

APPENDIX D

PLAN OPERATIONS & MAINTENANCE, PERMITTING, AND MONITORING

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D1.0 PLAN OPERATIONS, MAINTENANCE, PERMITTING, AND MONITORING

D1.1 Operations & Maintenance

With very few exceptions, the majority of projects features included in the Plan are likely to require some level of operation and maintenance (O&M). Consideration of operations and maintenance needs from the outset of planning is important to insuring that the project goals and objectives are achieved in the most efficient, effective, and safe manner. The term “operations and maintenance” collectively refers to the following five major elements:

- **Operations** – ongoing activities required to operate the management measure to achieve the project objectives – includes water control, fuels and materials, monitoring, etc.
- **Maintenance** – ongoing activities required to maintain system in an operable condition – includes machinery maintenance, mowing, inspections, etc.
- **Repair** – periodic repair of machinery or other structural elements as needed to restore complete operability of the management measure – includes machinery repair, filling scour holes, repairing erosion, etc.
- **Replacement** – periodic replacement of project elements that have reached or exceeded their functional life – includes pump replacement, stop-log riser replacement, etc.
- **Rehabilitation** – major rehabilitation of a project component may be required under the following circumstances:
 - When the component has exceeded its functional life and continued repair and replacement activities are no longer cost effective,
 - When there are substantive changes in conditions at the facility or associated components of the water management system that preclude meeting the project objectives or result in other undesirable impacts, or
 - Changes in design or safety standards.

Funding and labor requirements for O&M can vary dramatically depending on the type of management measure and its physical setting. For example, a wetland restoration element that is composed of a fixed crest weir constructed in an existing stream floods the wetland during wet conditions might require very little O&M beyond periodic inspections. On the other hand, a wetland restoration project that calls for pumped inflows to an area impounded by levees or berms with a water control structure to manage water levels might require substantial funding and labor resources for O&M.

As a result, O&M requirements cannot be fully determined until a significant level of design has been completed for elements of the Plan. Therefore, while O&M requirements for all Level 1 features have been fully identified; relatively little design information is available on O&M requirements for all other Plan features.

Eight different types of project features are included in the Plan. General O&M requirements for each type of feature are described below. Note that O&M requirements will have to be tailored for each individual facility based on site-specific conditions and project objectives.

D1.1.1 Reservoirs O&M Requirements

Operations – Hydrologic, water quality, and meteorologic data is monitored to guide water control operations. In many cases, water control operations are performed remotely from the SFWMD headquarters. Where remote operational capability does not exist, field personnel perform gate changes and other water control activities based on guidance from SFWMD headquarters. Operational activities are required on an ongoing basis to provide proper inflows, water control in the reservoir, and discharges. This includes operation of pump stations, water control structures, and culverts. Costs include hired labor and fuel and materials. Inflow pump stations require a particularly high level of operational activities and associated costs. Power costs for pump stations can be a large part of O&M.

Maintenance – The O&M Manual will establish preventative maintenance requirements for machinery at pump stations, water control structures, and culverts. These activities will include inspections, lubrication, cleaning, etc. Regular inspections of levees and channels are required to identify scouring or erosion problems. Periodic mowing of levees is also required.

Repair – Even with proper maintenance, occasional repairs will be necessary. The types of repairs that might be necessary for operation of a reservoir include machinery repair, levee erosion, channel scouring, etc.

Replacement – Pump motors, bearings, stop logs, etc will require eventual replacement when the frequency and/or the nature of required repairs becomes cost prohibitive or unsafe.

Rehabilitation – Levees and canals will be designed and constructed to be functional indefinitely. Major rehabilitation to levees and canals should only be necessary if there is a significant change in design and/or safety standards such as changes that occurred following the New Orleans levee failures caused by Hurricane Katrina. The most significant long-term requirements for major rehabilitation will be for the inflow pump stations.

