

APPENDIX A4
DESCRIPTION OF ALTERNATIVE D-13R

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APPENDIX A4 DESCRIPTION OF ALTERNATIVE D-13R

Alternative D13-R is the plan selected by the Restudy Team as the Initial Draft Plan. This plan is comprised of forty-nine operational and structural features that are referred to as components. Together, these forty-nine components make the Initial Draft Plan; it is a Comprehensive Plan that addresses many of the water resources problems of south Florida. This Section of the Plan Formulation Appendix includes a description of each of the components that make up the Initial Draft Plan. At the end of this Section is a series of figures and maps to aid the reader in understanding the conceptual features of the Initial Draft Plan. However, not all components have been mapped due to uncertainty in site location.

Component A6 - D13R - North of Lake Okeechobee Storage Reservoir

Study Region: Kissimmee River

Map: This component is not mapped due to uncertainty in site location

Purpose: To increase the capacity of the hydrologic system to better meet the water management objectives associated with flood protection, water supply and environmental enhancement. The additional water storage capacity in the reservoir and stormwater treatment area allows for greater detention of water during wet periods for subsequent use during dry periods. It is also anticipated that this increased storage capacity will shorten the duration and frequency of both high water levels in Lake Okeechobee that are stressful to the Lake littoral ecosystems, and large discharges from the Lake that are disruptive to the downstream estuary ecosystems.

Operation: Water from Lake Okeechobee is to be pumped into the north storage reservoir when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (14.35 feet - 14.75 feet NGVD; Figure 1). During the dry season, flows will be allowed back to the Lake from the reservoir through the stormwater treatment area when the Lake level is projected to fall to within three-quarters of a foot of the supply-side management line in the same dry season, or below 11.75 feet NGVD in the upcoming wet season. During the wet season, flow is allowed from the reservoir through the stormwater treatment area to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months and the Lake water level is either currently below 11.75 feet NGVD or projected to be in supply-side management during the upcoming dry season. The reservoir is also filled with runoff from the Kissimmee River or the S-65E drainage basin when water is available.

Design:

Reservoir:

17,500 acres at 11.5 feet maximum depth

Inflow pump capacity = 4800 cfs

Outflow structure = 4800 cfs

Stormwater Treatment Area:

2,500 acres at 4.0 feet maximum depth

gravity flow outlet

Location: To be determined – Specific site not necessary for Water Management Model simulation. Counties could include Glades, Highlands, or Okeechobee.

Assumption and Related Considerations: Uncertainty in land availability.

Component B2 - Component Title: St. Lucie/C-44 Basin Storage Reservoir

Study Region: Upper East Coast

Map: This component is not mapped due to uncertainty in site location

Purpose: Storage reservoir to capture local runoff from C-44 Basin. The reservoir will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary.

Operation:

Inflows from C-44 basin runoff (and only when Lake stage is > 14.5 feet NGVD)

Design:

10,000 acres at 4 feet maximum depth

Inflow pump capacity = 1,000 cfs

Outflow structure capacity = 800 cfs

Location: To be determined – Specific site not necessary for Water Management Model simulation. Counties include Martin.

Assumption and Related Considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loading to the estuary

Component C6 - Environmental Water Supply Deliveries to St. Lucie Estuary

Study Region: St. Lucie/C-44 Basin

Map: This component is not mapped.

Purpose: To provide freshwater deliveries to the St. Lucie Estuary to protect and restore more natural estuarine conditions. The time series of estuary target flows were developed to respond to desirable estuarine conditions.

Operation: Deliver desired estuary target discharge through S-80 from the reservoir when water is available or from Lake Okeechobee when the Lake stage exceeds 11.5 feet NGVD.

Design: Operational change only

Location: C-44 and St. Lucie Estuary. Counties include: Martin and St. Lucie.

Assumption and Related Considerations: Estuary deliveries are based on maintaining salinity conditions in the estuary to support a range of aquatic vegetation seagrass, invertebrates, and fish communities.

Component D5 - Caloosahatchee Basin Storage Reservoir(s) with Aquifer Storage and Recovery

Study Region: Caloosahatchee River

Map: This component is not mapped due to uncertainty in site location

Purpose: Storage reservoir(s) with Aquifer Storage and Recovery (ASR) to capture basin runoff and releases from Lake Okeechobee. These facilities will be designed for water supply benefits, some flood attenuation, and to provide environmental water supply deliveries to the Caloosahatchee estuary.

Operation: Excess runoff from the C-43 Basin and Lake Okeechobee flood control discharges will be captured by the proposed C-43 reservoir(s). Water from the reservoir(s) will be used to provide environmental deliveries to the Caloosahatchee Estuary, to meet demands in the Caloosahatchee Basin and to inject water into the ASR wellfield for long-term (multi-season) storage. The source of water to be injected into the ASR facility is surficial ground water adjacent to the reservoir. Water from the ASR facilities will be used to meet environmental demand of the estuary and meet basin demands. Any estuarine demands not met by basin runoff, the reservoir and the ASR system will be met by Lake Okeechobee, as long as Lake

Stage is above 11.5 feet NGVD. Lake water is also used to meet the remaining basin demands subject to supply-side management.

The C-43 reservoir is operated in conjunction with Component DDD5, the Caloosahatchee Backpumping Facility, which includes an STA for water quality treatment. If the levels of water in the reservoir exceed 6.5 feet and Lake Okeechobee is below the pulse release zone (see Figure 1), then water is released and sent to the backpumping/treatment facility at 2000 cfs.

Design:

Reservoir(s) total of 20,000 acres at 8 feet maximum depth.

ASR wellfields total of 44, 5-MGD wells

Reservoir(s) Inflow pump capacity = 3,800 cfs

ASR inflow capacity = limited to 220 MGD

Reservoir(s) outflow structure capacity = 3,000 cfs

ASR outflow capacity = limited to 220 MGD

Location: To be determined -- Specific site not necessary for Water Management Model simulations. Counties include Hendry, Glades, or Lee.

Assumption and Related Considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loadings.
- 3) Raw water ASR injection permittable.
- 4) 70 percent recovery for injected ASR water.
- 5) Size of injection bubble not limited.
- 6) ASR facility sized to slightly exceed minimum flows to estuary.

Component E5 - Environmental Water Supply Deliveries to Caloosahatchee Estuary

Study Region: Caloosahatchee/C-43 Basin

Map: This component is not mapped.

Purpose: To provide freshwater deliveries to the Caloosahatchee Estuary to establish desirable salinity regimes at locations of key estuarine biota.

Operation: Deliver desired estuary target flow through S-79 in priority order, from basin runoff, from the C-43 storage reservoir, from the C-43 Basin ASR system and from Lake Okeechobee when the Lake stage exceeds 15 feet NGVD.

Design: Operational changes to assure that desirable salinity patterns will be achieved and at the same time makes some water available for capture and

utilization in the regional system. The capture of the excess runoff is accomplished in by the Caloosahatchee Basin Reservoir and ASR system (Component D) and by Caloosahatchee Backpumping with Stormwater Treatment Area (Component DDD).

Location: C-43 and Caloosahatchee Estuary.

Assumption and Related Considerations: Estuary deliveries are made to maintain salinity conditions in the estuary that support a range of aquatic vegetation, seagrass, invertebrates and fish communities.

Component F3 - Lake Okeechobee Regulation Schedule

Study Region: Lake Okeechobee

Map: Refer to Figure 1

Purpose: Operating criteria for Lake Okeechobee that includes flood control, water supply (including releases to the Water Conservation Areas to meet estimated natural system needs), and Lake littoral zone and estuary protection.

Operation: Use current regulation schedule with the design modifications made in components A and GG and with the exception of eliminating all St. Lucie and Caloosahatchee regulatory discharges (except emergency releases - zone A, from Run 25).

Design: Operational changes only. Modify the regulation schedule by eliminating all but emergency discharges to both the St. Lucie and Caloosahatchee Estuaries.

Location: Within existing boundary of Lake Okeechobee
Counties: Glades, Hendry, Martin, Okeechobee and Palm Beach

Assumption and Related Considerations: It is assumed that the implementation of other project components will reduce the frequency of high Lake stage events therefore reducing the need for regulatory releases to the St. Lucie and Caloosahatchee Estuaries.

Component G6 - Everglades Agricultural Area Storage Reservoir

Study Region: Everglades Agricultural Area (EAA)

Map: This component is not mapped due to uncertainty in site location

Purpose: Storage reservoir improves timing of environmental deliveries to the Water Conservation Areas (WCA) including reducing damaging flood releases from

the EAA to the Water Conservation Areas; reduces Lake Okeechobee regulatory releases to estuaries; meets supplemental agricultural irrigation demands; and increases flood protection within the Everglades Agricultural Area. Conveyance capacity of the Miami and North New River Canals between Lake Okeechobee and the storage reservoir(s) is increased to convey additional Lake Okeechobee flood control releases that would have otherwise been discharged to the Caloosahatchee and St. Lucie Estuaries. Conveyance capacity of the Bolles and Cross Canals between the Miami and Hillsboro Canals is increased to facilitate interbasin transfers for storage and flood protection.

Operation: Inflows are from Lake Okeechobee regulatory discharges and runoff from Miami and North New River and adjacent basins. The reservoir will be divided into three compartments.

Compartment 1: 20,000 acres, meets EAA irrigation demands only. The source of water is excess EAA runoff. Inlet capacities for excess runoff are 2700 and 2300 cfs, for the Miami Canal and the North New River Canal Basins, respectively. Outlet capacities for EAA demands are 3000 and 4400 cfs, for the Miami Canal and the North New River Canal Basins. Overflow to compartment 2 occurs when the depth of water approaches 6 feet maximum and Lake Okeechobee regulatory discharges are not occurring or impending. Excess EAA runoff is diverted to compartment 3 only if WCA-3A is too deep.

Compartment 2: 20,000 acres, meets environmental demands as a priority, but can supply a portion of EAA irrigation demands if environmental demands equal zero. The sources of water are overflow from compartment 1 and Lake Okeechobee regulatory releases including the weather forecasting to initiate storage usage. Compartment 2A will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

Compartment 3: 20,000 acres, meets environmental demands as a priority. The sources of water are overflow from compartment 1 and 2A and Lake Okeechobee regulatory releases only during the extreme wet events. Compartment 3 will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

The conveyance of the northern reaches of the Miami and North New River Canals in the EAA are tripled (200% increase) for Lake Okeechobee regulatory releases as in Alternative 3. Structures with a capacity of 4500 cfs for diversion of regulatory releases through the Miami Canal and 3000 cfs for diversion of regulatory releases through the North New River Canal are added to compartments 2 and 3. When the reservoir depth falls below 1.5 feet, Lake Okeechobee is used for meeting supplemental irrigation and environmental demands. The flows will be delivered to the Water Conservation Areas through Stormwater Treatment Area 3/4.

Design:

Compartment 1: 1-20,000 acre reservoir at 6 feet maximum depth
Inflow structure capacity: inflow pumps of 2700 cfs Miami Canal Basin and 2300 cfs North New River Canal Basin for diversion of EAA runoff

Outflow structure capacity:

To Everglades Agricultural Area: 1-3000 cfs structure to Miami Canal Basin and 1-4400 cfs structure to North New River and Hillsboro Basins (initially assumed to not constrain performance).

Compartment 2: 1-20,000-acre reservoir at 6 feet maximum depth

Inflow structure capacity: inflow pumps of 4500 cfs and 3000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami Canal and the North New River Canal, respectively

Outflow structure capacity:

To Stormwater Treatment Area 3/4: 3600 cfs @ 6 feet head.

Increase in Miami, North New River and Bolles and Cross Canal capacities is 200%.

To Miami Canal: 4500 cfs

To North New River Canal: 3000 cfs

Compartment 3: 1-20,000-acre reservoir at 6 feet maximum depth

Inflow structure capacity: inflow pumps of 4500 cfs and 3000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami Canal and the North New River Canal, respectively

Location: To be determined - conceptually located in Palm Beach County between Miami and North New River Canals for Water Management Model simulation purposes only.

Assumption and Related Considerations:

- 1) Land Availability.
- 2) Modifications to Stormwater Treatment Areas if needed for Everglades water deliveries to meet the appropriate water quality.

Component H6 - D13R - Everglades Rain-Driven Operations

Study Region: Water Conservation Areas and Everglades National Park

Map: This component is not mapped.

Purpose: Improve timing and location of water depths in the Water Conservation Areas (WCAs) and Everglades National Park (ENP).

The rain-driven operational concept is a basic shift from the current operational practice, which uses calendar-based regulation schedules for the WCAs. Regulation schedules, also referred to as flood-control schedules, typically specify the release rules for a WCA based on the water level at one or more key water level gages. Regulation schedules do not typically contain rules for importing water from an upstream source. The schedules also repeat every year and make no allowance for inter-annual variability. The rain-driven operational concept includes rules for importing and exporting water from the WCAs in order to mimic a desired target stage hydrograph at key locations within the Everglades system. The target stage hydrographs mimic an estimate of the more natural (pre-drainage Everglades) water level response to rainfall.

Operation: Note that for the description below, the term "trigger level" means the water level used to trigger action at an upstream or downstream structure. Trigger levels are related to the target stage hydrographs by simple offsets which typically range less than +/-1.0ft. There is usually one trigger level for the import rules; and two trigger levels associated with the exportation of water. The two export trigger levels define two release zones. The lower zone is a conditional release zone; so releases are made only if the downstream area has a "need". The upper zone is an unconditional release, or flood control, release zone; so releases are made in this zone even if the downstream area doesn't "need" the water.

WCA-1: No rain-driven operations (use 1995 interim regulation schedule)

WCA-2 Import Rules: Import water from Lake Okeechobee via STA-2 if water levels fall below trigger levels in northern WCA-2A (South Florida Water Management Model grid cell R45C28).

WCA-2 Export Rules:

- a. Export water from WCA-2A to WCA-2B via S-144, S-145 & S-146, if levels at gage 2A-17 exceed trigger levels.
- b. Export water from WCA-2A via the S-11's if levels at gage 2A-17 exceed triggers.
- c. Export water from WCA-2B to ENP via new structures at south end of WCA-2B if levels at central WCA-2B (grid cell R36C30) exceed trigger levels.

WCA-3 Import Rules:

- a. Import water from Everglades Agricultural Area (EAA) storage and/or Lake Okeechobee via STA-3/4 to:
 - (1) Northeast WCA-3A if levels fall below trigger levels at gage 3A-NE.
 - (2) Northwest WCA-3A (via L-5/L-4, S8, G404, and spreader along L-4) if levels fall below trigger levels at gage 3A-NW.

(3) Central WCA-3A, via an improved S-140 & a spreader along the southernmost ~8miles of L-28{north reach}, if levels fall below trigger levels at gage 3A-4.

b. Import water from WCA-2A via S-11's if levels fall below trigger levels at gage 3A-3 (and WCA-2 has excess water {levels at gage 2A-17 significantly exceed targets}).

WCA-3 Export Rules:

a. Export water from WCA-3A to WCA-3B via proposed L-67 weir structures if water levels upstream of weirs exceed their respective crest elevations (passive structures).

b. Export water from WCA-3A to WCA-3B via proposed S-345 and S-349 structures if water levels at grid cell R33C26 exceed trigger levels.

c. Export water from WCA-3A to Central Lakebelt storage area, via proposed gravity structure near S-9, if water levels at grid cell R26C33 exceed trigger levels.

d. Export water from WCA-3B to Central Lakebelt storage area, via S-31, if water levels at grid cell R30C27 exceed trigger levels.

ENP Import Rules:

a. Import water from WCA-3A via proposed S-345 and S-349 structures if the average of water levels at Northeast Shark River Slough (NESRS) gages, NESRS-1 and NESRS-2, falls below trigger levels.

b. Import water from Central Lakebelt storage via proposed S-356A&B structures if levels at G-1502 fall below trigger levels.

c. Import excess water from WCA-2B, via improved L-37 & L-33 canals and S-356A&B.

Design: Deliveries from upstream sources (EAA runoff, EAA storage area, and/or Lake Okeechobee) through the Stormwater Treatment Areas (STAs) prior to release into the WCAs. Distribution of STA outflow designed to improve hydropatterns. Flows to ENP from WCAs 3A and 3B are uncontrolled in this alternative since the S-355 and S-12 structures, L-29, and the L-29 borrow canal are removed to allow overland flow from WCAs 3A and 3B to ENP.

Location: Within the existing boundaries of the WCAs and ENP. Counties include: Broward, Dade, Monroe, and Palm Beach

Assumption and Related Considerations:

- 1) Consideration given to tree islands and minimum floor levels consistent with South Florida Water Management District's proposed minimum flows and levels for these areas.
- 2) Potential increases in hydropatterns in relatively overdrained areas (e.g., northern WCA-3A) and decreases in hydropatterns in deep water areas (e.g., southern WCA-3A).

Component I - (not included in this Alternative)

Component J - (not included in this Alternative)

Component K6 - L-8 Project

Study Region: Lower East Coast

Map: Refer to Component Map 1

Purpose: Reduce water supply restrictions in the Northern Palm Beach County Service Area by capturing more of the annual discharges from portions of the southern L-8, C-51 and C-17 Basins and route this water to the West Palm Beach Water Catchment Area. Intent is to increase water supply availability and provide pass through flow to enhance hydroperiods in Loxahatchee Slough and increase base flows to the Northwest Fork of the Loxahatchee River.

Operation: Capture excess L-8, C-51 and C-17 Basin water to meet urban water supply demands in the Northern Palm Beach County Service Area and enhance hydroperiods in the Loxahatchee Slough. Water would be diverted through the M-Canal to the Water Catchment Area. Stormwater treatment areas will be provided to meet all water quality standards required if necessary.

Design:

48,000 acre-feet reservoir as described in component GGG6. The reservoir covers an area of approximately 1200 acres and is located immediately west of the L-8 Canal and north of the C-51 Canal.

50 MGD Aquifer Storage and Recovery (ASR) to provide water during regionally triggered droughts and as a means of reducing withdrawals from the West Palm Beach Water Catchment Area when the water levels are substantially below the target hydrograph. The majority or all of the 50 MGD ASR well clusters will be located in the vicinity of the City of West Palm Beach Water Treatment Plant (Clear Lake). However for modeling purposes, the ASR wells were located in the West Palm Beach Water Catchment Area. During periods when the West Palm Beach Water Catchment Area is above 18.0 feet NGVD, an additional (above the flow rate required to supply the water treatment plant) 50 MGD (78 cfs) will be sent to Lake Mangonia for subsequent storage through the ASR clusters (surficial well discharging into a Floridan well). The ASR wells will provide water directly to Lake Mangonia when water levels in the West Palm Beach Water Catchment Area are within 0.2 feet of the level that triggers regional supply to the West Palm Beach Water Catchment Area.

