South Florida Water Management District

GOVERNING BOARD MONTHLY MEETING
AGENDA

This meeting is open to the public

September 11, 2014
9:00 AM
District Headquarters - B-1 Auditorium
3301 Gun Club Road
West Palm Beach, FL 33406

FINAL

Pursuant to Section 373.079(7), Florida Statutes, all or part of this meeting may be conducted by means of communications media technology in order to permit maximum participation of Governing Board members.

The Governing Board may take official action at this meeting on any item appearing on this agenda and on any item that is added to this agenda as a result of a change to the agenda approved by the presiding officer of the meeting pursuant to Section 120.525, Florida Statutes. The order of items appearing on the agenda is subject to change during the meeting and is at the discretion of the presiding officer. Public Comment will be taken after each presentation and before any Governing Board action(s) except for Governing Board hearings that involve the issuance of final orders based on recommended Orders received from the Florida Division of Administrative Hearings.

1. Call to Order - Dan O'Keefe, Chairman, Governing Board

2. Pledge of Allegiance - Dan O'Keefe, Chairman, Governing Board

3. Employee Recognitions - Presented by Blake Guillory, Executive Director

   - July Employee of the Month: Clay Brown, Lead Engineer, Water Resources Division
   - September Employee of the Month: Megan Jacoby, Restoration Project Liaison, Office of Everglades Policy and Coordination
   - September Team of the Month: STA 1W Land Swap Initiative Team
   - 25-Year Service Award: Steve Sentes, Lead Regulatory Professional, Office of Everglades Policy and Coordination

4. Agenda Revisions - Jacki McGorty, District Clerk

5. Abstentions by Board Members from items on the Agenda

6. Water Resources Advisory Commission (WRAC) Report - Jim Moran, Chair

7. Big Cypress Basin Board Report - Rick Barber, Chair

Consent Agenda

Members of the public wishing to address the Governing Board are to complete a Public Comment Card and submit the card to the front desk attendant. You will be called by the Board Chair or designee to speak. If you want to request that an item be removed from the Consent Agenda and be discussed by the Governing Board, please advise the Governing Board when you are called upon to speak. Governing Board directives limit comments from the public to 3 minutes unless otherwise determined by the Governing Board Chair. Your comments will be considered by the Governing Board prior to adoption of the Consent Agenda.

Unless otherwise determined by the Chair, Board action on pulled Consent Agenda items will occur at or after 9:00 a.m. on Thursday. Regulatory items pulled from the Consent Agenda for discussion will be heard during the Discussion Agenda. ***Unless otherwise noted, all Consent Agenda items are recommended for approval.***

8. Public Comment on Consent Agenda

9. Pull Items for Discussion from Consent Agenda

10. Board Comment on Consent Agenda

11. Approval of the Minutes for the August 14, 2014 Regular Business Governing Board meeting held in West Palm Beach, Florida.

12. Waivers for Water Resource Advisory Commission (WRAC) members pursuant to Section 112.313, Florida Statutes.

13. Regulatory Consent Items

- Consent Orders
  - **Acosta Farms, Inc.; Acosta Farms (Miami-Dade County)** - Settlement of an enforcement action regarding unpermitted water use for agricultural irrigation.
  - **Sigma Bay Investments, LLC; Sigma Bay (Miami-Dade County) -** Settlement of an enforcement action regarding unpermitted water use for agricultural irrigation.
  - **Lionel J. Gray; Lionel Gray Property (Palm Beach County)** - Settlement of an enforcement action regarding unpermitted construction and unauthorized clearing, dredging and filling of wetlands.
  - **Domani Development, LLC; North Palm Beach Water Club (Palm Beach County)** - Settlement of an enforcement action regarding unpermitted filling and grading.

- Conservation Easements, Amendments and Releases
  - **The Bears Club Development Company, The Bears Club Wetland Slough Number 3 Buffer (Palm Beach County)** - Staff recommends the approval of a request for the release of .316 acre of upland buffer within an existing .316 acre conservation easement located within the Bear's Club development in Palm Beach County. A permit modification has been requested to release this portion of the upland buffer and designate an existing upland area in a different location within the project as a buffer.

14. **Resolution No. 2014 - 0901** Approve release of canal and road reservations and issuance of a non-use commitment. (OMC, Kathy Massey, ext. 6835)

Summary
The District has jurisdiction over certain reserved rights to construct canal and road right of ways, and mineral rights, together with the right of ingress, egress and exploration. Applications requesting releases of these reservations are routinely received from landowners, attorneys, title companies and lending institutions, who consider the reservations to be title defects. Applications are reviewed by appropriate District staff and applicable local governmental agencies to determine that there is no present or future need for the reservations.

Staff Recommendation
Staff recommends approval of the following:

- Release of Trustees canal reservations for Arrieta Landscaping Corp., a Florida dissolved corporation, (File No. 6-14-1) for 5.00 acres in Miami-Dade County
- Release of Trustees canal reservations, District canal and road reservations, and issuance of non-use commitment, for Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship, (File Nos. 6-14-2, 18592 and NUC 1653) for 2.50 acres in Miami-Dade County
- Release of Trustees canal reservations for Two Sisters Nursery, Inc., a Florida corporation, (File No. 7-14-1) for 6.97 acres in Miami-Dade County
- Release of Trustees canal reservations for Arthur I. Gilbert, (File No. 7-14-2) for 3.71 acres in Miami-Dade County
- Release of District canal reservations for Guillermo Salazar, a single man, (File No. 18596) for 1.94 acres in Miami-Dade County

15. **Resolution No. 2014 - 0902** Approve the release of a portion of the L-50 Right of Way Easement to the Trustees of the Internal Improvement Trust Fund, containing 0.06 acres, more or less, in Section 24, Township 40 South, Range 32 East, Glades County, at no cost. (OMC, Kathy Massey, ext. 6835)

Summary
The Trustees of the Internal Improvement Trust Fund (TIITF) has requested that a 0.06+/- acre portion of the L-50 right of way be released. The parcel is located in Section 24, Township 40 South, Range 32 East, Glades County. The release is being requested to clear up an encroachment within the right of way. TIITF is the underlying fee title owner. District staff has reviewed this request to determine that sufficient right of way will remain for operations and maintenance of the levee.

Staff Recommendation
Approve the release of a portion of the L-50 right of way Easement, containing 0.06 acres, more or less, located in Section 24, Township 40 South, Range 32 East, Glades County, to the Trustees of the Internal Improvement Trust Fund at no cost, and waive the application fee.

16. **Resolution No. 2014 - 0903** Approving a one year cost share agreement with the Everglades Agricultural Area Environmental Protection District for Stormwater Treatment Area optimization support, in the amount of $780,000, of which the District's total contribution is $400,000, subject to Governing Board approval of the FY2015 budget. (Contract No. 4600003125) (WR, Kim O'Dell, ext. 2650)

Summary
Continuing assessment of the environmental condition within the Stormwater Treatment Areas (STAs) and scientific investigations to better understand the phosphorus removal mechanisms are necessary to provide input in operating and managing these complex treatment wetlands.

This one-year cost-share STA Optimization Support agreement with the Everglades Agricultural Area Environmental Protection District (EAA EPD) provides for a research technical team to be formed by the parties, and for joint funding of research priorities to further the common interests and collaborative efforts of the District and the EAA EPD, in the amount of $780,000, of which the District's total contribution is $400,000, subject to Governing Board approval of the FY15 budget.

Staff Recommendation
Staff recommends approval to enter into this cost share agreement with the Everglades Agricultural Area Environmental Protection District for Stormwater Treatment Area optimization support.

17. **Resolution No. 2014 - 0904** Authorize entering into an Interagency Agreement between the South Florida Water Management District (SFWMD) and the Southwest Florida Water Management District (SWFWMD) for designation of regulatory responsibility for permitting under Part II of Chapter 373, Florida Statutes, for the project known as Kickin Tires Ranch that crosses the jurisdictional boundaries of both Water Management Districts. (REG, Maria Clemente, ext. 2308)

Summary
The SFWMD received a water use permit application for an agricultural project in Polk County, Florida known as Kickin Tires Ranch. However, the project crosses water management district boundaries. In order to issue a single permit for the entire project, an interagency agreement is necessary to delegate SFWMD's Part II, Chapter 373, F.S., jurisdiction and responsibility to SWFWMD.

Staff Recommendation
Approve an Interagency Agreement between SWFWMD and SFWMD authorizing SWFWMD to issue any Water Use Permits under Part II of Chapter 373, F.S., for the portion of Kickin Tires Ranch that lies within the boundaries of SFWMD.

18. Enter a Final Order concurring with the Executive Director's emergency authorization issued to Florida Power and Light for the purpose of authorizing temporary pump installation and water withdrawal along and from the L-31E Canal System; Miami-Dade County, Florida. (WR, Terrie Bates, ext. 6952)

Summary
On August 27, 2014, Florida Power and Light requested the District issue an Emergency Order for temporary authorization to utilize the District's right of way and to divert and use water, above that reserved in Rule 40E-10.061, F.A.C., from the L-31E Canal System to help moderate unusually high temperatures and salinity that are occurring in the Turkey Point Cooling Canal System. Based upon information provided by FPL and technical evaluation provided by District staff and in order to protect the public health, safety, and welfare pursuant to Section 373.119(2), F.S., and associated rules, the Executive Director determined that an emergency existed and the Emergency Order was necessary. On August 28, 2014, the District's Executive Director issued SFWMD No. 2014-078-DAO-WU/ROW/ERP, an

"Emergency Final Order issued to Florida Power and Light for the purpose of authorizing temporary pump installation and water withdrawal along and from the L-31E Canal System; Miami-Dade County, Florida." The Order includes specific conditions governing the temporary use of the District's Right of Way; provisions for daily determination and authorization of water withdrawals and pump operations to ensure that only water over and above the amounts reserved for Biscayne Bay are used; termination of the Order on October 15, 2014; and removal of all facilities upon termination of the Order.

Staff Recommendation:
Staff recommends the Governing Board enter a Final Order concurring with the Executive Director's emergency authorization issued to Florida Power and Light for the purpose of authorizing temporary pump installation and water withdrawal along and from the L-31E Canal System; Miami-Dade County, Florida.

19. Enter a Final Order Approving the 2014 Lower Kissimmee Basin Water Supply Plan. (WR, Cynthia Gefvert, ext. 2610)

Summary
Regional water supply plans are required to be updated at least every five years pursuant Chapter 373, F.S. With the advent of the Central Florida Water Initiative, the Kissimmee Basin was divided into the Upper Basin, which is part of the CFWI, and the Lower Kissimmee Basin (LKB) which includes portions of Okeechobee, Highlands and Glades counties. This *2014 Lower Kissimmee Basin Water Supply Plan* builds on the previous Kissimmee Basin plans.

The LKB Plan provides demand projections through 2035, and identifies sources to meet these demands pursuant to Chapter 373, F.S. The 2014 LKB Plan concludes that the future water needs of the LKB Planning Area can continue to be met through the 2035 planning horizon with appropriate management and continued development of available groundwater sources. The Draft Plan was released for public review in mid-June and comments were received and considered in the final plan draft.

Staff Recommendation
Staff recommends the Governing Board issue a final order approving the 2014 LKB Water Supply Plan.

20. **Resolution No. 2014 - 0905** Authorizing an amendment to cooperative agreement (4600002335) with the United States Geological Survey Florida Integrated Science Center (Orlando), for ground water, surface water, and evapotranspiration data in the amount of $228,219.00 in ad valorem funds subject to Governing Board approval of the FY15 budget. (OEC, Jeff Kivett, ext. 2680)

Summary
Over the past 60 years, the District and the U.S. Geological Survey (USGS) have partnered on collecting groundwater and surface water data for incorporation into the District's Data Management system, DBHydro. This Agreement continues that partnership for an additional one year period. It will allow the District to count on continued groundwater and surface water monitoring support from the USGS. These data support various District programs related to ecosystems restoration, water supply, regulatory requirements and baseline monitoring. The monitoring support provided by USGS assists the Districts efforts at assessing water resources available, changes in flow trends due to structural changes in the system and their

impact on water quality issues. The data is particularly useful in the assessment of environmental compliance of waters being discharged into Lake Okeechobee and the Everglades Protection Area with state water quality standards.

Continuing this agreement will insure continuity of the monitoring work that the USGS has partially funded for the sites listed in the statement of work of the agreement. The monitoring work includes the collection of monthly, quarterly, semi-annual, continuous recorder and satellite telemetry data from ten (10) surface water stations, one (1) evapo-transpiration station, and ground-water level data from twenty five (25) groundwater stations. Data are archived in the USGS's national database, and then transferred to the District via direct computer link on a monthly or as-needed basis.

Staff Recommendation
Staff recommends approval to enter into a 365 day cooperative agreement in the amount of $228,219.00 with the United States Geological Survey (USGS) for the collection of ground-water, surface-water, and Evapotranspiration (ET) data.

21. **Resolution No. 2014 - 0906** Authorize entering into a three-year contract with two (2) one-year renewal options with James L. King and Associates, Inc., the lowest responsive and responsible bidder, for Flat Mowing Services in the Okeechobee Field Station area, in the amount of $860,618.25 in ad valorem funds subject to Governing Board approval of FY15, FY16 and FY17 budgets. (Contract Number 4600003120) (FOLM, Karen Estock, ext. 6282)

Summary
Maintenance of the Right of Ways is required to ensure that vegetation is controlled at a manageable height and will uphold the operational integrity of the District's flood control system. This project for the Okeechobee Field Station area, will contract approximately 19,449 acres to be mowed on an annual basis. The lowest responsive and responsible bidder is James L. King & Associates, Inc., at $14.75 per acre. Since this is a work order contract, the amount of acres to be mowed will fluctuate, based on the weather, budget, and construction projects in these areas.

Staff Recommendation
Staff recommends authorizing the approval of Contract Number 4600003120, as this item supports continual operations and maintenance of the District canal system. If not mowed and maintained, these areas would become a potential hazard to the public as well as District employees.

22. **Resolution No. 2014 - 0907** Authorizing to enter into an amended and restated agreement with Lykes Brothers, Inc. for the West Waterhole Pasture Florida Ranchlands Environmental Services Pilot Project to extend the term of the agreement by two years and increase the funding in the amount of $940,476.20, subject to Governing Board approval of the FY15 and FY16 budgets. (Contract No. OT061107/3600001161) (EPC, Beth Lewis, ext. 6343)

Summary
On April 12, 2006 the parties entered into agreement number OT061107 to design and implement a water management alternative ("WMA") Pilot Project to provide water storage and water quality treatment in a 2,500 acre detention area of Lykes property known as the West Waterhole Pasture Pilot Project. The agreement was later renumbered as OT061107/3600001161. Since that time the Parties have executed amendments to the agreement to modify payment amounts and extend the

term of the agreement. The West Waterhole Pasture Pilot Project has been operating since 2008 and has successfully stored and treated stormwater consistent with the project goals. In 2013, the project removed from the regional system (C-40 Canal) 6.4 metric tons of TP (87% removal efficiency), 16.12 metric tons of TN (30% removal efficiency), and 2.6 billion gallons (7,955 acre-feet) of excess stormwater. The Parties wish to extend the agreement and continue the WMA water storage and treatment project. Highlands County Soil and Water Conservation District ("HSWCD") was a party to the original agreement and amendments and acted as an administrator for the Pilot Project. HSWCD is not a party to this amended and restated agreement. This amended and restated agreement supersedes and replaces the original agreement and all its amendments.

Staff Recommendation
Staff recommends authorization to enter into an amended and restated agreement with Lykes Brothers, Inc. for the West Waterhole Pasture Florida Ranchlands Environmental Services Pilot Project to extend the term of the agreement by two years and increase the funding in the amount of $940,476.20, subject to Governing Board approval of the FY15 and FY16 budgets.

23. Authorize publication of Notice of Proposed Rule in the Florida Administrative Register, request review by the Office of Fiscal Accountability and Regulatory Reform, and adopt new Rule 40E-1.800, Florida Administrative Code (provided no changes are made and no request for hearing is timely received), to implement the newly passed legislation regarding the lobbyist registration process for Water Management Districts, in an effort to provide a uniform system of lobbyist registrations. (OC, Derek Brown, ext. 6278)

Summary:
The State of Florida Water Management Districts (WMDs), in conjunction with the Florida Department of Environmental Protection (DEP), have worked together to implement consistency in the registration of lobbyists before the WMDs. The rule will establish procedures for registering to lobby the South Florida Water Management District (District). The rule will also adopt two forms for use in registration, changing information, renewing registration, and cancelling registration; along with incorporation of a business classification system for the principals of the registering lobbyists.

Staff Recommendation:
Staff is recommending the following actions by the Governing Board:
Authorize publication of Notice of Proposed Rule in the Florida Administrative Register, request review by the Office of Fiscal Accountability and Regulatory Reform, and adopt new Rule 40E-1.800, Florida Administrative Code (provided no changes are made and no request for hearing is timely received), to implement the newly passed legislation regarding the lobbyist registration process for WMDs, in an effort to provide a uniform system for lobbyist registration.

24. **Resolution No. 2014 - 0908** Approving an amendment to the Fiscal Year 2013-14 budget. (AS, Candida Heater, ext. 6486)

Summary
As noted in the August amendment request for $1M, the health insurance claims continue to trend higher than projected, therefore an additional amendment has become necessary before the end of this fiscal year. This amendment request is to recognize additional revenues in the amount of $1.5 million from FY2013-2014 ad

valorem revenue collection in excess of the FY2013-2014 budget. Expenditure trends for the first three quarters of FY2013-2014 indicate that there is insufficient budget for the remainder of the fiscal year. Internal Service Funds are used to account for District activities that provide services to other funds and organizational units on a cost reimbursement basis. The Health Benefits Fund accounts for the operations related to providing health and medical insurance coverage to District employees and retirees who choose to remain in the plan. Revenue is provided through interfund charges and employee and retiree contributions.

This amendment will increase the FY2013-14 budget by $3 million.

Staff Recommendation
Staff recommends Governing Board approval of this budget amendment.

25. **Resolution No. 2014 - 0909** Authorize entering into a Purchase Order with A.L. Jackson and Company, PA for three Enterprise Resource Planning (ERP) contractors, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $677,881 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is a request to continue the services of two ERP Programmer Analysts and one ERP Team Lead supporting SAP for the time period October 1, 2014 - September 30, 2015 in the amount of $677,881. These services will be procured from A.L. Jackson and Company, PA using the State of Florida Contract #973-561-10-1.

Staff Recommendation
Staff recommends approving the issuance of a purchase order to A.L. Jackson and Company, PA for two ERP Programmer Analysts and one ERP Team Lead, for the time period October 1, 2014 - September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $677,881 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

26. **Resolution No. 2014 - 0910** Authorize entering into a Purchase Order with Dyntek Services, Inc. for the annual renewal of Symantec storage software maintenance and upgrades, for the time period December 1, 2014 through November 30, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y, in the amount of $192,512 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the Symantec Corporation (Veritas) software maintenance in the amount of $192,512. The time period for support is December 1, 2014 through November 30, 2015. This maintenance will be procured from Dyntek Services, Inc. using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y.

Staff Recommendation
Staff recommends approving a purchase order with Dyntek Services, Inc. for the annual renewal of Symantec storage software maintenance and upgrades, for the time period December 1, 2014 - November 30, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y, in the amount of

$192,512 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

27. **Resolution No. 2014 - 0911** Authorize entering into a Purchase Order with an EMC Corporation authorized reseller for the annual renewal of the EMC Corporation hardware and software, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $258,571 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the EMC Corporation infrastructure hardware and software maintenance in the amount of $258,571. The time period for support is November 1, 2014 through October 31, 2015 and will be procured through an EMC Corporation authorized reseller using governmental contract pricing.

Staff Recommendation
Staff recommends approving a purchase order for the annual renewal of EMC Corporation infrastructure hardware and software maintenance, for the time period November 1, 2014 - October 31, 2015, through an EMC Corporation authorized reseller, in the amount of $258,571 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

28. **Resolution No. 2014 - 0912** Authorize entering into a Purchase Order with GDKN Corporation for a Data Warehouse Analyst, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $200,431 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is a request to continue the services of a Data Warehouse Analyst supporting SAP for the time period October 1, 2014 - September 30, 2015 in the amount of $200,431. These services will be procured from GDKN Corporation using the State of Florida Contract #973-561-10-1.

Staff Recommendation
Staff recommends approving a purchase order to GDKN Corporation for a Data Warehouse Analyst, for the time period October 1, 2014 - September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $200,431 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

29. **Resolution No. 2014 - 0913** Authorize entering into a Purchase Order with Mythics, Inc. for the annual renewal of the Oracle software maintenance and upgrades, for the time period October 25, 2014 through October 24, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0153M, in the amount of $942,578 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the Oracle software maintenance in the amount of $942,578. The time period for support is October 25, 2014 through October 24, 2015. This support will be procured from Mythics, Inc. using the United States

General Services Administration (GSA) Schedule #GS-35F-0153M.

Staff Recommendation
Staff recommends approving a purchase order with Mythics, Inc. for the annual renewal of Oracle software maintenance and upgrades, for the time period October 25, 2014 - October 24, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0153M, in the amount of $942,578 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

30. **Resolution No. 2014 - 0914** Authorize entering into a Purchase Order with Oracle Corporation for the annual renewal of the Sun Microsystems server, storage, and peripheral hardware maintenance, for the time period November 1, 2014 through October 31, 2015, in the amount of $280,384 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the Sun Microsystems (Oracle Corporation) hardware maintenance in the amount of $280,384. The time period for support is November 1, 2014 through October 31, 2015. This support will be procured directly from the manufacturer Oracle Corporation. Oracle Corporation purchased Sun Microsystems.

Staff Recommendation
Staff recommends approving a purchase order with Oracle Corporation for the annual renewal of Sun Microsystems server, storage, and peripheral hardware maintenance, for the time period November 1, 2014 - October 31, 2015, in the amount of $280,384 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

31. **Resolution No. 2014 - 0915** Authorize entering into a Purchase Order with a Cisco Systems authorized reseller for the annual renewal of the Cisco Systems hardware and software maintenance, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $352,405 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the Cisco Systems network hardware and software maintenance in the amount of $352,405. The time period for support is November 1, 2014 through October 31, 2015 and will be procured through a Cisco Systems authorized reseller using governmental contract pricing.

Staff Recommendation
Staff recommends approving a purchase order for the annual renewal of Cisco Systems network hardware and software maintenance, for the time period November 1, 2014 - October 31, 2015, through a Cisco Systems authorized reseller, in the amount of $352,405 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

32. **Resolution No. 2014 - 0916** Authorize entering into a Purchase Order with SAP Public Services, Inc. for software maintenance and upgrades, for the time period October 1, 2014 through September 30, 2015, in the amount of $592,000 for which ad valorem funds are subject to Governing Board approval of the FY15 budget. (AS, Doug Bergstrom, ext. 6214)

Summary
This is the annual renewal of the SAP software maintenance in the amount of $592,000. The time period for support is October 1, 2014 through September 30, 2015. This support will be procured directly from the manufacturer SAP.

Staff Recommendation
Staff recommends approving a purchase order with SAP for the annual renewal of SAP software maintenance and upgrades, for the time period October 1, 2014 - September 30, 2015, in the amount of $592,000 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

33. **Resolution No. 2014 - 0917** Authorize an amendment to increase the funding for Toshiba Business Solutions Multi-Function Devices Contract #4600002336, for the time period October 1, 2014 through November 8, 2015, in the amount of $366,708 for which ad valorem funds are subject to Governing Board approval of the FY15 and FY16 budgets. (AS, Doug Bergstrom, ext. 6214)

Summary
This request is to increase the Toshiba Business Solutions Multi-Function Devices Contract in the amount of $366,708. This additional funding will provide services for the time period October 1, 2014 through November 8, 2015.

Staff Recommendation
Staff recommends approving an increase to the Toshiba Business Solutions Multi-Function Devices Contract in the amount of $366,708 for the time period October 1, 2014 - November 8, 2015 for which ad valorem funds are budgeted and subject to Governing Board approval of the FY15 and FY16 budgets.

34. Board Vote on Consent Agenda

35. General Public Comment

36. Board Comment

Discussion Agenda

37. Technical Reports

A) Water Conditions Report - Jeff Kivett, Division Director, Operations, Engineering and Construction Division (ext. 2680)

B) Ecological Conditions Report - Terrie Bates, Division Director, Water Resources Division (ext. 6952)

38. **Resolution No. 2014 - 0918** Approving a Cooperative Funding Program that provides cost-share funding to local governments and other organizations for priority stormwater management and alternative water supply projects aligned with the District's core mission. (EXO, Blake Guillory, ext. 6302)

Summary
The Cooperative Funding Program provides a mechanism for District cost-share funding of priority stormwater and alternative water supply (AWS) construction projects. The Governing Board will establish priority considerations that are aligned with the District's core mission. A single, annual solicitation is proposed for both project types. Program funds would be budgeted each year and allocated between stormwater and AWS pursuant to Governing Board direction.

Staff Recommendation
Staff recommends approval to modify the existing program to issue an RFP by October and to follow the proposed program structure and schedule.

39. **Resolution No. 2014 - 0919** Authorizing the Executive Director, or his designee, to enter into an Interagency Agreement with other agency/governmental partners for the expanded Indian River Lagoon National Estuary Program; approving the allocation of $500,000 in ad valorem funds for FY15 as an initial investment subject to Governing Board approval of the FY15 budget. (Contract No. 4600003137) (EXO, Dan DeLisi, ext. 6232)

Summary
The Indian River Lagoon National Estuary Program (IRL NEP) was established in 1990 through the Environmental Protection Agency's (EPA) designation of the IRL as an "estuary of national significance." The IRL NEP provides a non-regulatory, stakeholder-driven, collaborative approach to coastal watershed restoration and protection. In 1991, a Management Conference was established to guide development of the IRL NEP Comprehensive Conservation Management Plan (CCMP) and its future implementation. Last month the Governing Board was briefed on proposed organizational changes that will increase community participation and expand project opportunities. This month staff is requesting authorization to enter into an Interagency Agreement and approval of initial investment funds.

Staff Recommendation
Staff recommends approval of this item as the project leverages state dollars with federal and local cost-share funds to implement water resource projects/programs that directly benefit the Indian River Lagoon. Further, this project is supported by the Indian River Lagoon County Collaborative and the Florida Legislature.

40. FY15 Budget Update - Doug Bergstrom, Division Director, Administrative Services Division (ext. 6214)

41. **Resolution No. 2014 - 0920** Authorize entering into a 540 day contract with Douglas N. Higgins, Inc., the lowest responsive and responsible bidder, for the G541 L8 Divide Structure project, for a total amount of $4,444,443.00, for which $1,500,218.00 in ad valorem funds are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15 and FY16 budgets. (Contract Number 4600003133) (EC, John Mitnik, ext. 2679)

Summary
As part of the District's Restoration Strategies initiative the L8 Divide Structure, G541, was identified as a component of the Eastern Flow Path in the Restoration Strategies Regional Water Quality Plan. It is to be located in the L8 Canal approximately 2.67 miles north of State Road 80 in Palm Beach County. The structure has two basic functions:

1. When closed, it allows stages in the L8 Canal, south of G541, to be raised and held without affecting water elevations in the remainder of the L8 Canal north of the structure. Raising stages south of G541 allows filling of the L8 FEB by gravity and also allows pumping of water out of the L8 FEB to nearby STA 1E and 1W.

2. When open, it is essentially hydraulically "invisible" based on flows in the L8 Canal and has no impact on the way the system is currently operated.

This G541 L8 Divide Structure project is to construct a fully automated, reinforced concrete vertical lift roller gate structure, utilizing a three gate arrangement. The structure also includes back-up power generation and considerations for passive public access across the facility.

Staff Recommendation
Staff recommends approval to enter into a 540 day contract in the amount of $4,444,443.00 with Douglas N. Higgins, Inc., the lowest responsive and responsible bidder, for the construction of the G541 L8 Divide Structure.

42. **Resolution No. 2014 - 0921** Authorize entering into a 1,034 day contract with Blue Goose Growers, LLC dba Blue Goose Construction, the lowest responsive and responsible bidder, for the C-44 Stormwater Treatment Area, in the amount of $100,792,387.00, for which $200,000.00 in dedicated funds (Save Our Everglades Trust Fund) are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15, FY16 and FY17 budgets. (Contract Number 4600003135) (OEC, Jeff Kivett, ext. 2680)

Summary
The C-44 Reservoir/Stormwater Treatment Area Project (C-44 Project) is intended to be constructed by the U.S. Army Corps of Engineers (USACE) and the District over the next five (5) years. In December 2013 the District completed construction of the C-44 Communication Tower and in July 2014 the USACE completed construction of Contract 1 (C-400 Intake Canal and Access Road, C-133A Canal, C-133 Canal, S-418 Spillway, and Citrus Boulevard improvements). As stated in the Project Partnership Agreement (PPA) Amendment executed in August 2014, the District intends to construct the System Discharge (approved by the Governing Board in August 2014, construction to start early September 2014), the Stormwater Treatment

Areas (construction start October 2014), and the S-401 Pump Station (construction start April 2015). The District started construction in July 2014 on the System Discharge Interim Spillway. That contract will achieve early benefits of retaining additional water within the C-44 Project site. That contract is not cost shareable since it was executed prior to the USACE executing the PPA Amendment. The USACE intends to start construction of the C-44 Reservoir (Contract 2) in July 2015.

This C-44 Stormwater Treatment Area (C-44 STA) construction contract is to construct six STA cells which include 32 miles of berms, 30 miles of canals, 56 concrete water control structures, and all associated ancillary features. These features in conjunction with the System Discharge features will provide water quality treatment on 6,300 wetted acres of STAs.

Staff Recommendation

Staff recommends approval to enter into a 1,034 day contract in the amount of $100,792,387.00 with Blue Goose Growers, LLC dba Blue Goose Construction, the lowest responsive and responsible bidder, for the construction of the C-44 STA.

43. **Resolution No. 2014 - 0922** Authorize entering into a 570 day contract with Murray Logan Construction, Inc., the lowest responsive and responsible bidder, for the S-5AS Divide Structure Rehabilitation Project, in the amount of $2,284,000.00, for which $475,250.00 in ad valorem funds are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15 budget. (Contract number 4600003132) (OEC, Jeff Kivett, ext. 2680)

Summary

The S-5AS Divide Structure Rehabilitation Project is intended to be constructed by the District over the next nineteen (19) months.

As part of the Restoration Strategies Project the S-5A Basin and C-51 West Basin runoff will be directed north through S-5AS to the L-8 FEB. With implementation of this project, the use of the S-5AS structure will increase and therefore will require the structure to be upgraded to ensure more efficient operations and increased use at higher stages and flow rates.

Staff Recommendation

Staff recommends approval to enter into a 570 day contract in the amount of $2,284,000.00 with Murray Logan Construction, Inc., the lowest responsive and responsible bidder, for the construction of the S-5AS Divide Structure Rehabilitation Project.

44. General Public Comment

Staff Reports

45. Monthly Financial Report - Doug Bergstrom, Division Director, Administrative Services Division

46. General Counsel's Report - Edward Artau

47. Executive Director's Report - Blake Guillory

    Report of permits issued by authority delegated to the Executive Director from August 1-31, 2014.

48. Board Comment

Attorney Client Sessions

49. Attorney Client Session - USA

Attorney client session pursuant to Section 286.011(8), Florida Statutes (2013), to discuss strategy related to litigation expenditures and/or settlement negotiations in United States of America v. South Florida Water Management District, et al., United States District Court, Southern District of Florida, Case No. 88-1886-CIV-Moreno.

ATTENDEES: Governing Board Members F. Barber, S. Batchelor, M. Hutchcraft, M. Peterson, J. Moran, D. O'Keefe, J. Portuondo, K. Powers; Executive Director B. Guillory; District attorneys E. Artau, K. Burns, J. Collier, C. Kowalsky. (Edward L. Artau, ext. 6431)

Action Items, (if any), Stemming from Attorney/Client Session

Attorney client session pursuant to Section 286.011(8), Florida Statutes (2013), to discuss strategy related to litigation expenditures and/or settlement negotiations in United States of America v. South Florida Water Management District, et al., United States District Court, Southern District of Florida, Case No. 88-1886-CIV-Moreno. (Edward L. Artau, ext. 6431)

50. Adjourn

CONSENT AGENDA TABLE OF CONTENTS
REGULATORY ITEMS FOR GOVERNING BOARD ACTION
September 11, 2014

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Attachment: ca_reg_rm_100_sd (II) (2052 : Regulatory Consent Agenda)

REGULATION AGENDA ITEMS

PERMIT DENIAL: Those listed on the consent agenda are routine in nature and non-controversial. Such denials are typically due to failure of applicant to complete the application. Unique or controversial projects or those requiring a policy decision are normally listed as discussion items. Permit types include:

Environmental Resource (ERP): Permits that consider such factors as the storage of storm water to prevent flooding of a project (upstream or downstream projects); the treatment of stormwater prior to discharge from the site to remove pollutants; and the protection of wetlands on the project site.