D1.1.2 STAs O&M Requirements

Operations – Water control operations for STAs require careful maintenance of water levels and flows to optimize TP reduction performance. Moreover, STAs are typically composed of multiple cells and/or treatment chains. Each individual STA cell will require control of water levels and flows. Monitoring of hydrologic, water quality, and meteorologic data is performed to guide water control operations. In many cases, water control operations are performed remotely from the SFWMD headquarters. Where remote operational capability does not exist, field personnel perform gate changes and other water control activities based on guidance from SFWMD headquarters. Water control operations will include operation of pump stations, water control structures, and culverts. Costs include hired labor and fuel and materials. Inflow pump stations require a particularly high level of operational activities and associated costs. Power costs for pump stations can be a large part of O&M.

Maintenance – Relative to reservoirs, the increased infrastructure (levees, canals, water control structures, culverts, etc) associated with STAs will generally require a greater level of effort for maintenance. The O&M Manual will establish preventative maintenance requirements for machinery at pump stations, water control structures, and culverts. These activities will include inspections, lubrication, cleaning, etc. Regular inspections of levees and channels are required to identify scouring or erosion problems. Periodic mowing of levees is also required. Within the STA cells, some reshaping of the bottom or levee modifications may be necessary after long periods of operation due to the soil accretion. Soil accretion in the STAs may create non-uniform depths and flows that could reduce TP reduction efficiency. Additionally, soil accretion may require levee modifications to prevent overtopping.

Repair – Even with proper maintenance, occasional repairs will be necessary. The types of repairs that might be necessary for operation of an STA include machinery repair, levee erosion, channel shoaling or scouring, etc.

Replacement – Relative to reservoirs, the increased infrastructure (levees, canals, water control structures, culverts, etc) associated with STAs will generally require a greater level of effort for repairs. Pump motors, bearings, stop logs, etc will require eventual replacement when the frequency and/or the nature of required repairs becomes cost prohibitive or unsafe.

Rehabilitation – Relative to reservoirs, the increased infrastructure (levees, canals, water control structures, culverts, etc) associated with STAs will generally require a greater level of effort for rehabilitation. Levees and canals will be designed and constructed to be functional indefinitely. Major rehabilitation to levees and canals is unlikely at an STA. The most significant long-term requirement for major rehabilitation will be for the inflow pump stations.

D1.1.3 ASR Well O&M Requirements

ASR wells will often be located so that they can utilize existing water management infrastructure. The O&M requirements described below are for those components that are directly related to ASR.

Operations – Primary operating requirements would involve pump operations to inject flood waters into the aquifer during wet periods and recovery operations to reclaim the water during dry periods. Monitoring of water quality of stored and recovered water would be included in the operations. The costs of powering the pumps will be significant during wet periods.

Maintenance – Normal pump maintenance will be the primary requirement since there will be very limited ancillary water management infrastructure. Periodic backwashing of the wells may be necessary to maintain efficient storage and recovery capacities.

Repair – Even with proper maintenance, occasional repairs will be necessary. The types of repairs that might be necessary for operation of an ASR are primarily related to machinery repair.

Replacement – After the pump machinery has reached its functional life, it will require replacement.

Rehabilitation – No need for major rehabilitation of ASR wells is anticipated.

D1.1.4 Deep Well O&M Requirements

Similar to ASR wells, deep wells will generally also be located so that they can utilize existing water management infrastructure. The O&M requirements described below are for those components that are directly related to deep well injection.

Operations – Primary operating requirements would involve pump operations to inject flood waters into the aquifer during wet periods. The costs of powering the pumps will be significant during wet periods.

Maintenance – Normal pump maintenance will be the primary requirement since there will be very limited ancillary water management infrastructure. Periodic backwashing of the wells may be necessary to maintain efficient storage capacity.

Repair – Even with proper maintenance, occasional repairs will be necessary. The types of repairs that might be necessary for operation of a deep well are primarily related to machinery repair.

Replacement – After the pump machinery has reached its functional life, it will require replacement.

Rehabilitation – No need for major rehabilitation of ASR wells is anticipated.

D1.1.5 O&M Requirements for AWSF and FERS Projects

Operations – Operational requirements for these projects will vary as a result of the variation in infrastructure required for each individual project. At one extreme, the operational requirements will be the same as a reservoir. At the other extreme, the project feature may be limited to a sheet pile weir constructed in an existing channel to retain floodwater runoff. In other cases, berms or levees or existing agricultural pump stations may require maintenance. Water control operations would be driven by onsite water elevations so that adverse flood impacts to adjacent areas would be avoided.

