11
92-05 Ave.	3,122	4,752	-188	1,020	-797	-1,669	-547

**TABLE 2-7. ANNUAL DIFFERENCE IN ACRES BETWEEN THE ECB16 (BASE) CONDITION AND THE INCR2B (CSSS-A, CSSS-AX) AND INCR2H (CSSS-B, CSSS-C, CSSS-D, CSSS-E, CSSS-F) MODELED SCENARIOS IN THE MARCH 1 TO JULY 15, CONSECUTIVE DRY DAYS  $\geq$  90 RANGE FOR THE 1965 – 2005 PERIOD.**

Year	Modelled Change From ECB16 Consecutive Dry $\geq$ 90 Days, 3/1-7/15						
	INCR2B-ECB16		INCR2H-ECB16				
	# Acres A	# Acres A exp	# Acres B	# Acres C	# Acres D	# Acres E	# Acres F
1965	-197	-1,736	0	0	666	-436	0
1966	-473	-2,249	-118	0	1,214	-3,690	-191
1967	3,195	2,644	39	0	78	-556	0
1968	39	79	-39	40	0	0	0
1969	1,539	4,459	-275	1,190	1,018	-2,698	76
1970	2,209	5,327	-1,022	-238	-1,097	-3,055	-343
1971	39	39	0	0	0	0	0
1972	0	-513	0	0	0	0	1,258
1973	-39	-434	-196	0	-39	-436	0
1974	0	0	0	0	0	0	0
1975	394	434	39	0	157	0	0
1976	710	1,144	-39	0	0	-278	0
1977	158	158	-236	-198	-39	-556	0
1978	-434	-2,881	-39	159	431	357	0
1979	3,669	4,065	-432	516	39	-1,984	0
1980	39	2,723	-314	79	2,311	-3,016	-191
1981	-158	-158	0	0	-39	0	0
1982	513	789	0	0	0	-278	38
1983	158	750	-432	-1,190	-39	-595	0
1984	3,393	4,499	-275	516	157	-913	114
1985	79	79	-79	0	0	0	0
1986	5,483	11,168	-432	595	822	-2,976	152
1987	5,483	8,998	-393	198	1,802	-1,667	38
1988	4,182	3,433	432	0	744	-2,817	0
1989	0	0	0	0	0	0	0
1990	-79	-158	0	0	-196	0	0
1991	-39	-197	39	159	78	0	114
1992	1,617	-158	39	0	1,253	-2,778	0
1993	6,982	13,417	-904	0	-509	-5,397	-2,363
1994	5,602	10,931	-1,297	635	117	-4,206	2,744
1995	0	395	-1,022	-1,388	-157	-516	0
1996	2,051	2,881	-236	238	666	-3,135	-305
1997	2,998	2,960	0	0	0	-317	0
1998	5,128	9,432	-1,022	-79	-196	-4,405	-1,296
1999	2,959	4,380	39	0	-39	-2,936	-114
2000	1,183	2,328	-157	0	-39	-4,603	0
2001	118	118	0	0	78	0	0
2002	1,420	-474	0	0	1,410	-2,778	0
2003	473	316	-236	0	117	-1,429	0
2004	394	434	0	0	0	0	0
2005	907	908	0	0	0	0	0
65-05 Ave.	1,505	2,203	-209	30	263	-1,417	-7
65-05 Max.	6,982	13,417	432	1,190	2,311	357	2,744
65-05 Min.	-473	-2,881	-1,297	-1,388	-1,097	-5,397	-2,363
# yrs. Decrease	7	10	22	5	11	27	7
# yrs. Increase	30	29	6	11	19	1	8
92-05 Ave.	2,274	3,419	-342	-43	193	-2,321	-95

It should be noted, that in order to further discern how potential changes in operations of S-12A, S-12B, S-343A, S-343B and S-344 may translate into benefits to the CSSS and its habitat, the Corps and USFWS enlisted U.S. Geological Survey (USGS) scientists to run a new CSSS model developed by Bereens et al. (2016). The objective of the USGS analysis was to compare modeled scenarios utilizing a set of metrics pertinent to CSSS (short to long time scales) that relate habitat suitability for the CSSS to hydrologic conditions. This analysis did not include all of the model

simulations noted in **Table 2-2**, **Table 2-3**, and **Table 2-4** above. Only simulations in Round 2 were evaluated (*i.e.* ECB16, R2F, R2G2, R2H, R1E). In summary, the analysis concluded that hydrologic outputs were similar across modeled scenarios in CSSS-A, however, R2H realized hydroperiod and depth suitability targets more than the other scenarios relative to ECB. The full report is included as **Appendix D** as the final report was not included within the 2016 ERTTP BO as an appendix. The analysis performed by USGS was also used during ERTTP consultation to inform potential benefits to CSSS resulting from implementation of the modeled simulations.

In summary, under the model scenarios identified in the 2016 ERTTP BO and RPA, CSSS-A shows benefits, while there are variable effects on the eastern subpopulations. However, the targets as presented by the 2016 ERTTP BO AND RPA are not being fully achieved under the model simulations conducted for purposes of reinitiation of consultation. Based on modeling analyses conducted to support the 2016 BO, the USFWS acknowledges within the BO that the CSSS performance targets are not technically feasible for all subpopulations in every year at this time. However, the actions included in the RPA were developed to move conditions toward the targets by providing the maximum benefits for the CSSS and its habitat with the features that are currently in place or will be in place in the near future. Please reference the 2016 ERTTP BO for a complete description regarding development of the RPA and the evaluation methodology that was utilized for purposes of selecting the RPA. The above summary is included for purposes of communicating how the alternatives presented in **Sections 2.1.2** through **2.1.6** were informed by the reinitiation of consultation for ERTTP. For full details on potential environmental consequences to other threatened and endangered species within the action area as a result of the RPA, please refer to the 2016 ERTTP BO.

### 2.1.2 ALTERNATIVE A: NO ACTION ALTERNATIVE

The No Action Alternative would continue C&SF water management operations as defined by Increment 1 of the COP for the operation of the water management infrastructure connected to the MWD to ENP and C-111 South Dade Projects (USACE 2015). Increment 1 of the COP is a deviation to the 2012 Water Control Plan. Water management operations for Increment 1 are further defined in Appendix A of the EA and FONSI (dated May 27, 2015) (USACE 2015). A comparison of Increment 1 operating criteria relative to the 2012 WCAs-ENP-SDCS Water Control Plan is provided in Table 2-8 below.

Under the No Action Alternative, the 2012 Water Control Plan, including the WCA 3A Regulation Schedule, Rainfall Plan, and Interim Operating Criteria for the 8.5 SMA Project will continue to govern water management operations during implementation of the No Action Alternative with the exception of operating criteria for S-333, S-334, S-356, S-197, and S-357N. The No Action Alternative will continue to maintain the current operating limit constraint of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. The G-3273 stage constraint will continue to be relaxed up to 7.5 feet, NGVD. Both S-333 and S-356 releases to the L-29 Canal will be subject to this constraint. The 6.8 feet, NGVD water level at G-3273 and the WCA 3A stage level (as measured using the average of monitoring gauges 63, 64, and 65, which is also referenced as the WCA 3A three gage average stage) will continue to be utilized to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS. The Increment 1 Action Line as shown in **Figure 2-11** is a seasonally varying WCA 3A water level (10.0 to 10.75 feet, NGVD) which will also serve to define the S-333 and S-356 releases to the L-29 Canal and NESRS. The combined flows to NESRS through S-333 and S-356 under the No Action Alternative, is expected to be more than what would have otherwise been discharged through S-333 under the 2012 Water Control Plan. S-355A and S-355B may also be utilized to discharge to the L-29 Canal as indicated under current operations and other future associated permit requirements, if available for use.

There are three distinct modes of water management operations specified in the WCAs-ENP-SDCS Water Control Plan (USACE 2012c): Column 1, Column 2, and water supply. As defined in the 2002 IOP for the Protection of the CSSS (IOP 2002 and IOP Supplement 2006) and retained through the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), Column 1 is the condition when regulatory releases from WCA 3A can be met by normal operation of the WCA 3A regulatory outlets (S-12s, S-333, S-344, S-343s, S-151). Column 2 is the condition when regulatory releases from WCA 3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the SDCS. Column 2 operations generally require the use of pumping stations S-331, S-332B, S-332C, and S-332D. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases to reach S-332B, S-332C, and S-332D pump stations. Column 2 operations were initially established under IOP 2002 to offset or mitigate for potential adverse effects on WCA 3A related to actions taken to protect CSSS sub-population A within western ENP, including seasonal closure of the S-12A, S-12B, and S-12C regulatory outlets under IOP. Under historical IOP and ERTTP operations, the Column 2 mode of operations has also been used as an additional water management tool for WCA 3A high water conditions. The 2012 Water Control Plan, which includes the operational guidance for the ERTTP, modified the WCA 3A Regulation Schedule from IOP, including the lowering of the top zone (Zone A) of

the Regulation Schedule, the expansion of Zone E1, and removal of the seasonal closure of S-12C. These changes were expected to reduce the need for S-334 releases from WCA 3A to the SDCS during Column 2 operations. Relaxation of the G-3273 constraint under Increment 1 is expected to further decrease reliance on Column 2 (S-334) operations as a water management tool for WCA 3A. Increment 1 operations have been developed to incorporate additional limitations on the conditions under which Column 2 operations discharging WCA 3A releases through S-334 to the SDCS may be used.

Under the No Action Alternative, releases from S-334 will continue to include both water supply deliveries to the SDCS and Column 2 operations under the 2012 Water Control Plan. Column 2 operations at S-334 will continue to be used to manage WCA 3A during the S-12 seasonal closure period as defined under ERTTP (*i.e.* closure period 01 November to 15 July for S-12A, S-343A/B, and S-344 and 01 January to 15 July for S-12B) and under limited conditions, Column 2 operations may be used outside of the S-12 seasonal closure period up until August 15 as described in Appendix A of the Increment 1 EA and FONSI (dated May 27, 2015) (USACE 2015). Column 2 operations at S-334 will not be used to manage high water between August 16 and October 31 as was periodically conducted under IOP/ERTP. The SDCS canals will continue to be operated using Column 2 open/close criteria when the WCA 3A stage is above the Increment 1 Action Line (**Figure 2-11**). S-356 is off under this condition and S-333 discharges to NESRS are maximized, to mitigate for potential flood impacts in SDCS that may result from increased stages within NESRS and concurrent restrictions on S-356 pump operation. No changes to water supply operations are proposed.

**TABLE 2-8. INCREMENT 1 OPERATING CRITERIA: COMPARISON TO 2012 WATER CONTROL PLAN**

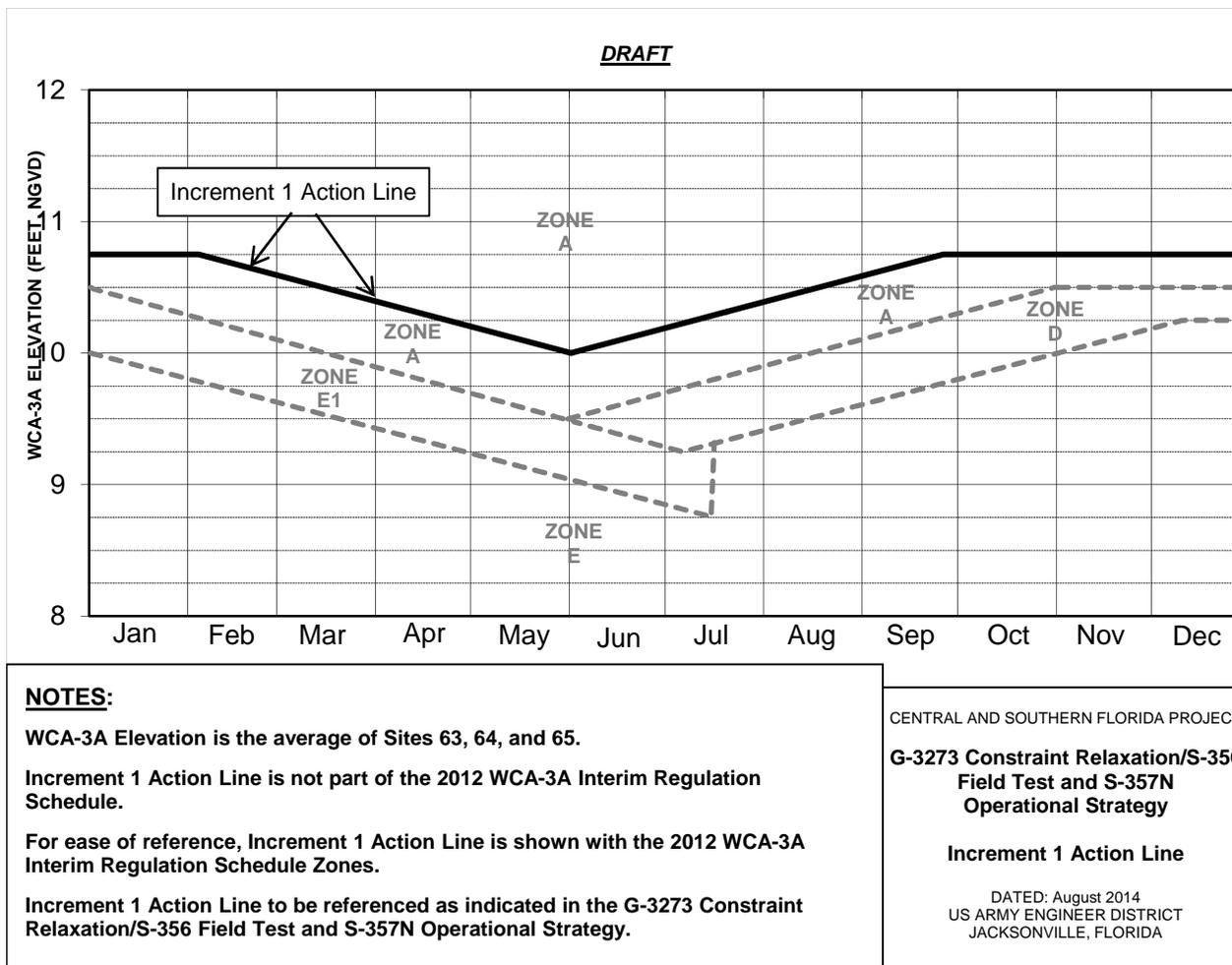
	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS
<b>2012 Water Control Plan</b>	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p>		
	<p>S-333: G-3273 less than or equal to 6.8 feet, NGVD</p>	<p>Rainfall Plan target flow for S-333 (to NESRS).</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.</p>	<p>Rainfall Plan target flow for S-333 (to NESRS), plus as much of the remaining Rainfall Plan target flow that the S-12s cannot discharge to be passed through S-334 and subject to capacity constraints, which are 1,350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.</p>
	<p>S-333: G-3273 greater than 6.8 feet, NGVD</p>	<p>Closed</p>	<p>Match S-333 with S-334 flows.</p>
<b>Temporary Deviation for Increment 1</b>	<p>S-333</p>	<p>Water supply.</p> <p>S-333 releases to L-29/NESRS subject to S-333/S-356 priority as defined in 1) thru 4) below and S-334 Temporary Deviation. This includes L-29 constraint (L-29 stage limitations): Stop flows into L-29 Canal when the L-29 Canal stage (average of S-333 TW and S-334 HW) rises above 7.5 feet, NGVD.</p> <ol style="list-style-type: none"> <li>1) <b>Year-round when stage at G-3273 is below 6.8 and when WCA-3A stage is below the Increment 1 Action Line (Figure 1) (S-333 has priority; S-356 use is secondary to S-333 but S-356 can and should be used subject to L-29 stage limitations):</b> S-333 will be used to release up to the full rate prescribed by WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject only to the L-29 constraint.</li> <li>2) <b>Year-round when stage at G-3273 is above 6.8 and the WCA-3A stage is below the Increment 1 Action Line (Figure 1) (S-356 has limited priority over S-333):</b> S-333 will be used to release up to the full rate prescribed by the WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject to the L-29 constraint and an assured minimum available capacity of 250 cfs through S-356. If 250 cfs at S-356 is not possible due to the L-29 constraint, then S-333 releases will be reduced to allow S-356 to achieve the minimum available capacity of 250 cfs, if the S-356 capacity is needed to maintain the target stage range in L-31N.</li> <li>3) <b>When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 1 November through 14 July (S-333 has priority with no use of S-356):</b> S-333 makes maximum releases to NESRS subject to L-29 constraint, with no dependency or other constraints (S-334 Temporary Deviation).</li> <li>4) <b>When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 15 July through 31 October (S-333 has priority with no use of S-356):</b> S-333 makes maximum releases to NESRS subject only to L-29 constraint.</li> </ol>	

2012 Water Control Plan	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	
	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p>			
	<p>S-333: G-3273 less than or equal to 6.8 feet, NGVD</p>	<p>Rainfall Plan target flow for S-333 (to NESRS).</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.</p>	<p>Rainfall Plan target flow for S-333 (to NESRS), plus as much of the remaining Rainfall Plan target flow that the S-12s cannot discharge to be passed through S-334 and subject to capacity constraints, which are 1,350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.</p>	
<p>S-333: G-3273 greater than 6.8 feet, NGVD</p>	<p>Closed</p>	<p>Match S-333 with S-334 flows.</p>		
2012 Water Control Plan	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	
	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p>			
	<p>S-334</p>	<p>Water supply</p>	<p>Pass all or partial S-333 flows depending on stage at G-3273.</p>	

<p><b>Temporary Deviation for Increment 1</b></p>	<p>S-334</p>	<p>Water supply.</p> <p><b>When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 1 November through 14 July * (S-333 has priority)</b>                  When L-29 constraint is reached or exceeded, S-334 may be utilized to maintain the L-29 Canal stage at or below 7.5 feet by delivering a portion of the WCA-3A regulatory releases to the SDCS (including the use of pumping stations S-331, S-332B, S-332C, and S-332D) when the following conditions (i, ii, and iii) are met:</p> <ul style="list-style-type: none"> <li>i) S-12C and S-12D are full open, and</li> <li>ii) the discharge to tide from all of the WCAs are maximized to the extent that downstream condition allow, and</li> <li>iii) the SDCS has available capacity (daily combined pumping rate at S-332B, C, and D is less than 1,125 cfs to maintain L-31N stage in the lower half of the range).</li> </ul> <p>Under these conditions (i, ii, and iii), the following criteria (iv, v, and vi) will govern S-334 operation, including maximum discharge limits:</p> <ul style="list-style-type: none"> <li>iv) When daily combined pumping at S-332B, C, and D is less than 1,125 cfs, S-334 may be utilized up to a maximum flow rate of 250 cfs.</li> <li>v) When daily combined pumping at S-332B, C, and D is less than 1,000 cfs (increased storage capacity may be available within the SDCS), S-334 may be utilized up to 400 cfs.</li> <li>vi) S-334 flows will not be constrained by S-333 flows, and there is no constraint to require matching S-333 and S-334 flows.</li> </ul> <p>* The use of S-334 may continue long enough past the end of the S-12A and S-12B closure period (14 July) to release the volume of water that would have been released, according to the WCA-3A Regulation Schedule, had the S-12s been allowed to be open. The determination of the extent to which the S-12 closures cause water to be retained in WCA-3A beyond that expected during the pre-ISOP schedule for WCA-3A will be computed weekly by USACE water managers and reported annually by the USACE for the period from 1 November thru 14 July. When the combined WCA-3A releases from the S-12s and S-333 are less than the releases computed for the pre-ISOP schedule, a WCA-3A "discharge deficit" resulting in additional accumulation of water in WCA-3A is indicated for the period from 1 November thru 14 July. For this WCA-3A accounting computation, S-333 discharges to NESRS computed under the pre-ISOP schedule will be based on inclusion of the G-3273 constraint of 6.8 feet.</p> <p><b>In addition to above, the following additional criteria will govern the use of S-334 operation after 14 July:</b></p> <ul style="list-style-type: none"> <li>I. When daily combined pumping at S-332B, C, and D is less than 1,125 cfs, S-334 may be utilized up to a maximum limit of 250 cfs to deliver a portion of the WCA-3A regulatory releases to the SDCS. Use of S-334 will be temporarily discontinued when daily combined pumping at S-332B, C, and D is greater than 1,125 cfs.</li> <li>II. Use of S-334 will be discontinued when the WCA-3A storage volume accumulated due to the discharge deficit (the balance) is discharged. S-334 discharges to the SDCS and S-333 deliveries to NESRS when G-3273 stage is above 6.8 feet (S-333 flows greater than S-334 flows) will both count as flows to be subtracted from the WCA-3A balance computed through 14 July.</li> <li>III. S-334 will not be used after 14 July during periods when the WCA-3A stage is below the Increment 1 Action Line. Regardless of conditions within WCA-3A or any residual WCA-3A storage deficit balance, the use of S-334 to deliver a portion of WCA-3A regulatory releases to the SDCS will be discontinued on 15 August. The WCA-3A storage deficit balance resultant from the S-12 closures, if applicable for the prior period from 1 Nov thru 14 July, will zero-out on 15 Aug and will preclude a balance carryover into the next year.</li> <li>IV. If more water was released from WCA-3A under Increment 1 than computed for the pre-ISOP schedule, a WCA-3A "discharge surplus" balance is indicated for the period from 1 November through 14 July, and S-334 will not be utilized for WCA-3A regulatory releases to the SDCS during the period from 15 July through 31 October.</li> </ul>
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2012 Water Control Plan	Structure/ Operational Component	<b>Column 1:</b> No WCA-3A Regulatory Releases to SDCS or SRS	<b>Column 2:</b> WCA-3A Releases to SDCS										
	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p>												
S-197	<p>If S-177 headwater is greater than 4.1 feet, NGVD or S-18C headwater is greater than 2.8 feet, NGVD, open 3 culverts.                      If S-177 headwater is greater than 4.2 feet, NGVD for 24 hours or S-18C headwater is greater than 3.1 feet, NGVD; open 4 more culverts for a total of 7 culverts open.                      If S-177 headwater is greater than 4.3 feet, NGVD or S-18C headwater is greater than 3.3 feet, NGVD, then open 6 more culverts for total of 13 open.                      Close gates when all the following conditions are met:                      1. S-176 headwater is less than 5.2 feet, NGVD and S-177 headwater is less than 4.2 feet, NGVD.                      2. Storm has moved away from the basin                      3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 feet, NGVD after all conditions are satisfied.</p>												
Temporary Deviation for Increment 1	S-197	<p><b>Year-round when WCA-3A stage is below the Increment 1 Action Line (Figure 1):</b>                      If S-177 HW is greater than 4.1 feet, NGVD or S-18C HW is greater than 2.8 feet, NGVD, S-197 release 1/3 capacity.                      If S-177 HW is greater than 4.2 feet, NGVD for 24 hours or S-18C HW is greater than 3.1 feet, NGVD, S-197 release 2/3 capacity.                      If S-177 HW is greater than 4.3 feet, NGVD or S-18C HW is greater than 3.3 feet, NGVD, S-197 release full capacity.                      Close gates when all the following three conditions are met:                      (1.) S-176 HW is less than 5.2 feet, NGVD and S-177 HW is less than 4.2 feet, NGVD. (2.) Storm has moved away from the basin.                      (3.) After Conditions 1 and 2 are met, keep the number of S-197 gates open necessary only to match residual flow through S-176. All gates should be closed if S-177 HW is less than 4.1 feet, NGVD after all conditions are satisfied.</p> <p><b>Year-round when WCA-3A stage is above the Increment 1 Action Line (Figure 1):</b>                      If S-177 HW is greater than 4.1 feet, NGVD, S-197 release 1/3 capacity.                      When the S-18C gates are out of the water and S-178 TW exceeds 2.4 feet, NGVD follow below table and text:</p> <table border="1"> <tr> <td>S-178 TW (feet, NGVD)</td> <td>2.5 to 2.6</td> <td>2.61 to 2.7</td> <td>2.71 to 2.9</td> <td>Greater than 2.9</td> </tr> <tr> <td>S-197 Target Flow (daily average cfs) *</td> <td>50 to 100</td> <td>100 to 150</td> <td>150 to 200</td> <td>500</td> </tr> </table> <p>*If the number of gate changes or the ability to maintain flow within the prescribed flow ranges becomes impractical, the three flow ranges may be consolidated to two (2.5 to 2.65 feet and 2.66 to 2.9 feet) with corresponding flows of 100 cfs and 200 cfs, respectively.                      If S-177 HW is greater than 4.2 feet, NGVD for 24 hours or S-18C HW is greater than 3.1 feet, NGVD, S-197 release 2/3 capacity.                      If S-177 HW is greater than 4.3 feet, NGVD or S-18C HW is greater than 3.3 feet, NGVD, S-197 release full capacity.</p> <p>When S-197 is releasing due to S-178 TW:                      S-197 gates may be adjusted to maintain the daily average flow rates and stages within the appropriate and corresponding ranges. If a flow or stage is outside of the corresponding range for more than one day (24 hour average) then the appropriate gate change will be made no later than the next working day. In addition to these criteria, if S-18C TW falls below 2.4 feet for 24 hours, S-197 will be reduced or closed as necessary to bring S-18C HW above 2.4 feet in 24 hours.</p> <p>When S-197 is releasing due to S-177 HW or S-18C HW:                      Close gates when all the following three conditions are met:                      (1.) S-176 HW is less than 5.2 feet, NGVD and S-177 HW is less than 4.2 feet, NGVD. (2.) Storm has moved away from the basin.                      (3.) After Conditions 1 and 2 are met, keep the number of S-197 gates open necessary only to match residual flow through S-176. All gates should be closed if S-177 HW is less than 4.1 feet, NGVD after all conditions are satisfied.</p>		S-178 TW (feet, NGVD)	2.5 to 2.6	2.61 to 2.7	2.71 to 2.9	Greater than 2.9	S-197 Target Flow (daily average cfs) *	50 to 100	100 to 150	150 to 200	500
		S-178 TW (feet, NGVD)	2.5 to 2.6	2.61 to 2.7	2.71 to 2.9	Greater than 2.9							
S-197 Target Flow (daily average cfs) *	50 to 100	100 to 150	150 to 200	500									

2012 Water Control	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS
	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p>		
Temporary Deviation for Increment 1	<p><b>Note:</b> Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.</p> <p><b>When WCA-3A stage is above the Increment 1 Action Line (Figure 1):</b> C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) are operated according to the 2012 WCP Column 2 criteria.</p> <p><b>When Hydraulic Testing for detention areas between S-331 and S-177:</b> Hydraulic testing is not to exceed one month duration and limits of keeping L-31N no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111 Spreader Canal Western Project Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.</p>		



**FIGURE 2-11. INCREMENT 1 ACTION LINE**

Under continued implementation of the No Action Alternative, it is expected that under typical hydro-meteorological conditions, the combined flows through S-173 and S-331 to the C-111 Basin will be less than what would have been discharged through these features under the 2012 Water Control Plan. Continued implementation of the No Action Alternative may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, Increment 1 considered additional water management operating criteria for features of the SDCS. Increased flood control releases from S-18C and S-197 were included within Increment 1 to mitigate for potential risks to flood protection for areas within South Miami-Dade County which may be affected by changes to the basin inflows from the S-331 pump station and increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. Additional S-197 discharges, relative to the 2012 Water Control Plan, will continue to occur under implementation of the No Action Alternative when the WCA 3A stage is above the Increment 1 Action Line and S-18C is fully open.

The No Action Alternative also assumes implementation of a testing protocol to assist in defining operating criteria for the new 8.5 SMA S-357N water control structure following completion of construction. The testing protocol for S-357N under Increment 1, was designed to be an iterative approach consisting of 4 to 5 weeks of gate changes during the wet season to test the hydrologic response of the system to minor adjustments in operations at S-357N. When the Increment 1 EA and FONSI was completed on May 27, 2015, completion of S-357N was anticipated by April 2016, prior to the second year of Increment 1 operations; the Corps currently anticipates completion of S-357N by January 2017.

The Increment 1 operational strategy and the associated EA was developed between July 2014 and February 2015. When the FONSI for Increment 1 was approved in May 2015, the construction contracts for completion of the C-111 South Dade NDA had not yet been awarded and construction schedules were therefore not available; Contract 8 and Contract 8A were awarded in October 2015 and September 2016, respectively. A typical wet season was then anticipated for 2015, not the extended drought conditions which delayed the onset of the Increment 1 field test until October 2015 and contributed to the extreme hyper-salinity event in Florida Bay. The development of the Increment 1 operational strategy was also not informed by the SFWMD South Dade Investigation, as this interagency coordination effort was conducted between October 2015 and February 2016, or informed by the system response information collected during and following the 2016 Temporary Emergency Deviation. Based on the information evaluated during the interagency coordination for the Increment 1 operational strategy, the No Action Alternative does not include operational changes to the C-357 Canal within the 8.5 SMA, and the No Action Alternative did not contemplate the ability to manage water levels within the C-358 Canal prior to completion of the S-357N gated culvert. The No Action Alternative also does not include operational changes for the L-31N Canal at S-331, S-332B, S-332C, S-332D, and/or S-176, which have been demonstrated during the recovery period following the 2016 Temporary Emergency Deviation as providing drier conditions which could help facilitate completion of the C-111 South Dade NDA construction required prior to implementation of the MWD Increment 2 field test.

### **2.1.3 ALTERNATIVE B: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344)**

Alternative B represents simulation INCR1B conducted for purposes of ESA consultation for the 2016 ERTF BO. Similar to Alternative A, the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), including the WCA 3A Regulation Schedule, Rainfall Plan, and Interim Operating Criteria for the 8.5 SMA Project will continue to govern water management operations during implementation of Alternative B with the exception of operating criteria for S-12A, S-12B, S-333, S-334, S-343A, S-343B, S-344, S-356, S-197 and S-357N. Operational criteria for S-333, S-334, S-356, S-197 and S-357N are defined in Appendix A of the Increment 1 EA and FONSI (dated May 27, 2015) (USACE 2015). Alternative B will continue to maintain the current operating limit constraint of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. Operational criteria for Alternative B are identical to that described in Alternative A, except for the seasonal closures of the WCA 3A outlet structures. Alternative A maintains the ERTF closure period of 01 November to 15 July for S-12A, S-343A, S-343B and S-344 and 01 January to 15 July for S-12B. Alternative B includes a closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October through 15 July. All other operational criteria for S-12A, S-12B, S-12C and S-12D will remain unchanged from the operations specified in the 2012 Water Control Plan under Alternative B.

### **2.1.4 ALTERNATIVE C: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 16 AUGUST (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE**

Alternative C represents simulation INCR1H conducted for purposes of ESA consultation for the 2016 ERTF BO. The 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), including the WCA 3A Regulation Schedule, Rainfall Plan, and Interim Operating Criteria for the 8.5 SMA Project will continue to govern water management operations during implementation of Alternative C with the exception of operating criteria for S-12A, S-12B, S-333, S-334, S-343A, S-343B, S-344, S-356, S-197, and S-357N in addition to SDCS water control structures. Alternative C will continue to maintain the current operating limit constraint of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. Alternative C includes a closure period for S-12A, S-12B, S-343A, S-343B and S-344 starting on 01 October through 16 August. These WCA 3A outlet structures are closed for an additional month early in the wet season relative to Alternative B. All other operational criteria for S-12A, S-12B, S-12C and S-12D will remain unchanged from the operations specified in the 2012 Water Control Plan.

Alternative C includes early dry season operations (August-December) to extend hydroperiods and promote additional flow towards ENP. Operational criteria included under Alternative C also looks for later dry season opportunities (February – May) to move water toward Biscayne National Park via S-338, S-196 and S-194 when hydraulic capacity exists and attempts to avoid water level excursions above ground surface adjacent to the eastern marl prairies from 1 March to 15 July due to the operation of eastern infrastructure. Operations in the early dry season include lowering canals in the SDCS by ~ 0.5 feet during August through December with a transition to current

operations by 15 February. A summary of SDCS water control structure operations included in the INCR1H modeling scenario are identified in **Annex 1 of Appendix A (Part 1)**. The operational criteria for these water control structures were not previously modified under the Increment 1 EA and FONSI (dated May 27, 2015) (*i.e.* No Action Alternative). All other operational criteria for the SDCS water control structures shall remain unchanged from the operations specified in the 2012 Water Control Plan.

### **2.1.5 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Alternative D represents a combination of simulations INCR1B and R2H conducted for purposes of ESA consultation for the 2016 ERTP BO. Reference **Appendix A (Part 1)** for a complete description of Alternative D. A comparison of operating criteria for Alternative D relative to the Increment 1 (*i.e.* No Action Alternative) is provided in **Appendix A (Part 2)**. The 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), including the WCA 3A Regulation Schedule, Rainfall Plan will continue to govern water management operations during implementation of Alternative D with the exception of operating criteria for S-12A, S-12B, S-328, S-151, S-331, S-333, S-334, S-335, S-337, S-338, S-343A, S-343B, S-344, S-355A, S-355B, S-356, S-357, S-357N, S-332B, S-332C, S-332D, S-194, S-196, S-176, S-177 and S-197. Alternative D will raise the current operating limit constraint of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. Alternative D has the ability to raise the L-29 Canal maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon compliance with all of the following conditions: (1) acquisition of required real estate interest and any associated improvements for the private ownership along Tamiami Trail including receipt of Tamiami Trail Bridge and roadway channel and flowage easements from the FDOT; (2) completion of the C-358 Canal (Richmond Drive Seepage Collection Canal) and installation of S-357N (C-358 control structure); (3) completion of sufficient portions of Contracts 8 (construction of the C-111 NDA L-315 western levee and the L-357W Extension Levee between Richmond Drive and the 8.5 SMA Detention Cell) and completion of the Contract 8A berms inside the 8.5 SMA Detention Cell. Similar to the No Action Alternative, Alternative B, and Alternative C described earlier within this section of the EA, the water level constraint at G-3273 will not be a pre-determined constraint under Alternative D, allowing NESRS to receive more water, relative to the 2012 Water Control Plan. G-3273 will continue to be used as an indicator to define when NESRS is experiencing low, moderate, and high water levels. WCA-3A stage as measured by the three gage average (average of monitoring gauges Sites 63, 64 and 65) will continue to be used to define the priority of releases from S-333 and S-356 to L-29 Canal and NESRS. The Increment 1 Action Line (**Figure 2-11**) will continue to define S-333 and S-356 releases to the L-29 Canal and NESRS.

Similar to the No Action and Action Alternatives above, it is anticipated that during implementation of Alternative D, the combined flows through S-333 and S-356 will be more than what would have been discharged through these features under the 2012 Water Control Plan. S-173 releases and pumping with S-331 will be used to: (1) maintain target L-31N Canal stages; (2)

provide flood mitigation to the 8.5 SMA eastern areas and assist S-357 in maintaining flood mitigation for the 8.5 SMA when S-357 operational capacity is limited; and (3) convey WCA 3A regulatory releases to the SDCS from S-334 during Column 2 operations. Water management operations will likely result in increased seepage to the L-31N Canal as the increased flow into NESRS will likely increase stages along the west side of L-31N. This increase is not expected to be fully manageable until the construction and operation of the C-111 South Dade Project NDA. Experience with sustained lower operational ranges in the L-31N Canal from G-211 to S-176 and in the C-111 Canal from pre-storm operations during the 2016 Temporary Emergency Deviation (Reference **Section 1.3.5**) and the extended recovery period which followed has shown that with the existing infrastructure, including incomplete features of the MWD and C-111 South Projects, additional operational flexibility for the 8.5 SMA Canals and the L-31N Canal are necessary to continue increased inflows to ENP while maintaining the authorized flood mitigation for the 8.5 SMA and to facilitate completion of the C-111 South Dade Projects ongoing construction necessary for Increment 2 of the field test. The need to maintain flood mitigation for 8.5 SMA while facilitating completion of S-357N (C-358 control structure) and completion of C-111 South Dade Contract 8 and 8A (construction of the C-111 NDA to fill the existing 2 mile gap in the hydraulic ridge system) warrant additional changes to the operational strategy identified in Appendix A of the Increment 1 EA and FONSI (dated May 27, 2015). The below text provides a general overview of the required operational changes and how the use of a given structure may change relative to the No Action Alternative.

- Less use of S-356 if there is average or above average rainfall as there will be the need to dedicate more capacity to WCA 3A.
- More use of S-331 to assist S-357 in maintaining flood mitigation for 8.5 SMA while restricting S-357 flow into the 8.5 SMA Detention Area. The 8.5 SMA Detention Cell is adjacent to the Contract 8 construction area, and minimizing the use of S-357 will help facilitate construction.
- More flexibility in the operational range for S-357 in order to compensate for the head losses expected due to the hydraulic limitation imposed by S-357N installation.
- Less use of S-332B North during L-315, L-316, and L-318 NDA levee construction, as the existing partial C-111 South Dade NDA is located near the southern end of the Contract 8 construction footprint.
- Less use of S-332B (West), S-332C and/or S-332DX1 during Contract 8 and Contract 8A construction within the C-111 South Dade SDA, as these structures discharge near the southern extent of the Contract 8 construction footprint.
- Less use of S-332B, S-332C, and S-332D to meet the habitat hydroperiod targets imposed by the 2016 ERTD BO for the eastern subpopulations.
- More use of the C-102 (S-194) and C-103 (S-196) canals to assist S-332C and S-332D during moderately wet conditions.
- More use of S-176, S-177, S-18C and S-197 to compensate for the increased pumping at S-331 and operational restrictions at S-332B, S-332C, and S-332DX1 during the C-111 South Dade Contracts 8 and 8A construction.

These operational changes will provide increased flexibility to maintain the authorized flood mitigation for the 8.5 SMA and to move water away from Contract 8 and 8A construction area during the time period when this is likely to help facilitate continued construction progress. SDCS

operations are intended to utilize the C-111 South Dade SDA and the S-332D Detention Area to maintain canal stage targets in the lower L-31N and C-111 canals. S-176 and structures downstream, S-177 and S-18C will be used to pass excess flows to the marsh downstream of S-18C and utilize S-197 as needed. Prolonged use of the C-111 South Dade detention areas, particularly following significant rain events has the tendency to set up a large stage difference between the marsh to the west and the canal stage in the lower L-31N and C-111 Canals. This is expected and is how the system is designed to work, as it is the water level in the detention areas that provides the hydraulic ridge that supports this stage difference. However, after the rain event has passed through the system, the hydraulic ridge can dissipate quickly following an abrupt cessation of pumping. This can result in rapid drainage of the marsh.

To mitigate for this potential rapid drainage of the marsh, Alternative D will include the operational flexibility for water managers to provide up to 250 cfs in order to avoid excessive drainage of the marsh to the west of the detention areas. Supplemental water deliveries will be limited to conditions when WCA 3A is above its floor elevation of 7.5 feet NGVD by 0.5 feet (8.0 feet, NGVD) in April and May and above 8.5 feet, NGVD (1.0 foot above the water supply floor) in all other months. This flow limit will be measured at S-334 or S-337. This operation will be limited to 8 weeks per year when the 3-gage average is below the historical median of WCA 3A. There will be no time limit while the 3-gage average is above the median stage. This operation is intended to support gradual recession rates in the marsh by providing additional water to the S-332D pump station, or maintain a canal stage in a range conducive gradual recession rates. Furthermore, S-328 (eight 60 inch diameter CMP with gates) may be used to increase deliveries to Taylor Slough up to 250 cfs as measured at S-332D. Prior to initial operation of S-328, construction of the three L-31W Canal plugs proposed between S-328 and the L-31W gap must be completed and the monitoring regime approved by the Corps must be implemented. The L-31W Canal plugs were identified in the 2016 C-111 South Dade Contract 9 EA. Water drained into the L-31W borrow canal, which is immediately adjacent to ENP, flows as groundwater and surface water to the south and east, raising groundwater and C-111 levels and impeding drainage of lands east of C-111. Fill or plugging in L-31 W, along with modifications to the L-31W levee gap, are expected to provide additional rehydration benefits to lands in eastern ENP, in addition to the expansion of the NDA and construction of flow ways in both the NDA and SDA (USACE 2016a). Reference **Section 1.3.2**.

Alternative D includes a closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting 01 October through 15 July consistent with the 2016 ERTP BO RPA. Alternative D also includes a ‘high water strategy’ criteria developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages in excess of the 90<sup>th</sup> percentile of historical water stages (compared to the 2012 Water Control Plan) associated with the expanded closure periods. The 90<sup>th</sup> percentile water level varies seasonally and reaches a maximum of 11.5 feet, NGVD during the month of October. Levee safety concerns and the risk of overtopping to the perimeter levees are exacerbated with higher water levels in WCA 3A and are most vulnerable during the later parts of the wet season (July, August, September and early October), which coincides with the height of the hurricane season. Therefore, a conditions based scenario that varies the opening and closing dates of the structures depending on measured conditions within the system was developed, rather than prescriptive open and close dates. A conditions based approach to the operation of S-12A and S-12 B is included in Alternative D to retain critical flexibility during WCA 3A high water

conditions while also ensuring that the structures are operated optimally for CSSS habitat during normal and low water conditions. The ‘high water strategy’ criteria are included within **Annex 1** of **Appendix A (Part 1)**.

It should be noted that the 2016 ERTF BO RPA provides performance targets for the CSSS eastern subpopulations and does not prescribe specific SDCS operational changes (the S-12A and S-12B conditional extended closure periods are specified within the RPA). The modeling assumptions for the SDCS operations as represented in simulation R2H and as described above under Alternative C (Reference **Section 2.1.4**) for protection of the eastern marl prairie and CSSS subpopulations were based on insights provided from the SFWMD South Dade Investigation Workshop, but these operations were not able to be optimized for the CSSS RPA performance metrics for the eastern subpopulations due to time constraints. While notable improvements are demonstrated for the CSSS western subpopulation resultant from the RPA conditional extended closure periods for S-12A and S-12B, the CSSS performance metrics for the eastern subpopulations demonstrate variability between moderate performance reductions to very slight performance improvements. **Table 2-9** presents a cross walk of SDCS operational criteria for Alternative C per the RPA and Alternative D. The R2H modeling assumptions which describe SDCS operations have been adjusted under Alternative D within the operational strategy to provide sufficient flexibility for the Corps and SFWMD water managers to achieve the intended performance from the RPA while taking into account the multiple purposes of the C&SF Project. The operational ranges for Alternative D are consistent with what was modeled for the RPA.