Surface Water Management: Permits for drainage systems, which address flood protection, water quality, and environmental protection of wetlands.

Water Use: Permits for the use of ground and/or surface water from wells, canals, or lakes.

Lake Okeechobee Works of the District: Permits that set concentration limits for total phosphorus in surface discharge from individual parcels in the Lake Okeechobee Basin.

EAA Works of the District: Permits to reduce the total phosphorus load from the EAA by 25 percent in water discharged to Works of the District.

Wetland Resource: Permits for dredge and fill activities within Waters of the State and their associated wetlands.

ADMINISTRATIVE HEARING: A case in litigation conducted pursuant to the Administrative Procedures Act (Chapter 120, Florida Statutes) involving the determination of a suit upon its merits. Administrative hearings provide for a timely and cost effective dispute resolution forum for interested persons objecting to agency action.

FINAL ORDER: The Administrative Procedures Act requires the District to timely render a final order for an administrative hearing after the hearing officer submits a recommended order. The final order must be in writing and include findings of fact and conclusions of law.

CONSENT ORDER: A voluntary contractual agreement between the District and a party in dispute which legally binds the parties to the terms and conditions contained in the agreement. Normally used as a vehicle to outline the terms and conditions regarding settlement of an enforcement action.

CONSERVATION EASEMENT: A perpetual interest to the District in real property that retains land or water areas in their existing, natural, vegetative, hydrologic, scenic, open or wooded condition and retains such areas as suitable habitat for fish, plants, or wildlife in accordance with Section 704.06, F.S.

TECHNICAL DENIAL: This action normally takes place when a proposed project design does not meet water management criteria or the applicant does not supply information necessary to complete the technical review of an application.

EMERGENCY ORDER and AUTHORIZATION: An immediate final order issued without notice by the Executive Director, with the concurrence and advice of the Governing Board, pursuant to (Section 373.119(2), Florida Statutes, when a situation arises that requires timely action to protect the public health, safety or welfare and other resources enumerated by rule and statute.

MEMORANDUM OF AGREEMENT/UNDERSTANDING: A contractual arrangement between the District and a named party or parties. This instrument typically is used to define or explain parameters of a long-term relationship and may establish certain procedures or joint operating decisions.

Attachment: ca_reg_rm_100_sd (II) (2052 : Regulatory Consent Agenda)

PETITION: An objection in writing to the District, requesting either a formal or an informal administrative hearing, regarding an agency action or a proposed agency action. Usually a petition filed pursuant to Chapter 120, Florida Statutes, challenges agency action, a permit, or a rule. Virtually all agency action is subject to petition by substantially affected persons.

SEMINOLE TRIBE WORK PLAN: The District and the Seminole Indians signed a Water Use Compact in 1987. Under the compact, annual work plans are submitted to the District for review and approval. This plan keeps the District informed about the tribe plans for use of their land and the natural resources. Although this is not a permit, the staff has water resource related input to this plan.

SITE CERTIFICATIONS: Certain types of projects (power plants, transmission lines, etc.) are permitted by the Governor and Cabinet under special one-stop permitting processes that supercede normal District permits. The Water Management Districts, DEP, DCA, FGFWFC, and other public agencies are mandatory participants. DEP usually coordinates these processes for the Governor and Cabinet.

VARIANCES FROM, OR WAIVERS OF, PERMIT CRITERIA: The Florida Administrative Procedures Act provides that persons subject to an agency rule may petition the agency for a variance from, or waiver of, a permitting rule. The Governing Board may grant a petition for variance or waiver when the petitioner demonstrates that 1) the purpose of the underlying statute will be or has been achieved by other means and, 2) when application of the rule would create a substantial hardship or would violate principles of fairness.

Attachment: ca_reg_rm_100_sd (II) (2052 : Regulatory Consent Agenda)

CONSENT ORDERS

1. RESPONDENT: ACOSTA FARMS, INC.
   PROJECT: ACOSTA FARMS

   SEC 7,9,12,13,15,23,25,28,29,34 TWP 55,56,57S RGE 38 MIAMI-DADE COUNTY
   SETTLEMENT OF AN ENFORCEMENT ACTION REGARDING UNPERMITTED WATER USE FOR AGRICULTURAL IRRIGATION

2. RESPONDENT: SIGMA BAY INVESTMENTS, LLC
   PROJECT: SIGMA BAY

   SEC 4,22,33 TWP 56,57S RGE 38E MIAMI-DADE COUNTY
   SETTLEMENT OF AN ENFORCEMENT ACTION REGARDING UNPERMITTED WATER USE FOR AGRICULTURAL IRRIGATION

3. RESPONDENT: LIONEL J. GRAY
   PROJECT: LIONEL GARY PROPERTY

   SEC 1 TWP 46S RGE 41E PALM BEACH COUNTY
   SETTLEMENT OF AN ENFORCEMENT ACTION REGARDING UNPERMITTED CONSTRUCTION AND UNAUTHORIZED CLEARING, DREDGING AND FILLING OF WETLANDS

4. RESPONDENT: DOMANI DEVELOPMENT, LLC
   PROJECT: NORTH PALM BEACH WATER CLUB

   SEC 4 TWP 42S RGE 43E PALM BEACH COUNTY
   SETTLEMENT OF AN ENFORCEMENT ACTION REGARDING UNPERMITTED FILLING AND GRADING

Attachment: ca_reg_rm_100_sd (II) (2052 : Regulatory Consent Agenda)

CONSERVATION EASEMENT AMENDMENTS AND RELEASES

1. PERMITTEE: THE BEARS CLUB DEVELOPMENT COMPANY
   PROJECT: THE BEARS CLUB WETLAND SLOUGH NUMBER 3 BUFFER

PALM BEACH COUNTY

APPROVE THE RELEASE OF .316 ACRE OF UPLAND BUFFER WITHIN AN EXISTING .316 ACRE CONSERVATION EASEMENT LOCATED WITHIN THE BEAR'S CLUB DEVELOPMENT IN PALM BEACH COUNTY. A PERMIT MODIFICATION HAS BEEN REQUESTED TO RELEASE THIS PORTION OF THE UPLAND BUFFER AND DESIGNATE AN EXISTING UPLAND AREA IN A DIFFERENT LOCATION WITHIN THE PROJECT AS A BUFFER.

Attachment: ca_reg_rm_100_sd (II) (2052 : Regulatory Consent Agenda)

M E M O R A N D U M

TO: Governing Board Members

FROM: Karen Estock, Division Director

DATE: September 11, 2014

SUBJECT: Release of Reservations

Summary
The District has jurisdiction over certain reserved rights to construct canal and road right of ways, and mineral rights, together with the right of ingress, egress and exploration. Applications requesting releases of these reservations are routinely received from landowners, attorneys, title companies and lending institutions, who consider the reservations to be title defects. Applications are reviewed by appropriate District staff and applicable local governmental agencies to determine that there is no present or future need for the reservations.

Staff Recommendation
Staff recommends approval of the following:

- Release of Trustees canal reservations for Arrieta Landscaping Corp., a Florida dissolved corporation, (File No. 6-14-1) for 5.00 acres in Miami-Dade County
- Release of Trustees canal reservations, District canal and road reservations, and issuance of non-use commitment, for Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship, (File Nos. 6-14-2, 18592 and NUC 1653) for 2.50 acres in Miami-Dade County
- Release of Trustees canal reservations for Two Sisters Nursery, Inc., a Florida corporation, (File No. 7-14-1) for 6.97 acres in Miami-Dade County
- Release of Trustees canal reservations for Arthur I. Gilbert, (File No. 7-14-2) for 3.71 acres in Miami-Dade County
- Release of District canal reservations for Guillermo Salazar, a single man, (File No. 18596) for 1.94 acres in Miami-Dade County

Additional Background
See Memorandum Exhibit “A” and maps attached hereto and made a part hereof, which contain the details and locations of the releases and non-use commitment to be approved and issued.

Core Mission and Strategic Priorities
Pursuant to Section 373.096 of the Florida Statutes, the Governing Board of the District may release any reservation for which it has no present or apparent use under terms and conditions determined by the Board.

Funding Source
None; reservations were acquired at no cost to the District.

Staff Contact and/or Presenter
Kathy Massey, ext. 6835

MEMORANDUM - EXHIBIT "A"

File No.:	6-14-1
Applicant:	Arrieta Landscaping Corp., a Florida dissolved corporation
Reserving Deed:	T-16571 (DB 176-339, 9/24/1917)
Fee Paid:	$250.00
Action:	Approve release of Trustees canal reservations
Acres:	5.00 acres, more or less
Legal Description:	S 1/2 of the SW ¼ of the SE ¼ of the NE ¼ of Section 14, Township 52 South, Range 39 East
Location:	NW 129th Avenue, Miami, Miami-Dade County
Reviewed by:	Water Supply Development Section, Right of Way Section, Environmental Resource Permitting Bureau, Survey Section, Office of Everglades Policy and Coordination, and Miami-Dade County

File Nos.:	6-14-2, 18592 and NUC 1653
Applicant:	Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship
Reserving Deeds:	T-16198 (DB 46-240, 12/24/1908) and E-2653 (DB 2499-335, 3/7/1945)
Fee Paid:	$750.00
Action:	Approve release of Trustees canal reservations, District canal and road reservations, and issuance of non-use commitment
Acres:	2.50 acres, more or less
Legal Description:	E ½ of the S ½ of Tract 52, Section 13, Township 52 South, Range 39 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17
Location:	NW 117th Avenue, Miami, Miami-Dade County
Reviewed by:	Water Supply Development Section, Right of Way Section, Environmental Resource Permitting Bureau, Survey Section, Office of Everglades Policy and Coordination, Florida Department of Transportation and Miami-Dade County

File No.:	7-14-1
Applicant:	Two Sisters Nursery, Inc., a Florida corporation
Reserving Deed:	T-16198 (DB 46-240, 12/24/1908)
Fee Paid:	$250.00
Action:	Approve release of Trustees canal reservations
Acres:	6.97 acres, more or less
Legal Description:	Tract 5, less the N 100 feet, Section 17, Township 52 South, Range 40 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17, LESS the East 130 feet of said Section 17-52-40
Location:	NW 166th Street and NW 97th Avenue, Hialeah, Miami-Dade County
Reviewed by:	Water Supply Development Section, Right of Way Section, Environmental Resource Permitting Bureau, Survey Section, Office of Everglades Policy and Coordination, and Miami-Dade County

File No.:	7-14-2
Applicant:	Arthur I. Gilbert
Reserving Deed:	T-16198 (DB 46-240, 12/24/1908)

Fee Paid:	$250.00
Action:	Approve release of Trustees canal reservations
Acres:	3.71 acres, more or less
Legal Description:	Portion of Tract 17, Section 21, Township 52 South, Range 40 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17
Location:	West of I-75 and South of NW 154th Street, Hialeah, Miami-Dade County
Reviewed by:	Water Supply Development Section, Right of Way Section, Environmental Resource Permitting Bureau, Survey Section, Office of Everglades Policy and Coordination, and Miami-Dade County

File No.:	18596
Applicant:	Guillermo Salazar, a single man
Reserving Deed:	T-5522 (DB 1367-514, 1/31/1930)
Fee Paid:	$250.00
Action:	Approve release of District canal reservations
Acres:	1.94 acres, more or less
Legal Description:	Lot 38, HIBISCUS COURT FELIX PARK HOME ACRES, PB 5-88
Location:	5790 SW 97th Street, Pinecrest, Miami-Dade County
Reviewed by:	Miami-Dade County; no internal routing due to size and land use

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0901

A Resolution of the Governing Board of the South Florida Water Management District approving release of canal and road reservations and issuance of a non-use commitment; providing an effective date.

WHEREAS, certain underlying landowners have requested that the South Florida Water Management District (District) release certain canal and road reservations, and issue a non-use commitment as to mineral reservations;

WHEREAS, the District is empowered to grant such releases and non-use commitments pursuant to Section 373.096, Florida Statutes;

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the release of canal and road reservations and the issuance of a non-use commitment, as described in Resolution Exhibit "A", attached hereto and made a part hereof.

Section 2. This Resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

RESOLUTION - EXHIBIT "A"

RELEASE OF TRUSTEES CANAL RESERVATIONS:

File No.:	6-14-1
Applicant:	Arrieta Landscaping Corp., a Florida dissolved corporation
Reserving Deed:	T16571 (DB 176-339, 9/24/1917)
Acres:	5.00 acres, more or less
Legal Description:	S 1/2 of the SW ¼ of the SE ¼ of the NE ¼ of Section 14, Township 52 South, Range 39 East
Location:	NW 129th Avenue, Miami, Miami-Dade County

File No.:	6-14-2
Applicant:	Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship
Reserving Deed:	T-16198 (DB 46-240, 12/24/1908)
Acres:	2.50 acres, more or less
Legal Description:	E ½ of the S ½ of Tract 52, Section 13, Township 52 South, Range 39 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17
Location:	W 117th Avenue, Miami, Miami-Dade County

File No.:	7-14-1
Applicant:	Two Sisters Nursery, Inc., a Florida corporation
Reserving Deed:	T-16198 (DB 46-240, 12/24/1908)
Acres:	6.97 acres, more or less
Legal Description:	Tract 5, less the N 100 feet in Section 17, Township 52 South, Range 40 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17, LESS the East 130 feet of said Section 17-52-40
Location:	NW 166th Street and NW 97th Avenue, Hialeah, Miami-Dade County

File No.:	7-14-2
Applicant:	Arthur I. Gilbert
Reserving Deed:	T-16198 (DB 46-240, 12/24/1908)
Acres:	3.71 acres, more or less
Legal Description:	Portion of Tract 17, Section 21, Township 52 South, Range 40 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISON NO. 1, PB 2-17
Location:	West of I-75 and South of NW 154th Street, Hialeah, Miami-Dade County

RELEASE OF DISTRICT CANAL RESERVATIONS:

File No.:	18596
Applicant:	Guillermo Salazar, a single man
Reserving Deed:	T-5522 (DB 1367-514, 1/31/1930)
Acres:	1.94 acres, more or less
Legal Description:	Lot 38, HIBISCUS COURT FELIX PARK HOME ACRES, PB 5-88
Location:	5790 SW 97th Street, Pinecrest, Miami-Dade County

Attachment: ca_om_200_Exhibit_Res_Massey_Releases (Resolution No. 2014 - 0901 : Release of Reservations)

RELEASE OF DISTRICT CANAL AND ROAD RESERVATIONS:

File No.:	18592
Applicant:	Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship
Reserving Deed:	E-2653 (DB 2499-335, 3/7/1945)
Acres:	2.50 acres, more or less
Legal Description:	E ½ of the S ½ of Tract 52, Section 13, Township 52 South, Range 39 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17
Location:	NW 117th Avenue, Miami, Miami-Dade County

ISSUANCE OF NON-USE COMMITMENT:

File No.:	NUC 1653
Applicant:	Francisco Llerena, Daisy Gorra and Gisela Vigo, as joint tenants with rights of survivorship
Reserving Deed:	E-2653 (DB 2499-335, 3/7/1945)
Acres:	2.50 acres, more or less
Legal Description:	E ½ of the S ½ of Tract 52, Section 13, Township 52 South, Range 39 East, FLORIDA FRUIT LAND COMPANY'S SUBDIVISION NO. 1, PB 2-17
Location:	NW 117th Avenue, Miami, Miami-Dade County

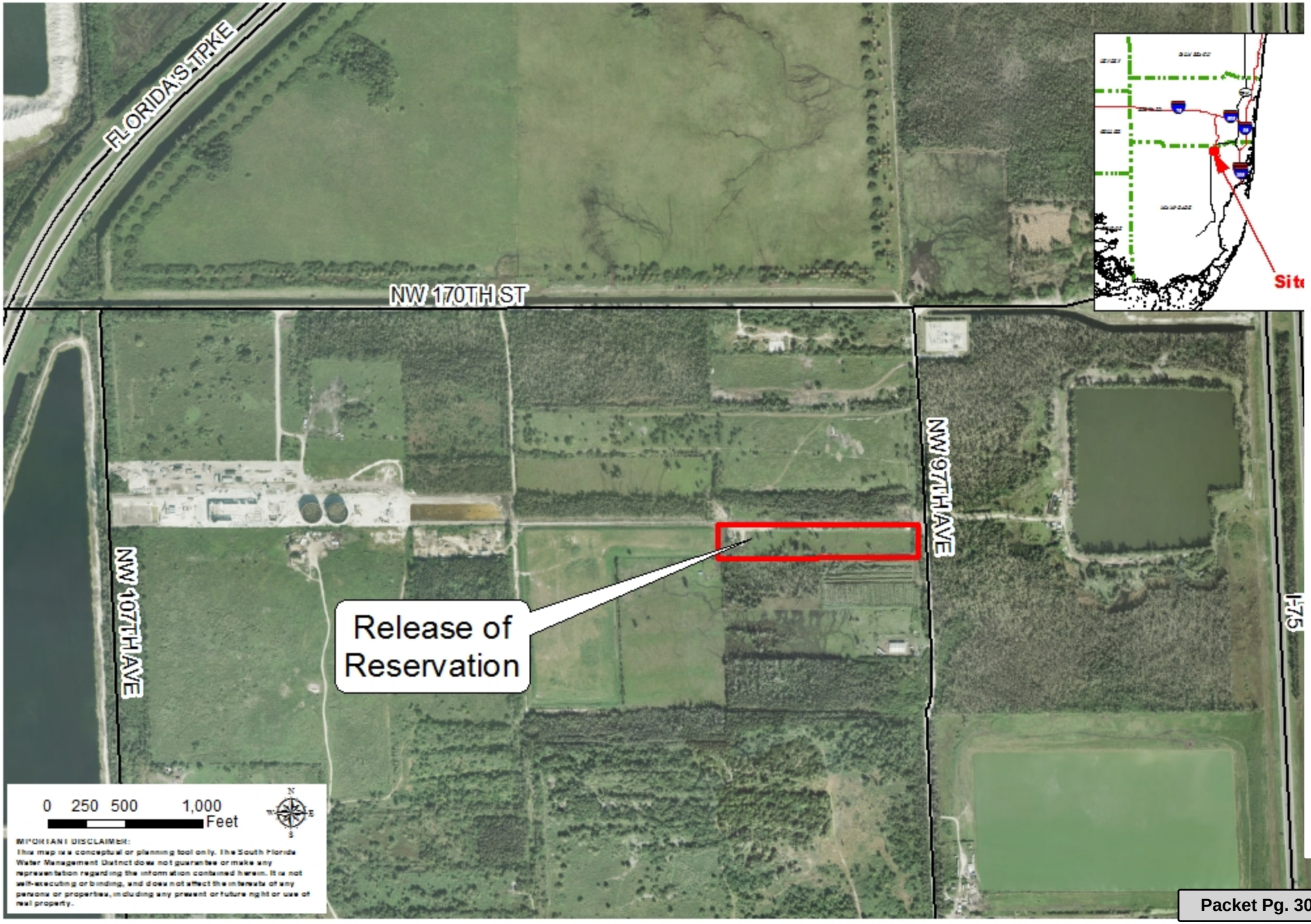
Attachment: ca_om_200_Exhibit_Res_Massey_Releases (Resolution No. 2014 - 0901 : Release of Reservations)

6-14-1
Miami-Dade County

For copies of this map: \\arc_data\maps\ReleaseOfReservations\GB_Sept14_6-14-1_sm(mxd), created by sf, contact the Real Estate Section.

Attachment: GB_Sept14_6-14-1_smf (Resolution No. 2014 - 0901 : Release of Reservations)

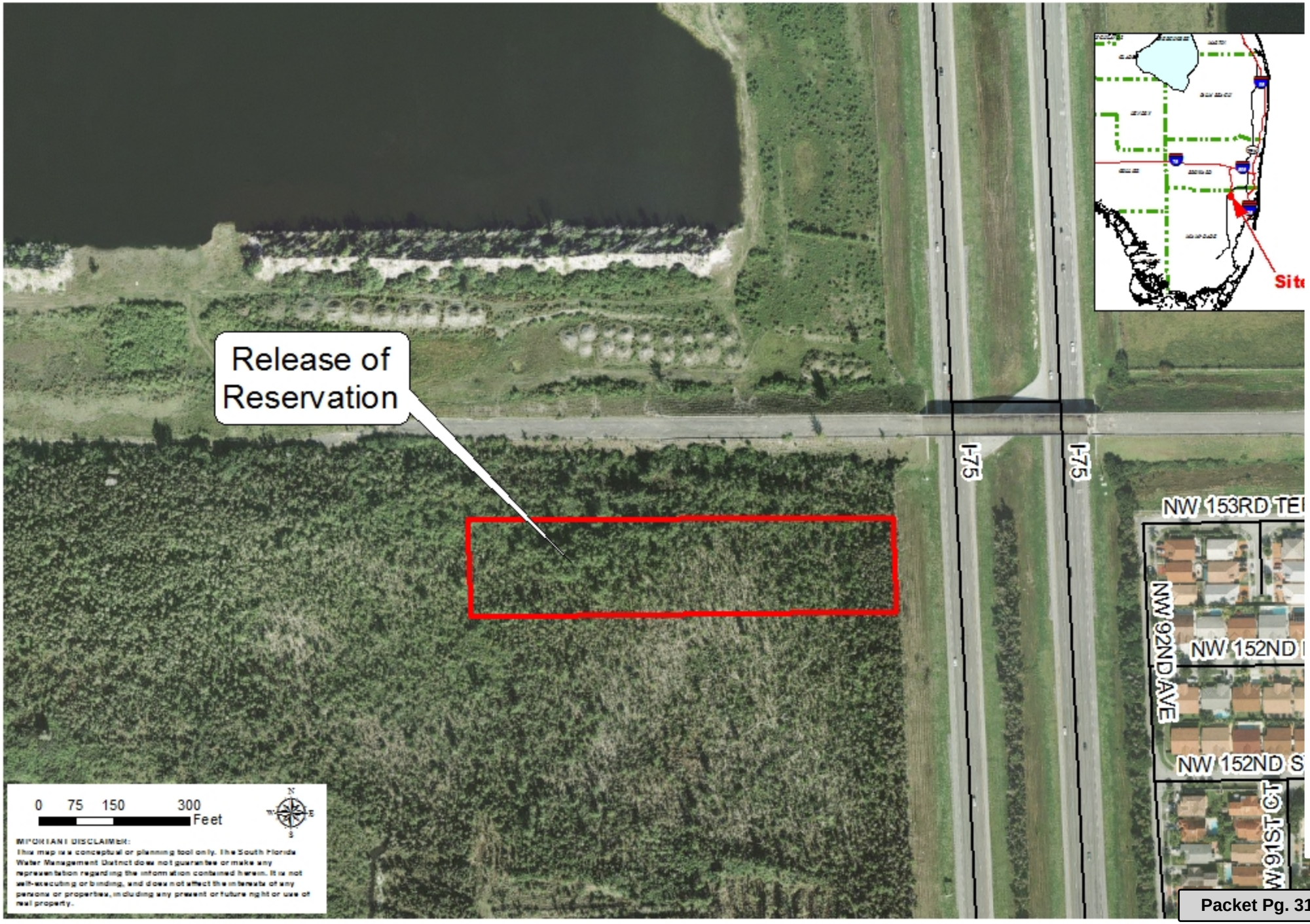
7-14-1
Miami-Dade County



Attachment: GB_Sept14_7-14-1_smf (Resolution No. 2014 - 0901 : Release of Reservations)

For copies of this map: \\arc_data\maps\ReleaseOfReservations\GB_Sept14_7-14-1_smf.mxd), created by sf, contact the Real Estate Section.

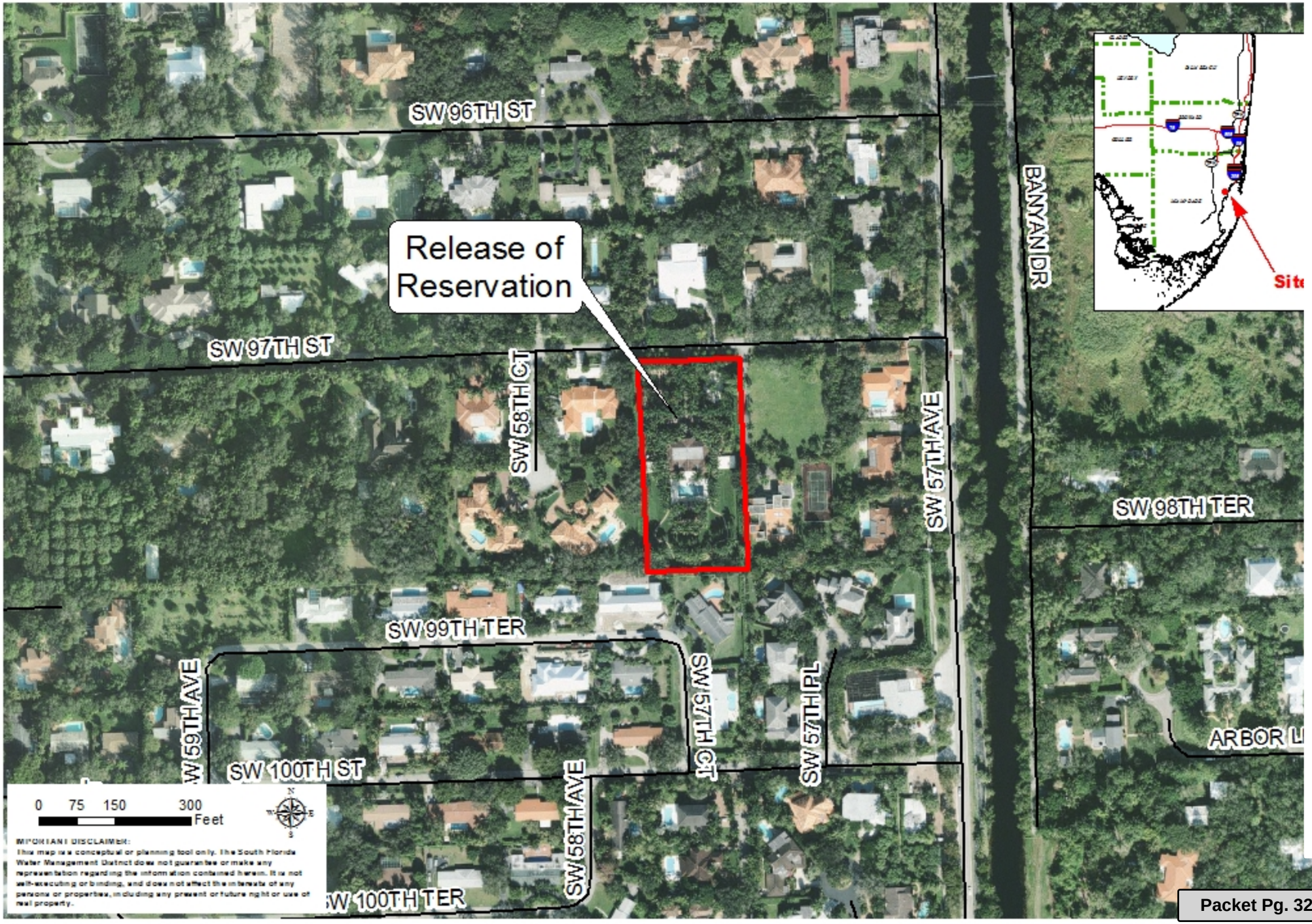
7-14-2
Miami-Dade County



For copies of this map (\\arc_data\maps\ReleaseOfReservations\GB_Sept14_7-14-2_smf.mxd), created by sf, contact the Real Estate Section.

Attachment: GB_Sept14_7-14-2_smf (Resolution No. 2014 - 0901 : Release of Reservations)

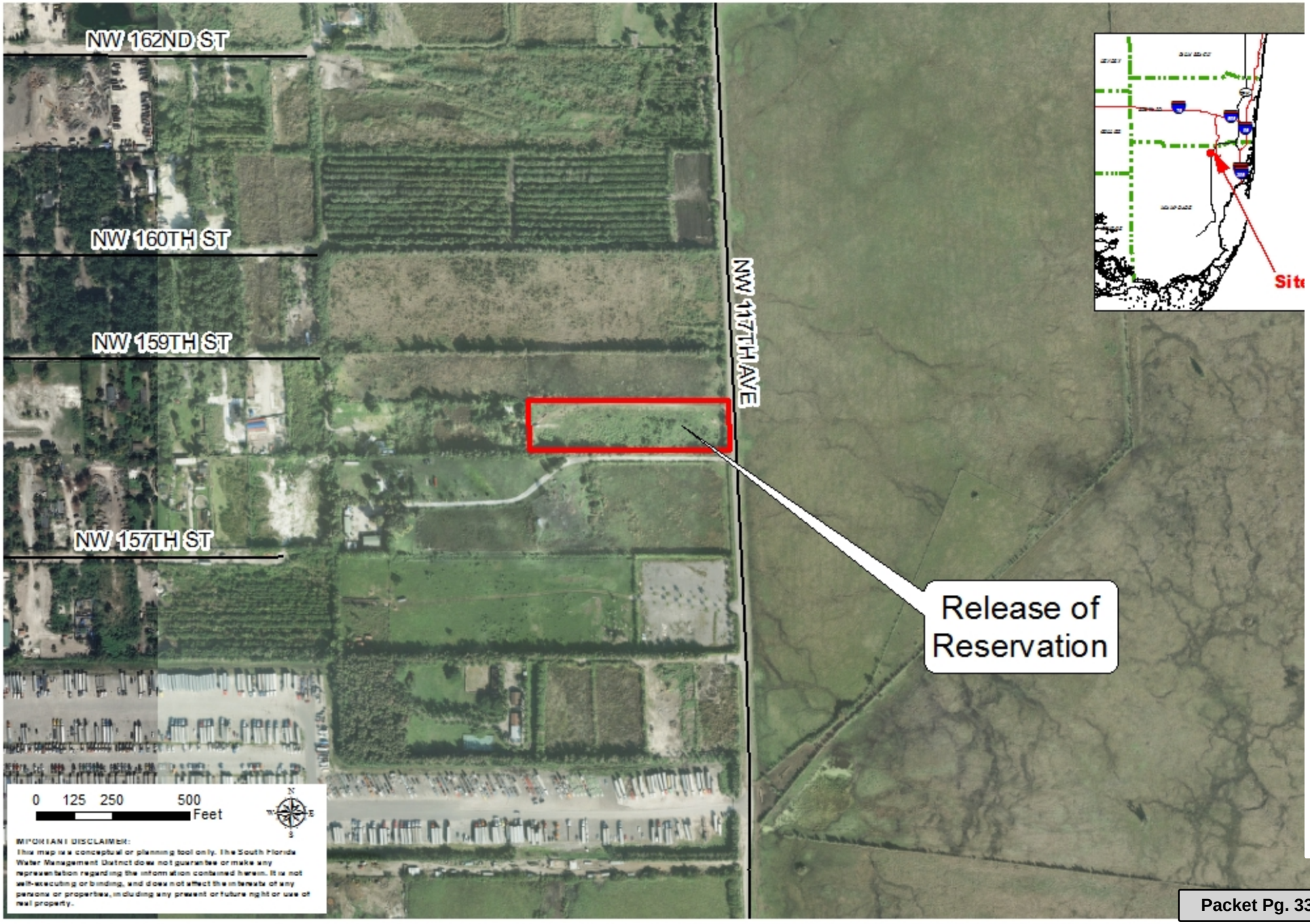
18596
Miami-Dade County



For copies of this map (\\arc_data\maps\ReleaseOfReservations\GB_Sept14_18596_smf.mxd), created by sf, contact the Real Estate Section.

Attachment: GB_Sept14_18596_smf (Resolution No. 2014 - 0901 : Release of Reservations)

NUC 1653, 18592 & 6-14-2
Miami-Dade County



Attachment: GB_Sept14_NUC1653_18592_6-14-2_smf (Resolution No. 2014 - 0901 : Release of

For copies of this map (\\arc_data\maps\ReleaseOfReservations\GB_Sept14_NUC1653_18592_6-14-2_smf.mxd), created by sf, contact the Real Estate Section.

M E M O R A N D U M

TO: Governing Board Members

FROM: Karen Estock, Division Director

DATE: September 11, 2014

SUBJECT: Partial Release of Easement

Summary
The Trustees of the Internal Improvement Trust Fund (TIITF) has requested that a 0.06+/- acre portion of the L-50 right of way be released. The parcel is located in Section 24, Township 40 South, Range 32 East, Glades County. The release is being requested to clear up an encroachment within the right of way. TIITF is the underlying fee title owner. District staff has reviewed this request to determine that sufficient right of way will remain for operations and maintenance of the levee.