Maintenance – Maintenance requirements would vary with the extent of infrastructure involved in each individual project. Normal maintenance activities would involve periodic inspections of levees, ditches, and water control structures. If pumps are used, maintenance would include compliance with the O&M Manual or manufacturer's guidelines.

Repair – In most cases, repairs would be minimal. However, when pump stations are included, repairing mechanical components would be necessary.

Replacement – With the exceptions of pump stations, requirements for replacement should be negligible.

Rehabilitation – With the exception of pump stations, major rehabilitation requirements should be minimal.

D1.1.6 O&M Requirements for Managed Aquatic Plant Systems

Operations – Active operation of Managed Aquatic Plant Systems (MAPS) would be anticipated to continue for longer durations than most other management measures. A MAPS would be operated at any time water would be available – during the wet season or dry season. Water control operations will require collecting hydrologic and flow data to guide precise control of inflows, internal water levels, and discharges within very close tolerances. This will involve the operation of multiple flow-ways and outlet structures. Monitoring and adjustment to internal water chemistry will be required. Harvesting and disposal of the aquatic plant byproducts must be performed frequently. Labor, fuel, and materials costs of operations are expected to be high.

Maintenance – The intensity of maintenance requirements for MAPS is commensurate with the intensity of required operations. Long periods of active operations will increase the required maintenance activities. Maintaining multiple pumps, flow-ways, and outlet structures will require a significant level of effort. Maintenance activities will include periodic inspections of the flow-way liners, pumps, and structures, lubrication of mechanical components, etc.

Repair – Repairs to pumps, flow-way liners, outlet structures, hauling equipment, etc will be an ongoing effort. The frequency of necessary repairs will be impacted by the long durations of active operations.

Replacement – The numerous mechanical components included in MAPS will result in numerous requirements for replacements – even with proper maintenance. The long periods of active operations will increase the frequency of required replacements.

Rehabilitation – Because the MAPS consists of multiple treatment flow-ways with duplicative infrastructure, the repair and replacement activities required for normal O&M of a MAPS should minimize the need for major rehabilitation. However, if advances in the technology occur, major rehabilitation of the project may be warranted.

D1.1.7 O&M Requirements for Wetland Restoration Projects

Operations – In general, wetland restoration projects are designed to be low maintenance, passive systems. A wetland restoration project that consists of simply plugging an existing drainage ditch may require virtually no operational activities beyond periodic inspections. Projects that involve berms or levees to protect adjacent land and downstream control structures will require additional operation activities. Hydrologic data would be collected and used to guide water control operations of the downstream control structure. Periodic inspections of the berms or levees would be required. For wetland restoration projects that include pump stations and conveyance canals, labor, fuel, and materials will be required for operations.

Maintenance – For passive wetland restoration projects, maintenance requirements may be negligible. However, for those projects that contain mechanical components (pumps or control structures) maintenance will be required. Mowing levees would be required.

Repair – For passive wetland restoration projects, repairs would be limited to potentially correcting erosion or scouring problems. For projects that involve mechanical components such as pumps or control structures, there would be an increased need for repair. Erosion or sedimentation problems may be required.

Replacement – For passive wetland restoration projects, replacement requirements would be negligible. For projects that involve mechanical components, repairs will be necessary – even with proper maintenance.

Rehabilitation – For passive wetland restoration projects, there will be no need for rehabilitation. For projects that involve mechanical components such as pumps or control structures, major rehabilitation will be required.

D1.1.8 O&M Requirements for BMPs

The components of BMPs are quite diverse. Some BMPs are entirely operational in their nature – feeding practices, fertilization, crop rotation, etc. Virtually all BMPs have some element of O&M that is required to insure that the objectives are being met. However, because the number and diversity of BMPs are so great, it is beyond the scope of this document to summarize these BMP O&M requirements.

D1.2 Permitting

Construction and implementation of the Plan features will require a variety of permits and regulatory approvals. Types of permits and approvals needed are likely to vary with feature type and location.