**TABLE 2-9. SDCS OPERATIONAL CRITERIA FOR ALTERNATIVE D. COMPARISON IS BEING MADE RELATIVE TO SIMULATION R2H SOUTH DADE OPERATIONS FROM THE 2016 E RTP BO.**

Structure (Influence on Eastern CSSS)	ERTP B.O modeling (R2H for SDCS) Operating Range		Increment 1.1/1.2 Operational Strategy Range	
	CSSS-A nesting period (15Feb-31July)	Outside CSSS-A nesting period (01Aug-31Dec)	CSSS-A nesting period (15Feb-31July)	Outside CSSS-A nesting period (01Aug-31Dec)
S-356	Conditions 1/2: 5.5-5.8	No change	Conditions 1/2: 5.5-5.8	No change
S-338	4.9-5.3	Column 1: 5.5-5.8; Column 2: 5.0-5.4	5.5-5.8	5.5-5.8
S-357	5.7-6.2*	No change	5.0-5.5 (5.5-6.0 for dry conditions) LPG-2 > 6.7: 3.5-4.0	No change
S-331 HW: High Range Intermediate Range Low Range Additional Criteria	No Limit* 4.5-5.0 4.0-4.5 4.5-5.0 (Low Range Adjustment if S-357 not limited)	No change	5.0-6.0 4.5-5.0 4.0-4.5 3.5-4.0 (LPG-2 > 6.6 ft NGVD)	No change
S-332B/C	4.5-5.0*	4.0-4.5 (Aug-Dec)	4.2-4.8	4.0-4.6 (4.2-4.8 after NDA and 8.5 SMA complete)
S-332D	4.5-4.85* (includes CSSS seasonal limits)	4.0-4.35 (Aug-Dec)	4.2-4.8	4.0-4.6 (4.2-4.8 after NDA and 8.5 SMA complete)
S-194 and S-196	4.0-4.5 (15Feb-15May); 4.3-4.8(01Jun-31Jul)	Column 1: 5.5-5.8; Column 2: 5.0-5.4	Column 1: 4.8-5.5 Column 2: 4.5-4.9	No change
S-176 HW	Column 1: 4.75-5.0*; Column 2: 4.7-4.9*	Column 1: 4.75-5.0*; Column 2: 4.7-4.9* Up to 200 cfs: 4.55-4.8 (Sep-Dec)	Column 1: 4.0-4.9 (4.75-5.0 after NDA and 8.5 SMA complete) Column 2: 4.7-4.9*	No change to Column 1 and Column 2 criteria Up to 200 cfs: 4.5-4.8 (Aug-Feb)
S-177 HW	Normal: 3.6-4.2* Dry Season, high rainfall: 3.1-3.7 high rainfall) Wet Season, med.-high rainfall: 3.1-3.7 Wet Season, high rainfall: 2.6-3.2	No change Up to 200 cfs: 3.2-3.9 (Sep-Dec)	3.6-4.2* 14-day rainfall > 5.5 inches: 3.3-4.2	No change

NOTE: All operating criteria are in feet, NGVD 1929

\* = Consistent with 2012 WCP

\*\* = Changed from 2016 SFWMD C-111SC POM (S-199: 3.4-3.8; S-200: 3.6-4.0)

### **2.1.6 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Operational criteria for Alternative E are identical to that described in Alternative D, except for exclusion of the ability to raise the L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD. Alternative E will continue to maintain the current maximum operating limit of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. Alternative E includes the seasonal closures of the WCA 3A outlet structures S-12A, S-12B, S-343A, S-343B, and S-344 between 01 October and 15 July included within Alternative D above. All other operational criteria for S-12A, S-12B, S-12C and S-12D will remain unchanged from the operations specified in the 2012 Control Plan. Alternative E also includes the high water strategy developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with these expanded closure periods.

## **2.2 ISSUES AND BASIS FOR CHOICE**

The overarching project need for Increment 1.1 and 1.2, consistent with the Increment 1 EA and FONSI (dated May 27, 2015) is to increase the availability of S-333 for water deliveries from WCA 3A to ENP through NESRS for the benefit of natural resources. The alternatives described in **Section 2.0** were formulated, considered, and evaluated based on achievement of project objectives (**Section 1.5**) and compliance with project constraints (**Section 1.6**). Potential environmental effects were also evaluated (**Section 4.0**). Alternatives were eliminated from detailed evaluation if the alternative: (1) did not maximize hydrologic improvements to NESRS; (2) did not ensure flood mitigation within 8.5 SMA; (3) did not enable the continued construction of MWD and C-111 South Dade Project features by introducing operational flexibility to move water away from the construction sites when needed; and (4) did not meet the RPA within the 2016 E RTP BO.

Modifications under Alternatives B and C include the continued removal of the G-3273 stage constraint of 6.8 feet, NGVD (L-29 Canal stage maximum operating limit of 7.5 feet, NGVD) to increase water deliveries from WCA 3 to ENP through NESRS, while implementing early closures of the WCA 3A control structures beyond their current restrictions to limit flows into western SRS for purposes of providing suitable nesting habitat for the endangered CSSS. Alternative B includes seasonal closures of S-12A, S-12B, S-343A, S-343B, and S-344 from 01 October through 15 July. Alternative C includes seasonal closures of those same structures from 01 October through 16 August. Neither Alternative B nor C meet the federally mandated requirements as outlined within the RPA from the 2016 E RTP BO. The RPA includes a seasonal closure period for S-12A, S-12B, S-343A, S-343B, and S-344 from 01 October through 15 July accompanied by a high water strategy for WCA 3A which allows conditional operation of S-12A and S-12B during the months of October and November. Inclusion of the extended seasonal closure periods under Alternatives B and C resulted in an increase in the number of days where WCA 3A is above the 90% (10% exceedance) water level relative to the base condition used for ESA consultation (ECB16), as well as increased the probability of exceeding Zone A of the regulation schedule; in each instance, the magnitude of increase was greater under Alternative C relative to Alternative B when each

alternative was compared to the base condition (ECB16). Alternatives B and C do not include the ‘high water strategy’ criteria developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with the expanded closure periods.

Furthermore, while Alternative B includes a closure period for the WCA 3A control structures consistent with the RPA, operational changes to the SDCS were not considered under Alternative B for the protection of the eastern marl prairie that were proposed within the 2016 ERTF BO. While Alternative C includes such operations, neither Alternative B nor Alternative C included SDCS operations that have been adjusted to provide sufficient flexibility for the Corps and SFWMD water managers to take into account the multiple purposes of the C&SF Project, including operational flexibility to ensure flood mitigation within 8.5 SMA and facilitate continued construction progress needed to provide restoration flows to NESRS. Operations within the SDCS under Alternative C include early dry season operations (August-December) to extend hydroperiods and promote additional flow towards ENP and also attempted to avoid water level excursions above ground surface adjacent to the eastern marl prairies from 01 March to 15 July due to the operation of eastern infrastructure. These operations were informed by the SFWMD’s South Dade Investigation Workshops which were held from October 2015 through February 2016 and resulted in operational refinements to provide supplemental flows to Taylor Slough. Alternatives B and C were eliminated from detailed evaluation for the reasons outlined above and as summarized in **Section 2.3** below.

The Preferred Alternative is expected to benefit ENP by increasing flows to NESRS. Alternative D best accomplishes this objective. The operational criteria governing inflows to NESRS for Alternative E are the same as the No Action Alternative; therefore the hydrologic effects within NESRS will be similar. Alternative D has the ability to raise the L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon downstream constraints identified within **Section 1.6**. Therefore, Alternative D is expected to provide a greater magnitude of increase relative to the No Action Alternative and Alternative E. Consistent with the objectives and constraints of the continuation of the Increment 1 field test, Alternative D further enables the Corps to continue to pursue opportunities to increase deliveries from WCA 3A to NESRS to the maximum extent practicable during Increment 1.1 and 1.2. These operational modifications are consistent with the RPA from the 2016 ERTF BO which identified the Corps to proceed as scheduled, and as allowable by law, for completing NEPA analysis on Increment 1 Plus (*i.e.* L-29 Canal up to 7.8 feet, NGVD) prior to March 1, 2017.

Since many of the MWD features have been built, including the seepage collection canals, pump station and protective levee around 8.5 SMA and the Tamiami Trail roadway modifications, the Increment 1 EA and FONSI (dated May 27, 2015) recognized there are more opportunities to begin relaxation of the G-3273 constraint and associated increased water deliveries from WCA 3A into NESRS. The El Niño hydrologic conditions during 2015-2016 and the operations from the 2016 Temporary Emergency Deviation have resulted in unanticipated challenges to the C-111 South Dade construction contract, which includes the perimeter levees for the C-111 South Dade NDA. Increment 2 of the MWD Project is dependent on construction completion and operation of the C-111 South Dade NDA. The El Niño hydrologic conditions during 2015 and the 2016 Temporary Emergency Deviation operations may have brought water to the C-111 South Dade construction project site, which includes the perimeter levees for the NDA, with elevated ground/surface water

conditions experienced onsite during April-May 2016 (atypical of the South Florida dry season conditions). During July-August 2016, significant rainfall within the 8.5 SMA and South-Dade basin led to operation of the S-332B pump station and the S-357 pump station to provide flood protection to the South Dade Basin (east of the L-31N Canal) and required flood mitigation for the 8.5 SMA, potentially contributing to elevated ground/surface water levels in the project footprint.

With one of the stated operational constraints of the project being to maintain the authorized purposes of the C&SF Project and subsequent modifications to include the MWD Project (including no reduction in current flood protection or mitigation), the Corps has extensively reviewed recent water management operations and has identified the need for additional operational flexibility for the 8.5 SMA Canals and the L-31N Canal in order to continue increased inflows to ENP while maintaining the authorized flood mitigation for the 8.5 SMA and to facilitate completion of the C-111 South Dade Projects necessary for Increment 2 of the MWD Project.

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the Proposed Action and associated hydrologic monitoring. Alternatives D and E propose to generally lower the target operational ranges for the SDCS L-31N Canal compared to the No Action Alternative in order to facilitate the construction of C-111 South Dade Contract 8 and Contract 8A and provide increased operational flexibility to achieve the hydroperiod and nesting condition targets specified by the 2016 ERTF BO for the eastern CSSS subpopulations. The lowered target stages along L-31N (between G-211 and S-331, and S-331 to S-176) may provide a minor improvement to flood risk management within the South Dade basin, compared to the No Action Alternative. Furthermore, low volume releases from S-197 have been included as components of Alternatives D and E to mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County. Alternatives D and E best meet the operational constraints identified in **Section 1.6**.

While Alternatives D and E both include the closure period for the WCA 3A outlet structures (S-12A, S-12B, S-343A, S-343B, S-344) of 01 October through 15 July consistent with the RPA from the 2016 ERTF BO, Alternative E does not meet the federally mandated requirements of the RPA as operations are consistent with the No Action Alternative and maintain the L-29 Canal stage maximum operating limit at 7.5 feet NGVD. Alternative D includes additional seasonal closures to outlet structures within WCA 3A (S-12A, S-12B, S-343A, S-343B, S-344), with the flexibility to conditionally open S-12A and S-12B under high water conditions between October and November, and adjustments in operations in the SDCS that will enable additional flows to Biscayne Bay during the dry season and increased flows toward eastern ENP to extend hydroperiods during the early dry season to provide suitable nesting habitat for the endangered CSSS.

### **2.3 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION**

Alternative B and C were eliminated from detailed evaluation for the reasons outlined below:

- Alternative B includes an unconditional closure period for S-12A, S-12B, S-343A, S-343B, and S-344 starting on 01 October through 15 July. Alternative C includes an unconditional

closure period for S-12A, S-12B, S-343A, S-343B and S-344 starting on 01 October through 16 August. These seasonal closure periods were represented by simulation R1B and simulation R2H evaluated during recent ESA consultation for ERTTP. Implementation of Alternatives B and C increase the number of days where WCA 3A is above the historical 90% stage threshold (10% exceedance) water level relative to the based condition (*i.e.*, ECB16). The seasonal closures under Alternative B (R1B) provided a 10% increase in days above the historical 90% stage threshold. Alternative C (R2H) provided a 13% increase (**Figure 2-2**). Alternative B (R1B) and Alternative C (R2H) both increased the probability of exceeding Zone A of the regulation schedule compared to the base simulation (ECB16) (**Figure 2-6**).

- Alternatives B and C do not include the ‘high water strategy’ criteria developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with the expanded closure periods. Levee safety concerns and the risk of overtopping to the perimeter levees are exacerbated with higher water levels in WCA 3A and are most vulnerable during the later parts of the wet season (July, August, September and early October), which coincides with the height of the hurricane season. Prescriptive closure of the WCA 3A outlet structures during the October timeframe was not acceptable to the Corps. During ESA consultation, the Corps provided recommendations to further develop a conditions based scenario that varies the opening and closing dates of the structures depending on measured conditions within the system, rather than prescriptive open and close dates. A conditions based approach to operation of S-12A and S-12 B was proposed by the Corps to allow the Corps to retain critical flexibility during WCA 3A high water conditions while also ensuring that the structures are operated optimally for CSSS habitat during normal and low water conditions. The WCA 3A high water strategy is included within the RPA for the 2016 BO.
- Alternative C includes operational criteria within the SDCS for protection of the eastern marl prairie and CSSS subpopulations. These operational criteria were not optimized under Alternative C to take into account the multiple purposes of the C&SF Project.
- Alternatives B and C do not meet the federally mandated 2016 ERTTP BO RPA requirement.

## 2.4 PREFERRED ALTERNATIVE

Based upon the impact analysis conducted within this Supplemental EA, Alternative D is the Preferred Alternative. This plan is expected to best meet the objectives and constraints identified in **Sections 1.5** and **1.6**. Summary details of the Preferred Alternative are listed below:

- The 2012 Water Control Plan will continue to govern water management operations during Increment 1.1 and 1.2, with the exception of operating criteria for S-12A, S-12B, S-328, S-151, S-331, S-333, S-334, S-335, S-337, S-338, S-343A, S-343B, S-344, S-355A, S-355B, S-356, S-357, S-357N, S-332B, S-332C, S-332D, S-194, S-196, S-176, S-177, and S-197 as contained in the operational strategy.
- At the start of Increment 1.1, the L-29 Canal will be managed to prevent a sustained stage above 7.5 feet, NGVD. Later in the sequential implementation of Increment 1.2 after the requisite real estate acquisitions are complete and the C-111 South Dade Contract 8 western levee construction is sufficiently complete, the L-29 Canal stage may be incrementally raised up to 7.8 feet, NGVD. Both S-333 and S-356 releases to the L-29 Canal will be subject to these constraints. If available for use, S-355A and S-355B may also be utilized

to discharge to the L-29 Canal as indicated in the 2012 Water Control Plan and other future associated permit requirements.

- The water level constraint at G-3273 will not be a pre-determined constraint under Increment 1.1 and 1.2, allowing NESRS to receive more water pursuant to the WCA 3A Regulation Schedule and Rainfall Plan. G-3273 will continue to be used as an indicator to define when NESRS is experiencing low, moderate, and high water levels.
- The WCA 3A water level (as measured using the average of monitoring gauges/sites 63, 64, and 65) will be utilized to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS. In addition, the Increment 1 Action Line (**Figure 2-11**) is a seasonally varying WCA 3A water level (10.0 to 10.75 feet NGVD) which will also serve to define S-333 and S-356 releases to the L-29 Canal and NESRS.
- Increment 1.1 and 1.2 water management operations will likely result in increased seepage to the L-31N Canal as increased flow into NESRS will likely increase stages along the west side of L-31N. This increase is not expected to be fully manageable until the construction and operation of the C-111 South Dade Project NDA. S-173 in conjunction with S-331 will be used to: (1) maintain target L-31N Canal stages; (2) provide flood mitigation to 8.5 SMA, assisting S-357 when operational capacity is limited; and (3) convey WCA 3A regulatory releases to the SDCS from S-334 during Column 2 operations. Implementation of a testing protocol for S-357N will be incorporated into the Increment 1.1 and 1.2 field test following completion of the C-358 seepage collection canal and the associated S-357N control structure. Water management operating criteria for S-197 (in addition to the S-197 operating criteria defined in the 2012 Water Control Plan) will occur in order to provide flexibility to help facilitate construction and to maintain flood risk management for Southeastern Miami-Dade County. S-332B, S-332C, S-332D, S-194, S-196, S-176 and S-177 will be utilized for these purposes as well.
- The combined duration of Increment 1 and Increment 1.1 and 1.2 may extend beyond the two calendar years initially envisioned for Increment 1 to compensate for the temporary suspension of the Increment 1 field test during the 2016 Temporary Emergency Deviation and extended recovery period (February-November 2016). In addition to the 2016 Temporary Emergency Deviation, extension of the Increment 1 and Increment 1.1 and 1.2 field test duration to up to three years will allow sufficient time to complete the C-111 South Dade construction components needed to operate the NDA during Increment 2 of the MWD Project. Increment 1.1 and 1.2 will extend until implementation of Increment 2. The Corps Water Management Section's assessment of hydrometeorological conditions and stakeholder or agency input may suspend or discontinue the field test due to impacts greater than expected/discussed.
- The Corps ongoing assessment of hydrometeorological conditions and stakeholder or agency input may suspend or discontinue the Increment 1.1 and 1.2 field test due to impacts greater than expected/discussed within this EA.
- Multiple purposes of the C&SF Project to provide flood control, water supply for municipal, industrial, and agricultural uses, prevention of saltwater intrusion, water supply for ENP, and protection of fish and wildlife will be maintained. A Monitoring Plan has been developed for Increment 1.1 and 1.2. Existing monitoring currently being funded by the Corps and/or other Federal and state agencies is noted in **Appendix C**. Roles and responsibilities are also identified within the Monitoring Plan.

### **3.0 AFFECTED ENVIRONMENT**

#### **3.1 GENERAL ENVIRONMENTAL SETTING**

The remaining portion of the Greater Everglades wetlands includes a mosaic of interconnected freshwater wetlands and estuaries located primarily south of the Everglades Agricultural Area (EAA). A ridge and slough system of patterned, freshwater peat lands extends throughout the WCAs into SRS in ENP. The ridge and slough wetlands drain into tidal rivers that flow through mangrove estuaries into the Gulf of Mexico. Higher elevation wetlands that flank either side of SRS are characterized by marl substrates and exposed limestone bedrock. Those wetland areas located to the east of SRS include the drainage basin for Taylor Slough, which flows through an estuary of dwarf mangrove forests into northeast Florida Bay. The Everglades wetlands merge with the forested wetlands of Big Cypress National Preserve (BCNP) to the west of WCA 3.

Declines in ecological function of the Everglades have been well documented. Construction of canals and levees by the C&SF Project has resulted in the creation of artificial impoundments and has altered hydroperiods and depths within the project area. The result has been substantially altered plant community structures, reduced abundance and diversity of animals and spread of non-native vegetation.

A complete description of the affected environment with respect to Increment 1 is discussed within the EA and FONSI dated May 27, 2015 (USACE 2015). Further information regarding 8.5 SMA can be found within the July 2000 8.5 SMA GRR/FSEIS (USACE 2000), 2011 Proposed Interim Operating Criteria for 8.5 SMA EA (USACE 2011), and 2012 design refinement for the 8.5 SMA EA (USACE 2012a).

#### **3.2 CLIMATE**

The climate of south Florida is subtropical. Seasonal rainfall patterns in south Florida resemble the wet and dry season patterns of the humid tropics more than the winter and summer patterns of temperate latitudes. Of the 53 inches of rain that south Florida receives on average annually, 75% falls during the wet season months of May through October. Tropical storms and hurricanes also provide major contributions to wet season rainfall. During the dry season (November through April), rainfall is governed by large-scale winter weather fronts that pass through the region approximately weekly. However, due to the variability of climate patterns (La Niña and El Niño), dry periods may occur during the wet season and wet periods may occur during the dry season. High evapotranspiration rates in south Florida roughly equal annual precipitation. Mean annual temperature for the south Florida ecosystem ranges from 72 ° Fahrenheit (F) (22 ° Celsius [C]) in the northern Everglades to 76 ° F (24 °C) in the southern Everglades (Thomas 1974). There is now evidence of anthropogenic changes to global climate patterns that will likely have an impact on south Florida in terms of rainfall, evapotranspiration, and temperature.

#### **3.3 GEOLOGY AND SOILS**

The geology and soils of South Florida represent many of the opportunities, constraints, and impacts of regional water management. The high transmissivity of the Biscayne Aquifer allows rapid recharge of lower east coast well fields while it sets the stage for water competition between the Everglades and Biscayne Bay regarding the issue of seepage control. The loss of peat soils of

the Everglades provides an indicator of ecosystem change due to drainage activities. Peat soils predominate in previously flooded areas. Peat soils have subsided as a result of oxidation due to drainage, which has affected local topography and hydroperiods.

The lower east coast on the Atlantic Coastal Ridge is mostly underlain by thin sand and Miami Limestone that are highly permeable and moderately to well-drained. To the west of the coastal ridge, soils of the lower east coast contain fine sand and loamy material and have poor drainage. Rockland areas on the coastal ridge in Miami-Dade County are characterized by weathered limestone surfaces and karst features such as solution holes and sinkholes. Higher elevation marshes of the southern Everglades on either side of SRS are characterized by calcitic marl soils deposited by calcareous algal mats and exposed lime rock surfaces with karst features such as solution pits and sinkholes.

### **3.4 STUDY AREA LAND USE**

The existing land use within the study area varies widely from agricultural to high-density multi-family and industrial urban uses. Much of the land use/cover change occurring in south Florida over the past several years can be categorized as either the creation of new developments in previously natural or agricultural areas, or the change in the types of agriculture practiced. Generally, urban development is concentrated along the Lower East Coast (LEC) from Palm Beach County to Miami-Dade County. WCA 3, located directly north of ENP, is part of the Everglades Complex of Wildlife Management Areas and are managed by the Florida Fish and Wildlife Conservation Commission (FWC).

### **3.5 HYDROLOGY**

The major characteristics of south Florida's hydrology are: (1) local rainfall; (2) evapotranspiration; (3) canals and water control structures; (4) flat topography; (5) the highly permeable surficial aquifer along a thirty to forty mile-wide coastal strip. Local rainfall is the source of all of south Florida's fresh water. The surface water that is not removed from the land by evapotranspiration and seepage to the underlying aquifer is drained to the Atlantic Ocean, Florida Bay, or the Gulf of Mexico by very slow, shallow sheetflow through wetlands or relatively quickly through man-made canals.

Levees and canals constructed during the last 60 years under the C&SF Project have divided the former Everglades into areas designated for development and areas for fish and wildlife benefits, natural system preservation, and water storage. The natural areas consist of the three WCAs located north of Tamiami Trail. ENP is located south of Tamiami Trail. The WCAs provide detention storage for water from Lake Okeechobee, the EAA, and parts of the east coast region. Detention of water helps prevent floodwaters from inundating the east coast urban areas; provides water supply and detention for east coast urban and agricultural areas and ENP; improves the water supply for east coast communities by recharging underground freshwater reservoirs; reduces seepage; and provides control for saltwater intrusion in coastal aquifers. While the WCAs may reduce the severity of the drainage of the Everglades caused by the major canal systems, thus reducing impacts to fish and wildlife caused by the major drainage systems, the levees surrounding the WCAs still function to impound the Everglades, precluding the historic flow patterns. The C&SF Project infrastructure, combined with operational constraints, makes it difficult to provide natural timing, volume and distribution. In wet periods, water is impounded in the WCAs and

then discharged to ENP or coastal canals for eventual release to tide. During dry periods, water can flow through the canals to coastal areas and bypass the ENP wetlands.

### **3.5.1 WATER CONSERVATION AREAS 3A AND 3B**

The largest WCA is WCA 3, which is divided into two parts, 3A and 3B. It is approximately 40 miles long from north to south and covers approximately 915 square miles. Ground elevations slope southeasterly one to three feet in ten miles ranging from 13 feet NGVD in northwest WCA 3A to six feet, NGVD in southeast WCA 3B. The area is enclosed by approximately 111 miles of levees, of which 15 miles are common to WCA 2. An interior levee system across the southeastern corner of the area reduces seepage into an extremely pervious aquifer.

The upper pool, WCA 3A, provides an area of approximately 752 square miles for storage of excess water from the following sources: regulatory releases from WCA 2A; rainfall excess from approximately 750 square miles in Collier and Hendry counties (through Mullet Slough); flood control inflows from 71 square miles of the former Davie agricultural area lying east of pump station S-9 in Broward County; and excess water from a 208 square mile agricultural drainage area of the Miami Canal and other adjacent EAA areas to the north. WCA 3A provides water supply to the LEC, as well as the SDCS, in accordance with the WCA 3A Regulation Schedule, and WCA 3A provides water deliveries to ENP in accordance with the Rainfall Formula and the WCA 3A Regulation Schedule, collectively referred to as the Rainfall Plan (USACE 2006). Due to its limited discharge capacity compared to the spatial extent of the watershed from which it receives water, consecutive rainfall events have the potential to quickly utilize potential storage within WCA 3A and result in discharges from WCA 3A to SRS and/or the SDCS via the S-12 structures and/or S-333 and S-334.

South of WCA 3 and within ENP, the northern portion of SRS is also partially divided by the remaining 5.5 miles of the L-67 Extension Levee, which extends south from the southern terminus of L-67A at Tamiami Trail. Outflows from WCA 3A to ENP are regulated according to the WCA 3A Regulation Schedule, with some additional WCA 3A outflows to ENP from groundwater seepage across Tamiami Trail and seasonal surface water flows through the L-28 gaps, which then continue south along the L-28 borrow canal towards the Tamiami Trail bridges west of S-12A.

Stage variability within WCA 3 typically follows an annual cycle; the levels vary from high stages in the late fall and early winter to low stages at the beginning of the wet season (typically late May or early June). Water stages within WCA 3A typically exceed the top of the WCA 3A Regulation Schedule during the months of August through October, with this duration extended to earlier in the wet season (May) and/or later into the dry season during wet years (November and December). Above-normal rainfall patterns associated with El Niño conditions during the dry season months (November through May) may also result in water stages which exceed the top of the Regulation Schedule. Overall, water stage decreases from northwest to southeast within WCA 3, consistent with the general direction of surface water flow and prevailing topography within WCA 3. Water depth is typically between one to two and a half feet, with the shallower waters in the higher elevation northwestern portion of WCA 3. Water stages and depths in WCA 3B are typically much lower than water stages and depths in WCA 3A, due to limited surface water inflows into WCA 3B and the reduction of seepage from WCA 3A to WCA 3B consistent with the design purpose of

the L-67A and L-67C levees. Water levels in WCA 3B are affected by seepage losses to the east towards the L-30 borrow canal and seepage losses to the south towards the L-29 Canal.

Water supply deliveries from the C&SF Project (also known as the Regional system) to coastal canals are utilized to recharge coastal well fields and to prevent saltwater intrusion into the Biscayne aquifer. When canal levels drop below adequate recharge levels due to a combination of well field drawdowns, evaporation, and lack of rainfall, water supply deliveries are typically made from the Regional system. When canal levels drop in Miami-Dade County, regional water supply is delivered from WCA 3A through one of two delivery routes. Depending on system conditions, both routes may be utilized concurrently. For the northern delivery route from WCA 3A, water supply deliveries are either released from S-151 to the Miami Canal within WCA 3B (C-304), followed by downstream releases to either Miami-Dade County's SDCS by utilizing S-337 and/or by utilizing S-31 to release into the C-6 Canal. For the southern delivery route from WCA 3A, water supply deliveries are released from S-333 (from the upstream L-67A Canal), passed through the L-29 Canal, and are released to the SDCS by utilizing S-334.

The most important component of the groundwater system within the study area is the Biscayne aquifer, an unconfined aquifer unit underlying an area of approximately 3,000 square miles in southeast Florida, from southern Palm Beach County southward through Broward County to South Miami-Dade County. Groundwater in WCA 3 generally flows from the northwest to the southeast, with extensive seepage across the eastern and southern levees, L-30 (southeast corner of WCA 3B) in particular. However, the direction of groundwater flow may be locally influenced by rainfall, drainage canals, or well fields. Fluctuations in groundwater levels are seasonal. Groundwater levels within WCA 3 are influenced by water levels in adjacent canals. Where there is no impermeable formation above the aquifer, surface water recharges the system and the groundwater level can rise freely. In times of heavy rainfall, the aquifer fills and the water table rises above the land surface, contributing to seasonal inundation patterns throughout the area.

### **3.5.2 NORTHEAST SHARK RIVER SLOUGH**

NESRS is a complex area located in the northeast corner of ENP. It is currently the northern terminus of SRS, which is aligned from the northeast to southwest across ENP. Tamiami Trail is the northern boundary, the L-31N Canal the eastern boundary, and the L-67 Extension Canal the western boundary of the NESRS. Prior to construction and operation of the C&SF Project, NESRS would have been characterized as wet most of the year, but regional developments have impacted historic freshwater routes into the area. In addition, if historic levels are not maintained through the end of the wet season, significant reductions in surface water can occur during the dry season below historic dry season levels.

Water enters NESRS primarily from WCA 3A via S-333, and then to the L-29 Borrow Canal and subsequent passage through several sets of culverts and the one-mile Tamiami Trail bridge (completed as part of the MWD Project in 2013) under Tamiami Trail. S-355A and S-355B may also be used to deliver water from WCA 3B to the L-29 Canal for subsequent passage through the culverts to NESRS. The discharges made from WCA 3A through the S-12 structures and S-333 are target flows determined from the Rainfall Plan (USACE 2012a). Under the Rainfall Plan, water deliveries would be computed and operations adjusted weekly, if necessary based on the sum of two components: a rainfall response component and a WCA 3A regulatory component.

The normal operational target flow distribution is 55% through the S-333 into NESRS and 45% through the S-12 structures into ENP west of the L-67 Extension. Eastern portions of the ENP are also influenced by the system of canals and structures that provide flood control and water supply for the LEC urban and agricultural areas.

### 3.5.3 WESTERN SHARK RIVER SLOUGH

Western SRS located to the west of L-67 Extension Levee and bounded on the north by Tamiami Trail, is primarily influenced by rainfall and water management operations at the S-12 structures (A, B, C and D). Under the ERTTP, the utilization of the S-12 structures and the seasonal sequential closure periods beginning from the west at S-12A (November 1 through July 15) and S-12B (January 1 through July 15) is meant to move water from WCA 3A into SRS while providing conditions for Cape Sable seaside sparrow Subpopulation-A (CSSS-A) nesting and breeding. Releases from WCA 3A are specified by the Rainfall Plan, which includes the regulation schedule for WCA 3A and the Rainfall Formula. This Rainfall Based Management Plan consists of a rainfall-based delivery target and a supplemental regulatory component that specifies the total amount of water to be delivered to ENP in weekly volumes through the S-333 and S-12 structures; additional details for the Rainfall Plan are provided in Section 3.6.

### 3.5.4 TAYLOR SLOUGH

Taylor Slough is in the southeast quadrant of ENP. The area through the Rocky Glades and Taylor Slough is higher in elevation compared to ground levels north, south, or west. Because of this characteristic, the area is normally drier than other areas in the ENP. The Rocky Glades and Taylor Slough are somewhat like an island or a peninsula extending from the canals into the ENP. Under ERTTP, specified C-111 basin canal water levels/ranges and S-332D pump station operations have resulted in Taylor Slough being provided water from the C-111 Basin mainly during the wet season. During the dry season, under ERTTP, water deliveries to Taylor Slough were limited to provide conditions conducive to CSSS Sub-population C nesting (325 cfs from December 1 – January 31; 250 cfs from February 1 – July 14).

Since completion of the S-332D Detention Area in 2003, maximum surface water flows observed at the Taylor Slough Bridge (approximately 1.8 miles downstream of the existing L-31W gap and the remnant S-332/S-332I pump stations) typically range between 250 and 550 cfs during the wet season months of June to October. The flow at Taylor Slough includes contributions from the S-332D Detention Area and flowway, southerly flow within the remnant L-31W Canal (including significant seepage inflows from the S-332D Detention Area), and drainage from the adjacent ENP wetlands. The S-332D Detention Area includes the High Head Cell (a portion of the S-327 weir was degraded by SFWMD in August 2016, as part of the C-111 South Dade Project), the Cell 1 detention area, the Cell 2 detention area, and the flowway cell. Figure 3-1 and Figure 3-2 provide an overview of the S-332D Detention Area and the northern reaches of the L-31W Canal, including prevalent surface water flow pathways (indicated by green arrows) and seepage/groundwater flow pathways (indicated by blue arrows). Backfill and/or plugs within the remnant segments of the L-31W Canal will reduce seepage losses from the S-332D Detention Area to the L-31W Canal, reduce drainage of the adjacent ENP wetlands by the L-31W Canal, and promote increased sheetflow to Taylor Slough. Additional plugs along the L-31W Canal are currently planned as part of the C-111 South Dade Project (Reference **Section 1.3.2**).

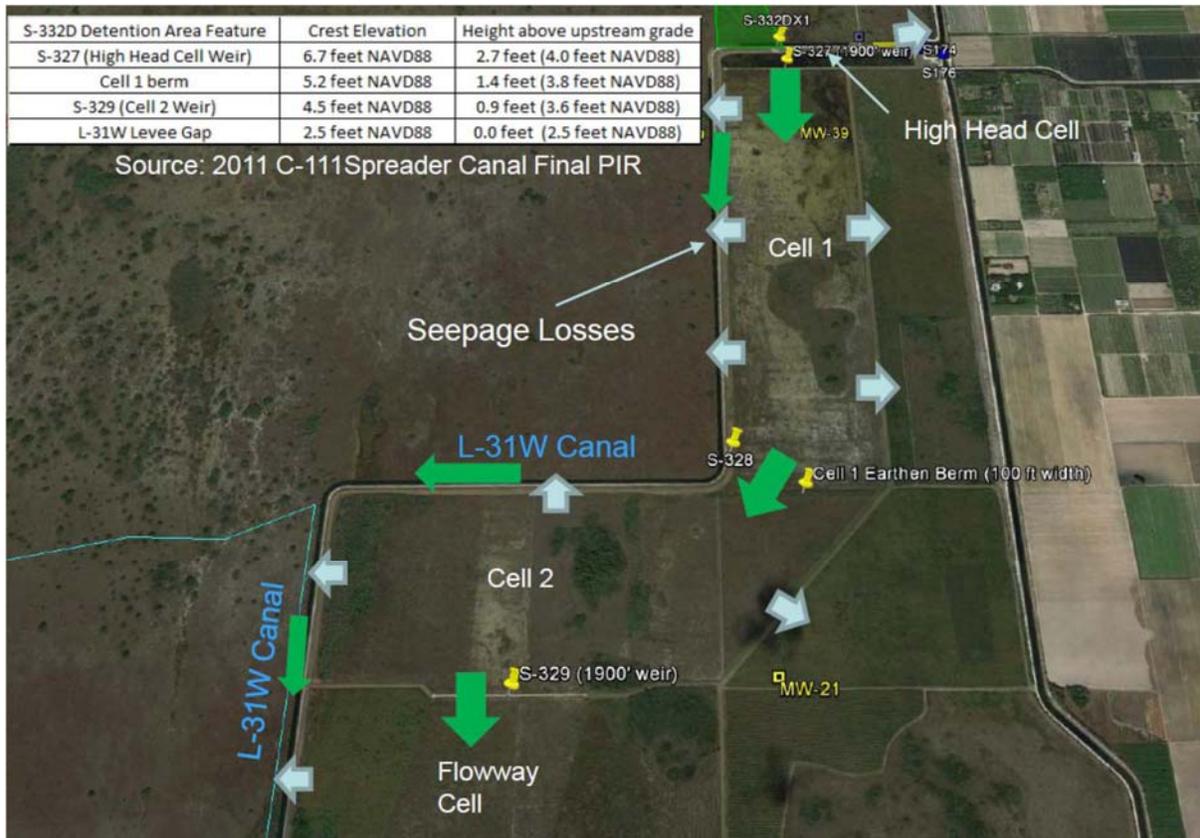
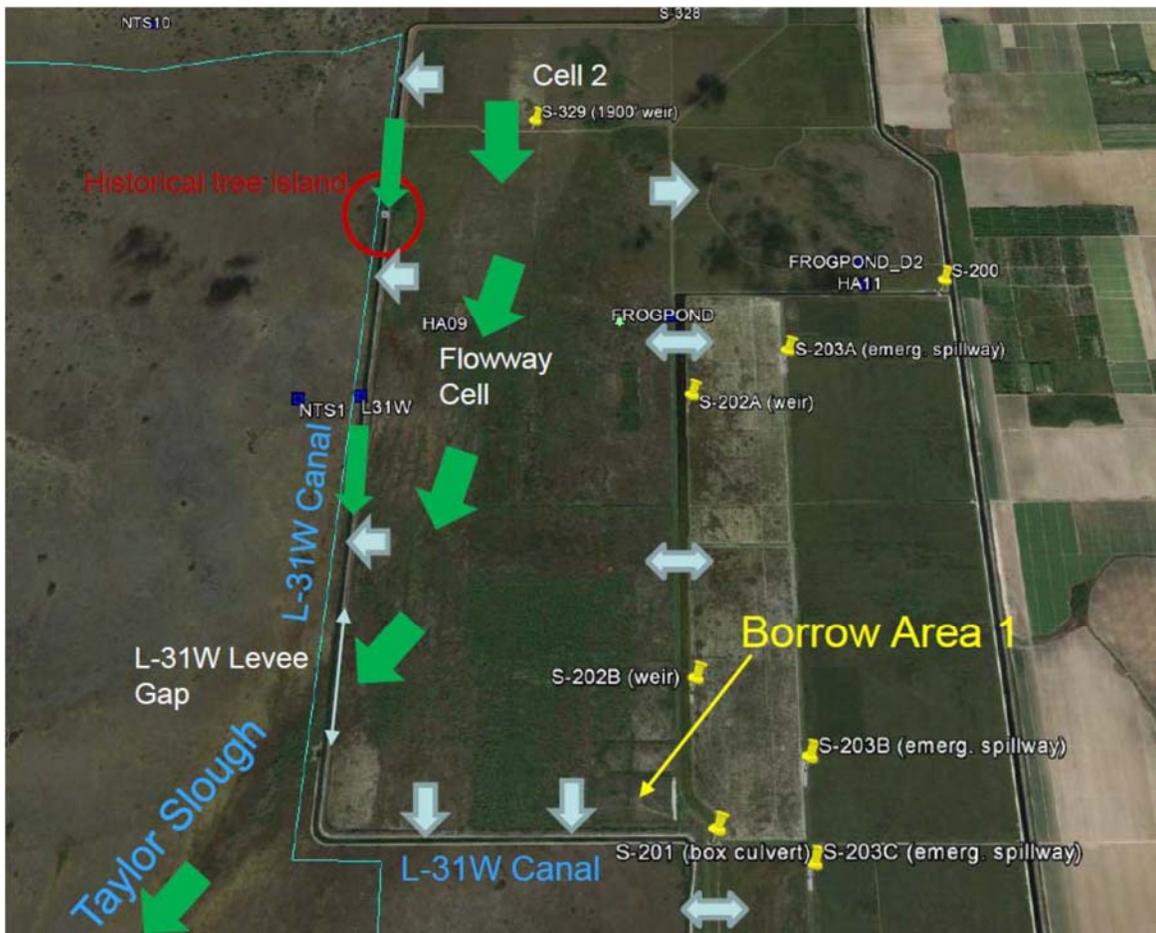


FIGURE 3-1. NORTHERN S-332D DETENTION AREA.



**FIGURE 3-2. SOUTHERN S-332D DETENTION AREA**

### 3.5.5 LOWER EAST COAST AREA

The LEC area is located to the east of the L-31N, L-31W, and C-111 canals. Under ERTTP, specified canal water levels/ranges are meant to provide flood protection, water supply, and prevention of saltwater intrusion for the LEC. The LEC can be provided water supply from WCA 3A and Lake Okeechobee according to their respective regulation schedules. In wet conditions, the excess water from the LEC is discharged to tide.

### 3.5.6 8.5 SQUARE MILE AREA

The 8.5 SMA is a primarily residential area adjacent to, but west of, the L-31N Canal. The 8.5 SMA, which is also known as the Las Palmas community, is bordered on both the west and north by NESRS. The community has water management infrastructure consisting of a perimeter levee, a seepage collection canal, a pump station (S-357), and a southern detention area meant to collectively provide flood mitigation as part of the MWD Project (USACE 2000). An additional seepage collection canal and gated water control structure (S-357N), which are being constructed along the southern boundary of the 8.5 SMA (along Richmond Drive) as part of the MWD Project, are presently planned for completion in January 2017.

### **3.5.7 BISCAYNE BAY**

Biscayne Bay is a shallow, tidal sound located near the extreme southeastern part of Florida. Biscayne Bay, its tributaries, and Card Sound are designated by the State of Florida as aquatic preserves, while Card and Barnes Sounds are part of the Florida Keys National Marine Sanctuary. A significant portion of the central and southern portions of Biscayne Bay comprise Biscayne National Park. Under ERTTP, specified canal water levels/ranges are meant to provide flood protection for the portions of the LEC and Miami-Dade County, which may result in discharges to Biscayne Bay.

### **3.5.8 FLORIDA BAY**

Florida Bay and the Ten Thousand Islands comprise approximately 1,500 square miles of ENP. The bay is shallow, with an average depth of less than three feet. To the north is the Florida mainland and to the south lie the Florida Keys. Sheet flow across the marl prairies of the southern Everglades and 20 creek systems fed by Taylor Slough and the C-111 Canal provide direct inflow of freshwater to the bay. Surface water from SRS flows into Whitewater Bay and these flows may also provide essential recharge for central and western Florida Bay. Exchange with Florida Bay occurs when this lower salinity water mass flows around Cape Sable into the western sub-region of the bay.

## **3.6 REGIONAL WATER MANAGEMENT (OPERATIONS)**

The C&SF Project contains multiple water bodies created by the existing C&SF levee infrastructure and implementation of the water management operating criteria, including WCA 1, WCA 2, and WCA 3. Associated with the inflow to and discharge from the water bodies is an infrastructure of structures and canals that are managed by the implementation of water management operating criteria that can include specified water levels or ranges. The WCA 3A Interim Regulation Schedule, which was implemented with ERTTP, is a compilation of water management operating criteria, guidelines, rule curves, and specifications that govern storage and release functions. Typically, a regulation schedule has water level thresholds which vary with the time of year and result in discharges. The threshold lines of regulation schedules define the discharge zones and are traditionally displayed graphically. Additionally, a corresponding table is typically used to identify the structure discharge rules for the zones. As with most regulation schedules, the WCA 1, WCA 2, and WCA 3A regulation schedules must take into account various, and often conflicting, project purposes. The WCAs are regulated for the Congressionally-authorized C&SF Project purposes to provide: flood control; water supply for agricultural irrigation, municipalities and industry, and ENP; regional groundwater control and prevention of saltwater intrusion; enhancement of fish and wildlife; and recreation. An important component of flood control is the maintenance of marsh vegetation in the WCAs, which provide a dampening effect on hurricane-induced wind tides that have the potential to affect residential areas to the east of the WCAs. The marsh vegetation, along with the east coast protection levee, also prevents floodwaters that historically flowed eastward from the Everglades from flowing into the developed areas along the southeast coast of Florida.

Besides releases from WCA 2A via the S-11 structures, WCA 3A receives inflow from pumping stations S-8, S-9, and S-140. The S-9 pump station removes runoff in the area west of Ft. Lauderdale known as Western C-11. The S-9A pump station, located adjacent to the S-9 pump

station, returns seepage water from WCA 3A and WCA3B collected in the L-37, L-33 and the US 27 borrow canals. The S-140 pump station serves the 110 square mile area north and east of the interceptor canal and west of L-28. S-140 is used to maintain canal levels below 10.5 feet, NGVD unless gravity flow into WCA 3A is possible at an adequate rate. Water also enters northeastern WCA 3A by gravity through the S-150 gated culvert. Discharges at S-142 are made from WCA 3A into the North New River Canal. The SFWMD can pump runoff from the North New River Canal and the C-13 Canal into WCA 3A through S-142 by operating their pump station, G-123.