Staff Recommendation
Approve the release of a portion of the L-50 right of way Easement, containing 0.06 acres, more or less, located in Section 24, Township 40 South, Range 32 East, Glades County, to the Trustees of the Internal Improvement Trust Fund at no cost, and waive the application fee.

Core Mission and Strategic Priorities
Pursuant to Section 373.096 of the Florida Statutes, the Governing Board of the District may release any easement, reservation, or right of way interest for which it has no present or apparent use under terms and conditions determined by the Board. Furthermore, pursuant to Section 373.056(4), Florida Statutes, the Governing Board has the authority to convey to any governmental entity land, or rights in land, owned by the District not required for its purposes, subject to terms and conditions approved by the Governing Board.

Funding Source
None; the Easement was acquired by the District at no cost.

Staff Contact and/or Presenter
Kathy Massey, kmassey@sfwmd.gov <mailto:kmassey@sfwmd.gov>, 561-682-6835

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0902

A Resolution of the Governing Board of the South Florida Water Management District to approve the release of a portion of the L-50 Right of Way Easement to the Trustees of the Internal Improvement Trust Fund, containing 0.06 acres, more or less, in Section 24, Township 40 South, Range 32 East, Glades County, at no cost; providing an effective date.

WHEREAS, at the request of the Department of Environmental Protection, the District has determined that it is in the public interest to release a portion of the L-50 right of way easement containing 0.06 acres, more or less, to the Trustees of the Internal Improvement Trust Fund, located in Section 24, Township 40 South, Range 32 East, Glades County; and

WHEREAS, the partial release of the right of way easement is being requested to clear a right of way encroachment, and TIITF desires to sell the property and return it to the tax rolls; and

WHEREAS, the Governing Board has determined that the 0.06 +/- acre portion of the easement is not required by the District for present or future use; and

WHEREAS, the Governing Board, pursuant to Section 373.096, Florida Statutes, may release any easement, reservation, or right of way interest for which it has no present or apparent use under terms and conditions determined by the Board; and

WHEREAS, the Governing Board, pursuant to Section 373.056(4), Florida Statutes, has the authority to convey to any governmental entity land, or rights in land, owned by the District not required for its purposes, under terms and conditions approved by the Governing Board; and

WHEREAS, the applicant has requested that the District waive the application fee, which is consistent with the respective agencies' mutual reciprocity with respect to such fees, and that the release be granted at no cost; and

WHEREAS, the applicant will pay all fees and costs associated with the release of the easement.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the release of a portion of the L-50 right of way easement encumbering 0.06 acres, more or less, located in Section 24, Township 40 South,

Range 32 East, Glades County, to the Trustees of the Internal Improvement Trust Fund at no cost, and approves a waiver of the application fee.

Section 2. The Governing Board of the South Florida Water Management District hereby authorizes the Chairman to execute the release document.

Section 3. This Resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

Disposal to FDEP
Glades County

Attachment: GB_Sept14_FDEP_Disposal_smf (Resolution No. 2014 - 0902 : Partial Release of Easement)

For copies of this map (\\arc_data\maps\RightofWay\L-50\GB_Sept14_FDEP_Disposal_smf.mxd), created by sf, contact the Real Estate Section.

M E M O R A N D U M

TO: Governing Board Members

FROM: Terrie Bates, Director, Water Resources Division

DATE: September 11, 2014

SUBJECT: Everglades Agricultural Area Environmental Protection District Agreement 4600003125

Summary
Continuing assessment of the environmental condition within the Stormwater Treatment Areas (STAs) and scientific investigations to better understand the phosphorus removal mechanisms are necessary to provide input in operating and managing these complex treatment wetlands.

This one-year cost-share STA Optimization Support agreement with the Everglades Agricultural Area Environmental Protection District provides for a research technical team to be formed by the parties, and for joint funding of research priorities to further the common interests and collaborative efforts of the District and the EAA EPD, in the amount of $780,000, of which the District's total contribution is $400,000, subject to Governing Board approval of the FY2015 budget.

Staff Recommendation
Staff recommends approval to enter into this cost share agreement with the Everglades Agricultural Area Environmental Protection District for Stormwater Treatment Area optimization support.

Additional Background
The main studies to be conducted under this agreement include:

1) Scientific investigations related to the STA 3/4 Periphyton-based Stormwater Treatment Area (PSTA) Performance, Design, and Operational Factors, one of the initial Restoration Sciences Science Plan studies
2) Water quality and submerged aquatic vegetation (SAV) internal transect surveys
3) Investigation on SAV sustainability in the STAs
4) Assessment of P flux from soils (and as a result of soil manipulation efforts) in the STA-1W expansion area

Core Mission and Strategic Priorities
This work conducted under this cooperative agreement will help the Water Resources Division, Applied Sciences Bureau achieve the goals and objectives of the Everglades Restoration Strategies by working cooperatively with another government agency to assess how to best optimize STA performance.

Funding Source
This item is funded by dedicated funds from the Restoration Strategies Sciences Plan, in the amount of $400,000 included in the proposed FY2015 budget. The EAA EPD will contribute $380,000 as a cost-share partner.

Staff Contact and/or Presenter
Terrie Bates (tbates@sfwmd.gov <mailto:tbates@sfwmd.gov>), ext. 6952 or Susan Gray (sgray@sfwmd.gov <mailto:sgray@sfwmd.gov>), ext. 6919

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0903

A Resolution of the Governing Board of the South Florida Water Management District approving a one year cost share agreement with the Everglades Agricultural Area Environmental Protection District for Stormwater Treatment Area optimization support, in the amount of $780,000, of which the District's total contribution is $400,000, subject to Governing Board approval of the FY2015 budget; providing an effective date.

WHEREAS, managing the Stormwater Treatment Areas (STAs) requires knowledge and understanding of the different environmental variables, and studies to find ways to further improve the performance of the STAs must continue in accordance with the Everglades Restoration Strategies; and

WHEREAS, the Everglades Agricultural Area Environmental Protection District has an established STA science program and previous agreements have generated high caliber scientific findings that enhanced our understanding and abilities to manage the STAs; **now therefore**

BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the agreement with the Everglades Agricultural Area Environmental Protection District

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

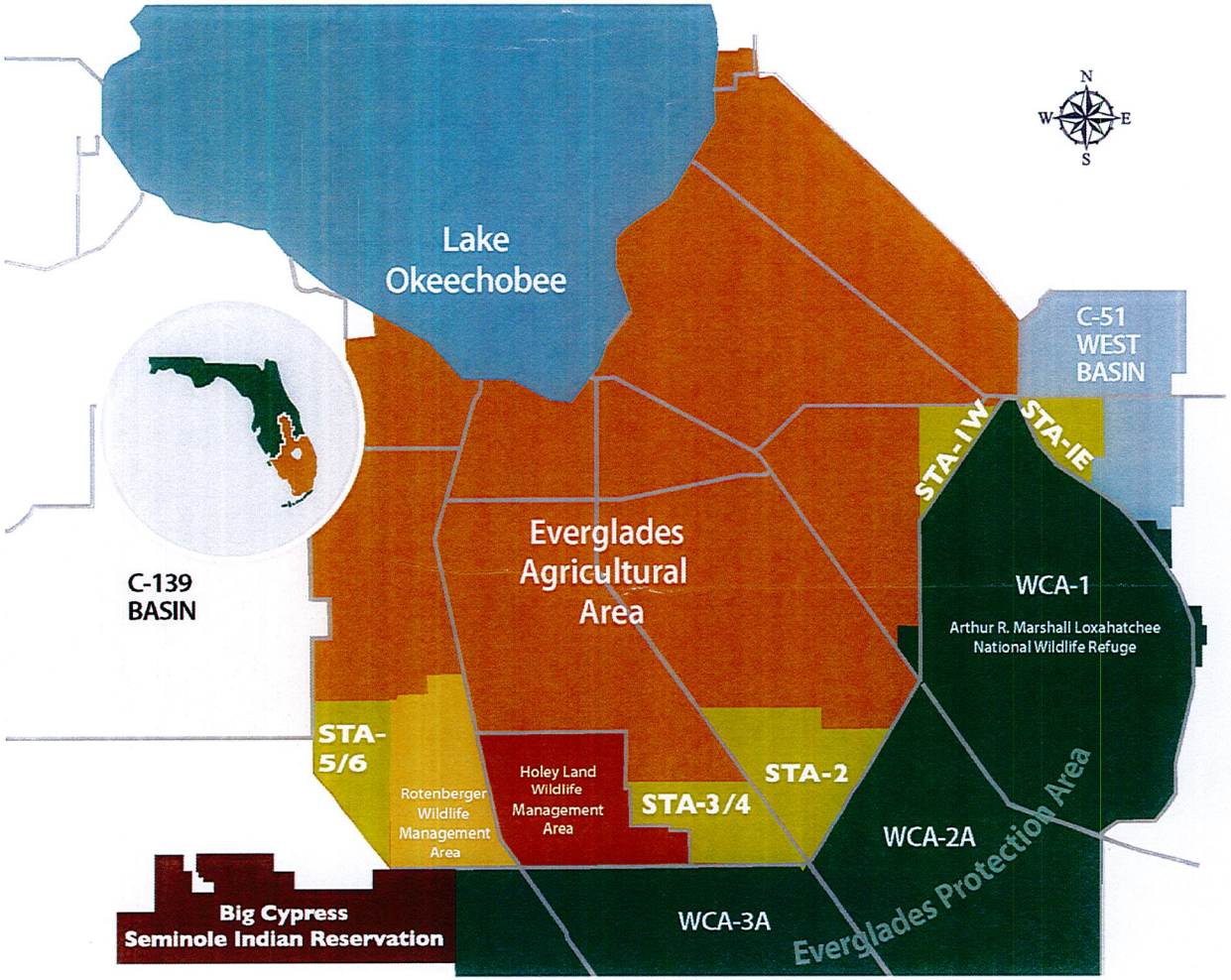
_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____



Area map showing location of STAs 1E, 1W, 2, 3/4, and 5/6, where the respective EAA-EPD studies and surveys will be conducted.

Exhibit B
Deliverables and Payment Schedule

Task	Del. #	Description	Due	Amount to be Invoiced*
A-1	A-1	Project work Plan update, including QA Plan for sampling and analysis	10/30/14	$2,000
A-2	A-2-a	Report 1 - containing a summary of results and interpretation from the internal transects; Excel file of results (Appendix A)	12/31/14	$20,000
A-2	A-2-b	Report 2 - containing a summary of results and interpretation from the internal transects; Excel file of results (Appendix A)	4/30/15	$20,000
A-2	A-2-c	Report 3 - containing a summary of results and interpretation from the internal transects; Excel file of results (Appendix A)	8/31/15	$20,000
A-3	A-3-a	Report 1 - containing results and interpretation from the vegetation/periphyton surveys, sampling and analysis; Excel file of results (Appendix A)	4/30/15	$10,000
A-3	A-3-b	Report 2 - containing results and interpretation from the vegetation/periphyton surveys, sampling and analysis; Excel file of results (Appendix A)	8/31/15	$30,000
A-4	A-4-a	A report containing results and interpretation from the soil accretion sampling; Excel file of results (Appendix A)	1/31/15	$20,000
A-4	A-4-b	A report containing results and interpretation from the core incubation and mesocosm studies; Excel file of results (Appendix A)	7/31/15	$40,000
A-5	A-5-a	A report containing results and interpretation from the biological and enzyme sampling efforts; Excel file of results (Appendix A)	7/31/15	$40,000
A-5	A-5-b	A report containing results and interpretation from the sampling of TP and other chemical parameters; Excel file of results (Appendix A)	6/30/15	$40,000
A-5	A-5-c	A report on the water depth and P loading effects on macrophyte and periphyton communities; Excel file of results (Appendix A)	8/31/15	$100,000

Attachment: Exhibit B (Resolution No. 2014 - 0903 : Everglades Agricultural Area Environmental Protection District Agreement 4600003125)

Task	Del. #	Description	Due	Amount to be Invoiced*
A-6	A-6-a	Update comprehensive interim report	5/31/15	$10,000
A-6	A-6-b	Additional support for feasibility study	9/15/15	$20,000
A-6	A-6-c	SFER write-up for PSTA	7/31/15	$5,000
A-6	A-6-d	Attendance at PSTA meetings/workshops (4 workshops/yr)	9/15/15	$5,000
A-6	A-6-e	Presentation of PSTA results (up to 4 presentations/yr	9/15/15	$5,000
A-7	A-7-a	Draft manuscript	8/21/15	$10,000
A-7	A-7-b	Final manuscript	9/15/15	$3,000
B	B-1	District data provided to EPD upon request.		In kind
C	C-1	Results and report of findings as they become available		EPD Funds**
C	C-2	Attendance in meetings (up to 4 meetings/yr);		EPD Funds**
C	C-3	Technical Presentations		EPD Funds**
	TOTAL			**$400,000**

*Amount specified in the table is for District cost-share.

The Everglades Agricultural Area Environmental Protection District will contribute **$380,000 as a cost-share partner.

Attachment: Exhibit B (Resolution No. 2014 - 0903 : Everglades Agricultural Area Environmental Protection District Agreement 4600003125)

M E M O R A N D U M

TO: Governing Board Members

FROM: Sharon M. Trost, P.G., AICP, Director, Regulation Division

DATE: September 11, 2014

SUBJECT: Approve Interagency Agreement for permitting responsibilities for Kickin Tires Ranch

Summary

The SFWMD received a water use permit application for an agricultural project in Polk County, Florida known as Kickin Tires Ranch. However, the project crosses water management district boundaries. In order to issue a single permit for the entire project, an interagency agreement is necessary to delegate SFWMD's Part II, Chapter 373, Fla. Stat., jurisdiction and responsibility to SWFWMD.

Recommendation

Approve an Interagency Agreement between SWFWMD and SFWMD authorizing SWFWMD to issue any Water Use Permits under Part II of Chapter 373, Fla. Stat., for the portion of Kickin Tires Ranch that lies within the boundaries of SFWMD.

Background

Kickin Tires Ranch is a new agricultural project located within the jurisdictional boundaries of both the SFWMD and SWFWMD. Kickin Tires, LLC is requesting authorization to withdraw 165.34 million gallons per year and 29.47 million gallons on a peak month basis to irrigate improved pasture.

Section 373.046(6), Fla. Stat., authorizes a water management district to designate, through an interagency agreement, regulatory responsibility to another water management district over a project which crosses the jurisdictional boundaries of both districts. For efficiency and effectiveness, both districts desire to designate SWFWMD with the regulatory responsibilities under Part II of Chapter 373, Fla. Stat., for the portion of Kickin Tires Ranch that lies within the jurisdictional boundaries of SFWMD.

Core Mission and Strategic Priorities

The Interagency Agreement allows for the protection of existing legal users and the water resources of the area while increasing the efficiency of the permitting process The Water Use Bureau is responsible for implementing this item.

Funding Source

No funding is necessary for the Interagency Agreement.

Staff Contact and/or Presenter

Maria Clemente, P.E., Bureau Chief, Water Use Bureau, (561) 682-2308

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0904

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into an Interagency Agreement between the South Florida Water Management District (SFWMD) and Southwest Florida Water Management District (SWFWMD) for designation of regulatory responsibility for permitting under Part II of Chapter 373, Florida Statutes, for the project known as "Kickin Tires Ranch" that crosses the jurisdictional boundaries of both water management districts; providing an effective date.

WHEREAS, on August 4, 2014, Kickin Tires Ranch, LLC submitted Water Use Permit (WUP) Application No. 140804-9 (Application) to the SFWMD requesting a new water use permit for Kickin Tires Ranch (Property) in Polk County, Florida; and

WHEREAS, the Application requests authorization to withdraw 165.34 million gallons per year and 29.47 million gallons on a peak month basis for the irrigation of improved pasture; and

WHEREAS, the Property is located within the jurisdictional boundaries of both the SFWMD and SWFWMD; and

WHEREAS, the predominant portion of the Property lies within the jurisdictional boundaries of the SFWMD; the remaining portion of the Property lies within the jurisdictional boundaries of the SWFWMD as do existing wells, as depicted on the map attached hereto as Exhibit A; and

WHEREAS, Subsection 373.046(6), F.S., authorizes a water management district to designate, via an interagency agreement, regulatory responsibility to another water management district when the geographic area of a project or local government crosses water management district boundaries; and

WHEREAS, the designation of the SWFWMD as the water management district with Part II, Chapter 373, F.S., regulatory responsibility for the Application would allow for more efficient processing of permit applications under that part; and

WHEREAS, the SFWMD and the SWFWMD desire to designate the SWFWMD as the water management district with Part II, Chapter 373, F.S., regulatory responsibility for the Application pursuant to Part II, Chapter 373, F.S.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE

SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the SFWMD hereby authorizes the execution of the Interagency Agreement with SWFWMD, which is attached hereto and incorporated herein as Exhibit B.

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

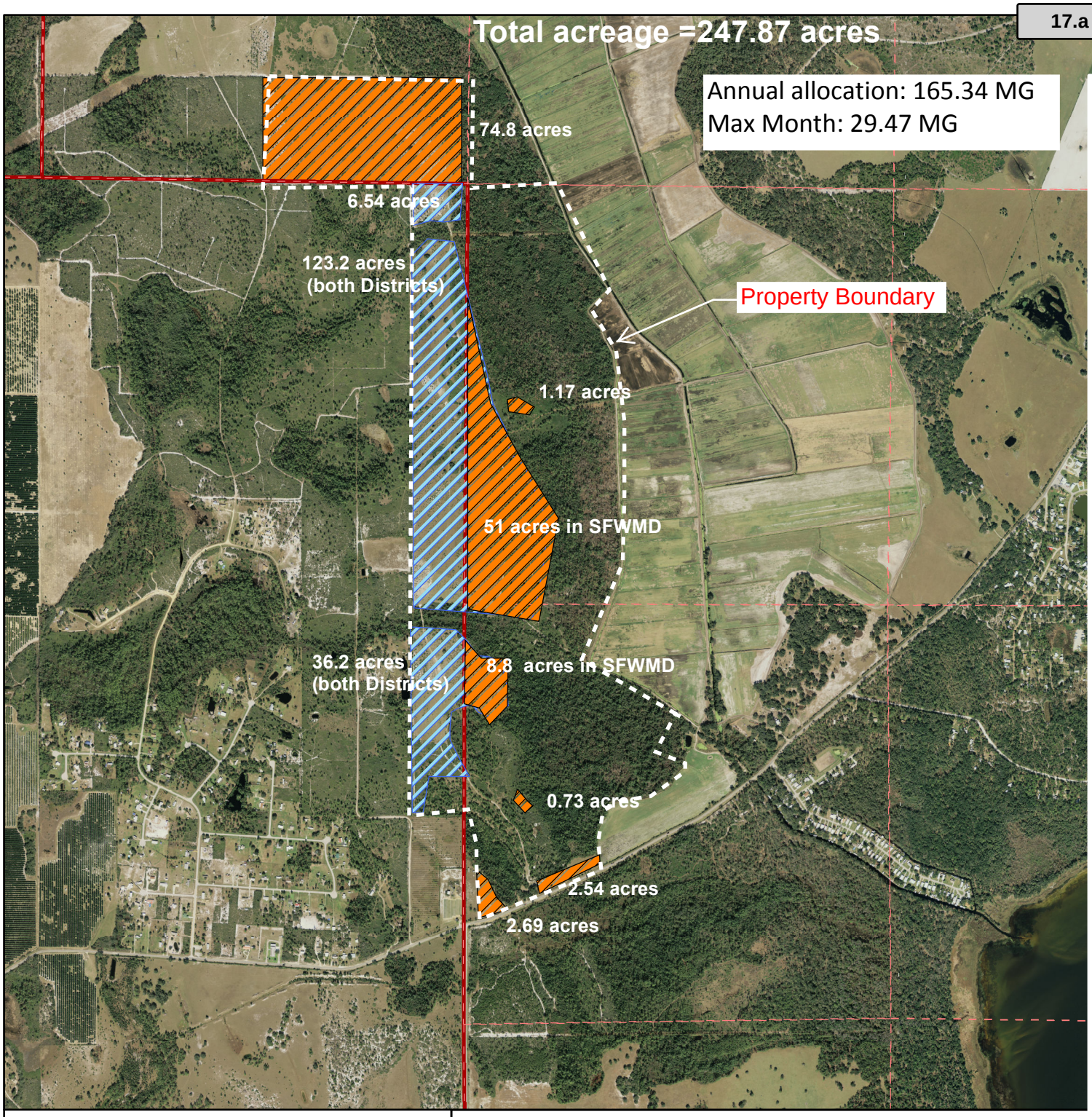
_____
District Clerk/Secretary

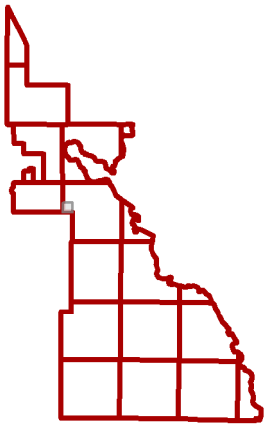
Legal form approved:
By:

_____
Office of Counsel

Print name:

_____





POLK COUNTY, FLORIDA

Legend

Application

Application No: 140804-9

Sec 18 / Twp 29 / Rge 29

Project Name: KICKIN TIRES

N

Map Date: 2014-08-13

Permit No: 53-00299-W

0 1,900 3,800 Feet

Attachment: Exhibit A to Resolution-Map Kickin Tires (Resolution No. 2014 - 0904 : Approve Interagency Agreement for permitting

EXHIBIT A

INTERAGENCY AGREEMENT BETWEEN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT FOR THE DESIGNATION OF REGULATORY RESPONSIBILITY FOR A WATER USE PERMIT APPLICATION FOR KICKIN TIRES RANCH

THIS INTERAGENCY AGREEMENT (Agreement) is made and entered into by and between the SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (SWFWMD) and the SOUTH FLORIDA WATER MANAGEMENT DISTRICT (SFWMD).

WITNESSETH:

WHEREAS, on August 4, 2014, Kickin Tires Ranch, LLC ("Applicant") submitted Application No. 140804-9 ("Application") to the SFWMD, applying for a water use permit to serve Kickin Tires Ranch in Polk County, Florida ("Property"); and

WHEREAS, the Application requests authorization to withdraw 165.34 million gallons per year and 29.47 million gallons on a peak month basis for agricultural uses; and

WHEREAS, the Property covers 247.87 acres, 141.73 of which lies within the jurisdictional boundaries of the SFWMD and the remaining portion of the Property lies within the jurisdictional boundaries of the SWFWMD, as depicted on the map attached hereto as Exhibit A; and

WHEREAS, Subsection 373.046(6), F.S., authorizes a water management district to designate, via an interagency agreement, regulatory responsibility to another water management district when the geographic area of a project or local government crosses water management district boundaries; and

WHEREAS, the designation of the SWFWMD as the water management district with Part II, Chapter 373, F.S., regulatory responsibility for the Application would allow for more efficient processing of permit applications under that part; and

WHEREAS, the SFWMD and the SWFWMD desire to designate the SWFWMD as the water management district with Part II, Chapter 373, F.S., regulatory responsibility for the Application pursuant to Part II, Chapter 373, F.S.;

NOW THEREFORE, the SFWMD and the SWFWMD, under the authority of Subsection 373.046(6), F.S., hereby agree as follows:

1. The SWFWMD is designated as the water management district that will have all regulatory responsibilities under Part II of Chapter 373, F.S., for the consumptive use of water for Kickin Tires Ranch. Such regulatory responsibilities shall include receiving, processing, and taking final agency action on all water use permit applications, or modifications thereof, and taking any compliance and enforcement action with regard to such permit.

2. This Agreement will commence upon execution by all parties and will remain in effect until either party terminates such agreement for its convenience upon ninety (90) days written notice to the other party.

3. This Agreement may be executed in counterparts, each of which shall constitute an original, but all of which taken together shall constitute one and the same document. Facsimile signature shall be deemed an equivalent to an original for each and every counterpart.

IN WITNESS WHEREOF, each party, or its lawful representative, has executed this Agreement on the date set forth next to their signature below.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

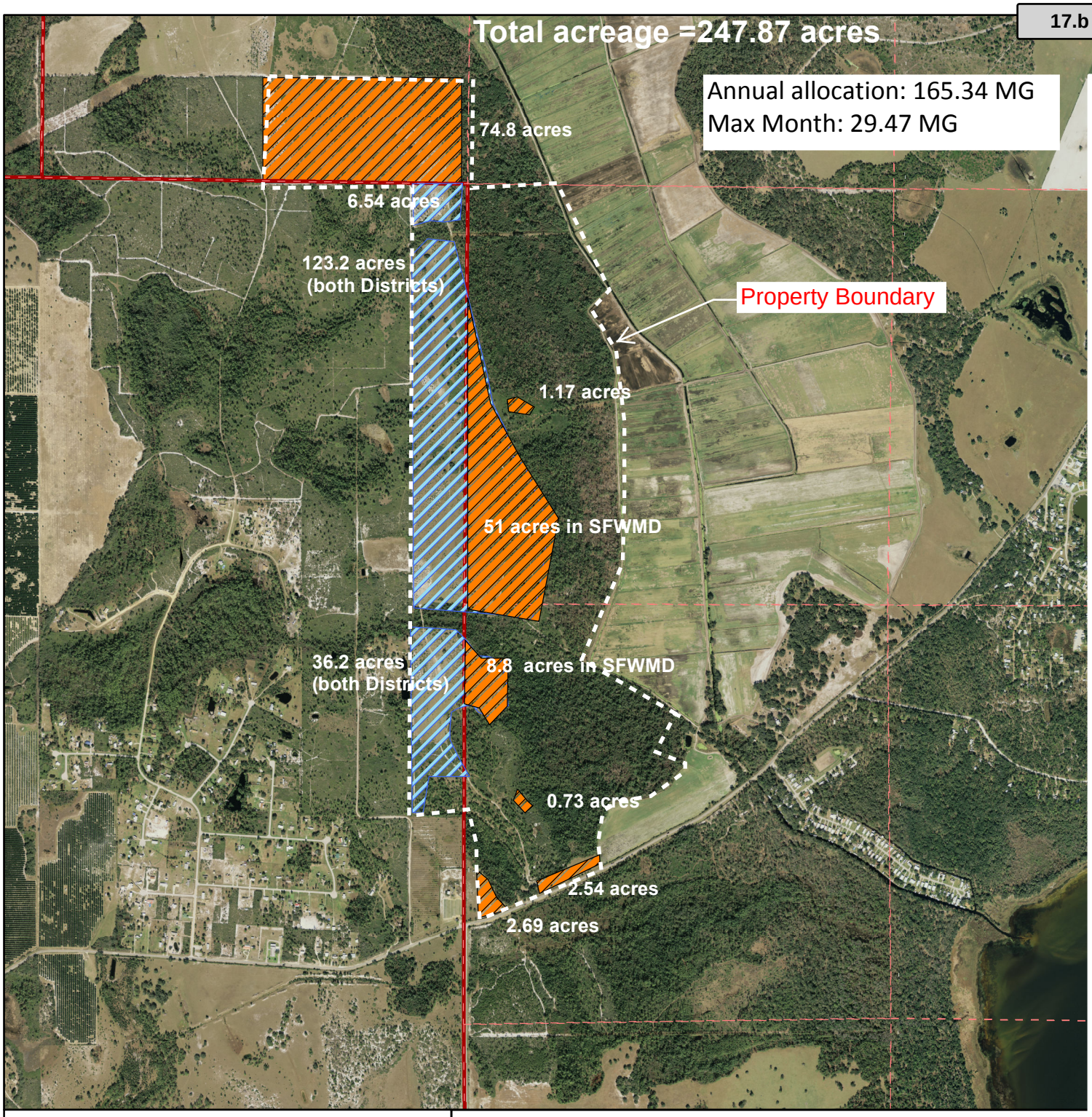
By: _____ Attest: _____
Michael A. Babb, Chair Jeffrey M. Adams, Secretary

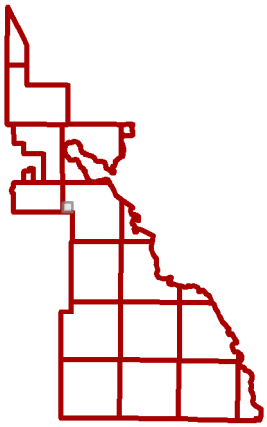
Date: _____ (Seal)

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

By: _____ Attest: _____
Daniel O'Keefe, Chair District Clerk/ Asst. Secretary

Date: _____ (Seal)





POLK COUNTY, FLORIDA

Legend

Application

Application No: 140804-9

Sec 18 / Twp 29 / Rge 29

Project Name: KICKIN TIRES

N

Map Date: 2014-08-13

Permit No: 53-00299-W

0 1,900 3,800 Feet

M E M O R A N D U M

TO: Governing Board Members

FROM: Terrie Bates, Director, Water Resources Division

DATE: September 11, 2014

SUBJECT: Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light

Summary

On August 27, 2014, Florida Power and Light requested the District issue an Emergency Order for temporary authorization to utilize the District's right of way and to divert and use water, above that reserved in Rule 40E-10.061, F.A.C., from the L-31E Canal System to help moderate unusually high temperatures and salinity that are occurring in the Turkey Point Cooling Canal System. Based upon information provided by FPL and technical evaluation provided by District staff and in order to protect the public health, safety, and welfare pursuant to Section 373.119(2), Fla. Stat., and associated rules, the Executive Director determined that an emergency existed and the Emergency Order was necessary. On August 28, 2014, the District's Executive Director issued SFWMD No. 2014-078-DAO-WU/ROW/ERP, an "Emergency Final Order issued to Florida Power and Light for the purpose of authorizing temporary pump installation and water withdrawal along and from the L-31E Canal System; Miami-Dade County, Florida." The Order includes specific conditions governing the temporary use of the District's Right of Way; provisions for daily determination and authorization of water withdrawals and pump operations to ensure that only water over and above the amounts reserved for Biscayne Bay are used; termination of the Order on October 15, 2014; and removal of all facilities upon termination of the Order.

Staff Recommendation:

Staff recommends the Governing Board enter a Final Order concurring with the Executive Director's emergency authorization issued to **Florida Power and Light** for the purpose of authorizing temporary pump installation and water withdrawal along and from the L-31E Canal System; Miami-Dade County, Florida.

Staff Contact and/or Presenter

Terrie Bates (561) 682-6952

BEFORE THE GOVERNING BOARD OF THE
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

SFWMD No. 2014-078-DAO-WU/ROW/ERP

IN RE:

EMERGENCY FINAL ORDER ISSUED TO FLORIDA POWER AND LIGHT FOR THE PURPOSE OF AUTHORIZING TEMPORARY PUMP INSTALLATION AND WATER WITHDRAWAL ALONG AND FROM THE L-31E CANAL SYSTEM; MIAMI-DADE COUNTY, FLORIDA

_____/

RECEIVED
AUG 28 2014 3:16 PM
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

EMERGENCY FINAL ORDER

The Executive Director of the South Florida Water Management District (District), pursuant to Sections 120.569 and 373.119(2), Florida Statutes (Fla. Stat.), after considering the recommendations of District staff and being otherwise fully appraised of the matter, issues the following Emergency Order (Order) containing Findings of Fact, Ultimate Facts and Conclusions of Law:

FINDINGS OF FACT

1. The District is a public corporation of the State of Florida, existing pursuant to Chapter 25270, Laws of Florida, 1949, and operating pursuant to Chapter 373, Fla. Stat., and Title 40E, Florida Administrative Code (Fla. Admin. Code), as a multi-purpose water management district with its principal office at 3301 Gun Club Road, West Palm Beach, Florida. The District has the power and duty to protect Florida's water resources and to administer and enforce the provisions of Chapter 373,

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Fla. Stat., and the rules promulgated there under, Title 40E, Fla. Admin. Code. The District has jurisdiction over the matters addressed in this Order.

2. Florida Power and Light (FPL) is a subsidiary of NextEra Energy, Inc. As a regulated utility, FPL is granted an exclusive franchise by the Public Service Commission to provide reliable and cost-effective electric service to customers, including critical infrastructure, within its service territory in Florida. FPL's service territory covers all or parts of 35 Florida counties and serves approximately nine million customers.

3. The customers particularly at issue in this matter are those residing in Miami-Dade and Broward counties. In these counties, FPL provides electrical service to two million customer accounts, including critical infrastructure.

4. FPL owns and operates the electric power generating facility known as the Turkey Point Power Plant (Turkey Point) that is the subject of this emergency authorization request.

5. Turkey Point is located in unincorporated southeast Miami-Dade County, east of Florida City and the City of Homestead. The Turkey Point site covers approximately 11,000 acres. Turkey Point is located approximately 25 miles south of Miami and about nine miles east of Florida City. Properties adjacent to Facility are almost exclusively undeveloped land. Turkey Point is bordered to the east by Biscayne Bay and Card Sound. A Turkey Point location map is attached and incorporated as Exhibit A.