Obtaining all required federal, state, and local permits for implementation and operation of a project often requires an intensive level of effort. Permitting can result in significant project delays if it is not adequately considered early in project development. However, specific permit requirements and/or issues may not be evident until a substantial level of detail has been developed during planning and design.

The types of permits and level of effort required during the permitting process may vary greatly for similar or identical measures depending on the physical conditions that exist at the project site and surrounding area. During the PD&E process, continuing consideration will be given to the types of permits required and the potential permitting issues that must be addressed. In this way the level of effort and time requirements can be factored into the planning and design process to minimize the potential for significant permit-related project delays.

Federal and state permits that are likely to be required for the types of project features contained in the Plan are described below. Local permit requirements will vary from site to site and will have to be addressed on a site-specific basis.

D1.2.1 Federal Permits

- **Section 404 Dredge and Fill Permit** – This permit is required by the Clean Water Act of 1972, as amended and is administered by the U.S. Army Corps of Engineers. A Section 404 Permit is required prior to discharging dredged or fill material into the waters of the United States. Waters of the United States (33 CFR Part 328) include essentially all surface waters, including all navigable waters and their tributaries, all interstate waters and their tributaries, all impoundments of these waters, all wetlands adjacent to these waters, and certain isolated wetlands.

The term "wetlands" means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A number of federal requirements are addressed during the permitting process under Section 404. These include the following:

- **National Environmental Policy Act (NEPA) of 1969** – This law requires federal agencies to study and consider the environmental impacts of their proposed actions. For actions that do not have any significant impact on the human environment, preparation of an Environmental Assessment (EA) is required. For projects that will have a significant impact, preparation of an Environmental Impact Statement (EIS) is required.
- **Coastal Zone Management Act** – The federal consistency requirement of the CZMA (Section 307) requires that federal actions (including permit approvals) that are likely to

affect any land or water in the coastal zone (within 3 miles landward or seaward of the coast) must be consistent with the state's coastal management program.

- **Endangered Species Act** – The Endangered Species Act (ESA) requires that permit applicants take no action that might adversely affect certain listed species. In addition, species that are under stress may become listed species if adverse impacts continue to their population or habitat. To help ensure that permitted projects do not contribute to further endangerment of a species, it may be required to modify or condition a permit where a species of concern is present.
- **Magnuson-Stevens Fishery Management Act and Essential Fish Habitat** – This act requires that actions minimize to the extent practicable the adverse effects of fishing on essential fish habitat, and identify other measures to promote the conservation and enhancement of essential fish habitat. Coordination with the National Marine Fisheries Service (NMFS) is required.
- **National Historic Act** – If the proposed activity would involve any property listed or eligible for listing in the National Register of Historic Places, coordination with the State Historic Preservation Officer will be required to determine the required course of action.
- **Section 401 Certification** – Issuance of a 404 Permit requires that water quality certification (Section 401 of the Clean Water Act) be obtained by the applicant or waived by the regulatory agency. In Florida, authority for water quality certification has been delegated to the Florida Department of Environmental Protection (FDEP).
- **Section 10 Permit** – This permit is required by the Rivers and Harbors Act of 1899 and is administered by the U.S. Army Corps of Engineers. Approval of a Section 10 Permits is required prior to any work in, over, or under navigable waters of the United States, or which affects the course, location, condition or capacity of such waters. Processing Section 10 Permit applications is generally subject to the same procedures and requirements as the Section 404 Permits. Applications under Sections 10 and 404 are processed together. For the purpose of a Section 10 permit, navigable waters (33 CFR Part 329) are defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce up to the head of navigation.
- **Corps of Engineers Consent to Easement Permit** – A Consent to Easement Permit will be required for any action that requires access to, or modification of Corps of Engineers' right of way for works of the Central and Southern Florida (C&SF) Project.
- **US Coast Guard Approvals** – In general, if a proposed project impacts a bridge or a navigation aide in a navigable waterway of the US, then Coast Guard approval will be required.
- **Federal Aviation Administration Guidelines** – Construction of Plan project features in the vicinity of public airports would potentially require compliance with two FAA guidelines:

- unsafe wildlife attractants near public airports, and
- obstructions to navigable airspace.