Water levels in WCA 3A are managed primarily by five gated spillways: the S-12 structures (S-12A, S-12B, S-12C, and S-12D) and S-333. Additionally, the S-151, S-343A, S-343B and S-344 gated culvert structures can be utilized to discharge from WCA 3A. From July 2002 through October 2012, WCA 3A was regulated according to a seasonally varying 8.75 to 10.75 feet, NGVD regulation schedule and the Rainfall Plan (initiated in 1985), as per IOP (2002 IOP EIS and 2006 IOP Final Supplemental EIS). In October 2012, the WCA 3A Regulation Schedule was revised with implementation of the ERTTP recommended plan through the 2012 Water Control Plan. Revisions to the WCA 3A Regulation Schedule included incorporation of the WCA-3A 1960 9.5 to 10.5 feet NGVD Zone A, along with expansion of Zone D forward to December 31 and expansion of Zone E1 backwards to January 1. The discharges made from WCA 3A through the S-12s and S-333 are target flows determined from the Rainfall Plan; when WCA 3A is in Zone A, these target flows are the maximum flow possible based on structure design capacities and consideration of downstream operational constraints. Under the Rainfall Plan, water deliveries are computed and operations adjusted weekly, if necessary based on the sum of two components: a rainfall response component and a WCA 3A supplemental regulatory component. The Rainfall Plan provides for the rainfall response component within all zones of the WCA 3A Regulation Schedule, with the additional regulatory release requirement added when the WCA 3A water levels fall within the higher regulation schedule zones above Zone E, including Zone E1. Under current ERTTP water management practice, which were unchanged with Increment 1, discharge capacity from S-333 into the L-29 Canal and NESRS is maximized prior to utilization of the S-12 structures, in order to limit potential effects from WCA 3A discharges on the CSSS western subpopulation (CSSS-A). When flows through the S-12 structures are determined necessary by the WCA 3A Regulation Schedule and the Rainfall Plan, water managers prioritize flow through the easternmost S-12 structures as capacity allows, in order to minimize flow through the S-12A and S-12B structures. The historical operational target flow distribution of 55% through S-333 into NESRS and 45% through the S-12 structures into ENP west of the L-67 Extension is no longer used as a constraint governing water management operations of WCA 3A and northern ENP under ERTTP. Weekly WCA 3A water management release decisions are coordinated with ENP. ERTTP specifies seasonal closure of the S-343A, S-343B, S-344, S-12A and S-12B structures, with the following rigid closure periods: November 1 through July 14 for S-343A, S-343B, S-344, and S-12A; and January 1 through July 14 for S-12B. There are no prescribed closure periods for S-12C or D, although either or both of these structures may be closed when Rainfall Plan target releases are achieved through S-333.

Water deliveries to eastern ENP (NESRS) are controlled by the stage in L-29 Canal, as pressure from the water within the canal (hydraulic head), is required to force water through the Tamiami Trail culverts and the one mile bridge and into ENP. As the L-29 Canal stage increases, more water is forced beneath the road through 17 sets of culverts (49 total culverts, three culverts per

set in most locations) and the one mile bridge. The L-29 Canal maximum operating stage has been limited under ERTP and previous regional operating plans due to concerns regarding: (1) potential flooding and seepage effects within residential or agricultural areas of Miami-Dade County; (2) potential damage to the Tamiami Trail roadway sub-base; and (3) potential flooding effects to privately-owned real estate adjacent to Tamiami Trail and within eastern ENP. The MWD Tamiami Trail Modifications (TTM) Project, which was completed in December 2013, included construction of the one mile bridge and Tamiami Trail roadway reconstruction/resurfacing to allow for the maximum operating stage in the L-29 Canal to be raised from 7.5 feet to 8.5 feet, NGVD following the acquisition of the required real estate interests by the Corps and ENP. Following completion of the MWD TTM Project, the current ERTP water management operating criteria for the L-29 Canal between S-333 and S-334 is meant to limit the L-29 Canal stage to no more than 7.5 feet, NGVD in response to potential flooding effects to privately-owned real estate adjacent to Tamiami Trail and within eastern ENP which may result from extended durations with higher operating stages in the L-29 Canal (above 7.5 feet, NGVD). ERTP also included an additional operational constraint for the L-29 Canal water level related to potential flooding and seepage effects within residential and/or agricultural areas of Miami-Dade County; this constraint, which is removed during implementation of the Increment 1 planned deviation, required S-333 discharges to NESRS will be discontinued when the G-3273 water level within NESRS reaches 6.8 feet, NGVD during the normal Column 1 mode of operations, or S-333 discharges into the L-29 Canal to be matched with S-334 discharges out of the L-29 Canal when operating under the Column 2 mode of operations.

When WCA 3A water levels are in Zone A of the WCA 3A Interim Regulation Schedule, S-343A, S-343B, and S-344 can be utilized to discharge from WCA 3A into BCNP outside of the prescribed closure period for these gated culvert structures. Discharges can also be made through S-343A, S-343B and S-344 when agreed to by SFWMD, Corps, and NPS to extend hydroperiods within BCNP. The S-151 gated culvert structure is located along the Miami Canal and operated according to the WCA 3A Interim Regulation Schedule (USACE 2012a). S-151 discharges into the Miami Canal (C-304) in WCA 3B for flood diversion and for the purpose of providing water supply to LEC canals and the SDCS. Under existing conditions, water does not flow directly from WCA 3B into the L-29 Borrow canal. There are two discharge structures, gated spillways S-355A and S-355B, along L-29 south of WCA 3B that are designed to move water from WCA 3B into the L-29 Canal. The S-355 structures are completed components of the MWD Project, intended to function in concert with the proposed MWD S-345 structures along L-67A/L-67C to address the MWD Project objective of restoring WCA 3B as a functioning component of the Everglades hydrologic system and restoration of water deliveries to NESRS.

There are three distinct modes of water management operations for ERTP, which are consistent with the previous IOP (2002, 2006 Supplement): Column 1, Column 2, and water supply. Column 1 refers to the condition when regulatory releases from WCA 3A can be met by normal operation of the WCA 3A regulatory outlets (the S-12 structures, S-333, S-151, S-343A, S-343B, and/or S-344). Column 2 refers to the condition when regulatory releases from WCA 3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the SDCS; Column 2 operations generally require the use of pump stations S-331, S-332B, S-332C, and S-332D. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases

to reach S-332B, S-332C, and S-332D pump stations. Column 2 operations are used to offset or mitigate for potential adverse effects on WCA 3A related to actions taken to protect CSSS sub-population A within western ENP, including seasonal closure of the S-12A and S-12B regulatory outlets under ERTTP (S-12C seasonal closure criteria were additionally included with IOP). The IOP/ERTTP generally prescribed that the Column 2 mode of operation would be used when any S-12 structure is closed in order to protect the CSSS (November 1 through July 14, under ERTTP), although Column 1 operations would continue until the capacity of the S-12 structures that remain open is insufficient to handle the discharge from WCA 3A. Similarly, the IOP/ERTTP generally prescribed that Column 2 operations may continue past re-opening of the S-12 structures (July 15) to mitigate for adverse effects on WCA 3A stage levels resulting from the ERTTP closures of S-12A, S-12B, S-343A, S-343B, and S-344, based on comparison to WCA stage levels that would have been expected under the WCA 3A Regulation Schedule in place prior to the 2000 Interim Structural and Operational Plan (ISOP; the predecessor of IOP 2002); the cited 1985 WCA 3A Regulation Schedule was first incorporated the Rainfall Plan and included no seasonal closures for the S-12s. Under historical IOP and ERTTP operations, the Column 2 mode of operations has also been used as an additional water management tool for WCA 3A high water conditions. Beginning in 2014, the Corps and SFWMD are applying a WCA 3A water budget accounting tool to track the expected effect on WCA 3A stage levels resulting from the ERTTP closures of S-12A, S-12B, S-343A, S-343B, and S-344.

Increment 1 is a planned deviation from ERTTP. Increment 1, which was initiated on October 15, 2015 will maintain the ERTTP maximum operating limit of 7.5 feet, NGVD in the L-29 Canal, while relaxing the G-3273 constraint for S-333, and utilizing S-356 for control of the seepage to the L-31N Canal. Upon review of monitoring data associated with Increment 1 and the 2016 Temporary Emergency Deviation, it became apparent that modifications are necessary to the Increment 1 operational strategy to maintain the Congressionally-authorized flood mitigation requirements within the 8.5 SMA and to facilitate completion of the Canal 111 South Dade Projects ongoing construction necessary for Increment 2 of the field test. Reference **Section 1.3**.

### **3.7 FLOOD CONTROL**

Water management and flood control is achieved in south Florida through a variety of canals, levees, pumping stations, and control structures within the WCAs, ENP, and SDCS. The WCAs provide a detention reservoir for rainfall over the WCAs, excess water from the EAA and parts of the east coast region, and for flood discharge from Lake Okeechobee to tide. The WCAs provide levees to prevent the Everglades floodwaters from inundating the east coast urban areas; provide a water supply for the east coast areas and ENP; improve water supply for east coast communities by recharging underground freshwater reservoirs; reduce seepage; ameliorate salt-water intrusion in coastal well fields; and provide mixed quality habitat for fish and wildlife in the Everglades.

The East Coast Canals are flood control and outlet works that extend from St. Lucie County southward through Martin, Palm Beach, and Broward Counties to Miami-Dade County. The East Coast Canal watersheds encompass the primary canals and water control structures located along the LEC and their hydrologic basins. The main design functions of the project canals and structures in the East Coast Canal area are to protect the adjacent coastal areas against flooding; store water in conservation areas west of the levees; control water elevations in adjacent areas; prevent salt-water intrusion and over-drainage; provide freshwater to Biscayne Bay; and provide

for water conservation and public consumption. The East Coast Canals consist of 40 independently operated canals, one levee, and 50 operating structures, consisting of 35 spillways, 14 culverts, and one pump station. The project operates to prevent major flood damage; however, due to urbanization, the existing surface water management system now has to handle greater peak flows than in the past. The SDCS provides a way to deliver water to areas of south Miami-Dade County. This canal system was overlaid on the existing flood control system. Many of these canals are used to remove water from interior areas to tide in times of excess water.

The C-111 South Dade Project was authorized to remove 40 percent of the Standard Project Flood (SPF) flows. This purpose remains an important objective because of the remaining agriculture within the basin. The South-Dade County Basin (south of the S-331 pump station) is provided flood protection by operation of the S-332B/S-332C/S-332D pump stations completed under the C-111 South Dade Project and through operation of the L-31N and C-111 Canal control structures (S-176, S-177, S-18C, and S-197). The South-Dade County basin may also receive inflows from upstream basin drainage through the S-331 pump station and the adjacent S-173 gated culvert structure. Under the current 2012 Water Control Plan, S-331/S-173 releases are the result of water management operations to: (1) maintain target L-31N Canal stages; (2) provide flood mitigation to the 8.5 SMA eastern areas when sufficient capacity is available at S-357 and maintain flood mitigation for the 8.5 SMA when S-357 operational capacity is limited; and (3) WCA 3A regulatory releases to the SDCS from S-334 during ERTF Column 2 operations. The COP will include regional hydrologic modeling in order to balance the ecological restoration objectives of the MWD and C-111 South Dade projects while demonstrating compliance with the project constraints. This will include flood mitigation requirements to prevent potential MWD project-induced flood damages in the 8.5 SMA and to maintain the level of flood damage reduction associated with the 1994 C-111 GRR-EIS Recommended Plan. The performance of the C-111 South Dade Project features, with respect to both project objectives and constraints, is dependent on the outcome of the COP, including details of the operational plans and operational constraints within WCA 3A, ENP, and the 8.5 SMA.

### **3.8 VEGETATIVE COMMUNITIES**

The Everglades landscape is dominated by a complex of freshwater wetland communities that includes open water sloughs and marshes, dense grass- and sedge-dominated marshes, forested islands, and wet marl prairies. The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999). These communities generally occur along a hydrological gradient with the slough/open water marsh communities occupying the wettest areas (flooded more than nine months per year), followed by sawgrass marshes (flooded six to nine months per year), and wet marl prairie communities (flooded less than six months per year) (USFWS 1999). The Everglades freshwater wetlands eventually grade into intertidal mangrove wetlands and sub tidal seagrass beds in the estuarine waters of Florida Bay. Development and drainage over the last century have dramatically reduced the overall spatial extent of freshwater wetlands within the Everglades, with approximately half of the pre-drainage 2.96 million acres of wetlands being converted for development and agriculture (Davis and Ogden 1997). Alteration of the normal flow of freshwater through the Everglades has also contributed to conversions between community types, invasion by exotic species, and a general loss of community diversity and heterogeneity.

Vegetative communities of the WCAs have suffered from both over-drainage and prolonged periods of inundation associated with the stabilization of water levels (USACE 1999). Many areas of WCA 3A still contain relatively good wetland habitat consisting of a complex of tree islands, sawgrass marshes, wet prairies, and aquatic sloughs. However, the northern portion of WCA 3A has been over-drained, resulting in increased fire frequency and the associated loss of tree islands, wet prairie, and aquatic slough habitat. Northern WCA 3A is currently dominated largely by mono-specific sawgrass stands and lacks the diversity of communities that exists in southern WCA 3A. In southern WCA 3A, Wood and Tanner (1990) first documented the trend toward deep water lily dominated sloughs due to impoundment. In approximately 1991, the hydrology of southern WCA 3A shifted to deeper water and extended hydroperiods resulting in corresponding shifts in vegetation communities (Zweig and Kitchens 2008). Typical Everglades vegetation, including tree islands, wet prairies, sawgrass marshes, and aquatic sloughs is contained in WCA 3B. However, within WCA 3B, the ridge and slough landscape has been severely degraded by the virtual elimination of overland sheetflow due to the L-67 Canal and Levee system. WCA 3B experiences very little overland flow and has become primarily a rain-fed system pre-dominated by shorter hydroperiod sawgrass marshes with relatively few sloughs or tree islands remaining. Water levels in WCA 3B are also too low and do not vary seasonally, contributing to poor ridge and slough patterning. Loss of sheetflow to WCA 3B has also accelerated soil loss reducing elevations of the remaining tree islands in WCA 3B and making them vulnerable to high water stages.

Vegetative trends in ENP have included a substantial shift from the longer hydroperiod slough/open water marsh communities to shorter hydroperiod sawgrass marshes (Davis and Ogden 1997; Armentano et al. 2006). In addition, invasion of sawgrass marshes and wet prairies by exotic woody species has led to the conversion of some marsh communities to forested wetlands (Gunderson et al. 1997).

The estuarine communities of Florida Bay have also been affected by upstream changes in freshwater flows through the Everglades. A reduction in freshwater inflows into Florida Bay and alterations of the normal salinity balance have affected mangrove community composition and may have contributed to a large-scale die-off of seagrass beds (USFWS 1999). Mangrove communities along Biscayne Bay have also seen a reduction in freshwater inflows and a reduction in historic habitat range by urban and agricultural development leaving only a remnant ribbon of suitable habitat immediately adjacent to the bay. Both bays experiences salinities in excess of 40 psu on a seasonal basis. Manatee Bay and Barnes Sound are presently characterized by extended periods with little or no freshwater input, interspersed with erratic large volume discharges from the C-111 Canal, which is presently the major source of freshwater flows.

In contrast to the vast extent of wetland communities, upland communities comprise a relatively small component of the Everglades landscape and are largely restricted to Long Pine Key, the northern shores of Florida Bay, and the many tree islands scattered throughout the region. Vegetative communities of Long Pine Key include rockland pine forest and tropical hardwood forest. In addition, substantial areas of tropical hardwood hammock occur along the northern shores of Florida Bay and on elevated portions of some forested islands.

The vast majority of wetland features within the 8.5 SMA have undergone varying degrees of disturbance related to land clearing for agricultural or residential improvements and invasion by exotic species. Generally, wetlands with the least amount of disturbance are located in the western areas of the 8.5 SMA. The developed (eastern) portion of the 8.5 SMA, except the Federal Aviation Administration (FAA) radar facility, is virtually devoid of wetlands, whereas a zone extending down the central portion is dotted by wetlands intermixed within agricultural and residential land uses. Many of the wetland communities include varying densities of exotics including: Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina equisetifolia* L.), and melaleuca (*Melaleuca quinquenervia*). The 8.5 SMA includes an Australian pine forest that is very dense, supporting a sparsely vegetated understory and ground cover. A prevalent ground cover species is sawgrass, growing within a thick layer of duff comprised entirely of pine needles. Australian pine can be found in monotypic stands, along marsh and prairie edges, and in abandoned fields. Brazilian pepper is common along roadsides and also forms dense wooded plots throughout the 8.5 SMA (USACE 2012a).

### 3.9 FISH AND WILDLIFE RESOURCES

Aquatic macro invertebrates form a vital link between the algal and detrital food web base of freshwater wetlands and the fishes, amphibians, reptiles, and wading birds that feed upon them. Important macro invertebrates of the freshwater aquatic community include crayfish (*Procambarus alleni*), riverine grass shrimp (*Palaemonetes paludosus*), amphipods (*Hyallela aztecus*), Florida apple snail (*Pomacea paludosa*), Seminole ramshorn (*Planorbella duryi*), and numerous species of aquatic insects (USACE 1999).

Small freshwater marsh fishes are also important processors of algae, plankton, macrophytes, and macro invertebrates. Marsh fishes provide an important food source for wading birds, amphibians, and reptiles. Common small freshwater marsh species include the native and introduced golden topminnow (*Fundulus chrysotus*), least killifish (*Heterandria formosa*), Florida flagfish (*Jordenella floridae*), golden shiner (*Notemigonus crysoleucas*), sailfin molly (*Poecilia latipinna*), bluefin killifish (*Lucania goodei*), oscar (*Astronotus ocellatus*), eastern mosquitofish (*Gambusia holbrooki*), and small sunfishes (*Lepomis* spp.) (USACE 1999).

Within the Greater Everglades, numerous sport and larger predatory fishes occur in deeper canals and sloughs. Common species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), black crappie (*Pomoxis nigromaculatus*), Florida gar (*Lepisosteus platyrhincus*), threadfin shad (*Dorosoma petenense*), gizzard shad (*Dorosoma cepedianum*), yellow bullhead (*Ameiurus natilis*), white catfish (*Ameiurus catus*), bowfin (*Amia calva*), and tilapia (*Tilapia* spp.) (USACE 1999). Larger fishes are an important food source for wading birds, alligators, otters, raccoons, and mink.

The freshwater wetland complex supports a diverse assemblage of reptiles and amphibians. Common amphibians include the greater siren (*Siren lacertina*), Everglades dwarf siren (*Pseudobranchius striatus*), two-toed amphiuma (*Amphiuma means*), pig frog (*Rana grylio*), southern leopard frog (*Rana sphenoccephala*), Florida cricket frog (*Acris gryllus*), southern chorus frog (*Pseudacris nigrita*), squirrel tree frog (*Hyla squirela*), and green tree frog (*Hyla cinerea*) (USACE 1999). Amphibians also represent an important forage base for wading birds, alligators, and larger predatory fishes (USACE 1999).

Common reptiles of freshwater wetlands include the American alligator (*Alligator mississippiensis*), snapping turtle (*Chelydra serpentina*), striped mud turtle (*Kinosternon bauri*), mud turtle (*Kinosternon subrubrum*), cooter (*Chrysemys floridana*), Florida chicken turtle (*Deirochelys reticularia*), Florida softshell turtle (*Trionyx ferox*), water snake (*Natrix sipidon*), green water snake (*Natrix cyclopion*), mud snake (*Francina abacura*), and Florida cottonmouth (*Agkistrodon piscivorus*) (USACE 1999).

The freshwater wetlands of the Everglades are noted for their abundance and diversity of colonial wading birds. Common wading birds include the white ibis (*Eudocimus albus*), glossy ibis (*Plegadus falcenellus*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), green-backed heron (*Butorides striatus*), cattle egret (*Bubulcus ibis*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nycticorax violacea*), roseate spoonbill (*Ajaia ajaja*), and wood stork (*Mycteria americana*) (USACE 1999).

Mammals that are well-adapted to the aquatic and wetland conditions of the freshwater marsh complex include the rice rat (*Oryzomys palustris natator*), round-tailed muskrat (*Neofiber alleni*), and river otter (*Lutra canadensis*). Additional mammals that may utilize freshwater wetlands on a temporary basis include the white-tailed deer (*Odocoileus virginianus*), Florida panther (*Puma concolor coryi*), bobcat (*Lynx rufus*), and raccoon (*Procyon lotor*).

Conditions within the 8.5 SMA provide important resources for opportunistic small animals including raccoons, rabbits, squirrels, songbirds, hawks, kestrels, crows, turkey vultures, frogs, and various reptiles. White-tailed deer have been observed. On-site surveys have found the greatest degree of species richness within the forested wetland systems within the ENP lands to the west of the 8.5 SMA, whereas species richness was lowest in wetlands on higher elevations (7.0-8.0 feet, NGVD) in the eastern regions of the 8.5 SMA, in close proximity to L-31N (USACE 2011). This eastern region of the 8.5 SMA is dedicated to agricultural and residential land uses, and provides only marginal benefits to resident wildlife (USACE 2012a).

The change in fish and wildlife diversity and wetland function between the western and eastern portions of the 8.5 SMA correlates with an elevation gradient (increasing elevations from west to east) and land use. Both elevation and land use are interdependent co-variables as lower elevations correlate with frequent flooding that limits the extent and type of land use. Higher elevations are more compatible with agricultural, commercial, and residential land uses. A recent overview of wildlife observed within the 8.5 SMA can be found in the 2011 Proposed Interim Operating Criteria for 8.5 SMA EA (USACE 2011), and 2012 design refinement for the 8.5 SMA EA (USACE 2012a).

### **3.10 THREATENED AND ENDANGERED SPECIES**

#### **3.10.1 FEDERALLY PROTECTED SPECIES**

The Corps has coordinated with USFWS and National Marine Fisheries Service (NMFS), in accordance with Section 7 of the Endangered Species Act, to determine federally-listed threatened and endangered species that are either known to occur or are likely to occur within the project area (**Table 3-1**).

**TABLE 3-1. FEDERALLY THREATENED AND ENDANGERED SPECIES WITHIN THE PROJECT AREA**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>
<b>Mammals</b>		
Florida panther	<i>Puma concolor coryi</i>	E
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH
Florida bonneted bat	<i>Eumops floridanus</i>	E
<b>Birds</b>		
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	E, CH
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E, CH
Piping plover	<i>Charadrius melodus</i>	T
Red-cockaded woodpecker	<i>Picoides borealis</i>	E
Roseate tern	<i>Sterna dougallii</i>	T
Wood stork	<i>Mycteria Americana</i>	T
<b>Reptiles</b>		
American Alligator	<i>Alligator mississippiensis</i>	T, SA
American crocodile	<i>Crocodylus acutus</i>	T, CH
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T
Gopher tortoise	<i>Gopherus polyphemus</i>	C
Green sea turtle	<i>Chelonia mydas</i>	E
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E
Kemp's Ridley sea turtle	<i>Lipodochelys kempii</i>	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E
Loggerhead sea turtle	<i>Caretta</i>	T
<b>Fish</b>		
Smalltooth sawfish	<i>Pristis pectinata</i>	E
<b>Invertebrates</b>		
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	E
Elkhorn coral	<i>Acropora palmata</i>	T, CH
Florida leafwing butterfly	<i>Anaea troglodyta florialis</i>	E
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	E
Schaus swallowtail butterfly	<i>Heraclides aristodemus ponceanus</i>	E
Staghorn coral	<i>Acropora cervicornis</i>	T, CH

Stock Island tree snail	<i>Orthalicus reses</i> (not incl. <i>nesodryas</i> )	T
<b>Plants</b>		
Crenulate lead plant	<i>Amorpha crenulata</i>	E
Deltoid spurge	<i>Chamaesyce deltoidea</i> <i>spp. deltoidea</i>	E
Garber's spurge	<i>Chamaesyce garberi</i>	T
Johnson's seagrass	<i>Halophila johnsonii</i>	E, CH
Okeechobee gourd	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>	E
Small's milkpea	<i>Galactia smallii</i>	E
Tiny polygala	<i>Polygala smallii</i>	E
Big pine partridge pea	<i>Chamaecrista lineata</i> var. <i>keyensis</i>	E
Blodgett's silverbush	<i>Argythamnia blodgettii</i>	T
Cape Sable thoroughwort	<i>Chromolaena frustrata</i>	E, CH
Carter's small-flowered flax	<i>Linum carteri</i> var. <i>carteri</i>	E, CH
Everglades bully	<i>Sideroxylon reclinatum</i> <i>spp. austrofloridense</i>	C
Florida brickell-bush	<i>Brickellia mosieri</i>	E, CH
Florida bristle fern	<i>Trichomanes punctatum</i> <i>spp. floridanum</i>	E
Florida semaphore cactus	<i>Consolea corallicola</i>	E, CH
Sand flax	<i>Linum arenicola</i>	E

### 3.10.2 STATE LISTED SPECIES

The project area also provides habitat for several state listed species (**Table 3-2**).

**TABLE 3-2. STATE LISTED SPECIES WITHIN THE PROJECT AREA**

Common Name	Scientific Name	Status
Mammals		
Florida black bear	<i>Ursus americanus floridanus</i>	T
Everglades mink	<i>Mustela vison evergladensis</i>	T
Florida mouse	<i>Podomys floridanus</i>	SC
Florida mastiff bat	<i>Eumops glaucinus floridanus</i>	E
Birds		
Piping plover	<i>Charadrius melodus</i>	T
Snowy plover	<i>Charadrius alexandrinus</i>	T
American oystercatcher	<i>Haematopus palliatus</i>	E
Brown pelican	<i>Pelecanus occidentalis</i>	SC
Black skimmer	<i>Rynchops niger</i>	SC
Least tern	<i>Sterna antillarum</i>	T
White-crowned pigeon	<i>Columba leucocephalus</i>	T
Least tern	<i>Sterna antillarum</i>	T

Limpkin	<i>Aramus guarauna</i>	SC
Little blue heron	<i>Egretta caerulea</i>	SC
Tricolored heron	<i>Egretta tricolor</i>	SC
Snowy egret	<i>Egretta thula</i>	SC
Reddish egret	<i>Egretta rufescens</i>	SC
White ibis	<i>Eudocimus albus</i>	SC
Roseate spoonbill	<i>Ajajaajaja</i>	SC
Fish		
Mangrove rivulus	<i>Rivulus marmoratus</i>	SC
Invertebrates		
Miami blue butterfly	<i>Cyclargus [=Hermiargus] thomasi bethunebakeri</i>	E
Florida tree snail	<i>Liguus fasciatus</i>	SC
Plants		
Pine-pink orchid	<i>Bletia purpurea</i>	T
Lattace vein fern	<i>Thelypteris reticulata</i>	E
Eatons spikemoss	<i>Selaginella eatonii</i>	E
Wright's flowering fern	<i>Anemia wrightii</i>	E
Tropical fern	<i>Schizaea pennula</i>	E
Mexican vanilla	<i>Manilla mexicana</i>	E

E=Endangered; T=Threatened; SC=Species of Special Concern

### 3.11 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, 16USC 1801 et seq. Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fish habitat (EFH). The southern estuaries comprise Biscayne National Park and a large portion of ENP and are a shallow estuarine system (average depth less than 3 feet). Florida Bay is the main receiving water of the greater Everglades. The southern estuaries contain essential fish habitat for corals; coral reef and live bottom habitat; red drum (*Sciaenops ocellatus*); penaeid shrimps; spiny lobster (*Panulirus argus*); other coastal migratory pelagic species and the snapper-grouper complex. Essential fish habitat in the southern estuaries is comprised of seagrasses, estuarine mangroves, intertidal flats, the estuarine water column, live/hard bottoms, and coral reefs.

### 3.12 WATER QUALITY

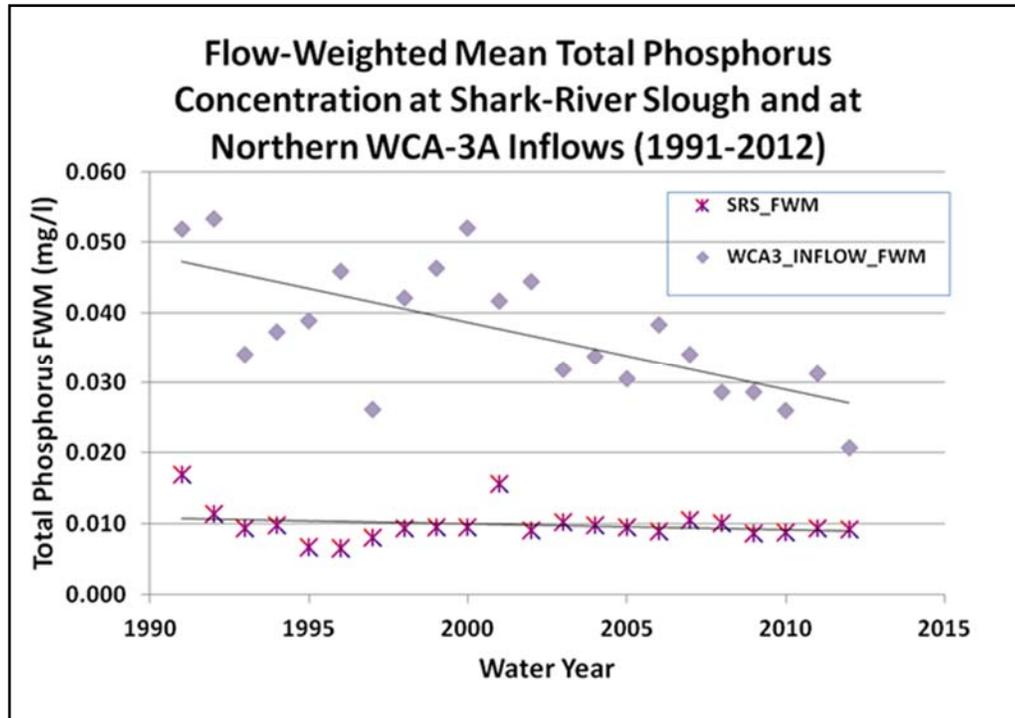
Water quality in the study area is significantly influenced by development. The C&SF Project led to significant changes in the landscape by opening large land tracts for urban development and agricultural uses, and by the construction of extensive drainage networks. Natural drainage patterns in the region have been disrupted by the extensive array of levees and canals which has resulted in further water quality degradation. The water quality of the study area is largely controlled by Lake Okeechobee and the EAA to the north and urban and agricultural development southeast of ENP. The northern WCAs are fed from Lake Okeechobee as well as runoff from the EAA. Stormwater Treatment Areas (STAs) were constructed to reduce total phosphorus from surface water runoff releases from Lake Okeechobee. Water quality impairment within the study area can generally be attributed to nutrients and bioavailable forms of mercury. A short discussion of each of these water pollutants is provided below followed by a review of water quality within the project area.

### 3.12.1 NUTRIENTS

Nutrients such as phosphorus and nitrogen compounds are a concern in the estuaries, WCAs, ENP, and Lake Okeechobee since they result in an imbalance of flora and fauna. To address nutrient discharges the FDEP has recently established surface water quality numeric nutrient criteria for all Florida water bodies and developed National Pollution Discharge Elimination (NPDES) Total Maximum Daily Loads (TMDLs) for many watersheds with excessive nutrient pollution. TMDLs for phosphorus and/or nitrogen currently exist for Lake Okeechobee. Additional information on the status and implementation of TMDLs within the study area can be found at <http://www.dep.state.fl.us/water/tmdl/>.) Within the Everglades Protection Area (EPA), phosphorus concentrations are regulated by the “Phosphorus Rule” 62-302.540 F.A.C. and are subject to the terms of the 1992 Consent Decree in *United States v. South Florida Water Management District* (S.D. Fla No. 88-1886-CIV-MORENO).

Total phosphorus is the nutrient of concern within WCA 3 and NESRS. Under the current conditions, total phosphorus concentrations at the structures involved in this project area are within the low range for the entire water year (2016). It is anticipated that SRS will be in compliance with the SA requirements for WY 2016 (1 October 2015-30 September 2016).

See below graph for background information on total phosphorus concentrations. Due to the long duration of the upstream wet season conditions in the WCA’s, water quality was good (low phosphorus concentrations) for deliveries to WCA 3B and the ENP NESRS during WY 2016 as compared to average rainfall and dry years.



**FIGURE 3-3. FLOW-WEIGHTED MEAN TOTAL PHOSPHORUS CONCENTRATION AT SHARK RIVER SLOUGH AND NORTHERN WCA 3A INFLOWS**

### 3.13 NATIVE AMERICANS

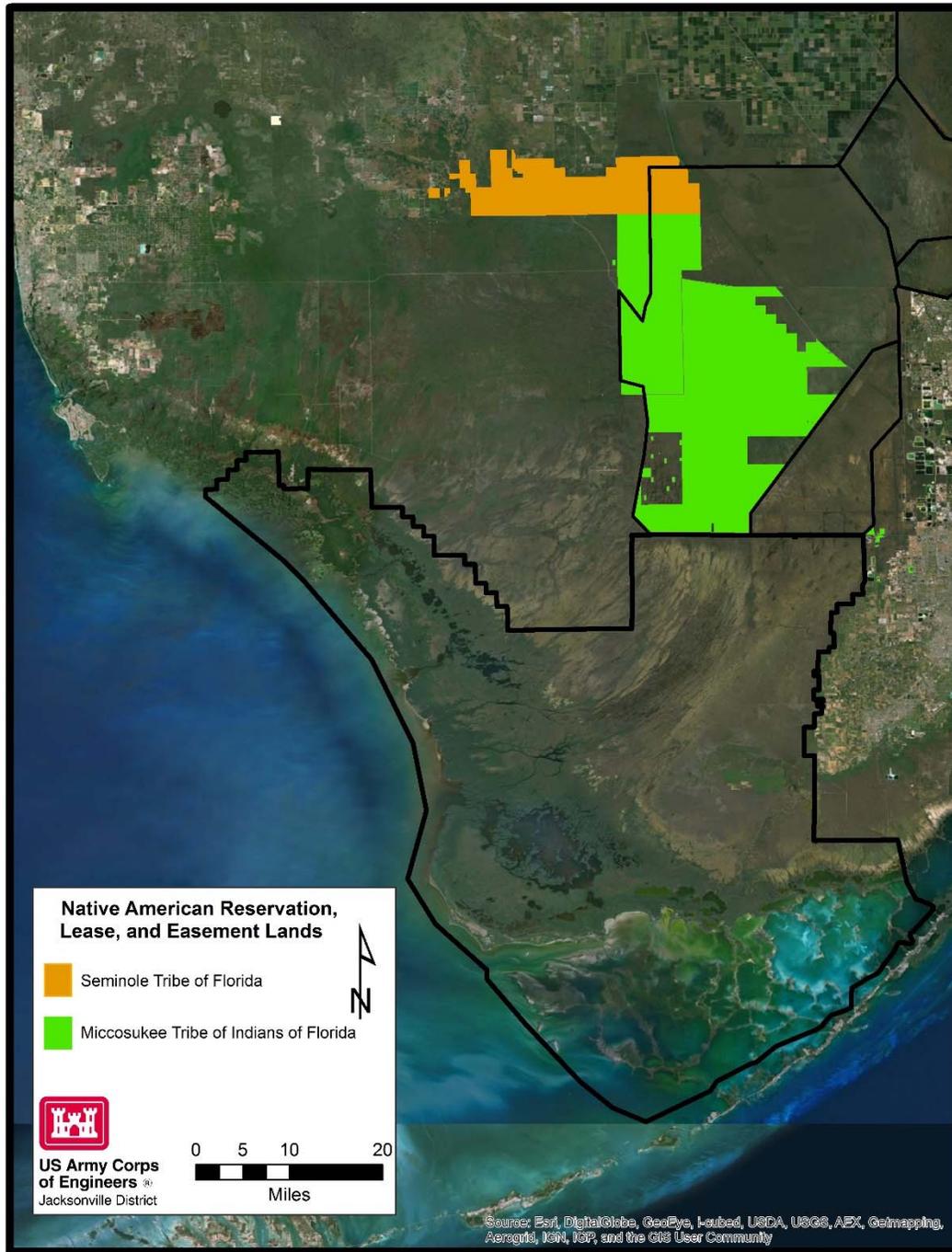
There are two federally recognized tribes (Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida) that are located within and adjacent to the project area (**Figure 3-4**). Both tribes maintain a strong connection to the project area through continued use and regard the indigenous populations of Florida as their ancestors. The project area includes a large segment of the Miccosukee Tribe's Alligator Alley Reservation which spans portions of WCA 3A, the Tamiami Trail Reservation Area which consists of three parcels of land used for commercial services, and the Miccosukee Reserved Area which is the center of the Miccosukee Indian population. In addition, both tribes have leases and easements within WCA 3A and have historically recognized rights within ENP that stems from the Native Americans who lived within the ENP boundary prior to the parks creation.

The Miccosukee Tribe of Indians of Florida and Seminole Tribe of Florida have a long history of living within the project area. Both tribes moved into the region during the eighteenth and nineteenth centuries from Georgia and Alabama. Fleeing the U.S. Army and the forced relocation policies of the Indian Removal Act (1830), the Miccosukee and Seminoles were part of Native American groups commonly referred to as Seminoles; however, there are references to some of the groups involved in the conflict as Mikasuki, which supports the subsequent separation of the two groups (Weisman 1999). Many of these groups fled into the swamp areas of south Florida and made their homes within the Everglades and other remote areas of region. The coming of the Civil War led to the abandonment of the removal efforts and the various Native American groups were largely left alone until the late nineteenth century. In 1928 the Tamiami Trail opened, cutting

through the Everglades and bringing along with it tourists and explorers into the region, and, for the first time, bringing complete access for the various tribes to participate in the larger economy that was growing in south Florida.

As early as 1894, the Federal governmental and later the State of Florida started to acquire lands within the Big Cypress area. However, initial attempts to relocate tribal members to these areas failed as there were simply no incentives to abandon traditionally occupied areas in favor of the new lands (Weisman 1999). “The Indian New Deal changed that, and for the first time, services, programs, and land were brought together...at Big Cypress” (Weisman 1999:125). In the 1930s, the Federal Government started to bring services to the various Seminole groups. Some of the groups relocated and started to receive Federal aid, while some groups resisted government intrusion into their lives and remained in various traditional areas that now included sites along Tamiami Trail (Weisman 1999). Throughout the next two decades the Federal Government instituted various aid programs to assist the Native American groups living within the reservations until the early 1950s. In the early 1950s, the Federal Government’s policies radically changed, as it was felt that native groups should now join “mainstream society” and that Federal aid should come to an end (Weisman 1999:131). Being faced with a reduction in support and possible termination of recognition as a group by the government, various Native American groups on these reservations began to organize and form their own tribal governments to assist in the protection of their interests. In 1957, the Seminole Tribe of Florida received Federal recognition. However, wishing to remain separate and to maintain their own identity, many of the groups along the Tamiami Trail refused to join and instead held out to form their own government that would be federally recognized in 1962 as the Miccosukee Tribes of Indians of Florida.

Today most of the Miccosukee Tribe lives within the confines of the reservation located along the forty mile bend of Tamiami Trail while many of the Seminoles Tribal members live on various reservations properties with the largest being those of Big Cypress, Hollywood, and Brighton Reservations. In addition to the Federal reservation, the Miccosukee Tribe has also established a perpetual lease to large portions of the WCA 3A area while the Seminole Tribe has a lease within the northwestern portion of WCA 3A. The members of both groups maintain a traditional life style that is intricately connected to the Everglades. Traditional practices of hunting, fishing and general living are still maintained, along with modern entrepreneurship through various enterprises such as cattle ranching and with tourism related businesses along Tamiami Trail. Today, both tribes have vibrant, thriving cultures based within the Everglades region. These practices continue to tie the Tribes to the Everglades in such a way that careful consideration of effects is warranted.



**FIGURE 3-4. MAP OUTLINING THE LOCATION OF TRIBAL RESERVATION, LEASED AND EASEMENT LANDS**

### 3.14 CULTURAL RESOURCES

Within the larger region that includes ENP and WCA3, there are numerous recorded archeological sites indicative of Native American habitation. Prior to European contact, the Everglades were a heavily populated area. Native Americans traveled via canoe and on foot through the saw grass

and inhabited many of the tree islands that dot the landscape. The earliest known habitation sites date to the Early Archaic period (7,500 BC) when the Everglades were much drier. However, within the larger area of south Florida, evidence of Paleo-Indian (12,000 to 7,500 BC) habitation has also been recorded (i.e. Warm Mineral Springs (8SO18) and Little Salt Spring (8SO79) (Griffin 1988). Some of the Early Archaic habitation sites have only recently been rediscovered as the result of managed drainage programs in south Florida. As the climate warmed and sea level rose, many Native Americans abandoned the lowest of the tree islands as they became submerged. This process continued through what is known as the Middle Archaic, until climate conditions stabilized around 300 BC at the start of the Late Archaic. Today many sites from both the Early and Middle Archaic periods are no longer submerged and may have more modern Native American use.

After the Archaic period, the region became incorporated into what is known as the Glades region and remained inhabited until European contact, when Old World diseases and slave raiding heavily reduced the Native populations during the late 1,500s-1,700s. Many of the tree islands through this portion of the Everglades have sites associated to the Glades period. This period has been broken down into successive stages starting with Glades I, which dates from 500 BC to 750 AD, Glades Period II dating from 750 to 1,200 AD, and Glades Period III dating from 1,200 AD to European contact in the 1,500s. Typical habitation sites through this region are commonly referred to as middens, which are the accumulation of daily life activities on these tree islands. Material remains can stretch from the surface to well over one meter below the surface on certain islands. Native American burials can also be found among these habitation sites.

After European contact, Native American populations in the region continuously declined and remained at low levels until Miccosukee and Seminole tribal groups moved into the area while fleeing the U.S. Army and U.S. Governments' forced relocation program. Many sites associated with both the Miccosukee and Seminole tribes are known to exist throughout the region.

The broad region of ENP and WCA3 has been subject to numerous cultural resource investigations and have been found to contain a wide variety of cultural resources that vary within their significance. There are archaeological resources associated with some of the earliest habitation sequences within south Florida and relatively recent sites directly associated with modern Native American tribes who were removed from ENP shortly after its creation.

Approximately 277 cultural resources, as identified in the Florida Master Site File, are located within the project area. Of these resources, 121 sites are located within WCA 3 north of the L-29 canal. The majority of these sites were identified based on a 1987 aerial analysis of the WCA and the presence of archaeological materials was not ground-truthed (Taylor 1987). Only approximately 25 sites within WCA 3 have been identified based on a physical archaeological investigation. A total of 8 cultural resources within WCA3 have been listed or determined eligible for listing in the National Register of Historic Places (NRHP), including Mack's Fish Camp Historical District.

The southern portion of the project area, south of the L-29 Canal, is located entirely within ENP. ENP has been subject to many archaeological investigations that have identified approximately 156 cultural resources within the project area. Of these resources, 40 have been listed or

determined eligible for listing in the NRHP, including two archaeological districts. A small portion of Ten Thousand Islands Archaeological District is located on the western edge of the project area and the SRS Archaeological District is contained entirely within the project area. The SRS Archaeological District contains no less than 63 archaeological resources, 39 of which are contributing resources to the district (Schwandron 1996). Sites typically found within the SRS are described as earth middens; however, multi-occupation sites such as Tiger Hammock (8DA11) which is associated with Glades II and III and Seminole occupations have also been identified.

### 3.15 AIR QUALITY

Air monitoring reports are prepared annually by FDEP to inform the public of the air pollutant levels throughout the State of Florida. All areas within the state are designated with respect to each of the six pollutants (carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particle pollution (10 microns or less in diameter (PM<sub>10</sub>), and 2.5 microns or less in diameter (PM<sub>2.5</sub>), and sulfur dioxide (SO<sub>2</sub>)) as attainment (*i.e.*, in compliance with the standards); non-attainment (*i.e.*, not in compliance with the standards); or unclassifiable (*i.e.*, insufficient data to classify). Attainment areas can be further classified as maintenance areas. Maintenance areas are areas previously classified as non-attainment which have successfully reduced air pollutant concentrations to below the standard. Southeast Florida including Miami-Dade County continues to be classified by the USEPA as an attainment/maintenance area for ozone. Florida remains designated as unclassifiable for PM<sub>10</sub>. Although sufficient data have been collected for attainment determinations, USEPA has not considered PM<sub>10</sub> for attainment determinations in Florida yet.

### 3.16 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES

Along the southern boundary of WCA 3A and WCA 3B there are levees and canals constructed in the 1950s and 1960s that limit vehicle access to the interior. Activity within the WCA is generally limited to fishing, hunting, and birding though there may be some illegal dumping of solid wastes along the perimeter. No soil testing for residual contaminants has been conducted within the WCA 3A and WCA 3B as part of this project since the lands have no history of prior agricultural or industrial use that would cause such contamination.