6. Turkey Point consists of five steam electric generating units: three fossil fuel-fired units (Units 1, 2, and 5) and two nuclear units (Units 3 and 4). Units 1 and 2

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

constructed in the late 1960s each have a continuous generating capacity of approximately 404 megawatts (MW). Operations of units 1 and 2 are on a standby basis and not routinely in service. Unit 5 has a continuous generating capacity of approximately 1150 MW. Units 3 and 4 each have continuous generating capacity of approximately 820 MW.

7. Units 3, 4, and 5 are certified under Florida's Power Plant Siting Act (PPSA). Units 1 and 2 pre-date the PPSA and are not certified.

8. FPL owns and operates a cooling canal system ("CCS"), an approximately 5,900-acre network of unlined canals at Turkey Point, to provide cooling water. Construction of the CCS was completed in 1973, and the CCS was closed from the surface waters of both Biscayne Bay and Card Sound. The CCS facilities pre-date the PPSA and are not certified. Under routine operations, there are no active surface water inflows utilized to maintain CCS water levels, temperature, or salinity.

9. The L-31E Canal system is of particular import to FPL's emergency authorization request. The L-31E Canal system is part of the Central and Southern Florida Flood Control Project (C & SF Project) for which the District is the designated local sponsor pursuant to Section 373.1501, Fla. Stat. As local sponsor, the District operates C&SF Project components, including the L-31E Canal system and the surface water flow to tide from the associated basins consistent with the guidance provided in the United States Army Corps of Engineers Master Water Control Manual, East Coast Canals, Volume 5.

10. The L-31E Canal system is a borrow canal and levee system that stretches north – south both intercepting water as it flows eastward to tide in southeast

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Dade County and providing storm surge protection. A map depicting the L-31E Canal system is attached and incorporated as Exhibit B. The L-31E Canal runs parallel to the South Central Biscayne Bay and across several drainage basins, six of which are named for the associated major east-west canals: Canal 100 (C-100), C-1, C-102, C-103, North Canal and Florida City Canal. This canal network and coastal levee system is operated for several C & SF Project purposes, including reducing the potential for flood and storm surge damage as well as limiting saline water intrusion. Water from the L-31E is discharged to Biscayne Bay at several coastal structures, as depicted on Exhibit B.

11. Operation of the C & SF Project coastal structure gates in this canal network controls the quantity and timing of water discharged into this portion of Biscayne Bay. Overall, these surface water inflows comprise the largest input of fresh water to Biscayne Bay in this area.

12. In the 1990's the U.S. Army Corps of Engineers and the District developed the Comprehensive Everglades Restoration Program (CERP) which was approved by Congress in the Water Resources Development Act of 2000 (WRDA 2000). A component of CERP includes the Biscayne Bay Coastal Wetlands Phase 1 Project. This project component aims to restore the overland sheetflow in an area of up to 11,000 acres, and to improve the ecology of Biscayne Bay, including its freshwater and saltwater wetlands, nearshore bay habitat, marine nursery habitat, and the oyster reef community.

13. Implementation of the Biscayne Bay Coastal Wetlands Phase 1 Project will impound and redistribute freshwater runoff from the existing canal discharges into

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

the coastal wetlands adjoining Biscayne Bay to provide a more natural and historical overland flow pattern through existing coastal wetlands and tidal creeks. This redistribution of freshwater runoff will improve the temporal and spatial distribution of inflows to Biscayne Bay.

14. The WRDA 2000 requires that water be reserved from allocation as an assurance that each CERP project component will meet its goals and objectives. Water is to be reserved consistent with the objectives and information contained within the *Central and Southern Florida Project Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Project Phase I Final Integrated Project Implementation Report and Environmental Impact Statement* (PIR) and other sources of information.

15. To this end, the District conducted technical studies identifying water to be reserved for the protection of fish and wildlife within the western near-shore portion of Central Biscayne Bay, engaged in rule development, and adopted the Nearshore Central Biscayne Bay reservation rule and associated implementation rules. (Exhibit C) The location of the Nearshore Central Biscayne Bay as well as the associated, Project canal system is depicted in Figure 3-1 of the attached and incorporated Exhibit C.

16. The determination of the amount of water needed for protection of fish and wildlife in the Nearshore Central Biscayne Bay reservation rule is based on meeting a year-round salinity target for the nearshore area of central Biscayne Bay of 20 (practical salinity scale) given in the PIR. More detailed analyses were performed to determine the locations and quantities of surface water for the reservation rules. This information is contained in the District's Technical Document to Support a Water Reservation Rule

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

for the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Project (July 2013).

17. Rule 40E-10.061, Florida Administrative Code, is the water reservation rule for the Nearshore Central Biscayne Bay. Pursuant to this rule, surface water flowing into the Nearshore Central Biscayne Bay, as derived from various and listed contributing canal reaches, is reserved from allocation. Figure 3-4A depicts surface water flow from the C-102 + Military + C-103 Canal through S-21A + S-20G + S-20F into Biscayne Bay during the Wet Season and is the relevant reservation for this Order; the reserved Target Flow to the Bay is 504 acre-ft / day or 254 cubic feet per second (cfs).

18. On August 27, 2014, FPL requested the District issue an Emergency Order for temporary authorization to utilize the District's right of way and to divert and use water, above that reserved in Rule 40E-10.061, F.A.C., from the L-31E Canal System to help moderate unusually high temperatures and salinity that are occurring in the CCS. A copy of FPL's request and related correspondence between FPL and the Nuclear Regulatory Commission is attached and incorporated as Composite Exhibit D. In summary, FPL seeks to divert water that is available, above the water reserved by Rule 40E-10.061, F.A.C., which would otherwise be discharged to tide via the S-20F,S-20G and S-21A coastal structures. District staff reviewed and considered FPL's request, the District's right of way, the infrastructure proposal, historic data, District statutory authorizations and rules, and the potential water availability and provided input to the District's Executive Director.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

19. In support of their emergency authorization request, FPL provided the following information which is contained in Composite Exhibit D and summarized below:

a. United States Nuclear Regulatory Commission (NRC) Operating Licenses for Turkey Point and CCS Temperature Requirements: Turkey Point Power Plant Units 3 & 4 operate under a license from the Nuclear Regulatory Commission. The original operating license included a requirement that the maximum allowed CCS water temperature on the intake or inlet side of Units 3 & 4 cannot exceed 100ºF. During July 2014, numerous factors contributed to higher than usual inlet temperatures in the CCS that approached 100ºF. Also, during July – August, intake temperatures approached 102ºF. After analysis, FPL requested and received temporary approval from the NRC to temporarily deviate from the water temperature requirement as is pursued a permanent change to the plant's operating license. In parallel, FPL submitted and received (August 8, 2014) approval for a License Amendment Request (LAR) that permanently increases the CCS intake water temperature limit from 100ºF to 104ºF. (Composite Exhibit D) This LAR is conditioned such that if the NRC license limit is exceeded and certain conditions met, both Turkey Point Units 3 and 4 will be required to commence shut down within 12 hours which could impact grid reliability. If Units 3 and 4 were required to shut down, an important piece of FPL's power generation portfolio will not be available to meet the current and anticipated high electricity demand, potentially impacting electrical service to more than 2 million customer accounts in Miami-Dade and Broward Counties, including critical infrastructure.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

b. CCS Temperatures and Record-Breaking Power Demand: Peak demand for electric generation in south Florida is directly related to high temperatures and humidity which generally occur in the summer and early fall. Beginning in July 2014, Turkey Point's CCS experienced higher than usual temperatures as well as record breaking electricity demand. By the end of July, CCS Plant intake temperatures exceeded 100°F and have continued to exceed 100°F during afternoon peaks, recently reaching a high of 102°F, as depicted in Composite Exhibit D.

c. Factors Contributing to CCS Temperatures: A number of factors are contributing to higher than usual temperatures in the CCS. These factors include: high summer temperatures; significantly less rainfall in the vicinity of Turkey Point, including rainfall at the CCS; elevated salinity; and an algae bloom.

i. Temperature Data: For the Miami-Dade and Broward areas, the average high in September is 89°F and in October it is 86°F. CCS temperatures exceeded 100°F during July and August, 2014.

ii. Rainfall, Evaporation, Salinity, and Seepage Data: FPL reports typical annual rainfall at Turkey Point totals range between 50 inches to 75 inches. Normally, summer rainfall is effective in moderating the CCS water temperature and salinity. In 2013, the annual rainfall accumulation at Turkey Point measured at the CCS was less than 20 inches. As of the end of May, 2014, there had been less than 3 inches of rain at the rain station within the CCS. Although additional rainfall has occurred in June and July, the

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overall rainfall remains less than 26 inches at the CCS, compared to 40 inches at the Miami Airport during the same timeframe. Moreover, FPL data indicates that the high evaporation, averaging 34 MGD, and losses to groundwater, averaging 12 MGD, have resulted in more water leaving the CCS than is being provided from the aquifer or rainfall and ultimately concentrating salinity in the CCS. FPL reports the CCS salinity has reached levels near 90 ppt, compared to historic levels of approximately 60 ppt.

iii. Algae Bloom: FPL indicates the above described conditions have allowed an algal bloom in the CCS to persist and affect Plant operations. The algae concentration, prior to treatments beginning mid-summer, was as high as 1.8 million cells per milliliter, far exceeding the historic average values of 50,000 cells per milliliter. Recent FPL treatments have reduced the algae concentrations. However, the turbidity associated with the algae bloom has caused unusual amounts of solar energy to be absorbed in the CCS, thereby increasing CCS temperatures. FPL reports effective treatment of the algae will require the salinity to be reduced to bring the dead algae out of suspension, which is necessary to reduce CCS temperatures and, thereby, restore the heat exchange capacity of the CCS. Detailed information concerning the CCS algae bloom are contained in Composite Exhibit D, particularly the correspondence between FPL and the NRC.

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d. FPL's Request for Temporary, Emergency Water Supply: In summary, FPL requests an immediate, temporary emergency authorization from the District to allow FPL to access the District's right of way, connect to the L-31E canal, and conditionally withdraw stormwater from the L-31E Canal, and convey this water to the CCS with above-ground piping. Composite Exhibit D contains the design details for FPL's request. FPL's proposed operational plan synchronizes the volumes and rates of its northern and southern pumping operations so as to avert dewatering of wetlands adjacent to the L-31E canal. A portion of the proposed infrastructure involves temporary installation of pipes across wetlands.

20. Temporary installation of the pipes within wetlands, as shown in Exhibit D, will have only minimal or insignificant individual or cumulative adverse impacts on the water resources of the District. Based on the design proposed in Exhibit D, FPL's proposed, temporary installation qualifies for an exemption from the requirement to obtain an environmental resource permit pursuant to subsection 373.406(6), Florida Statutes.

21. Water levels in the L-31E Canal system, the proposed water supply source, are influenced by the operation of coastal canal structures. Operation of the S-20F, S-20G and S-21A are performed consistent with guidance from the United States Army Corps of Engineers regulation schedule and Master Water Control Manual, East Coast Canals, Volume 5. Under normal operating conditions for April 30 – October 15 the S-20F, S-20G, and S-21A structures are operated in the "high range" meaning discharges to tide are conditionally made when stages upstream of the structure

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including stages within the L-31E Canal are 2.2 ft. NGVD or higher and the gates are closed when headwater stages drop to 1.8 ft NGVD.

22. Operational records of the District show combined average daily flow from the C-102, Military, C-103 canals through Structures S-21A, S-20G, and S-20F, respectively, into this portion of Biscayne Bay are 481 cfs during the month of August (1993 – 2013) and 620 cfs for the month of September (1993 - 2013), with daily combined flows ranging from 0 to more than 3,000 cfs during these months.

23. The combined reserved target flow for structures S-21A, S-20G, and S-20F is 254 cfs suggesting that there is a reasonable expectation that daily flows exceeding the reservation target flows will occur during the months of August and September.

24. Based on FPL's request and the above-described facts, the Executive Director of the District has considered this matter and finds that an emergency exists and the emergency measures proposed herein are necessary to protect the public health, safety or welfare.

ULTIMATE FACTS AND CONCLUSIONS OF LAW

25. Section 373.119(2), Fla. Stat., and Rule 28-106.501, Fla. Admin. Code, authorize the Executive Director of the District, in the event of an emergency requiring immediate action to protect the public health, safety or welfare, with the concurrence of the Governing Board, and without prior notice, to issue an order reciting the existence of such an emergency and requiring that such action be taken as deemed necessary. Section 120.569, Florida Statutes, also authorizes issuance of emergency authorizations. Moreover, the District is authorized, in summary, to regulate

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connections and use of the District's rights of way, use of water, construction of new diversion facilities, initiation of new water uses, diversion and withdrawal facilities pursuant to a variety of statutes. (*e.g.*: §§373.083, 373.085, 373.086, 373.1501, 373.171, 373.219, Florida Statutes) The proposed activities are exempt from the requirement to obtain an environmental resource permit pursuant to subsection 373.406(6), Florida Statutes.

26. As to right of way matters, Rules 40E-6.451 and 40E-6.481, Fla. Admin. Code, further provide an emergency exists when immediate action is necessary to protect lives or property.

27. Pursuant to statutory authorizations, FPL's request and supporting documents, and the facts described herein, the Executive Director finds that an emergency exists requiring immediate action necessary to protect the public health, safety, or welfare. The Executive Director also finds the wetland impacts identified in Exhibit D and authorized by this Order qualify for a Section 373.406(6), Fla. Stat., exemption.

28. The action authorized by this Emergency Order is appropriate to address this emergency situation.

29. The L-31E Canal system is part of the C&SF Project for which the District is the designated local sponsor pursuant to Section 373.1501, Fla. Stat. Pursuant to Sections 373.085 and 373.086, Fla. Stat., the District is authorized to operate the C&SF Project, including the S-20 Structure and the L-31E Canal system.

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ORDER

Based upon the Findings of Fact, Ultimate Facts and Conclusions of Law, the Executive Director orders FPL is authorized to undertake the following, temporary actions in accordance with the conditions stated herein:

30. Temporary Utilization of District Right of Way:

a. Authorized Facilities and Installation: FPL is authorized to install the infrastructure depicted in Exhibit D on the District's L-31E Canal right of way. The design details, including facility description and location, authorized by this Order are contained in the attached and incorporated Exhibit D. To the extent the information contained in Exhibit D conflicts with the terms and conditions of this Emergency Order, this Emergency Order shall control. FPL shall install, operate, and maintain the temporary withdrawal facilities and associated equipment in accordance with this Order. Any deviations from the design schematics identified in Exhibit D shall be presented to the District for approval prior to installation of the modified design. These facilities are temporarily authorized for the purpose of diverting and use water from the L-31E Canal system to help meet its cooling water needs pursuant to the following conditions.

b. Right of Way Installation Conditions:

i. Installation Coordination: Prior to commencement of construction or utilization of the District's right of way and, again, upon completion of the installation of the authorized facilities, FPL is required to contact the District's Field Representative, Mike Worley of the District's Homestead Field Station, (954)410-7383, and schedule a pre-construction

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meeting and final inspection. The District's Homestead Field Station Superintendent is authorized to make field changes to installations or operations described herein to better achieve the District's objectives; such changes shall be subsequently documented in writing and communicated by the District to FPL.

ii. Site Security: The pumps at both the north and south pumping sites shall be manned continuously throughout the entire time the pumps are deployed pursuant to this Order. The south pumping site shall be manned by a pump operator provided by the pump manufacturer.

iii. Right of Way Conditions: FPL is required to comply with all Right of Way conditions contained in the body of this Order and attached and incorporated Exhibit E.

31. Temporary Water Withdrawal Authorization:

a. Authorization to Withdraw and Use Water, if available, from the L-31E Canal System:

i. Water Availability Restriction: FPL is prohibited from withdrawing and using water from the L-31E Canal system that is reserved for fish and wildlife by Rule 40E-10.061, F.A.C., for the Nearshore Central Biscayne Bay. The only water available for the purpose of this Order is that water which would otherwise be discharged to tide from either the S-20F, S-20G, and S-21A structures and is in excess of the flows reserved for protection of fish and wildlife in Rule 40E-10.061, F.A.C. This available surface water may, temporarily, be withdrawn and used within FPL's

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cooling canal system in accordance with the conditions as set forth herein. There are no assurances provided by this Order that water will be available for FPL's withdrawal and use on any given day.

ii. District's Daily Determination of Water Availability and FPL Pump Operation: On a daily basis, the District will determine the amount and timing that FPL may operate the pumps and facilities authorized herein to withdraw water from the L-31E Canal system. Only when the combined flows to tide through coastal structures S-20F, S-20G, and S-21A exceed 254 cfs will the District determine the amount and timing water available for a FPL pump operation. The rate and volume of a potential FPL withdrawal, if any, shall be determined by the District, no later than 10:00 a.m., each day and for the duration of this Order. The District's daily determination of water availability shall cover a 24 hour period and last until no later than 9:59 a.m. the next day. In the event the District does not provide any written direction to FPL in accordance with this paragraph, then FPL shall cease all pumping until further notice.

iii. Communication of Water Availability Determination: The District's Operation Control Center will communicate its daily water availability determination to FPL by e-mail, to the FPL's designated contact(s): Matthew Raffenberg, or his designee, at Matthew.Raffenberg@fpl.com. The District's Operation Control Center may be contacted 24 hours a day, 7 days a week at: 561-682-6116 and

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occ@sfwmd.gov. FPL may not commence any daily withdrawal operations prior to this District communication confirming water availability.

iv. Monitoring and Reporting: FPL shall monitor and report the amount of water diverted from the L-31E Canal system to its cooling canal system. When FPL withdraws water, then FPL must generate a daily report including the following detailed information: (1) the water availability determination for each day as provided by the District's Operational Control Center, (2) identification of which pump(s) were used over the course of the day; (3) time on and time off, per pump; (4) RPM setting, per pump, if variable; (5) calculated volume of water pumped, per pump; and (6) cumulative log flows at each pump station. In addition, the report shall include hourly stage data for the L-31E Canal measured at TPSW-1 and TPSW-2 for the weekly reporting period, whether or not the pumps operated. Water quality grab samples consisting of conductivity, turbidity, total kjedahl nitrogen, nitrate nitrite as N, phosphorus, ortho phosphorus, ammonia, and TRPH (total recoverable peteroleum hydrocarbons, also known as Florida Petroleum Residual Organic or "FL-PRO") shall be collected prior to initiation of pumping pursuant to this Order and once a week thereafter for the duration of this Order. These samples shall be collected at TPSW-1 and TPSW-2. FPL shall make the sampling logs and lab reports available upon request. The report shall reference this Order and be submitted by noon, Tuesday of each week for all withdrawals occurring during the preceding week. (The preceding week

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reporting period is considered Monday at 1:00 a.m. through Sunday midnight.) The report shall be e-mailed to both the District's Assistant Executive Director, Len Lindahl at llindahl@sfwmd.gov and Terrie Bates, Division Director – Water Resources, at tbates@sfwmd.gov. Upon Executive review of the weekly report, conference calls may be required. Additionally, the District may request available monitoring data at any time and FPL shall provide the same within two hours of the District's request.

v. Special Pump Station Criteria:

(a) The District may require FPL to terminate pumping at any time. Upon receipt of any oral or written request from the District to terminate pumping, FPL must cease pumping within two (2) hours.

(b) FPL shall wirelessly coordinate the pumping at both stations to assure that, from a non-flow condition, the north station pumps shall be started first. The south station pumps shall be started within 5 minutes of the north station pumps start, with an equivalent flow. Similarly, when pump operation ceases, the south station pumps shall cease first and the north station pumps shall cease within 5 minutes.

vi. Pump Requirements:

(a) Pump On / Off Switches: Each pump authorized pursuant to this Order shall be equipped with an operable,

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remote pump operational device prior to initiating pump operations.

(b) Pump discharge curves: Pump discharge curves used in determining rates of discharge while pumps are operating, as deployed in the field, shall be provided to the District prior to pump operation for the purpose of calculating flow rates and volumes.

(c) Totalizing Hour Meters: FPL shall install totalizing hour meters at each pump authorized by this Order and such meters shall be available for periodic District inspection and verification.

32. Section 373.406(6), F.S., Exemption Conditions:

a. No permanent fill shall be placed in the wetland area described in Exhibit D.

b. All activities which qualify for the subject exemption shall be conducted and operated using appropriate best management practices and in a manner which does not cause a violation of water quality standards, pursuant to Chapter 62-302, Florida Administrative Code.

c. The District's determination that the proposed temporary placement of pipes, pumps, and associated infrastructure qualifies as an exempt activity may be revoked if the installation is substantially modified from that described in Exhibit D, if the basis for the exemption is determined to be materially incorrect, or if the installation results in violation of state water quality standards. Any

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changes made in the construction plans or location of the project may necessitate a permit from the District. Therefore, FPL is advised to contact the District before beginning any work in wetlands or surface waters which is not specifically described in Exhibit D.

d. Upon termination of this Order, all pipes, mats, other materials and equipment shall immediately be removed from the wetland to allow the wetland vegetation to recover.

33. Immediate Facility Removal and Reinstallation:

a. Prior to a Storm Event: FPL shall remove the temporary withdrawal facilities authorized by this Order located within the District's right of way within 24 hours of receipt of notice from the District. The temporary withdrawal facilities should be maintained and secured so as to not impede the District's ability to make flood control releases in advance of a storm event.

b. After a Severe Storm Event: FPL shall notify the District of its intent to reinstall the temporary withdrawal facilities in the District's right-of-way at least three (3) business days before such reinstallation is scheduled to occur.

34. All documents, plans, and reports required by this Order shall be submitted to Len Lindahl via email at llindahl@sfwmd.gov and Terrie Bates via email at tbates@sfwmd.gov.

35. Miscellaneous Conditions:

a. This Order authorizes FPL to take actions under Chapter 373, Fla. Stat., as provided herein. This Order does not relieve FPL from the requirements to obtain any other federal, state, or local authorizations.

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b. This Order does not constitute a water use or right-of-way permit or grant any legal right to water as set forth in Chapter 373 Fla. Stat., and associated District rules and regulations over the water intercepted and stored under this Order.

c. This Order does not convey any property right to FPL, nor any rights and privileges other than those specified in this Order. This Order shall not be construed as an abandonment or any other such impairment or disposition of the District's property rights.

d. This Order shall not be construed as a substitute for, or waiver of, any right-of-way, surface water management, water use, or other permits required of FPL under the District's rules and regulations.

e. FPL shall insure that harmful impacts to the water resources, off-site land uses, or existing legal uses of water do not occur as a result of this Order. In the event such harmful impacts result from actions authorized by this Order, FPL shall implement all actions, as directed by the District, to cease such harmful impacts and, if necessary, to mitigate such impacts. Failure to comply with this requirement shall be considered a violation of this Order.

f. Failure to comply with the terms of this Order shall constitute a violation of a District Order under Chapter 373, Fla. Stat., and enforcement proceedings may be brought in any appropriate administrative or judicial forum.

g. The District reserves the right to initiate appropriate legal action, to impose civil penalties, and collect attorney's fees and costs to enforce the terms of this Order.

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h. This Order may be modified or amended at any time, as appropriate for the protection of the public health, safety, and welfare and the water resources of south Florida by the Governing Board, Executive Director, or Executive Director's designee.

i. The Executive Director or Executive Director's designee may require FPL to remove all or part of the authorized facilities and cease withdrawal and / or use activities under this Order at any time.

j. The District's immunity from liability under Section 373.443, Florida Statutes, for any damages that might result from the activities authorized under this Order, shall not be diminished by the terms of this Order, or any activities taken pursuant to this Order.

k. Failure to comply with the conditions contained within this Order shall constitute a violation of a District Order under Chapter 373, Florida Statutes, and enforcement proceedings may be brought in any appropriate administrative or judicial forum.

l. If the District petitions or sues for enforcement of the terms of this Order, the District reserves the right to initiate appropriate legal action, to impose civil penalties and collect attorney's fees and costs.

36. Termination: This Order shall terminate on the earliest of: (1) failure to receive Governing Board concurrence at their next regularly scheduled meeting, (2) October 15, 2014, or (3) at any time upon written notice from the District's Executive Director or the Executive Director's designee.

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37. Required Facility Removal: Within 30 days of termination of this Order, FPL shall remove all temporary withdrawal facilities and associated infrastructure authorized by this Order, including the pipes buried under 344th Avenue. Moreover, FPL shall properly restore the right-of-way to the District's satisfaction. In the event of failure to so comply within the specified time, the District may remove the temporary withdrawal facilities and associated infrastructure authorized by this Order and associated equipment and FPL shall be responsible for all removal and restoration costs.

38. A Notice of Rights attached hereto as Exhibit F.

39. This Order shall take effect upon execution by the Executive Director of the District and shall expire as provided herein. This Order is subject to the Governing Board's concurrence at its next regularly scheduled Governing Board meeting.

DONE AND SO ORDERED in West Palm Beach, Florida, on this 28th day of August, 2014.

SOUTH FLORIDA WATER
MANAGEMENT DISTRICT
By its Executive Director

Blake C. Guillory, P.E.
Executive Director

Attested:

District Clerk/Assistant Secretary
August 28, 2014

Legal Form Approved:

8/28/14

Elizabeth D. Ross, Esq.

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FPL TURKEY POINT COOLING CANAL FRESHWATER RECHARGE

MIAMI-DADE COUNTY, FLORIDA

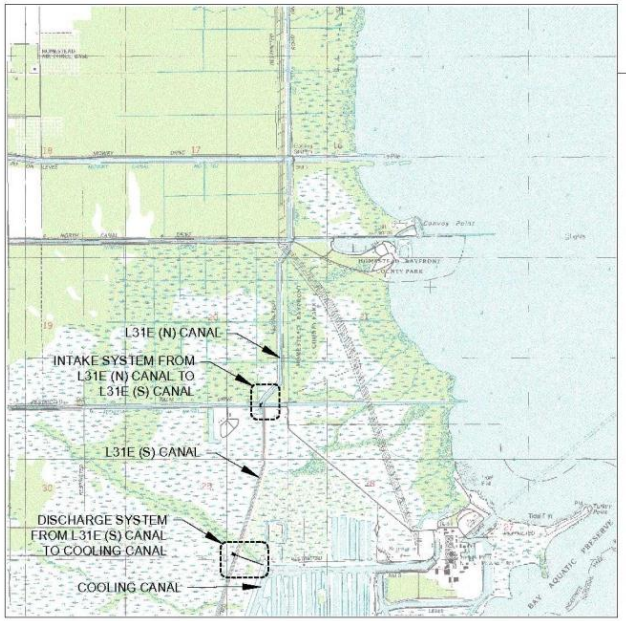
PROJECT LOCATION

LOCATION MAP

N.T.S.

DRAWING INDEX

C-1	COVER SHEET
C-2	CONSTRUCTION NOTES
C-3	PROJECT OVERVIEW
C-4	INTAKE SYSTEM SITE PLAN
C-5	INTAKE SYSTEM PUMP AND UNDER ROAD CROSSING
C-6	DISCHARGE SYSTEM SITE PLAN
C-7	DISCHARGE SYSTEM PUMP AND LEVEE CROSSING
C-8	DISCHARGE SYSTEM PROFILES
C-9	DISCHARGE SYSTEM PIPE CROSSING OVER INTERCEPTOR CANAL
C-10	PIPE BRIDGE PLAN AND DETAILS
C-11	EROSION CONTROL PLAN



VICINITY MAP

1"= 2000' (22x34)
1"= 4000' (11x17)

REFERENCE:
USGS 7.5' QUADRANGLE MAP,
ARSENICKER KEYS, FLORIDA 1988

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TAYLOR ENGINEERING INC.
10161 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-7310
CERTIFICATE OF AUTHORIZATION # 4615

PROJECT TITLE
FPL TURKEY POINT COOLING CANAL FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

PROJECT NO C2014-066
DATE 08-22-2014

SEAL
KEITH A. KNIGHT P.E. # 58084

C-1
SHEET 1 OF 11

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EXHIBIT B

Rules of the

South Florida Water Management District

Water Reservations

CHAPTER 40E-10, F.A.C.

Effective: July 16, 2014

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CHAPTER 40E-10
WATER RESERVATIONS

40E-10.011 Policy and Purpose
40E-10.021 Definitions
40E-10.031 Water Reservations Implementation
40E-10.041 Water Reservation Areas: Lower West Coast Planning Area
40E-10.051 Water Reservation Areas: Upper East Coast Planning Area

40E-10.011 Policy and Purpose.
The purpose of this chapter is to define the quantity, location and timing of waters reserved from allocation for the protection of fish and wildlife pursuant to Section 373.223(4), F.S., for specified water bodies. Water reservations are implemented in the water use program pursuant to Chapter 40E-2, F.A.C.

Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New 7-2-09, Amended 7-14-14.

40E-10.021 Definitions.
(1) *Fakahatchee Estuary* – The area within the Ten Thousand Islands region including the following river/bay systems, from west to east: Blackwater River/Blackwater Bay, Whitney River/Buttonwood Bay, Pumpkin River/Pumpkin Bay, Wood River, Little Wood River and Faka Union Canal/Faka Union Bay, and Fakahatchee Bay as depicted in Figure 1-3 Fakahatchee Estuary.

(2) *Picayune Strand* – The area located southwest of the Florida Panther National Wildlife Refuge, north of the Ten Thousand Islands NWR, east of the South Belle Meade State Conservation and Recreation Lands (CARL) Project, west of the Fakahatchee Strand Preserve State Park, and northeast of Collier-Seminole State Park as depicted in Figure 1-2 Picayune Strand. The legal description of the Picayune Strand is contained in Appendix 1.

(3) *North Fork of the St. Lucie River* – The area that extends from the Gordy Road structure (state plane coordinates, x851212.831, y1116105.7470), to the confluence of the North Fork of the St. Lucie River and the C-24 canal (state plane coordinates, x873,712.20, y1064,390.41) as depicted in Appendix 2, Figure 2-1.

(4) *Nearshore Central Biscayne Bay* – The area within Biscayne Bay up to 1640 feet (500 meters) from the shoreline beginning south of Shoal Point extending southward to north of Turkey Point as depicted in Figure 3-1.

(5) Caloosahatchee River – The surface waters that flow through the S-79 structure, combined with tributary contributions below S-79 that collectively flow southwest to San Carlos Bay, as defined in subsection 40E-8.021(2), F.A.C.

(6) Caloosahatchee River (C-43) West Basin Storage Reservoir – A reservoir located in Hendry County, Florida, west of the City of LaBelle on the east side of the Townsend Canal and south of SR 80 as described in Appendix 1-12, and depicted in Figure 1-13 (also known as the 'C-43 Reservoir').

Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New 7-2-09, Amended 3-18-10, 7-21-13, 7-16-14.

40E-10.031 Water Reservations Implementation.
(1) Applicants for consumptive use permits shall meet the requirements of this rule by providing reasonable assurances that Rule 40E-2.301, F.A.C., and Section 3.11 of the "Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District," incorporated by reference in Rules 40E-2.091, F.A.C., are met.

(2) Water reserved for the protection of fish and wildlife contained within the Picayune Strand and Fakahatchee Estuary is defined in subsections 40E-10.041(1)-(2), F.A.C.

(3) Water reserved for the protection of fish and wildlife contained within the North Fork of the St. Lucie River is defined in subsection 40E-10.051(1), F.A.C.

(4) Water reserved for the protection of fish and wildlife contained within Nearshore Central Biscayne Bay is defined in subsections 40E-10.061(1)-(2), F.A.C.

(5) Water reserved for the protection of fish and wildlife contained within and released, via operation, from the Caloosahatchee River (C-43) west Basin Storage Reservoir is defined in subsection 40E-10.041(3), F.A.C.

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Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New 7-2-09, Amended 3-18-10, 7-21-13, 7-14-14, 7-16-14.

40E-10.041 Water Reservation Areas: Lower West Coast Planning Area.

(1) Picayune Strand as defined in subsection 40E-10.021(2), F.A.C.:

(a) Surface waters:

1. All surface water contained within the Picayune Strand are reserved from allocation (see Figure 1).

2. All surface water flowing into the Picayune Strand identified below is reserved from allocation:

i. The surface water flows depicted on Figures 1-4.A, B, and C, simulated at weir 'Miller2' within the Miller Canal (see Figure 1-2);

ii. The surface water flows depicted on Figures 1-5.A, B, and C, simulated at weir 'FU3' within the Faka Union Canal (see Figure 1-2); and

iii. The surface water flows depicted on Figures 1-6.A, B, and C simulated at spillway 'Lucky LA' within the Merritt Canal (see Figure 1-2).

(b) Groundwater: All groundwater in the water table and unconfined portions of Lower Tamiami aquifer underlying the Picayune Strand is reserved from allocation.