Construction of facilities that might attract wildlife that would create unsafe conditions for landings and take-offs would be performed only beyond specified distances from the airport boundary. The specified distances vary based on the airport capacity. To ensure compliance with this guideline, management measure sites closer than 10,000 ft from any airport were eliminated from consideration. FAA notification of an obstruction to navigable airspace is required by law for construction that would penetrate an imaginary plane that rises 1 foot vertically for every 100 ft of horizontal distance from the runway.

D1.2.2 State Permits

- **Environmental Resource Permits** – An Environmental Resource Permit (ERP) is required before beginning any construction activity that would affect wetlands, alter surface water flows, or contribute to water pollution. The permitting program is authorized by Part IV of Chapter 373, F.S. The ERP process is administered by the SFWMD. However, for action proposed to be implemented by SFWMD, Florida DEP administers the permitting process. Exemptions from the requirement to obtain ERP permits are authorized for implementation of many agricultural BMPs. Environmental Resource Permits are recognized by the US Army Corps of Engineers as water quality certification for Section 404 Permits. A joint ERP and 404 permit application is used and the state and federal review processes proceed in parallel.

The Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) was enacted by the Florida legislature (Chapter 373.1502 F.S.) for the purpose of providing efficient and effective permitting of CERP project components. CERPRA permits are in lieu of all other permits required in Chapters 373 and 403, except for permits that are under any delegated authority. For elements of the Plan that are included in CERP, the CERPRA permit would take the place of the ERP.

- **National Pollution Discharge Elimination System Stormwater Permitting Program** – Federal law prohibits the point source discharge of pollutants to the waters of the United States without a National Pollution Discharge Elimination System (NPDES) Permit. The US Environmental Protection Agency has delegated authority to FDEP to implement the NPDES stormwater permitting program in the State of Florida.
 - **Stormwater Pollution Protection Plan** – This program regulates point source discharges of stormwater runoff from large (> 5 ac) and small (between 1 and 5 ac) construction sites. The applicant must implement appropriate pollution prevention techniques to minimize erosion and sedimentation and properly manage stormwater.
- **Title V Air Quality Permit** – These permits are required by the Clean Air act. Administration has been delegated by the US EPA to the Florida Department of Environmental Protection. Permits are required for construction and operation. The extent of required permitting varies with the magnitude of the impact of the proposed action.

- **Dewatering Water Use Permit** – The South Florida Water Management manages the water use permitting process within its boundaries under authority of Chapter 373, State Statutes, 40E-20 F.A.C. A water use permit allows a user to withdraw a specified amount of water, either from the ground, a canal, a lake, or a river. The water can be used for a public water supply; to irrigate crops, nursery plants or golf courses; or for industrial processes. Short-term dewatering required during the construction of elements of the Plan would also require a water use permit. For features being constructed by the SFWMD, the permit application would be processed by the FDEP.

D1.2.3 Permitting Issues

Key permitting issues likely to be encountered during permitting of Plan features are described in **Table D-1**.

Table D-1. Plan features permitting issues.

Potential Permitting Obstacles	Reservoirs	STAs	ASRs	Deep Wells
Land Requirements District needs to demonstrate ownership of lands prior to obtaining Federal and State permits	Real estate needed for the Taylor Creek reservoir has already been acquired. Lands for all other reservoirs included in the Plan will have to be purchased prior to applying for 404 and 1502 permits.	Acreage required for Taylor Creek, Nubbin Slough, Lakeside, and Brady Ranch STAs has already been purchased. Lands for all other STAs included in the Plan will have to be purchased prior to applying for 404 and 1502 permits.	Lands required for some of the ASR Projects has already been purchased. Lands for all other ASR projects included in the Plan will have to be purchased prior to applying for 404 and 1502 permits.	Acreage needed for the S-154 Deep Injection Well project included in the Plan will have to be purchased prior to applying for 404 and 1502 permits.
Existing Permits Projects that are currently permitted within the proposed project footprints will have to be researched. Such existing permitting requirements, if any, may impact design criteria	Research existing permits for within proposed reservoir footprints	Research existing permits for within proposed STA footprints	Research existing permits for within proposed ASR footprints	Research existing permits for within proposed deep well footprints
	Identify owners/operators of permitted projects with proposed reservoir footprints.	Identify owners/operators of permitted projects with proposed STA footprints.	Identify owners/operators of permitted projects with proposed ASR footprints.	Identify owners/operators of permitted projects within proposed deep well footprints.