Increase the pumping capacity from the L-8 Tieback into the M-canal to 300 cfs to increase the volume of water captured from the southern L-8 Canal and deliver it to the Water Catchment Area. This pump has dual purposes, 1) to capture L-8 Basin runoff when available and 2) to deliver regional deliveries when needed.

Assume that the Indian Trail Improvement District will adopt an operation plan which promotes water conservation by prioritizing discharge. In this operation excess storm water is first offered to the West Palm Beach Water Catchment Area through installation of 2 pumps (300 cfs and 200 cfs) and secondarily discharged through off peak releases to the C-51 Canal via the M-1 Canal. For this alternative pumping from Indian Trail Improvement District into the M-Canal for subsequent discharge into the West Palm Beach Water Catchment Area will be assumed to occur under the following conditions:

- 1) When the City of West Palm Beach Water Catchment Area has sufficient need for imported water as defined by being below 18.2 feet NGVD.
- 2) When water levels in the lower M-1 Basin exceed 14.0 feet NGVD during the wet season (June 1 through October 31) or 16.0 feet NGVD during the dry season (November 1 through May 31) the lower M-1 Basin may discharge up to 200 cfs for subsequent storage.
- 3) When water levels in the upper M-1 Basin exceed 15.0 feet NGVD during the wet season or 16.0 feet NGVD during the dry season) the upper M-1 Basin may discharge up to 300 cfs for subsequent storage.

Increase conveyance of the M-Canal between the pump and the West Palm Beach Water Catchment Area to accommodate the increased inflow from the L-8 Canal and the Indian Trail Improvement District.

Install a new structure in the south leg of C-18 just south of the west leg to facilitate better management of water levels and discharges from the Loxahatchee Slough. The new gravity structure would consist of a variable discharge up to 400 cfs and emergency overflow weirs.

50 cfs pump for water supply deliveries to utilities. A recharge canal may be improved to convey deliveries to utilities.

New culverts under Bee-Line Highway for up to 100 cfs deliveries to Loxahatchee Slough.

Eliminate ASR component described in the Future Without Project Condition.

Location: Southern L-8 Basin including the Indian Trail Improvement District, West Palm Beach Water Catchment Area, and the Loxahatchee Slough. Counties include Palm Beach.

Assumption and Related Considerations:

- 1) Should help maintain stages in the Loxahatchee Slough and reduce high discharges to the southwest fork of the Loxahatchee River.
- 2) Stormwater Treatment Area upstream of the Water Catchment Area may be needed to accommodate future degradation of water quality.
- 3) Secondary structures (recharge canals) may be needed downstream of the Water Catchment Area to provide water to achieve the desired result.

Component L3 - Change Coastal Wellfield Operations

Study Region: Lower East Coast

Map: This component is not mapped.

Purpose: Shift demands from eastern wellfields to western facilities away from the saltwater interface to reduce impact of salt water intrusion.

Operation: For coastal utilities in the Lower East Coast Service Area which are experiencing an increased threat of saltwater intrusion, demands will be shifted from the eastern facilities to the western facilities away from the saltwater interface. The volume shifted is dependent upon the degree of saltwater intrusion but is generally proportional to the increase in demands between the 1995 existing conditions and the 2050 future without project conditions unless otherwise noted.

Design: For this alternative the following utilities have a portion of their demands shifted inland and include Riviera Beach, Lake Worth, Lantana, Manalapan, Boca Raton, Hollywood (including Broward County 3B and 3C), Dania, Miramar, Broward County 3A, Hallandale and Florida City. Redistribution of demands for Lake Worth, Lantana, Manalapan, Boca Raton and Florida City are generally consistent with the Lower East Coast Water Supply Plan. For the City of Riviera Beach, demands will be shifted from the eastern facilities to the western facilities, with the western facilities absorbing the increased demand between the 1995 and 2050 conditions. For this alternative, the City of Miramar's eastern wellfield will be placed on standby and all demands will be met from the western wellfield. For the City of Hollywood, Hallandale, Dania, Broward County 3A, and Broward County 3B/3C all these wellfields will be placed on standby and the entire demand (with the exception of 4 MGD from the Floridan aquifer for Hollywood) will be met from the South Broward County Regional wellfield. Recharge to the Regional wellfield will be met through the existing canal system supplied from locally captured runoff from the C-9 Basin (Components R and S).

Location: Lower East Coast Service Area. Counties include: Broward, Miami-Dade and Palm Beach.

Assumption and Related Considerations: It is assumed that the western facilities of the individual utilities have sufficient capacity to meet the increased demands.

Component M6 - Site 1 Impoundment with Aquifer Storage and Recovery

Study Region: Lower East Coast

Map: Refer to Component Map 2

Purpose: Water supply storage reservoir to supplement water deliveries to the Hillsboro Canal during the dry-season.

Operation: The enlarged reservoir will be filled during the wet-season from excess water backpumped from the Hillsboro Canal. Water will be released back to the Hillsboro Canal to help maintain canal stages during the dry-season. If water is not available in the reservoir, existing rules for water delivery to this region will be applied. Aquifer Storage and Recovery (ASR) capacity is being increased to improve water supply during dry seasons and droughts. Fifteen (15) 5 MGD capacity ASR wells will be added for a total of thirty (30) ASR clusters for this alternative (total injection and recovery capacity is 150 MGD or about 230 cfs). Water will be injected into the ASR wells when stages in the impoundment are greater than 12.0 feet NGVD (0.5 feet of depth) The source of water to be injected is surficial ground water wells located adjacent to the reservoir. Water will be recovered from the ASR wells when stages in the Hillsboro Canal are less than 7.0 feet NGVD.

Design:

2460 acres with a maximum depth of 6 feet located north and south of the Hillsboro Canal. The portion of the canal that is located within the proposed reservoir will be incorporated into the reservoir.

Inflow pump capacity = 700 cfs and is relocated to the eastern end of the Hillsboro Canal.

Outflow structure capacity = 200 cfs @ 4 feet of head.

Emergency outflow structure = 700 cfs.

Thirty (30) – 5 MGD ASR wells (total capacity 150 MGD or about 230 cfs).

Location: The Water Preserve Area Land Suitability Analysis previously identified 2460-acre site. Counties include: Palm Beach

Assumption and Related Considerations:

1) Excess storage could be discharged to Water Conservation Area 2A if a treatment facility could be added to meet Everglades' water quality standards.

- 2) Based on results of the pilot project, ASR facilities maybe located along Hillsboro Canal
- 3) Recovery rate of 70 percent for water stored by ASR.

Component N - (not included in this Alternative)

Component O4 - Water Conservation Area 3A and 3B Levee Seepage Management

Study Region: Lower East Coast

Map: Refer to Component Map 4 and 5

Purpose: Reduce seepage from WCAs 3A and 3B to improve hydro patterns within the Conservation Areas by allowing higher water levels in the borrow canals and longer inundation durations within the marsh areas that are located east of the WCAs and west of US Highway 27. Seepage from the WCAs and marshes will be collected and directed south into the Central Lake Belt Storage Area. This will maintain flood protection and the separation of seepage water from urban runoff originating in the C-11 Basin and Lake Okechobee water supply deliveries.

Operation: The L-37 and L-33 borrow canals will be held at higher stages as part of the WCA 3 seepage collection and conveyance system (Component YY). Seepage collected in the L-37 and L-33 borrow canals and from the marsh areas will be directed into the WCA 3 seepage collection and conveyance system and directed south into the Central Lake Belt Storage Area or directly to Northeast Shark River Slough.

Design: New levees will be constructed west of US Highway 27 from the North New River Canal to the Miami (C-6) Canal to separate seepage water from the urban runoff in the C-11 diversion canal (Component Q). The L-37 and L-33 borrow canals will be controlled at higher stages as will the marshes located east of the WCAs. A divide structure will be added to the C-11 Canal west of US Highway 27 to maintain the separation of seepage water from urban runoff. Water from C-11 west will be diverted to the North Lake Belt Storage Area.

Location: Seepage collected in borrow canals along the existing eastern protective levees adjacent to WCA 3. Divide structure located in C-11 Canal east of US Highway 27 in Broward County.

Assumption and Related Considerations: It is assumed that the seepage from the Water Conservation Areas meets the water quality standards necessary to achieve ecosystem restoration.

Component P - (not included in this Alternative)

Component Q5 - Western C-11 Diversion Impoundment and Diversion Canal

Study Region: Lower East Coast

Map: Refer to Component Map 4

Purpose: Divert untreated runoff from western C-11 that is presently discharged into Water Conservation Area 3A through the C-11 Stormwater Treatment Area / Impoundment to the North Lake Belt Storage Area.

Operation: Runoff in the western C-11 Canal that was previously backpumped into Water Conservation Area 3A will be diverted to the C-11 STA/Impoundment and then to North Lake Belt Storage Area (NLBSA). If storage capacity is not available in the impoundment or NLBSA, then the S-9 pump will be used for flood protection for the Western C-11 Basin, which pumps to WCA-3A. To improve groundwater elevations in the Eastern C-11 Basin, the S-9 seepage divide structure will be operated to maintain the Western C-11 Canal stage at elevation 3.0 feet NGVD.

Design:

2500 cfs diversion canal west of U.S. 27 between C-11 and C-9 and a 2500 cfs conveyance capacity improvements to the C-9 Canal between S-30 and the NLBSA. Intermediate 2500 cfs pump station in the C-11 Canal to direct runoff to the C11 STA/impoundment.

1600 acre STA/Impoundment with a maximum depth of 4 feet.

Seepage collection canal and pump for C-11 STA/impoundment.

2200 cfs structure to discharge from the impoundment to C-11 west of US 27 to diversion canal.

Location: The diversion canal is located west of US-27 between C-11 and C-9 Canals. The C-11 STA/impoundment is located northeast of the intersection of US27 and C-11 Canal.

Counties: Broward, Miami-Dade

Assumption and Related Considerations:

- 1) Flood protection component for Florida Power and Light substation and mobile home park may be needed.
- 2) Telemetry systems will be required for all operable structures and pump stations.

Component R4 - C-9 Stormwater Treatment Area/Impoundment

Study Region: Lower East Coast

Map: Refer to Component Map 5

Purpose: Treatment of water supply deliveries from North Lake Belt Storage Area (NLBSA) to C-9, C-6/C-7 and C-2/C-4 Canals. NLBSA is used to capture runoff from western C-9 Basin and C-11 west by backpumping into the curtain walled reservoir area. The C-9 impoundment will provide treatment of runoff stored in North Lake Belt Storage Area, groundwater recharge within the basin and seepage control of WCA3 and buffer areas to the west.

Operation: Water supply deliveries from North Lake Belt Storage Area to C-9, C-6/C-7 and C-2/C-4 Canals will be pumped into the C-9 STA/impoundment for treatment of the stormwater runoff stored in the NLBSA. Seepage from C-9 impoundment will be collected and returned to the impoundment.

Design:

2500 acres with a maximum depth of 4 feet.

Inflow structure: 1000 cfs pump (see component XX North Lake Belt Storage Area).

Outflow structure: Gravity structure with 1000 cfs capacity at 4 foot head.

Discharge C-9 impoundment to C-9, C-6/C-7 and C-2/C-4 Canals for water supply deliveries.

Seepage Collection: 200 cfs recycled into the impoundment area.

Location: Site identified by Water Preserve Area Land Suitability Analysis
Counties: Broward

Assumption and Related Considerations:

- 1) Additional treatment facility needed if stored water is backpumped into Water Conservation Area 3A.
- 2) Telemetry systems will be required for all operable structures and pump stations

Component S6 - Central Lake Belt Storage Area

Study Region: Lower East Coast

Map: Refer to Component Map 6 and 6A

Purpose: In-ground reservoir to receive excess water from Water Conservation Areas (WCA) 2B, 3A and 3B. The Central Lake Belt Storage Area (CLBSA) is an in-ground reservoir with perimeter seepage barrier will allow storage of large quantities of water without groundwater seepage losses in this highly transmissive region. The water stored in CLBSA will be provided to:

- 1) Northeast Shark River Slough (NESRS),
- 2) Water Conservation Area 3B, and
- 3) to supply flows to Biscayne Bay when available.

Operation: Inflows from L-33 (see Component ZZ) is through a 1500 cfs pump. Inflow ceases when stages reach ~21.0 feet NGVD (16 feet above adjacent land elevation). Inflows from L-33 diverted to CLBSA.

Outflows for water deliveries are pumped through a polishing marsh cell prior delivery to NESRS via L-30 and a reconfigured L-31 N (see component U). Deliveries of water to NESRS to maintain inundation will occur when NESRS dries below trigger levels and target hydroperiods simulations call for NESRS to be inundated. CLBSA delivers water to WCA 3B through a polishing marsh cells via L-30 to inundate the eastern area of WCA 3B to a 6 inch depth when triggers call for deliveries. This delivery occurs when WCA 3B dries below 6 inches above ground and target hydroperiods simulations indicate inundation in WCA 3B. When available, outflows will be directed to Biscayne Bay through discharges to Snapper Creek at the Turnpike.

Supply from the reservoir can be withdrawn for stages down to -15 feet NGVD (up to 36 feet of working storage & maximum head on seepage barrier).

Design:

Reservoir: 5200 acres with subterranean seepage barrier around the perimeter to enable drawdown during dry periods and to prevent seepage losses.

STA: 640 acre Stormwater Treatment Area to serve as a polishing prior to discharging to the Everglades (if required)

Inflow Structures:

1500 cfs pump from the L-33 borrow canal.

500 cfs structure at S-9 pump station to gravity discharge from WCA 3A to L-33.

700 cfs structure (Existing S-31) for WCA 3B to CLBSA via C-6 Canal.

Outflow Structures:

800 cfs pump to polishing cell to make deliveries to NESRS and WCA 3B.

500 cfs pump off L-30 to deliver to WCA 3B.

300 cfs pump to make deliveries for Snapper Creek Canal

1100 cfs structure @ 0.5 feet head to provide regional system deliveries to Snapper Creek Canal via C-6 if CLBS is out of water.

Location: Reservoir would be located within the area proposed for rock mining by the Lake Belt Issue Team. It would be sited south of Miami Canal (C-6) and north of the Northwest Wellfield Delivery Canal to minimize impacts to the Northwest Wellfield. The feature is located in Miami-Dade County.

Assumption and Related Considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's Northwest Wellfield.
- 2) Treatment facility maybe needed.
- 3) All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- 5) Limestone Filter Treatment system within the Reservoir may be developed through use of compartmentalization of rockmining excavation pattern.
- 6) Telemetry systems will be required for all operable structures and pump stations.

Component T6 - C-4 Structures

Study Region: Lower East Coast

Map: This component is not mapped.

Purpose: Proposed structures (East and West) would provide two separate benefits. The West structure would control water levels in the C-4 Canal at higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure. The East structure would reduce regional system deliveries by diverting dry season stormwater flows to the C-2 Canal to increase recharge nearby in several coastal wellfields.

Operation: The West structure would maintain water levels at 6.5 feet NGVD for seepage control purposes and be capable of passing flood flows with a minimum of head loss and supplying water to the C-4 Basin to meet demands. The East structure would divert dry season stormwater flows from the western C-4 Basin to the C-2 Canal to recharge the wellfields in the eastern C-2 Basin.

Design:

East Structure- Operable lift-gate with 6.5 feet NGVD overflow and approximately 400 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: Just downstream of the Dade-Broward Levee in C-4 Canal in Miami-Dade County.

West Structure- Operable lift-gate with 4.5 feet NGVD overflow and approximately 600 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: In C-4, just downstream of the confluence of the C-2 and C-4 Canals in Miami Dade County.

Assumption and Related Considerations:

- 1) Benefits to WCA-3B associated with improved C-4 seepage control are directly related to the proposed G-356 pumpage (Modified Water Deliveries).
- 2) Head losses across the proposed structures will not inhibit passing flood releases when necessary.
- 3) A pump may be associated with the West structure if back pumping the C-4 basin runoff to the Bird Drive Recharge Area becomes a component of the final alternative.

Component U6 - Bird Drive Recharge Area

Study Region: Lower East Coast

Map: Refer to Component Map 7

Purpose: Captures runoff from the western C-4 Basin and accepts inflows from the West Miami-Dade Wastewater Treatment Plant (WDWTP) (see component HHH) to recharge groundwater and reduce seepage from the Everglades National Park (ENP) buffer areas by increasing water table elevations east of Krome Ave. The facility will also provide C-4 flood peak attenuation and water supply deliveries to the South Dade Conveyance System (SDCS) and Northeast Shark River Slough.

Operation: Inflows from western C-4 Basin and the WDWTP will be pumped into the proposed Recharge Area. C-4 runoff in excess of 200 cfs will be discharged eastward. Inflows from the WDWTP will be continuous when the Recharge Area depth is equal to or less than 3' above ground. WDWTP discharges will be to deep injection wells if the depth is greater than 3 feet. A seepage management system will be operated around the east and southern perimeters of the Recharge Area. Recharge Area outflows will be prioritized to meet 1) groundwater recharge demands, 2) South Dade Conveyance System demands and 3) Northeast Shark River Slough demands, when supply is available. Regional system deliveries will also be routed through the seepage collection canal system of the Bird Drive

Recharge Area to the South Dade Conveyance System, which should reduce seepage from areas west of Krome Avenue.

Design:

2877 acres with a maximum depth of 4 feet.

Inflow structure: 200 cfs pump (to be resized as needed) from C-4.

Outflow structure:

Water supply: Gravity structure with 200 cfs capacity at 2 feet of head.

Seepage Collection System: up to 500 cfs pump to control seepage collection canal at 5.0 feet NGVD. Seepage is returned to Bird Drive Recharge Area.

Delivery System: 800 cfs pump to provide regional system deliveries to SDCS.

800 cfs canal capacity, in addition to the canal required for the Bird Drive seepage collection system, to pass the regional system deliveries to the South Dade Conveyance System.

5 miles of canal with 800 cfs capacity between Bird Drive seepage collection system to C-1W just east of Krome Ave.