Notwithstanding the above, presently existing legal uses for the duration of the permit existing on July 2, 2009 are determined to be not contrary to the public interest, pursuant to Section 373.223(4), F.S.

(2) Fakahatchee Estuary as defined in subsection 40E-10.021(1), F.A.C.:

(a) Surface waters:

The surface water flows into the Fakahatchee Estuary identified below are reserved from allocation:

1. The surface water flows depicted on Figures 1-7.A, B, and C simulated at Faka Union Canal at structure FU1 (See Figure 1-3);

2. The surface water flows depicted on Figures 1-8.A, B, and C simulated at 'Miller@41' transect (beginning at coordinate 471365.13N, 599423.29 E Southeast to 479226.67N, 595105.77E (delivering surface water to Blackwater Bay and Buttonwood Bay) see Figure 1-3);

3. The surface water flows depicted on Figures 1-9.A, B, and C simulated at 'FU@41' transect (beginning at coordinate 480427.89N, 595005.67E Southeast to 487735.34N, 592478.09E (delivering surface water to Pumpkin Bay) see Figure 1-3);

4. The surface water flows depicted on Figures 1-10.A, B, and C simulated at 'Merritt@41' transect (beginning at coordinate 490942.49N, 593218.49E flowing Southeast to 499050.54N, 590515.81E (delivering surface water to Faka Union Bay) see Figure 1-3); and

5. The surface water flows depicted on Figures 1-11.A, B, and C simulated at 'Fakahatchee@41' transect (beginning at coordinate 498623.81N, 587955.37E Southeast to 533587.95N, 575807.53E (delivering surface water to Fakahatchee Bay) see Figure 1-3).

(b) Groundwater: All groundwater in the water table and unconfined portions of Lower Tamiami aquifer underlying the Fakahatchee Estuary is reserved from allocation.

Notwithstanding the above, presently existing legal uses for the duration of the permit existing on July 2, 2009 are determined to be not contrary to the public interest, pursuant to Section 373.223(4), F.S. Reservations contained in this subparagraphs 1. and 2. above shall be reviewed in light of changed conditions or new information by December 31, 2014.

(3) Caloosahatchee River (C-43) West Basin Storage Reservoir:

(a) All surface water contained within and released, via operation, from the Caloosahatchee River (C-43) West Basin Storage Reservoir is reserved from allocation.

(b) The water reserved under this subsection will be available for fish and wildlife upon a formal determination of the Governing Board, pursuant to state and federal law, that the Caloosahatchee River (C-43) West Basin Storage Reservoir is operational.

(c) The reservation contained in this subsection and the criteria contained in Section 3.11.4 of the "Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District," incorporated by reference in Rule 40E-2.091, F.A.C., shall be revised pursuant to subsection 373.223(4), F.S., in light of changed conditions or new information and prior to the approval described in paragraph (3)(b) above.

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Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New 7-2-09, Amended 3-18-10, 7-21-13, 7-16-14.

40E-10.051 Water Reservation Areas: Upper East Coast Planning Area.

North Fork of the St. Lucie River, as defined in subsection 40E-10.021(3), F.A.C.:

Surface waters up to and including the mean monthly flow of 130 cubic feet per second flowing over the Gordy Road Structure from November 1st through May 31st; see Appendix 2, Figure 2-2; are reserved from allocation. The water reserved under this Rule will be available for fish and wildlife upon formal determination of the Governing Board, pursuant to state and federal law, that any one or all of the Comprehensive Everglades Restoration Plan's C-23/C-24 North and South Reservoirs and STA Project are operational. Reservations contained in this Rule and the criteria contained in section 3.11.2 of the "Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District," incorporated by reference in Rule 40E-2.091, F.A.C., shall be revised pursuant to Section 373.223(4), F.S., in light of changed conditions or new information and concurrent with the approval specified, above.

Notwithstanding the above, presently existing legal uses for the duration of a permit existing on March 18, 2010 are determined to be not contrary to the public interest pursuant to Section 373.223(4), F.S.

Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New-3-18-10, Amended 7-21-13, 7-14-14.

40E-10.061 Water Reservation Areas: Lower East Coast Planning Area.

(1) Nearshore Central Biscayne Bay as defined in subsection 40E-10.021(6), F.A.C.:

All surface water contained within Nearshore Central Biscayne Bay is reserved from allocation (see Figure 3-1).

(2) Surface water flowing into Nearshore Central Biscayne Bay as identified below is reserved from allocation:

(a) Surface water flows depicted on Figures 3-2.A and 3-2.B through S-123 derived from the following contributing canal reaches:

1. The C-100A canal upstream of S-123 to S-120 including all integrated conveyance canals.
2. The C-100C canal upstream of S-123 to S-119 including all integrated conveyance canals.
3. The C-100B canal upstream of S-123 to S-122 including all integrated conveyance canals.
4. The C-100 canal upstream of S-123 to S-118 including all integrated conveyance canals.

(b) Surface water flows depicted on Figures 3-3.A and 3-3.B through S-21 derived from the following contributing canal reaches:

1. The L-31E borrow canal upstream of S-21 to the canal terminus.
2. The C-1 canal upstream of S-21 to S-122 and S-149 including all integrated conveyance canals.
3. The C-1 canal upstream of S-21 to the C-1W canal and S-338 including all integrated conveyance canals.

(c) Surface water flows depicted on Figures 3-4.A and 3-4.B which is the combined flow through S-21A, S-20G, and S-20F as derived from the following contributing canal reaches:

1. The C-102 canal connecting to the C-102 N canal upstream of S-21A to S-195.
2. The C-102 canal upstream of S-21A to S-165
3. The L-31E borrow canal upstream of S-21A to its terminus near S-21 including the Gould's Canal.
4. The L-31E borrow canal upstream of S-21A south to S-20G.
5. The Military canal upstream of S-20G.
6. The C-103 canal upstream of S-20F to S-179.
7. The L-31E borrow canal upstream of S-20F to S-20G including all integrated conveyance canals.
8. The L-31E borrow canal from S-20F south to the North Canal.
9. The North Canal.
10. The L-31E borrow canal from S-20F south to the Florida City Canal.
11. The Florida City Canal from Southwest 107th Avenue to its confluence with the L-31E borrow canal.

Notwithstanding the above, presently existing legal uses for the duration of a permit existing on July 18, 2013, are determined to be not contrary to the public interest pursuant to Section 373.223(4), F.S.

Reservations contained in the section shall be reviewed in light of changed conditions or new information.

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Rulemaking Authority 373.044, 373.113, 373.171 FS. Law Implemented 373.016, 373.026, 373.036, 373.1501, 373.1502, 373.219, 373.223, 373.4592, 373.4595, 373.470 FS. History–New 7-21-13.

APPENDIX 1 LOWER WEST COAST PLANNING AREA

1-1 LEGAL DESCRIPTION OF PICAYUNE STRAND AS DEFINED IN SUBSECTION 40E-10.021(1), F.A.C.

A tract of land in Townships 50, 51 and 52 South, Ranges 27 and 28 East, Collier County, Florida, more particularly described as follows:

Beginning at the Southeast Corner of Section 25, Township 51 South, Range 28 East, Collier County, Florida, run S 89°10'50" W, 2659.84 feet to the South Quarter Corner of said Section 25; thence S 89°09'41" W, 2659.37 feet to the Southwest Corner of said Section 25; thence S 00°19'11" W, 2611.61 feet to the East Quarter Corner of Section 35 of said Township 51 South, Range 28 East; thence S 88°56'33" W, 2652.73 feet to the Northeast Corner of the Southwest Quarter of said Section 35; thence S 00°18'15" W, 2614.86 feet to the South Quarter Corner of said Section 35; thence S 88°54'23" W, 2650.59 feet to the Southwest Corner of Section 35; thence S 88°50'39" W, 2639.94 feet to the South Quarter Corner of Section 34 of said Township 51 South, Range 28 East;

thence S 89°00'23" W, 2652.66 feet to the Southwest Corner of said Section 34;

thence S 88°44'21" W along the north line of the Northeast Quarter of Section 4, Township 52 South, Range 28 East, 1450.32 feet to the Northeast Corner of those lands described in Official Record Book 2624, Page 2509, Public Records of Collier County, Florida; thence S 00°27'37" E along the east line of said lands, 6308.01 feet; thence continuing along said east line, S 89°34'56" W, 16.37 feet;

thence continuing along said east line, S 00°25'04" E, 360.00 feet to the north right-of-way line of U.S. Highway 41; thence westerly along the north right-of-way line of U.S. Highway 41, S 84°52'54" W, 327.99 feet; thence N 05°07'06" W, 39.00 feet to a point on a non-tangent curve; thence westerly 900.69 feet along the arc of said curve, concave to the northeast, having a radius of 1835.08 feet, a central angle of 28°07'18" and a chord of 891.68 feet, bearing N 81°03'27" W;

thence S 23°00'12" W, 39.00 feet; thence N 66°59'48" W, 5570.19 feet to a point of curvature; thence northwesterly 800.00 feet along the arc of a curve, concave to the southwest, having a radius of 17224.80 feet, a central angle of 02°39'40" and a chord of 799.93 feet, bearing N 68°19'38" W to a point of tangency;

thence N 69°39'28" W, 6844.52 feet; thence N 20°20'32" E, 39.00 feet to a point on a non-tangent curve; thence northwesterly 671.08 feet along the arc of said curve, concave to the northeast, having a radius of 1835.08 feet, a central angle of 20°57'10" and a chord of 667.35 feet, bearing N 59°10'53" W; thence S 41°17'43" W, 39.00 feet; thence N 48°42'17" W, 6815.31 feet to a point of curvature; thence northwesterly 442.16 feet along the arc of a curve, concave to the southwest, having a radius of 725.20 feet, a central angle of 34°56'02" and a chord of 435.35 feet, bearing N 66°10'19" W to a point of tangency; thence N 83°38'20" W, 300.77 feet to the intersection of the north right-of-way line of U.S. Highway 41 with the west line of Section 36, Township 51 South, Range 27 East;

thence N 00°03'59" E along the west line of said Section 36, 1586.32 feet to the Northwest Corner of Section 36; thence N 01°15'40" W, 2658.40 feet, to the West Quarter Corner of Section 25 of said Township 51 South, Range 27 East;

thence N 01°17'06" W, 2656.42 feet to the Northwest Corner of said Section 25;

thence N 01°16'05" W, 2655.83 feet to the West Quarter Corner of Section 24 of said Township 51 South, Range 27 East; thence N 01°16'15" W, 2656.76 feet to the Northwest Corner of said Section 24; thence N 00°19'01" E, 2764.38 feet to the West Quarter Corner of Section 13 of said Township 51 South, Range 27 East; thence N 00°19'04" E, 2764.32 feet to the Northwest Corner of said Section 13; thence N 01°15'53" E, 2764.69 feet to the West Quarter Corner of Section 12 of said Township 51 South, Range 27 East; thence N 01°16'08" E, 2764.72 feet to the Northwest Corner of said Section 12; thence N 00°37'07" E, 2763.78 feet to the West Quarter Corner of Section 1 of said Township 51 South, Range 27 East; thence N 00°35'09" E, 2732.08 feet to the Northwest Corner of said Section 1; thence N 01°09'58" E, 2697.35 feet to the West Quarter Corner of Section 36 of Township 50 South, Range 27 East; thence N 01°14'25" E, 2554.73 feet to the Northwest Corner of said Section 36; thence N 00°49'11" E, 2618.76 feet to the West Quarter Corner of Section 25 of said Township 50 South, Range 27 East;

thence N 01°30'13" E, 2623.02 feet to the Northwest Corner of said Section 25;

thence N 01°14'51" E, 2643.78 feet to the West Quarter Corner of Section 24 of said Township 50 South, Range 27 East; thence N 00°55'45" E, 2647.27 feet to the Northwest Corner of said Section 24; thence N 89°04'28" W, 2655.08 feet to the South Quarter Corner of Section 14 of said Township 50 South, Range 27 East; thence N 89°06'09" W, 2673.56 feet to the Southwest Corner of

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said Section 14; thence N 01°20’52" E, 2642.45 feet to the West Quarter Corner of said Section 14; thence N 01°02'27" E, 2638.34 feet to the Northwest Corner of said Section 14; thence S 88°57’18” E, 2650.45 feet to the North Quarter Corner of said Section 14; thence S 89°16’05” E, 2679.46 feet to the Northeast Corner of said Section 14; thence N 00°32'07" E, 2629.53 feet to the West Quarter Corner of Section 12 of said Township 50 South, Range 27 East; thence N 00°05'55" E, 2655.64 feet to the Northwest Corner of said Section 12; thence N 00°35'20" E, 2638.33 feet to the West Quarter Corner of Section 1 of said Township 50 South, Range 27 East; thence N 09°11'51" W along the west line of the Northwest Quarter of said Section 1 a distance of 2352.20 feet to the intersection with the south line of the south drainage right-of-way of Interstate 75; thence easterly along said line, N 89°40’16” E, 2640.00 feet; thence S 88°14'35" E, 2676.02 feet;
thence S 89°13'04" E, 2656.26 feet; thence N 89°51'50" E, 2650.84 feet;
thence N 89°28’53" E, 2647.15 feet; thence S 89°53’38" E, 2654.08 feet;
thence S 89°59'57" E, 2650.10 feet; thence N 89°51'03" E, 2650.97 feet;
thence S 89°32'18" E, 2648.17 feet; thence N 89°47'26" E, 2686.92 feet;
thence N 00°23'28" W, 124.56 feet; thence S 89°54'09" E, 2649.59 feet;
thence S 89°56'18" E, 2651.63 feet; thence N 89°41'16" E, 2652.50 feet;
thence S 89°49'15" E, 2651.54 feet to the intersection of the south line of said south drainage right-of-way with the east line of Section 1, Township 50 South, Range 28 East; thence S 00°18'22" E along the east line of the Northeast Quarter of said Section 1 a distance of 2460.78 feet to the East Quarter Corner of said Section 1; thence S 00°18'26" E, 2663.16 feet to the Southeast Corner of said Section 1; thence S 00°19'17" E, 2661.71 feet to the East Quarter Corner of Section 12 of said Township 50 South, Range 28 East; thence S 00°18'47" E, 2661.88 feet to the Southeast Corner of said Section 12; thence S 00°18'10" E, 2662.06 feet to the East Quarter Corner of Section 13 of said Township 50 South, Range 28 East; thence S 00°18'16" E, 2662.13 feet to the Southeast Corner of said Section 13; thence S 00°18'16" E, 2662.14 feet to the East Quarter Corner of Section 24 of said Township 50 South, Range 28 East; thence S 00°17'28" E, 2661.81 feet to the Southeast Corner of said Section 24; thence S 00°17'38" E, 2674.16 feet to the East Quarter Corner of Section 25 of said Township 50 South, Range 28 East; thence S 00°10'00" E, 2674.56 feet to the Southeast Corner of said Section 25; thence S 00°13'47" E, 2674.47 feet to the East Quarter Corner of Section 36 of said Township 50 South, Range 28 East; thence S 00°13'47" E, 2674.49 feet to the Southeast Corner of said Section 36; thence S 00°51'18" E, 2682.32 feet to the East Quarter Corner of Section 1 of Township 51 South, Range 28 East; thence S 00°51'18" E, 2682.32 feet to the Southeast Corner of said Section 1; thence S 00°28'26” W, 2596.09 feet to the East Quarter Corner of Section 12 of said Township 51 South, Range 28 East; thence S 00°41'47" W, 2598.68 feet to the Southeast Corner of said Section 12; thence southerly along the east line of Section 13, Township 51 South, Range 28 East, S 00°35'55" W, 5191.01 feet to the Southeast Corner of said Section 13; thence S 00°36'41" W, 2596.95 feet to the East Quarter Corner of Section 24 of said Township 51 South, Range 28 East; thence S 00°34'08" W, 2597.43 feet to the Southeast Corner of said Section 24; thence S 00°33'57" W, 2596.90 feet to the East Quarter Corner of Section 25 of said Township 51 South, Range 28 East; thence S 00°34'27" W, 2597.76 feet to the Southeast Corner of said Section 25 and the Point of Beginning.

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Figure 1-2

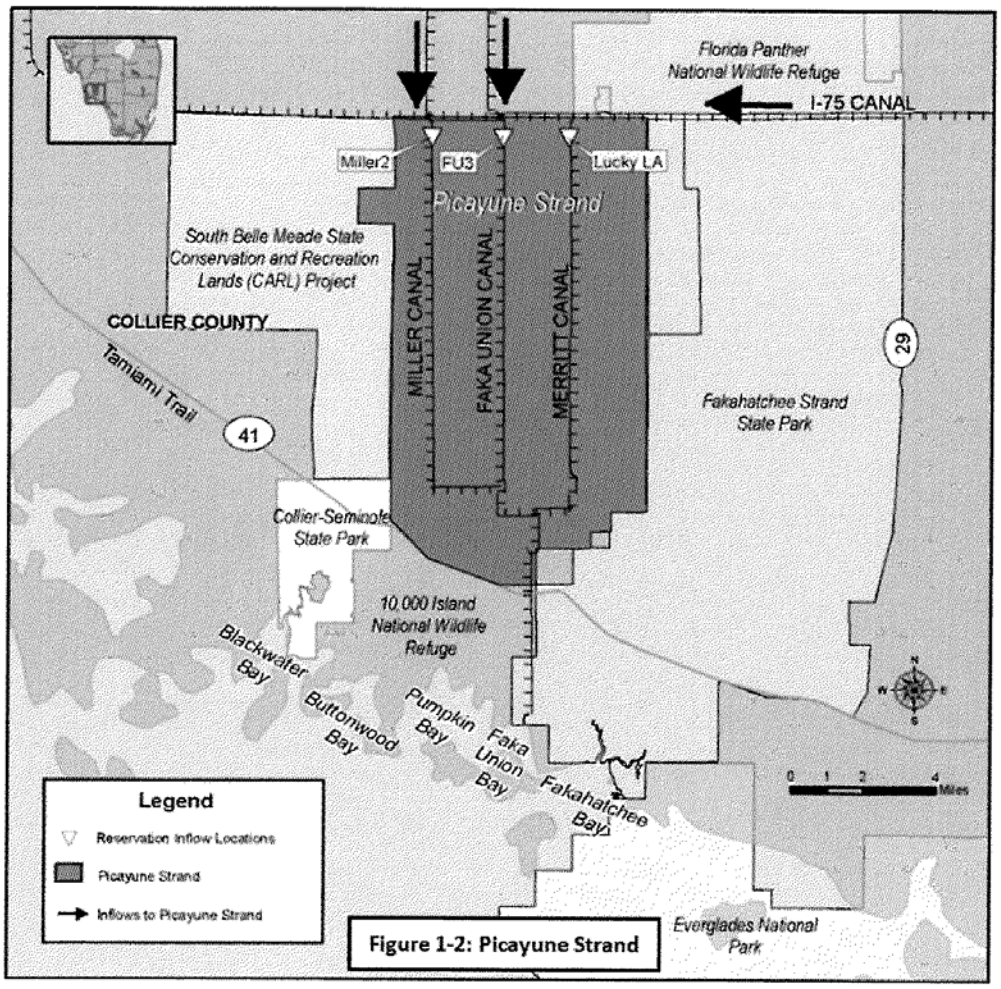

Figure 1-2: Picayune Strand

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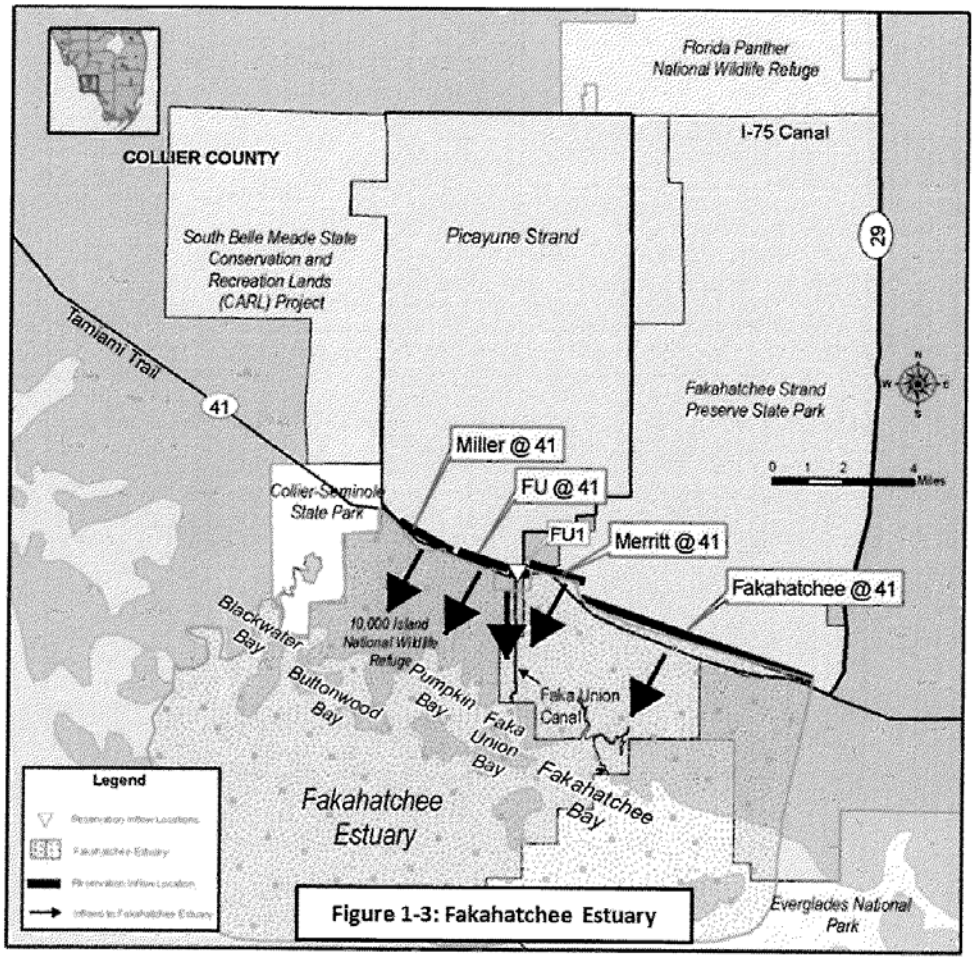
Figure 1-3



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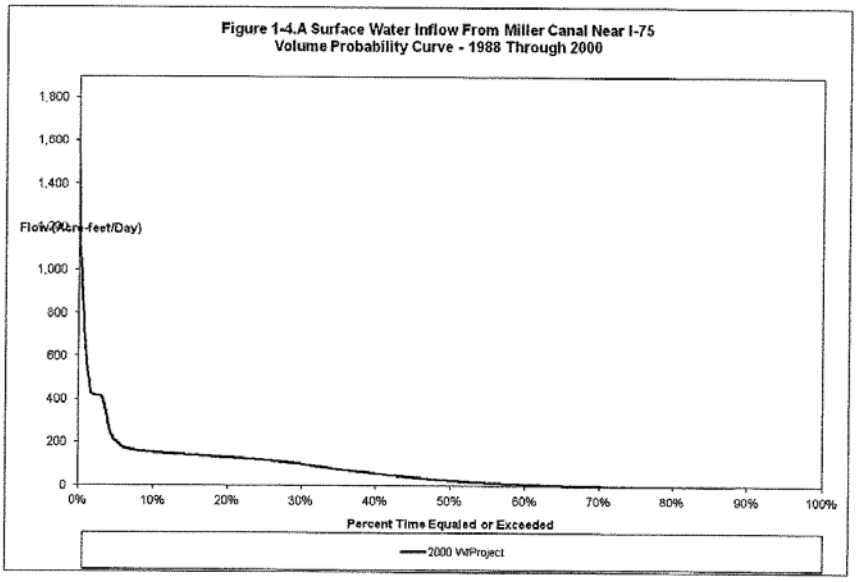

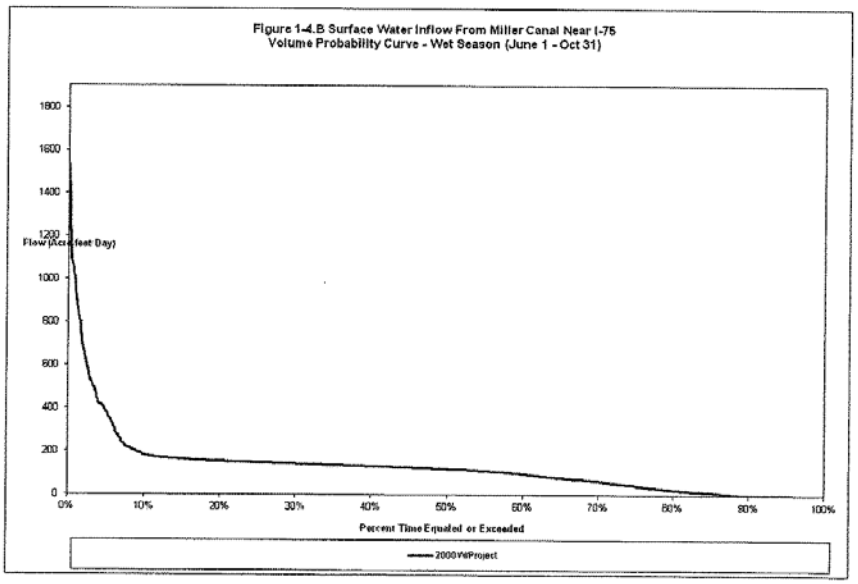

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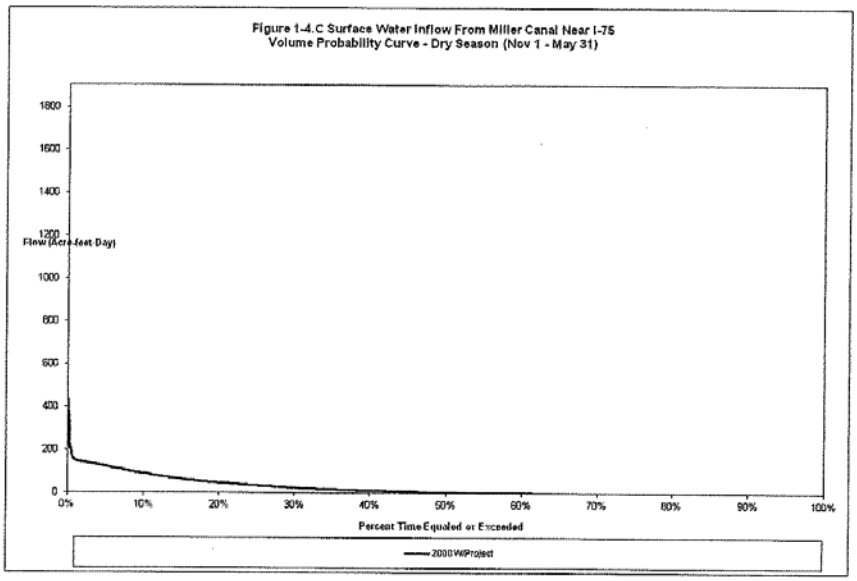

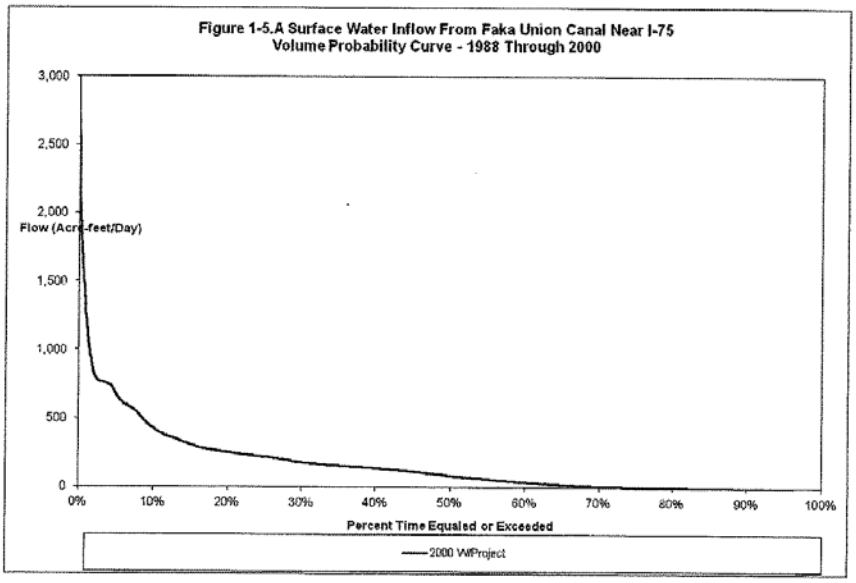

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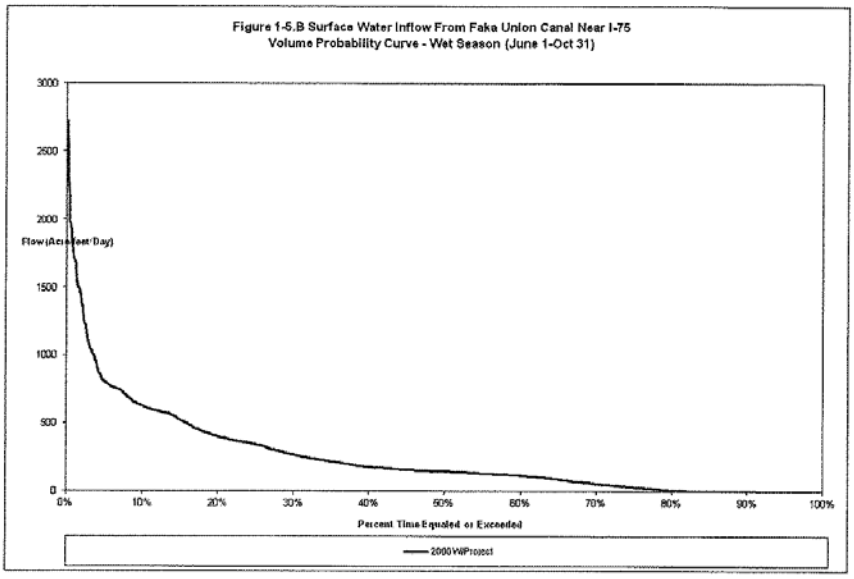

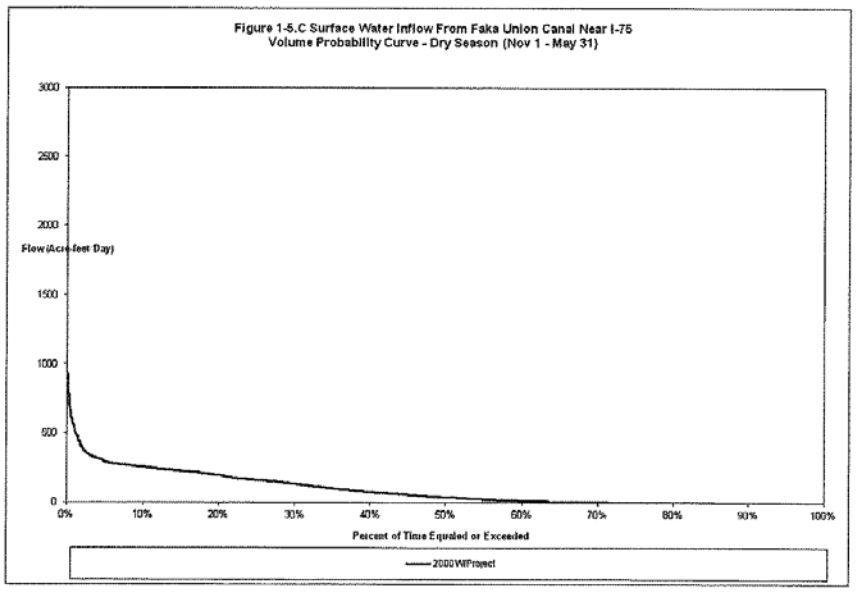

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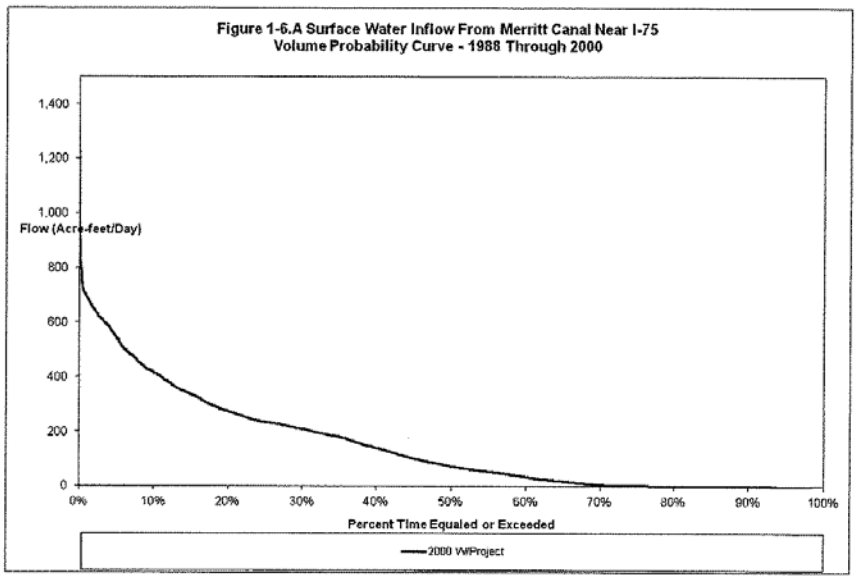