Potential Permitting Obstacles	Reservoirs	STAs	ASRs	Deep Wells
<p>Federally Listed Threatened & Endangered (T&E) Species</p> <p>28 federally listed plant species (24 endangered and 4 threatened) – plants are associated with the Florida scrub, scrubby high pine, and scrubby flatwoods communities in the LOW. Of particular concern is the Okeechobee gourd found inside the levee that encircles Lake Okeechobee.</p> <p>12 federally listed faunal species (2 endangered mammals, 7 birds, and 5 reptiles) – Florida grasshopper sparrow, Audubon’s crested caracara, Florida panther, Snail Kite, Manatee, Woodstork, Snail Kite critical habitat exists in the LOW.</p>	<p>Information on occurrence of T&E species within proposed project footprints will have to be determined.</p> <p>This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc.</p> <p>Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site.</p> <p>Surveys will have to be conducted at all other sites proposed for locating Plan features.</p>	<p>Information on occurrence of T&E species within proposed project footprints will have to be determined.</p> <p>This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc.</p> <p>Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site.</p> <p>Surveys will have to be conducted at all other sites proposed for locating Plan features.</p>	<p>Information on occurrence of T&E species within proposed project footprints will have to be determined.</p> <p>This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc.</p> <p>Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site.</p> <p>Surveys will have to be conducted at all other sites proposed for locating Plan features.</p>	<p>Information on occurrence of T&E species within proposed project footprints will have to be determined.</p> <p>This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc.</p> <p>Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site.</p> <p>Surveys will have to be conducted at all other sites proposed for locating Plan features.</p>

Potential Permitting Obstacles	Reservoirs	STAs	ASRs	Deep Wells
State Listed T&E Species 4 mammals (1 endangered, 1 threatened, and 2 species of special concern); 13 avian species (3 endangered, 5 threatened, and 5 species of special concern); 1 amphibian – species of special concern; 40 listed plant species (32 endangered, 8 threatened) which are primarily scrub associated species are known to occur in the LOW.	Information on occurrence of T&E species within proposed project footprints will have to be determined. This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc. Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site. Surveys will have to be conducted at all other sites proposed for locating Plan features.	Information on occurrence of T&E species within proposed project footprints will have to be determined. This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc. Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site. Surveys will have to be conducted at all other sites proposed for locating Plan features.	Information on occurrence of T&E species within proposed project footprints will have to be determined. This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc. Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site. Surveys will have to be conducted at all other sites proposed for locating Plan features.	Information on occurrence of T&E species within proposed project footprints will have to be determined. This information will help determine species that will be impacted, mitigation strategies, construction schedules, design criteria, management protocols, etc. Biological surveys have been conducted on all District owned parcels, except at the Brady Ranch site. Surveys will have to be conducted at all other sites proposed for locating Plan features.
Water Resources	Proposed projects that directly impact the Okeechobee waterways (Caloosahatchee River, Lake Okeechobee and the St. Lucie River) may require US Coast Guard navigation permit in accordance with 23 CFR 650, Subpart H	Proposed projects that directly impact the Okeechobee waterways (Caloosahatchee River, Lake Okeechobee, and the St. Lucie River) may require US Coast Guard navigation permit in accordance with 23 CFR 650, Subpart H	Proposed projects that directly impact the Okeechobee waterways (Caloosahatchee River, Lake Okeechobee and the St. Lucie River) may require US Coast Guard navigation permit in accordance with 23 CFR 650, Subpart H	Proposed projects that directly impact the Okeechobee waterways (Caloosahatchee River, Lake Okeechobee and the St. Lucie River) may require US Coast Guard navigation permit in accordance with 23 CFR 650, Subpart H
Transportation and Other Infrastructures Coordination with agencies such as FDOT, FP&L, airports, cell towers, railroad crossings, etc. may be required.	Determine likely impact of proposed project features on existing transportation and other infrastructure. This information will be needed for design criteria, easement access, right-of-ways, etc.	Determine likely impact of proposed project features on existing transportation and other infrastructure. This information will be needed for design criteria, easement access, right-of-ways, etc.	Determine likely impact of proposed project features on existing transportation and other infrastructure. This information will be needed for design criteria, easement access, right-of-ways, etc.	Determine likely impact of proposed project features on existing transportation and other infrastructure. This information will be needed for design criteria, easement access, right-of-ways, etc.