A search of FDEP petroleum spill and storage sites database done in October of 2014 identified six petroleum storage sites and one spill site along Tamiami Trail between S-333 and S-356. Petroleum storage at Everglades Safari site was closed in 2005; however, a petroleum spill at this site is listed as ongoing as of October 2014. Petroleum storage facilities operated by the SFWMD are located at the S-333 and S-356 structures.

A search of FDEP's databases of contamination sites and petroleum storage facilities identified five spill sites and 15 petroleum storage facilities located along the canal or within the 8.5 SMA. The SFWMD is listed as the permit holder for storage facilities at the S-357 and S-331 pump stations. The spill at the SFWMD's S-331 pump station has been completed. A spill at the General Portland, Inc. facility west of the canal is listed as ongoing. Three non-petroleum cleanup sites are located along the L-31N Canal. Two of the sites are located along the L-31N Canal buffer trail and one is located within the 8.5 SMA.

### 3.17 NOISE

Noise levels are associated with surrounding land use. Within the major natural areas of south Florida, external sources of noise are limited and of low occurrence. Existing sources of noise are limited to vehicular traffic travelling on roads adjacent to and cutting through the project area. Other sources of noise which may occur within these natural areas include air boats, off road vehicles, swamp buggies, motor boats, and occasional air traffic. Sources of noise in rural, areas include noise associated with agricultural production such as the processing and transportation of agricultural produce. Within the rural municipalities and urban areas, sound levels would be expected to be of greater intensity, frequency, and duration. Noise associated with transportation arteries, such as highways, railroads, primary and secondary roads, airports, operations at commercial and industrial facilities etc., inherent in areas of higher population would be significant and probably override those sounds associated with natural emissions.

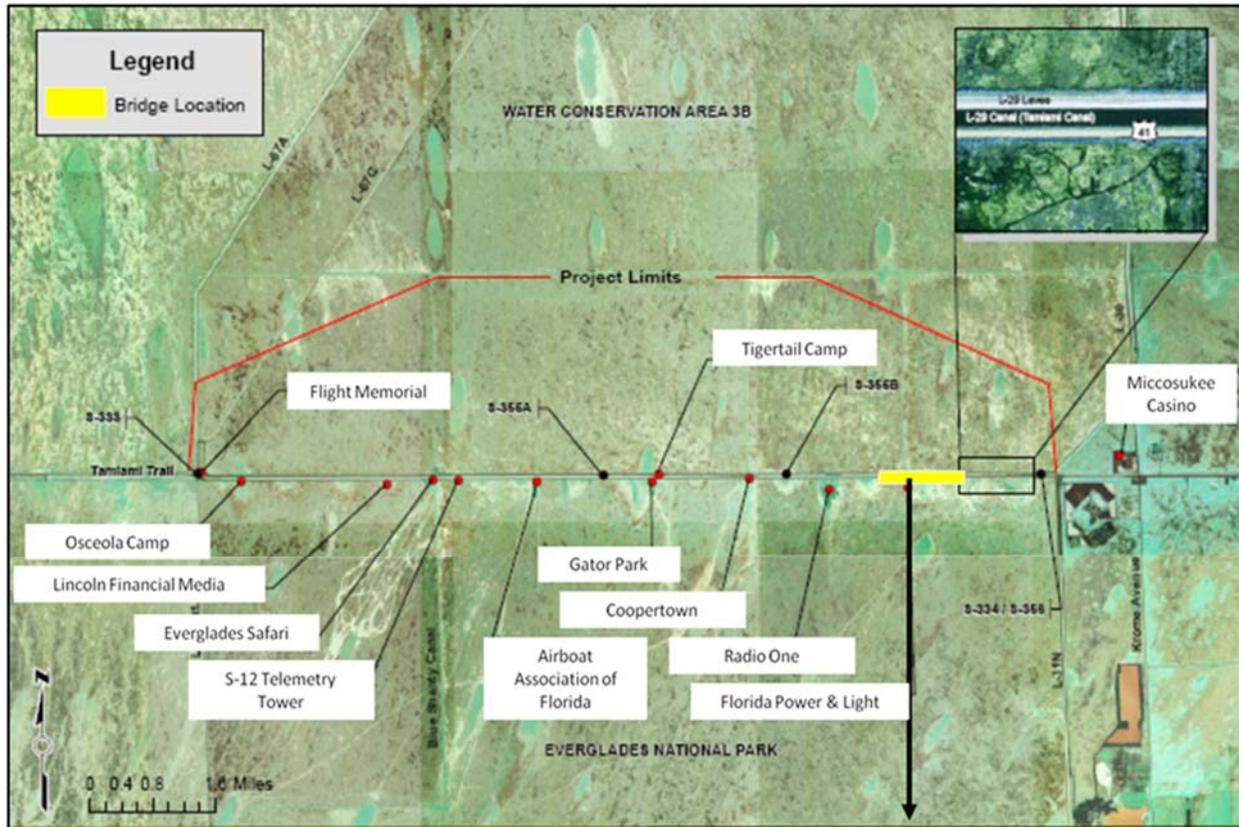
### 3.18 AESTHETICS

The visual characteristics of south Florida can be described according to the three dominant land use categories: natural areas, agricultural lands, and urban areas. The natural areas consist of a variety of upland and wetland ecosystems, including lakes, ponds, vast expanses of marsh and wet prairie, with varying vegetative components. Uplands are often dominated by pine, although other sub-tropical and tropical hardwoods do occur. Overall, the land is extremely flat, with few natural topographic features such as hills or other undulations. Much of the visible topographic features within the natural areas are man-made. Generally, urban development is concentrated along the LEC. Development is typically immediately adjacent to or nearby protected natural areas.

### 3.19 SOCIOECONOMICS

Florida's economy is characterized by strong wholesale and retail trade, government, and service sectors. The economy of south Florida is based on services, agriculture, and tourism. The three counties that comprise the LEC are heavily populated. Much of the land within the area potentially impacted is within ENP and is publicly owned. However, a number of privately owned parcels still exist within this region. Several private entities currently own real estate within the project area adjacent to Tamiami Trail and within ENP (**Figure 3-5**). Property owners include three airboat concessionaires, the Airboat Association of Florida, Florida Power and Light, Lincoln Financial Media, and Salem Communications. Efforts by the Corps and DOI/ENP to acquire real estate interests are ongoing and also include channel and flowage easements for the Tamiami Trail Bridge and roadway. All required real estate, channel and flowage easements to allow raising of the L-29 Canal maximum operating limit above 7.5 feet, NGVD are expected to be acquired by October of 2017. The Corps will acquire flowage easements for the Airboat Association by December 2016.

The Miccosukee Indian Tribe of Florida currently lease two areas adjacent to Tamiami Trail (Osceola and Tigertail Camps) and have several businesses adjacent to Tamiami Trail west of S-333 including the Miccosukee Indian Village, Restaurant and airboat concessionaires.



**FIGURE 3-5. LOCATIONS OF PRIVATELY OWNED REAL ESTATE WITHIN THE PROJECT AREA**

The 8.5 SMA is located in the East Everglades, approximately 20 miles southwest of Miami, ten miles north of Homestead, and 6.6 miles south of U.S. Highway 41. It is bounded on the east by L-31N, on the west by NESRS (part of ENP), on the north by SW 104th Street, and on the south by SW 168th (Richmond Drive) Street. The 8.5 SMA presently encompasses approximately ten square miles of mixed use development. Approximately 42 percent (2,699 acres) of the 8.5 SMA is classified as wetlands, one percent (65 acres) as uplands, and 57 percent (3,646 acres) as residential and/or agricultural lands based on a Wetland Rapid Assessment Procedure (WRAP) performed for the 2000 GRR/FSEIS (USACE 2000). The eastern region of the 8.5 SMA is dedicated to agricultural and residential land uses (USACE 2012a).

### 3.20 AGRICULTURE

The Miami-Dade County agricultural industry is unique in both the types of commodities produced and the method of cultivation. The majority of agricultural activities in the county are located south of Tamiami Trail and east of ENP. A variety of vegetables, fruits, and ornamentals are grown within this region and include many tropical and subtropical crops, which are grown year-round. The most active growing season is between September and May. Because of the wet and dry rainy seasons in the area, planting times are controlled by the elevation of ground water. Soils in these agricultural areas are rocky soils and marl soils.

### **3.21 RECREATION**

There are many recreational opportunities throughout south Florida. WCA 3 has been used for recreational activities including hunting, fishing, frogging, boating, camping, and off-road vehicle use. Private camps are located throughout WCA 3. A variety of other nature-based recreational opportunities are also provided to the public within WCA 3. These activities include wildlife viewing and nature photography. Hiking and bicycling are also permitted on existing levees within the project area where appropriate. There are also several recreation areas at locations along the boundary of WCA 3. Similar recreational opportunities are provided in ENP.

## **4.0 ENVIRONMENTAL EFFECTS**

### **4.1 GENERAL ENVIRONMENTAL EFFECTS**

The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects. Environmental effects are expected to be spatially limited and small in magnitude given the short duration of the Proposed Action. Potential environmental effects of current water management operations (No Action Alternative) are thoroughly evaluated within the Increment 1 EA and FONSI (dated May 27, 2015) (USACE 2015) and are hereby incorporated by reference. Please refer to the Increment 1 EA and FONSI for additional information.

### **4.2 CLIMATE**

Implementation of the No Action Alternative and Action Alternatives would not result in significant impacts to the climate of south Florida.

The impact of current or projected effects of climate change on C&SF operations is difficult to estimate given the uncertainty in predictions of future weather patterns and water management strategies. Higher average ambient temperatures are expected to result in increased evapotranspiration. Rainfall events are expected to become less frequent but larger in magnitude. As a peat soil ecosystem, increasing drought would reduce available water to keep the soils wet, resulting in higher peat oxidation and loss of soil elevations in freshwater wetlands. Regional surface water storage systems (*i.e.* canals) will most likely experience more rapid water loss when compared to current water levels, ultimately impacting availability of water supplies. Sea level change is one of the more certain consequences of climate change, and because it affects the land/ocean interface, it has the potential for environmental impacts on coastal areas. Future rates of sea level change are expected to result in significant impacts on coastal canals and communities, with loss of flood protection and increased saltwater intrusion being the primary effects. Additionally, coastal ecosystems and estuaries are expected to be adversely affected and require additional deliveries of freshwater to maintain desirable salinity patterns and healthy ecosystems.

The influence of climate change is not anticipated to alter the severity or nature of impacts resulting from the Proposed Action. The overarching project need for Increment 1.1 and 1.2, consistent with the Increment 1 EA and FONSI (dated May 27, 2015) is to increase the availability of S-333 for water deliveries from WCA 3A to ENP through NESRS for the benefit of natural resources. Potential benefits (*i.e.* improved hydroperiods) expected from implementation of the Proposed Action may be reduced as a result of climate change and the potential for increased evapotranspiration; however general environmental effects of the Proposed Action are expected to be of short duration as Increment 1.1 and 1.2 will extend until implementation of Increment 2 (March of 2018).

### **4.3 GEOLOGY AND SOILS**

#### **4.3.1 ALTERNATIVE A: NO ACTION ALTERNATIVE**

The No Action Alternative does not include construction of permanent structures or structural modifications to existing C&SF Project features. Geologic impacts resulting from removal of surface cover (*i.e.* vegetation and soil), or removal of caprock from blasting and/or removal of limestone would not occur under continued implementation of Increment 1 (USACE 2015).

As described in the EA and FONSI (dated May 27, 2015) during Increment 1, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations prior to the initiation of the field test (USACE 2015). The duration at which water stages within the L-29 Canal approach 7.5 feet, NGVD is expected to be greater under Increment 1 relative to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Improved hydroperiods within NESRS has the potential to reduce soil oxidation, and promote peat accretion. A potential decrease in drying event severity relative to the 2012 Water Control Plan (USACE 2012c), has the potential for reduced fire incidence within NESRS; however the frequency of muck fires are primarily controlled by weather patterns within the area.

#### **4.3.2 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Implementation of Alternative D would result in similar effects as discussed under the No Action Alternative and Alternative E within WCA 3 and ENP. Alternative D may have a temporary minor beneficial effect on geology and soils. Since Alternative D maintains the L-29 Canal stage slightly higher than the No Action Alternative and Alternative E; Alternative D would likely show a slightly higher beneficial effect on geology and soils within ENP. Alternative D is expected to have a beneficial effects on geology and soils within ENP due to improvements in hydroperiods.

Potential affects to geology and soils within WCA 3A as a result of implementation of early closures of the WCA 3A control structures beyond their current restrictions is not expected to result in significant impacts to the geology and soils of WCA 3A. Implementation of Alternative D does not alter the duration of dry downs which often results in increased oxidation, subsidence and peat fires.

#### **4.3.3 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Implementation of Alternative E would result in similar effects as discussed under the No Action Alternative within WCA 3 and ENP. Alternative E may have a temporary minor beneficial effect on geology and soils. Alternative E is expected to have a beneficial effects on geology and soils within ENP due to improvements in hydroperiods.

## **4.4 STUDY AREA LAND USE**

Implementation of the No Action Alternative and Action Alternatives would not result in significant impacts to study area land use.

## 4.5 HYDROLOGY

### 4.5.1 ALTERNATIVE A: NO ACTION ALTERNATIVE

#### 4.5.1.1 WCA 3A AND ENP SHARK RIVER SLOUGH

Continued implementation of Increment 1 is expected to result in improvements to NESRS (USACE 2015). Based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Increment 1 is anticipated to provide the following hydrologic effects within WCA 3A and NESRS relative to the 2012 Water Control Plan:

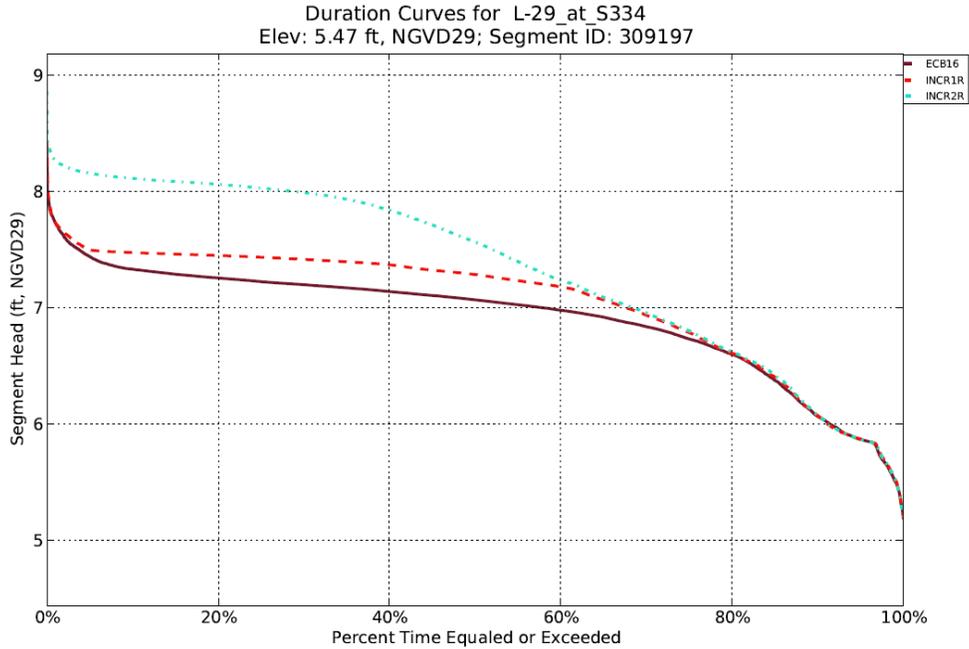
- Increase the number of days with WCA 3A unconstrained discharges to NESRS by up to 1176 days (up to 64% increase);
- Increase the frequency and duration of L-29 Canal stages approaching the maximum operating limit of 7.5 feet, NGVD (IOP/ERTP stage exceeds 7.3 feet, NGVD ~29 % of the 2002-2014 assessment period);
- No increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions;
- Reduced seepage losses from ENP to the SDCS due to reduced use of Column 2 operational criteria for the SDCS Canals during the period from November through June (including the dry season months of November through May)

Reference Section 4.5 of the Increment 1 EA and FONSI (dated May 27, 2015) for the assumptions used for the Increment 1 analysis.

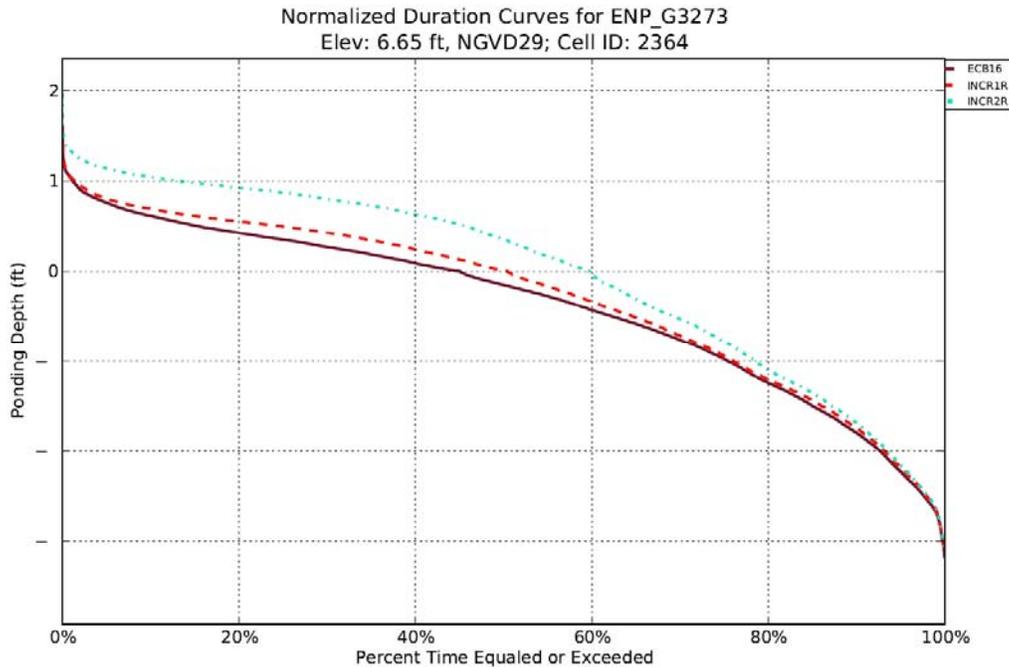
Updated hydrologic modeling was completed in support of the ESA consultation which resulted in the USFWS 2016 July ERTTP BO. Since ESA consultation was conducted based on the current approved 2012 Water Control Plan and since the Corps was operating under Increment 1 when the modeling was completed, both base conditions were referenced during the ESA consultation. A base condition model was also prepared with Increment 2 placeholder operations, which included raising the L-29 Canal stage maximum operating limit up to 8.5 feet, NGVD, given recognition that Increment 2 operations are expected to be implemented during the time period covered by the 2016 ERTTP BO. Hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) but the base condition models developed for the ESA consultation are consistent with the hydrologic effects for Increment 1 as summarized in the 2015 EA and previously within this section. The RSM-GL simulation period of record includes 1965 through 2005. Stage duration curves within the L-29 Canal (**Figure 4-1**) and at the G-3273 monitoring gauge (**Figure 4-2**), which are generated from a ranked sequence of daily simulated water stages across the period of record, indicate an average annual stage increase of approximately 0.25 feet and 0.1-0.2 feet, respectively, with Increment 1 for hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages. The stage duration curve for the 3A-28 monitoring gauge in southern WCA 3A (**Figure 4-3**) indicates no significant change to WCA 3A water stages across all hydrologic conditions with Increment 1, including no increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions. A comparison of the average annual hydroperiod for the 1965-2005 period (**Figure 4-4**) indicates that Increment 1 would increase hydroperiods by 15 to 60 days along the eastern perimeter of NESRS and increase hydroperiods by 15 to 30 days within Western SRS, downstream of S-12D. Hydroperiods within the CSSS-A habitat in Western

SRS indicate a minor hydroperiod reduction (less than 5 days) within northern CSSS-A areas and a minor hydroperiod increase (less than 5 days) within southern CSSS-A areas.

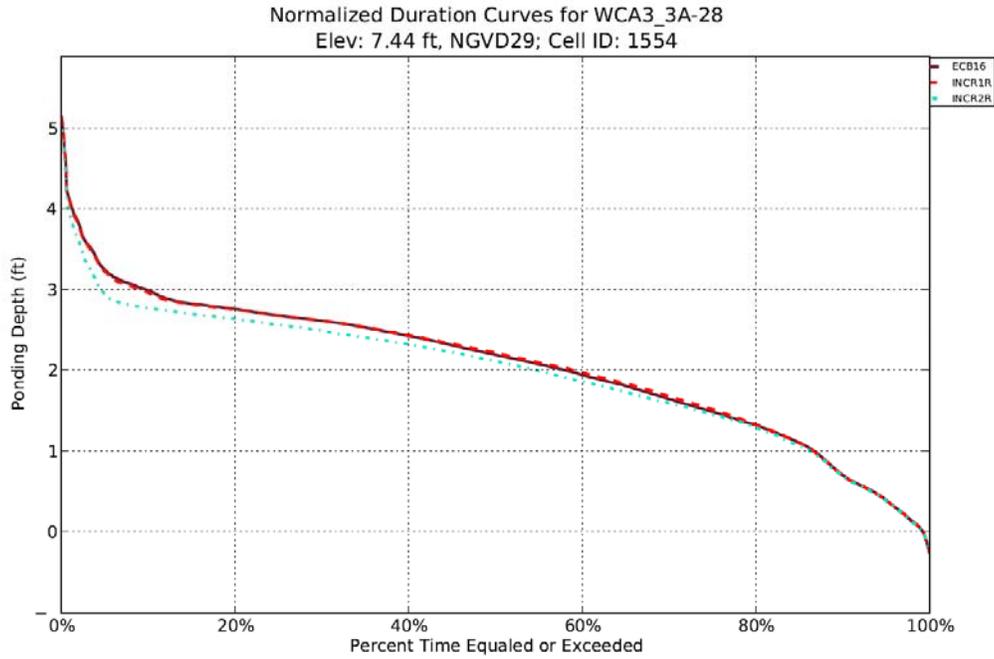
Consistent with the 2012 Water Control Plan, the DOI will continue to sandbag or otherwise block the culverts under Tram Road by February 1 if necessary. The effect of blocking the Tram Road culverts would be to prevent westward flow of water from S-12C into the western marl prairies and CSSS-A. In addition, to further prevent westward flow of water from the borrow canal associated with the old Tamiami Trail road, the DOI may elect to purchase, install, monitor and maintain a removable stopper in this borrow canal between S-12C and S-12B, at the junction with the Shark Valley Tram Road; the environmental effects were previously evaluated by ENP, and this assessment was incorporated within the 2011 ERTF FEIS (Appendix I) at the request of the DOI. Authority to purchase, install, monitor and maintain this feature resides with the DOI. Due to potential effects on the WCA 3A discharge capacity (most notably during high water conditions) and concerns previously indicated by the Miccosukee Tribe, this action will be closely coordinated by DOI with the Corps. If DOI decides that they want to install this structure (in coordination with the Corps), it would be compatible with the currently proposed operational plan. However, the Corps would have authority to remove this stopper in the event that increased conveyance capacity is required to remove water from WCA3A due to high water concerns.



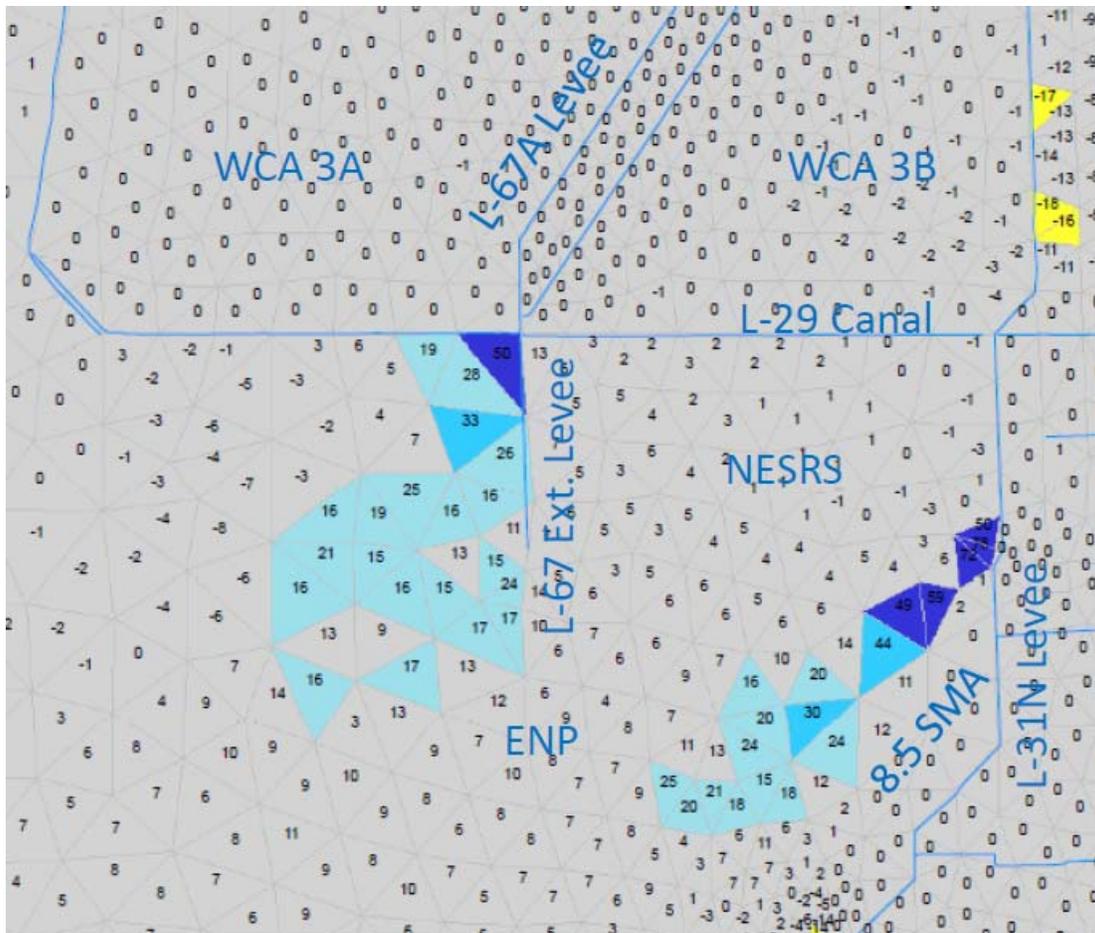
**FIGURE 4-1. SIMULATED L-29 CANAL STAGE DURATION CURVE INCLUDING COMPARISON BETWEEN ERTP (ECB16), INCREMENT 1, AND PLACEHOLDER FOR INCREMENT 2**



**FIGURE 4-2. SIMULATED G-3273 STAGE DURATION CURVE, INCLUDING COMPARISON BETWEEN ERTP (ECB16), INCREMENT 1, AND PLACEHOLDER FOR INCREMENT 2**



**FIGURE 4-3. SIMULATED WCA 3A 3A-28 STAGE DURATION CURVE, INCLUDING COMAPRISON BETWEEN ERTP (ECB16), INCREMENT 1, AND PLACEHOLDER FOR INCREMENT 2**



**FIGURE 4-4. AVERAGE ANNUAL HYDROPERIOD DIFFERENCE MAP, COMPARING INCREMENT 1 AND ERTP (ECB16). POSITIVE VALUES INDICATE AN INCREASED HYDROPERIOD (DAYS) WITHIN INCREMENT 1**

#### **4.5.1.2 ENP EASTERN PANHANDLE AND MANATEE BAY/BARNES SOUND**

Continued implemental of Increment 1 is expected to result in potential impacts to ENP eastern Panhandle and Manatee Bay and Barnes Sound as a result of expected increases in frequency and duration of low volume discharges from S-197 relative to the 2012 Water Control Plan (USACE 2015). Because the S-199 and S-200 pump stations (constructed and operated by the SFWMD) redirect up to 450 cfs of potential S-177 discharges prior to S-177 HW stage rising to trigger opening of the S-177 structure gates (operating range of 3.6-4.2 feet, NGVD) or the S-197 culverts (tiered gate opening for S-177 headwater range above 4.1-4.3 feet, NGVD), continued operation of the C-111 Spreader Canal Western Project will reduce the frequency, duration, and magnitude of S-197 discharges to downstream Manatee Bay and Barnes Sound. Based on assessment of the historical hydrological conditions experienced during the two-year C-111 Spreader Canal Western Project operational period (July 2012 through June 2014), Increment 1 is anticipated to provide the following hydrologic effects within the ENP Eastern Panhandle and Manatee Bay/Barnes Sound relative to the 2012 Water Control Plan:

- Increase the frequency and duration of S-197 discharges to Manatee Bay/Barnes Sound from 14 days to a range of 39-82 days (S-197 discharge durations are slightly higher than Alternative E since releases start at a lower discharge rate of 100 cfs);
- Increase the total volume of S-197 discharges from 18 thousand acre-feet (kAF) to a range between 20-30 kAF (increase of 11-67%), with a comparable reduction to overland flow across the ENP Eastern Panhandle to eastern Florida Bay;
- Reduce the frequency and duration of S-197 discharges from 200-800 cfs (Level 1 S-197 gate opening range);
- No significant change to the timing of S-197 operations (July to October / wet season);
- Increase flood control releases from S-18C and S-197 to mitigate for increased risk to flood protection for South Dade areas, which may be conditionally affected by a combination of the following water management factors during the Increment 1 field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

Updated hydrologic modeling was completed in support of the ESA consultation which resulted in the USFWS July 2016 ERTP BO. Hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) and hydrologic effects for Increment 1 as modeled are reduced compared to the effects which were identified in the 2015 EA and summarized previously within this section. The historical data assessed for the previous EA was very limited due to the necessity to consider only the period coincident with SFWMD operation of the C-111 Spreader Canal Project's S-199 and S-200 pump stations, and these results may not be representative of longer-term trends. Based on the hydrologic modeling results over the 1965-2005 period, Increment 1 would result in a slight decrease in average annual release volume from S-197 compared to ERTP (16,640 acre-feet for Increment 1, compared to 17,130 acre-feet for ERTP) and no significant change to the timing of S-197 operations (typically during the wet season from July to October); the minor reduction at S-197 is principally due to a predicted significant reduction in the average annual regulatory releases from WCA 3A to the SDCS (S-334 regulatory discharges of 48,870 acre-feet for Increment 1, compared to 8,500 acre-feet for ERTP). Compared to ERTP, average annual simulated S-331 discharges are reduced by 26,720 acre-feet; combined S-332B/S-332C/S-332D average annual simulated discharges are reduced by 31,860 acre-feet; and S-176 average annual simulated discharges are reduced by 560 acre-feet. The Increment 1 EA hydrologic effects evaluation previously stated that the net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the Increment 1 field test and associated hydrologic monitoring. The ongoing Increment 1 monitoring plans for surface water hydrology and ground water hydrology will continue to provide data to analyze the net effects within the L-31N Basin (south of S-331 and north of S-176) and the C-111 Basin (south of S-176) from changes to the basin inflows from the S-331 pump station and increased seepage to the L-31N Canal south of S-331, including the

capability of the S-332B/C/D pump stations and the C-111 South Dade SDA to manage potential additional flows into the L-31N Canal under certain operational conditions.

#### **4.5.1.3 ENP TAYLOR SLOUGH**

Increment 1 did not incorporate changes to the operation of S-332D, and no operational criteria were specified for the S-328 gated culvert (**Figure 3-1**). Hydrologic performance within ENP Taylor Slough will remain unchanged from the existing conditions described in **Section 3.5.4**.

#### **4.5.2 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

##### **4.5.2.1 WCA 3A AND ENP SHARK RIVER SLOUGH**

The hydrologic effects within WCA 3A, NESRS, and Western SRS will be similar to the hydrologic effects for Alternative E, which are detailed in **Section 4.5.3.1**. Alternative D is expected to provide a greater magnitude of increase relative to Alternative E. Alternative D has the ability to raise the L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon compliance with all of the following conditions: (1) acquisition of required real estate interest and any associated improvements for the private ownership along Tamiami Trail including receipt of Tamiami Trail Bridge and roadway channel and flowage easements from the FDOT; (2) completion of the C-358 Canal (Richmond Drive Seepage Collection Canal) and installation of S-357N (C-358 control structure); (3) completion of sufficient portions of Contracts 8 (construction of the C-111 NDA L-315 western levee and the L-357W Extension Levee between Richmond Drive and the 8.5 SMA Detention Cell) and completion of the Contract 8A berms inside the 8.5 SMA Detention Cell. Based on the current construction schedule for the C-111 South Dade Contract 8, the earliest opportunity to consider incremental raising of the L-29 Canal above 7.5 feet, NGVD is expected between July and October 2017, coincident with the 2017 wet season.

Increment 2 of the MWD Project is dependent on construction completion and operation of the C-111 South Dade NDA. Prior to operation of the C-111 South Dade NDA, the capability of the S-357 pump station to maintain flood mitigation requirements for the 8.5 SMA is expected to limit the ability to raise the L-29 Canal stage above 7.5 feet, NGVD, most notably during the wet season months of June to October when approximately two-thirds of the average annual rainfall total is accumulated across South Florida. During the dry season months, limited water availability within WCA 3A may also limit the opportunity to raise the L-29 Canal stage above 7.5 feet, NGVD. Prior to operation of the NDA, the opportunity to raise the L-29 Canal above 7.5 feet, NGVD may be restricted to late in the wet season (September-October) and during the early dry season (November-December) when excess water storage remains within WCA 3A to facilitate continued regulatory releases in accordance with the Rainfall Plan and the limited operations at S-357 and operations a S-331 are effective to maintain 8.5 SMA flood mitigation requirements.

Consistent with the objectives and constraints of Increment 1, the Corps will continue to pursue opportunities to increase deliveries from WCA 3A to NESRS to the maximum extent practicable during Increment 1.1 and 1.2.

#### **4.5.2.2 ENP EASTERN PANHANDLE AND MANATEE BAY/BARNES SOUND**

The hydrologic effects within the ENP Eastern Panhandle and Manatee Bay/Barned Sound will be similar to the hydrologic effects for Alternative E, which are detailed in Section 4.5.3.2. Increased available storage within NESRS may result in increased seepage into the SDCS, prior to completion of the C-111 South Dade NDA, but will also reduce the frequency and duration for regulatory releases from WCA 3A to the SDCS. The net effect of reduced WCA 3A regulatory discharges to the SDCS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and associated hydrologic monitoring, as identified prior to Increment 1.

#### **4.5.2.3 ENP TAYLOR SLOUGH**

The hydrologic effects within the Eastern Panhandle of ENP and Manatee Bay/Barned Sound will be similar to the hydrologic effects for Alternative E, which are detailed in Section 4.5.3.3.

### **4.5.3 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

#### **4.5.3.1 WCA 3A AND ENP NORTHEAST SHARK RIVER SLOUGH**

The operational criteria governing inflows to NESRS for Alternative E are the same as for the No Action Alternative, the continued implementation of Increment 1. Based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Alternative E is anticipated to provide the same hydrologic effects within NESRS as the No Action Alternative:

- Increase the number of days with WCA 3A unconstrained discharges to NESRS by up to 1176 days (up to 64% increase);
- Increase the frequency and duration of L-29 Canal stages approaching the maximum operating limit of 7.5 feet, NGVD (IOP/ERTP stage exceeds 7.3 feet, NGVD ~29 % of the 2002-2014 assessment period);
- No increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions;
- Reduced seepage losses from ENP to the SDCS due to reduced use of Column 2 operational criteria for the SDCS Canals during the period from November through June (including the dry season months of November through May).

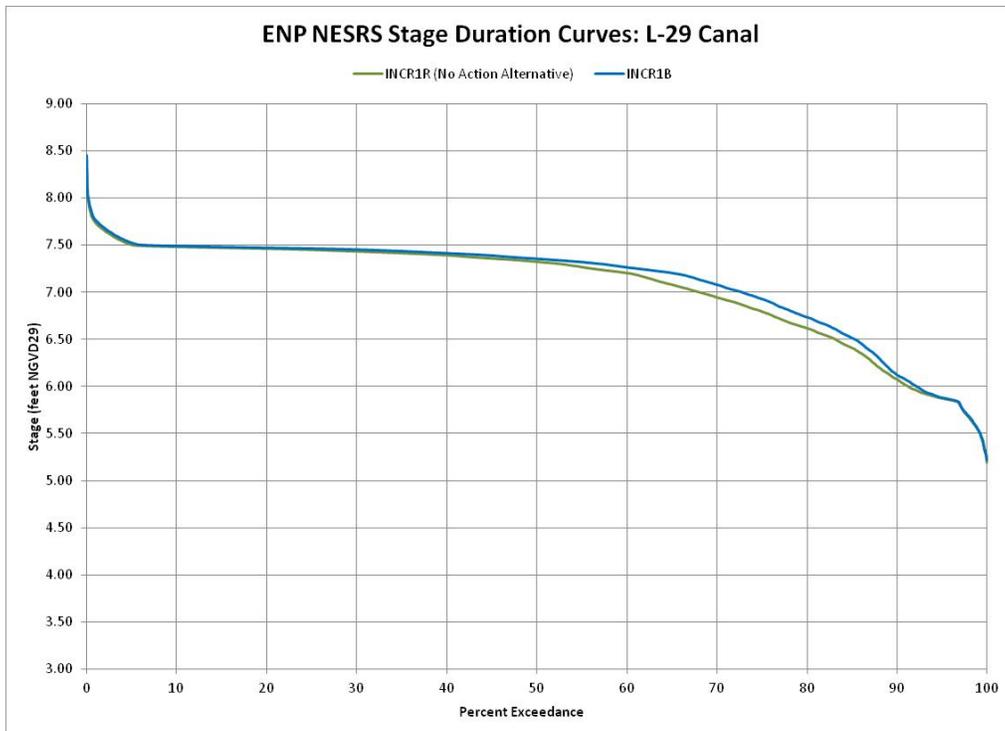
Updated hydrologic modeling was completed in support of the ESA consultation which resulted in the USFWS July 2016 ERTTP BO (Section 2.1.1). After review of the model runs, the Corps and Service have determined that a hybrid of the R1B and R2H runs would provide the benefits included in the RPA. This hybrid includes the S-12A/B closure regime of R1B (October 1 through July 15) and the South Dade Operations of R2H. Therefore the USFWS analysis of effects of the RPA was based on the effects of R1B for the western subpopulation and WCA 3A and the effects

of R2H on the eastern subpopulations. Given that the operations of the system will be changing as each MWD incremental field test is completed, the USFWS assessment also considered INCR1B (R1B with Increment 1 operational assumptions) and INCR1H (R2H with Increment 1 operational assumptions) to evaluate effects of the RPA if implemented concurrent with MWD Increment 1. Similarly, the INCR1B modeling simulation can provide additional information regarding the long-term hydrologic effects for Alternative E. Although the L-29 Canal maximum operating limit (7.5 feet, NGVD) and the removal of the G-3273 constraint are the same, the stage duration curves for the L-29 Canal, the stage duration curve at G-3273, and the hydroperiod changes within NESRS for Alternative E demonstrate a minor improvement to NESRS compared to the No Action Alternative (Increment 1):

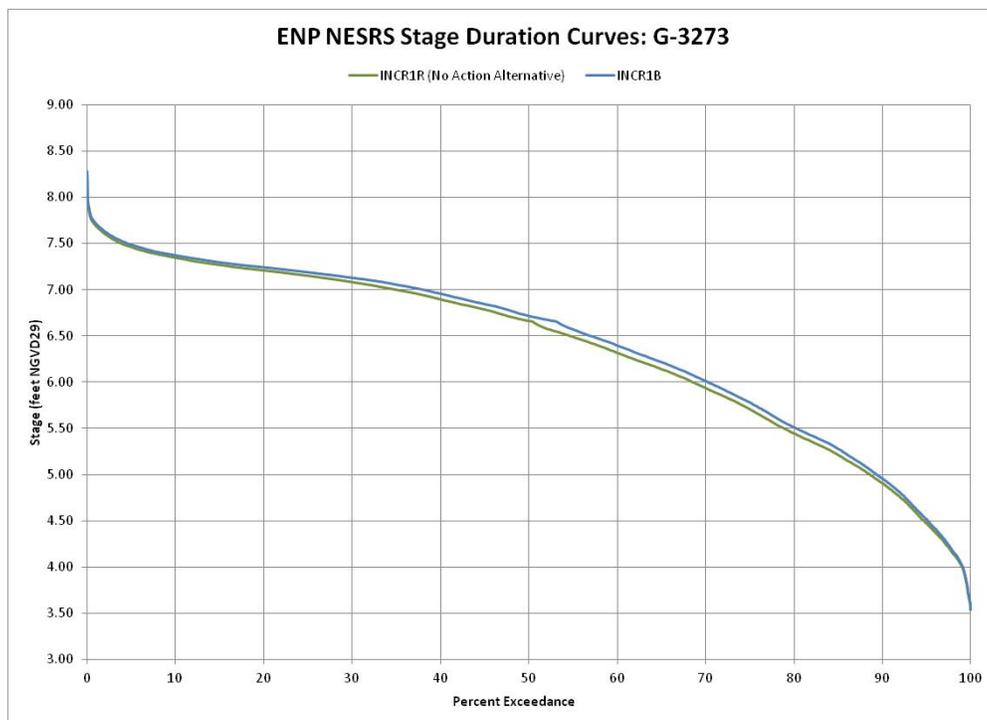
- Average annual stage increase of approximately 0.1-0.2 feet for the L-29 Canal for hydrologic conditions ranging from normal to moderate dry, with no significant change to the frequency of wet, extreme wet or extreme dry stages (**Figure 4-5**);
- Average annual stage increase of approximately 0.1 feet for G-3273 for hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages (**Figure 4-6**);
- Increase hydroperiods by 5 to 15 days along the eastern perimeter of NESRS;
- Decrease hydroperiods by 10 to 15 days within Western SRS, downstream of S-12D;
- Decrease hydroperiods within northern CSSS-A habitat in Western SRS by 5 to 30 days and decrease hydroperiods within southern CSSS-A habitat in Western SRS by 0 to 5 days.

The hydroperiod difference map shown in **Figure 4-8** is relative to the same ERTTP base condition (ECB16) that was used to generate the hydroperiod difference map included in the discussion of the No Action Alternative in **Section 4.5.1.1 (Figure 4-4)**. The ERTTP base condition, which documents expected performance of the current approved Water Control Plan, was the common base condition used for the ESA consultation. The hydroperiod changes between the No Action Alternative and Alternative E are generated from comparison of **Figure 4-4** and **Figure 4-8**.