Relocate S-338 east of Krome Ave. and delivery canal.

Location: Northwestern 4 sections in Bird Drive Basin. This site was identified during the Water Preserve Area Land Suitability Analysis.

Counties: Miami-Dade

Assumption and Related Considerations:

- 1) Treatment facility needed if seepage collected does not meet Everglades standards (component HHH).
- 2) Telemetry systems will be required for all operable structures and pump stations.
- 3) Flood protection in the basin will not be removed by the introduction of the West Miami-Dade Wastewater Treatment Plant inflows.
- 4) Regional-scale simulation using SFWMM 2mi X 2mi resolution is rather coarse for this local-scale feature. Specific land elevations in the Bird Drive Recharge Area are not precisely mimicked due to location and scale considerations in the SFWMM.

Component V4 - L-31N Improvements for Seepage Management

Study Region: Lower East Coast

Map: See Component Map 7

Purpose: Levee seepage management along the eastern edge (L-31N) of Everglades National Park to eliminate losses due to levee seepage to the East Coast. An additional feature has been added to reduce all wet-season

seepage/ground water flows to the east. Feature will help restore hydro patterns in Everglades National Park.

Operation: 100% reduction in levee seepage flow from Everglades National Park year-round (to be achieved via Component FF4). Further 100% reduction in all groundwater flows during the wet-season. Bird Drive Recharge Area and North Lake Belt Storage Area will be used to recharge aquifers to the east.

Design:

Levee Seepage: Refer to Component FF4.

Wet-Season Ground Water Seepage: Distributed ground water wells adjacent to L-31N and return flows to Everglades National Park.

If needed, aquifer recharge will occur from deliveries from Bird Drive Recharge Area and North Lake Belt Storage Area.

Location: Along the existing eastern protective levee (L-31N) adjacent to Everglades National Park.

Counties: Miami-Dade

Component W2 - Taylor Creek/Nubbin Slough Storage and Treatment Area

Study Region: Kissimmee River

Map: This component is not mapped due to uncertainty of site location.

Purpose: Storage reservoir to provide flood protection, water quality treatment, estuary protection and water supply benefits.

Operation: Local runoff from the Taylor Creek/Nubbin Slough Basin to be pumped into a 5000-acre reservoir and then into a 5000-acre stormwater treatment area. The stormwater treatment area will reduce phosphorus concentrations in the runoff from approximately 0.58 mg/l to 0.117 mg/l. Treated water will then be pumped into Lake Okeechobee when the lake stage is falling and is at least 0.5 feet below the bottom pulse release zone.

Design:

Storage Reservoir:

5000-acres at 10 feet maximum depth

Inflow pump capacity 2500 cfs

Outflow pump capacity 1000 cfs

Stormwater Treatment Area:

5000-acres at 4 feet maximum depth
Inflow pump capacity 1000 cfs (same structure as reservoir outflow)
Outflow pump capacity 1000 cfs

Location: North of Lake Okeechobee
Counties: Okeechobee, St. Lucie, Martin

Assumption and Related Considerations:

- 1) Uncertainty in land availability.
 - 2) Potential increase in stage duration of Lake Okeechobee.
 - 3) Potential decrease in maximum stages of Lake Okeechobee.
- Phosphorus inflow concentrations (flow-weighted) for the Taylor Creek/Nubbin Slough (S-191) Basin obtained from 5-year rolling averages (1991-1995).
- 4) Average annual discharge rates determined from the period of record 1965-1990.

Component X6 - C-17 Backpumping

Study Region: Lower East Coast

Map: Refer to Component Map 8

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-17 Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in the Loxahatchee Slough.

Operation: Capture excess C-17 Canal water to meet urban water supply demands in North Palm Beach Service Area. Water would be diverted through existing canals to a stormwater treatment area and ultimately to the West Palm Beach Water Catchment Area.

Design: 200 cfs pump in the existing Northern Palm Beach County Improvement District Canal at its intersection with the Turnpike Canal to pull flows west and direct them south into the east Turnpike Canal.
Culvert under 45th Street (N/S) to connect the east Turnpike Canal.
150 cfs capacity culvert and pump from the Turnpike Canal to direct flows into the proposed stormwater treatment area.
550 acre stormwater treatment area at 4 feet maximum depth.
200 cfs Culvert to connect stormwater treatment area under Florida's Turnpike to allow nonrestrictive flows.
100 cfs gravity discharge structure into West Palm Beach Water Catchment Area..

Location: 550 acres located east of the West Palm Beach Water Catchment Area in Palm Beach County.

Assumption and Related Considerations:

- (1) Water quality of C-17 water similar to C-51 water quality.
- (2) Location of stormwater treatment area south of existing landfill.
- (3) Improve conveyance in the Northern Palm Beach County Improvement District and Turnpike canals as necessary to pass flows.

Component Y6 - C-51 Backpumping to West Palm Beach Water Catchment Area

Study Region: Lower East Coast

Map Refer to Component Map 9

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-51 West Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in Loxahatchee Slough.

Operation: Capture excess C-51 Canal water to meet urban water supply demands in the North Palm Beach County Service Area. Water would be diverted from C-51 to a water treatment area and then into the Water Catchment Area.

Design: 600 acres at 4 feet maximum depth to be used for stormwater treatment. Relocate the S-155A structure east of the intersection of Lake Worth Drainage District's E-1 Canal and the C-51 Canal and increase the capacity of S-155A as necessary to pass the additional inflows.

Improve conveyance between C-51 and the stormwater treatment area as necessary.

450 cfs inflow pump to stormwater treatment area.

100 cfs gravity discharge structure into West Palm Beach Water Catchment Area.

Location: 600 acres located southwest of West Palm Beach Water Catchment Area in Palm Beach County.

Assumption and Related Considerations:

- (1) Uncertainty in land availability.
- (2) Connection of L-8 and C-51 Basins.

Component Z - (not included in this Alternative)

Component AA6_D13R - Additional S-345 structures

Study Region: Water Conservation Areas

Map: Component Map

Purpose: The compartmentalization of the Water Conservation Areas (WCAs) has contributed to the loss of historic overland flows of the central Everglades slough system. This alteration of flows has resulted in temporal changes in hydropatterns and hydroperiods in the historic deepwater, central axis of the Shark River Slough system. This component adds conveyance to WCA 3B to help in re-establishing NSM-like hydroperiods and hydropatterns in WCA 3B and Northeast Shark River Slough.

Operation: The addition of a Northeast Shark River Slough rainfall trigger well and modification of western Shark River Slough Basin rainfall triggers deliver additional flows to the basin. Modification of L-67A decreases downstream conveyance to the S-12's required to promote surface water flows to Water Conservation Area 3B and to Northeast Shark River Slough.

Design: Triple the total discharge capacity of S-345's to 4500 cfs and the addition of associated plugs (S-349's).

Location: The additional structures and plugs are to be spaced evenly along the southern half of L-67A.

Assumptions and related Considerations: The emphasis is in re-establishing the historic persistent, deep-water slough that existed in Water Conservation Area 3B and Northeast Shark River Slough.

Component BB5 - Dade Broward Levee / Pennsuco Wetlands

Study Region: Lower East Coast

Map: Refer to Component Map 6

Purpose: Reduce seepage to the east from the Pennsuco Wetlands and southern Water Conservation Area (WCA) 3B and enhance hydroperiods in the Pennsuco Wetlands. Also an improved Dade Broward Levee will enhance recharge to Miami-Dade County's Northwest Wellfield.

Operation: Improvements to the Dade-Broward Levee and associated conveyance system will reduce seepage losses to the east and provide recharge to Miami-Dade County's Northwest Wellfield. Seepage reduction will enhance hydroperiods in Pennsuco Wetlands and hold stage higher along southeastern WCA 3B. Recharging the conveyance features of the Dade-Broward Levee from the regional system deliveries provides recharge to Miami-Dade County's Northwest Wellfield. Treatment areas will be provided to meet all water quality standards required, if necessary.

Design:

Improve the Dade-Broward Levee:

Construct or improve existing levee to five-foot height with 2-foot top width while creating or improving existing conveyance to a capacity of up to 300 cfs.

150 cfs bypass structure and canal from C-6 Canal to Dade-Broward Levee to provide recharge from the regional system via the improved US Highway #27 borrow canal.

150 cfs gravity structure in the Dade-Broward Levee Borrow Channels due west of the southern end of the Northwest Wellfield.

Provide recharge for the Dade-Broward Levee from the regional system when the Conveyance Channel is below 5.0 feet NGVD at the C-4 structure located at the southern end of the Dade-Broward Levee.

Location: Dade-Broward Levee, Pennsuco Wetlands, WCA-3B, the Central Lake Belt Storage Area and Miami-Dade County's Northwest Wellfield.

Assumption and Related Considerations:

- 1) Wellfield protection must be maintain through recharge of acceptable water quality.
- 2) Secondary structures within the recharge canals may be needed to provide seepage reduction and wellfield recharge desired.

Component CC6 - Broward County Secondary Canal System

Study Region: Lower East Coast

Map: Refer to Component Map 10

Purpose: Increase pump capacity of existing facilities (from the 2050 Base Case) and construct additional canal and pump facilities for the Broward Secondary Canal System to provide recharge to wellfields located in central and southern coastal Broward County, stabilize the salt water interface and reduce storm water discharges to tide.

Operation: When excess water is available in the basin, water is pumped into the coastal canal systems to maintain canal stages. When local water is not sufficient to maintain canal stages, canals are maintained first from local sources and then from Lake Okeechobee and the Water Conservation Areas. Local sources include the Site 1 Impoundment (Component M) and the North Lake Belt Storage Area (Component XX).

Secondary canals maintained are 1) Broward County's C-2 from the Hillsboro Canal, 2) north secondary canal from C-13, 3) south secondary canal from C-13, 4)

Turnpike canal south from C-12 and 5) canal north from C-9 (added in Alternative 5) at levels discussed below.

Design:

Canal Conveyance: Improve canal conveyance of secondary canal located east of the Florida Turnpike from the C-12 Canal south to the Fort Lauderdale Golf and Country Club. Alternative 5 includes routing of water eastward to recharge the aquifer and help stabilize the saltwater interface at Ft. Lauderdale. Canal conveyance improvements may also be necessary for the Old Plantation Water Control District's eastern canal and in southeastern Broward County.

Pump capacities and maintenance levels:

100 cfs pump from Hillsboro to Broward County Secondary Canal (pump #1).

100 cfs pump from C-13 north to Broward County Secondary Canal.

100 cfs pump from C-13 south to Broward County Secondary Canal (pumps #2 and #3 described in the 2050 Base Case increased from 33 cfs to 100 cfs.

100 cfs pump on the east Turnpike canal withdrawing water from the C-12

Canal.

150 cfs pump on the C-9 Canal for maintaining water in southeastern Broward County.

Canal improvements and control elevations:

Improve east and west Turnpike canals and golf course lake system between C-12 and the North New River to achieve an average top width of 200 feet.

The Turnpike canals shall be maintained at a minimum elevation of 4.0 feet NGVD.

Improve canal/ lake systems in southeastern Broward County and the Orangebrook Golf Course to have an average canal top width of 30 feet.

The southeastern Broward Canal system shall be maintained at a minimum elevation of 2.5 feet NGVD.

Location: Broward County

Assumption and Related Considerations:

1) Canal levels are maintained from local basin runoff and sources. When water is not available from local sources, water is supplied to the canal systems from the regional system.

2) Canal operations do not impact existing flood control levels.

**Component DD5 - Modified Holey Land Wildlife Management Area
Water Management Operations**

Study Region: Water Conservation Areas

Map: This component is not mapped.

Purpose: Improve timing and location of water depths within the Holey Land Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven modified operational rules with NSM-like hydrologic conditions triggering deliveries. Rainfall-driven inflows are driven by target water depths in cell R45C18. Outflows are based on target water depths in cell R42C20. Alternative 5 truncates the peaks 1.5' above ground level and the troughs 1.0' below ground level.

Design: Operational changes only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A in Palm Beach County.

Assumption and Related Considerations: Water deliveries are made to the Holey Land through G-200A or from Stormwater Treatment Areas 3 & 4 if Rotenberger Wildlife Management Area flows are insufficient. The deliveries are assumed to be of acceptable water quality from either Rotenberger Wildlife Management Area or Lake Okeechobee through Stormwater Treatment Areas 3 & 4.

Component EE5 - Modified Rotenberger Wildlife Management Area Water Management Operations

Study Region: Water Conservation Areas

Map: This component is not mapped.

Purpose: Improve timing and location of water depths within the Rotenberger Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven operational rules with Natural System Model-like hydrologic conditions triggering deliveries. Rainfall-driven inflows and outflows are driven by the average of target water depths in South Florida Water Management Model grid cells R46C15 and R43C16. Alternative 5 truncates the peaks 1.5 feet above ground level and the troughs 1.0 feet below ground level.

Design: Operational changes only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A in Palm Beach County.

Assumption and Related Considerations: Water deliveries made to Rotenberger Wildlife Management Area from Stormwater Treatment Area 5 are assumed to be of acceptable water quality.

Component FF4 - Construction of S-356 A & B Structures

Study Region: Lower East Coast

Map: Refer to Component Map 7

Purpose: To improve deliveries to Northeast Shark River Slough in Everglades National Park and reduce seepage to Lower East Coast Service Area 3.

Operation: Redirect S-357 outfall from L-31N to the mid-point of the Modified Water Deliveries (MWD) mitigation canal northwest of the 8.5 Square Mile Area. Operate new S-356 pumps to direct seepage collection from Water Conservation Areas and water deliveries from Central Lake Belt Storage Area to Northeast Shark River Slough.

Design:

Remove MWD S-356.

Relocate MWD S-357.

Add S-356 A & B Structures (900 cfs each) at locations along modified L-31N between G-211 and Tamiami Trail.

Reroute L-31N borrow canal to east side of buffer cell.

Relocate L-31N to east side of buffer cell.

Backfill portion of L-31N where levee moved.

5 foot levee along west side of existing lakes.

Location: L-31N along east side of Northeast Shark River Slough.

Counties: Miami-Dade

Assumption and Related Considerations:

- 1) Water Quality is not a problem
- 2) No adverse impacts to areas east of L-31N

Component GG4 - Lake Okeechobee Aquifer Storage and Recovery

Study Region: Lake Okeechobee

Map: Refer to Figure 1

Purpose: Provides additional regional storage while reducing both evapotranspiration losses and the amount of land removed from current land use

(e.g. agriculture) that would normally be associated with construction and operation of above-ground storage facilities (reservoirs);

Increase the Lake's water storage capability to better meet regional water supply demands for agriculture, Lower East Coast urban areas, and the Everglades;

Manage a portion of regulatory releases from the Lake primarily to improve Everglades hydropatterns, meet environmental targets within the Water Conservation Areas (WCAs), and meet supplemental water supply demands of the Lower East Coast;

Reduce harmful regulatory discharges to the St. Lucie and Caloosahatchee Estuaries;

Maintain existing level of flood protection.

Operation: Water from Lake Okeechobee is to be pumped into the Lake Aquifer Storage and Recovery (ASR) wells when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (15.25 - 14.85 feet NGVD; Figure 1). During the dry season, flow may be made back to the Lake from the ASR wells either when the Lake water level is projected to fall to within three-quarters of a foot of the supply-side management line the same dry season, or below 11.75 feet NGVD the upcoming wet season. During the wet season, flow is allowed from the ASR wells to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months, and the Lake water level is either below 11.75 feet (NGVD) during the current wet season, or is projected to be in supply-side management during the upcoming dry season.

Design: 1000 MGD total: 200, 5-MGD ASR wells and associated infrastructure

Location: Glades and Okeechobee Counties

Assumption and Related Considerations:

- 1) Current United States Environmental Protection Agency and Florida Department of Environmental Protection regulations require that ASR source water meet primary drinking water standards before injection.
- 2) ASRs will have an approximate recovery rate of 70%, i.e. 30% of water injected to the deep wells is lost due to transmission (injection and recovery) and storage (mixing with deep aquifer saline water, migration of ASR storage flume) losses.

Component HH- (not included in this Alternative)

Component II3 - Pump Station G-404 Modification

Study Region: Everglades Agricultural Area (EAA)

Map: Refer to Component Map 15

Purpose: Increase the capacity of proposed Everglades Construction Project (ECP) pump station G-404 to improve the hydropattern restoration in the northwest corner of Water Conservation Area 3A (WCA 3A) and increase the amount of water available in the west-central region of WCA 3A to reduce dry out periods.

Operation: Pump the maximum Stormwater Treatment Area (STA) 3/4 treated discharge possible across the Miami Canal from the L-5 borrow canal to the L-4 borrow canal to the northwest corner of WCA 3A. The treated discharge will sheet flow across the northern reach of WCA 3A between the Miami Canal and L-28 and flow down the L-28 Canal through structure S-140. This additional water should improve the hydropattern restoration and reduce the number of dry out periods in the central region of WCA 3A. This diversion of water from the northeast section of WCA 3A should reduce the inundation duration and extreme high water depths in this sector of the water conservation area.

Design: Increase the capacity from 1000 cfs to 2000 cfs on this proposed vertical, axial flow, low head, high capacity pump station (may be slightly resized after further hydraulic analyses).

Location: Confluence of Miami Canal, L-5 Borrow Canal and the L-4 Borrow Canal north of the S-8 Pump Station.
Counties : Palm Beach

Assumption and Related Considerations:

- 1) Land Availability.
- 2) Compatibility with proposed G-404 design.
- 3) Modifications to the L-4 and L-5 borrow canals if needed to increase the conveyance capacities to handle the additional conveyance.
- 4) Preliminary analyses indicate the pump intake elevation for G-404 and S-8 should be about 8.0 feet NGVD to facilitate water supply deliveries west through G-404 and south through S-8.

Component JJ - (not included in this Alternative)

Component KK4 - Loxahatchee National Wildlife Refuge Internal Canal Structures

Study Region: Water Conservation Areas

Map: This component is not mapped.

Purpose: Improve timing and location of water depths in the Refuge.

Operation: Structures would remain closed except to pass Stormwater Treatment Area (STA) 1 East and STA – 1 West outflow and water supply deliveries.

Design:

- (1) L-7 borrow canal structure: 1500 cfs gravity structure at 0.5 foot head.
- (2) L-40 borrow canal structure: 1500 cfs gravity structure at 0.5 foot head.