Potential Permitting Obstacles	Reservoirs	STAs	ASRs	Deep Wells
Archaeological/Historical Resources Numerous pre-Columbian and post-Columbian archaeological sites as well as a large number of historic structures and districts have been recorded at various locations in the LOW.	Cultural resource surveys will have to be conducted within all proposed project feature footprints. If such sites are present, it may impact design and probably also require monitoring during construction.	Cultural resource surveys will have to be conducted within all proposed project feature footprints. If such sites are present, it may impact design and probably also require monitoring during construction. Cultural resource surveys have been completed at Taylor Creek and Nubbin Slough STA sites and they are currently ongoing at Lakeside Ranch site.	Cultural resource surveys will have to be conducted within all proposed project feature footprints. If such sites are present, it may impact design and probably also require monitoring during construction.	Cultural resource surveys will have to be conducted within all proposed project feature footprints. If such sites are present, it may impact design and probably also require monitoring during construction.
Wetlands/Uplands Presence of jurisdictional wetlands (JD) within proposed project footprints will have to be addressed.	Extent of jurisdictional wetlands (JD) within proposed project footprints will have to be determined. This information is needed to determine federal and state JD impacts. UMAM analysis will need to be conducted to evaluate existing functional values and determine compensatory mitigation for these impacts. No JDs have been conducted for wetland impacts.	Extent of jurisdictional wetlands (JD) within proposed project footprints will have to be determined. This information is needed to determine federal and state JD impacts. UMAM analysis will need to be conducted to evaluate existing functional values and determine compensatory mitigation for these impacts. A JD has been conducted for the Lakeside Ranch STA.	Extent of jurisdictional wetlands (JD) within proposed project footprints will have to be determined. This information is needed to determine federal and state JD impacts. UMAM analysis will need to be conducted to evaluate existing functional values and determine compensatory mitigation for these impacts. No JDs have been conducted for wetland impacts.	Extent of jurisdictional wetlands (JD) within proposed project footprints will have to be determined. This information is needed to determine federal and state JD impacts. UMAM analysis will need to be conducted to evaluate existing functional values and determine compensatory mitigation for these impacts. No JDs have been conducted for wetland impacts.
Contamination Presence of contaminants within project footprints will have to be determined and appropriately addressed.	Phase 1 assessment will be required for all proposed project footprints. This information is needed to determine potential contamination that may require corrective actions/	Phase 1 assessment will be required for all proposed project footprints. This information is needed to determine potential contamination that may require corrective actions/	Phase 1 assessment will be required for all proposed project footprints. This information is needed to determine potential contamination that may require corrective actions/	Phase 1 assessment will be required for all proposed project footprints. This information is needed to determine potential contamination that may require corrective actions/