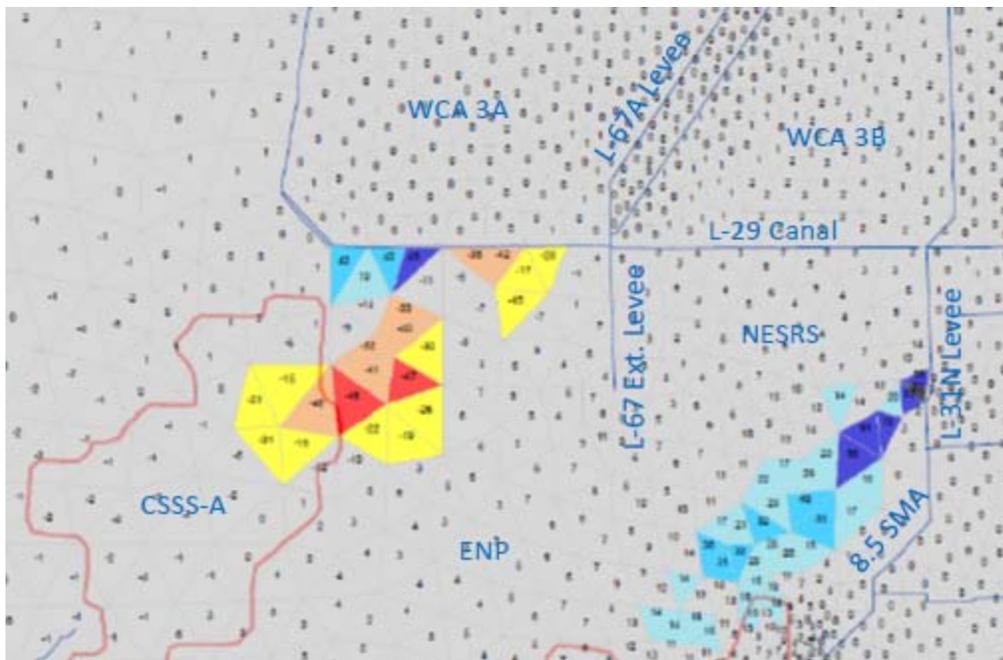
Consistent with the 2012 Water Control Plan, the DOI will continue to sandbag or otherwise block the culverts under Tram Road by February 1 if necessary. The effect of blocking the Tram Road culverts would be to prevent westward flow of water from S-12C into the western marl prairies and CSSS-A. In addition, to further prevent westward flow of water from the borrow canal associated with the old Tamiami Trail road, the DOI may elect to purchase, install, monitor and maintain a removable stopper in this borrow canal between S-12C and S-12B, at the junction with the Shark Valley Tram Road; the environmental effects were previously evaluated by ENP, and this assessment was incorporated within the 2011 ERTTP FEIS (Appendix I) at the request of the DOI. Authority to purchase, install, monitor and maintain this feature resides with the DOI. Due to potential effects on the WCA 3A discharge capacity (most notably during high water conditions) and concerns previously indicated by the Miccosukee Tribe, this action will be closely coordinated by DOI with the Corps. If DOI decides that they want to install this structure (in coordination with the Corps), it would be compatible with the currently proposed operational plan. However, the Corps would have authority to remove this stopper in the event that increased conveyance capacity is required to remove water from WCA3A due to high water concerns.



**FIGURE 4-5. SIMULATED L-29 CANAL STAGE DURATION CURVES, INCLUDING COMPARISON BETWEEN NO ACTION ALTERNATIVE (INCR1R) AND ALTERNATIVE E (INCR1B)**



**FIGURE 4-6. G-3273 STAGE DURATION CURVES, INCLUDING COMPARISON BETWEEN NO ACTION ALTERNATIVE (INCR1R) AND ALTERNATIVE E (INCR1B)**



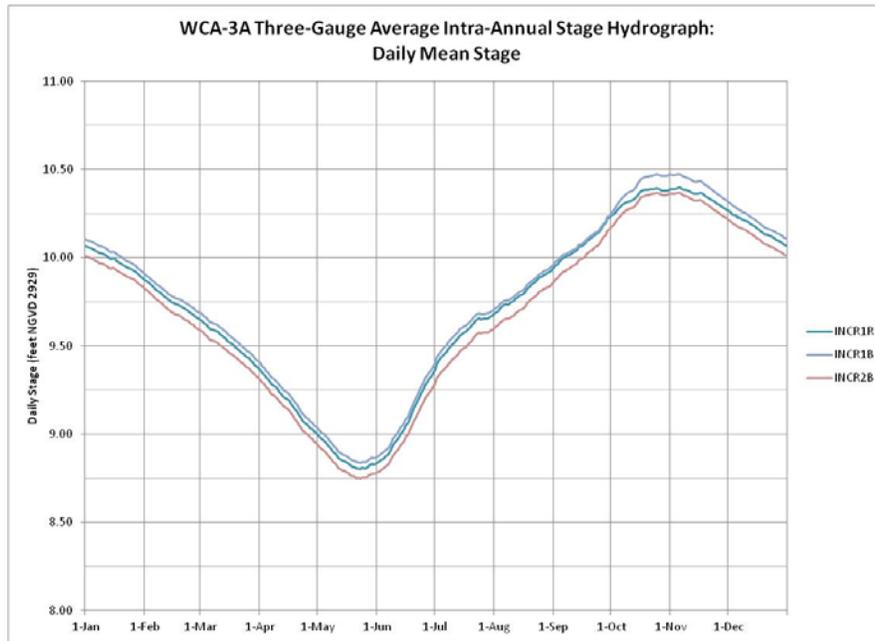
**FIGURE 4-7. AVERAGE ANNUAL HYDROPERIOD DIFFERENCE MAP, COMPARING ALTERNATIVE E AND ERTP (ECB16). POSITIVE VALUES INDICATE AN INCREASED HYDROPERIOD WITHIN ALTERNATIVE E**

The hydrologic effects for WCA 3A and western SRS are affected by the modified closure regime for the S-12A and S-12B structures. The modeling conducted for ESA consultation (R1B and INCR1B) each assumed that these structures, in addition to the S-343A, S-343B, and S-344, would be closed between 01 October and 14 July during all years. However, the 2016 ERTP BO RPA and the operational strategy for Increment 1.1 and 1.2 both recognize that the modified closure period for S-12A and S-12B would be accompanied by a high-water strategy for October and November that was developed by the Corps to limit the duration of WCA 3A high water stages during the late wet season. The INCR1R simulation corresponds to the No Action Alternative for this EA; the INCR1B simulation corresponds to Alternative E within this EA, without the WCA 3A high water strategy to limit additional S-12A and/or S-12B closures during late wet season high water conditions; the INCR2B simulation corresponds to Alternative E within this EA, without the WCA 3A high water strategy and with the L-29 Canal maximum operating limit raised up to 8.5 feet, NGVD (surrogate placeholder for MWD Increment 2). The model assumptions for the INCR2B simulation assumed no seasonal constraints on water levels up to 8.5 feet, NGVD within the L-29 Canal. However, the USFWS recognizes within the 2016 ERTP BO a particular concern regarding “the apparent negative effects on CSSS-E, the second largest subpopulation, which appear to be as a result of increased restoration flows in SRS, including implementation of Increment 2 as demonstrated by model run INCR2H. These effects will need to be monitored closely and adaptive operations, potentially including seasonal limitations on water levels in the L-29 Canal, may need to be considered during the transitional period covered by this consultation.” Inclusion of additional seasonal water level constraints within NESRS will result in less water being delivered from WCA 3A to the L-29 Canal and NESRS under a future MWD Increment 2, with a minor increase in stage levels within WCA 3A, compared to the Increment 2 surrogate simulations used in support of the ERTP ESA consultations (INCR2B and INCR2H).

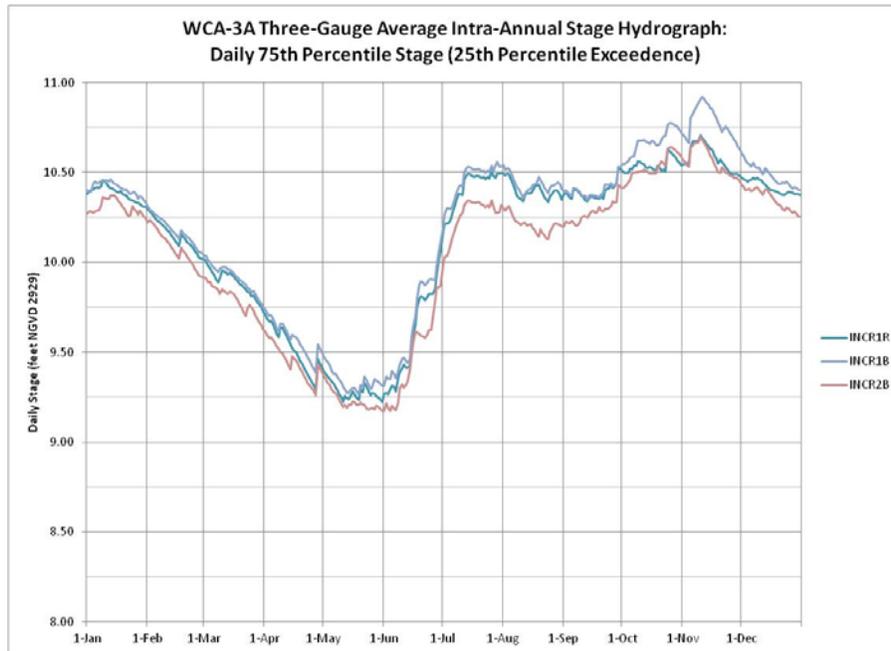
Intra-annual stage hydrographs were generated for the average daily stage (average of each of the 41 years within the simulation period of record, for each day of the year; refer to **Figure 4-8** and the 75<sup>th</sup> percentile daily stage (25 percent of daily stages are higher, and 75 percent are lower, for each day of the year; refer to **Figure 4-9**) to characterize the effects of Alternative E on WCA 3A water levels:

- Average water levels across WCA 3A are increased by 0.0-0.1 feet during the months of January through September and December;
- Average water levels across WCA 3A are increased by 0.20-0.25 feet during the months of October and November, without consideration of the WCA 3A high water criteria that are included in Alternative E;
- During moderate wet hydrologic conditions (characterized by the 75<sup>th</sup> percentile intra-annual stage hydrographs), water levels across WCA 3A are increased by 0.0-0.1 feet during the months of January through September;
- During moderate wet hydrologic conditions, water levels across WCA 3A are increased by 0.2-0.5 feet during the months of October through December, without consideration of the WCA 3A high water criteria that are included in Alternative E;
- Implementation of MWD Increment 2, which is currently anticipated prior to the first year for the extended S-12A and S-12B closure periods (01 October 2017), has the potential to reduce WCA 3A average water levels by 0.1-0.2 feet compared to the No Action Alternative (including during October and November);
- Implementation of MWD Increment 2, has the potential to reduce WCA 3A water levels during moderate wet hydrologic conditions by 0.0-0.5 feet compared to the No Action Alternative (including no increase during October and November).

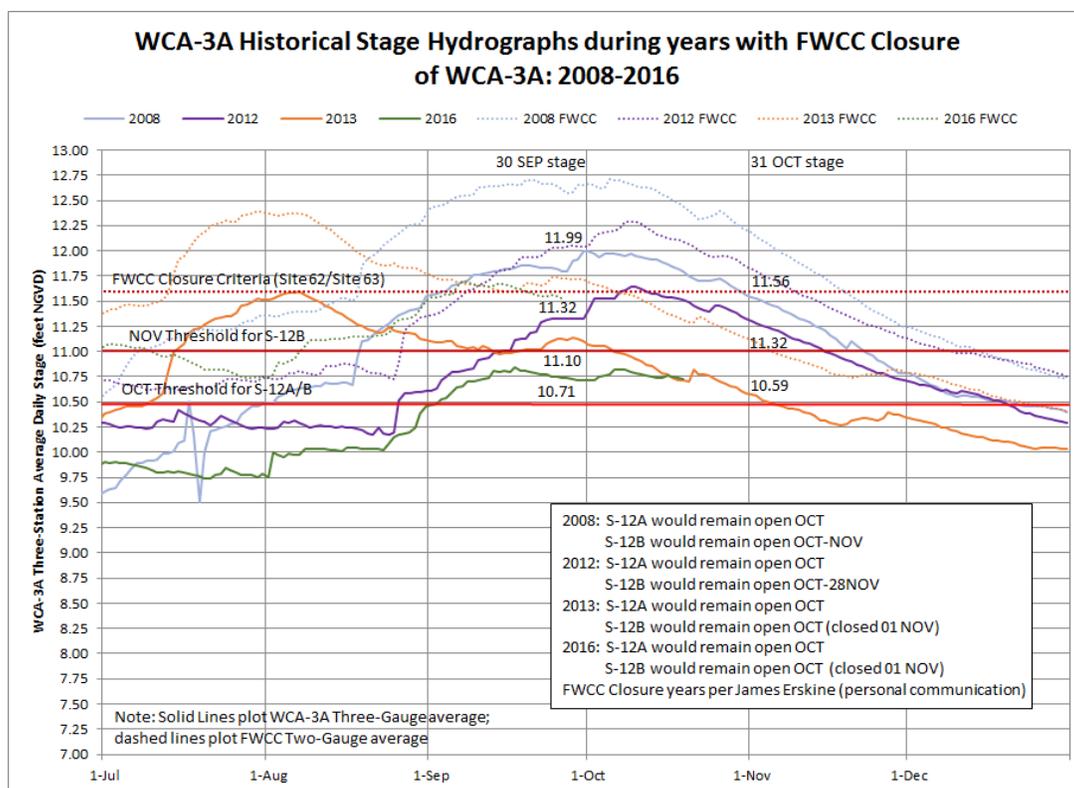
The WCA 3A high water criteria, which are included in Alternative E, were also assessed to determine whether the high water criteria would have kept the S-12A and/or S-12B structures open during historical years where the Florida Fish and Wildlife Conservation Commission (FWC) previously closed recreational access to WCA 3A due to the two-gauge average stage at the 3A-2 and 3A-3 monitoring gauges. A summary graphic showing historical observed stages for the WCA 3A three-gauge average (3A-3, 3A-4, and 3A-28) and the FWC two-gauge average during recent years with FWC closures of WCA 3A (2008, 2012, 2013, and 2016) is shown in **Figure 4-10**. Based on the WCA 3A high water criteria included in Increment 1.1 and 1.2 **Appendix A (Part 1)** for S-12A and S-12B operations, the WCA 3A high water criteria would have resulted in S-12A remaining open during October in 2008, 2012, 2013 and 2016; the WCA 3A high water criteria would have resulted in S-12B remaining open during October and November in 2008 and 2012, and remaining open through the end of October in 2013 and 2016.



**FIGURE 4-8. WCA 3A THREE-GAUGE AVERAGE INTRA-ANNUAL STAGE HYDROGRAPH FOR AVERAGE HYDROLOGIC CONDITIONS, INCLUDING COMPARISON BETWEEN NO ACTION ALTERNATIVE (INCR1R), ALTERNATIVE E (INCR1B), AND PLACEHOLDER FOR ALTERNATIVE E WITH MWD INCREMENT 2 (INCR2B)**



**FIGURE 4-9. WCA 3A THREE GAUGE AVERAGE INTRA-ANNUAL STAGE HYDROGRAPH FOR MODERATE WET HYDROLOGIC CONDITIONS, INCLUDING COMPARISON BETWEEN NO ACTION ALTERNATIVE (INCR1R), ALTERNATIVE E (INCR1B) AND PLACEHOLDER FOR ALTERNATIVE E WITH MWD INCREMENT 2 (INCR2B)**



**FIGURE 4-10. WCA 3A HISTORICAL HYDROGRAPHS DURING RECENT YEARS WITH FWC CLOSURE OF WCA 3A FROM 2008-2016**

#### 4.5.3.2 ENP EASTERN PANHANDLE AND MANATEE BAY/BARNES SOUND

The hydrologic modeling conducted for ESA consultation included evaluation of operational changes along the SDCS Canals between S-334/S-335 and S-197 intended to provide increased flexibility to achieve the RPA hydroperiod and nesting targets for the eastern CSSS Subpopulations (CSSS-B through CSSS-F). Specifically, the modeling assumptions in the R2H/INCR1H/INCR2H simulations included early dry season operations (August-December) informed by the SFWMD South Dade Investigation Workshops to promote more flow toward ENP and extend hydroperiods, use of later dry season opportunities during the CSSS nesting season (February-May) to move water toward Biscayne National Park and away from CSSS subpopulations, and efforts to avoid water level excursions above ground surface from 1 March to 15 July due using modified operational criteria for the SDCS infrastructure (S-332B, S-332C, S-332D, S-200, and S-199). Because of the compressed duration of the RSM-GL modeling effort and the USFWS emphasis on evaluation of changes to operation of the S-12s to promote improved hydrologic conditions for CSSS-A, the ESA consultation period afforded only a single modeled alternative with the modified SDCS operational criteria.

The modeling assumptions for the SDCS operational changes within the simulations for R2H, INCR1H, and INCR2H were based on insights provided from the SFWMD South Dade Investigation Workshop, but these operations were not able to be optimized for the CSSS RPA performance metrics for the eastern subpopulations due to time constraints. While notable improvements are demonstrated for the CSSS western subpopulation resultant from the RPA

conditional extended closure periods for S-12A and S-12B, the CSSS performance metrics for the eastern subpopulations demonstrate variability between a moderate performance reductions to very slight performance improvements (refer to **Section 2.1.1**). Since the 2016 ERTTP BO and RPA provides performance targets for the CSSS eastern subpopulations and does not prescribe specific SDCS operational changes, the Corps advocated to provide sufficient flexibility within the Increment 1.1 and 1.2 operational strategy to allow the Corps and SFWMD water managers to achieve the intended performance from the RPA proposed operational condition.

The Increment 1 EA and FONSI (dated May 27, 2015) specified that S-197 would be operated consistent with the 2012 Water Control Plan during condition 1 and condition 2, when the WCA 3A stage was below the Increment 1 Action Line. Under condition 3 and condition 4, when the WCA 3A stage was above the Increment 1 Action Line, additional criteria were used which prescribe small discharges expected to assist in moderating high stages within the C-111 Canal through use of S-197 discharges. The additional S-197 gate openings ranged from 50 to 200 cfs based upon S-178 TW stage between 2.5-2.9 feet, NGVD (note: these stages correspond to approximately 2.4-2.8 feet, NGVD at the S-18C headwater) when the S-18C gates are out of the water. These additional S-197 operating criteria did not change the existing S-197 operating criteria for opening prescribed by the conditions at S-177 headwater. These additional S-197 operating criteria reduced how much S-197 is opened for the first level (normally S-197 opened to one third of S-197 capacity, or 800 cfs) while leaving the criteria for the second level (two thirds open) and third level (full open) unchanged. The reduction in discharge for level one openings of S-197 was from approximately 800 cfs to 500 cfs.

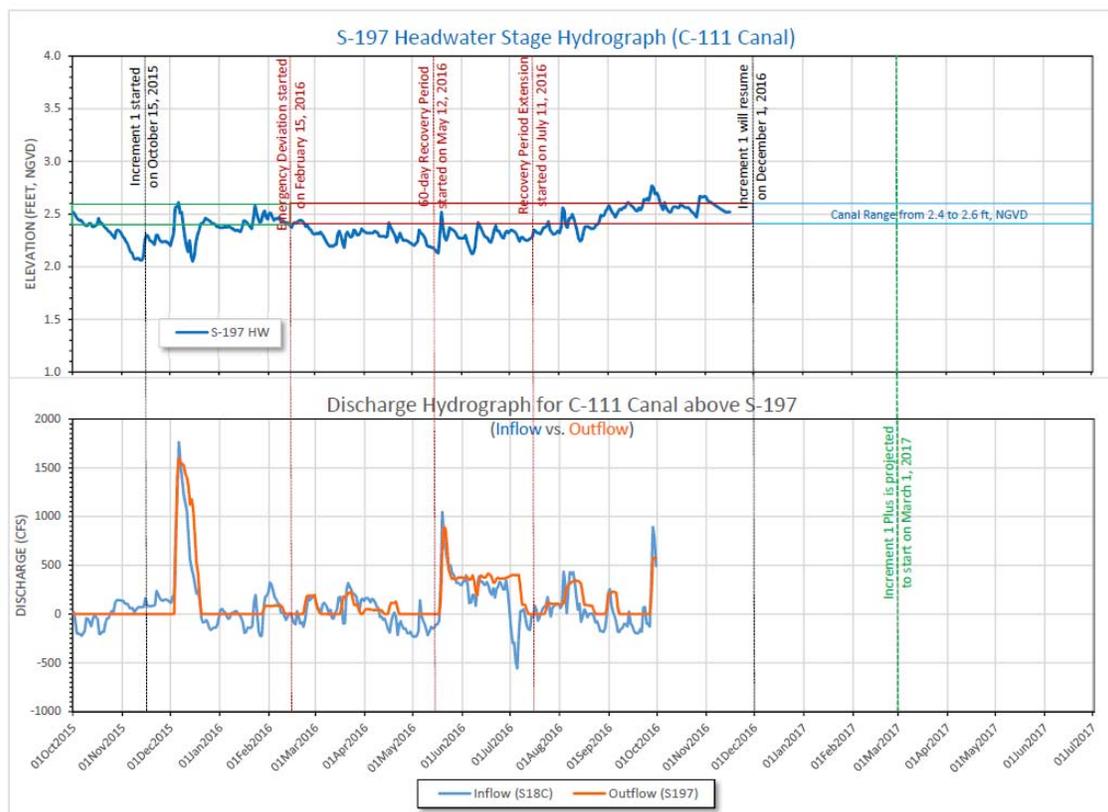
Not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects have been constructed. Therefore, Increment 1.1 retains from Increment 1, a requirement for additional water management operating criteria for features of the SDCS including S-197 (in addition to the S-197 operating criteria defined in the 2012 Water Control Plan). Operating criteria for S 197 will be reassessed once construction of the C-111 South Dade Project NDA is constructed and operable, and/or upon completion of the Increment 1.1 field test. Additional S-197 operating criteria are included under all conditions where implementation of increase stages within NESRS may result in increased seepage inflows into the SDCS, including condition 2 (when G-3273 stage is above 6.6 feet, NGVD) and conditions 3 and 4 (when the WCA 3A stage was above the Increment 1 Action Line. Based on the modeling analysis conducted in support of the 2016 ERTTP BO and RPA, the Increment 1.1 and 1.2 operational strategy has been expanded to include the following new operations for S-176 and S-177: (1) from 01 August through 14 February (outside of CSSS nesting period), S-176 may release up to an additional 200 cfs discharge to Manatee Bay while maintaining C-111 Canal stages at S-176 HW above 4.2 feet, NGVD; and (2) during the period from 01 August through 14 February, S-177 may release up to an additional 200 cfs water supply delivery to Manatee Bay while maintaining C-111 Canal stages at S-177 HW above 3.2 feet, NGVD (normal operating range is from 3.6-4.2 feet, NGVD). In order to limit the necessity for second level or third level S-197 gate openings, given recognition of these potential increased flows being transferred south from S-176 and S-177, the Increment 1.1 and 1.2 Operational strategy accommodates limited S-197 gate openings, which may range from 50 to 400 cfs, for conditions when the S-18C headwater stage is above the historical average for the month (refer to Table 2B/3B in **Appendix A (Part 1)**). The hydrologic modeling conducted for the ESA consultation does not account for the effects of the operational flexibility added to the

Increment 1.1 and 1.2 operational strategy to allow the Corps and SFWMD water managers to achieve the intended performance from the RPA proposed operational condition; however, the comparison between Increment 1 (simulation INCR1R) and the modified SDCS operations initially evaluated for the BO (INCR1H) does notably predict a moderate reduction in southward flows from S-176 (average annual discharge volume reduced from 51,000 acre-feet to 41,000 acre-feet) and a corresponding moderate reduction at S-197 (average annual discharge volume reduced from 16,600 acre-feet to 13,600 acre-feet, associated principally with increased operation of the S-332B/C/D pump stations (average annual discharge volume increased from 292,000 acre-feet to 339,000 acre-feet).

The frequency of opening S-197 will be highly dependent on: (1) conditions necessary upstream to facilitate completion of the C-111 South Dade construction needed prior to MWD Increment 2; and (2) operational modifications required to provide the necessary suitable hydrologic conditions for the eastern CSSS sub-populations. Compared to the No Action Alternative, based on qualitative assessment of the S-197 criteria described in the Increment 1.1 Operational strategy, Alternative E may result in the following hydrologic effects within the ENP Eastern Panhandle and Manatee Bay/Barnes Sound:

- Minor to moderate increase in the frequency and duration of low-volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound;
- No significant change to the timing of S-197 operations (July to October / wet season);
- Minor increase to flood control releases from S-18C and S-197 to mitigate for increased discharges from S-331 for 8.5 SMA flood mitigation;
- Minor increase to flood control releases from S-18C and S-197 to mitigate for increased operation of the S-332 D pump station and/or the C-111 South Dade SDA, to manage L-31N Canal stages and facilitate completion of the C-111 South Dade construction needed prior to MWD Increment 2.

Compared to the conditions observed during the 2016 Temporary Emergency Deviation and extended recovery period **Figure 4-11**, which included prolonged periods of low volume releases (less than 500 cfs) at S-197 during February-April 2016 and June-August 2016, the frequency and duration of low volume S-197 discharges to Manatee Bay/Barnes Sound is expected to be significantly reduced with the Increment 1.1 operations. Negative flows are observed at S-197 when the downstream tidal stage exceeds the S-197 headwater stage during gate openings.



**FIGURE 4-11. S-197 HEADWATER STAGE AND DISCHARGE HYDROGRAPH DURING THE FIRST YEAR FOLLOWING INITIATION OF MWD INCREMENT 1 (OCTOBER 2015-SEPTEMBER 2016)**

#### 4.5.3.3 ENP TAYLOR SLOUGH

The operational strategy for Increment 1.1 and 1.2 (**Appendix A (Part 1)**) incorporates changes to the operation of S-332D and prescribes operational criteria for the S-328 gated culvert (refer to map on **Figure 3-1**). A general indication of potential increased inflows to Taylor Slough is provided by comparison between Increment 1 (simulation INCR1R) and the modified SDCS operations initially evaluated and modeled for the 2016 ERTF BO (INCR1H), although the hydrologic modeling conducted for ESA consultation does not account for the effects of the operational flexibility added to the Increment 1.1 and 1.2 operational strategy to allow the Corps and SFWMD water managers to achieve the intended performance from the RPA proposed operational condition. The comparison indicates that increased operation of the S-332D pump stations may result in up to a 17 percent increases towards Taylor Slough (average annual discharge volume increased from 103,000 acre-feet to 121,000 acre-feet).

During development of the operational strategy for Increment 1.1 and 1.2, operational modifications to provide supplemental flows to Taylor Slough were suggested by the SFWMD to help facilitate the recovery of Florida Bay from the 2015 extreme hyper-salinity event. The SFWMD plan, presented at the July 14, 2016 SFWMD Governing Board, is expected to increase the flow of water directly into Taylor Slough in ENP, a major source of fresh water for the bay.

Components of this plan include, but are not limited to, sending additional water through the S-328 water control structure into the L-31 West Canal to reach Taylor Slough. The S-328 gated culvert, is located in the southwest corner of Cell 1 of the S-332D Detention Area and provides an ability to discharge up to 500 cfs from Cell 1 into the L-31W Canal to short-circuit the southern portion of the S-332D Detention Area if necessary to ensure water deliveries reach Taylor Slough. During initial stakeholder outreach efforts conducted by the SFWMD following release of the Florida Bay proposal, some stakeholder agencies expressed concerns regarding potential for the S-328 inflows to the L-31W Canal to by-pass the southern portion of the S-332D Detention Area flowpath (approximately 2.7 miles of the 4.5 miles flowpath is located south of S-328); concerns were expressed that the S-328 operation would potentially limit the opportunity of nutrient uptake by the wetland vegetation within the S-332D Detention Area, resulting in an increased nutrient load into Taylor Slough. Other stakeholders advocated for increased operation of S-328 as a means to reduce the potential for return seepage from the S-332D Detention Area to the C-111 Canal, upstream of the C-111 Spreader Canal project's Frog Pond Detention Area.

Given consideration of these conflicting viewpoints, the Corps is recommending inclusion of conditional operations for the S-328 gated culvert within the operational strategy for Increment 1.1 and 1.2 in order to collect additional information needed to inform whether S-328 operations warrant inclusion within Water Control Plan updates following completion of the Increment 1 field test and/or inclusion for additional testing during Increment 2. The S-328 may be used to increase deliveries to Taylor Slough up to 250 cfs (restricted to half of the structure design capacity) as measured at S-332D provided that an average water depth of at least six inches is maintained in Cell 1. Prior to initial operation of S-328, construction of the three L-31W Canal plugs proposed between S-328 and the L-31W gap must be completed. The L-31W Canal plugs were identified in the 2016 C-111 South Dade Contract 9 EA; these features may be constructed by the SFWMD. Monitoring will need to be conducted to characterize the water quality of these new discharges into the ENP to determine if the current compliance monitoring point (S-332D) needs to be shifted to or include the S-328 flows. Reference **Section 4.11.2**.

The Increment 1.1 and 1.2 operational strategy also includes provisions for supplemental flows to Taylor Slough to help facilitate the recovery of Florida Bay from the 2015 extreme Hyper-Salinity event. When conditions allow, the Increment 1.1 and 1.2 operational strategy includes flexibility to enable the distribution of flows along the L-31N Canal to be changed to move water away from the C-111 South Dade Contracts 8 and 8A construction area during the time period when this is likely to help facilitate continued construction progress for Contract 8 and expedite construction for Contract 8A. Some short-term loss of effectiveness of the hydraulic ridge is expected with the corresponding increase in use of the downstream facilities. To offset the potential for reduced flows to Taylor Slough, up to 250 cfs of supplemental flows to Taylor Slough may be supplied to S-332D (and/or the SFWMD proposed connection from S-200 to Taylor Slough) as long as WCA 3A is above its floor elevation of 7.5 feet, NGVD by 0.5 feet (8.0 feet, NGVD) in April and May and above 8.5 feet, NGVD (1.0 foot above the water supply floor) in all other months. During supplemental deliveries up to 250 cfs as measured at S-334 or S-337 to Taylor Slough, Florida Bay, and Manatee Bay, it is expected that except during relatively dry conditions with typical seasonal rainfall patterns S-356 will be used less in Increment 1.1 than expected in the previous Increment 1.

## 4.6 FLOOD RISK MANAGEMENT

### 4.6.1 ALTERNATIVE A: NO ACTION ALTERNATIVE

#### 4.6.1.1 WCA 3A High Water Conditions and SDCS Column 2 Operations

Continued implementation of Increment 1 is not expected to have a significant effect on WCA 3A as increases in WCA 3A peak stage and/or increases in the duration or frequency of WCA 3A high water conditions relative to the 2012 WCAs-ENP-SDCS Water Control Plan are not anticipated. As described in the Increment 1 EA and FONSI (dated May 27, 2015), significant effects to South-Dade County are not expected due to the significant reduction in WCA 3A regulatory releases to the SDCS and inclusion of increased flood control releases from S-18C and S-197 to mitigate for increased risk to flood protection for South Dade areas which may be conditionally affected by the field test (USACE 2015). Based on an assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2015), Increment 1 is anticipated to provide the following flood control effects within WCA 3A and the SDCS relative to the 2012 Water Control Plan:

- Increase the frequency and duration of L-29 Canal stages approaching the maximum operating limit of 7.5 feet, NGVD (IOP/ERTP stage exceeds 7.3 feet, NGVD ~29 % of the 2002-2014 assessment period);
- Reduce the total duration of WCA 3A regulatory releases to the SDCS by an estimated 832 days (81% reduction; frequency reduced from 23.5 % to 4.5 percent of the assessment period);
- Reduce the accumulated volume of WCA 3A regulatory releases to the SDCS by an estimated 85% (735 kAF under IOP/ERTP to 112 kAF);
- No increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions;
- Increased use of Column 2 operational criteria for the SDCS Canals during the wet season months of July through October, which provide increased canal storage for management of local basin runoff and potential increased seepage from NESRS;
- Limited increased structure discharges from the L-31N Canal to central Biscayne Bay when conveyance capacity is available within the C-102 Canal (S-194) and/or the C-103 Canal (S-196) during the wet season months of July through October, due to increased use of Column 2 operational criteria for the SDCS Canals (design capacity of the S-194 and S-196 gated culverts are each 200 cfs).

Reference Section 4.6 of the Increment 1 EA and FONSI (dated May 27, 2015) for the assumptions used for the Increment 1 analysis.

Updated hydrologic modeling was completed in support of the ESA consultation which resulted in the USFWS 2016 July ERTTP BO. Consistent with the WCA 3A flood risk management evaluation from the Increment 1 EA and FONSI, no net adverse effects are shown for WCA 3A high water conditions compared to conditions anticipated under the current ERTTP. The stage duration curve for the 3A-28 monitoring gauge in southern WCA 3A (**Figure 4-3**) indicates no significant change to WCA 3A water stages across all hydrologic conditions with Increment 1, including no increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions. For the purposes of this EA assessment, based on recognition of the

concerns previously raised by the Corps regarding WCA 3A high water stages experienced under IOP, the flood control function of WCA 3A will be assumed to be maintained if no net adverse effects are anticipated for WCA 3A high water conditions compared to conditions anticipated under the current E RTP.

#### 4.6.1.2 8.5 Square Mile Area

Since many of the MWD features have been built, including the seepage collection canals, pump station and protective levee around 8.5 SMA and the Tamiami Trail roadway modifications, the Increment 1 EA and FONSI (dated May 27, 2015) recognized there are more opportunities to begin relaxation of the G-3273 constraint and associated increased water deliveries from WCA 3A into NESRS. Interim water management operating criteria for the planned 8.5 SMA gated culvert S--357N were identified with Increment 1, which assumed completion of these features by April 2016 prior to the second year of the Increment 1 field test (the current expected schedule is February 2017).

The Increment 1 operational strategy did not include revisions to the 8.5 SMA operations for the C-357 Canal targets or the S-357 pump station, and these operations were continued as described in the 2012 Water Control Plan. Although initial operations under the Increment 1 field test during October-November 2016 did not identify specific concerns with the ability of the 8.5 SMA features to provide the authorized flood mitigation without availability of the C-111 South Dade NDA, it is noteworthy that the L-29 Canal remained constrained to 7.5 feet, NGVD and the G-3273 stage did not exceed 7.1 feet, NGVD during this period.

During the 2016 Temporary Emergency Deviation and the subsequent recovery transition period, L-29 Canal stages were raised up to approximately 8.3 feet, NGVD and the G-3273 stage remained above 7.1 feet, NGVD for nearly 4 months (maximum stage 7.6 feet, NGVD). In response to concerns expressed by residents within the Las Palmas community during the 2016 Temporary Emergency Deviation, the SFWMD constructed temporary measures including: the use of temporary pumps and an open channel connection between the C-358 Canal and the C-357 Canal prior to construction of S-357N to maintain flood mitigation requirements for the 8.5 SMA; temporary plugs in the drainage swales located north and south of Richmond Drive (SW 168th Street); a berm around the western end of the C-358 Canal; and temporary culverts in the southern levee of the 8.5 SMA Detention Cell (Reference **Section 1.3.5**). Based on the demonstrated ability of these measures to maintain flood mitigation requirements for the 8.5 SMA, the Corps completed construction of a temporary by-pass connection between the C-358 Canal and the C-357 Canal, upstream of the S-357 pump station, in July 2016 in order to maintain this level of service during construction of S-357N. Stated objectives of the Increment 1 field test include improving hydrological conditions in NESRS through the relaxation of the G-3273 stage criteria to increase water deliveries from WCA 3A to NESRS. Achievement of this objective is subject to constraints which include maintaining the authorized purposes of the MWD project and maintaining flood mitigation levels in 8.5 SMA. The Corps has extensively reviewed the 8.5 SMA performance during the 2016 Temporary Emergency Deviation and subsequent recovery period; as a result of this review, revised 8.5 SMA operations for the C-357 Canal targets or the S-357 pump station are included within the Increment 1.1 and 1.2 operational strategy (**Appendix A (Part 1)**).

#### **4.6.1.3 C-111 South Dade Construction**

The operational strategy for Increment 1 was developed between July 2014 and February 2015. When the FONSI for Increment 1 was approved in May 2015, the construction contracts for completion of the C-111 South Dade NDA had not yet been awarded and construction schedules were therefore not available; Contract 8 and Contract 8A were awarded in October 2015 and September 2016, respectively. Hence operational flexibility to facilitate the construction of the associated features of the C-111 South Dade Project was not included within the Increment 1 operational strategy. Furthermore, at the time, a typical wet season was anticipated for 2015, not the extended drought conditions which delayed the onset of Increment 1 until October 2015, which was then followed by a very strong El Niño during the 2015 to 2016 dry season in which WCA 3A experienced unseasonable high water levels.

Increment 2 of the MWD Project is dependent on construction completion and operation of the C-111 South Dade NDA. The El Niño hydrologic conditions during 2015 and the 2016 Temporary Emergency Deviation operations may have brought water to the C-111 South Dade construction project site, which includes the perimeter levees for the NDA, with elevated ground/surface water conditions experienced onsite during April-May 2016 (atypical of the South Florida dry season conditions). During July-August 2016, significant rainfall within the 8.5 SMA and South-Dade basin led to operation of the S-332B pump station and the S-357 pump station to provide flood protection to the South Dade Basin (east of the L-31N Canal) and required flood mitigation for the 8.5 SMA, potentially contributing to elevated ground/surface water levels in the project footprint.

#### **4.6.1.4 South-Dade County Flood Risk Management**

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra-annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Detention Area using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS.

The C-111 Spreader Canal Western Project will continue to be operated by SFWMD and provide flows to Taylor Slough. The SFWMD efforts to monitor the impacts of the project operation and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project area remain ongoing and inconclusive based on the limited period of monitoring data collected since June 2012. To mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test, low volume releases from S-197 are included as components of Alternative E. The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the C-111 Spreader Canal Western Project.

#### **4.6.1 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

##### **4.6.1.1 WCA 3A High Water Conditions and SDCS Column 2 Operations**

The effects on flood risk management within WCA 3A will be similar to the hydrologic effects for Alternative E, which are detailed in **Section 4.6.2.1**. Alternative D is expected to provide a greater magnitude of increase relative to Alternative E as Alternative D has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD contingent upon downstream constraints. Based on the current construction schedule for the C-111 South Dade Contract 8, the earliest opportunity to consider incremental raising of the L-29 Canal above 7.5 feet, NGVD is expected between July and October 2017, coincident with the 2017 wet season.

Consistent with the objectives and constraints of Increment, the Corps will continue to pursue opportunities to increase deliveries from WCA 3A to NESRS to the maximum extent practicable during Increment 1.1 and 1.2.

##### **4.6.1.2 8.5 Square Mile Area**

The hydrologic effects within the 8.5 SMA will be similar to the hydrologic effects for Alternative E, which are detailed in **Section 4.6.2.2**. Based on the stated constraints of the Increment 1 field test to maintain the authorized purposes of the MWD project, which includes the authorized flood mitigation requirements, water levels within the L-29 Canal and NESRS will not be raised above 7.5 feet, NGVD except under conditions that ensure adherence with the flood mitigation requirements for the 8.5 SMA.

##### **4.6.1.3 C-111 South Dade Construction**

The hydrologic effects within the C-111 South Dade construction footprint will be similar to the hydrologic effects for Alternative E, which are detailed in **Section 4.6.2.3**. Alternative D has the ability to raise the L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD, contingent upon compliance with all of the following conditions: (1) acquisition of required real estate interest and any associated improvements for the private ownership along Tamiami Trail including receipt of Tamiami Trail Bridge and roadway channel and flowage easements from the FDOT; (2) completion of the C-358 Canal (Richmond Drive Seepage Collection Canal) and installation of S-357N (C-358 control structure); and (3) completion of sufficient portions of Contracts 8 (construction of the C-111 NDA L-315 western levee and the L-357W Extension Levee between Richmond Drive and the 8.5 SMA Detention Cell) and completion of the Contract 8A berms inside the 8.5 SMA Detention Cell. Based on the current construction schedule for the C-111 South Dade Contract 8, the earliest opportunity to consider incremental raising of the L-29 Canal above 7.5 feet, NGVD is expected between July and October 2017, coincident with the 2017 wet season. Water levels within the L-29 Canal and NESRS will not be raised above 7.5 feet, NGVD prior to completion of sufficient portions of Contracts 8 (construction of the C-111 NDA L-315 western levee and the L-357W Extension Levee between Richmond Drive and the 8.5 SMA Detention Cell) and completion of the Contract 8A berms inside the 8.5 SMA Detention Cell.

#### 4.6.1.4 South-Dade County Flood Risk Management

The hydrologic effects within the C-111 South Dade basin will be similar to the hydrologic effects for Alternative E, which are detailed in **Section 4.6.2.4**.

#### 4.6.2 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A

##### 4.6.2.1 WCA 3A High Water Conditions and SDCS Column 2 Operations

Section 4.5.3.1 provides a detailed review of the hydrologic effects for WCA-3A resultant from the modified closure regime for the S-12A and S-12B structures. The modeling conducted for ESA consultation (R1B and INCR1B) each assumed that these structures, in addition to the S-343A, S-343B, and S-344, would be closed between 01 October and 14 July during all years. However, the 2016 ERTP BO RPA and the operational strategy for Increment 1.1 and 1.2 both recognize that the modified closure period for S-12A and S-12B would be accompanied by a high water strategy for October and November that was developed by the Corps to limit the duration of WCA 3A high water stages during the late wet season. Alternative E includes the high water strategy criteria developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages in excess of the 90th percentile of historical water stages (compared to the 2012 Water Control Plan associated with the expanded closure periods). The 90th percentile water level varies seasonally and reaches a maximum of 11.5 feet, NGVD during the month of October. Levee safety concerns and the risk of overtopping to the perimeter levees are exacerbated with higher water levels in WCA 3A and are most vulnerable during the later parts of the wet season (July, August, September and early October), which coincides with the height of the hurricane season. Therefore, a conditions based scenario that varies the opening and closing dates of the structures depending on measured conditions within the system was developed, rather than prescriptive open and close dates. The conditions based approach to the operation of S-12A and S-12 B retains critical flexibility during WCA 3A high water conditions while also ensuring that the structures are operated optimally for CSSS habitat during normal and low water conditions. The high water strategy criteria are included within **Annex 1 of Appendix A (Part 1)**.

##### 4.6.2.2 8.5 Square Mile Area

For Alternative D, the S-357 pump station will continue to be operated for the purpose of providing flood mitigation for the 8.5 SMA. The future hydraulic connection between the 8.5 SMA Detention Cell and the C-111 South Dade NDA, which is a prerequisite for MWD Increment 2, will enable the S-357 pump station to move water further away from the protected portion of the 8.5 SMA, thereby reducing the frequency of operational restrictions on the S-357 pump station caused by storing water within the 8.5 SMA detention cell. By not allowing significant water storage depths within the 8.5 SMA Detention Cell and by constructing the internal flowway to convey water through the 8.5 SMA Detention Cell more efficiently, the potential for backwater drainage effects on the southwest corner of the 8.5 SMA caused by retardation of the regional groundwater flow to the southeast will also be significantly reduced.