Location: The L-7 structure is located at cell R28C50 in the L-7 borrow canal within the Loxahatchee National Wildlife Refuge. The L-40 structure is located at cell R34C50 in the L-40 borrow canal within the refuge.

Counties: Palm Beach

Assumptions and Related Considerations: STA discharges to the Loxahatchee National Wildlife Refuge are assumed to be of acceptable water quality.

Component LL6 - C-51 Regional Groundwater Aquifer Storage and Recovery

Study Region: Lower East Coast

Map: Refer to Component Map 1

Purpose: This is a regional groundwater aquifer storage and recovery (ASR) system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. The ability to use the recovered water during dry periods will increase regional water resources.

Operation: Water will be captured and stored when water is being discharged out of S-155 to tide. Water will be recovered during dry periods based on canal elevations. Recoverable water is limited to 70 % of injected water.

Design: This component consists of 34 well clusters located along the West Palm Beach Canal (C-51 Canal), each being composed of two (2) surficial aquifer wells and one Upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5 MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide in wet periods. Each upper Floridan aquifer ASR well will have a capacity of 5 MGD (the total injection and recovery capacity of the ASR system is 170 MGD or about 264 cfs.) Water will be injected when stages in the C-51 Canal are above 8.0 feet NGVD. Water will be retrieved from the ASR wells when canal stages are below 7.8 feet NGVD. Recovered water will be discharged to the C-51 Canal.

Location: Along the C-51 Canal in eastern Palm Beach County east of U.S. Route 441.

Assumption and Related Considerations: It is assumed that groundwater ASR in proximity to the C-51 Canal is permittable without treatment.

Component MM4 - (not included in this Alternative)

Component NN3 - (not included in this Alternative)

Component OO4 - Modification to South Dade Conveyance System in Southern Portion of L-31N and C-111

Study Region: Lower East Coast

Map: This component is not mapped.

Purpose: To improve deliveries to Everglades National Park and decrease potential flood risk in the Lower East Coast Service Area.

Operation: Modify C-111 Canal operations by holding lower canal water levels by increasing pumping frequency.

Design:

S-332D at 500 cfs (consistent with Experimental Program for Water Deliveries to Everglades National Park)

Remove S-332B (consistent with recent C-111 detailed project designs)

Add 100 cfs to S-332C (keep total of S-332 A-D < 1200 cfs)

Remove S-332 pump station

Remove S-332D Tieback Canal which provides flow from C-111 to S-332.

Location: South Dade Conveyance System in Miami-Dade County.

Assumption and Related Considerations:

- 1) Will not cause adverse impacts to ENP and South Dade Agricultural Lands.
- 2) This component is dependent on Component FF.

Component PP3 - (not included in this Alternative)

Component QQ6_D13R - Decompartmentalization of Water Conservation Area 3

Study Region: Water Conservation Areas and Everglades National Park

Map: Refer to Component Map 17

Purpose: Remove most flow obstructions to achieve unconstrained or passive flow between Water Conservation Areas 3A and 3B and Northeast Shark River Slough and reestablish the ecological and hydrologic connection between these areas.

Operation: Rain-driven trigger gages in Northwest Shark River Slough similar to Alternative 3. Sheetflow to Everglades National Park (refer to Component H6_D13R for Everglades Rain-Driven Operations).

Design:

Structural Changes:

- Backfill the Miami Canal in Water Conservation Area 3 from the east coast protective levee to one to two miles south of the S-8 pump station to maintain flood discharge capability. Water supply deliveries previously made through the Miami Canal will be delivered through the North New River Canal, and improved US 27 borrow canal (see Component SS).
- Remove the L-68A levees (this feature is outside SFWMM model detail).
- Degrade the L-67C levee and backfill the adjacent borrow canal.
- Backfill the L-67A Canal from Tamiami Trail approximately 7.5 miles north.
- Relocate a single S-349 structure at the downstream end of L-67A Canal (upstream of the S-345 structures).
- Remove the L-29 Levee and Canal (south of WCA-3A and 3B) to restore sheetflow into Everglades National Park.
- Remove the L-28 and L-28 Tieback levees and borrow canals from L-28 Tieback south to L-29.
- Elevate Tamiami Trail (U.S. 41) through the installation of a series of bridges between L-31N and L-28 consist with conveyance capacities determined at I-75 and any increases required due to inflows downstream of I-75 and upstream of Tamiami Trail.
- Remove the S-344, S-343A and B and S-12 structures.
- Construct 8 passive weir structures along the entire length of L-67A to promote sheetflow during high flow conditions and locate the S-345s (component AA3) just downstream of the new termination of L-67A Canal.

Operational Changes:

- 1) Operate WCA-2A import trigger using only 2A-N gage as the trigger rather than using average of 2A-N and 2A-17 gages.
- 2) The time series target at 2A-N was truncated at 1.25 ft above and 0.5 ft below land surface elevation.
- 3) The time series target at 3A-NE was truncated at 1.0 ft above and 0.5 ft below land surface elevation.

- 4) S-345 operations are now based on triggers at R33C26 and the NESRS-1 and NESRS-2 gages (the 3A-4 gage is no longer used).
- 5) S-349 structure operations are the same as the S-345's operations.

Location: Within the existing boundaries of the Water Conservation Areas and Everglades National Park in Broward and Miami-Dade County.

Assumption and Related Considerations:

- 1) Potential increases in hydropatterns in dry areas and decrease in hydropatterns in deep water areas.
- 2) Tradeoff between water levels and hydroperiods in central and south central Water Conservation Area 3A and Everglades National Park.
- 3) Additional S-345s are needed to ensure that significant dry season flows into WCA-3B and ultimately Everglades National Park can be achieved.
- 4) Miccosukee Tribal Lands adjacent to L-29 and Tamiami Trail will not be impacted.

Component RR4 - Flow to Central Water Conservation Area 3A (WCA 3A)

Study Region: Water Conservation Areas

Map: Refer to Component Map 15

Purpose: To increase depths and extend hydroperiods in central WCA 3A.

Operation: Relocate pump station S-140 and distribute flows into central WCA 3A. Pump operation will be driven by target stages at the 3A-4 gage.

Design: Relocate S-140 pump station approximately 8 miles south of its current location and increase the capacity from 1300 cfs to 2000 cfs. A spreader system will be needed to distribute the S-140 discharge via sheetflow.

Location: Within the existing boundaries of the Water Conservation in Broward County.

Assumption and Related Considerations:

- 1) Potential increases in hydropatterns in dry areas and decrease in hydropatterns in deep water areas.
- 2) Tradeoff between water levels in indicator regions 18 and 17 in central WCA 3A.
- 3) May require increased flows from Lake Okeechobee to achieve the desired hydropatterns in central WCA 3A.
- 4) Spreader mechanism required at the point where flows will be introduced into WCA 3.

Component SS4 - Reroute Miami-Dade County Water Supply Deliveries

Study Region: Everglades Agricultural Area and Lower East Coast

Map Refer to Component Map 11

Purpose: Reroute water supply deliveries made to Miami-Dade County from the Miami and Tamiami Canals and Water Conservation Area 3 (WCA 3) to the North New River Canal due to the backfilling of the Miami Canal as part of the decompartmentalization of WCA 3.

Operation: Send water supply deliveries from Lake Okeechobee to Miami-Dade County southeast through the North New River Canal in the Everglades Agricultural Area (EAA) (L-20, L-19, L-18) to S-150. From S-150 send deliveries into L-38W and at the southern terminus of L-38W south through a 1500 cfs pump to the borrow canal along the west side of US 27.

Design:

Double the capacity of the North New River Canal south of the proposed EAA Storage Reservoir (see Component G3) to convey additional water supply deliveries to Miami-Dade County as necessary.

Double the capacity of S-351 and S-150 to pass additional water supply deliveries to Miami-Dade County as necessary.

Improve conveyance in the borrow canal on the west side of US 27 between L-38W and the Miami Canal as necessary to pass the additional flows.

Pump intake at S-7 lowered to elevation 8.0 feet NGVD.

Location: EAA and Water Conservation Area 3 in Palm Beach, Broward, and Miami-Dade County.

Assumption and Related Considerations: Operational flexibility is reduced since there is only one delivery route to Miami-Dade County (back-up routes have been eliminated).

Component TT4 - (not included in this Alternative)

Component UU6_D13R - C-23, C-24, 25 and Northfork and Southfork Basins Storage Reservoirs

Study Region: Upper East Coast

Map: This component is not mapped due to uncertainty in site location.

Purpose: Storage reservoirs to capture local runoff from the C-23, 24, 25, and Northfork and Southfork Basins of the St. Lucie River Estuary. The reservoirs will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary. There is one reservoir in each basin.

Operation:

Inflows from C-23, C-24, C-25, and Northfork and Southfork of the St. Lucie River.

Design:

A total of 39,000 acres at 8 feet maximum depth distributed as follows among these basins: C-23 – 8,400 acres, C-24 – 6,000 acres, C-25 – 12,800 acres, Northfork – 11,800 acres. In the Southfork Basin storage requirements were met using 9,350 acres inundated to a depth of 4 feet.

Inflow pump capacity = 1.0 to 1.5 inches per day

Outflow structure capacity = TBD (initially assumed to not constrain performance)

Location: To be determined – Specific site not necessary for Water Management Model simulation. Conceptually located in Martin and St. Lucie Counties.

Assumption and Related Considerations:

- (1) Uncertainty in land availability
- (2) Potential water quality benefits by reducing nutrient and sediment loading to the estuary

Component VV6 - Palm Beach County Agricultural Reserve Reservoir

Study Region: Lower East Coast

Map: Refer to Component Map 12

Purpose: Supplement water supply deliveries to central and southern Palm Beach County by capturing and storing water currently discharge to tide. These supplemental deliveries will reduce demands on Lake Okeechobee and the Water Conservation Areas.

Operation: The reservoir will be filled during the wet-season from excess water pumped out of the western portions of the Lake Worth Drainage District (LWDD) (backpumped). Water will be released back to LWDD to maintain canal stages during the dry-season. As with the base cases and the previous alternatives, regional water will be supplied to the LWDD when water level fall below 15.8'

NGVD. Water will be back pumped into the reservoir when water levels are above 16.0 feet NGVD.

Aquifer Storage and Recovery (ASR) capacity was added in Alternative 5 to improve supply during dry seasons and droughts. Fifteen (15), 5-MGD capacity ASR wells (total injection and recovery capacity 75 MGD or about 116 cfs) were added. Water will be injected when depths in the impoundment are above 1 foot. The source of water to be injected is surficial ground water adjacent to the reservoir. Water will be supplied from the reservoir before tapping water from ASR systems. Specifically, the water supplied from the reservoir will be maximized (up to the outflow capacity) before water is supplied from ASR storage.

Design:

1660 acres with a maximum depth of 12 feet (volume of 19920 acre-feet)
Inflow pump capacity = 500 cfs (provided by two 250 cfs pumps)
Outflow structure capacity = 500 cfs @ 4 feet head
Emergency outflow structure = 300 cfs

Location: The western portion of central Palm Beach County.

Assumption and Related Considerations:

- 1) Excess storage could be discharged to the LWDD during off peak times.
- 2) Canal conveyance improvements for two secondary canals LWDD's E-1 to the E-2.
- 3) No operation changes in the LWDD.

Component WW5 - C-111N Spreader Canal

Study Region: Lower East Coast

Map: Refer to Component Map 13

Purpose: To reduce wet season flows in C-111, improve deliveries to Model Lands and Southern Glades and decrease potential flood risk in the lower south Miami-Dade area.

Operation: Water is pumped from C-111 and C-111E into a Stormwater Treatment Area (STA) prior to pumping through S-332E into C-111N Canal to Southern Glades and Model Lands. S-197 and S-18C are removed and C-111 is backfilled.

Design:

Increase S-332E to 500 cfs from 50 cfs (pump when available)
Relocate C-111N to SW theoretical 440th street (approximately 1 section north)
Culvert under US 1

Culvert under Card Sound Road
Canal through triangle area of Model Lands, east of Card Sound Road
Fill in C-111 Canal south of confluence with C-111N to S-197
Remove levees and access roads
Completely backfill C-110
Create STA in triangle land between C-111 and C-111E Canals to clean water prior to putting in Model Lands

Location: South Dade Conveyance System in Miami-Dade County.

Assumption and Related Considerations:

- 1) Will not cause adverse impacts to South Miami-Dade Agricultural and Urban Lands.
- 2) Assume clean water from C-111 and C-111E

Component XX6 - North Lake Belt Storage Area

Study Region: Lower East Coast

Map: Refer to Component Map 6A

Purpose: The North Lake Belt Storage Area (NLBSA) is an in-ground reservoir to capture a portion of runoff from C-6, western C-11 and C-9 Basins. The in-ground reservoir, with perimeter seepage barrier, will allow storage of untreated runoff without concerns of ground water contamination. The stored water will be used to maintain stages during the dry season in the C-9, C-6, C-7, C-4 and C-2 Canals and to provide deliveries to Biscayne Bay to aid in meeting salinity targets.

Operation: Inflows from C-6 (west of the turnpike), western C-11, and C-9 Basin runoff are pumped and gravity fed into the in-ground reservoir. Inflow ceases when stages reach ~5.0 feet NGVD (0 feet above adjacent land elevation).

Outflows for water supply are pumped to the C-9 Storm Water Treatment Area (STA)/Impoundment prior to delivery to the C-9, C-6, C-7, C-4 and C-2 Canals.

Water from the reservoir can be withdrawn down to a stage of -15 feet NGVD (up to 20 feet of working storage & maximum head on seepage barrier).

Prioritization of outflows: If water levels in NLBSA are from between +5.0 feet NGVD and 0.0 feet NGVD flows will be discharged to Biscayne Bay via the C-2 Canal. If water levels in NLBSA are from between -10 feet NGVD and 0.0 feet NGVD flows will be discharged to C-9, C-6, C-7, C-4 and C-2 Canals only to prevent salt water intrusion. If water levels in NLBSA drop to levels between -15 feet

NGVD and -10.0 feet NGVD flows will be limited to discharge to the C-9 Canals only to avoid water shortage restrictions.

The storage area is 4500 acres to capture runoff from C-6, C-9 and C-11 basins. (Note: SFWMM simulation assumes 5120 acres of surface area. To simulate equivalent working storage volumes, the simulated water levels are higher from those prescribed here.)

Design:

Reservoir: 4500 acres with subterranean seepage barrier around perimeter to enable drawdown during dry periods, prevent seepage and to prevent water quality impacts. The component also includes 1250 acres of stormwater treatment area.

Inflow Structures:

2500 cfs gravity structure @ 0.5 feet head, from C-11W

600 cfs pump from C-9

300 cfs pump from C-6 west of divide structure

Outflow Structures: 1000 cfs pump to C-9 STA/Impoundment for treatment prior to deliveries to C-6, C-7, C-2, C-4 and C-9 to prevent saltwater intrusion in coastal canals. (Stormwater Treatment Area detention time requirements need to be addressed. Pretreatment in reservoir may reduce size requirements of treatment area).

Canal: 800 cfs canal capacity - Water supply discharges are routed to C-4/C-2 via a canal to be located east of the Snapper Creek Canal (Northwest wellfield protection canal system).

2-1400 cfs delivery structures, one each at the new canal's confluence with C-6 and C-4.

Location: Reservoir would be located within the area proposed for rock mining by the Lake Belt Issue Team. It would be sited north of Miami Canal (C-6) and south of the C-9 Canal to minimize impacts to the Northwest Wellfield in Miami-Dade County.

Assumption and Related Considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's Northwest Wellfield.
- 2) Treatment facility needed if stored water is backpumped to the Everglades.
- 3) All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- 5) Limestone Filter Treatment system within the Reservoir may be developed through use of compartmentalization of rockmining excavation pattern.

- 6) Telemetry systems will be required for all operable structures and pump stations.
- 7) Any specific water quality considerations regarding capture of C-6 Basin runoff will be addressed during the detailed design stage.

Component YY4 - Divert WCA2 flows to Central Lake Belt Storage

Study Region: Lower East Coast

Map: Refer to Component Map 11

Purpose: Capture excess in Water Conservation Area 2B (WCA 2B) to reduce stages above desired target levels in Water Conservation Area 2B and to divert water through improved L-37 and L-33 Borrow Canals to 1) Northeast Shark River Slough (NESRS) to meet targets or 2) Central Lake Belt Storage Area.

Operation: Surface water in WCA 2B above NSM will overflow through 3 structures along L-35 and L-35A to North New River Canal along with seepage from WCA 2B and pumped to L-37. North New River Canal, L-37 and L-33 Borrow Canals will be improved to accept this additional flow along with the seepage collected from WCA 3. This water will be pumped to Northeast Shark River Slough (NESRS) if the Slough is below target levels or into a lined reservoir south of the confluence of L-33 and the C-6 Canal referred to as the Central Lake Belt Storage Area (CLBSA). SEE COMPONENT S.

Design:

3- diversion structures with 120 cfs capacity @0.5 feet of head and 350 cfs capacity @4.0 feet of head along the southern perimeter of WCA 2B.

Intermediate 1500 cfs pump station to divert overflow and seepage from North New River to L-37.

Inverted siphon with 1500 cfs capacity to pass water supply deliveries from L-38 borrow canal to US 27 West borrow canal.

Improved conveyance of L-37 and L-33 to 3000 cfs to handle WCA 2B flows plus seepage from WCA 3.

Remove S-9XN and S-9XS or improve structures to accommodate increased flows.

Location: The overflow structures are located along the southern levee of WCA 2B. L-37 and L-33 borrow canal improvements are located east of the Protective levees and 0.5 miles west of US 27 between North New River Canal and the Miami Canal in Broward County.

Assumption and Related Considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations

Component ZZ5 - Divert WCA 3 flows to Central Lake Belt Storage Area

Map: Refer to Component Map 6

Study Region: Lower East Coast

Purpose: Capture excess in Water Conservation Area 3A (WCA 3A) and WCA 3B to reduce stages above target stages in Water Conservation Area 3 and to divert water through modified structures at S-9 and S-31 to Central Lake Belt Storage Area via the L-33 borrow canal.

Operation: When surface water in WCA 3B exceeds target depths by 0.10 feet it will be diverted to the Central Lake Belt Storage Area via L-33. When surface water in WCA 3A near S-9 exceeds target depths by 1.0 foot, water will be diverted to the Central Lake Belt Storage Area via L-33.