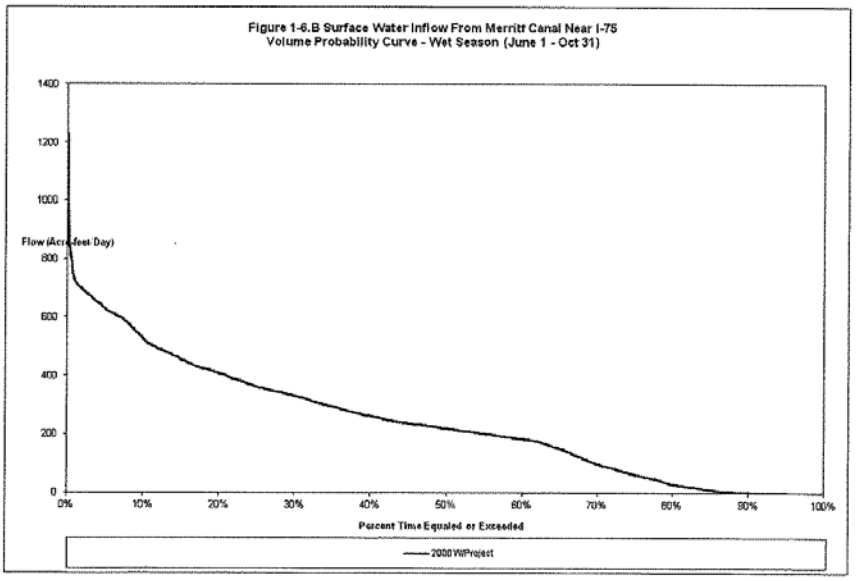

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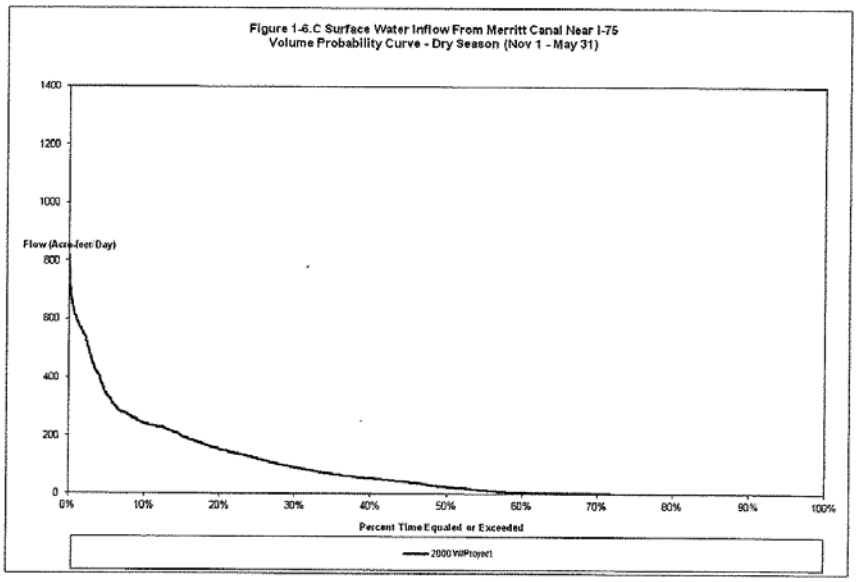

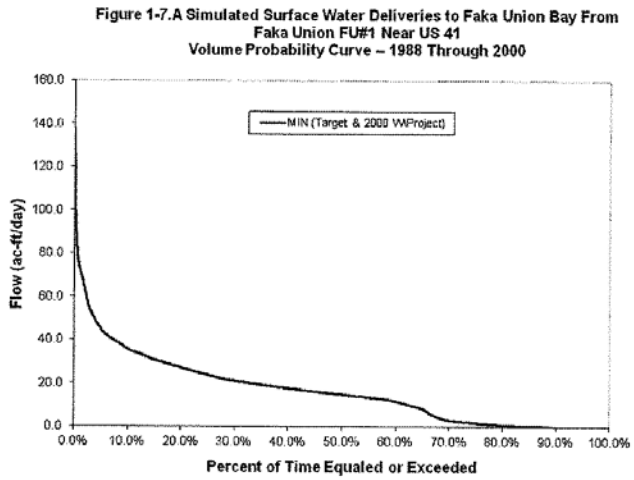

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Figure 1-7.B Simulated Surface Water Deliveries to Faka Union Bay from Faka Union FU#1 Near US 41
Wet Season Volume Probability Curve – (June 1 - Oct 31)

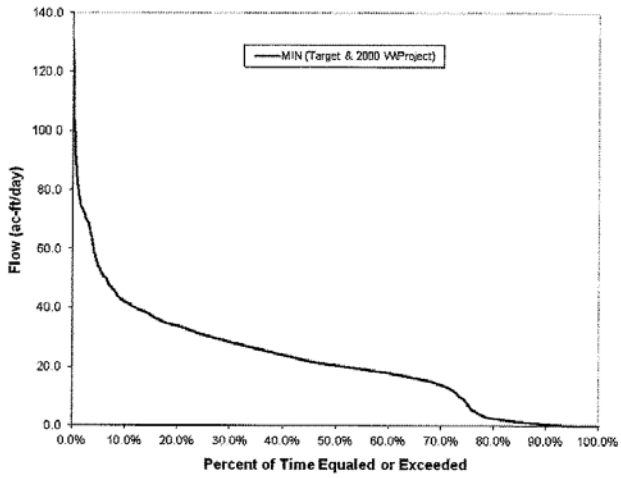
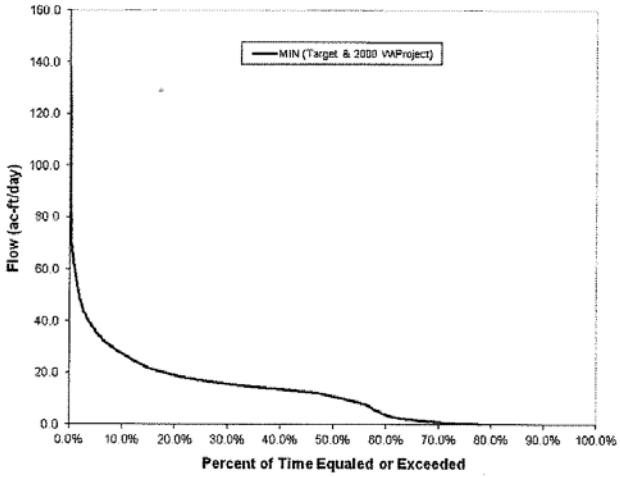


Figure 1-7.C Simulated Surface Water Deliveries to Faka Union Bay from Faka Union FU#1 Near US 41
Dry Sesaon Volume Probability Curve (Nov 1- May 31)



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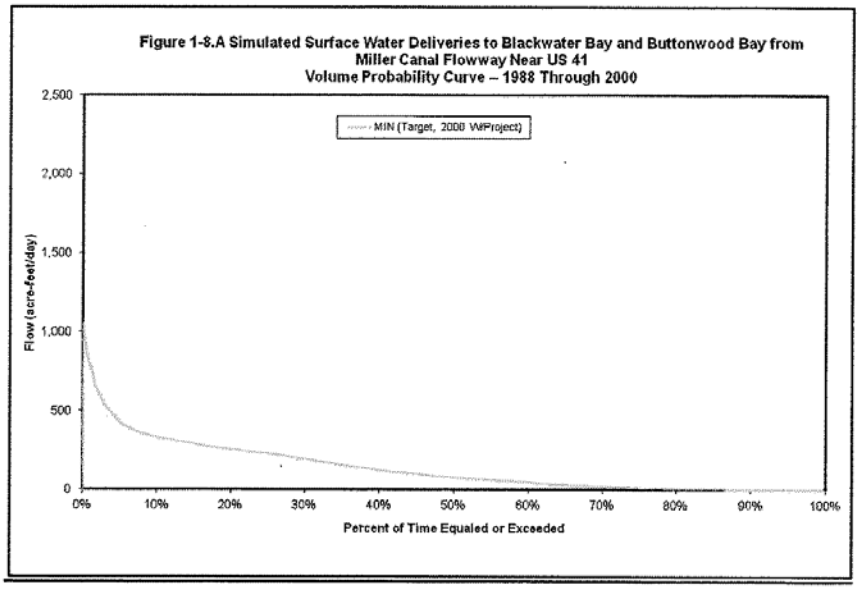

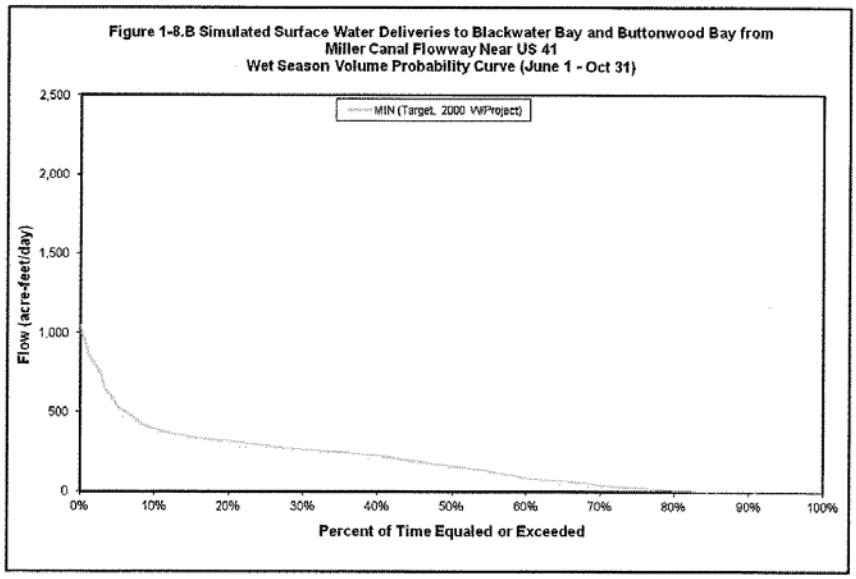

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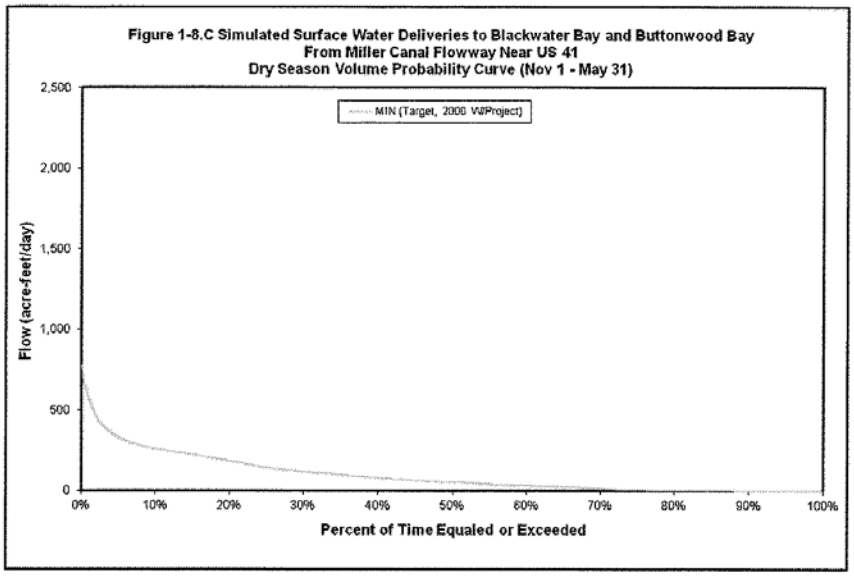

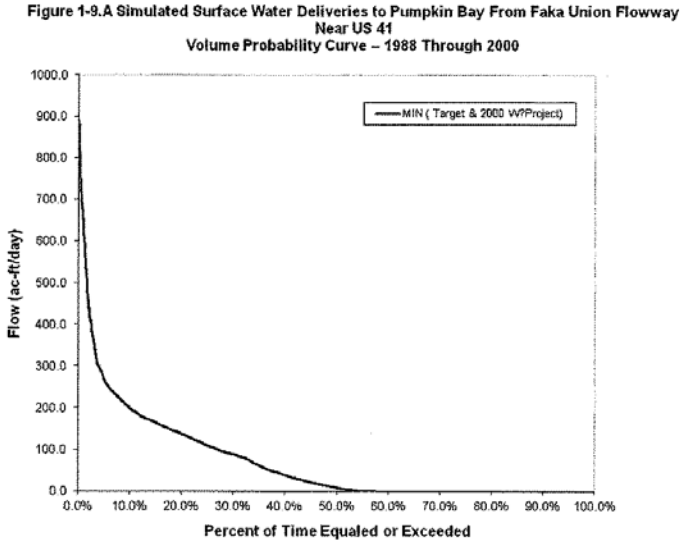

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Figure 1-9.B Simulated Surface Water Deliveries to Pumpkin Bay from Faka Union Flowway Near US 41
Wet Season Volume Probability Curve (June 1 - Oct 31)

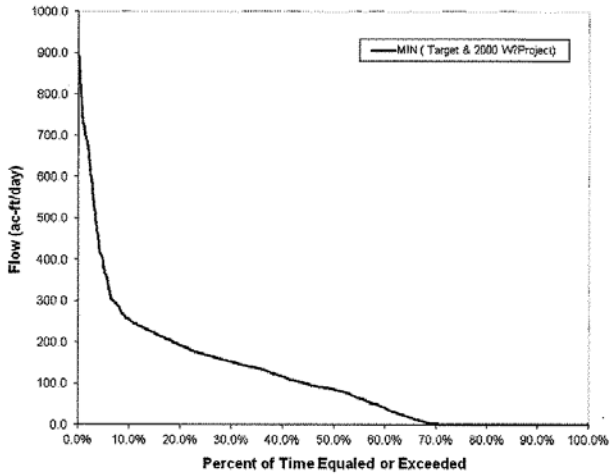
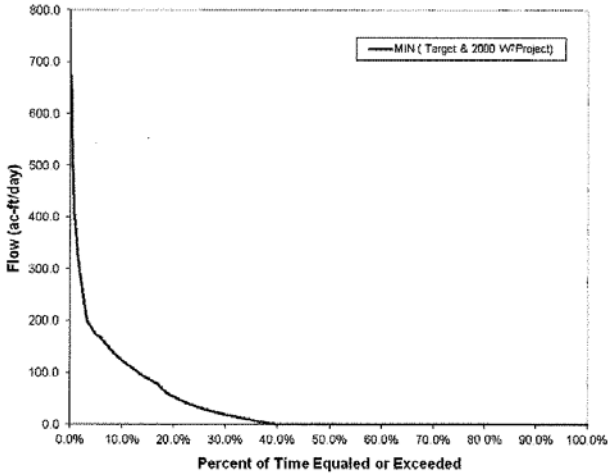


Figure 1-9.C Simulated Surface Water Deliveries to Pumpkin Bay from Faka Union Flowway Near US 41
Dry Season Volume Probability Curve (Nov1 - May 31)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 1-10.A Simulated Surface Water Deliveries to Faka Union Bay From Merritt Canal Flowway Near US41 Volume Probability Curve – 1988 Through 2000

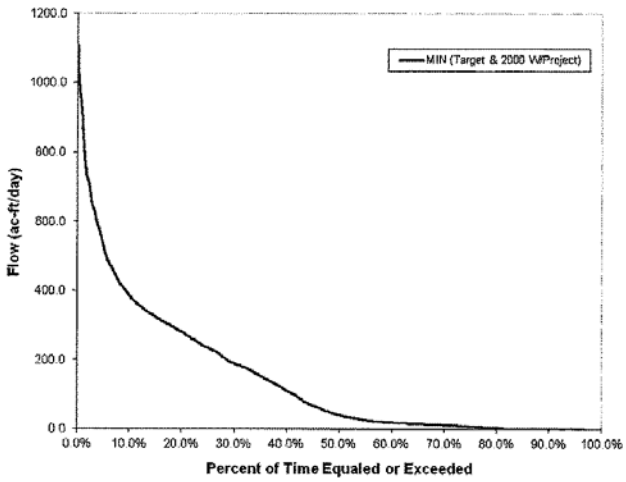
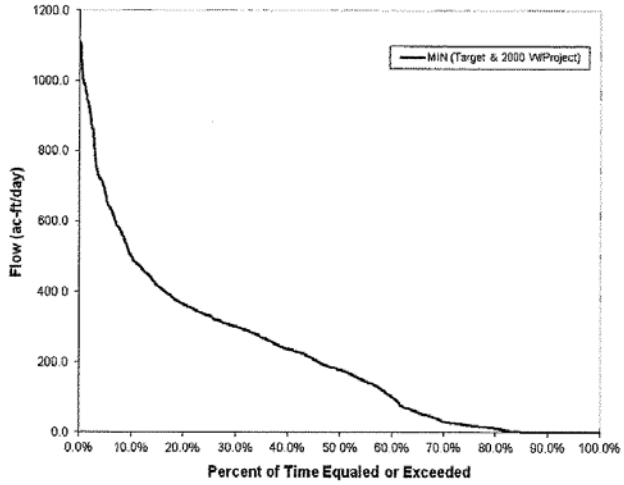


Figure 1-10.B Simulated Surface Water Deliveries to Faka Union Bay from Merritt Canal Flowway Near US41 Wet Sesaon Volume Probability Curve (June 1- Oct 31)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 1-10.C Simulated Surface Water Deliveries to Faka Union Bay from Merritt Canal Flowway Near US41
Dry Season Volume Probability Curve (Nov 1 - May 31)

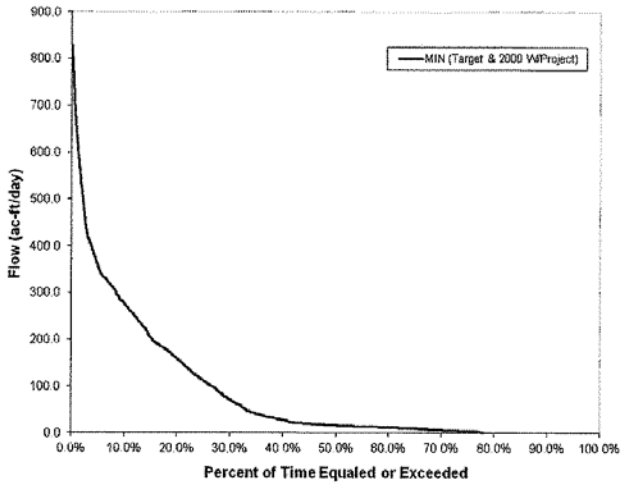
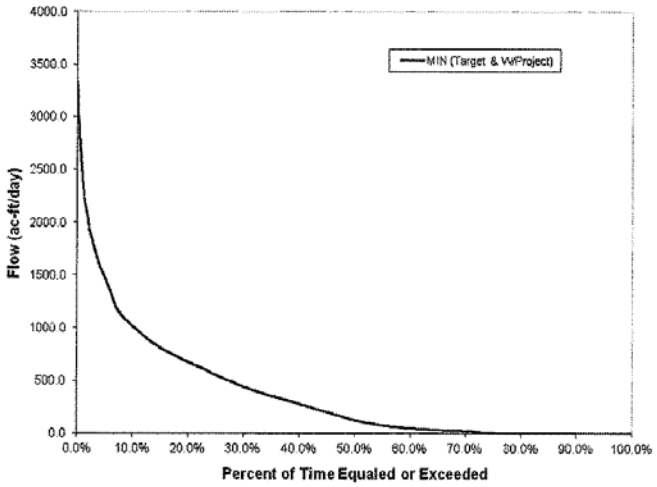


Figure 1-11.A Simulated Surface Water Deliveries to Fakahatchee Bay From Fakahatchee Strand
Volume Probability Curve – 1988 Through 2000



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 1-11.B Simulated Surface Water Deliveries to Fakahatchee Bay from Fakahatchee Strand
Wet Season Volume Probability Curve (June 1- Oct 31)

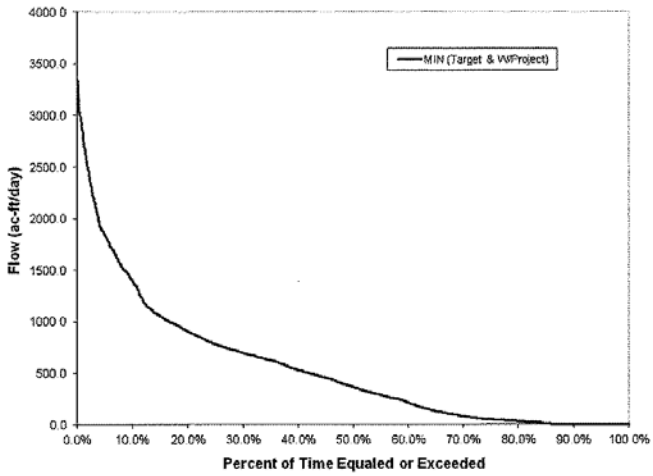
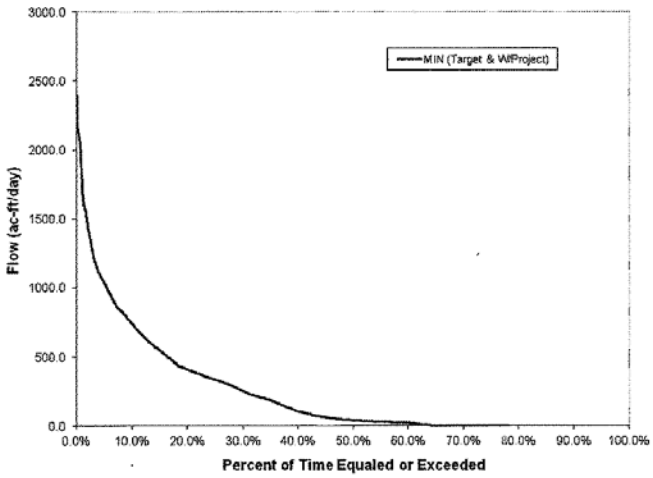


Figure 1-11.C Simulated Surface Water Deliveries to Fakahatchee Bay from Fakahatchee Strand
Dry Season Volume Probability Curve (Nov 1 - May 31)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

1-12 LEGAL DESCRIPTION OF CALOOSAHATCHEE RIVER C-43 WEST BASIN STORAGE RESERVOIR

Caloosahatchee River
C-43 West Basin Storage Reservoir

A parcel of land lying in Sections 31, 32, 33, 34, 35, and 36, Township 43 South, Range 28 East, Section 31, Township 43 South, Range 29 East, Section 6, Township 44 South, Range 29 East, and Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12, Township 44 South Range 28 East, Hendry County Florida, being more particularly described as follows:

Beginning at the Northwest corner of the East 1/2 of said Section 31, Township 43 South, Range 28 East; Thence, S89°51'14"E, along the North line of said East 1/2 , a distance of 2,635.83 feet to the Northwest corner of said Section 32;

Thence, N89°26'04"E, along the North line of the Northwest 1/4 of Section 32, a distance of 2,650.29 feet to the North quarter corner of section 32;

Thence, N89°27'01"E, along the North line of the Northeast 1/4 of Section 32 , a distance of 2,651.17 feet to the Northwest corner of said section 33;

Thence, N89°39'17"E, along the North line of the Northwest 1/4 of Section 33, a distance of 2,644.00 feet to the North 1/4 corner of Section 33;

Thence, N89°40'58"E, along the North line of the Northeast 1/4 of Section 33, a distance of 2,644.65 feet to the Northwest corner of said Section 34;

Thence, N89°24'50"E, along the North line of the Northwest 1/4 of Section 34, a distance of 2,644.35 feet to the North 1/4 corner of Section 34;

Thence, N89°25'57"E, along the North line of the Northeast 1/4 of Section 34, a distance of 2,644.21 feet to the Northwest corner of said Section 35;

Thence, N89°13'34"E, along the North line of the Northwest 1/4 of Section 35, a distance of 2,652.53 feet to the North 1/4 corner of Section 35;

Thence, N89°25'25"E, along the North line of Northeast 1/4 of Section 35, a distance of 2,650.20 feet to the Northwest corner of said Section 36;

Thence, N89°39'37"E, along the North line of the Northwest 1/4 of Section 36, a distance of 2,642.30 feet to the North 1/4 corner of Section 36;

Thence, N89°39'50"E, along the North line of the Northeast 1/4 of Section 36, a distance of 1,436.88 feet to an East corner of the Berry land as described in Official Record Book 605, page 1149, public records of Hendry County;

Thence , continue N 89°39'50"E, along said North line 1205.97 feet to the Northwest corner of said Section 31, Township 43 South, Range 29 East;

Thence, N89°39'59"E, along the North line of said Section 31, Township 43 South, Range 29 East for 1878.01 feet to an intersection with a line parallel with and 1,877.97 feet Easterly of, as measured perpendicular to the West line of said Section 31, Township 43 South, Range 29 East;

Thence, S00°09'39"E, along said parallel line for 5298.32 feet to an intersection with a line parallel with and 1877.97 feet Easterly of, as measured perpendicular to the West line of said Section 6, Township 44 South, Range 29 East;

Thence, S00°13'51"E, along said parallel line for 5241.63 feet to an intersection with the South line of the Southwest quarter of said Section 6, Township 44 South, Range 29 East;

Thence, N89°53'18”W, along said South line for 1878.00 feet to the Southwest corner of said Section 6 also being the Northeast corner of said Section 12, Township 44 South, Range 28 East;

Thence, S00°33'18"E, along the East line of Section 12, a distance of 5,310.64 feet to the Southeast corner of Section 12;

Thence, S89°30'12”W, along the South line of the Southeast 1/4 of Section 12, a distance of 2,634.72 feet to the South 1/4 corner;

Thence, S89°09'14”W, along the South line of the Southwest 1/4, a distance of 2,632.48 feet to the Southeast corner of said Section 11;

Thence, S87°42'48”W, along the South line of the Southeast 1/4 of Section 11, a distance of 2,640.48 feet to the South 1/4 corner of section 11;

Thence, S87°51'34”W, along the South line of the Southwest 1/4 of Section 11, a distance of 2,641.90 feet to the Southeast corner of said Section 10;

Thence, N89°40'57”W, along the South line of the Southeast 1/4 of Section 10 , a distance of 2,643.20 feet to the South 1/4 corner of Section 10;

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Thence, N89°41'44"W, along the South line of the Southwest 1/4 of Section 10, a distance of 2,643.59 feet to the Southeast corner of said Section 9;
Thence, N89°47'36"W, along the South line of the Southeast 1/4 of Section 9, a distance of 2,654.46 feet to the South 1/4 corner of Section 9;
Thence, N89°47'39"W, along the South line of the Southwest 1/4 of Section 9, a distance of 2,201.47 feet to a point of curvature with the arc of a circular curve to the right having a radius of 459.30 feet and a central angle of 89°13'48"; thence Northwesterly along the arc of said curve, for 715.29 feet to a point of tangency on the West line of Section 9;
Thence, N00°34'21"W, along the West line of Section 9, a distance of 2,230.83 feet to an intersection with a line being 50 feet Northerly of, as measured at right angles and parallel with the South line of the North 1/2 of said Section 8;
Thence, N89°52'19"W, along said parallel line, a distance of 5,287.36 feet;
Thence, N44°21'33"W, a distance of 2,971.24 feet;
Thence, N32°48'36"W, a distance of 535.22 feet to an intersection with a line being 300 feet Easterly of, as measured at right angles and parallel to the West line of the East 1/2 of Section 6, Township 44 South, Range 28 East;
Thence, S89°40'57"W, along the South line of section 6, Township 44 South, Range 28 East, a distance of 300.00 feet to the West line of the East 1/2 ;
Thence, N00°21'09"W, along said West line, a distance of 5,287.40 feet to the South 1/4 corner of said Section 31;
Thence, N00°21'57"W, along the West line of the East 1/2 of Section 31, a distance of 5,275.89 feet to the Point of Beginning.