Potential Permitting Obstacles	Reservoirs	STAs	ASRs	Deep Wells
	remediation; their impacts to endangered species such as the snail kite.	remediation; their impacts to endangered species such as the snail kite.	remediation; their impacts to endangered species such as the snail kite.	remediation; their impacts to endangered species such as the snail kite.
Geotechnical Information This information will help in understanding the soil composition within the project footprints (i.e. if soils would need to dryout prior to use for construction, if soil materials can be used or if they need to be hauled offsite, etc.) and design of the various features; determine blasting protocols for endangered species, road traffic, and safety protocols.	Soil profiles for seepage, embankment materials, ability to retain water, etc. will have to be developed.	Soil profiles for seepage, levee materials, ability to retain water, etc. will have to be developed.	Need information to determine soil profiles and depths to cavities.	Need information to determine soil profiles and depths to cavities.
Pump Type Benefits of diesel vs. electric pumps will have to be evaluated.	If a diesel pump is selected, and depending on its size, a Title V Air Permit may be required.	If a diesel pump is selected, and depending on its size, a Title V Air Permit may be required.	If a diesel pump is selected, and depending on its size, a Title V Air Permit may be required.	If a diesel pump is selected, and depending on its size, a Title V Air Permit may be required.
Water quality	Effluent discharge will have to meet water quality standards and avoid impacts to downstream water bodies and ecological health of the natural system.	Effluent discharge will have to meet water quality standards and avoid impacts to downstream water bodies and ecological health of the natural system.	Effluent discharge will have to meet water quality standards and avoid impacts to downstream water bodies and ecological health of the natural system.	Effluent discharge will have to meet water quality standards and avoid impacts to downstream water bodies and ecological health of the natural system.

D1.3 Monitoring

Monitoring is generally required to determine if individual project features and the plan as a whole are performing as intended. Typically, monitoring requirements for individual projects are established during the permitting process. Therefore, specific monitoring requirements (parameters, frequency, locations) for individual Level 1 and 2 features, which have already been permitted, are known. No information is currently available for monitoring likely to be required for Level 3, 4, and 5 features.

However, since the two primary objectives of the Plan are storage and water quality improvements, it can be expected that performance of all structural and non-structural project features included in the plan will have to be monitored for flow and phosphorus load reduction. In addition, safety monitoring will be required for features such as reservoirs, STAs, ASRs, and Deep Wells. BMPs will also need to be inspected periodically to ensure structural efficacy and performance.

Known monitoring requirements for the more common types of features included in the Plan are described below:

Reservoirs – Reservoirs that have been previously permitted in South Florida are required to monitor some or all of the following parameters: water level, discharge through spillways and outlet works, DO, nutrients, rainfall, water quality, algae blooms and vegetation changes, sediment in reservoir, downstream sediment, and concrete safety (horizontal alignment, vertical deflection, variations in foundation). The majority of the monitoring is to be conducted at locations within the reservoir and at the discharge point. Frequency of monitoring varies depending upon the parameter.

STAs – Water quality monitoring permitting required at recently permitted STAs includes parameters such as total phosphorus, mercury (total and methyl), vegetation, temperature, specific conductance, DO, pH, total nitrogen, and sulfates. Monitoring is typically conducted at inflow and outflow locations; some internal stations may also be monitored to provide data for performance optimization. Monitoring is generally conducted weekly or bi-weekly.

ASWF and FRES Projects – Monitoring requirements for existing FRES projects include monitoring for water quality (P and N), water quantity (flows), groundwater, and vegetation. Locations upstream and downstream of project site (inflow and outflow) are typically monitored. Continuous monitoring is generally conducted using data loggers, sensors, and auto-samplers.

Managed Aquatic Plan Systems – The only MAPS facility currently in operation in the LOW consists of an Algal Turf Scrubber (ATS) system that is managed by Hydromentia, Inc. Monitoring requirements for this facility, as dictated by its operating permit, include daily and weekly monitoring for total, ortho, and total dissolved phosphorus. Total nitrogen is sampled once a week. In-situ pH, temp, DO, and conductivity are measured hourly. In addition, quarterly water samples are collected at influent to the harvest

bypass pond to assess TP, total N, and total solids. Ammonia, TON, TKN, Nitrate, TDS, TSS, TVSS, TOC, BOD, Mg, Ca, Fe, K, Color, Alkalinity, and Hardness are also measured quarterly. Semi-annual sampling is also conducted for Hg, Pb, As, Se, Cr, Cd, Cu, Zn, herbicides, and pesticides. All of the above monitoring is conducted at designated locations within the facility.

In addition, the facility is required to monitor dissolved oxygen, pH, conductivity, and temperature on a weekly basis at the discharge points to the receiving water bodies. Total P, Ortho P, Total N, TDS, TSS, and TVSS are measured quarterly at the discharge points to the receiving water body. Total P, Ortho P, Total N, TDS, and TSS are measured monthly at the settling pond influent.