Design:

Outflow Structures - 500 cfs structure @ 2.0 feet of head (new structure) at S-9 (WCA 3A).

700 cfs structure (modify existing S-31 if necessary) (WCA 3B)

Location: The eastern levees of WCA 3.

Counties: Broward and Miami-Dade

Assumption and Related Considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations

Component AAA6 - Lower East Coast Water Conservation

Study Region: Lower East Coast Service Areas

Map: This component is not mapped.

Purpose: The purpose of this component is to reduce the public water supply demands through the full implementation of the South Florida Water Management District's (SFWMD) current mandatory water conservation program. The regional affect from the implementation of water conservation would include greater efficiency of the water utilized by the public water supply utilities and a year round reduction of the volume of water delivered from the regional water resource facilities to recharge coastal canals and wellfields.

Operation: On average, a six percent reduction in the projected 2050 withdrawals will be applied to each service area uniformly over each month of the simulation period. The percentage reduction will be based on the anticipated water conservation measures for each of the service areas.

Design: The current mandatory water conservation program of the SFWMD was applied throughout the service area to the public water supply demand projections using the Institute for Water Resources-Main (IWR-Main) forecasts. The percentage reduction is a result of the conversion of residential end users to ultra-low flow fixtures and daytime restrictions on lawn watering throughout the service areas, both practices are required by existing regulations. The percentage of the population using water-conserving fixtures is increased thereby reducing public water supply demands when compared to the 2050 Base. The percentage reduction is calculated from the 2050 Base that contains a moderate application of conservation techniques. The reduction applied in this component assumes full implementation of the District's water conservation program as predicted by IWR-Main.

The 2050 Base utility demands in the Lower East Coast Service Area were reduced by six percent on average in this Alternative.

Location: Lower East Coast in Palm Beach, Broward and Miami-Dade County.

Assumption and Related Considerations:

1) Water conservation measures apply to all sources of water. It is most likely that demands met by reuse water would not be affected by restrictions in irrigation.

Component BBB6 - South Miami-Dade County

Study Region: Lower East Coast

Map: Refer to Component Map 14

Purpose: The existing South District Wastewater Treatment Plant (SDRWTP) located north of the C-1 Canal will provide wastewater treatment coupled with superior treatment technology to supply reclaimed water to the South Biscayne Bay and Coastal Wetlands Enhancement (SBBCWE) Project. The water will be provided throughout the year to augment water supply to the SBBCWE upon demand. This supplemental water will restore overland flow in the coastal area and recharge groundwater to enhance groundwater discharge to Biscayne Bay. Saltwater intrusion benefits to the southern part of Miami-Dade County are anticipated.

Operation: The SDRWTP with superior treatment technology will be operated when the additional water is needed to supply the SBBCWE. When water is not needed, the SDRWTP will stop treatment beyond secondary treatment standards and will dispose of the secondary treated effluent into the existing deep injection wells.

Design: The SDRWTP will be designed to add on pretreatment and membrane treatment system to the existing secondary treatment facility. The plant will have a capacity of 131 MGD. It is anticipated that phosphorus will be the constituent of concern in the reclaimed water. Therefore, the treatment will be designed to remove total phosphorous to acceptable levels.

The SDRWTP will be located at, or in the vicinity of, the existing SDRWTP. The reclaimed water will be discharged to the C-1 Canal (Black Creek), upstream of S-21A, and then delivered southward towards the C-102 and C-103 Canals, and northward towards the C-100 Canal. The wastewater treatment facility will provide advanced treated water to L-31E. Flow southward in L-31E towards C-102 and C-103 shall be 202 acre-feet per day. Flow northward in L-31E towards C-100 shall be 200 acre-feet per day (through a canal extension). The combined inflow into L-31E shall be 402 acre-feet per day for every day of the simulation. Flows will reach C-102 and C-100 via modifications to L-31E as shown on Component Map 14. Operation of C-102 and C-103 shall be contingent upon Component FFF5.

Location: Miami-Dade County

Assumptions and other considerations:

- 1) The reuse facility uses advanced treatment resulting in water quality acceptable to the Bay.
- 2) No adverse impacts to adjacent agricultural or urban areas.
- 3) Discharge capacity at S-123, S-20F, S-21 and S-21A is sufficient to pass basin runoff and inflows from the reuse facility during storm events.
- 4) This component is dependent on Component FFF.

Component CCC6 - Big Cypress/L-28 Interceptor Modifications

Study Region: Big Cypress

Map: Refer to Component Map 15

Purpose: Alleviate over drainage in Northeast Big Cypress, Kissimmee Billy and Mullet Slough area and ensure that inflows meet applicable water quality standards.

Operation: Reroute water from West and North Feeder Canals to wetlands in Northeast Big Cypress. Allow flow along the south side of the West Feeder at designated locations and through a new S-190 Pump Station, while maintaining flood protection on Tribal lands and consistency with the Seminole Tribe's Conceptual Water Conservation System master plan. Establish sheetflow south of the West Feeder Canal across the Native Area of the Big Cypress Reservation. Establish sheetflow off the reservation in the Big Cypress National Preserve Addition. Operate pumps for approximate equalization of flows.

Design:

Degrade the levee on the SW side of the L-28 Interceptor Canal below the S-190 structure.

Backfill the L-28 Interceptor Canal at a point south of the Big Cypress Reservation boundary with Big Cypress National Preserve Addition.

Retain levee on NE side of L-28 Interceptor through the Big Cypress Seminole Reservation.

Develop sheetflow along the south side of the West Feeder Canal through three pump stations and spreader canals. The pump station locations shall be adjacent to the discharge points from Water Resource Areas (WRA) 1, 2 and 3 of the Seminole Conceptual Water Conservation System.

Pump station at WRA-1 discharge: 250 cfs

Pump station at WRA-2 discharge: 500 cfs

Pump station at WRA-3 discharge: 750 cfs

Replace S-190 gated structure (existing capacity of 2960 cfs) with a 1460 cfs pump station.

North Feeder stormwater treatment area: 1100 acres at 4-foot maximum depth.

Inflow pump station: 270 cfs

Outflow structure: 100 cfs

West Feeder stormwater treatment area: 800 acres at 4-foot maximum depth.

Inflow pump station: 430 cfs

Outflow structure: 150 cfs

Location: Western Basin, Big Cypress Seminole Reservation, Big Cypress National Preserve Addition in Hendry, Collier, and Broward Counties.

Assumption and Related Considerations:

- 1) Water quality treatment for runoff entering the West and North Feeder Canals is provided by stormwater treatment areas, if necessary, to meet applicable water quality standards.
- 2) Design shall be consistent with the Seminole Tribe's Conceptual Water Conservation System master plan.
- 3) Existing flood protection shall be maintained.
- 4) Evaluation of flow changes in the area south of the West Feeder Canal and

- 5) S-190 shall be accomplished by assessing impact on Seminole Tribe's passive use rights.
- 6) Evaluation of flow changes reflects minimal impact.
- 7) Component construction occurs after completion of the Seminole Conceptual Water Conservation System.

Component DDD5 - Caloosahatchee Backpumping with Stormwater Treatment Area (STA)

Study Region: Caloosahatchee River

Map: This component is not mapped due to uncertainty of site location

Purpose: Capture excess C-43 Basin runoff to augment the regional system. These facilities will be designed to backpump excess water from C-43 to Lake Okeechobee after treatment through an STA.

Operation: This component operates after estuary and Agricultural/Urban demands have been met in the C-43 Basin and when water levels in the C-43 storage reservoir (Component D5) exceed 6.5 feet. When this situation occurs, water will be released from the reservoir and delivered to the STA at the capacity of the backpumping/treatment system (2000 cfs). The STA water is then backpumped to Lake Okeechobee. An additional requirement for the backpumping to take place is that Lake Okeechobee must be considered to have available storage, i.e. when its levels are below the pulse release zone line shown on Figure 1.

Design: The key components in the design are pumps and a stormwater treatment area. For the design it has been assumed that the STA is located adjacent to Lake Okeechobee. Because it is not known where the reservoir will be located relative to the STA, it has been assumed that water to be delivered to the STA will be released from the reservoir to the Caloosahatchee River and then pumped from the River into the STA. Since no pump to bring water from the lower basin (below S-78) to the upper basin has been included in the reservoir design and since most of the basin runoff is generated in the lower basin, a pump to bring the water from the lower Caloosahatchee Basin to the upper basin has also been included. The STA has been included to meet the anticipated need to improve the quality of the water before it enters Lake Okeechobee. Finally, a pump station will be used to lift the water from the STA to Lake Okeechobee.

Pumps: 1 pump of 2000 cfs capacity to take water from the lower Caloosahatchee Basin to the upper Caloosahatchee Basin; 1 pump of 2000 cfs capacity to take water from the Caloosahatchee River into the STA; and 1 pump of 2000 cfs capacity to discharge water from the STA to Lake Okeechobee.

STA: an STA of approximately 5000 acres is proposed to achieve water quality improvements.

Location(s) TBD - Specific site not necessary for model simulations. Conceptually located in Hendry and Glades Counties.

Assumption and Related Considerations:

- 1) Uncertainty in land availability.
- 2) Water quality benefits to the Lake.
- 3) The Franklin Lock and Dam S-79 time series flow demand for the Caloosahatchee Estuary has been reduced. The Performance Measures were not changed.
- 4) The model assumes that the backpumping/treatment facility, primarily the STA, functions as a flow-through system.

Component EEE5 - Flows to Eastern Water Conservation Area

Study Region: Water Conservation Areas and Lower East Coast

Map: Refer to Component Map 6 and 11

Purpose: Captured excess surface water and seepage from Water Conservation Area 2B, 3A and 3B in Central Lake Belt Storage Area (CLBSA) delivered to eastern WCA 3B during dryouts.

Operation: Deliveries will be made to maintain 6 inch depths in WCA 3B if NSM hydroperiod indicate WCA 3B water levels should be at or above 6 inches and water is available in CLBSA. Deliveries from CLBSA will occur through a wetland treatment cell and the L-30 borrow canal to a spreader swale system in the eastern areas of WCA 3B.

Design: 500 cfs pump from L-30 to eastern portion of WCA 3B. Spreader Swale along eastern WCA 3B to convert 500 cfs to sheetflow. Upgrade of 1500 cfs from CLBSA deliveries NESRS to 2000 cfs to accommodate additional flows to WCA 3B (also seen in component S5)

Location: The discharge point from L-30 borrow canal to WCA 3B is at the bend in the canal and is approximately 4.5 miles south of the intersection of the L-30 and the C-6 Canal in Miami-Dade County

Assumption and Related Considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations.

Component FFF5 - Biscayne Bay Coastal Canals

Study Region: Lower East Coast and Biscayne Bay

Map: Refer to Component Map 14

Purpose: Maintain higher stages in C-102 and C-103 for urban and environmental water supply.

Operation: Maintain canal stages in C-102 and C-103 with water provided from local sources. Wet season operation for C-102 between S-21A and S-195 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) and for C-103 between S-20F and S-179 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) will remain unchanged. Dry season operation of C-102, between S-21A and S-195, and C-103 between S-20F and S-179, will both change from opening at 1.4 feet NGVD and closing at 1.2 feet NGVD to opening at 1.6 feet NGVD and closing at 1.5 feet NGVD. A borrow canal will be constructed west of L-31E which directly connects the downstream reach of C-102 with C-103 to maintain levels in the lower reaches of C-103.

Design: 3.5 mile connection canal

Location: Biscayne Bay Coastal Canals in Miami-Dade County.

Assumption and Related Considerations:

- 1) Local water source tied to Component BBB5, water reuse.
- 2) Component simulates overland flow to Biscayne Bay. South Biscayne Bay Coastal Wetlands Components will be included as part of Other Project Elements, since their effect is not measurable with current modeling techniques. The intent of these components is to restore overland flow and groundwater seepage to Biscayne Bay while reducing the frequency of point-source discharges.

Component GGG6 - C-51 and Southern L-8 Reservoir

Study Region: Lower East Coast

Map: Refer to Component Map 16

Purpose: Storage reservoir managed for the environmental and water supply goals listed below:

- Reduce the number of events when discharges to the Lake Worth Lagoon exceed the desired daily average flow rate of 500 cfs.
- Reduce the magnitude of events exceeding the desired flow rate of 500 cfs.

- Reduce the average annual volume discharged to tide (over the S-155 structure) by detaining storm water runoff for subsequent environmental (routing from the West Palm Beach Water Catchment Area to the Northwest Fork of the Loxahatchee River) and water supply needs (providing water to the Lake Worth Drainage District and the West Palm Beach Water Catchment Area).
- Provide increased drainage to the C-51 Basin and the Southern L-8 Basin by lowering the average stages in the C-51 Canal

Operation: The reservoir will be filled, with excess water from the Southern L-8 Basin and the C-51 Basin, when flows over the S155 structure exceed 300 cfs during the wet-season from excess water in C-51 Canal and Southern L-8 (backpumped). Water will be released back to C-51 to help maintain canal stages during the dry-season.

Design:

1200 acres of usable area with a 100-foot deep, 2-foot thick slurry wall for seepage control along the approximate perimeter length of 6 miles (this depth assumes a surficial aquifer thickness of 170 feet, 20 feet of embankment and 10 feet of embedment of the slurry was into the confining layer). The reservoir will have a total storage depth of 40 feet (30 below grade and 10 above grade).

Inflow pump capacity of 1500 cfs at the reservoir.

Emergency outflow structure with a capacity of 1500 cfs when the water level exceeds the maximum operation depth of 40 feet by 2 feet.

Pumped outflow with a maximum rate of 400 cfs at 40 feet and using the discharge schedule shown below.

<u>Depth</u> <u>(feet)</u>	<u>Discharge Rate</u> <u>(cfs)</u>	<u>Storage Volume</u> <u>(acre-feet)</u>
42	1500	50400
41	415	49200
40	400	48000
30	300	36000
20	300	24000
10	300	12000
0	300	0

This component includes a 1000 cfs pump at S-155A, which will be operated when flows through S-155 exceed 300 cfs, and there is capacity in the reservoir.

Location: Immediately west of the L-8 Canal and north of the C-51 Canal in Palm Beach County.

Assumption and Related Considerations:

- 1) This parcel is owned by Palm Beach Aggregate and is currently an active mining operation with a nominal excavation depth of 40 feet.
- 2) Slurry wall surrounding perimeter to address seepage and water quality issues due to ancient or connate water with a chloride content of 500 mg/L.
- 3) The component will include telemetry control and monitoring.

Component HHH6 - West Miami-Dade Reuse

Study Region: Lower East Coast

Map: Refer to Component Map 7

Purpose: The future West Miami-Dade Wastewater Treatment Plant (WDWTP), will be located immediately south of the Bird Drive Recharge Area and east of the relocated L-31 North Protective Levee, will provide wastewater treatment coupled with superior treatment technology to supply reclaimed water to the Bird Drive Recharge Area. The water will be supplied year round as needed to enhance groundwater recharge. Excess water, when available, will be sent as a second priority to the South Dade Conveyance System, to Northeast Shark River Slough as a third priority and to deep injection wells when there are no demands from the three designated priorities.

Operation: The proposed reclaimed water production facility will be operated by Miami-Dade County and has the potential to discharge 100 MGD. As stated previously, the water will be provided to three prioritized demands of 1) Bird Drive Recharge Area, 2) South Dade Conveyance System and 3) Northeast Shark River Slough. When all demands have been met, the WDWTP will stop treatment beyond secondary treatment standards and will dispose of the secondary treated effluent into deep injection wells.

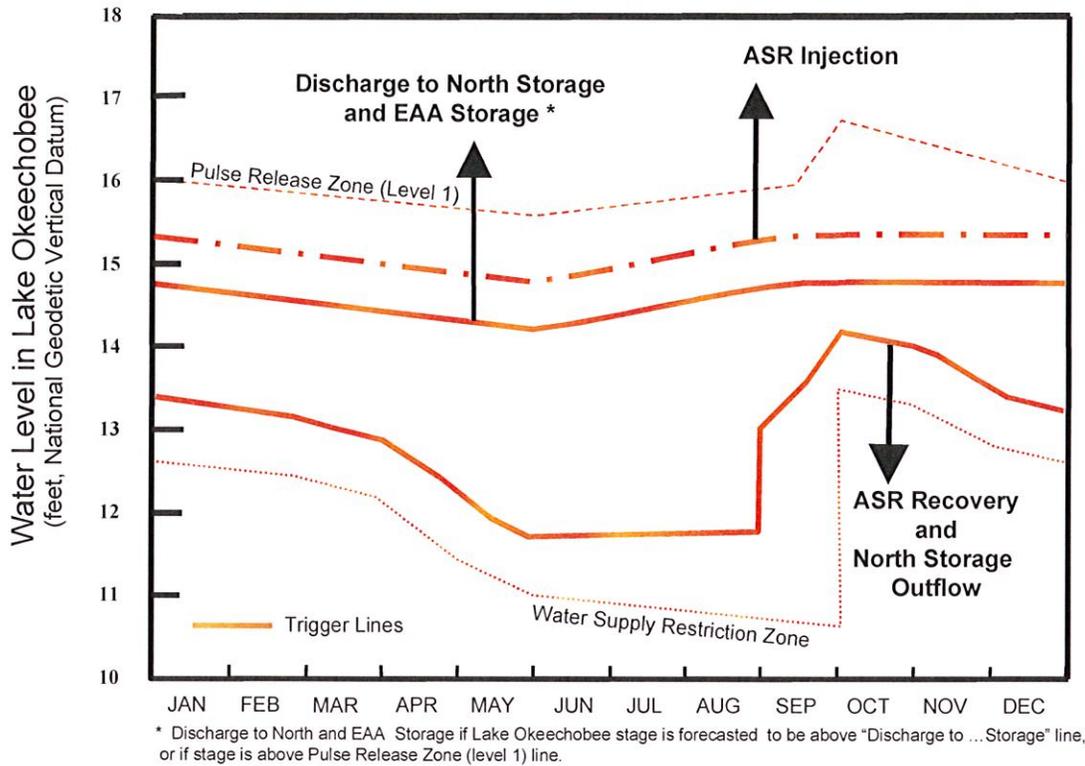
Design: Treatment will be biological nutrient-removal advanced wastewater treatment (AWT) followed by a superior treatment technology using iron salts to lower phosphorus to levels required for Everglades discharges. The iron salt coagulation system would be designed for a constant flow rate of 100 MGD.