Figure 1-13. Caloosahatchee River (C-43) West Basin Storage Reservoir Project Location

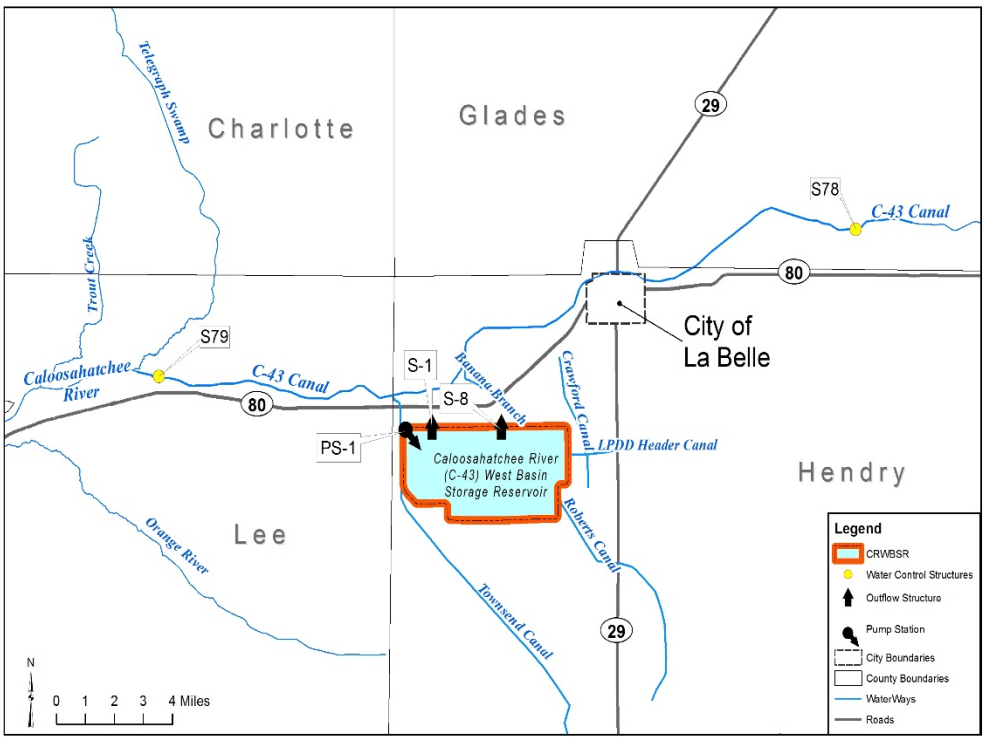


Figure 1-13. Caloosahatchee River (C-43) West Basin Storage Reservoir (CRWBSR) Project Location

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

APPENDIX 2 UPPER EAST COAST PLANNING AREA

2-1 Upper East Coast Reservation Water Bodies

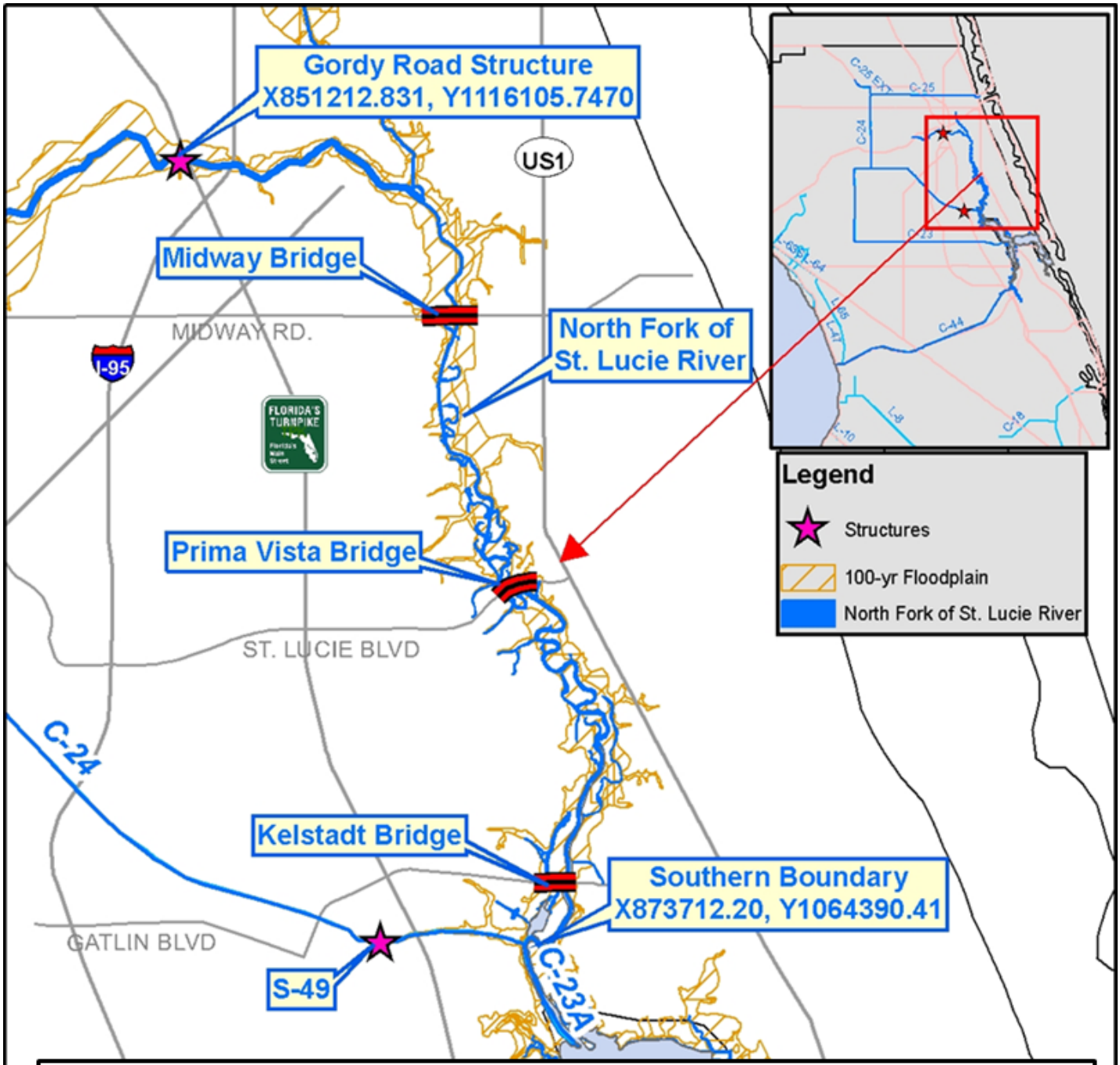
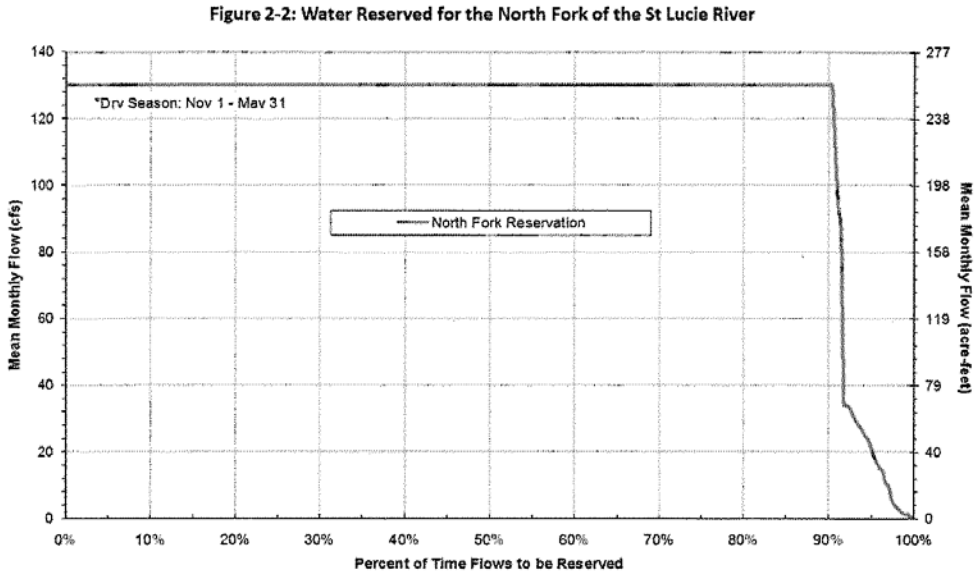


Figure 2-1: North Fork of the St. Lucie River Reservation Waterbody

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

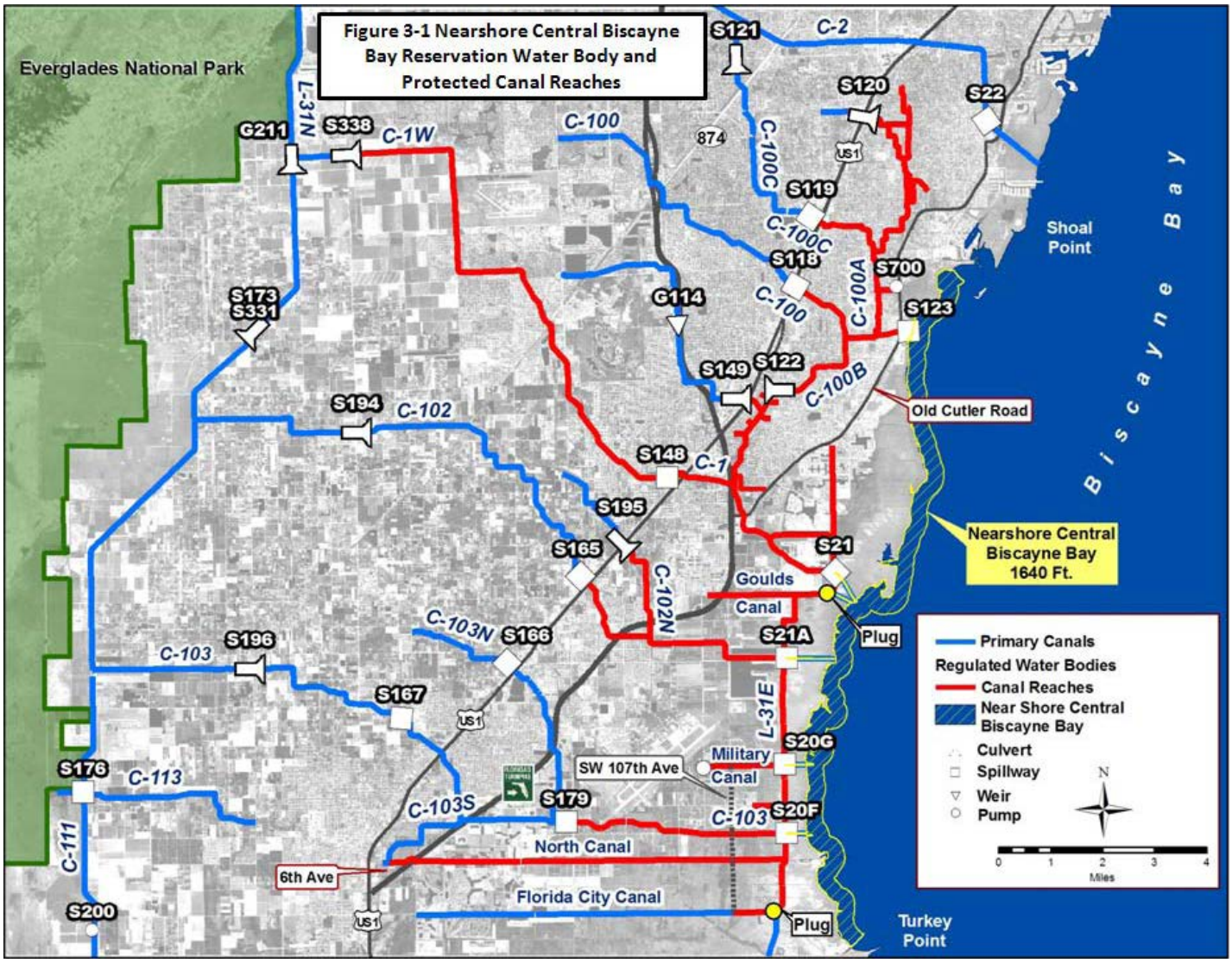
Figure 2-2: Water Reserved for the North Fork of the St Lucie River



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

APPENDIX 3: LOWER EAST COAST PLANNING AREA

Figure 3-1 Nearshore Central Biscayne Bay Reservation Water Body and Protected Canal Reaches



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 3-2.A Surface Water Flow from the C-100 canal through S-123 into Biscayne Bay during the Wet Season (June-October) (1986-2011)

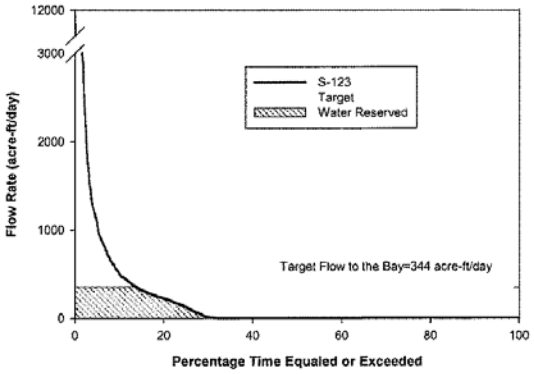
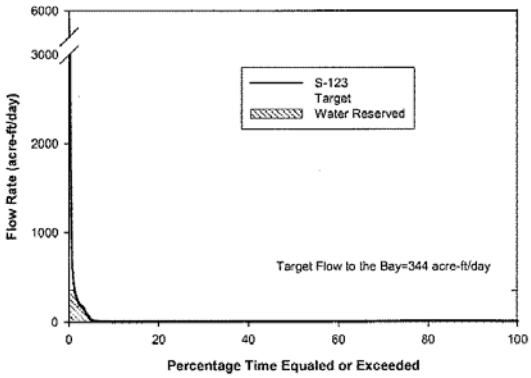


Figure 3-2.B Surface Water Flow from the C-100 canal through S-123 into Biscayne Bay during the Dry Season (November-May) (1986-2011)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 3-3.A Surface Water Flow from the C-1 canal through S-21 into Biscayne Bay during the Wet Season (June-October) (1986-2011)

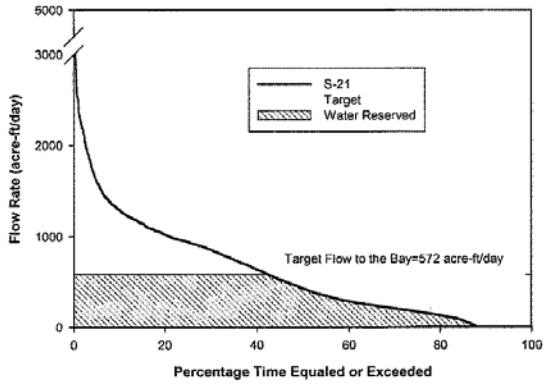
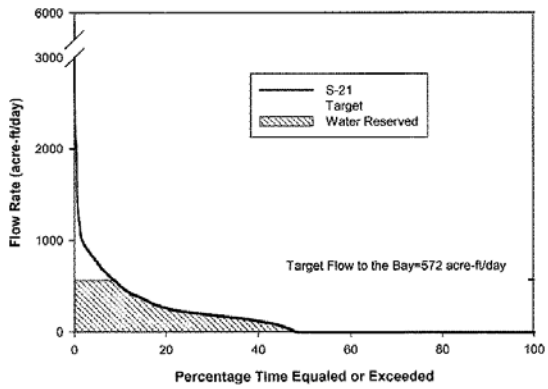


Figure 3-3.B Surface Water Flow from the C-1 canal through S-21 into Biscayne Bay during the Dry Season (November-May) (1986-2011)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Figure 3-4.A Surface Water Flow from the C-102+Military+C-103 Canal through S-21A+S-20G+S-20F into Biscayne Bay during the Wet Season (June-October) (1986-2011)

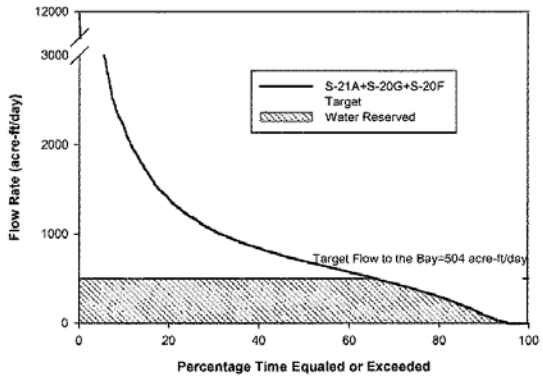
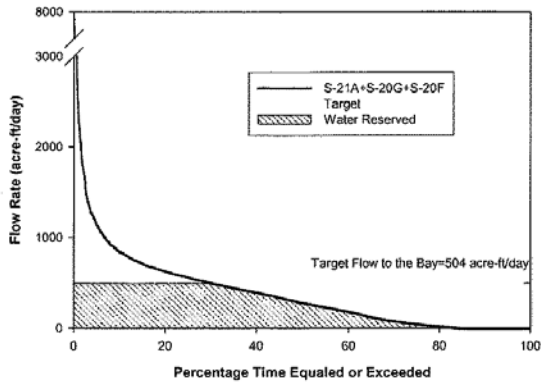


Figure 3-4.B Surface Water Flow from the C-102+Military+C-103 Canal through S-21A+S-20G+S-20F into Biscayne Bay during the Dry Season (November-May) (1986-2011)



Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

August 27, 2014

Mr. Blake Guillory, P.E.
Executive Director
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33416-4680

Re: Request for Emergency Authorization
Of Temporary Water Withdrawal from Excess Stormwater from L-31E Canal
Florida Power & Light Company
Turkey Point Plant

Dear Mr. Guillory:

Florida Power & Light Company (FPL) is requesting emergency temporary authorization from the South Florida Water Management District (SFWMD) to access the District's right of way, connect to the L-31E, canal, and withdraw excess stormwater (above the 254 cubic feet per second (cfs), required for the CERP Biscayne Bay Coastal Wetlands restoration project) from the L-31E canal north of the Turkey Point Plant to aid in reducing temperature and salinity in the Cooling Canal System (CCS). This CCS is integral to power generation at Turkey Point. The CCS works as a heat exchange for Turkey Point Power Plant Units 1, 3 & 4 cooling the units during the power generation process. As described below this excess stormwater is important for the continued reliable operation of Turkey Point Power Plant. FPL has more than 2 million customer accounts in Miami-Dade and Broward Counties and Turkey Point provides electricity supporting the region. The temporary water withdrawal is not expected to have adverse effects to vegetation, wildlife within the canal system, adjacent lands, L-31E canal, Biscayne Bay or the model lands. The following provides background information supporting this request.

Turkey Point Power Plant Units 3 & 4 operate under a license from the Nuclear Regulatory Commission (NRC). The original operating license included a requirement that the maximum allowed CCS water temperature on the intake or inlet side of Units 3 & 4 cannot exceed 100°F. As described below, during July 2014, numerous factors contributed to higher-than-usual inlet temperatures in the CCS that approached 100°F. Also, during July-August intake temperatures approached 102°F (Attachment A). As a result of engineering analysis demonstrating that the plant could safely operate with the water temperature exceeding 100°F, FPL requested and received temporary approval from the NRC to temporarily deviate from the water temperature requirement as it pursued a permanent change to the plant's operating license. In parallel, FPL submitted and received (August 8, 2014) approval for a License Amendment Request (LAR) that permanently increases the CCS intake water temperature limit from 100°F to 104°F. Should the 104°F temperature limit be exceeded and certain conditions met, the plant's current license requires Turkey Point Units 3 & 4 to commence shut down within 12 hrs, which could impact grid reliability. Although FPL received a License Amendment from the NRC to increase the intake temperature limit in the CCS, the inlet temperature still continues to be high (>100°F during afternoon peaks). The persisting factors that are resulting in the high water temperatures are described below. Our analysis supports that the addition of excess stormwater from the L-31E canal will add much needed water to the CCS, reducing the salinity, increasing the thermal efficiency of the CCS and ultimately reducing temperature. As a result of the temperature increases in the CCS, the Units, at times, have had to operate at capacities lower than 100%.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

The continued temperature increase can be attributed to the lack of rain and cloud cover over the past several weeks, as well as the on-going algae, salinity conditions, and multiple days of record breaking electricity demand. During spring and summer 2014, low rainfall and high evaporation are important factors that have increased temperature and salinity in the canals. For example, annual rainfall at Turkey Point is typically between 50-75 inches. In 2013, rainfall accumulation was less than 20 inches at the cooling canals, and, as of the end of May 2014 there had been less than 3 inches at the rain station within the canals. Although we have seen more rain in June and July, overall rainfall has remained low (less than 26 inches compared 40 inches at the Miami Airport during the same timeframe) at Turkey Point. This rainfall shortage and the high evaporation (average 34 MGD) and losses to groundwater (average 12 MGD) have resulted in more water leaving from the system than is being provided from the aquifer or rainfall and ultimately concentrating the salinity in the water.

These conditions have also allowed an algal bloom to persist and it is further affecting operations. Our analysis has shown that the higher than normal salinity is a driving factor affecting the canal conditions and our ability to manage the canals we did historically. Currently, the salinity in the CCS is approximately 90 ppt, compared to historic levels of approximately 60 ppt. Effective treatment of the algae will require the salinity to be reduced to bring the dead algae out of suspension, which is also necessary to reduce CCS temperature and, thereby, restore the heat exchange capacity of the canals. For these reasons, there is an immediate temporary need for additional water for the cooling canals. Excess stormwater in the L-31E canal is the best temporary opportunity to reduce the temperature and salinity in the cooling canals and help to offset the high evaporation rate. In addition to the temporary request for excess stormwater from the L-31E canal, FPL requests right of way access to allow for the placement of pipes and pumps to withdrawal and distribute water from the L-31E canal into the CCS and temporary impacts to wetlands.

The project will require 0.33 acres of temporary wetland and surface water impacts - no permanent wetland fill is proposed with this project. Within wetland areas, the pipes are proposed to be installed upon the surface of the substrate without trenching. An excavator will be used to pull pipe segments into place; the excavator will be located upon existing upland access roadways or upon temporary construction matting to minimize wetland impacts (0.05 acres). Please refer to Attachment B for wetland impact drawings. Temporary wetland and surface water impacts will be restored upon completion of the project. In addition to in-situ restoration of temporary impacts, FPL will also purchase 0.18 mangrove mitigation credits from the Everglades Mitigation Bank, equivalent to the amount of functional loss required if the proposed impacts were permanent.

Attached are plans that depict the proposed layout of the system to withdrawal excess stormwater from the L-31E canal (Attachment C). The maximum amount we anticipate temporarily withdrawing is 100MGD, if available. We request authorization to pump 24 hours a day, if the water is available, and at variable rates determined by the SFWMD as based on flow rates at S-20F. We will coordinate with the SFWMD Homestead Field Station and SFWMD's Operations Control Room on a continual basis throughout this temporary operation. Please see Attachment D for the pumping description and expected District requirements. Finally, FPL will receive all appropriate authorizations from Army Corps of Engineers, Florida Department of Environmental Protection (FDEP) and Miami-Dade County.

If you have any questions, please contact me at 561-691-2808 or Stacy Foster at 561-691-7065.

Sincerely,
Florida Power & Light Company

Matthew J. Raffenberg
Director, Environmental Licensing and Permitting

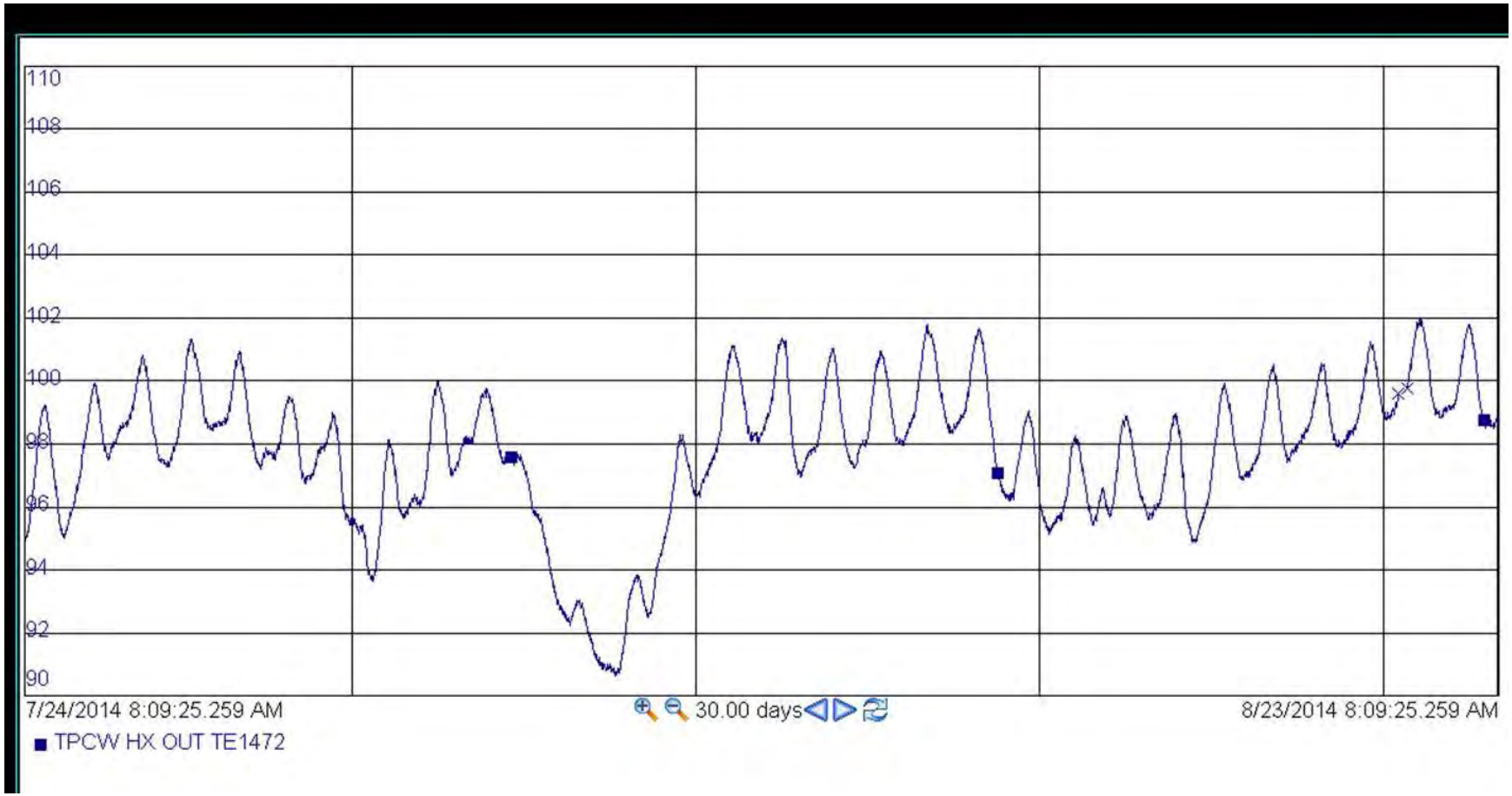
Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Cc: Lennart Lindahl, SFWMD
Terrie Bates, SFWMD

Attachment A

Turkey Point Intake Temperature

July 24, 2014 – August 23, 2014



Temperature (Degree Fahrenheit)

Attachment B

LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
- Area of Temporary Wetland Impact

TABLE 1 - TEMPORARY WETLAND IMPACT ACREAGE[1]

Wetland ID	Habitat Type	Acreage
B	6411 - Sawgrass Marshes	0.04
HW	510 - Canal	0.04
O	510 - Canal	0.02
P	612 - Mangrove Swamps	0.11
R	510 - Canal	0.04
	612 - Mangrove Swamps	0.05
	Grand Total	**0.30**

NOTES

[1]SEE ATTACHED SHEETS FOR DETAILS

REFERENCE

PIPELINE ROUTE, TAYLOR ENGINEERING INC., 2014

600 300 0 600

1:7,200 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL AUGMENTATION PIPELINE

TITLE
PROJECT OVERVIEW MAP

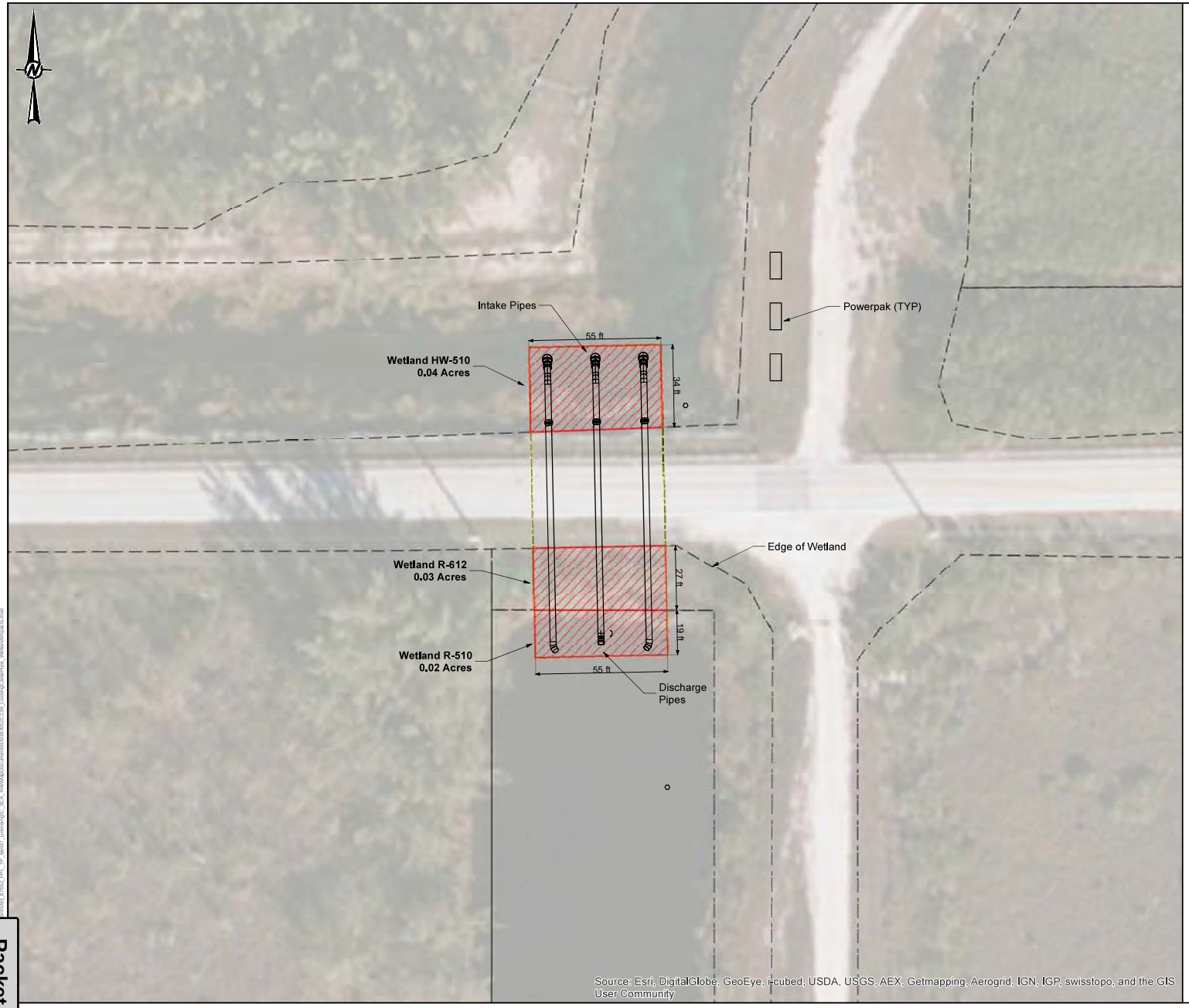
CONSULTANT

Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	KAB

PROJECT No.	CONTROL	Rev.	FIGURE
09387652	C134	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
- Area of Temporary Disturbance
- Limits of Temporary Construction Matting
- Area of Temporary Wetland Impact

TABLE 1 - TEMPORARY WETLAND ACREAGE

Wetland ID	Habitat Type	Acreage
B	6411 - Sawgrass Marshes	0.04
HW	510 - Canal	0.04
O	510 - Canal	0.02
P	612 - Mangrove Swamps	0.11
R	510 - Canal	0.04
	612 - Mangrove Swamps	0.05
	Grand Total	**0.30**

REFERENCE

PIPELINE ROUTE AND EQUIPMENT DETAIL, TAYLOR ENGINEERING INC., 2014
TEMPORARY WETLAND IMPACTS, GOLDER ASSOCIATES INC., 2014

40 20 0 40
1:480 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL
AUGMENTATION PIPELINE

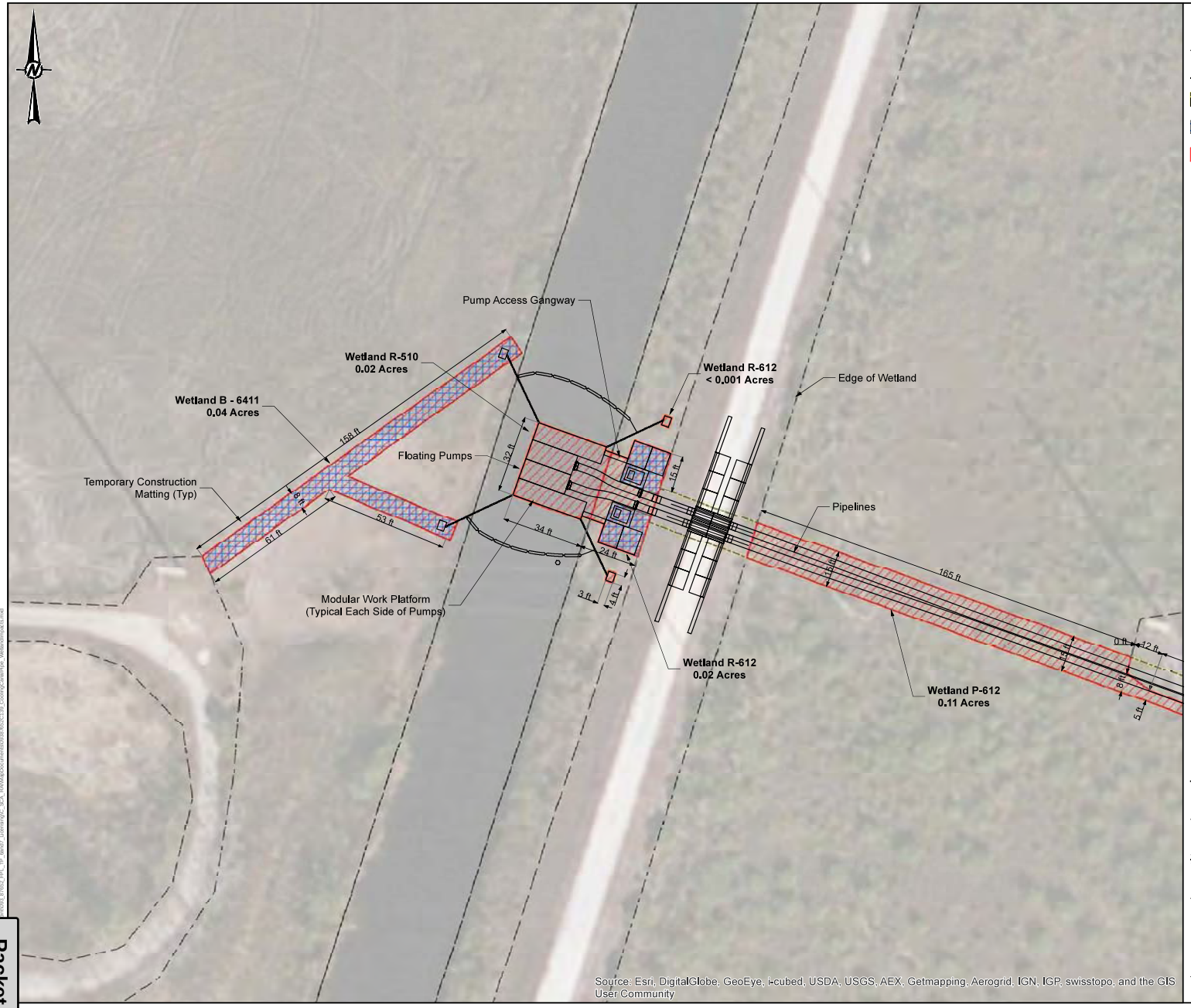
TITLE
INTAKE SYSTEM
TEMPORARY WETLAND IMPACTS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	KAB

PROJECT No.	CONTROL	Rev.	FIGURE
09387652	C139	0	

IF THE MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN CHANGED FROM ANSI B



LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
- Area of Temporary Disturbance
- Limits of Temporary Construction Matting
- Area of Temporary Wetland Impact

TABLE 1 - TEMPORARY WETLAND ACREAGE

Wetland ID	Habitat Type	Acreage
B	6411 - Sawgrass Marshes	0.04
HW	510 - Canal	0.04
O	510 - Canal	0.02
P	612 - Mangrove Swamps	0.11
R	510 - Canal	0.04
	612 - Mangrove Swamps	0.05
	Grand Total	**0.30**