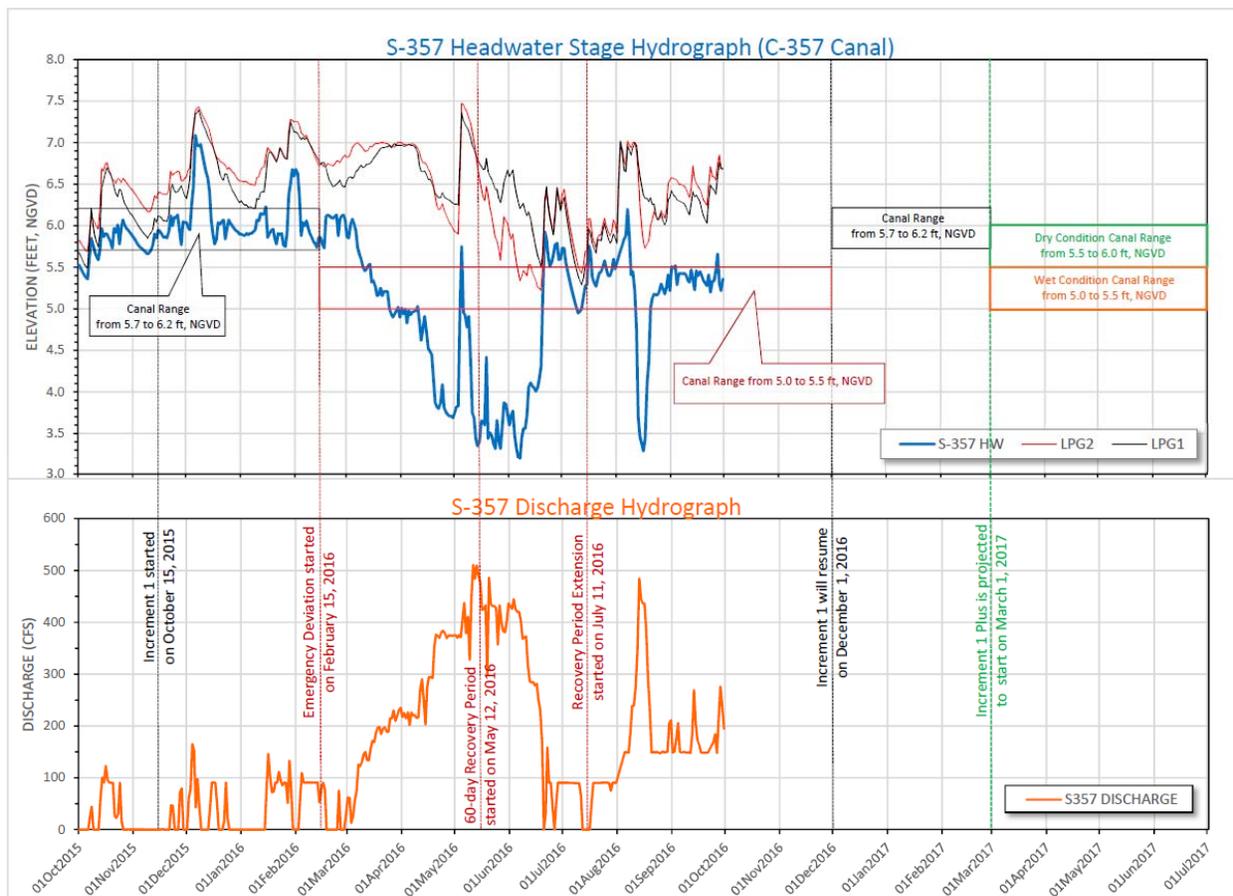
During the 2016 Temporary Emergency Deviation and the subsequent recovery transition period, L-29 Canal stages were raised up to approximately 8.3 feet, NGVD and the G-3273 stage remained above 7.1 feet, NGVD for nearly 4 months (maximum stage 7.6 feet, NGVD); refer to **Figure 4-12**. In response to concerns expressed by residents within the Las Palmas community during the 2016 Temporary Emergency Deviation, the SFWMD constructed temporary measures including: the use of temporary pumps and an open channel connection between the C-358 Canal and the C-357 Canal prior to construction of S-357N to maintain flood mitigation requirements for the 8.5 SMA; temporary plugs in the drainage swales located north and south of Richmond Drive (SW 168th Street); a berm around the western end of the C-358 Canal; and temporary culverts in the southern levee of the 8.5 SMA Detention Cell. Based on the demonstrated ability of these measures to maintain flood mitigation requirements for the 8.5 SMA, the Corps completed construction of a temporary by-pass connection between the C-358 Canal and the C-357 Canal, upstream of the S-357 pump station, in July 2016 in order to maintain this level of service during construction of S-357N. With one of the stated objectives of the Increment 1 field test being to improve hydrological conditions in NESRS through the relaxation of the G-3273 stage criteria to increase water deliveries from WCA 3A to NESRS, subject to constraints which include to maintain the authorized purposes of the MWD project and no reduction in current flood protection and mitigation, the Corps has extensively reviewed the 8.5 SMA performance which resulted from revised operational criteria used during the 2016 Temporary Emergency Deviation and subsequent recovery period; as a result of this review, revised 8.5 SMA operations for the C-357 Canal targets or the S-357 pump station are included within the Increment 1.1 and 1.2 operational strategy (**Appendix A (Part 1)**).

As described in the operational strategy (**Appendix A (Part 1)**), S-357 will be operated to maintain an average-daily water level in C-357 at LPC1 or S-357 headwater between 5.0 to 5.5 feet, NGVD. When drier conditions allow reduced pumping at S-357, canal range of 5.5 to 6.0 feet, NGVD may be utilized. The ground surface elevation along the western perimeter of the 8.5 SMA is approximately 6.7 feet, NGVD at the LPG-2 monitoring gauge and approximately 6.6 at the LPG-1 monitoring gauge. The operational strategy specifies a pump sequence that first leverages the operational capability of S-331, prior to incrementally increasing operations at S-357.

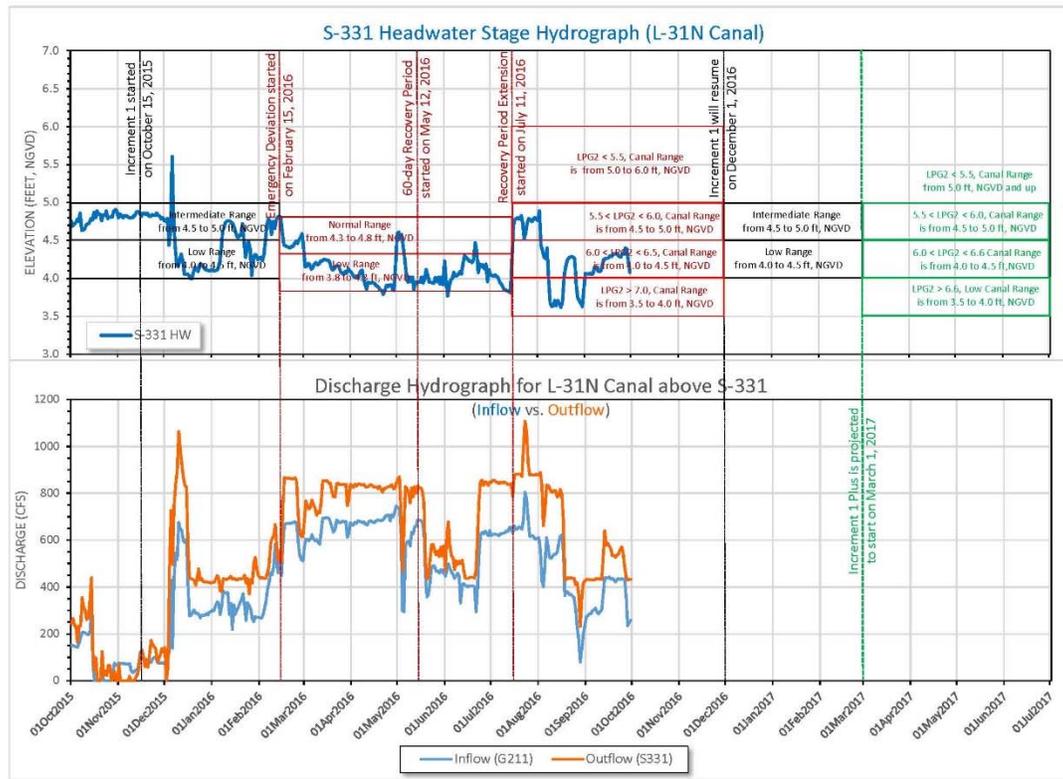
S-357 operations will be constrained to two pump units for most conditions and S-331 will be used more to provide flood mitigation for the Las Palmas Community (8.5 SMA) and to help facilitate the S-357N, Contract 8, and Contract 8A construction. If the stage at LPG2 rises above 6.6 feet NGVD then a canal range of 3.5-4.0 may be used at S-331 until the stage at LPG-2 falls below 6.5 feet NGVD. If capacity is not available at S-331 to maintain this lower range or S-357 stage exceeds 6.2 feet, NGVD, then pumping at S-357 may be increased to more than two units until the stage at LPG2 falls below 6.5 feet NGVD. Following completion of C-111 South Dade NDA, there will be no restrictions of the number of pump units at S-357.

Compared to the S-357 operations observed during the 2016 Temporary Emergency Deviation and extended recovery period (**Figure 4-12**), which included prolonged periods of high S-357 pumping (greater than 250 cfs, or approximately half of the 575 cfs design capacity) during April-July 2016 and September 2016, the frequency and duration of high S-357 discharges to the 8.5 SMA Detention Cell will be significantly reduced with the Increment 1.1 operations. Since Increment 1.1 limits the maximum operating stage in the L-29 Canal to 7.5 feet, NGVD, the Increment 1.1

operational strategy does not require the ability to lower C-357 and/or C-358 to the 3.0-4.0 feet, NGVD range that was determined necessary to provide 8.5 SMA flood mitigation during the 2016 Temporary Emergency Deviation and extended recovery period. Section 12.0 of the operational strategy for Increment 1.1 does include the following additional flexibility to ensure continued maintenance of 8.5 flood mitigation, if necessary during future Increment 1 operations: (1) during the period when pumping at S-357 is limited to 250 cfs due to construction within the 8.5 SMA Detention Cell (Contract 8A): the operational range for L-31N may be lowered by 0.2 feet; S-197 may be used per the criteria in Table 3A regardless of the current operational condition; and G-3273 will be constrained to 7.0 feet, NGVD; and (2) operational flexibility for S-357 and S-357N is included within the 8.5 SMA test operations which includes adjustments from +/- 0.2 to +/- 0.5 feet (to a minimum C-357 Canal range 4.5-5.0 feet, NGVD) after the initial + 0.5 feet change. S-331 pump station operations under Increment 1.1 will maintain the L-31N Canal target stages that were used during the extended recovery period following the 2016 Temporary Emergency Deviation, as illustrated in **Figure 4-13**.



**FIGURE 4-12. S-357 HEADWATER, LPG-1, AND LPG-2 STAGE HYDROGRAPHS AND S-357 DISCHARGE HYDROGRAPH DURING THE FIRST YEAR FOLLOWING INITIATION OF INCREMENT 1 (OCTOBER 2015-SEPTEMBER 2016)**



**FIGURE 4-13. S-331 HEADWATER STAGE HYDROGRAPH AND DISCHARGE HYDROGRAPH DURING THE FIRST YEAR FOLLOWING INITIATION OF MWD INCREMENT 1 (OCTOBER 2015-SEPTEMBER 2016)**

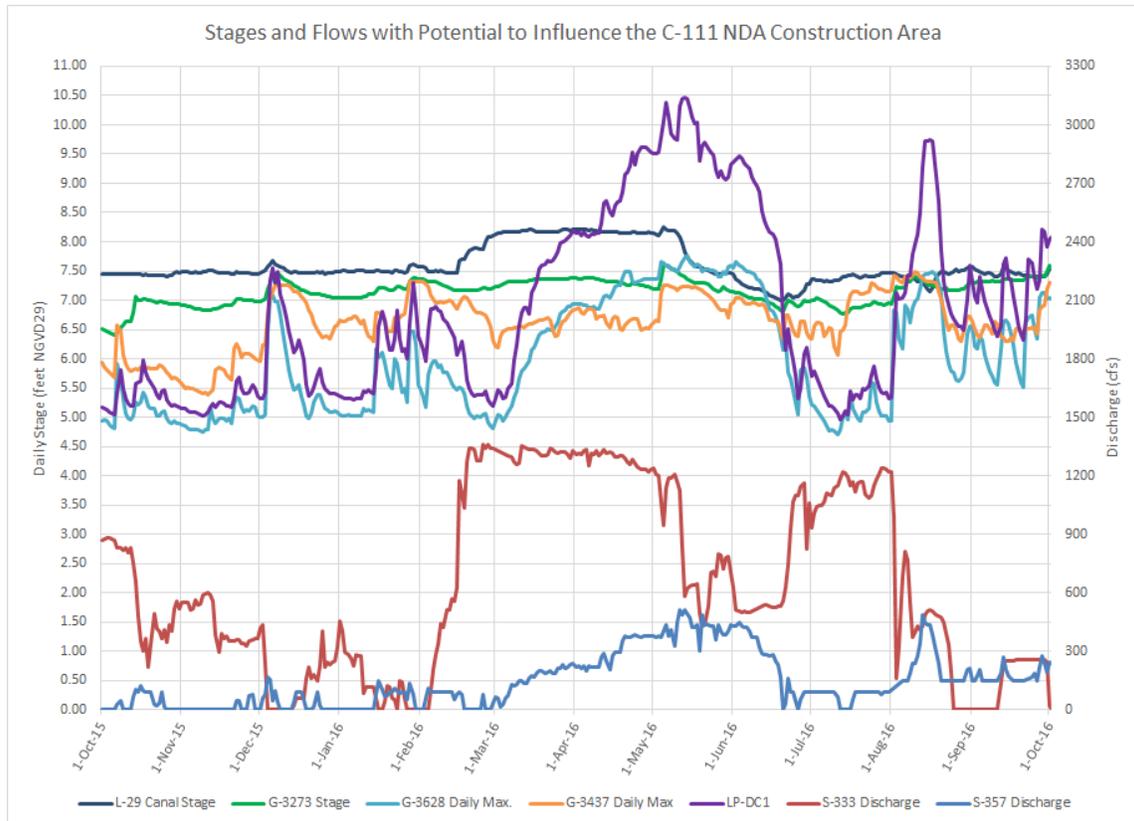
#### 4.6.2.3 C-111 South Dade Construction

Increment 2 of the MWD Project is dependent on construction completion and operation of the C-111 South Dade NDA. The El Nino hydrologic conditions during 2015 and the 2016 L-29 Temporary Emergency Deviation operations may have brought water to the C-111 South Dade construction project site, which includes the perimeter levees for the NDA, with elevated ground/surface water conditions experienced onsite during April-May 2016 (atypical of the South Florida dry season conditions). During July-August 2016, significant rainfall within the 8.5 SMA and South-Dade basin led to operation of the S-332B pump station and the S-357 pump station to provide flood protection to the South Dade Basin (east of the L-31N Canal) and required flood mitigation for the 8.5 SMA, potentially contributing to elevated ground/surface water levels in the project footprint. The Corps has extensively reviewed the hydrologic conditions proximal to the C-111 South Dade NDA (**Figure 4-14**) which resulted from revised SDCS operational criteria (**Figure 4-15**) used during the 2016 Temporary Emergency Deviation and subsequent recovery period. Water stages within the NDA construction footprint are generally influenced by a combination of factors which include: direct rainfall; 8.5 SMA operations at S-357 and resulting water stages within the 8.5 SMA Detention Cell (LP-DC1 gauge); water stages within NESRS,

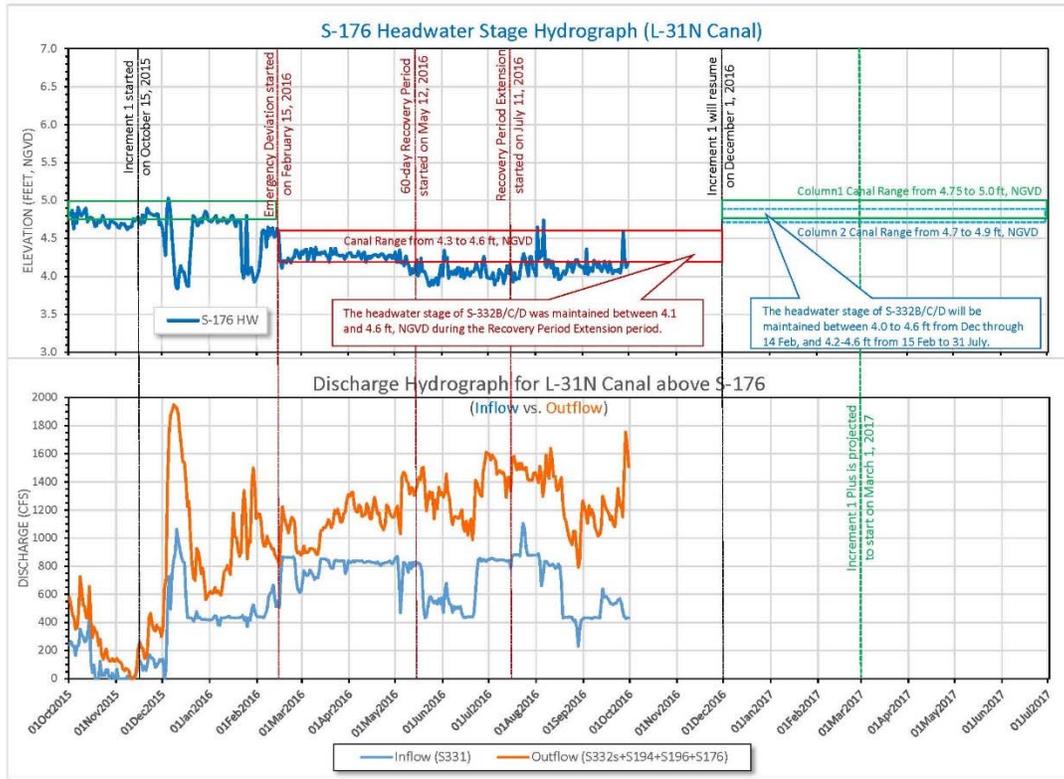
south of G-3273 and west of the NDA footprint; SDCS operations at S-332B and resulting water stages within the Partial NDA; and operational levels within the L-31N Canal, 0.5 miles east of the NDA footprint. During the 2016 Temporary Emergency Deviation, direct precipitation for the area of the 8.5 SMA and NDA footprint was less than 3.6 inches combined during February-April 2016, and no significant rainfall was observed until the first week of May 2016 (refer to **Appendix A (Part 1)**). A scatter plot demonstrating the correlation between historical water levels in the L-29 Canal and G-3273 (located approximately 9 miles south of the L-29 Canal, with NESRS) during S-333 operations is provided in **Figure 4-16**. This figure includes daily observed water levels for the period corresponding to IOP, E RTP (implemented October 2012), Increment 1, and the 2016 Temporary Emergency Deviation and subsequent recovery period, extending from July 2002 through September 2016; since the L-29 Canal maximum operating limit was maintained at 7.5 feet, NGVD with the G-3273 constraint of 6.8 feet, NGVD during both IOP and E RTP, the historical data points are combined (light blue data points on the figure), and also displayed for the wet season period only (June through October; dark blue data points). The observations collected during the 2016 Temporary Emergency Deviation (purple data points), the 60-day recovery period (orange data points), and the recovery period extension (yellow data points) indicate an increased slope compared to the IOP/E RTP base condition. The increased slope observed during the Temporary Emergency Deviation is indicative that the NESRS marsh vegetation results in a 1-2 week lag time before the influence of the L-29 Canal stages is observed at G-3273, and the observed trends may also demonstrate the effects from the completion of Phase 2 of the L-31N seepage barrier construction in the spring of 2016; also potentially influencing the observed data at G-3273 (located 2 miles west of the 8.5 SMA) is the combined influence of increased pumping at S-357, lowered C-357 Canal stages, and lowered L-31N Canal stages during the 2016 Temporary Emergency Deviation and extended recovery period. Due to large number of variables changing throughout the first year following implementation of the Increment 1 field test, additional monitoring and data analysis is needed to further assess the cause and effect relationships and ultimately to inform the development of MWD Increment 2.

Implementation of lowered L-31N Canal levels during the initial 60-day recovery period and the subsequent extended recovery period, when combined with limited pumping at S-357 and reduced deliveries into NESRS (compared to the 2016 Temporary Emergency Deviation) demonstrated an improved ability for water managers to maintain site conditions favorable to completion of the NDA levees. The hydrologic response observed at G-3628 (located immediately south of the 8.5 SMA Detention Cell) and G-3437 (located immediately northwest of the Partial NDA) during the first year following implementation of Increment 1 are shown in **Figure 4-17** and **Figure 4-18**, respectively. Refer to **Figure 4** within **Part 1** of the operational strategy for the location of these monitoring gauges. Based on the demonstrated ability of these measures to facilitate continued construction progress for the NDA construction footprint, revised S-332B/C/D pump station operations for the L-31N Canal stage targets are included within the Increment 1.1 and 1.2 operational strategy (**Appendix A (Part 1)**). The S-332B, S-332C, and S-332D pump stations, along with the S-176 gated spillway, will be operated to maintain an operating range within the L-31N Canal between 4.2-4.8 feet, NGVD during the CSSS nesting window (15 February through 31 August) and between 4.0-4.6 feet, NGVD outside the CSSS nesting window (01 August through 14 February). Once the NDA and 8.5 SMA features are functionally complete, such that construction conflicts with water management of canal levels are resolved, the operational range for the L-31N will be raised 0.2 feet to 4.2-4.8 feet, NGVD throughout the year. The normal

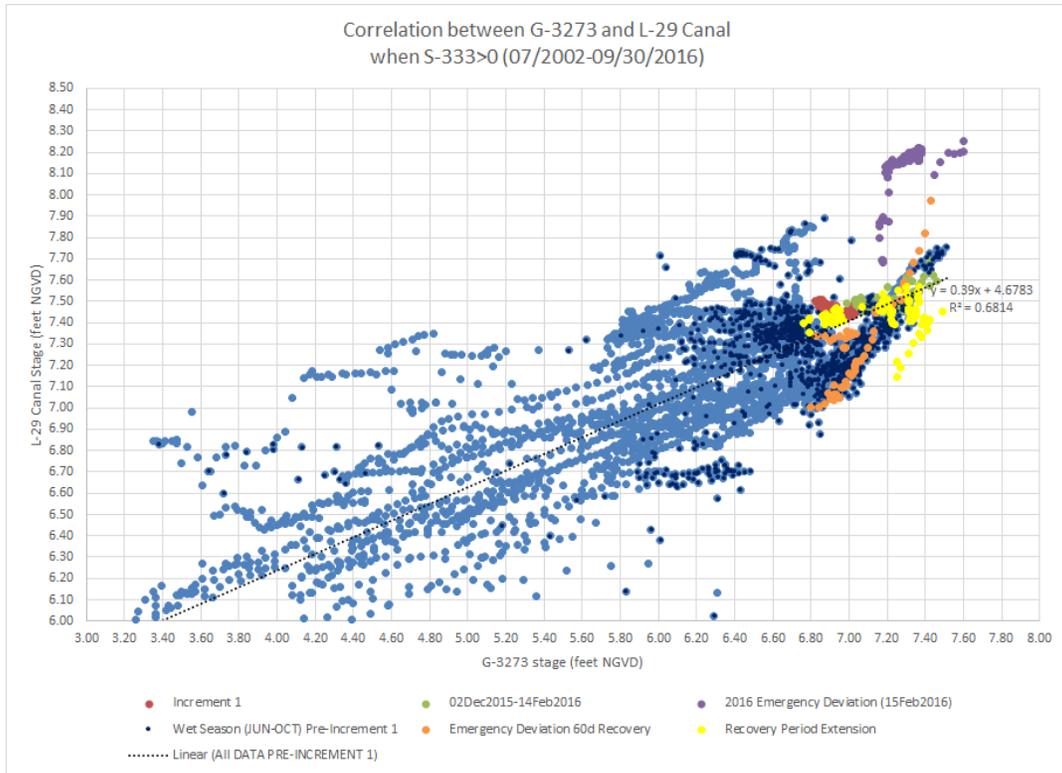
management of water will be to fully maintain the hydraulic ridge and deliver water to eastern ENP using the full available capacity of S-332B, S-332C, and S-332D. If the capacity available at S-332B, S-332C, and S-332D is unable to maintain the operational range then S-194/S-196/S-197 may be additionally used (low flow discharges through S 197 available for conditions 2, 3, and 4). To facilitate management of hydroperiods along the eastern boundary of ENP to better meet habitat and nesting targets specified in the 2016 ERTF BO RPA, up to one pump may be run at S-332BN, S-332B, and S-332C and up to two pumps at S-332D may be run within an operating range from 3.8 to 4.2 feet NGVD (highest stage at which water supply is usually initiated).



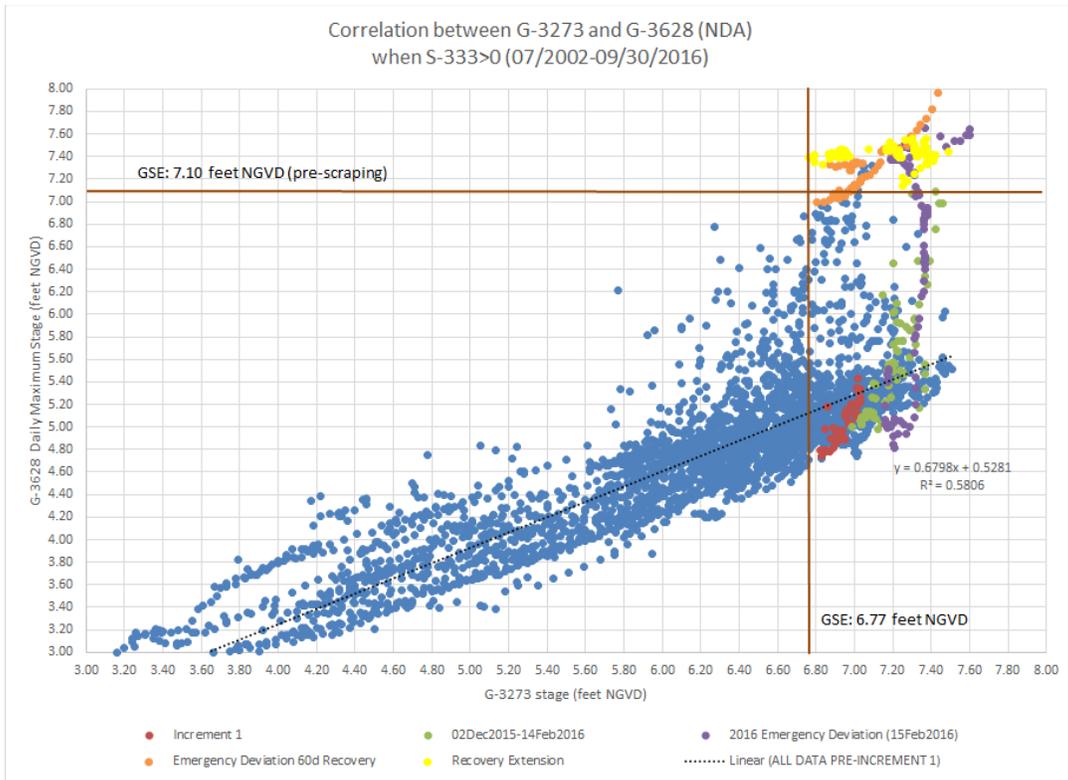
**FIGURE 4-14. NESRS STAGES AND FLOWS WITH POTENTIAL TO INFLUENCE THE C-111 NDA CONSTRUCTION AREA**



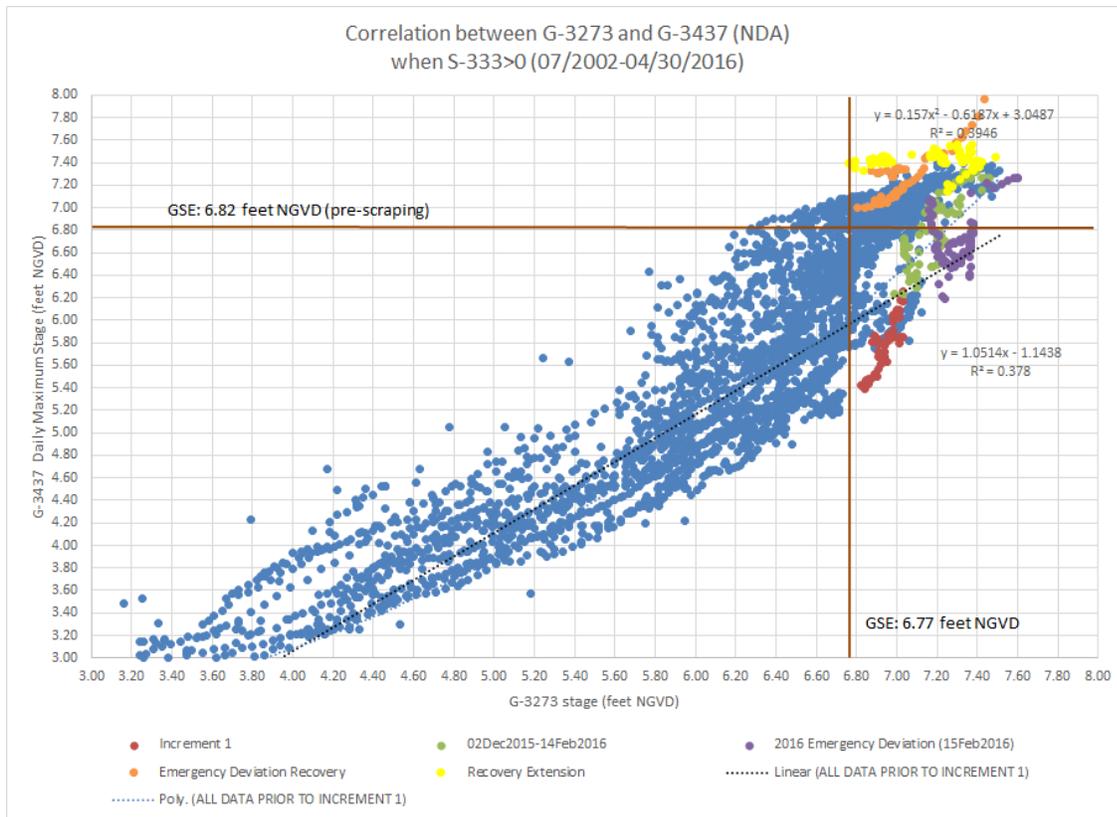
**FIGURE 4-15. S-176 HEADWATER STAGE HYDROGRAPH AND L-31N DISCHARGE HYDROGRAPHS DURING THE FIRST YEAR FOLLOWING INITIATION OF INCREMENT 1 (OCTOBER 2015-SEPTEMBER 2016)**



**FIGURE 4-16. HISTORICAL COORELATION BETWEEN L-29 CANAL STAGES AND G-3272 STAGES (2002-2016)**



**FIGURE 4-17. HISTORICAL COORELATION BETWEEN G-3273 STAGES AND G-3268 STAGES (2002-2016)**



**FIGURE 4-18. HISTORICAL CORRELATION BETWEEN G-3273 STAGES AND G-3437 STAGES (2002-2016)**

**4.6.2.4 South-Dade County Flood Risk Management**

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C- 111 South Detention Area using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS.

The Increment 1.1 and 1.2 operational strategy proposes to generally lower the target operational ranges for the SDCS L-31N Canal compared to the No Action Alternative in order to facilitate the construction of C-111 South Dade Contract 8 and Contract 8A and provide increased operational flexibility to achieve the hydroperiod and nesting condition targets specified by the 2016 BO RPA for the Eastern CSSS subpopulations. The lowered target stages along L-31N (between G-211 and S-331, and S-331 to S-176) may provide a minor improvement to flood risk management within the South Dade basin, compared to the No Action Alternative. All structures in Increment 1 and Increment 1.1 and 1.2 will be evaluated and their operating criteria will be subject to a complete revision in Increment 2.

The C-111 Spreader Canal Western Project will continue to be operated by SFWMD and provide flows to Taylor Slough. The SFWMD efforts to monitor the impacts of the project operation and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project area remain ongoing and inconclusive based on the limited period of monitoring data collected since June 2012. To mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test, low volume releases from S-197 are included as components of Alternative E. The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the C 111 Spreader Canal Western Project.

## 4.7 VEGETATIVE COMMUNITIES

### 4.7.1 ALTERNATIVE A: NO ACTION ALTERNATIVE

The continued implementation of Increment 1 has the potential for minor beneficial effects on wetland vegetation within ENP by increasing flows to NESRS relative to 2012 Water Control Plan. As described in the Increment 1 EA and FONSI (dated May 27, 2015) the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations prior to the initiation of the field test (USACE 2015). The duration at which water stages within the L-29 Canal approach 7.5 feet, NGVD is expected to be greater under Increment 1 relative to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), resulting in the potential for temporary minor beneficial effects on wetland vegetation caused by improved hydroperiods.

Hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) but as referenced in **Section 4.5.1**, base conditions developed for recent ESA consultation for ERTP are consistent with the hydrologic effects for Increment 1. Stage duration curves at the G-3273 monitoring gauge (**Figure 4-2**) indicate an average annual stage increase of approximately 0.25 feet and 0.1-0.2 feet, respectively, with hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages. A comparison of the average annual hydroperiod for the 1965-2005 period (**Figure 4-4**) indicates that Increment 1 would increase hydroperiods by 15 to 60 days along the eastern perimeter of NESRS and increase hydroperiods by 15 to 30 days within Western SRS, downstream of S-12D relative to base conditions. Reference **Section 4.5.1.1**.

The Increment 1 EA and FONSI (dated May 27, 2015) specified that S-197 would be operated consistent with the 2012 Water Control Plan during condition 1 and condition 2, when the WCA 3A stage was below the Increment 1 Action Line. Under condition 3 and condition 4, when the WCA 3A stage was above the Increment 1 Action Line, additional criteria were used which prescribe small discharges expected to assist in moderating high stages within the C-111 Canal through use of S-197 discharges. The additional S-197 gate openings ranged from 50 to 200 cfs based upon S-178 TW stage between 2.5-2.9 feet, NGVD (note: these stages correspond to approximately 2.4-2.8 feet, NGVD at the S-18C headwater) when the S-18C gates are out of the water. An analysis was performed within the Increment 1 EA (dated May 27, 2015) to evaluate the potential increase in S-197 discharges relative to the 2012 Water Control Plan. Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency

of S-197 discharges under Increment 1 increased from 14 days under the 2012 Water Control Plan to a range of 39 to 82 days (timing unchanged) under Increment 1 (USACE 2015). Reference **Section 4.5.1.2**. The total volume of S-197 discharges increased from 18,000 acre-feet under the 2012 Water Control Plan to a range of 20,000 to 30,000 acre-feet. Potential minor adverse impacts associated with salinity fluctuations under the continued implementation of Increment 1, would be temporary and spatially limited to nearshore areas within the southern estuaries. Manatee Bay and Barnes Sound are relatively large bodies of water with open connections to Card Sound and the Atlantic Ocean. Waters within Manatee Bay and Barnes Sound have been documented to have shorter residence times and experience more tidal flushing relative to northeastern Florida Bay (Marshall 2014).

It should be noted, that hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) but as referenced in **Section 4.5.1.2**, hydrologic modeling developed for the recent ESA consultation for ERTTP indicated that Increment 1 would result in a slight decrease in average annual release volume from S-197 compared to base conditions (*i.e.* ERTTP) (16,640 acre-feet for Increment 1, compared to 17,130 acre-feet for ERTTP); less than that predicted within the analysis completed for the Increment 1 EA. The historical data assessed for the previous EA was very limited due to the necessity to consider only the period coincident with SFWMD operation of the C-111 Spreader Canal Project's S-199 and S-200 pump stations, and these results may not be representative of longer-term trends.

#### **4.7.1 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Alternative D and Alternative E would result in similar effects on vegetation. Alternative D is expected to provide minor beneficial effects on wetland vegetation within ENP by increasing flows to NESRS. Alternative D is expected to provide a greater magnitude of increase relative to Alternative E as Alternative D has the ability to raise the L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD contingent upon downstream constraints. Alternative D would likely show a slightly higher beneficial effect on vegetation communities within NESRS. It is expected that shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities. Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions and promote a shift in vegetation. Inclusion of the 'high water strategy' developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with the expanded closure periods of the WCA 3A control structures beyond their current restrictions, is expected to help prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities. Potential effects to mangrove habitats and seagrass beds within the coastal estuaries under Alternative D would be similar to that as discussed under Alternative E as a result of the minor to moderate increases in the frequency and duration of low-volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound. Due to the short duration of the Proposed Action, significant vegetation changes are not anticipated.

#### **4.7.2 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

##### **4.7.2.1 WCA 3A AND ENP SHARK RIVER SLOUGH**

Deep slough communities formerly occurred throughout the pre-drainage Ridge and Slough region of the Everglades (McVoy et al. 2011). Sloughs within the Greater Everglades have been degraded by compartmentalization resulting in reduced sheetflow, depths and inundation durations, and alteration of vegetation communities. The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999).

The operational criteria governing inflows to NESRS for Alternative E are the same as the No Action Alternative; therefore the hydrologic effects within NESRS will be similar. Updated hydrologic modeling was completed to support recent ESA consultation for E RTP. Model simulation INCR1B can be utilized to provide the long term hydrologic effects for Alternative E. Although the L-29 Canal maximum operating limit (7.5 feet, NGVD) and the removal of the G-3273 constraint are the same, the stage duration curves for the L-29 Canal, the stage duration curve at G-3273, and the hydroperiod changes within NESRS for Alternative E demonstrate a minor improvement to NESRS compared to the No Action Alternative. Stage duration curves at the G-3273 monitoring gauge (**Figure 4-6**) indicate an average annual stage increase of approximately 0.1 feet for G-3273 for hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages. A comparison of the average annual hydroperiod for the 1965-2005 period (**Figure 4-8**) indicates that Alternative E would increase hydroperiods by 5 to 15 days along the eastern perimeter of NESRS and decrease hydroperiods by 10 to 15 days within western SRS, downstream of S-12 D. A decrease in hydroperiods by 50 to 30 days and 0 to 5 days were observed within northern and southern portions of CSSS-A habitat, respectively within western SRS. Reference **Section 4.5.3.1**.

Improved hydroperiods within NESRS and ENP have the potential to reduce soil oxidation, which is expected to promote peat accretion. A potential decrease in drying event severity, if achieved under Alternative E would aid in the restoration of historic wetland vegetation communities. Alternative E may have a temporary minor beneficial effect on vegetative communities within NESRS. However, due to the short duration of the Proposed Action, significant vegetation changes are not anticipated. A potential decrease in hydroperiod within the vicinity of CSSS-A within NESRS may be beneficial in terms of achieving the desired vegetation and performance measure targets (Reference **Section 2.1.1**) as the USFWS has identified this area as being too wet. An average annual discontinuous hydroperiod of between 90 and 210 days is required to maintain suitable marl prairie habitat for the CSSS. If the number of days with surface water is consistently more than 210 days, the habitat will convert to sawgrass. If it is consistently too dry (less than 90 days) woody vegetation encroaches on the habitat and there is an increased risk of fire and predation on CSSS from aerial predators (raptors).

The hydrologic effects for western SRS and WCA 3A are affected by the modified closure regime for the S-12A, S-12B, S-343A, S-343B, and S-344 structures considered under Alternative E. It

should be noted, that the modeling conducted for ESA consultation (R1B and INCR1B) did not include the high water strategy for October and November that was developed by the Corps to limit the duration of WCA 3A high water stages during the late wet season. Intra-annual stage hydrographs were generated for the average daily stage (**Figure 4-8**) to characterize the effects of Alternative E on WCA 3A water levels. Average water levels across WCA 3A are increased by 0.0-0.1 feet during the months of January through September and December. Average water levels across WCA 3A are increased by 0.20-0.25 feet during the months of October and November, without consideration of the WCA 3A high water criteria that are included in Alternative E.

Vegetation within WCA 3A would not be expected to significantly change from current conditions with implementation of Alternative E. Alternative E includes a seasonally varying WCA 3A water level of 10.0 to 10.75 feet NGVD (*i.e.* Increment 1 Action Line), as measured by the three gage average, which will continue to be used to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS consistent with the No Action Alternative. Implementation of the Increment 1 Action Line (**Figure 2-11**) to manage high water conditions in WCA 3A, would help to prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities. Prolonged periods of inundation are of particular concern for tree islands within WCA 3A. ERTF tree island performance measures strive to keep high water peaks less than 10.8 feet NGVD, and strive to reach water levels less than 10.3 feet NGVD by December 31.

Alternative E, consistent with the No Action Alternative, include increasing flows through S-333. With an increase in S-333 flow, there is an increased likelihood of increased total phosphorus (TP) entering NESRS. The Everglades, a phosphorus-limited system, historically received most inputs of phosphorus through rainfall, with average TP concentrations of less than 0.01 mg/L (McCormick et al. 1996, Newman et al. 2004). However, more recently, areas within ENP, including NESRS, have been exposed to TP concentrations at or in excess of 0.10 mg/L (SFWMD 2010). Vegetation that can assimilate nutrients directly from the water column appears to be the most sensitive to nutrient enrichment and include periphyton and floating-leaved plants, such as spatterdock and water lily (Chaing et al. 2000; Newman et al. 2004). Potential effects to vegetation and species composition within NESRS and ENP as a result of changes in water quality cannot be fully determined at this time.

#### **4.7.2.2 ENP EASTERN PANHANDLE AND MANATEE BAY/BARNES SOUND**

The estuarine communities of Florida and Biscayne Bays have been affected by upstream changes in freshwater flows through the Everglades and eastward across the Miami Rock Ridge. The estuarine communities of Biscayne Bay have been further affected by agricultural and urban development of the areas east of the current boundaries of ENP. A reduction in freshwater inflows into Florida Bay and alterations of the normal salinity balance have affected mangrove community composition and may have contributed to a large-scale die-off of seagrass beds (USFWS 1999). Mangrove communities along Biscayne Bay have also seen a reduction in freshwater inflows and a reduction in historic habitat range by urban and agricultural development leaving only a remnant ribbon of suitable habitat immediately adjacent to the bay. Both bays experiences salinities in excess of 40 psu on a seasonal basis. Manatee Bay and Barnes Sound are presently characterized by extended periods with little or no freshwater input, interspersed with erratic large volume discharges from the C-111 Canal, which is presently the major source of freshwater flows. The

timing and quantity of these flows however cause abrupt, major reductions in salinity that may persist for periods of days to weeks, followed by a return to moderate-to-high salinities.

Not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects have been constructed. Therefore, Alternative E retains from Increment 1, a requirement for additional water management operating criteria for features of the SDCS including S-197 (in addition to the S-197 operating criteria defined in the 2012 Water Control Plan). Additional S-197 operating criteria are included under all conditions where implementation of increased stages within NESRS may result in increased seepage inflows into the SDCS. Compared to the No Action Alternative, based on the qualitative assessment of the S-197 criteria described in the Increment 1.1 operational strategy, Alternative E may result in minor to moderate increases in the frequency and duration of low-volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound.

Alternative E incorporates changes to the operation of S-332D and prescribes operational criteria for the S-328 gated culvert. During development of the Proposed Action, operational modifications to provide supplemental flows to Taylor Slough were suggested by the SFWMD to help facilitate the recovery of Florida Bay from the 2015 extreme hyper-salinity event. The S-328 gated culvert, is located in the southwest corner of Cell 1 of the S-332D Detention Area and provides an ability to discharge up to 500 cfs from Cell 1 into the L-31W Canal to short-circuit the southern portion of the S-332D Detention Area if necessary to ensure water deliveries reach Taylor Slough. Under Alternative D, S-328 may be used to increase deliveries to Taylor Slough up to 250 cfs (restricted to half of the structure design capacity) as measured at S-332D subject to operational constraints. Supplemental flows may be useful in providing potential benefits to Taylor Slough and northeastern areas of Florida Bay, by reducing salinity in those areas directly influenced by Taylor Slough inflows.

Alternative E also includes flexibility to enable the distribution of flows along the L-31N Canal to be changed to move water away from the C-111 South Dade Contracts 8 and 8A construction area during the time period when this is likely to help facilitate continued construction progress. Some short-term loss of effectiveness of the hydraulic ridge is expected with the corresponding increase in use of the downstream facilities. To offset the potential for reduced flows to Taylor Slough, up to 250 cfs of supplemental flows to Taylor Slough may be supplied to S-332D (and/or the SFWMD proposed connection from S-200 to Taylor Slough) subject to operational constraints. For clarification, the SFWMD has also proposed to establish a connection between S-200 and Taylor Slough by constructing a new culvert structure between the C-200 Header Channel and the L-31W Canal. This new structure will be named G-737.

Experimentation with surface water flow to Taylor Slough and its effect on the vegetation within and adjacent to the slough has been well studied (Armentano et al. 2000, 2006, Nott et al. 1998, Olmstead et al. 1980, Van Lent et al. 1993, 1999). From 1980-1999, as part of the C&SF Project, various amounts of overland flow were discharged through the now decommissioned S-332 pump station which was located in the south western corner of L-31W. Rapid vegetation changes were observed where habitats dominated by short hydroperiod species such as *Muhlenbergia* were replaced by sawgrass and where sawgrass dominated habitats were replaced by more aquatic

species such as *Eleocharis*. Cattail also became established near the pumping station potentially due to increased phosphorus loading.