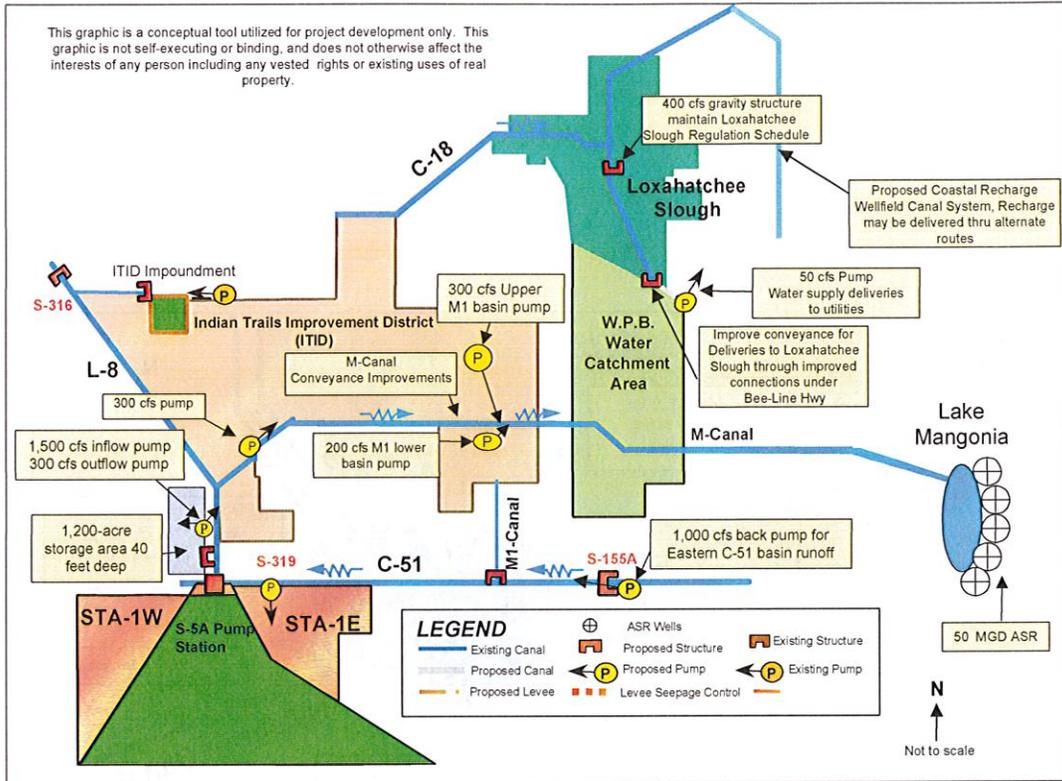
The WDWTP will pump superior, advanced treated water to the Bird Drive Recharge Area when the elevation of the Recharge Area is equal to or below 3' above natural ground at a rate of 155 cfs (100 MGD).

Location: South of the Bird Drive Recharge Area and east of the relocated L-31 North protective levee in Miami-Dade County.

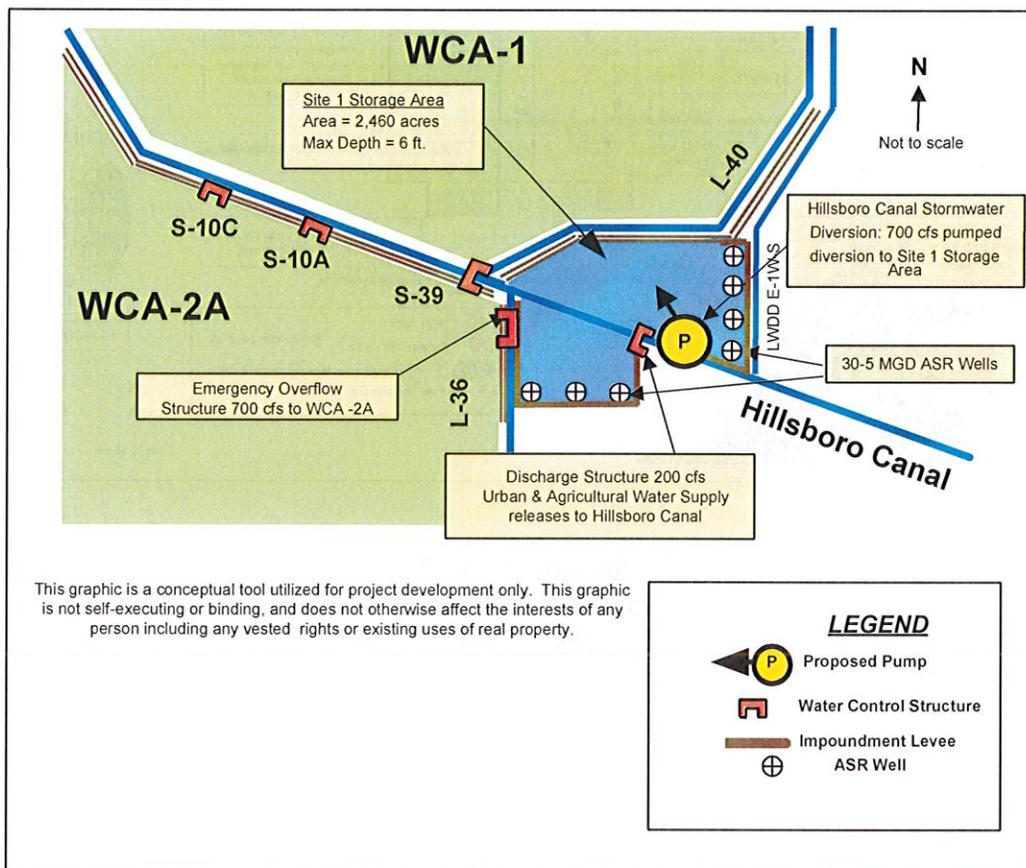
Assumption and Related Considerations: The superior treatment technology will be able to treat the AWT effluent to remove phosphorous and nitrogen to the low levels desired to meet State water quality standards and provide an acceptable water quality for the above priorities.

Figure 1. Operation Criteria for Lake Okeechobee and Surrounding Storage Components

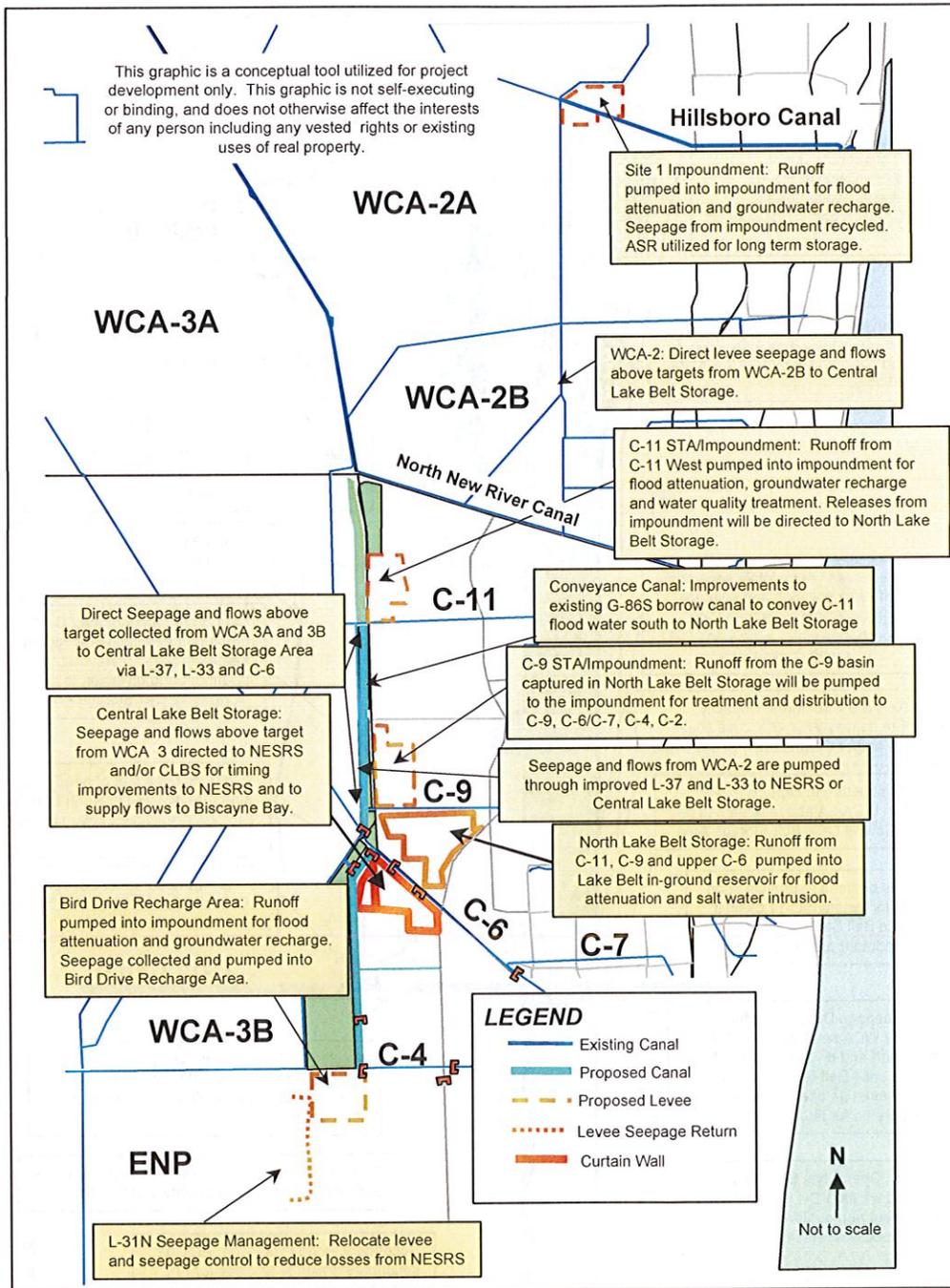




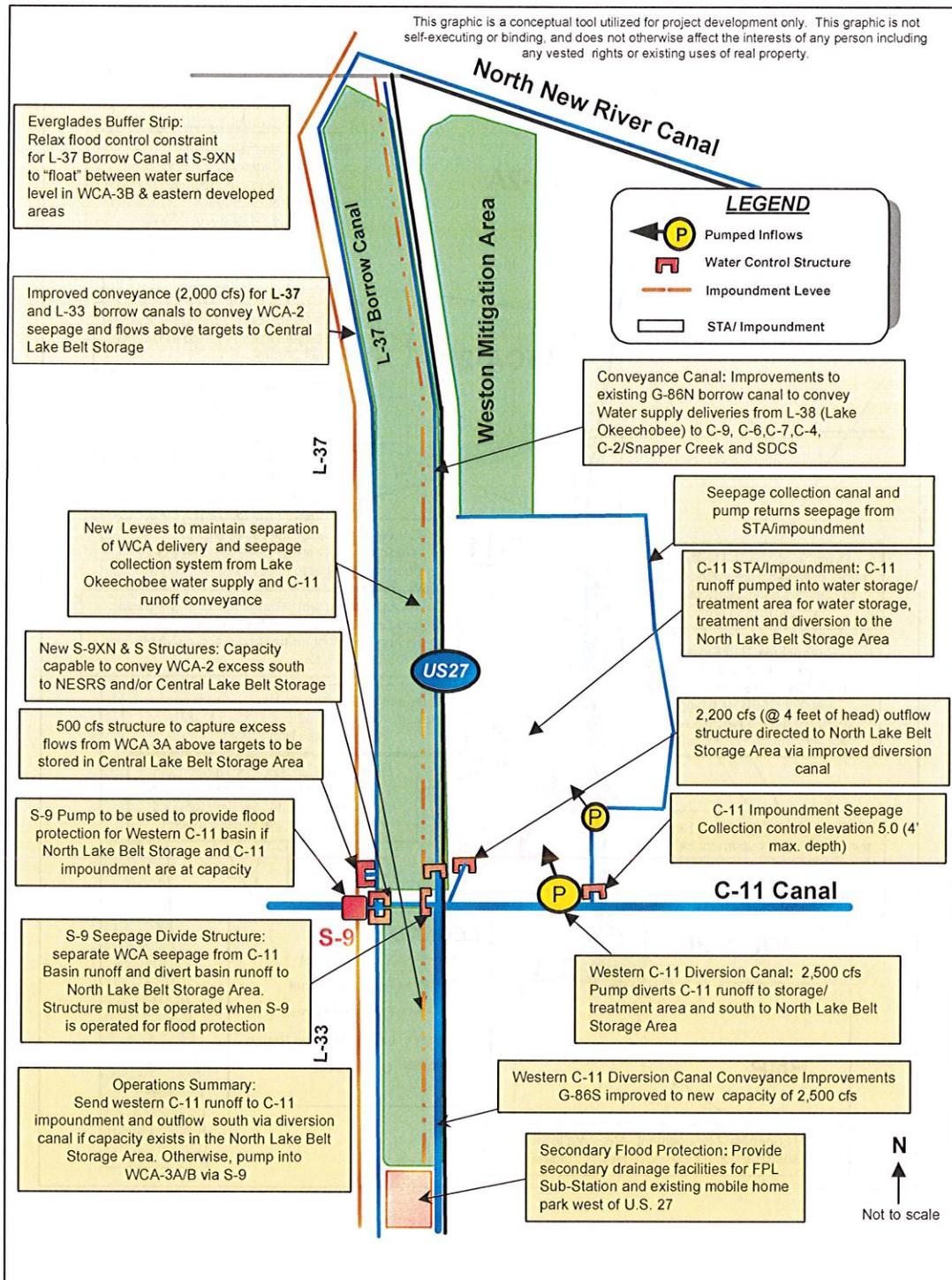
Alternative D13R
Southern L-8 Basin
Component Map 1



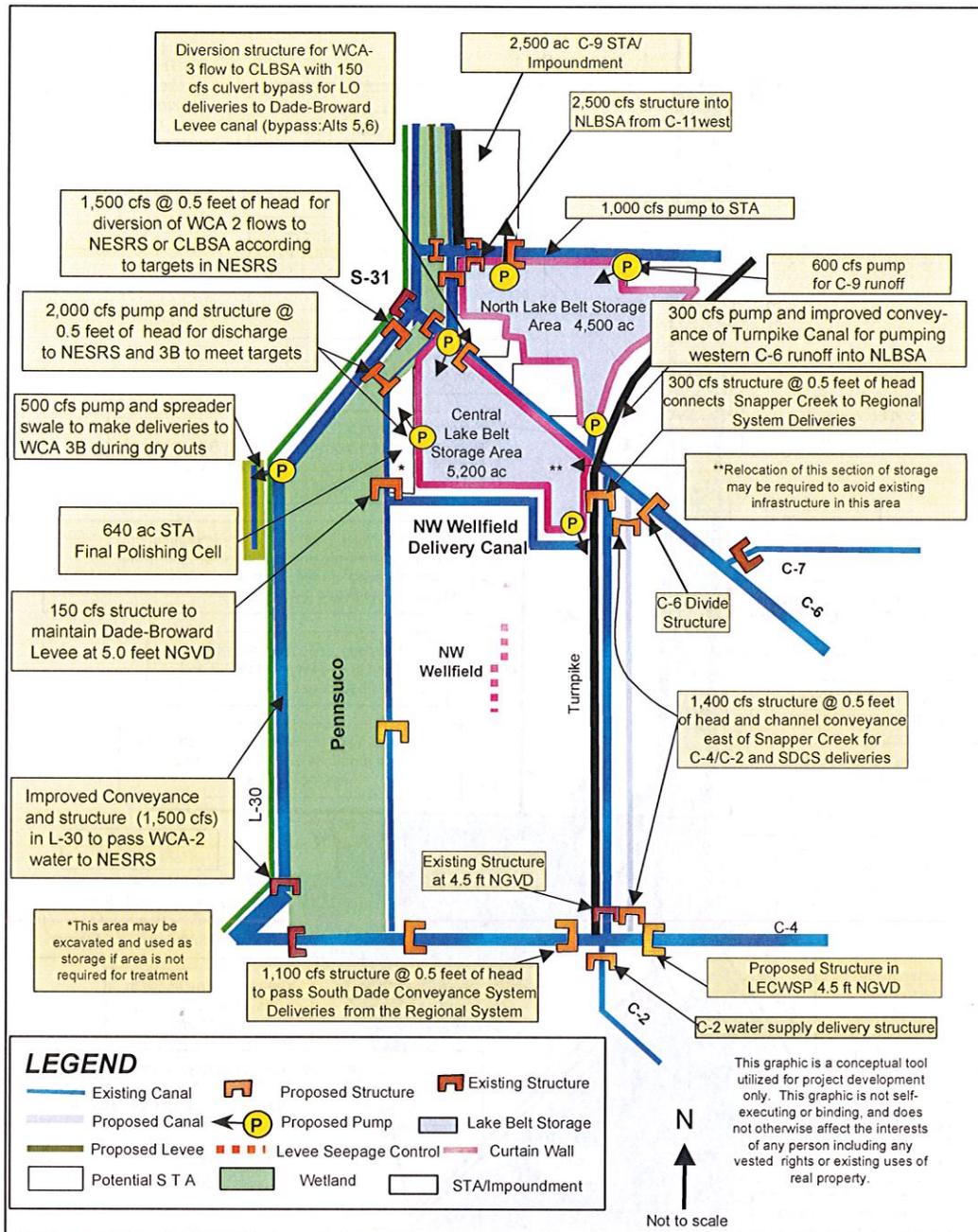
Alternative D13R
Site 1 Impoundment
Component Map 2



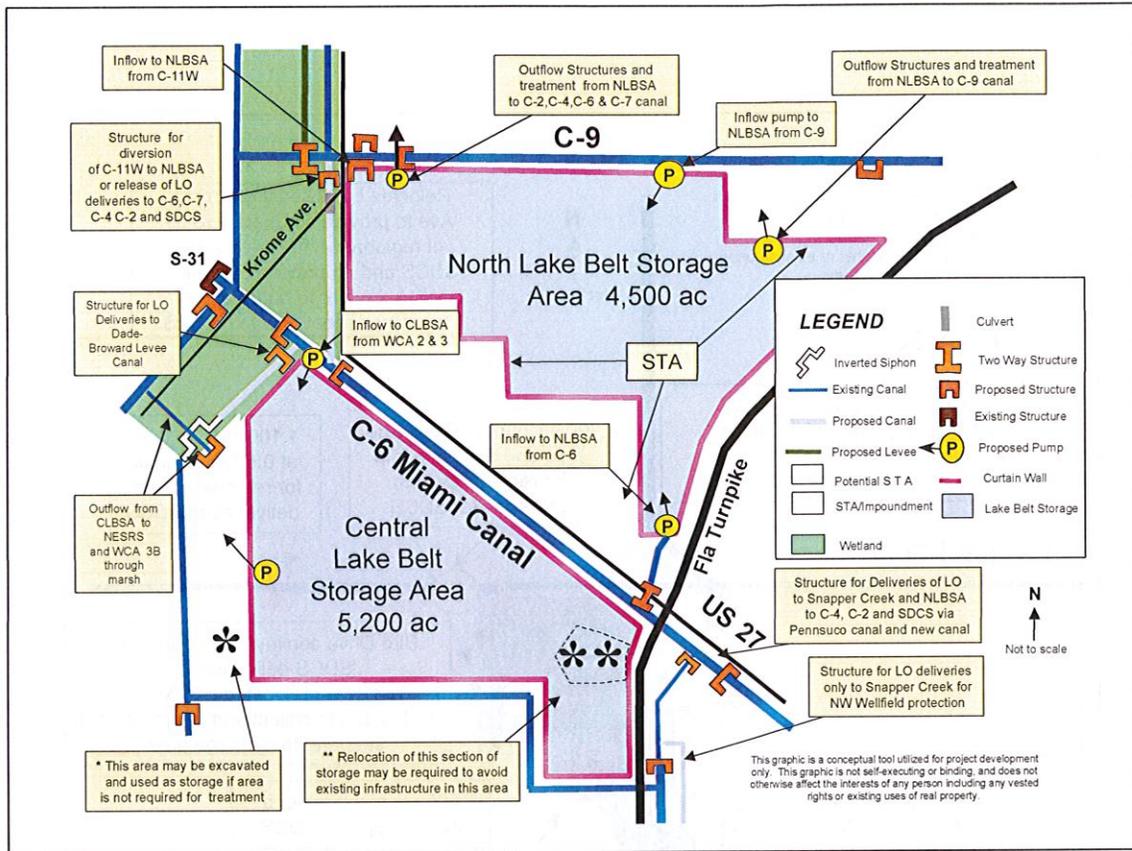
Alternative D13R
General Water Preserve Areas Components
Component Map 3



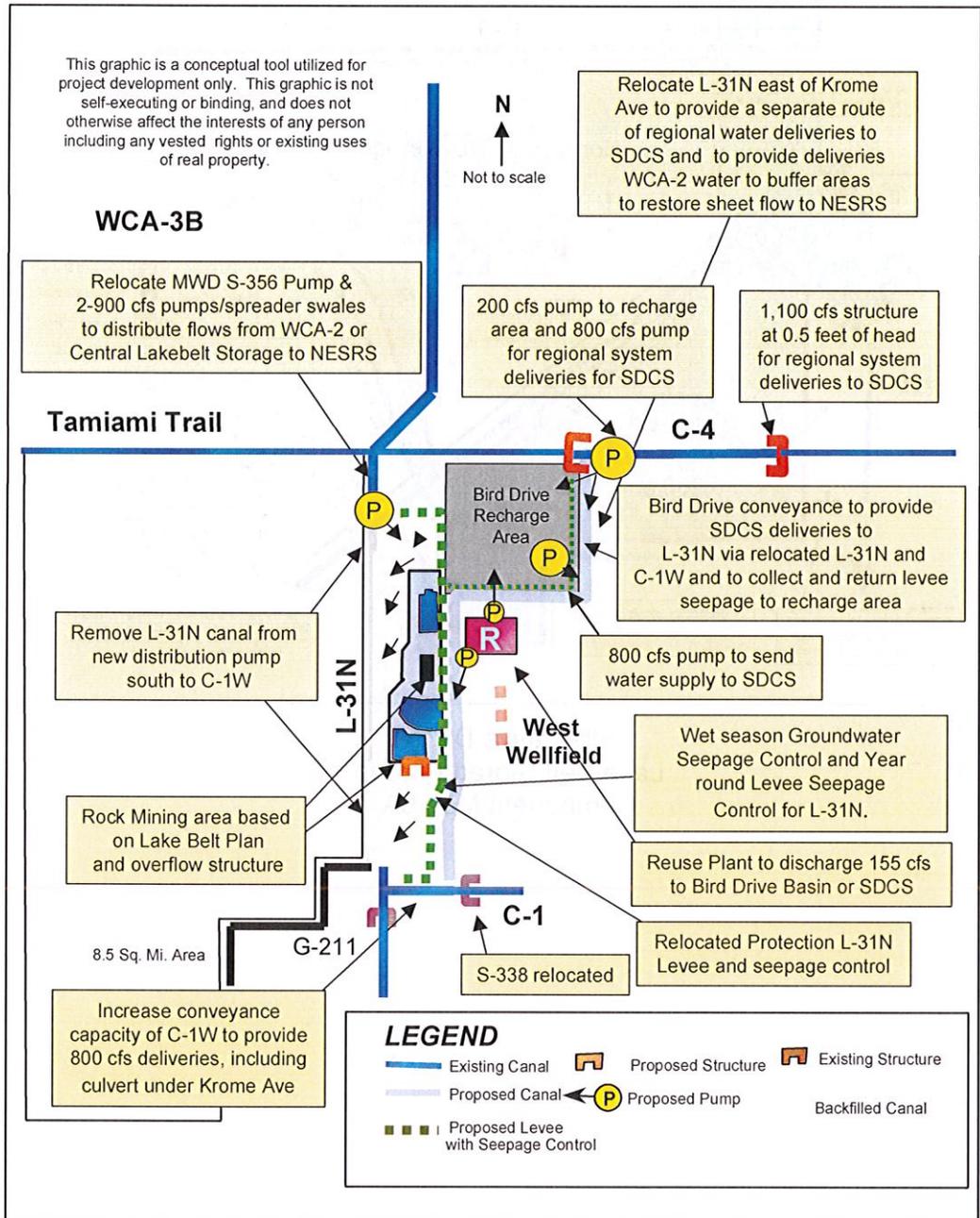
Alternative D13R
Central Broward Area
Component Map 4



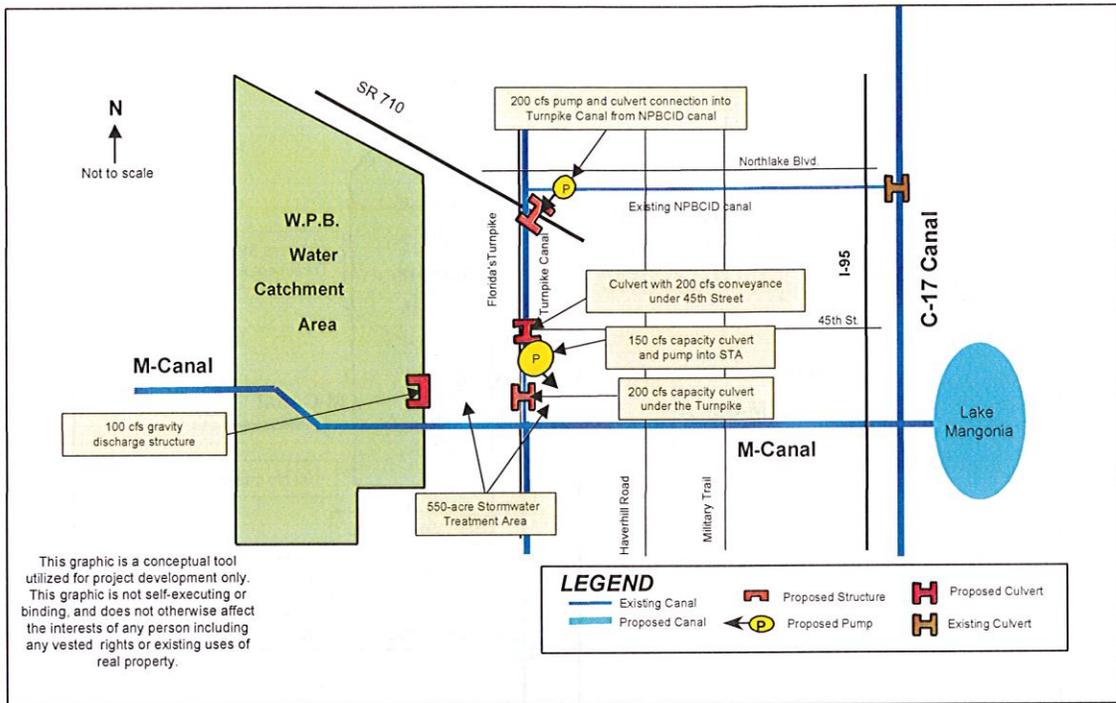
Alternative D13R
 North and Central Lake Belt Storage Areas
 Component Map 6



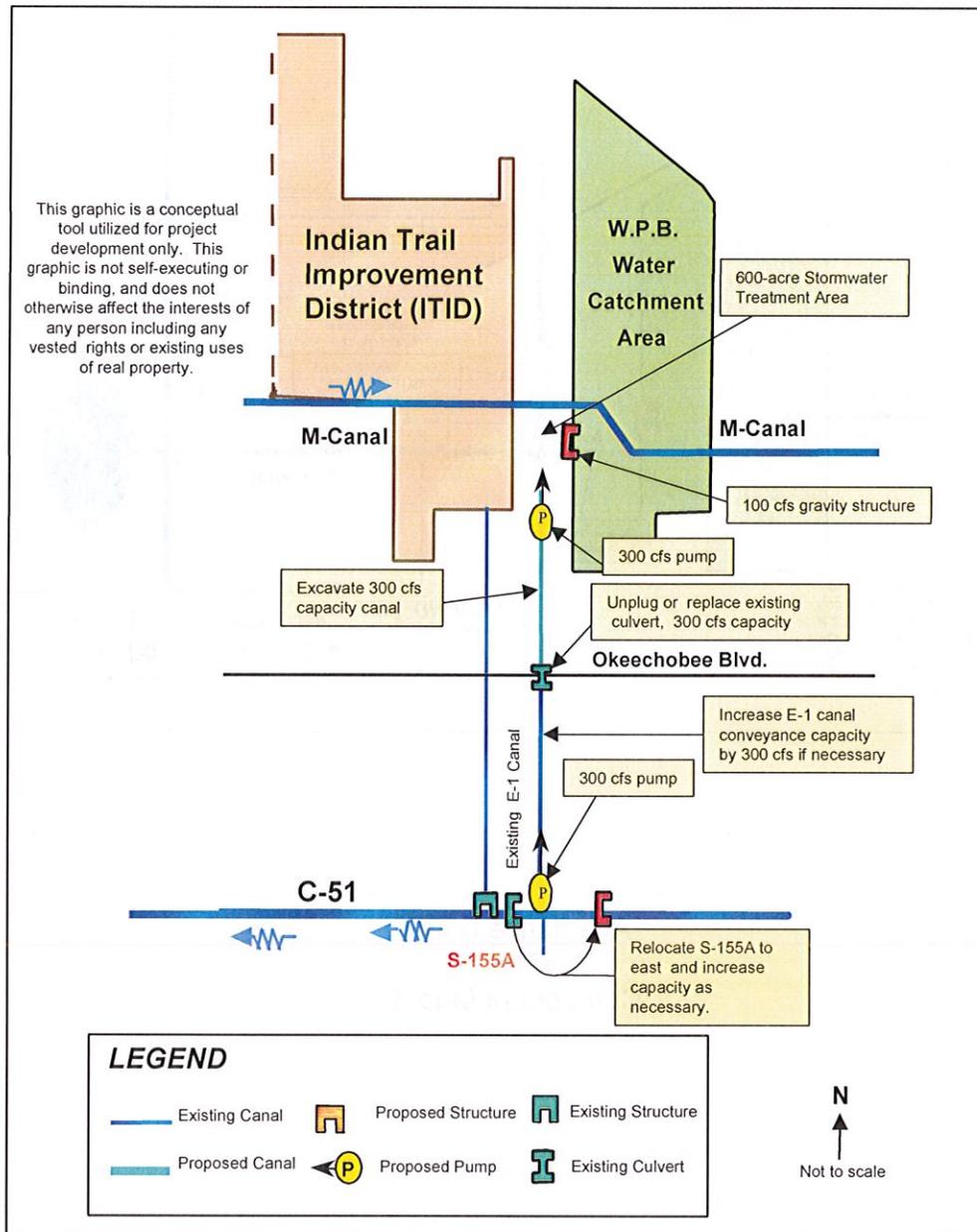
Alternative D13R
Lake Belt Storage Areas
Component Map 6A



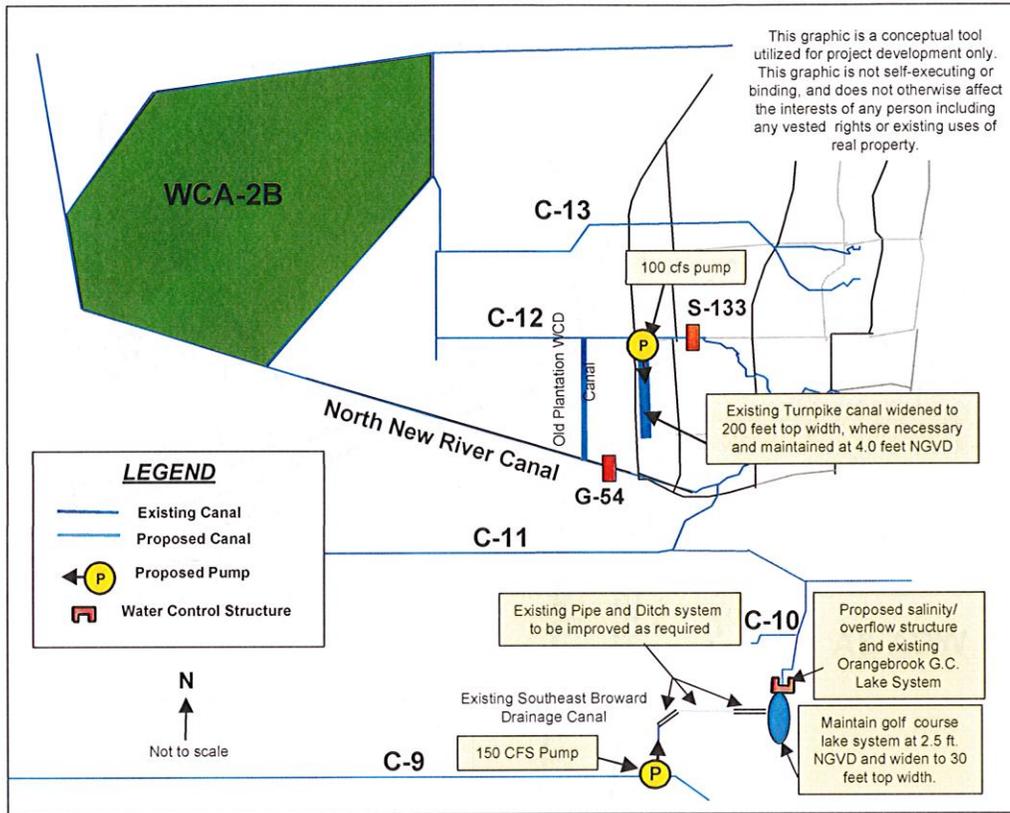
Alternative D13R
 Bird Drive Basin and L-31N Seepage Management
 Component Map 7