Additional supplemental water supply to Taylor Slough under Alternative E, is not expected to have significant effects on vegetative communities as a result of the limited duration and limited spatial extent of the operational changes being considered. Utilization of S-328 may not occur until the construction of the three L-31W Canal plugs proposed between S-328 and the L-31W gap currently proposed as part of the C-111 South Dade Project; therefore reducing the potential for increased nutrient load into Taylor Slough as a longer residence time within the L-31W canal may provide increased opportunity for nutrient uptake. The L-31W Canal plugs were identified in the 2016 C-111 South Dade Contract 9 EA. Water drained into the L-31W borrow canal, which is immediately adjacent to ENP, flows as groundwater and surface water to the south and east, raising groundwater and C-111 levels and impeding drainage of lands east of C-111. Fill or plugging in L-31 W, along with modifications to the L-31W levee gap, are expected to provide additional rehydration benefits to lands in eastern ENP, in addition to the expansion of the NDA and construction of flow ways in both the NDA and SDA (USACE 2016a).

Furthermore, as noted under the No Action Alternative, potential impacts associated with salinity fluctuations in Manatee Bay and Barnes Sound are not anticipated as these areas are relatively large bodies of water. Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Alternative E is not expected to have significant effects on vegetative communities within Taylor Slough and the coastal estuaries as a result of the limited duration and limited extent of operational changes being considered the southern estuaries.

#### **4.7.2.3 Slough/Open Water Marsh**

Flows through NESRS under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Over-drainage within ENP has resulted in the conversion of slough/open-water marsh communities to shorter hydroperiod sawgrass marshes and wet prairies (Davis et al. 1994, Davis and Ogden 1997; Armentano et al. 2006; McVoy et al. 2011). Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative E. Shifts from one vegetation type to another may occur in a relatively short time frame (1 to 4 years) following hydrological alteration (Armentano et al. 2006, Zweig 2008, Zweig and Kitchens 2008, Sah et al. 2008). Alternative E may have a temporary minor beneficial effect on slough/open water marsh communities within NESRS. However, due to the short duration of this test, significant vegetation changes are not anticipated.

#### **4.7.2.4 Sawgrass Marsh**

As a result of increased durations under Alternative E, it is expected that shorter hydroperiod sawgrass marshes within ENP may transition to wet prairie, except where there is deep water that will transition to slough.

#### 4.7.2.5 Wet Marl Prairies

Areas within the eastern marl prairies along the boundary of ENP suffer from over-drainage, reduced water flow, exotic tree invasion and frequent human-induced fires (Lockwood et al. 2003; Ross et al. 2006). To alleviate the perpetually drier conditions and associated problems, increased water flows within this area are required. Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions and promote a shift in species community composition to benefit native vegetation and provide a temporary minor beneficial effect.

The hydrologic modeling conducted for ESA consultation included evaluation of operational changes along the SDCS Canals between S-334/S-335 and S-197 intended to provide increased flexibility to achieve the RPA hydroperiod and nesting targets for the eastern CSSS Subpopulations (CSSS-B through CSSS-F) within the 2016 ERTTP BO. Specifically, the modeling assumptions in the R2H/INCR1H/INCR2H simulations included early dry season operations (September-December) informed by the SFWMD South Dade Investigation Workshops to promote more flow toward ENP and extend hydroperiods, use of later dry season opportunities during the CSSS nesting season (February-May) to move water toward Biscayne National Park and away from CSSS sub-populations, and efforts to avoid water level excursions above ground surface from 1 March to 15 July due using modified operational criteria for the SDCS infrastructure (S-332B, S-332C, S-332D, S-200, and S-199). Alternative E represents a combination of simulations INCR1B and R2H conducted for purposes of ESA consultation for the 2016 ERTTP BO. Since the 2016 ERTTP BO and RPA provides performance targets for the CSSS eastern subpopulations and does not prescribe specific SDCS operational changes, the Corps advocated to provide sufficient flexibility within the Increment 1.1 and 1.2 operational strategy to allow the Corps and SFWMD water managers to achieve the intended performance from the RPA proposed operational condition. While notable improvements are demonstrated for the CSSS western subpopulation resultant from the RPA conditional extended closure periods for S-12A and S-12B, the CSSS performance metrics for the eastern subpopulations demonstrate variability between a moderate performance reductions to very slight performance improvements (refer to **Section 2.1.1**).

#### 4.7.2.6 Rockland Pine Forest

Pine rocklands within the action area occur on the Miami Rock Ridge and extend into the Everglades as Long Pine Key. The pine rocklands, also called the pinelands, have a hard rocky ground, made up of limestone. The pinelands, like the hardwood hammock are found on higher ground, making it a dry habitat. Significant impacts are not predicted within rockland pine forest with implementation of Alternative E.

#### 4.7.2.7 Tropical Hardwood Hammock

Tropical hardwood hammocks on the Miami Rock Ridge have been affected by a lowered water table associated with the reduction of freshwater flow through the Everglades. Tropical hardwood hammocks within the action area occur on the Miami Rock Ridge, along the northern shores of Florida Bay, and on elevated outcrops on the upstream side of tree islands. Significant impacts are not predicted within tropical hardwood hammock with implementation of Alternative E.

#### 4.7.2.8 Tree Islands

Tree islands in SRS rise above the surrounding marsh. Potential for flooding stress is low with implementation of Alternative E. Since 1942, a 55% decline in the extent and number of tree islands in SRS has been observed due to intensive fires that migrate across the marshes and burn tree island peat soils leaving rocky outcroppings. Tree islands are connected to the surrounding marsh via the roots of the trees. When the water table drops below these roots, tree islands often become too dry and can burn. Under Alternative E, the duration of water above the marsh surface is expected to improve. Alternative E may have a temporary minor beneficial effect on tree islands within ENP by reducing the potential for devastating fires. Reference **Section 4.13.2** for additional information regarding tree islands and the potential for overtopping as a result of the Proposed Action.

Alternative E includes a seasonally varying WCA 3A water level of 10.0 to 10.75 feet NGVD (*i.e.* Increment 1 Action Line), as measured by the three gage average, which will continue to be used to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS consistent with the No Action Alternative. Implementation of the Increment 1 Action Line (**Figure 2-11**) to manage high water conditions in WCA 3A, would help to prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities. Inclusion of the ‘high water strategy’ developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with the expanded closure periods of the WCA 3A control structures beyond their current restrictions, is also expected to help prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to tree islands.

#### 4.7.2.9 Mangroves

Mangrove communities occur within a range of salinities from 0 to 40 practical salinity units (psu). Jiang et al. (2012) developed a model to estimate the resilience of a system against a regime shift. Their model was applied to a halophytic mangrove and glycophytic hardwood hammock ecotone to measure its resilience to storm surge. The boundary between these two vegetative types is typically distinct, with only slight changes in topography. The authors noted that a disturbance, such as an input of salinity to the soil from a storm event, could upset this ecotone boundary. This could possibly cause salinity-tolerant vegetation to migrate inland. For the model developed in this study, the authors found a pulse disturbance was not sufficient to cause a regime shift in the vegetative boundary. Any change in salinity would have to be held at a high level for some time for this type of boundary shift to occur (Jiang et al., 2012). Compared to the No Action Alternative, based on the qualitative assessment of the S-197 criteria described in the Increment 1.1 operational strategy, Alternative E may result in minor to moderate increases in the frequency and duration of low-volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound. No significant changes to the timing of S-197 operations (July to October/wet season) are anticipated to occur relative to the No Action Alternative. Reference **Section 4.5.3.2**. Although the above referenced study by Jiang et al. (2012) provides only limited data on how mangrove habitats respond to salinity variations, it suggests that low volume freshwater releases (*i.e.* less than 500 cfs) from S-197 under Alternative E would not be sufficient to affect mangrove habitats within the coastal estuaries.

#### 4.7.2.10 Seagrass Beds

Nearshore salinity conditions within the coastal estuaries are elevated much of the year as a result of the less than adequate freshwater flow deliveries. Compared to the No Action Alternative, based on the qualitative assessment of the S-197 criteria described in the Increment 1.1 operational strategy, Alternative E may result in minor to moderate increases in the frequency and duration of low-volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound. No significant changes to the timing of S-197 operations (July to October/wet season) are anticipated to occur relative to the No Action Alternative. Reference **Section 4.5.3.2**. Overland flow of freshwater into coastal estuaries is preferred as compared with transfers through the S-197 structure, however; low volume releases to Manatee Bay and Barnes Sound through this structure are considered preferential to high volume releases which result in increased incidence of large salinity swings as well as high nutrient load delivery. Extreme salinity fluctuations associated with high volume discharges are not expected under Alternative E, as additional S-197 releases are anticipated to be less than 500 cfs. Scouring of bottom sediments and significant increases in turbidity resulting in diminished light penetrations through the water column is not expected. Significant impacts to seagrass beds within the coastal estuaries are not expected due to the limited duration and limited extent of operational changes at S-197 being considered. Seagrasses have an optimum salinity range of 24 to 35 psu, but can tolerate considerable short-term salinity fluctuations.

Furthermore, as a component of the Increment 1 Monitoring Plan, the SFWMD has installed benthic salinity and temperature monitoring probes downstream of S-197 to supplement the ability of the existing network to capture the eco-hydrologic response to openings of S-197. The first annual performance report summarizing these results covers work performed from June 15, 2015 through June 14, 2016 (SFWMD 2016) in accordance with a cooperative agreement with ENP. The SFWMD has also conducted event-driven (S-197 opening) deployment of a high-resolution surface water quality mapping unit when S-197 was operated and the structure remained opened for more than three days during recent water management operations. A spatial analysis of the output was used to estimate freshwater plume dynamics in Barnes Sound. The 2016 referenced report summarized results from five mapping trips conducted so far: December 1 and 16; January 12, March 8, and April 5, 2016. It should be noted that these periods of time correspond to operations directly prior to and during implementation of the 2016 Temporary Emergency Deviation in which pre-storm drawdown and flood control operations and/or the operational strategy for the 2016 Temporary Emergency Deviation dictated C&SF operations. However, compared to the conditions observed during the 2016 Temporary Emergency Deviation and extended recovery period, which included prolonged periods of low volume releases (less than 500 cfs) at S-197 during February-April 2016 and June-August 2016, the frequency and duration of low volume S-197 discharges to Manatee Bay/Barnes Sound is expected to be significantly reduced with Increment 1.1 operations. Reference **Section 4.5.3.2**. Therefore; potential effects to salinity are anticipated to be less than those observed and reported on in the SFWMD 2016 referenced report.

During the five water release events from S-197 between December 2015 and March 31, 2016, salinity decreased downstream in both Manatee Bay and Barnes Sound (SFWMD 2016). The horizontal impact of the releases extended into Barnes Sound. The initial salinity level in both basins was 30–35 and declined to 20–25 during and following releases. The salinity map sequence shows that, following an initial large release in early December 2015, subsequent small releases

did not appreciably reduce salinity further, though the cumulative effect was to maintain reduced salinity throughout the dry season to date. It is unknown how much the direct precipitation from greater than average rainfall during the El Niño season contributed to salinity reduction. Although no benthic assessments were conducted for the evaluation, it was reported from visual observations that bottom vegetation seemed to be unaffected by the releases with *Thalassia spp.* and *Halodule spp.* continuing to maintain moderate bottom cover. The waters in both basins remained mostly clear throughout the study period covered within the performance report.

Surface and bottom water measurements of salinity showed stratification in December 2015 at two of the three sites monitored and again at one site in January 2016. Data suggest that the potential impacts of freshwater on the benthos (*i.e.* flora and fauna found on the bottom) may be mitigated somewhat by stratification, which allows higher salinity water on the bottom to buffer the osmotic shock on biota as the water masses gradually mix, leading to a mesohaline regime.

## 4.8 FISH AND WILDLIFE RESOURCES

### 4.8.1 ALTERNATIVE A: NO ACTION ALTERNATIVE

The continued implementation of Increment 1 has the potential for minor beneficial effects on fish and wildlife resources within ENP by increasing flows to NESRS relative to 2012 Water Control Plan (USACE 2012c). As described in the Increment 1 EA and FONSI (dated May 27, 2015) the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations prior to the initiation of the field test (USACE 2015). The duration at which water stages within the L-29 Canal approach 7.5 feet, NGVD is expected to be greater under Increment 1 relative to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), resulting in the potential for temporary minor beneficial effects on fish and wildlife resources caused by improved hydroperiods.

Hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) but as referenced in **Section 4.5.1**, base conditions developed for recent ESA consultation for ERTP are consistent with the hydrologic effects for Increment 1. Stage duration curves at the G-3273 monitoring gauge (**Figure 4-2**) indicate an average annual stage increase of approximately 0.25 feet and 0.1-0.2 feet, respectively, with hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages. A comparison of the average annual hydroperiod for the 1965-2005 period (**Figure 4-4**) indicates that Increment 1 would increase hydroperiods by 15 to 60 days along the eastern perimeter of NESRS and increase hydroperiods by 15 to 30 days within Western SRS, downstream of S-12D relative to base conditions. Reference **Section 4.5.1.1**.

The Increment 1 EA and FONSI (dated May 27, 2015) specified that S-197 would be operated consistent with the 2012 Water Control Plan during condition 1 and condition 2, when the WCA 3A stage was below the Increment 1 Action Line. Under condition 3 and condition 4, when the WCA 3A stage was above the Increment 1 Action Line, additional criteria were used which prescribe small discharges expected to assist in moderating high stages within the C-111 Canal through use of S-197 discharges. The additional S-197 gate openings ranged from 50 to 200 cfs based upon S-178 TW stage between 2.5-2.9 feet, NGVD (note: these stages correspond to approximately 2.4-2.8 feet, NGVD at the S-18C headwater) when the S-18C gates are out of the water. An analysis was performed within the Increment 1 EA (dated May 27, 2015) to evaluate

the potential increase in S-197 discharges relative to the 2012 Water Control Plan. Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency of S-197 discharges under Increment 1 increased from 14 days under the 2012 Water Control Plan to a range of 39 to 82 days (timing unchanged) under Increment 1 (USACE 2015). Reference **Section 4.5.1.2**. The total volume of S-197 discharges increased from 18,000 acre-feet under the 2012 Water Control Plan to a range of 20,000 to 30,000 acre-feet. Potential minor adverse impacts associated with salinity fluctuations under the continued implementation of Increment 1, would be temporary and spatially limited to nearshore areas within the southern estuaries. Manatee Bay and Barnes Sound are relatively large bodies of water with open connections to Card Sound and the Atlantic Ocean. Waters within Manatee Bay and Barnes Sound have been documented to have shorter residence times and experience more tidal flushing relative to northeastern Florida Bay (Marshall 2014).

It should be noted, that hydrologic modeling was not completed to support the Increment 1 EA and FONSI (dated May 27, 2015) but as referenced in **Section 4.5.1.2**, hydrologic modeling developed for the recent ESA consultation for ERTTP indicated that Increment 1 would result in a slight decrease in average annual release volume from S-197 compared to base conditions (*i.e.* ERTTP) (16,640 acre-feet for Increment 1, compared to 17,130 acre-feet for ERTTP); less than that predicted within the analysis completed for the Increment 1 EA. The historical data assessed for the previous EA was very limited due to the necessity to consider only the period coincident with SFWMD operation of the C-111 Spreader Canal Project's S-199 and S-200 pump stations, and these results may not be representative of longer-term trends.

#### **4.8.1 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

Alternative D and Alternative E would result in similar effects on fish and wildlife resources. Alternative D is expected to provide minor beneficial effects on fish and wildlife resources within ENP by increasing flows to NESRS. Alternative D is expected to provide a greater magnitude of increase relative to Alternative E as Alternative D has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD contingent upon downstream constraints. Alternative D would likely show a slightly higher beneficial effect on fish and wildlife resources within the project area depending on location and species. Improved hydroperiods would increase forage prey availability (*i.e.* crayfish and other invertebrates, fish), providing a direct benefit for amphibian, reptile, small mammal and wading bird species within ENP. Inclusion of the 'high water strategy' developed by the Corps to mitigate for the increased frequency and duration of WCA 3A high water stages associated with the expanded closure periods of the WCA 3A control structures beyond their current restrictions, is expected to help prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities.

Potential effects to fish and wildlife resources inhabiting mangrove habitats and seagrass beds within the coastal estuaries under Alternative D would be similar to that as discussed under Alternative E as a result of the minor to moderate increases in the frequency and duration of low-

volume (less than 500 cfs) S-197 discharges to Manatee Bay/Barnes Sound. Significant impacts to fish and wildlife resources as a result of implementation of the Proposed Action are not expected due to the short duration of the operational modifications being considered.

#### **4.8.2 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The operational criteria governing inflows to NESRS for Alternative E are the same as the No Action Alternative; therefore the hydrologic effects within NESRS will be similar. Updated hydrologic modeling was completed to support recent ESA consultation for ERTTP. Model simulation INCR1B can be utilized to provide the long term hydrologic effects for Alternative E. Although the L-29 Canal maximum operating limit (7.5 feet, NGVD) and the removal of the G-3273 constraint are the same, the stage duration curves for the L-29 Canal, the stage duration curve at G-3273, and the hydroperiod changes within NESRS for Alternative E demonstrate a minor improvement to NESRS compared to the No Action Alternative. Stage duration curves at the G-3273 monitoring gauge (**Figure 4-6**) indicate an average annual stage increase of approximately 0.1 feet for G-3273 for hydrologic conditions ranging from moderate wet to moderate dry, with no significant change to the frequency of extreme wet or extreme dry stages. A comparison of the average annual hydroperiod for the 1965-2005 period (**Figure 4-8**) indicates that Alternative E would increase hydroperiods by 5 to 15 days along the eastern perimeter of NESRS and decrease hydroperiods by 10 to 15 days within western SRS, downstream of S-12 D. A decrease in hydroperiods by 50 to 30 days and 0 to 5 days were observed within northern and southern portions of CSSS-A habitat, respectively within western SRS. Reference **Section 4.5.3.1**.

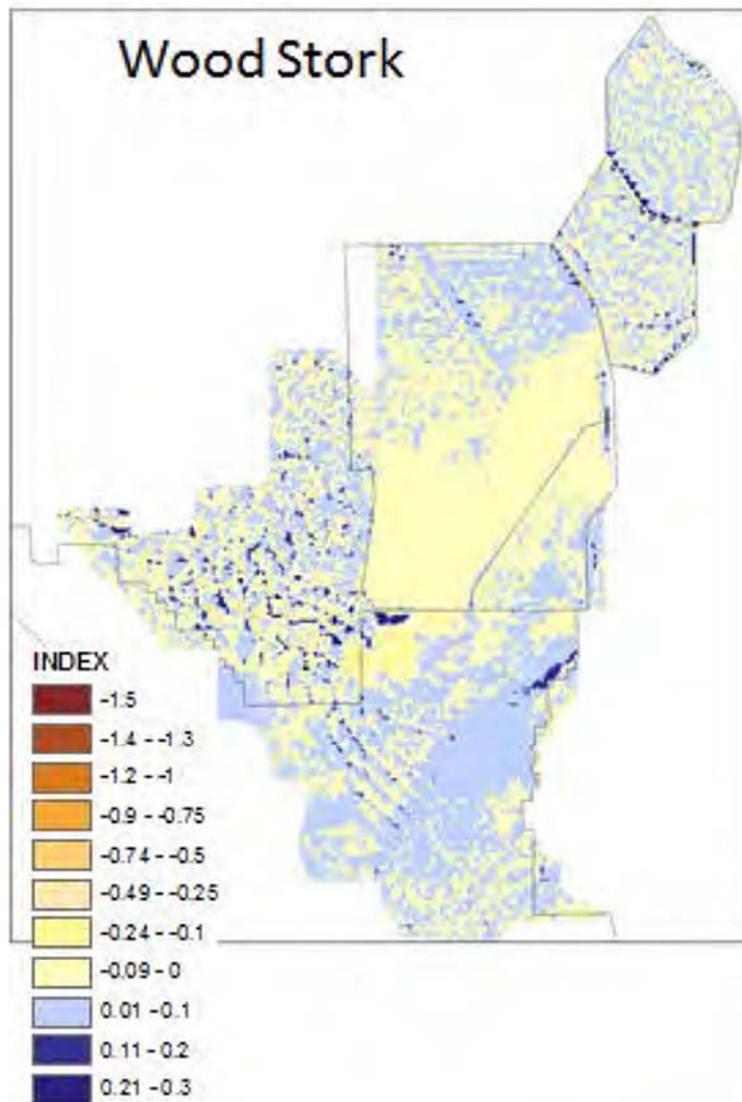
Alternative E may have a temporary minor beneficial effect on fish and wildlife resources within NESRS. Flows through NESRS under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Improved hydroperiods would directly benefit aquatic invertebrates within the project area. Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative E. Shifts from one vegetation type to another may occur in a relatively short time frame (1 to 4 years) following hydrological alteration (Armentano et al. 2006, Zweig 2008, Zweig and Kitchens 2008, Sah et al. 2008). Submerged aquatic plants are commonly associated with sloughs providing structure for growth of periphyton, the main source of primary production within the freshwater Everglades (Gunderson 1994; Powers 2005) and a primary component of invertebrate diets.

Crayfish are important components within the Everglades food web, serving as primary dietary components of higher trophic level species including fish, amphibians, alligators, wading birds and mammals such as raccoons and river otters (Kashan and Kushlan 1979). Crayfish species composition and abundance within the Greater Everglades are linked to hydroperiod. Increases in hydroperiod associated with implementation of Alternative E may provide temporary, minor beneficial effects to crayfishes within areas of NESRS as well as Taylor Slough, as a result of operational modifications to provide supplemental flows to this area.

Increases in forage prey availability (*i.e.* crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species. Abrupt increases in water levels during nesting, termed reversals, may cause wading bird nest abandonment, re-nesting, late nest initiation, and poor fledging success. Potential wading bird colony abandonment due to artificial reversals at the end of the dry season/start of the wet season is not anticipated as a result of Alternative E.

The hydrologic effects for western SRS and WCA 3A are affected by the modified closure regime for the S-12A and S-12B structures considered under Alternative E. It should be noted, that the modeling conducted for ESA consultation (R1B and INCR1B) did not include the high water strategy for October and November that was developed by the Corps to limit the duration of WCA 3A high water stages during the late wet season. Intra-annual stage hydrographs were generated for the average daily stage (**Figure 4-8**) to characterize the effects of Alternative E on WCA 3A water levels. Average water levels across WCA 3A are increased by 0.0-0.1 feet during the months of January through September and December. Average water levels across WCA 3A are increased by 0.20-0.25 feet during the months of October and November, without consideration of the WCA 3A high water criteria that are included in Alternative E.

Fish and wildlife resources within WCA 3A would not be expected to be significantly affected with implementation of Alternative E. Alternative E includes a seasonally varying WCA 3A water level of 10.0 to 10.75 feet NGVD (*i.e.* Increment 1 Action Line), as measured by the three gage average, which will continue to be used to define the priority of releases from S-333 and S 356 to the L-29 Canal and NESRS consistent with the No Action Alternative. Implementation of the Increment 1 Action Line (**Figure 2-11**) to manage high water conditions in WCA 3A, would help to prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities. Prolonged inundation periods are of particular concern for mammals dependent on upland habitat, particularly for deer populations within northern WCA 3A that utilize tree islands for refugia. Potential adverse effects to small mammals resulting from elimination or modification of upland habitat are not expected under the Proposed Action. A potential loss of foraging conditions for wading birds within WCA 3A as a result of increased stages and/or potential effects on recession rates would potentially be offset by increased foraging opportunities gained within NESRS. **Figure 4-19** displays the mean difference in wood stork foraging conditions expected to occur as a result of the implementation of INCR1B as modeled under ESA consultation for ERTTP within the action area relative to base conditions (ECB16). The model results display no overall significant change in foraging conditions in WCA 3A under INCR1B.



**FIGURE 4-19. MEAN DIFFERENCE IN WOOD STORK FORAGING CONDITIONS FOR INCR1B RELATIVE TO ERTP BASE CONDITIONS (ECB16)**

Additional low volume freshwater releases from S-197 (less than 500 cfs) and potential increases in structural discharges from the L-31N Canal considered under Alternative E would not be sufficient to affect mangrove and seagrass habitats within the coastal estuaries (**Section 4.7.2.9** and **Section 4.7.2.10**). Mangrove habitats provide food and refuge to a large variety of species. Seagrass habitats are heavily utilized by both juvenile and adult fishes and invertebrates for feeding and shelter. Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Significant effects to fish and wildlife resources with eastern Florida Bay, Biscayne Bay, and Manatee Bay and Barnes Sound are not anticipated as a result of the test.

## 4.9 THREATENED AND ENDANGERED SPECIES

### 4.9.1 FEDERALLY PROTECTED SPECIES

Effects determinations for federally threatened and endangered species within the project area are listed in **Table 4-1**. The Corps reinitiated ESA consultation on ERTTP on November 17, 2014 as a result of an exceedance of an Incidental Take Reinitiation Trigger from the November 17, 2010 ERTTP BO for the CSSS (Reference **Section 1.3.6**). USFWS issued a Jeopardy BO for ERTTP on July 22, 2016, developed in formal ESA consultation with the Corps. The RPA specifies that the Corps shall proceed as scheduled for completing NEPA analysis on Increment 1 Plus (referred to as Increment 1.2 within the operational strategy) and, as allowable by law, raising L-29 Canal levels up to 7.8 feet NGVD prior to March 1, 2017. There has been no change in the operational intent of the Proposed Action that would require the need to re-initiate consultation with the USFWS since the completion of prior resource agency consultation under ERTTP. Increment 1.1 and 1.2 meets the intent of the proposed BO operational changes for the WCA 3A control structures and the expanded operational changes within the SDCS. Correspondence dated November 23, 2016 has been provided to the USFWS requesting concurrence on species determinations listed in **Table 4-1**, noting that the conclusion of ESA consultation on the Proposed Action presented within this EA is previously covered under the 2016 ERTTP BO. The USFWS concurred with this assessment by correspondence dated December 7, 2016. Reference **Appendix D** for pertinent correspondence. Upon completion of an assessment for species under NMFS purview it was determined that the Proposed Action would have no effect on these species; therefore, consultation with NMFS was not necessary.

**TABLE 4-1. FEDERALLY THREATENED AND ENDANGERED SPECIES WITHIN THE PROJECT AREA AND SPECIES DETERMINATION FOR THE PROPOSED ACTION**

Common Name	Scientific Name	Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
<b>Mammals</b>					
Florida panther	<i>Puma concolor coryi</i>	E			X
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH			X
Florida bonneted bat	<i>Eumops floridanus</i>	E		X	
<b>Birds</b>					
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	E, CH		X	
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E, CH		X	
Piping plover	<i>Charadrius melodus</i>	T			X
Red-cockaded woodpecker	<i>Picoides borealis</i>	E			X

Roseate tern	<i>Sterna dougallii</i>	T			X
Wood stork	<i>Mycteria Americana</i>	T		X	
<b>Reptiles</b>					
American Alligator	<i>Alligator mississippiensis</i>	T, SA			X
American crocodile	<i>Crocodylus acutus</i>	T, CH			X
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T			X
Gopher tortoise	<i>Gopherus polyphemus</i>	C			X
Green sea turtle	<i>Chelonia mydas</i>	E			X
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E			X
Kemp's Ridley sea turtle*	<i>Lipodochelys kempii</i>	E			X
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E			X
Loggerhead sea turtle	<i>Caretta</i>	T			X
<b>Fish</b>					
Smalltooth sawfish	<i>Pristis pectinata</i>	E			X
<b>Invertebrates</b>					
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	E			X
Elkhorn coral	<i>Acropora palmata</i>	T, CH			X
Florida leafwing butterfly	<i>Anaea troglodyta floridalis</i>	E			X
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	E			X
Schaus swallowtail butterfly	<i>Heraclides aristodemus ponceanus</i>	E			X
Staghorn coral*	<i>Acropora cervicornis</i>	T, CH			X
Stock Island tree snail	<i>Orthalicus reses</i> (not incl. <i>nesodryas</i> )	T			X
<b>Plants</b>					
Crenulate lead plant	<i>Amorpha crenulata</i>	E			X
Deltoid spurge	<i>Chamaesyce deltoidea</i> spp. <i>deltoidea</i>	E		X	
Garber's spurge	<i>Chamaesyce garberi</i>	T		X	
Johnson's seagrass	<i>Halophila johnsonii</i>	E, CH			X
Okeechobee gourd	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeenis</i>	E			X
Small's milkpea	<i>Galactia smallii</i>	E		X	
Tiny polygala	<i>Polygala smallii</i>	E		X	

Big pine partridge pea	<i>Chamaecrista lineata</i> var. <i>keyensis</i>	E			X
Blodgett's silverbush	<i>Argythamnia</i> <i>blodgettii</i>	T			X
Cape Sable thoroughwort	<i>Chromolaena frustrata</i>	E, CH			X
Carter's small-flowered flax	<i>Linum carteri</i> var. <i>carteri</i>	E, CH			X
Everglades bully	<i>Sideroxylon</i> <i>reclinatum</i> spp. <i>austrofloridense</i>	C			X
Florida brickell-bush	<i>Brickellia mosieri</i>	E, CH			X
Florida bristle fern	<i>Trichomanes</i> <i>punctatum</i> spp. <i>floridanum</i>	E			X
Florida semaphore cactus	<i>Consolea corallicola</i>	E, CH			X
Sand flax	<i>Linum arenicola</i>	E			X

E=Endangered; T=Threatened; CH=Critical Habitat; Candidate Species

#### 4.9.2 STATE LISTED SPECIES

Implementation of the Proposed Action would not result in significant impacts to state listed species (**Table 4-2**). Impacts to state listed species would be similar to those outlined for fish and wildlife resources in **Section 4.8**.

**TABLE 4-2. STATE LISTED SPECIES WITHIN THE PROJECT AREA AND SPECIES DETERMINATION FOR THE PROPOSED ACTION**

Common Name	Scientific Name	Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
Mammals					
Florida black bear	<i>Ursus americanus</i> <i>floridanus</i>	T			X
Everglades mink	<i>Mustela vison</i> <i>evergladensis</i>	T			X
Florida mouse	<i>Podomys floridanus</i>	SC			X
Florida mastiff bat	<i>Eumops glaucinus</i> <i>floridanus</i>	E			X
Birds					
Piping plover	<i>Charadrius melodus</i>	T			X
Snowy plover	<i>Charadrius alexandrinus</i>	T			X

American oystercatcher	<i>Haematopus palliatus</i>	E			X
Brown pelican	<i>Pelecanus occidentalis</i>	SC			X
Black skimmer	<i>Rynchops niger</i>	SC			X
Least tern	<i>Sterna antillarum</i>	T			X
White-crowned pigeon	<i>Columba leucocephalus</i>	T			X
Least tern	<i>Sterna antillarum</i>	T			X
Limpkin	<i>Aramus guarauna</i>	SC			X
Little blue heron	<i>Egretta caerulea</i>	SC		X	X
Tricolored heron	<i>Egretta tricolor</i>	SC		X	X
Snowy egret	<i>Egretta thula</i>	SC		X	X
Reddish egret	<i>Egretta rufescens</i>	SC			X
White ibis	<i>Eudocimus albus</i>	SC		X	
Roseate spoonbill	<i>Ajaja</i>	SC			X
Fish					
Mangrove rivulus	<i>Rivulus marmoratus</i>	SC			X
Invertebrates					
Miami blue butterfly	<i>Cyclargus</i> [= <i>Hermiargus</i> ] <i>thomasi</i> <i>bethunebakeri</i>	E			X
Florida tree snail	<i>Liguus fasciatus</i>	SC			X
Plants					
Pine-pink orchid	<i>Bletia purpurea</i>	T			X
Lattace vein fern	<i>Thelypteris reticulata</i>	E			X
Eatons spikemoss	<i>Selaginella eatonii</i>	E			X
Wright's flowering fern	<i>Anemia wrightii</i>	E			X
Tropical fern	<i>Schizaea pennula</i>	E			X
Mexican vanilla	<i>Manilla mexicana</i>	E			X

E=Endangered; T=Threatened; SC=Species of Special Concern

#### 4.10 ESSENTIAL FISH HABITAT

Implementation of the No Action Alternative, Alternative D, and Alternative E are not expected to adversely affect Essential Fish Habitat. Mangrove habitats provide food and refuge to a large variety of species (SAFM 1998). These species include: spiny lobsters, pink shrimp, snook (*Centropomus undecimalis*), goliath grouper (*Epinephelus itajara*), tripletail (*Lobotes surinamensis*), leatherjack (*Oligoplites saurus*), gray snapper (*Lutjanus griseus*), dog snapper (*L. jocu*), sailor's choice (*Haemulon parra*), bluestriped grunt (*H. sciurus*), sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*) and red drum (SAFM 1998). Low volume freshwater releases from S-197 considered under the No Action Alternative, and Alternatives D and E would not be sufficient to affect mangrove habitats within the coastal estuaries (**Section 4.7**) due to the limited duration and limited extent of operational changes at S-197 being considered.

Seagrass habitats are heavily utilized by both juvenile and adult fishes and invertebrates for feeding and shelter (SAFM 1998). Species that depend on seagrass habitats include the penaeid pink and brown shrimp, and spiny lobster (SAFM 1998). Seagrass performs as an important nursery habitat

for red drum, snook (*Centropomus undecimalis*), bonefish (*Albula vulpes*), tarpon (*Megalops atlanticus*) and several species of snapper and grouper, and is critical to the health of a number of commercial and recreational fisheries (SAFM 1998). Significant impacts to seagrass beds within the coastal estuaries are not expected due to the limited duration and limited extent of operational changes at S-197 being considered under the No Action Alternative and Alternatives D and E. Seagrasses have an optimum salinity range of 24 to 35 psu, but can tolerate considerable short-term salinity fluctuations (**Section 4.7**).

There are no coral reefs or hard bottom communities located within the proposed project area or the nearshore waters affected by the project. Corals found within Florida Bay and Biscayne Bay are outside the area of potential effect.

## 4.11 WATER QUALITY

### 4.11.1 ALTERNATIVE A: NO ACTION ALTERNATIVE

Water deliveries to ENP and NESRS are subject to the water quality limit for TP contained in Appendix A of the 1991 Everglades Settlement Agreement. Appendix A compliance is currently assessed by comparing the long term limit (LTL) against the 12-month flow weighted mean (FWM) TP concentration in ppb, calculated using the measured total annual flows from the S-12A, S-12B, S-12C, S-12D, and S-333 (S-333 flows expressed as S-333 minus S-334) structures that distribute flows from WCA 3A into SRS. The LTL equation from the Appendix A has an inverse relationship with flow: as flow into SRS increases, the LTL gradually falls until reaching 7.6 ppb for flow volumes equal or greater than  $1,061 \times 10^3$  AF per year. Although the effect of the Increment 1 test is largely to redistribute existing flows, with respect to the Appendix A LTL, Increment 1 operations are expected to result in higher flow volumes through the S-333 structure, lower flow volumes through the S-334 structure, and moderately lower flow volumes through the S-12D structure. In view of known patterns of TP concentrations across inflow structures, it is anticipated that these flow changes are likely to cause some increase in the FWM TP concentration and a decrease in the associated LTL due to increased flow volumes. Given that the FWM TP concentration has been at or just below the LTL for four of the past seven years, it is possible that Increment 1 test operations will increase the risk of exceeding the LTL limit. At present, TP concentrations measured at the S-356 pump station are not included in the Appendix A calculation. However, the TOC is continuing to determine how this structure will be incorporated in future Appendix A calculations. Currently it will be reported provisionally until the exact methods is determined. For the first year of testing the S-356 yielded favorable water quality monitoring results with a flow weighted mean of 6 ppb total phosphorus (October 15, 2015 through January 2016) using the SFWMD calculation method used for Settlement Agreement compliance calculations.

S-356 flows are in compliance with the FDEP/SFWMD proposed annual guidelines for the first year of testing and are likely to be in compliance with the multi-year compliance assessment methodology for flows entering ENP, an Outstanding Florida Water (OFW). The proposed S-356 OFW compliance criteria are FWM TP concentration no greater than 11 parts per billion (ppb) on an annual basis and no greater than 9 ppb on a three-year average annual basis. The Increment 1 EA and FONSI (dated May 27, 2015) estimated a 10 to 20 percent increase in the frequency of exceedance of the Appendix A LTL for flows entering ENP at the L-29 Canal compared to the 2012 Water Control Plan (USACE 2015). No adverse impact to water quality conditions in WCA

3A, WCA 3B, the L-30 Canal, L-31N Canal, or C-111 Basins were predicted with Increment 1. Significant changes in the potential for mercury methylation or bioaccumulation of mercury by aquatic species in ENP or WCA 3A and WCA 3B were not expected.

Water quality monitoring and analyses during Increment 1 testing will be used to help identify potential changes to the operating rules that could increase the probability of water quality compliance for additional flows entering NESRS. A water quality assessment will be evaluated at the S-356 pump station in accordance with the FDEP test authorization to conduct Increment 1 testing. Concurrently, compliance with the LTL will be determined in accordance with the Settlement Agreement Appendix A requirements on an annual basis during Increment 1 testing. Operating plan changes resulting from the S-356 water quality assessment, if needed because of Increment 1 operations, would be implemented only after the conclusion of the Increment 1 test period. During Increment 1 test operations (to include Increment 1.1 and Increment 1.2), the Corps does not plan to impose operational constraints for water quality that could restrict or otherwise limit inflows to NESRS. Water quality conditions in the vicinity of the L-29 Canal and L-31N Canal might be affected by implementation of the project.

#### **4.11.2 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The operation of S-328 will be added to Increment 1.1 and 1.2. This will allow S-332D flows to directly enter the L-31W Canal which is directly adjacent to ENP, an Outstanding Florida Water. Whether this new discharge will be included in the Settlement Agreement compliance calculation will be evaluated by the Technical Oversight Committee. It is likely that this new flow input to the ENP will be low in phosphorus but there is a potential for nutrient spikes during initial discharges after a dry out period. On the other hand, periodic dry out conditions favor the periphyton that can quickly uptake phosphorus in the water column to levels below 10ppb. Monitoring will be conducted to characterize the water quality of these new discharges into the ENP. The S-328 structure will be closely monitored during startup operations to ensure no adverse water quality impacts occur as a result of S-328 flows. The water quality at the S-328 intake area would be sampled before initially opening the S-328. As operations proceed and water quality data is obtained and evaluated, the operational regime would be adjusted if necessary to manage potential water quality concerns. The monitoring plan for this new inflow to the ENP is currently being developed by the SFWMD in conjunction with ENP and FDEP, in support of the SFWMD initiative to increase flows to Taylor Slough and Florida Bay and the monitoring plan will be the responsibility of SFWMD. Pending concurrence with the monitoring regime by these agencies and the Corps, the preliminary S-328 operational criteria identified in the operational strategy (**Appendix A**) will be included within Increment 1.1 and 1.2. Prior to initial operation of S-328, construction of the three L-31W Canal plugs proposed between S-328 and the L31W gap must be completed and the monitoring regime approved by the Corps must be implemented.

#### **4.11.3 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH**

## **OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The operation of S-328 will be added to Increment 1.1 and 1.2. This will allow S-332D flows to directly enter the L31W which is directly adjacent to the ENP, a designated OFW. Whether this new discharge will be included in the Settlement Agreement compliance calculation needs to be evaluated by the Technical Oversight Committee. It is likely that this new flow input to the ENP will be low in phosphorus but there is a potential for nutrient spikes during initial discharges after a dry out period. On the other hand, periodic dry out conditions favor the periphyton that can quickly uptake phosphorus in the water column to levels below 10ppb. Monitoring will need to be conducted to characterize the water quality of these new discharges into the ENP to determine if the current compliance monitoring point (S-332D) needs to be shifted to or include the S-328 flows. The S-328 structure will be closely monitored during startup operations to ensure no adverse water quality impacts occur as a result of S-328 flows. The water quality at S-328 intake area would be sampled current concept is that the water quality at the S-328 intake area would be sampled before initially opening the S-328. As operations proceed and water quality data is obtained and evaluated, the operational regime would be adjusted if necessary to manage potential water quality concerns. The monitoring plan for this new inflow to the ENP is currently being developed by the SFWMD in conjunction with ENP and FDEP, in support of the SFWMD initiative to increase flows to Taylor Slough and Florida Bay, and the monitoring plan will be the responsibility of SFWMD. Pending concurrence with the monitoring regime by these agencies and the Corps, the preliminary S-328 operational criteria identified in the operational strategy (**Appendix A**) will be included within Increment 1.1 and 1.2. Prior to initial operation of S-328, construction of the three L-31W Canal plugs proposed between S-328 and the L31W gap must be completed and the monitoring regime approved by the Corps must be implemented.

### **4.12 NATIVE AMERICANS**

As part of the development of this project consultation has occurred between the Corps and the two federally recognized tribes within the immediate area of potential effect. Letters requesting government-to-government consultation were sent to both the Miccosukee and Seminole Chairmen on May 27, 2016 (**Appendix D**). In addition, presentations and face-to-face meetings were conducted as well as email and phone correspondence with tribal government staff members to brief them on the project development and to discuss issues of concern with each tribe. The following evaluations are designed to assess potential impacts to Native American lands discussed in Section 3.13. The reader should note that Native American concerns extend beyond physical impacts to their lands and, as such, considerations have taken into account discussions and consultations that have occurred with federally recognized tribes. This includes letters requesting government-to-government consultation on E RTP dated February 24, 2016.

#### **4.12.1 ALTERNATIVE A: NO ACTION ALTERNATIVE**

Continued implementation of Increment 1 will have no effect to Tribal properties. Affiliated non-Federally recognized tribes located along Tamiami Trail are of sufficient elevation that increased water flows will have no effect as described in the Increment 1 EA and FONSI (dated May 27, 2015) (USACE 2015). The ability for increased flows out of WCA 3A has the potential to alleviate concerns associated with excessive high water elevations and offers flexibility to provide

additional outlets for water removal. However, any changes to the system are a priority concern for both Federally-recognized tribes as their cultures remain interconnected to the Everglades.

#### **4.12.1 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The implementation of Alternative D is not anticipated to effect Tribal lands. Although the increased closure period of structures S-12A/B, S-343A/B, and S-344 may increase water levels within WCA 3 between 0.01 and 1.57 inches compared to Increment 1 (Reference **Section 4.13**), the relaxation of the G-3273 stage constraint and the L-29 Canal stage maximum operating limit of 7.5 feet NGVD, will allow for increased water flows in NESRS and help alleviate high water level issues that are associated with tribal lands within WCA 3. In addition, Alternative D also includes a ‘high water strategy’ criteria to mitigate for the increased frequency and duration of WCA 3A high water stages in excess of the 90th percentile of historical water stages (compared to the 2012 Water Control Plan) associated with the expanded closure periods. Water levels in WCA 3 should remain consistent within the ranges expected under ERTTP with the implementation of Alternative D.

#### **4.12.2 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The implementation of Alternative E would see similar affects to Tribal lands compared with Alternative D; however, Alternative D would potentially cause higher water levels in WCA3 due to maintaining the L-29 Canal stage at 7.5 feet NGVD. The increased closure period of structures S-12A/B, S-343A/B, and S344 may increase water levels within WCA3 between 0.01 and 1.57 inches compared to Increment 1 as discussed above. Although Alternative E includes some mitigation of higher water levels in WCA 3 by relaxing the G-3273 stage constraint and inclusion of a ‘high water strategy’ criteria, Alternative E will provide less water flows into NESRS to help alleviate high water level issues that are associated with tribal lands within WCA3. Therefore, water levels within WCA 3 may be higher with the implementation of Alternative E than the No Action Alternative and Alternative D by not providing for the maximum outlet of water by relaxing the L-29 Canal stage maximum operating limit of 7.5 feet NGVD.