Alternative D13R
C-17
Component Map 8

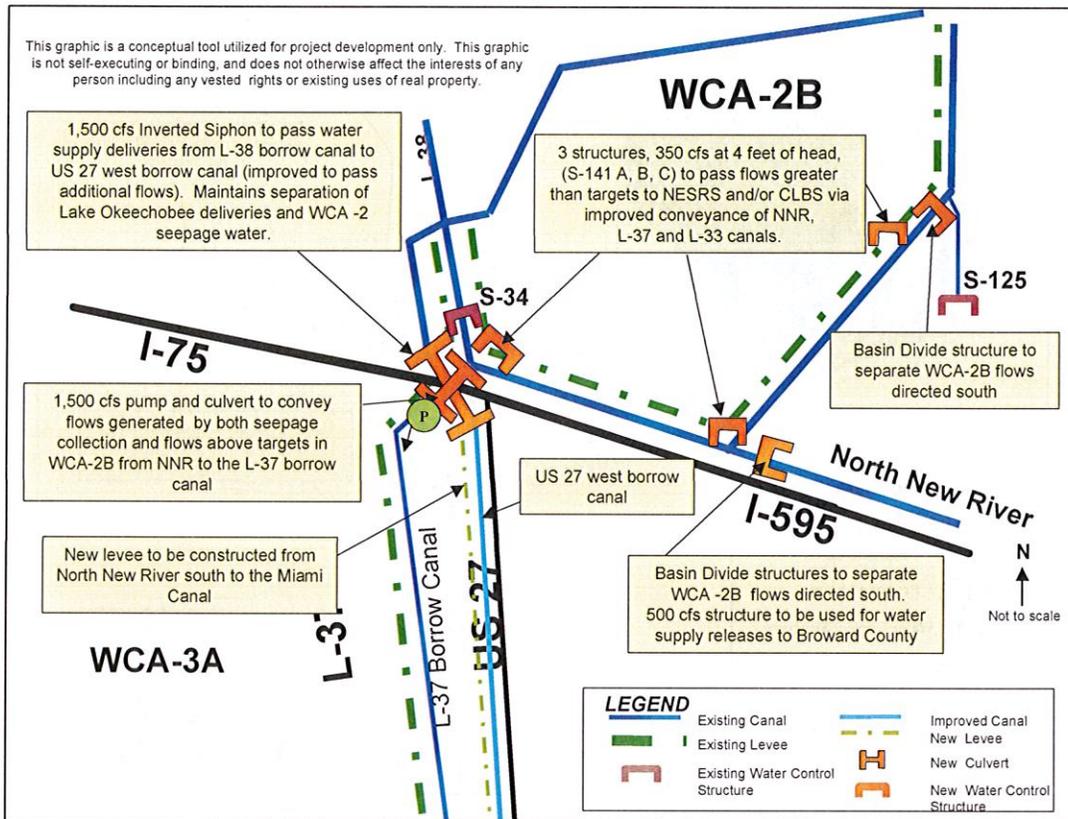


Alternative D13R
C-51 East
Component Map 9

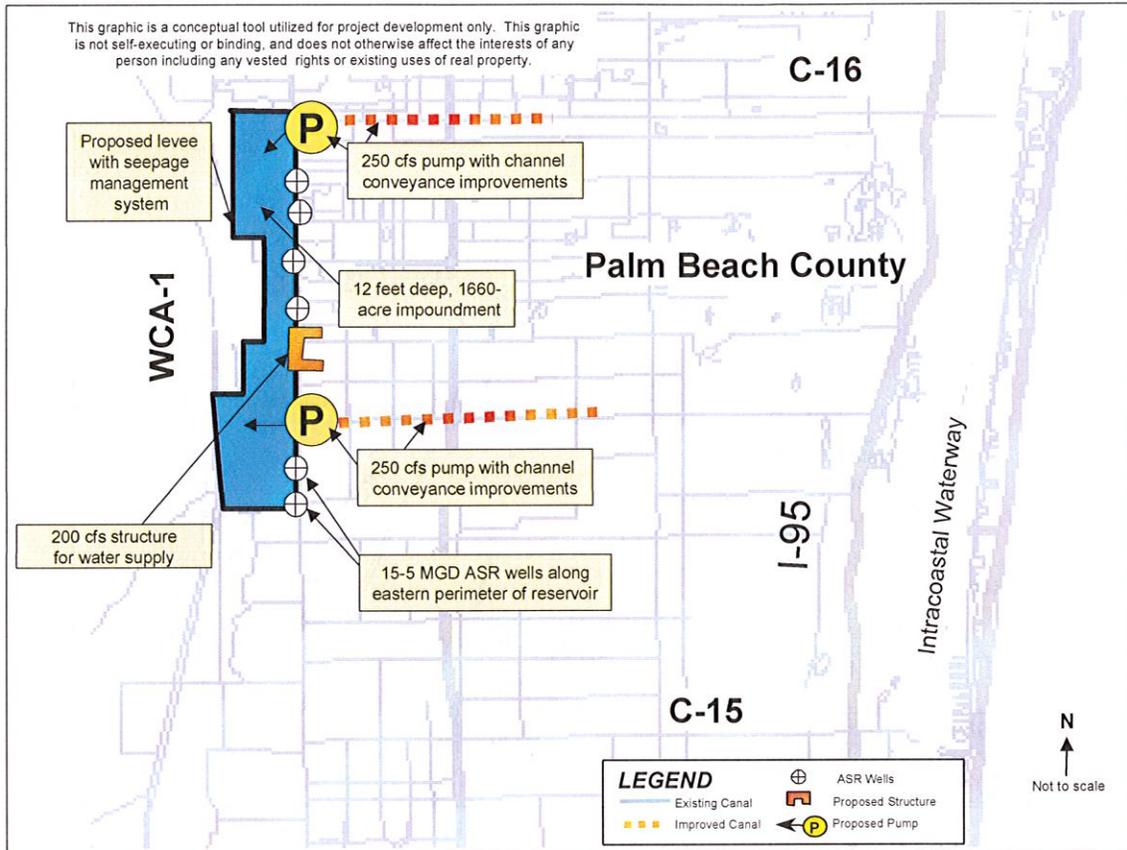


Alternative D13R

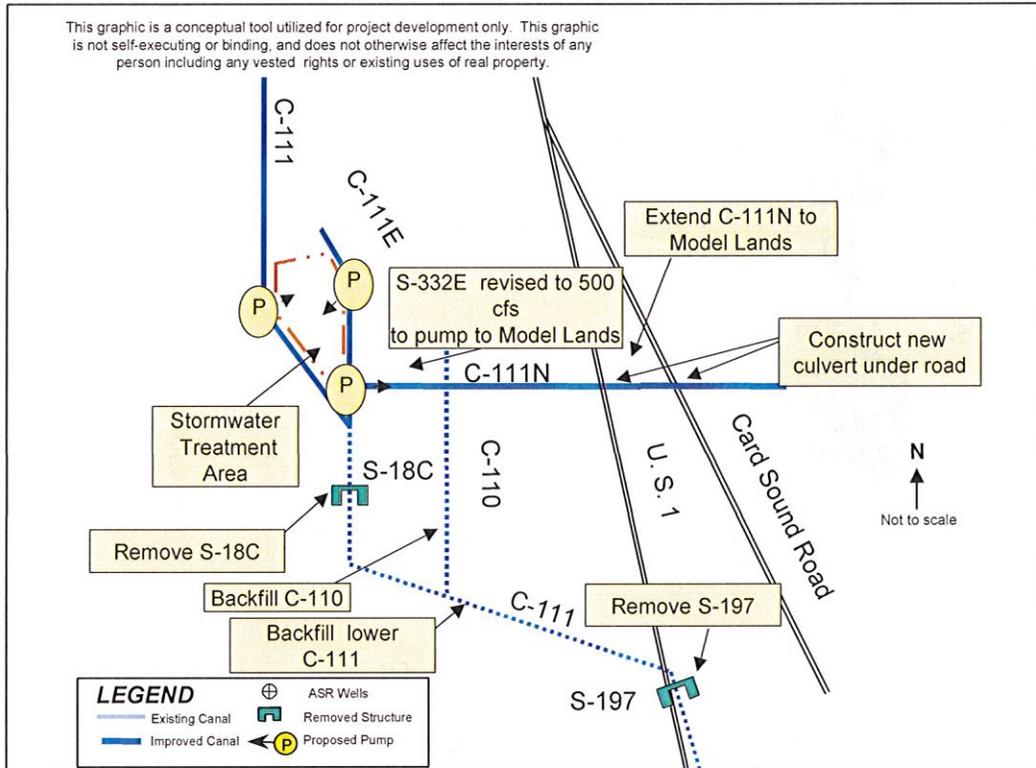
Broward County Secondary Canal System
Component Map 10



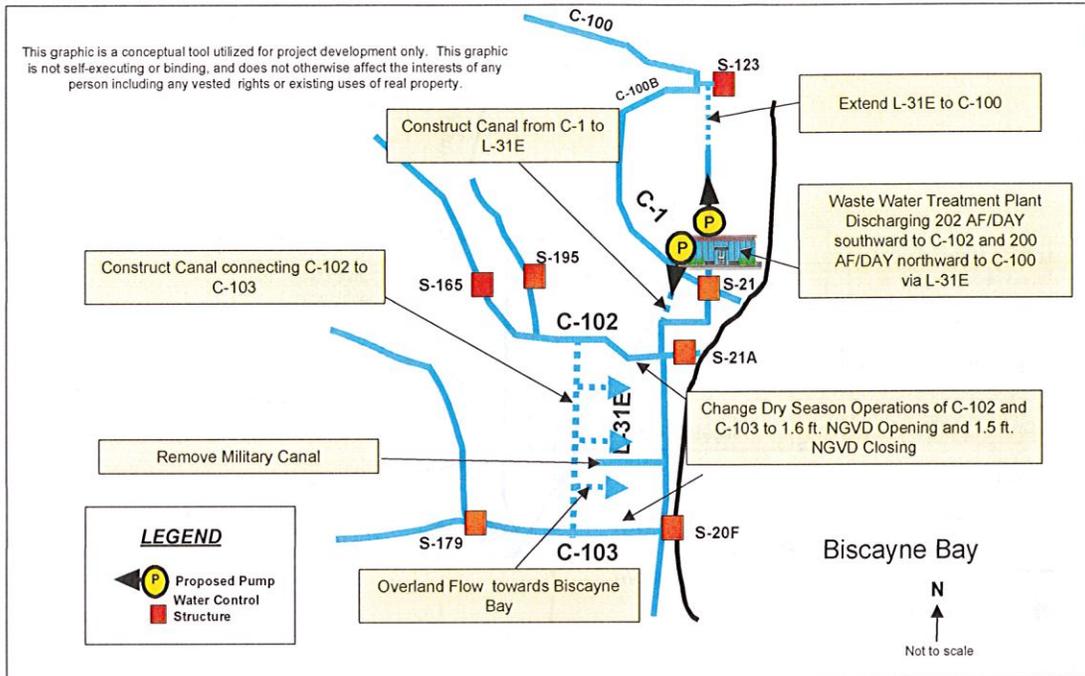
Alternative D13R
North New River
Component Map 11



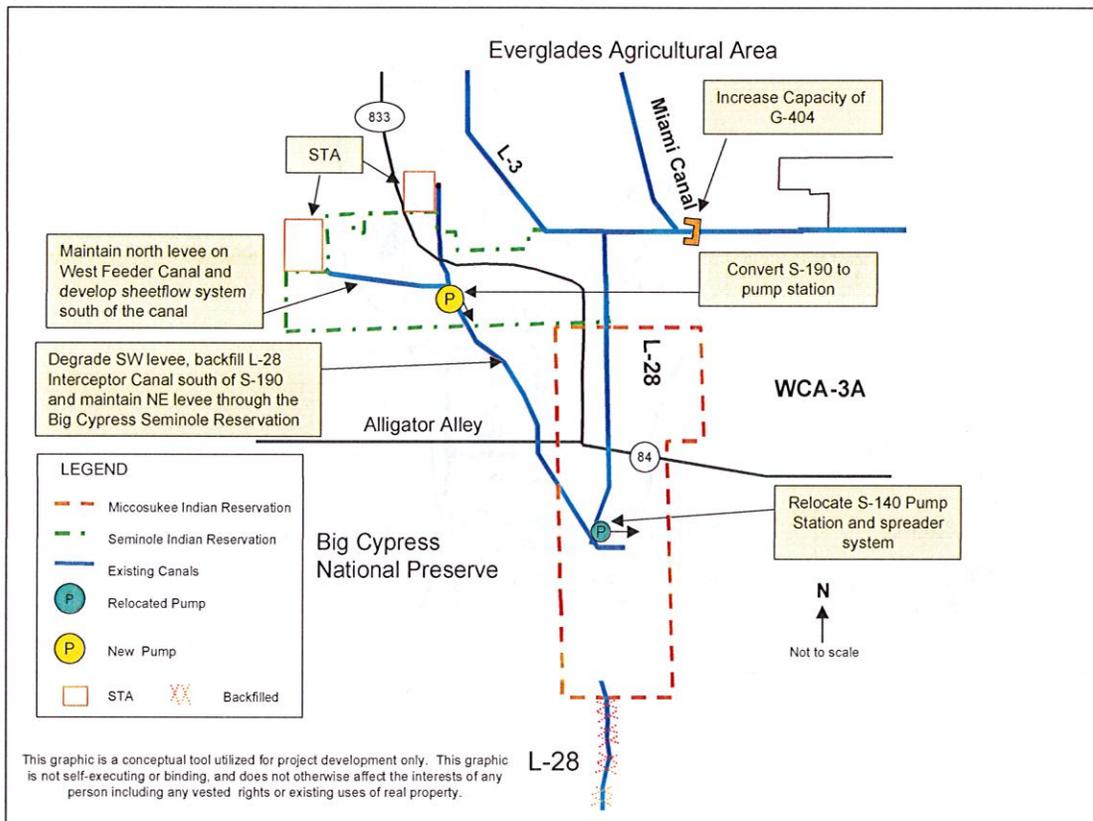
Alternative D13R
Agricultural Reserve Reservoir
Component Map 12



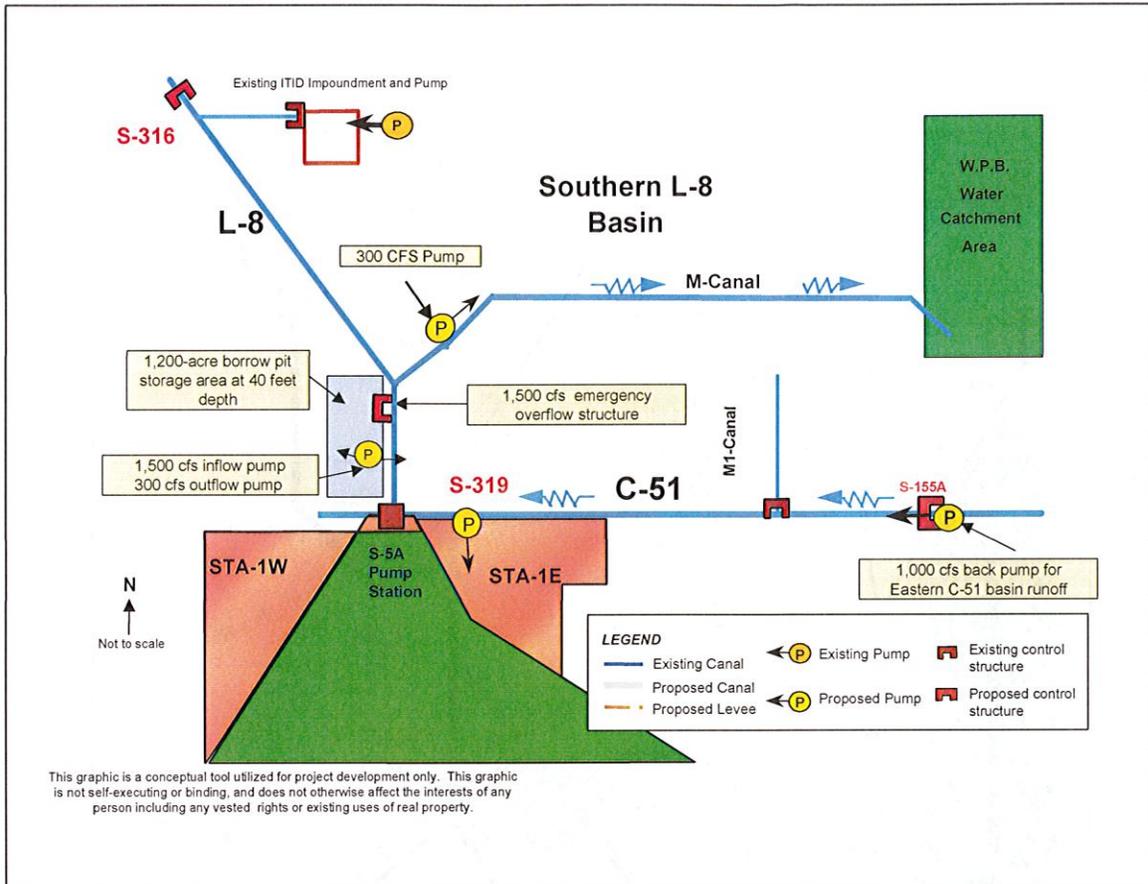
Alternative D13R
C-111N Spreader Canal
Component Map 13



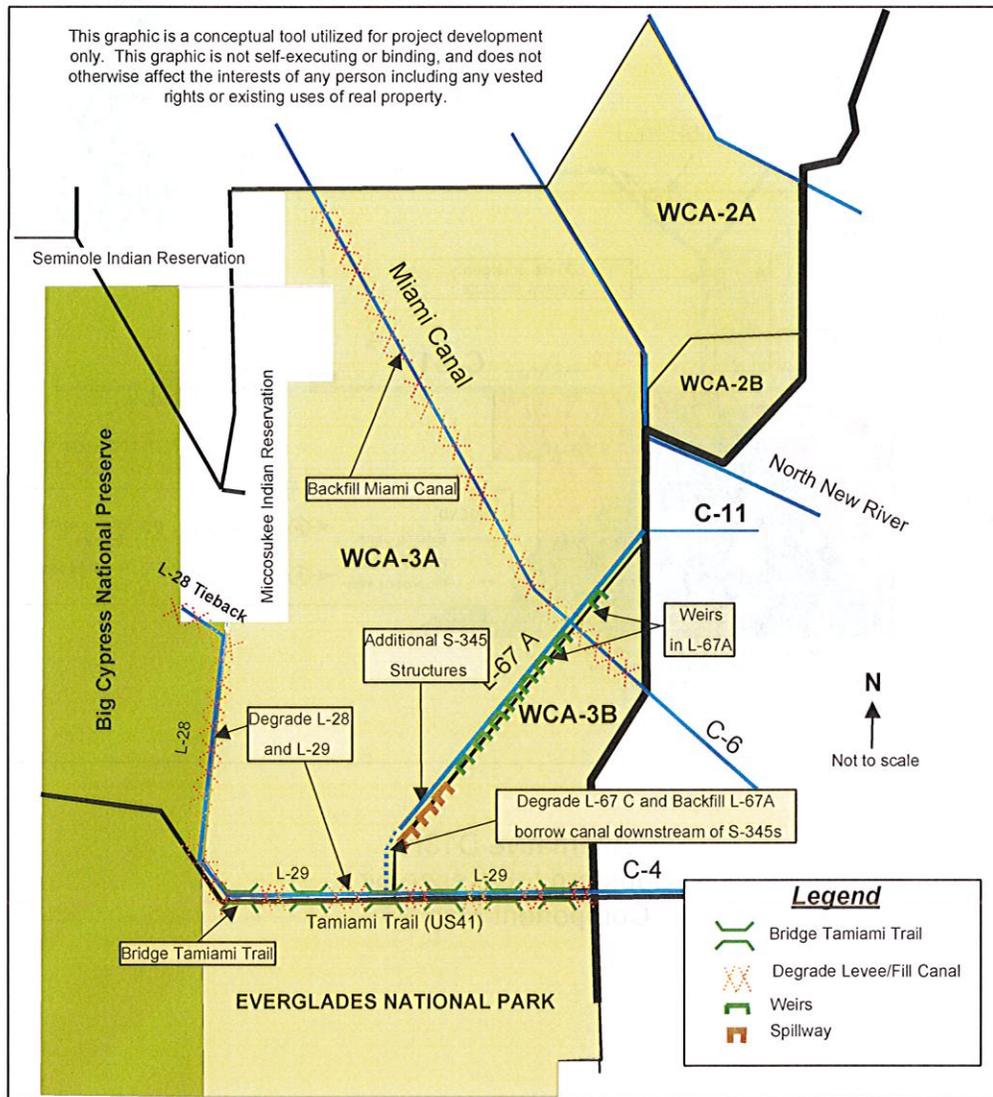
Alternative D13R
 South Biscayne Bay and Coastal Wetlands Enhancement
 Component Map 14



Alternative D13R
Big Cypress/ L-28 Interceptor
Component Map 15



Alternative D13R
Southern L-8 Reservoir
Component Map 16



Alternative D13R
Water Conservation Areas
Component Map 17

APPENDIX A5
CRITICAL PROJECTS