### **4.13 CULTURAL RESOURCES**

As part of consideration of effects, the Corps has been actively consulting with interested parties in conjunction with its obligation under Section 106 of the National Historic Preservation Act (NHPA) and the Everglades Restoration Transition Plan Programmatic Agreement (PA). Within these consultation events, information has been sought to determine what if any effects the project could have on previously identified cultural resources located within the area of potential effects (Reference **Appendix D**). Consultation has occurred between the Corps, the State Historic Preservation Officer (SHPO), appropriate Federally-recognized tribes, Everglades National Park,

the Bureau of Indian Affairs, and the Advisory Council on Historic Preservation (ACHP) as signatories of the ERTTP PA. Letters requesting consultation on potential effects to cultural resources were sent to the Seminole Tribal Historic Preservation Office (THPO), the Miccosukee Tribal Representative, and the SHPO on November 11, 2016. A letter requesting information on potential effects within ENP was sent to the park Superintendent on October 18, 2016. In addition, presentations and face-to-face meetings were conducted, as well as email and phone correspondence with state, federal, and tribal government staff members to brief them on the project development and to discuss issues of concern. Formal letters requesting concurrence of the Corps' determination of no adverse effect to historic properties was sent to the SHPO, Seminole THPO, Miccosukee Tribal Representative, and the ENP Superintendent on December 15, 2016. The SHPO concurred with the Corps determination of no adverse effect in a letter dated January 31, 2017 and the Seminole THPO indicated "no objections to the project" in a letter dated February 3, 2017 (**Appendix D**). The Corps has not received formal comments from ENP or the Miccosukee Tribal Representative regarding the determination of no adverse effect to historic properties.

In conjunction with this effort, multiple lines of research were conducted as part of the analysis of the proposed alternatives. To better understand potential effects associated with the Action Alternatives (D and E), an examination of tree islands and associated cultural resources that are currently monitored within the Everglades Depth Estimation Network (EDEN) network as part of the ERTTP PA was performed. The use of this data is warranted as it is a common factor that most, if not all of the known archaeological sites are located on such tree islands thus creating relationship within effects to tree islands and the cultural resources contained within them. This research builds on previously existing information gathered as part of the ERTTP PA and the Increment 1 EA and FONSI (dated May 27, 2015).

Based on the constraints of both Action Alternatives, effects to tree islands and their associated cultural resources within WCA 3 would be a result of the increased closure period of structures S-12A/B, S-343A/B, and S344. Additionally, effects to tree islands and their associated cultural resources in ENP would be a result of the relaxation of the L-29 Canal stage maximum operating limit constraint of 7.5 feet NGVD. Both Action Alternatives could result in slight increases in water levels compared to the effects from the ERTTP and Increment 1 water control plans; as such, the greatest difference between existing conditions and the effects of the Action Alternatives would be the potential overtopping of tree islands that do not seasonally inundated historically. Therefore, an analysis of those tree islands that are not subject to periodic inundation was warranted.

The first step in the analysis was to determine past water elevations based on the EDEN network and to determine if tree islands were inundated using a period of record from 1965 to 2005. Next this data was correlated with water elevations during the 2002-2012 period of IOP regulation schedule to identify a subset of tree islands that have not been subjected to past flooding events. A total of 394 tree islands are located within the current area of potential effects, of these, 66 tree islands have not been overtopped by water since the 2002 implementation of IOP. Using data collected from the EDEN network, the RSM-GL hydrologic modeling discussed in Section 2.1.1 of this EA, and the observed data from the 2016 Temporary Emergency Deviation, these 66 tree islands and their corresponding 53 cultural resources were analyzed.

Within WCA 3, RSM-GL hydrologic modeling (INCR1B) was utilized to predict anticipated water levels. For the 28 tree islands and 16 associated cultural resources located within WCA 3A the baseline IOP observed water elevations was compared with modeled data from gages throughout WCA 3. Each tree island was correlated to the closest modeled gage to determine predicted effects of water levels. Using the observed IOP yearly averages and the predicted model yearly averages, each of the 28 tree island in WCA 3 was graphed to determine in the predicted water elevations would exceed previously observed water levels. Results of this analysis determined that water levels would increase between 0.01 to 0.17 inches in northern WCA 3 and between 0.52 to 1.57 inches in southern WCA 3 as a result of the Action Alternatives when compared to Increment 1. However, the modeling does not account for the relaxation of the L-29 Canal stage maximum operating limit of 7.5 feet NGVD and the ‘high water strategy’ which would allow for increased flow into NESRS and mitigate the increase in water levels in WCA 3. Therefore, this analysis indicates the maximum water levels that would be observed as a result of the Action Alternatives. Actual water levels would likely be lower than those modeled results. Evaluation of the tree islands in WCA 3 indicated that tree islands that have not been subject to seasonal inundation historically, will not be inundated as a result of the Increment 1.1 and 1.2.

Within ENP, observed data from the previous 2016 Temporary Emergency Deviation was utilized to predict anticipated water levels that would result from the Action Alternatives. For the 38 tree islands and 37 associated cultural resources located within ENP, the baseline IOP water elevations collected from the EDEN network was compared to the water elevations observed at those tree islands when the L-29 Canal was at or near 7.8 feet NGVD. Based on historic data collected from 2002-2016, the L-29 Canal has reached a stage of 7.8 feet NGVD 103 times. This data was averaged and graphed for each of the 38 tree islands in ENP to determine if the maximum predicted water elevations would exceed previously observed water levels. Results of this analysis determined that maximum water levels at tree islands within ENP were generally consistent with the maximum water levels observed during IOP. Additionally, tree islands that have not been subject to seasonal inundation historically will not be inundated as a result of raising the canal stage to 7.8 feet NGVD.

#### **4.13.1 ALTERNATIVE A: NO ACTION ALTERNATIVE**

Continued implementation of Increment 1 will have no adverse effect on cultural resources. During Increment 1, the Corps undertook a review of water elevations provided by the EDEN network in relation to overtopping of tree islands within ENP (USACE 2015). The No Action Alternative was previously consulted upon and consultation history can be found within the Increment 1 EA and FONSI (dated May 27, 2015) (USACE 2015).

#### **4.13.1 ALTERNATIVE D: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.8 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The implementation of Alternative D is not anticipated to adversely affect historic properties eligible of potentially eligible for listing in the NRHP based on the above referenced modeling of tree islands and the archaeological sites that are associated with them. Although the increased closure period of structures S-12A/B, S-343A/B, and S344 may increase water levels within WCA

3 between 0.01 and 1.57 inches compared to Increment 1, the relaxation of the G-3273 stage constraint and the L-29 Canal stage maximum operating limit of 7.5 feet NGVD, will allow for increased water flows in NESRS and help alleviate potential high water levels within WCA 3. In addition, Alternative D also includes a ‘high water strategy’ criteria to mitigate for the increased frequency and duration of WCA 3 high water stages in excess of the 90th percentile of historical water stages (compared to the 2012 Water Control Plan) associated with the expanded closure periods. Water levels in WCA 3 should remain consistent within the ranges expected under E RTP with the implementation of Alternative D.

Effects of Alternative D within ENP are based on increased water flows as a result of the relaxation of the G-3273 stage constraint, raising of the L-29 operating limit to 7.8 feet NGVD, and the ‘high water strategy’. Although ENP will experience greater water volumes as a result of this operational change, the maximum water levels at tree islands within ENP were generally consistent with the maximum water levels observed during IOP. Based on observed data from the previous 2016 Temporary Emergency Deviation, tree islands that have not been subject to seasonal inundation historically will not be inundated as a result of raising the canal stage to 7.8 feet NGVD.

#### **4.13.1 ALTERNATIVE E: RELAXATION OF G-3273 STAGE CONSTRAINT AND L-29 CANAL UP TO 7.5 FEET NGVD PLUS SEASONAL CLOSURES FROM 01 OCTOBER THROUGH 15 JULY (S-12A/B, S-343A/B, S-344) WITH OPERATIONAL CHANGES TO SOUTH DADE AND EXIT STRATEGY FOR WCA 3A**

The implementation of Alternative E would see similar affects to historic properties compared with Alternative D; however, Alternative D would potentially cause higher water levels in WCA 3 due to maintaining the L-29 Canal stage at 7.5 feet NGVD. The increased closure period of structures S-12A/B, S-343A/B, and S344 may increase water levels within WCA 3 between 0.01 and 1.57 inches compared to Increment 1 as discussed above. Although Alternative E includes some mitigation of higher water levels in WCA 3 by relaxing the G-3273 stage constraint and inclusion of a ‘high water strategy’ criteria, Alternative E will provide less water flows into NESRS to help alleviate high water levels within WCA 3. Therefore, water levels within WCA 3 may be higher with the implementation of Alternative E than the No Action Alternative and Alternative D by not providing for the maximum outlet of water by relaxing the L-29 Canal stage maximum operating limit of 7.5 feet NGVD.

Effects of Alternative E within ENP will be similar to those observed during the No Action Alternative and less than those expected by the implementation of Alternative D, due to the maintenance of the L-29 Canal stage at 7.5 feet NGVD. Water levels at tree islands and their associated cultural resources would be similar to those experienced during the previous operational strategies.

#### **4.14 AIR QUALITY**

Air quality conditions within the project area are in compliance under the No Action Alternative. Air quality within the project area would not be expected to change from current conditions. Air quality emissions associated with continued implementation of the No Action Alternative would occur from continued operation of diesel powered pump stations (S-331, S-332B, S-332C, S-332D) related to C&SF operations. Diesel exhaust includes gaseous compounds (*e.g.*, carbon

dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogen compounds, sulfur compounds, and numerous low molecular-weight hydrocarbons) and contains fine particulate matter, PM<sub>2.5</sub>. Air quality within the project area as a result of implementation of Alternatives D and E is expected to be similar to that of the No Action. Potential impacts would be limited to the immediate vicinity of the associated pump stations which are located in remote rural areas. Air quality impacts are not expected to cause negative effects to human health. Potential impacts due to implementation of the Action Alternatives on air quality would be negligible.

As described in the EA and FONSI (dated May 27, 2015) during Increment 1, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations prior to the initiation of the field test (USACE 2015). The duration at which water stages within the L-29 Canal approach 7.5 feet, NGVD is expected to be greater under the No Action Alternative relative to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Alternative D is expected to provide a greater magnitude of increase relative to Alternative E as Alternative D has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD contingent upon downstream constraints. A potential decrease in drying event severity under Alternatives D and E relative to the No Action Alternative, if achieved, may result in reduced fire incidence within wetlands which should improve air quality; however the frequency of muck fires are primarily controlled by weather patterns within the area. Additional water being delivered to NESRS is also only expected to occur during the wet season when areas are already anticipated to be inundated.

#### **4.15 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES (HTRW)**

Implementation of the No Action Alternative, Alternative D, and Alternative E would not result in the discovery of HTRW since there is no excavation or other construction activities being considered. The project has a very low risk for increased mobilization of existing HTRW where it might exist within the study area. Increased operation of C&SF Project features will increase the frequency of diesel fuel delivery to pump stations.

#### **4.16 NOISE**

Noise levels within the project area would not be expected to change from current conditions with implementation of the No Action Alternative. Noise levels associated with implementation of the No Action Alternative would occur from continued operation of diesel powered pump stations (S-331, S-332B, S-332C, S-332D) related to C&SF operations (USACE 2015). Noise levels within the project area as a result of implementation of Alternatives D and E are expected to be similar to that of the No Action. Potential impacts would be limited to the immediate vicinity of the associated pump stations which are located in remote rural areas. Sound levels would decrease with distance from the pump stations due to attenuation. Noise levels are not expected to cause negative effects to human health. Potential impacts due to implementation of the Action Alternatives on noise levels would be negligible.

#### **4.17 AESTHETICS**

The continued implementation of Increment 1 has the potential for minor beneficial effects on aesthetics within ENP by increasing flows to NESRS relative to the 2012 Water Control Plan.

Alternative D and Alternative E consist of an operational change to the 2012 Water Control Plan and do not include construction of permanent structures or structural modifications to existing C&SF Project features. As such, the existing landscape profile would not be altered. Alternatives D and E would result in similar effects as the No Action Alternative. Alternative D is expected to provide a greater magnitude of increase as Alternative D has the ability to raise the for L-29 Canal stage maximum operating limit from 7.5 up to 7.8 feet, NGVD contingent upon downstream constraints. A potential increase in hydroperiods, if may contribute positively to maintaining a healthy and aesthetically pleasing ecosystem within ENP. Since Alternative D maintains the L-29 Canal stage slightly higher than Alternative E; Alternative D would likely show a slightly higher beneficial effect on aesthetic resources within NESRS. Potential increases in stage within WCA 3A as a result of implementation of early closures of the WCA 3A control structures beyond their current restrictions is not expected to result in significant impacts to aesthetics resources. Inclusion of the high water strategy within Alternatives D and E was developed to ensure no adverse effects to WCA 3A during extreme wet years.

#### 4.18 AGRICULTURE

The majority of agricultural activities within Miami-Dade County are located south of Tamiami Trail and directly east of ENP within and adjacent to the SDCS. The Increment 1 EA and FONSI, (dated May 27, 2015) acknowledged that water management operations may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA (USACE 2015). Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, Increment 1 included additional water management operating criteria for features of the SDCS (*i.e.* S-197) to mitigate for potential risks to flood protection for areas within South Dade which may be affected by a combination of the following water management factors during the Increment 1: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

During Increment 1 and the 2016 Temporary Emergency Deviation, the Corps learned information with respect to how 8.5 SMA and the SDCS respond to increased water levels in NESRS prior to the full build out of the MWD and C-111 South Dade Project features. Operational limitations of canals within 8.5 SMA, ongoing construction efforts, and remaining needed infrastructure all currently limit flowing additional water into NESRS. With one of the stated objectives of the Increment 1 field test being to improve hydrological conditions in NESRS through the relaxation of the G-3273 stage criteria to increase water deliveries from WCA 3A to NESRS, subject to constraints which include to maintain the authorized purposes of the MWD project and no reduction in current flood protection or mitigation, the Corps has extensively reviewed the 8.5 SMA performance which resulted from revised operational criteria used during the 2016 Temporary Emergency Deviation and subsequent recovery period; as a result of this review, revised 8.5 SMA operations are included under Alternatives D and E to address observed increases in ground and surface water within 8.5 SMA and adjacent lands.

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the Proposed Action and associated hydrologic monitoring. Alternatives D and E propose to generally lower the target operational ranges for the SDCS L-31N Canal compared to the No Action Alternative in order to facilitate the construction of C-111 South Dade Contract 8 and Contract 8A and provide increased operational flexibility to achieve the hydroperiod and nesting condition targets specified by the 2016 ERTF BO for the eastern CSSS subpopulations. The lowered target stages along L-31N (between G-211 and S-331, and S-331 to S-176) may provide a minor improvement to flood risk management within the South Dade basin, compared to the No Action Alternative. Furthermore, low volume releases from S-197 have been included as components of Alternatives D and E to mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County.

#### 4.19 RECREATION

Implementation of the No Action Alternative and Action Alternatives would not result in significant impacts to recreation. Inclusion of the high water strategy within Alternatives D and E was developed to ensure no adverse effects to WCA 3A during extreme wet years. The WCA 3A high water criteria for S-12 A and S-12 B referenced in **Annex 1 of Appendix A (Part 1)** were assessed to determine whether the criteria would have kept these structures open during historical years where the FWC had previously closed recreational access to WCA 3A due to stage within WCA 3A being above a specified limit. Recent closures of WCA 3A by the FWC occurred in 2008, 2012, 2013 and 2016. The WCA 3A high water criteria included in Increment 1.1 and 1.2 would have resulted in S-12A remaining open during October in 2008, 2012, 2013 and 2016; the WCA 3A high water criteria would have resulted in S-12B remaining open during October and November in 2008 and 2012, and remaining open through the end of October in 2013 and 2016. Reference **Section 4.5.3.1**.

#### 4.20 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR 1508.7 as those effects that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The following summarizes past, present, and projected Corps efforts that cumulatively affect the regional environment of south Florida (**Table 4-3**). Additional information on design refinements and operational modifications to MWD and C-111 South Dade Project features can be found within the environmental documents listed in **Section 1.7**. **Table 4-4** shows the net cumulative effects of the various resources which are directly or indirectly impacted. Increment 1.1 and 1.2 is expected to contribute to a net beneficial cumulative impact on the regional ecosystem, providing benefits to ENP by increasing flows to NESRS.

**TABLE 4-3. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS AND PLANS AFFECTING THE PROJECT AREA**

	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
Status of Non-CERP Projects	<ul style="list-style-type: none"> <li>- C&amp;SF Project (1948)</li> <li>- ENP Protection and Expansion Act (1989)</li> <li>- MWD GDM and Final EIS (1992)</li> <li>- C-111 South Dade GRR (1994)</li> </ul>	<ul style="list-style-type: none"> <li>- MWD 8.5 SMA GRR (2000)</li> <li>- MWD Tamiami Trail Modifications Limited Reevaluation Report (2008)</li> <li>- MWD 8.5 SMA Interim Operating Criteria EA (2011) and Design Refinement EA (2012)</li> <li>- C&amp;SF C-51 West End Flood Control Project</li> <li>- Kissimmee River Restoration</li> <li>- Seepage Barrier near the L-31 N Levee (Miami-Dade Limestone Products Association)</li> <li>- Tamiami Trail Modifications Next Steps (TTMNS) Project</li> <li>- SFWMD Florida Bay Initiatives</li> </ul>	<ul style="list-style-type: none"> <li>- SFWMD Restoration Strategies Project</li> <li>- MWD Closeout</li> <li>- C-111 South Dade Project (Contracts 8, 8A, and 9)</li> </ul>
Operations Plan for Lake Okeechobee, WCA 3A, ENP and the SDCS	<ul style="list-style-type: none"> <li>- Water Supply and Environment (WSE) Lake Okeechobee Regulation Schedule (2000)</li> <li>- IOP 2002 to Present</li> </ul>	<ul style="list-style-type: none"> <li>- Lake Okeechobee Regulation Schedule (LORS 2008)</li> <li>- SFWMD LEC Regional Water Supply Plan</li> <li>- ERTP October 2012 to present; deviation includes Increment 1 Operational Strategy</li> <li>- Herbert Hoover Dike Dam Safety Modification Study (HHD DSMS) risk reduction measures (2011 through 2025)</li> </ul>	<ul style="list-style-type: none"> <li>- LORS 2008 to be replaced by revised Lake Okeechobee Regulation Schedule by 2024-2025 (per Integrated Delivery Schedule)</li> <li>- SFWMD periodically revises the LEC Regional Water Supply Interim Plan</li> <li>- ERTP to be replaced by COP to be completed to include MWD and C-111 components.</li> </ul>
CERP Projects		<p>Congressional Authorization Received:</p> <ul style="list-style-type: none"> <li>- Broward County Water Preserve Areas Project</li> <li>- Caloosahatchee River (C-43) West Basin Storage Reservoir</li> <li>- C-111 Spreader Canal Western Project</li> </ul> <p>Congressional Authorization Received and Construction in Progress:</p> <ul style="list-style-type: none"> <li>- Indian River Lagoon-South Project</li> </ul>	<ul style="list-style-type: none"> <li>- Future CERP Projects</li> </ul>

	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
		<ul style="list-style-type: none"> <li>- Picayune Strand Restoration Project</li> <li>- Site 1 Impoundment Project</li> <li>- Biscayne Bay Coastal Wetlands Project</li> <li>- C-111 Spreader Canal Western Project</li> </ul>	

**TABLE 4-4. SUMMARY OF CUMULATIVE EFFECTS**

<b>Hydrology</b>	
Past Actions	Flood and water control projects have greatly altered the natural hydrology.
Present Actions	Federal and state agencies are coordinating on and implementing projects to improve hydrology.
Proposed Action	Modifications under the Proposed Action include the continued removal of the G-3273 stage constraint of 6.8 feet, NGVD (L-29 Canal stage maximum operating limit of 7.8 feet, NGVD) to increase water deliveries from WCA 3 to ENP through NESRS, while implementing early closures of the WCA 3A control structures beyond their current restrictions to limit flows into western SRS for purposes of providing suitable nesting habitat for the endangered CSSS. The combined flows to NESRS are anticipated to be more than what would have otherwise been discharged to ENP relative to the 2012 Water Control Plan. Hydroperiods within NESRS are expected to improve with the Proposed Action.
Future Actions	Additional CERP projects propose to restore hydrology to more natural conditions.
Cumulative Effect	Although it is unlikely that natural hydrologic conditions would be fully restored to pre-drainage conditions, improved hydrology would occur with implementation of the Proposed Action. CERP is expected to improve the quantity, quality, timing and distribution of freshwater flow.
<b>Threatened and Endangered Species</b>	
Past Actions	Water management practices and urbanization have resulted in the degradation of existing habitat function and direct habitat loss leading to negative population trends of threatened and endangered species.
Present Actions	ERTP implementation represents a paradigm shift from single species to multi-species management. ERTP includes performance measures specifically directed at managing water levels and releases for the protection of multiple species and their habitats within the project area.
Proposed Action	The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, CSSS and its associated critical habitat; Everglade snail kite and its associated critical habitat; wood stork; Florida bonneted bat; Deltoid spurge; Garber's spurge; Small's milkpea; and Tiny polygala. Effects determinations for Federally threatened and endangered species within the project area are listed within <b>Table 4-1</b> . The Proposed Action is being implemented in accordance with the mandated RPAs of the 2016 ERTP BO and RPA for the benefit of the CSSS.
Future Actions	Ongoing projects would be implemented to maintain threatened and endangered species within the project area. It is anticipated that suitable CSSS habitat will be maintained under future restoration initiatives, but it may not occur with the current or historic footprints in some areas.
Cumulative Effect	Habitat improvement, monitoring and management of threatened and endangered species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the project area.
<b>Fish and Wildlife Resources</b>	
Past Actions	Water management practices have resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions through the food web, including effects on wading birds, large predatory fishes, reptiles and mammals.
Present Actions	Ongoing efforts have been made by Federal and state agencies to implement projects to improve hydrology within the project area to restore habitat conditions for fish and wildlife resources.
Proposed Action	Increases in forage prey availability ( <i>i.e.</i> crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species within NESRS. Additional low volume freshwater releases from S-197 would not be sufficient to affect mangrove and seagrass habitats within the coastal estuaries. Significant effects to fish and wildlife resources with eastern Florida Bay, Biscayne Bay, and Manatee Bay and Barnes Sound are not anticipated.

Future Actions	Some level of improvement to fish and wildlife resources is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. Hydrologic restoration planned as part of CERP would further improve fish and wildlife habitat.
Cumulative Effect	Habitat improvement efforts are anticipated to benefit fish and wildlife resources.
<b>Vegetation and Wetlands</b>	
Past Actions	Drainage of Florida's interior wetlands, conversion of wetlands to agriculture, and urban development has reduced the spatial extent and quality of wetland resources.
Present Actions	Efforts are being taken by state and Federal regulatory agencies to reduce wetland losses.
Proposed Action	Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions. The Proposed Action may have a temporary minor beneficial effect on vegetative communities within NESRS.
Future Actions	Some level of improvement to vegetative communities is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. More natural hydrology as part of the CERP would assist in restoring natural plant communities.
Cumulative Effect	While the spatial extent of natural plant communities would not be restored to historic proportions, the quality of vegetative communities would be improved.
<b>Cultural Resources</b>	
Past Actions	Previous water control plans and associated environmental analyses had determined that there were no effects associated with changing water regulation schedules.
Present Actions	Long term effects to cultural resources remain unknown. Current testing associated with the ERTTP Programmatic Agreement is investigating such cumulative issues.
Proposed Action	The Proposed Action by its short nature is not capable of producing a cumulative effect as such effects if they were to occur would cease at the end of the Proposed Action.
Future Actions	Continued improvement to hydroperiods and sheetflow within WCA 3A, 3B and ENP could reduce soil oxidation, which could stabilize the environment, and this in turn could stabilize tree islands containing cultural resources. Investigations mandated in the Programmatic Agreement for ERTTP will be completed and will determine the effects of fluctuating water on subsurface historic properties.
Cumulative Effect	Cumulative effects to historic properties and culturally significant sites will potentially be long-term adverse effects if not avoided. Mitigation measures for effects to historic properties could potentially reduce the cumulative effect to minor long-term adverse effects. Mitigation measures for culturally significant sites are unknown.
<b>Water Quality</b>	
Past Actions	Water quality has been degraded from urban, suburban, commercial, industrial, recreational and agricultural development.
Present Actions	Efforts to improve water quality from agricultural areas are ongoing. Construction of Federal and state projects can temporarily elevate localized levels of suspended solids and turbidity.
Proposed Action	Water quality conditions in the vicinity of the L-29 Canal and L-31N Canal may be affected by implementation of the Proposed Action. New surface water discharge into ENP at the S328 needs to be evaluated by monitoring. It may impact ENP water quality negatively or may be neutral. Only monitoring will resolve this question. Operations may need to be adjusted to minimize any negative water quality impacts resulting from the new S328 discharges into the ENP. This could be accomplished by allowing some residence time before allowing any S-328 discharges after extended detention cell dry out conditions.
Future Actions	Actions by the State of Florida's Restoration Strategies will decrease nutrient concentration and loadings to the project area. The Broward County Water Preserve Area Project would reduce storm runoff deliveries to WCA 3 and improve water quality coming across Tamiami Trail. In

	general there is a slowly improving trend in water quality entering and exiting the upstream WCA's.
Cumulative Effect	While anthropogenic effects on water quality are unlikely to be eliminated, water quality is expected to slowly improve. This is based on trends indicated by data analysis and the fact that BMP's are continuing to reduce nutrient loading to the system. Significant improvement in water quality from Lake O discharges and other upstream areas will take decades due to the large legacy loading. Corps and SFWMD are committed to ensuring that project feature implementation will not result in violations of water quality standards.

#### 4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action consists of an operational change to current water management operations and does not include construction of permanent structures or modifications to existing water management features. The Proposed Action would not cause the permanent removal or consumption of any natural resources.

#### 4.22 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Environmental effects for each resource are discussed in **Section 4.0**. Temporary minor adverse impacts as previously identified in the Increment 1 EA and FONSI (dated May 27, 2015) have the potential to occur within Manatee Bay and Barnes Sound due to increases in the frequency, duration, and volume of S-197 discharges; however significant impacts are not expected. Potential environmental effects would be limited in spatial extent to the nearshore areas of the southern estuaries. A monitoring plan has been developed for Increment 1.1 and 1.2 to evaluate potential effects of S-197 operations on downstream salinity and natural resources. Reference **Appendix C**.

#### 4.23 CONFLICTS AND CONTROVERSY

Over the lifetime of the MWD and C-111 South Dade Projects, considerable interest has been generated among local and regional stakeholders. The Corps continually strives to include all interested parties in its decision making process and will continue to consider all issues that arise.

#### 4.24 ENVIRONMENTAL COMMITMENTS

The Corps commits to avoiding, minimizing or mitigating for adverse effects. All practicable means to avoid or minimize environmental effects were incorporated into the Proposed Action. A monitoring plan has been developed for Increment 1.1 and 1.2. Reference **Appendix C**. Interagency workshops to facilitate discussion of field test performance relative to the achievement of field test goals and objectives are planned to be conducted. Field Test operations updates and action items will be discussed on a weekly basis between water managers from the Corps and SFWMD, as well as ENP when needed, to provide collective interpretation of results and evaluate implementation of field test operations relative to the goals, objectives, and constraints. Corps, SFWMD, and ENP water managers will meet monthly to discuss the collected data and the results of preliminary analyses, as well as system conditions and field test operations; additional technical staff from these agencies who are involved in the monitoring and data assessment efforts will also participate in the monthly coordination meetings, as needed. Results from these weekly and monthly coordination meetings, including preliminary recommendations from water managers to incrementally modify the operational strategy (within the covered NEPA EA scope), will be further discussed with the project delivery team (PDT) during regularly-scheduled interagency

meetings to occur four times per year. PDT meetings will also include updates from the water quality and ecological monitoring sub-teams. Additional meetings (*i.e.* WCA 3 Periodic Scientist Calls) and/or workshops may be conducted in support of the field test on an as-needed basis based upon ongoing or anticipated conditions within WCAs, ENP, and/or the SDCS.

It is recognized that as hydrologic restoration actions are implemented there may be water quality issues that need to be worked through in order to allow restoration to progress. Language was developed to address a path forward to address water quality potential concerns and how to work through them in the CEPP Final Project Implementation Report (PIR) and EIS (Chapter 8, Section 8.3). The Corps intends to follow these guiding principles identified in the CEPP language to resolve water quality issues associated with this field test. This CEPP language addressing water quality issues is provided below:

***“CEPP Water Quality Language as a Framework for MWD to ENP Project Increments  
Source: CEPP Final PIR and EIS (Chapter 8, Section 8.3)***

*“In addition to the aforementioned items of local cooperation, the United States Army and the State of Florida entered into a separate agreement regarding water quality that is intended to govern the implementation and operation of CEPP project features:*

*Restoration of the Everglades requires projects that address hydrologic restoration as well as water quality improvement. This has been recognized by the National Academy of Sciences in its most recent biennial report where it noted that near-term progress to address both water quality and water quantity improvements in the central Everglades is needed to prevent further declines of the ecosystem. The significant amount of water resulting from CEPP is contemplated to significantly improve restoration of the Everglades. Both the Federal and State parties recognize that water quantity and quality restoration should be pursued concurrently and have collaborated to develop and concur on a suite of restoration strategies being implemented by the State to improve water quality (“State Restoration Strategies”), as well as other State and Federal restoration projects, both underway and planned, to best achieve Everglades hydrologic objectives. Specific examples of Federally authorized projects include the Everglades Restoration Transition Plan, Modified Water Deliveries to Everglades National Park Project, and the Tamiami Trail Next Steps Project.<sup>1</sup> One of the goals of these projects and their associated operating plans, as well as certain components of the CERP awaiting authorization or that are being planned as part of the CEPP is to improve water quantity and quality in the Everglades through more natural water flow within the remnant Everglades which includes the water conservation areas and ENP. Variations in flows of the C&SF system may result from a variety of reasons. These reasons include natural phenomena (e.g. weather) and updates to the operating manuals to achieve the purposes of the C&SF Project such as flood control and water supply.*

*One goal of the Consent Decree<sup>2</sup> is to restore and maintain water quality within ENP. The Consent Decree established, among other things, long-term water quality limits for water entering ENP to achieve this goal. The existing limits for ENP are flow dependent and, generally, increased volume of water results in a lower allowable concentration of*

*phosphorus to maintain the overall load of phosphorus entering the ENP. There will be redistribution of flows and increased water volume above existing flows associated with system restoration efforts beyond the current State Restoration Strategies projects. The USACE and its Federal and State partners recognize that to achieve long-term hydrologic improvement, water quality may be impacted, particularly as measured by the current Consent Decree Appendix A compliance methodology. The USACE and the State partners agree that the monitoring locations/stations for inflows to ENP will require revision. An evaluation of this and other aspects of the compliance methodology are currently being conducted by the Technical Oversight Committee (TOC).*

*In an effort to address these potential impacts and determine updates to Appendix A to reflect increased inflows and new discharges into ENP since the Consent Decree was entered, the parties to the Consent Decree have established a process and scope for evaluating and identifying necessary revisions to the Appendix A compliance methodology utilizing the scientific expertise of the TOC. The TOC may consider all relevant data, including the 20 years of data collected since Appendix A was implemented. Ultimately, such evaluations and changes to the Appendix A compliance methodology would be recommended by the Consent Decree's TOC for potential agreement by all parties. Failure to develop a mutually agreed upon and scientifically supportable revised compliance methodology will impact the State's ability to implement or approve these projects.*

*The aforementioned State Restoration Strategies will be implemented under a Clean Water Act discharge permit that incorporates and requires implementation of corrective actions required under a State law Consent Order, as well as a Framework Agreement between the U.S. Environmental Protection Agency and the State discharge permitting agency, the Florida Department of Environmental Protection, to ensure compliance with Clean Water Act and State water quality requirements for existing flows into the Everglades. The Clean Water Act permit for the State facilities, the associated Consent Order (including a detailed schedule for the planning, design, construction, and operation of the new project features), and technical support documents were reviewed by, and addressed all of, the U.S. Environmental Protection Agency's previous objections related to the draft National Pollutant Discharge Elimination System ("NPDES") permits, prior to issuance.*

*All parties are committed to implementing the State Restoration Strategies, joint restoration projects, and associated operational plans, in an adaptive manner that is consistent with the objectives of the underlying C&SF Project. The USACE and the State will use all available relevant data and supporting information to inform operational planning and decision making, document decisions made, and evaluate the resulting information from those decisions to avoid adverse impacts to water quality where practicable and consistent with the purposes of the C&SF Project. Based upon current and best available technical information, the Federal parties believe at this time that the State Restoration Strategies, implemented in accordance with the State issued Consent Order and other joint restoration projects, are sufficient and anticipated to achieve water quality requirements for existing flows to the Everglades. If there is an exceedance of the Appendix A compliance limits, which results from a change in*

*operation of a Federal project, and it has been determined that an exceedance cannot be remedied without additional water quality measures, the Federal and State partners agree to meet to determine the most appropriate course of action, including what joint measures should be undertaken as a matter of shared responsibility. These discussions will include whether it is appropriate to exercise any applicable cost share authority. If additional measures are required and mutually agreed upon, then they shall be implemented in accordance with an approved process, such as a general reevaluation report or limited reevaluation report, and if necessary, supported through individual project partnership agreements. Failure to develop mutually agreed upon measures and cost share for these measures may impact the State's ability to operate the Federal project features."*

<sup>1</sup>*The next phase of bridging for Tamiami Trail roadway as authorized by Congress.*

<sup>2</sup>*United States v. South Florida Water Management District, et al., Case No. 88-1886-CIV-Moreno (U.S.D.C., S.D.Fla.).*

## **4.25 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS**

### **4.25.1 National Environmental Policy Act of 1969**

Environmental information on the project has been compiled and this EA has been prepared and coordinated for public, state, and Federal agency review. The Proposed Action is in compliance with the National Environmental Policy Act.

### **4.25.2 Endangered Species Act of 1973**

Upon completion of an assessment for species under NMFS purview it was determined that the Proposed Action would have no effect on these species; therefore, consultation with NMFS was not necessary. The Corps requested written confirmation of federally listed threatened and endangered species that are either known to occur or are likely to occur within the project area from USFWS by email dated October 25, 2016 for Increment 1.1 and 1.2. Correspondence dated November 23, 2016 has been provided to the USFWS requesting concurrence on species determinations as a result of the Proposed Action, noting that the conclusion of ESA consultation on Increment 1.1 and 1.2 presented within this EA is previously covered under the 2016 E RTP BO. The USFWS concurred with this assessment by correspondence dated December 7, 2016. Reference **Appendix D** for pertinent correspondence. The Proposed Action has been fully coordinated under the Endangered Species Act and will be in full compliance with the Act.

### **4.25.3 Fish and Wildlife Coordination Act of 1958, as amended**

The Proposed Action has been fully coordinated with USFWS and FWC. In response to the requirements of this Act, the Corps has and will continue to maintain continuous coordination with USFWS and FWC. The Proposed Action is in full compliance with the Act.

### **4.25.4 National Historic Preservation Act of 1966**

The Proposed Action is in compliance with Section 106 of the National Historic Preservation Act, as amended (PL 89-665). As part of the requirements and consultation process contained within the National Historic Preservation Act implementing regulations of 36 CFR 800, this project is

also in compliance through ongoing consultation with the Archaeological and Historic Preservation Act, as amended (PL 93-29), Archeological Resources Protection Act (PL96-95), American Indian Religious Freedom Act (PL 95-341), Native American Graves Protection and Repatriation Act (NAGPRA) (PL 101-601), Executive Order 11593, 13007, and 13175, the Presidential Memo of 1994 on Government to Government Relations and appropriate Florida Statutes. Consultation with the Florida SHPO, appropriate Federally-recognized tribes, and other interested parties has occurred (Reference **Appendix D**). The Corps has determined the Proposed Action poses no adverse effect to historic properties eligible or potentially eligible for listing in the NRHP. The Florida SHPO concurred with the Corps determination of no adverse effect in a letter dated January 31, 2017 and the Seminole THPO indicated “no objections to the project” in a letter dated February 3, 2017. The Proposed Action is in compliance with the goals of this Act.

#### **4.25.5 Clean Water Act of 1972**

The Proposed Action is in compliance with this Act. The Supplemental EA has been coordinated with the State of Florida to determine CZMA consistency.

#### **4.25.6 Clean Air Act of 1972**

The Proposed Action is being coordinated with the State of Florida. The Proposed Action is in compliance with Section 176 of the Clean Air Act, known as the General Conformity Rule. The Proposed Action will not cause or contribute to violations of the National Ambient Air Quality Standards.

#### **4.25.7 Coastal Zone Management Act of 1972**

A Federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report as **Appendix B**. The Corps has coordinated a consistency determination pursuant to the CZMA through the circulation of the Supplemental EA. The Corps has determined that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of Florida’s approved CZMP. The Florida State Clearinghouse has reviewed the Proposed Action and has stated that the Proposed Action is consistent with the CZMP. Final concurrence of consistency with the CZMP will be determined during environmental permitting processes, as applicable.

#### **4.25.8 Farmland Protection Policy Act of 1981**

Correspondence with USDA-NRCS for Increment 1 occurred on November 21, 2014. Reference Appendix C of the Increment 1 EA and FONSI (dated May 27, 2015). The USDA-NRCS had previously determined that there are delineations of Important Farmland Soils (Farmland of Unique Importance) within the project area. Approximately 975 acres of Prime and Unique Farmland are located mainly within the boundaries of ENP. Correspondence related to Increment 1.1 and 1.2 was provided to the USDA-NRCS on November 23, 2016 noting conversion of Prime and Unique Farmland are not anticipated as a result of the Proposed Action.

#### **4.25.9 Wild and Scenic River Act of 1968**

No designated Wild and Scenic river reaches would be affected by project related activities. This Act is not applicable.

**4.25.10 Marine Mammal Protection Act of 1972**

No marine mammals would be harmed, harassed, injured or killed as a result of the Proposed Action. Therefore, the Proposed Action is in compliance with this Act.

**4.25.11 Estuary Protection Act of 1968**

No designated estuary would be affected by the Proposed Action. This Act is not applicable.

**4.25.12 Federal Water Project Recreation Act of 1965, as amended**

Recreation and fish and wildlife enhancement have been given full consideration in the Proposed Action.

**4.25.13 Fishery Conservation and Management Act of 1976**

No fisheries or other areas under the purview of NMFS would be affected by this action. The Proposed Action is in compliance with the Act.

**4.25.14 Submerged Lands Act of 1953**

Potential minor adverse impacts associated with salinity fluctuations to Manatee Bay, and Barnes Sound as previously identified in the Increment 1 EA and FONSI (dated May 27, 2015) would be temporary and spatially limited to nearshore areas within the southern estuaries (USACE 2015). Significant effects to fish and wildlife resources and vegetative communities within submerged lands of the State of Florida are not expected. The Proposed Action is in compliance with the Act.

**4.25.15 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990**

There are no designated coastal barrier resources in the project area that would be affected by the Proposed Action. These Acts are not applicable.

**4.25.16 Resource Conservation and Recovery Act (RCRA), As Amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Toxic Substances Control Act (TSCA) of 1976**

Implementation of the Proposed Action is not expected to result in the discovery of HTRW since there is no excavation or other construction activities associated with this project. The Proposed Action has a very low risk for increased mobilization of existing HTRW where it might exist within the study area. The Proposed Action is in compliance with these Acts.

**4.25.17 Rivers and Harbors Act of 1899**

The Proposed Action would not obstruct navigable waters of the United States. The Proposed Action is in full compliance.

**4.25.18 Safe Drinking Water Act of 1974, As Amended**

The Proposed Action would not impact safe drinking water standards. The Proposed Action is in full compliance.

#### **4.25.19 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646)**

Acquisition of real estate is not required for the Proposed Action. The Proposed Action is in compliance with this Act.

#### **4.25.20 Anadromous Fish Conservation Act**

Anadromous fish species would not be affected. The Proposed Action is in compliance with the Act.

#### **4.25.21 Migratory Bird Treaty Act and Migratory Bird Conservation Act**

Migratory and resident bird species have been observed within the project area and are likely to use available habitat for foraging, nesting, and breeding. The Proposed Action is not expected to destroy migratory birds, their active nests, their eggs, or their hatchlings. The Proposed Action will not pursue, hunt, take, capture, kill or sell migratory birds. The Proposed Action is in compliance with these Acts.

#### **4.25.22 Marine Protection, Research and Sanctuaries Act**

The Marine Protection, Research and Sanctuaries Act does not apply to the Proposed Action. Ocean disposal of dredge material is not proposed as part of the Proposed Action.

#### **4.25.23 Magnuson-Stevens Fishery Conservation and Management Act**

No Essential Fish Habitat would be impacted by this action. Therefore the Proposed Action is in compliance with this Act.

#### **4.25.24 E.O. 11990, Protection of Wetlands**

The Proposed Action is expected to have beneficial effects on wetlands. The Proposed Action is in compliance with the goals of this Executive Order (E.O.).

#### **4.25.25 E.O. 11988, Floodplain Management**

This E.O. instructs Federal agencies to avoid development in floodplains to the maximum extent possible. The Proposed Action is an operational change to existing infrastructure; therefore, no construction is proposed. This action is consistent with the intent of this E.O. and is in compliance.

#### **4.25.26 E.O. 12898, Environmental Justice**

E.O. 12899 provides that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low income populations. The Proposed Action would not result in disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The Proposed Action is in compliance with this E.O.

**4.25.27 E.O. 13089, Coral Reef Protection**

No coral reefs would be impacted by the Proposed Action. This E.O. does not apply.

**4.25.28 E.O. 13112, Invasive Species**

The Proposed Action would have no significant impact on invasive species. The Proposed Action is in compliance with the goals of this E.O.

**4.25.29 E.O. 13045, Protection of Children**

E.O. 13045, requires each Federal agency to “identify and assess environmental risk and safety risks [that] may disproportionately affect children” and ensure that its “policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.” This action has no environmental safety risks that may disproportionately affect children. The Proposed Action is in compliance.

**4.25.30 E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds**

Migratory and resident bird species have been observed within the project area and are likely to use available habitat for foraging, nesting, and breeding. The Proposed Action is not expected to destroy migratory birds, their active nests, their eggs, or their hatchlings. The Proposed Action is in compliance with the goals of this E.O.

**5.0 LIST OF PREPARERS****TABLE 5-1. TABLE OF PREPARERS**

Name	Organization	Role in EA
Donna George	USACE	Project Manager
Melissa Nasuti	USACE	Biologist
Dan Crawford	USACE	Hydrologist/Engineer
Lan Do	USACE	Water Manager
Olice Williams	USACE	Water Manager
June Mirecki	USACE	Geologist
Jim Riley	USACE	Water Quality
Meredith Moreno	USACE	Archeologist

## **6.0 PUBLIC INVOLVEMENT**

### **6.1 SCOPING AND EA**

Reference **Section 1.9**.

### **6.2 AGENCY COORDINATION**

The Corps is in continuous coordination with other Federal and state agencies, Tribal representatives, and members of the general public. This extensive coordination is a result of the magnitude of Corps efforts underway to implement water management strategies in south Florida. All agency coordination letters related to the Proposed Action are included in **Appendix D**.

### **6.3 LIST OF RECIPIENTS**

A notice of availability for the EA and FONSI was mailed to Federal and state agencies, Tribal representatives, and members of the general public. A complete mailing list is available upon request. The EA and FONSI was also posted the internet at the following address:

<http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments.aspx#>

<http://www.saj.usace.army.mil/Missions/Environmental/EcosystemRestoration/G3273andS356PumpStationFieldTest.aspx#>

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