REFERENCE

PIPELINE ROUTE AND EQUIPMENT DETAIL, TAYLOR ENGINEERING INC., 2014
TEMPORARY WETLAND IMPACTS, GOLDER ASSOCIATES INC., 2014

40 20 0 40
1:480 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL
AUGMENTATION PIPELINE

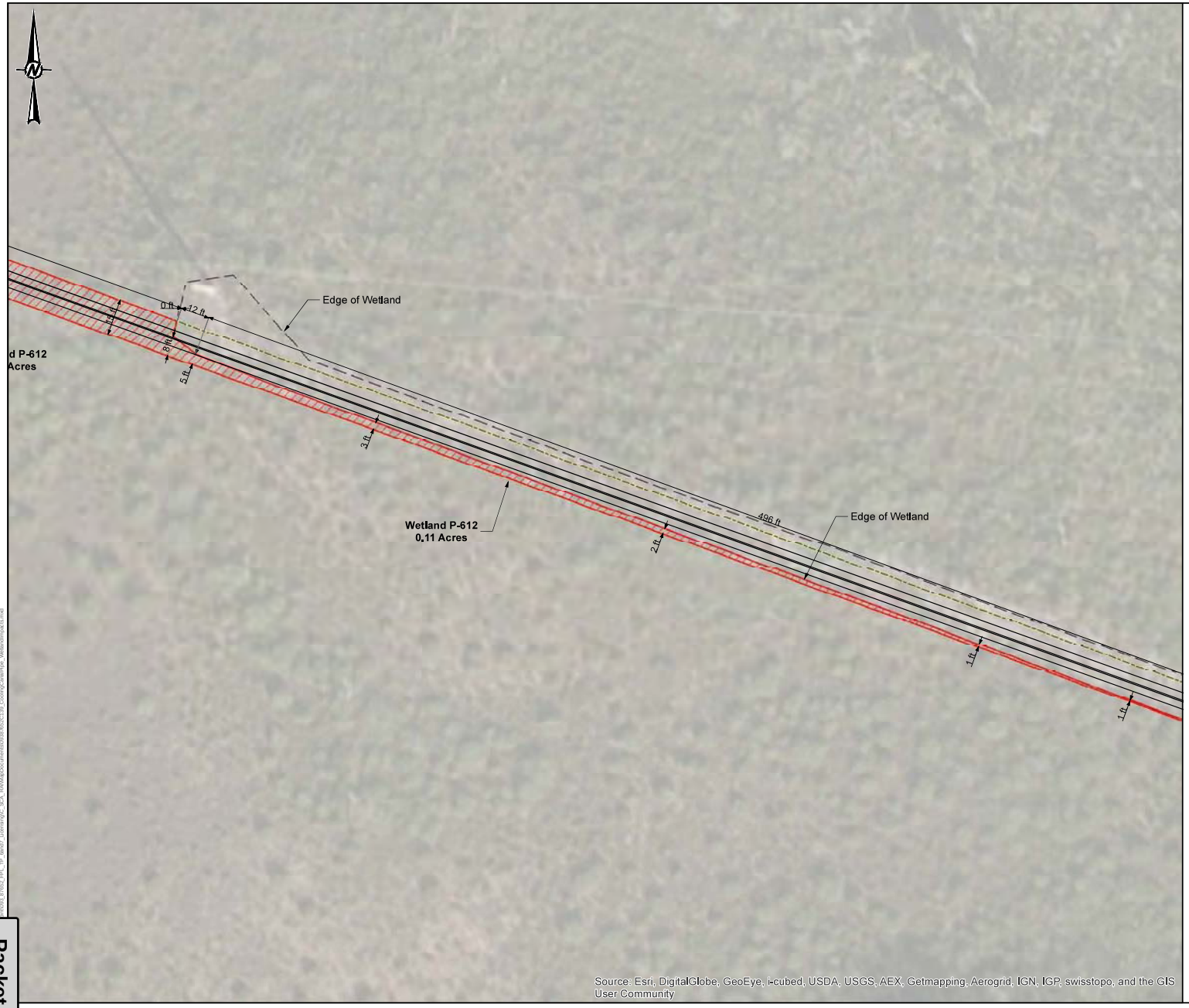
TITLE
DISCHARGE SYSTEM
TEMPORARY WETLAND IMPACTS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	KAB

PROJECT No. 09387652 CONTROL C139 Rev. 0 FIGURE

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
- Area of Temporary Disturbance
- Limits of Temporary Construction Matting
- Area of Temporary Wetland Impact

TABLE 1 - TEMPORARY WETLAND ACREAGE

Wetland ID	Habitat Type	Acreage
B	6411 - Sawgrass Marshes	0.04
HW	510 - Canal	0.04
O	510 - Canal	0.02
P	612 - Mangrove Swamps	0.11
R	510 - Canal	0.04
	612 - Mangrove Swamps	0.05
	Grand Total	**0.30**

REFERENCE

PIPELINE ROUTE AND EQUIPMENT DETAIL, TAYLOR ENGINEERING INC., 2014
TEMPORARY WETLAND IMPACTS, GOLDER ASSOCIATES INC., 2014

40 20 0 40
1:480 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL
AUGMENTATION PIPELINE

TITLE
DISCHARGE SYSTEM
TEMPORARY WETLAND IMPACTS

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
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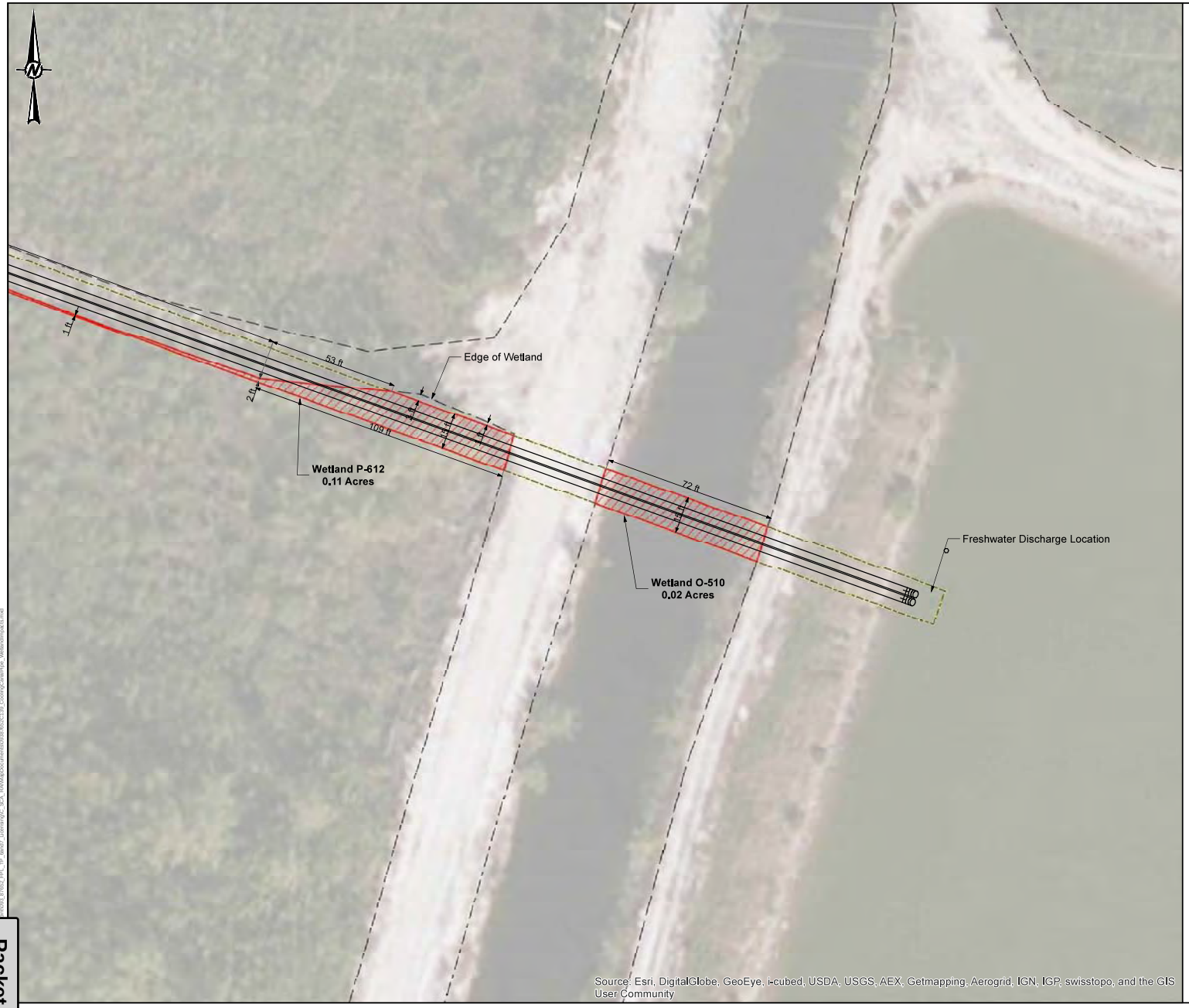
APPROVED	KAB

PROJECT No.	CONTROL	Rev.	FIGURE
09387652	C139	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
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	612 - Mangrove Swamps	0.05
	Grand Total	**0.30**

REFERENCE

PIPELINE ROUTE AND EQUIPMENT DETAIL, TAYLOR ENGINEERING INC., 2014
TEMPORARY WETLAND IMPACTS, GOLDER ASSOCIATES INC., 2014

40 20 0 40
1:480 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL
AUGMENTATION PIPELINE

TITLE
DISCHARGE SYSTEM
TEMPORARY WETLAND IMPACTS

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	KAB

PROJECT No.	CONTROL	Rev.	FIGURE
09387652	C139	0	

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

LEGEND

- Temporary Cooling Canal Augmentation Pipeline & Equipment
- Wetland Line
- American Crocodile Critical Habitat (USFWS)

REFERENCE

PIPELINE ROUTE, TAYLOR ENGINEERING INC., 2014
AMERICAN CROCODILE CRITICAL HABITAT, USFWS, 2003

800 400 0 800

1:9,600 FEET

CLIENT
FPL

PROJECT
TEMPORARY COOLING CANAL
AUGMENTATION PIPELINE

TITLE
PROPOSED PIPELINE ROUTE AND AMERICAN CROCODILE CRITICAL HABITAT

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-08-27
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	KAB

PROJECT No.	CONTROL	Rev.	FIGURE
09387652	C135	0	

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Attachment C

FPL TURKEY POINT COOLING CANAL FRESHWATER RECHARGE

MIAMI-DADE COUNTY, FLORIDA

PROJECT LOCATION

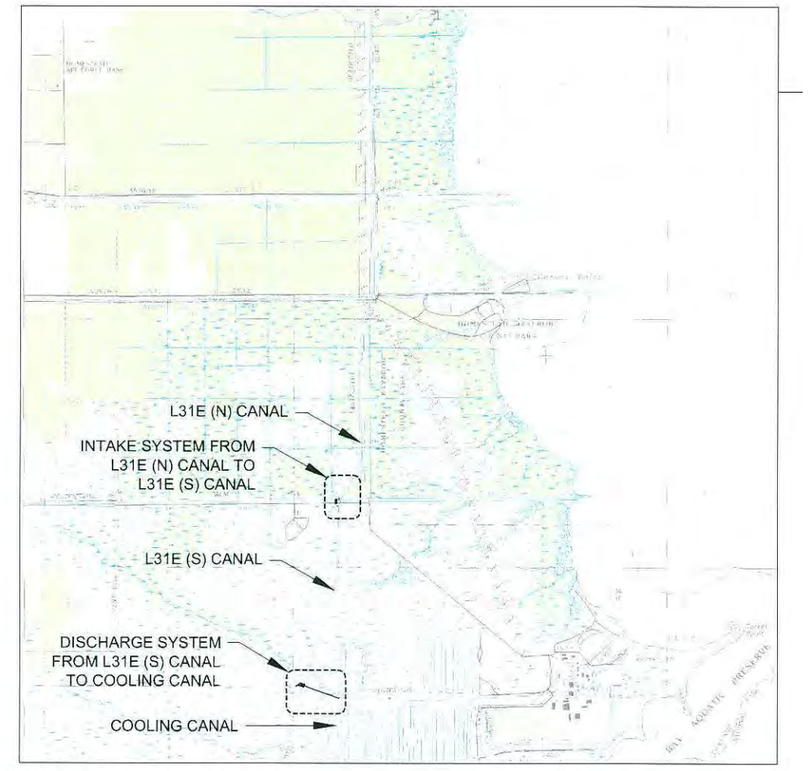
LOCATION MAP

N.T.S.

FPL

DRAWING INDEX

C-1	COVER SHEET
C-2	CONSTRUCTION NOTES
C-3	PROJECT OVERVIEW
C-4	INTAKE SYSTEM SITE PLAN
C-5	INTAKE SYSTEM PUMP AND UNDER ROAD CROSSING
C-6	DISCHARGE SYSTEM SITE PLAN
C-7	DISCHARGE SYSTEM PUMP AND LEVEE CROSSING
C-8	DISCHARGE SYSTEM PROFILES
C-9	DISCHARGE SYSTEM PIPE CROSSING OVER INTERCEPTOR CANAL
C-10	PIPE BRIDGE PLAN AND ELEVATION
C-11	DETAILS
C-12	EROSION CONTROL DETAILS



VICINITY MAP

1"= 2000' (22x34)
1"= 4000' (11x17)

REFERENCE:
USGS 7.5' QUADRANGLE MAP,
ARSENICKER KEYS, FLORIDA 1988

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1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-7310
CERTIFICATE OF AUTHORIZATION # 4815

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

PROJECT TITLE

FPL TURKEY POINT COOLING CANAL FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

PROJECT NO	C2014-066
DATE	08-27-2014

SEAL
JONATHAN T. ARMBRUSTER
LICENSE No. 57959
STATE OF FLORIDA
PROFESSIONAL ENGINEER
8-27-2014
JONATHAN T. ARMBRUSTER P.E. # 57959

C-1

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

PUMPING DESCRIPTION, MONITORING, AND CONTROL PLAN

1. BRIDGE OVER PIPES ON LEVEE WITH CONCRETE BOX CULVERT DESIGN AND SOIL RAMPS. NO MODIFICATION TO THE DAM WILL BE REQUIRED.
2. A PRE-CONSTRUCTION SURVEY OF THE DAM CREST WILL BE PERFORMED BEFORE BRIDGE INSTALLATION AND DAM CREST WILL BE RESTORED TO AS GOOD AS OR BETTER CONDITION WHEN THE BRIDGE IS REMOVED.
3. PRIOR TO COMMENCEMENT OF CONSTRUCTION WITHIN ANY SOUTH FLORIDA WATER MANAGEMENT DISTRICT (THE DISTRICT) RIGHT OF WAY (ROW), FPL SHALL CONTACT THE DISTRICT'S FIELD REPRESENTATIVE AT THE HOMESTEAD FIELD STATION TO SCHEDULE A PRE-CONSTRUCTION MEETING AND FINAL INSPECTION.
4. FPL SHALL COMPLY WITH THE FOLLOWING ROW CONDITIONS;
   - A. ALL EQUIPMENT SHALL BE SKID MOUNTED OR LIE ABOVE GROUND AND BE CAPABLE OF BEING REMOVED FROM THE DISTRICT'S ROW WITHIN 24 HOURS OF THE DISTRICT'S REQUEST TO DO SO.
   - B. THE HDPE PIPES BURIED UNDER 344TH AVE SHALL BE BLANKED AT THE NORTH END, BUT LEFT IN PLACE, IN THE EVENT OF DISTRICT NOTIFICATION TO REMOVE EQUIPMENT.
   - C. THE HDPE PIPES BETWEEN THE L-31E CANAL AND THE SOUTH PUMPING STATION SHALL BE BLANKED AT THE CANAL END, BUT LEFT IN PLACE, IN THE EVENT OF DISTRICT NOTIFICATION TO REMOVE EQUIPMENT WITHIN 24 HOURS. THESE PIPES SHALL BE CAPABLE OF BEING REMOVED FROM THE DISTRICT'S ROW WITHIN 30 DAYS OF THE DISTRICT'S REQUEST TO DO SO.
   - D. ALL DISTRICT ROWS SHALL REMAIN IN A CONDITION TO ALLOW ACCESS FOR DISTRICT'S NORMAL AND EMERGENCY USE AT ALL TIMES.
5. FPL'S MONITORING AND CONTROL PLAN FOR PUMPING OPERATIONS SHALL COMPLY WITH THE FOLLOWING CONSTRAINTS:
   - A. THE PUMPS AT THE L-31E WITHDRAWAL LOCATION NORTH OF 344TH AVE (THE NORTH STATION) SHALL BE MANNED CONTINUOUSLY DURING PUMPING OPERATIONS.
   - B. THE PUMPS AT THE SOUTHERN WITHDRAWAL LOCATION (APPROXIMATELY ONE MILE SOUTH OF 344TH AVE) SHALL BE MANNED CONTINUOUSLY.
   - C. PERSONNEL AT BOTH PUMP LOCATIONS WILL BE PROVIDED CONTACT INFORMATION, MEANS OF COMMUNICATION, AND TRAINING TO UTILIZE THE EMERGENCY RESPONSE TEAM AT THE TURKEY POINT FACILITY.
   - D. THE PUMPS AT THE SOUTHERN WITHDRAWAL LOCATION SHALL BE INSTALLED, MANNED AND OPERATED BY TRAINED PERSONNEL FROM THE PUMP SUPPLIER.
   - E. EACH DAY PRIOR TO 10AM, THE FPL OPERATORS SHALL CONTACT THE DISTRICT'S OPERATION CONTROL CENTER, VIA EMAIL, TO DETERMINE THE RATE AND VOLUME OF FPL WITHDRAWALS FOR THE 24-HOUR PERIOD FROM 10AM TO 9:59AM THE FOLLOWING CALENDAR DAY.
   - F. FPL SHALL MONITOR PUMP STARTS AND PUMP STOPS AT BOTH PUMPING LOCATIONS (NORTH STATION AND SOUTH STATION). FPL SHALL ALSO MONITOR AND DATA LOG FLOW RATES OF THE L-31E WATER PUMPED AT BOTH LOCATIONS.
   - G. FPL SHALL GENERATE A WEEKLY REPORT, DELIVERED VIA EMAIL BY NOON TUESDAY, WHICH REPORTS THE FOLLOWING TO THE DISTRICT FOR THE PRECEDING WEEK:
     - a. ID OF PUMPS THAT RAN
     - b. ON AND OFF TIMES FOR EACH PUMP
     - c. RPM SETTING, PER PUMP, IF VARIABLE
     - d. CALCULATED VOLUME OF WATER PER PUMP
     - e. LOGGED FLOWS AT EACH PUMP STATION, FROM TOTALIZING HOUR FLOW METERS.
     - f. THE OFFICIAL TUESDAY REPORTS SHALL BE SENT FROM MATTHEW.RAFFENBERG@FPL.COM (OR DELEGATE) TO BOTH LLINDAHL@SFWMD.GOV AND TO TBATES@SFWMD.GOV (OR THEIR DELEGATES).
   - H. FPL SHALL BE CAPABLE OF SUPPLYING THE ABOVE DATA UPON REQUEST AT ANY TIME BETWEEN TUESDAY REPORTS, WITHIN 2 HOURS OF THE DISTRICT'S REQUEST.
   - I. FPL SHALL BE CAPABLE OF TERMINATING ALL PUMPING AT ANY TIME, WITHIN 2 HOURS AN EMAILED REQUEST FROM EITHER DISTRICT PARTY IDENTIFIED IN 5.G.F.
   - J. EACH PUMP SHALL BE OPERATED BY TRAINED PUMP OPERATORS WHICH WILL BE ON SITE 24 HOURS PER DAY DURING OPERATION. THE PUMP OPERATORS WILL HAVE WIRELESS COMMUNICATION TO PROVIDE IMMEDIATE RESPONSE IF REQUIRED AND THIS SHALL BE VERIFIED AS OPERABLE PRIOR TO PUMPING.
   - K. FPL SHALL WIRELESSLY COORDINATE THE PUMPING AT BOTH STATIONS TO ASSURE THAT:
     - a. FROM A NON-FLOW CONDITION, THE NORTH STATION PUMPS SHALL BE STARTED FIRST.
     - b. FROM A FLOW CONDITION, THE SOUTH STATION PUMPS SHALL BE STOPPED FIRST.
     - c. SOUTH STATION PUMPS SHALL BE STARTED AFTER 5 MINUTES OR MORE OF NORTH STATION PUMPS' STARTS, WITH EQUIVALENT FLOW MAINTAINED AT BOTH STATIONS DURING OPERATION.
     - d. NORTH STATION PUMPS SHALL BE STOPPED AFTER 5 MINUTES OR MORE FOLLOWING SOUTH STATION PUMPS' STOPS.
     - e. FPL SHALL PROVIDE THE PUMP CURVES USED TO DETERMINE DISCHARGE RATES TO THE DISTRICT, FOR EACH PUMP, PRIOR TO THEIR OPERATION.
     - f. FPL SHALL MONITOR THE CANAL WATER LEVEL UTILIZING STAFF GAUGES TO ASSURE THAT UNDER NO CONDITIONS, THE WATER LEVEL IN THE SOUTH END OF THE L-31E CANAL IS LOWER THAN THE POINT AT WHICH THE PUMPS ARE FIRST STARTED. CONTROL OF THE PUMP OUTPUT TO GUARANTEE THIS WILL INCLUDE SHUTTING ONE OR BOTH SOUTH PUMPS DOWN AND/OR THROTTLING THE PUMPS BACK TO MATCH FLOWS.
   - L. FPL SHALL ENSURE THAT THE TOTALIZING HOUR FLOW METERS USED AT EACH PUMP STATION ARE AVAILABLE FOR PERIODIC DISTRICT INSPECTION AND VERIFICATION.
6. SPILL PREVENTION
   - A. ALL EQUIPMENT WILL BE BERMED IN ACCORDANCE WITH FPL STANDARD PROCEDURES FOR SPILL PREVENTION AND CONTROL
   - B. ALL EQUIPMENT, HOSES, AND TANKS SHALL BE DESIGNED FOR USE ON OR NEAR WATER. CONDITION CHECKS OF ALL FLUID CONTAINING DEVICES SHALL BE MONITORED CONTINUOUSLY AS A PART OF THE 24 HOUR PUMP COVERAGE.
   - C. HYDRAULIC HOSES USED ON THE PUMPS NORTH OF 344TH AVE SHALL BE INSTALLED ACCORDING TO MANUFACTURES RECOMMENDATIONS. THE HOSES SHALL UTILIZE THE SHORTEST PATH OUT OF THE WATER THAT IS AVAILABLE TO ASSURE GOOD VISIBILITY FOR MONITORING. THE HOSES SHALL BE SECURED IN PLACE TO PREVENT OVER TENSIONING AND ALLOW FOR CONTINUOUS INSPECTION.
   - D. THE HYDRAULIC PUMPS NORTH OF 344TH AVE WILL CONTAIN ONLY BIODEGRADABLE HYDRAULIC OIL DESIGNED FOR USE OVER WATER.
   - E. ALL FUEL TANKS USED FOR THE SOUTHERN PUMPS HAVE BUILT IN SECONDARY CONTAINMENT. ALL FUEL LINES WILL BE PROVIDED WITH SECONDARY CONTAINMENT.
   - F. THE PUMPS NORTH OF 344TH AVE. WILL BE FUELED TWICE PER DAY OR AS NEEDED. NO ADDITIONAL FUEL STORAGE WILL BE IN THE SFWMD RIGHT OF WAY.
   - G. THE PUMPS SOUTH OF 344TH AVE WILL BE FUELED THROUGH NURSE TANKS ON SHORE AS NEEDED. THE TRANSFER LINES BETWEEN THE PUMP AND THE NURSE TANKS WILL NOT BE CHARGED WHEN NOT IN USE.
   - H. FLOATING BOOM WILL BE STAGED ON SITE FOR IMMEDIATE DEPLOYMENT IF NEEDED. ENOUGH BOOM TO CROSS THE CANAL A MINIMUM OF TWO TIMES WILL BE PROVIDED. PUMP OPERATORS WILL BE PROVIDED EMERGENCY NUMBERS TO IMMEDIATELY DISPATCH A CLEANUP AND BOOM CREW FROM THE TURKEY POINT FACILITY.
   - I. A FIXED OIL BOOM WILL BE INSTALLED BOTH NORTH AND SOUTH OF THE FLOATING PUMPS IN THE SOUTHERN REACH.
   - J. OIL ABSORBENT BOOMS AND PADS DESIGNED TO CLEAN UP PETROLEUM SPILLS ON WATER WILL BE LOCATED ON SITE. PUMP OPERATORS WILL BE TRAINED IN THE USE OF THESE MATERIALS.
   - K. A DETECTED LEAK OF ANY PETROLEUM PRODUCTS (FUEL OR HYDRAULIC OIL) WILL RESULT IN THE IMMEDIATE SHUTDOWN OF THE PUMPS AT BOTH ENDS. THE PUMPS WILL NOT BE RESTARTED UNTIL ALL ISSUES HAVE BEEN RESOLVED AND THE EQUIPMENT CLEANED TO ALLOW FOR CONTINUOUS MONITORING.

TECHNICAL SPECIFICATIONS

DEFINITIONS

1. OWNER: FLORIDA POWER AND LIGHT (FPL).
2. ENGINEER: OWNER'S DESIGNATED REPRESENTATIVE FOR CONSTRUCTION INSPECTION AND OVERSIGHT.
3. ENGINEER OF RECORD (EOR): ENGINEER WHOSE NAME AND SEAL IS AFFIXED TO THE DRAWINGS AND SPECIFICATIONS.
4. U.N.O.: UNLESS NOTED OTHERWISE

GENERAL NOTES

1. THE CONTRACTOR SHALL INVESTIGATE THE PROJECT SITE PRIOR TO INITIATING ANY CONSTRUCTION.
2. THE CONTRACTOR SHALL FIELD VERIFY LOCATIONS OF ALL STRUCTURES AND EXISTING UTILITIES, WHETHER SHOWN OR NOT ON THE DRAWINGS.
3. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION TOGETHER WITH THE FPL PROJECT MANAGER TO ENSURE PUBLIC AND PRIVATE SAFETY IN AND AROUND THE CONSTRUCTION SITE.
4. DEMOLITION DEBRIS SHALL BE DISPOSED OF OFFSITE AT A LICENSED LANDFILL IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS.
5. THE CONTRACTOR SHALL LOCATE ALL ABOVE-GROUND AND BELOW-GROUND UTILITIES BEFORE BEGINNING WORK.

SUBMITTALS AND TESTING REQUIREMENTS

1. ALL TESTING, EITHER PRE-CONSTRUCTION OR CONSTRUCTION, AS REQUIRED HEREIN OR IN THE CONTRACT DOCUMENTS, SHALL BE PERFORMED BY AN INDEPENDENT QUALIFIED TESTING COMPANY. THE COSTS OF ALL SUCH TESTING SHALL BE BORNE BY THE CONTRACTOR AND SHALL BE INCLUDED IN THE BID PRICE..
2. THE QUALIFIED TESTING AGENCY SHALL BE APPROVED PER FDOT STANDARDS, AASHTO STANDARDS OR SIMILAR SUCH STANDARDS AS APPROVED BY THE ENGINEER. ALL TESTING WORK SHALL BE DONE UNDER THE SUPERVISION OF A PROFESSIONAL ENGINEER REGISTERED IN FLORIDA AND SHALL BE SIGNED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER REGISTERED IN FLORIDA IF REQUESTED.
3. ALL SUBMITTALS REQUIRE APPROVAL BY THE ENGINEER U.N.O.

SUBMITTAL PROCEDURES

1. BEFORE COMMENCING WORK, THE CONTRACTOR SHALL REVIEW THE SUBMITTAL REQUIREMENTS AND PROVIDE A SUBMITTAL LOG.
2. ENGINEER'S REVIEW OF SUBMITTALS DO NOT RELEASE CONTRACTOR FROM CONTRACTOR'S RESPONSIBILITY FOR PERFORMANCE OF REQUIREMENTS OF CONTRACT DOCUMENTS. NEITHER SHALL ENGINEER'S REVIEW RELEASE THE CONTRACTOR FROM FULFILLING PURPOSE OF INSTALLATION NOR FROM CONTRACTOR'S LIABILITY TO REPLACE DEFECTIVE WORK.
3. ENGINEER'S REVIEW OF SHOP DRAWINGS, SAMPLES, OR TEST PROCEDURES WILL BE ONLY FOR CONFORMANCE WITH DESIGN CONCEPTS AND FOR COMPLIANCE WITH INFORMATION GIVEN IN CONTRACT DOCUMENTS.
4. ENGINEER'S REVIEW DOES NOT EXTEND TO:
   - a. ACCURACY OF DIMENSIONS, QUANTITIES, OR PERFORMANCE OF EQUIPMENT AND SYSTEMS DESIGNED BY CONTRACTOR.
   - b. CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES EXCEPT WHEN SPECIFIED, INDICATED ON THE DRAWINGS, OR REQUIRED BY CONTRACT DOCUMENTS
   - c. SAFETY PRECAUTIONS OR PROGRAMS RELATED TO SAFETY, WHICH SHALL REMAIN THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
5. ENGINEER WILL BE ENTITLED TO RELY UPON THE ACCURACY OR COMPLETENESS OF DESIGNS, CALCULATIONS, OR CERTIFICATIONS MADE BY LICENSED PROFESSIONALS ACCOMPANYING A PARTICULAR SUBMITTAL WHETHER OR NOT A STAMP OR SEAL IS REQUIRED BY CONTRACT DOCUMENTS OR LAWS AND REGULATIONS.

HDPE PIPE AND FITTINGS

1. POLYETHYLENE PIPE AND FITTINGS SHALL BE PE4710 MATERIAL AND SHALL MEET THE SPECIFICATIONS DEFINED IN ASTM D3350 FOR A CELL CLASSIFICATION OF 445574C/E.
2. PIPE SHALL BE IPS DR 26 OR DR 21 (PER ASTM F714) AS SPECIFIED ON THE DRAWINGS AND HAVING A MINIMUM WORKING PRESSURE RATING OF 80 PSI AND 100 PSI RESPECTIVELY. PIPE SHALL HAVE A SMOOTH INTERIOR WITH A MANNING'S N OF 0.011 OR LESS.
3. FITTINGS SHALL BE OF THE SAME TYPE, GRADE, MATERIAL AND MINIMUM WALL THICKNESS AS THE PIPE.
4. FITTINGS SHALL BE IPS WITH A WORKING PRESSURE RATING EQUAL TO OR GREATER THAN THAT OF THE PIPE AND JOINTS..
5. FITTINGS SHALL COMPLY WITH ASTM D3261, F1055, OR F2206 AS APPLICABLE.
6. BACK UP RINGS SHALL BE DUCTILE IRON. BOLTS SHALL BE ASTM A307, GRADE A GALVANIZED IN ACCORDANCE WITH ASTM A153.
7. FITTINGS, FLANGES, BACKUP RINGS AND OTHER APPURTENANCES SHALL BE SIZED FOR THE MAXIMUM ANTICIPATED WORKING PRESSURE AND ANY ANTICIPATED SURGE PRESSURES BUT NOT LESS THAN CLASS B (86 PSI).
8. INSTALL PIPE AND FITTINGS ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS FOR ABOVE-GROUND INSTALLATIONS.
9. ALL PIPES SHALL BE JOINED USING HEAT FUSION IN ACCORDANCE WITH ASTM F2620. JOINTS SHALL BE BUTT FUSION WELDED, RESULTING IN A JOINT THAT IS INTEGRAL WITH THE PIPE AND AS STRONG AS THE PIPE ITSELF. WHERE BUTT FUSION WELDING IS NOT POSSIBLE PIPE SHALL BE JOINED USING EXTRUSION WELDING.
10. LAY PIPELINES TO THE GRADES (VERTICAL) AND ALIGNMENT (HORIZONTAL) INDICATED ON THE PROJECT DRAWINGS.

HDPE PIPE AND FITTINGS SUBMITTALS

1. HDPE PIPE AND FITTING MATERIAL INFORMATION: SUBMIT DOCUMENTATION DEMONSTRATING THAT THE HDPE PIPE AND ASSOCIATED FITTINGS MEET THE SPECIFICATIONS.

PUMPS AND VALVES

1. PUMPS SHALL BE SUPPLIED BY THE CONTRACTOR. THE PUMP AND PIPING SYSTEM SHALL BE CAPABLE OF CONVEYING UP TO 100 MILLION GALLONS OF WATER IN A 24 HOUR PERIOD AND CAPABLE OF OPERATING CONTINUOUSLY. PUMPS SHALL BE THE TYPE SHOWN ON THE DRAWINGS AND PLACED AT THE LOCATION SHOWN ON THE DRAWINGS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. PUMPS SHALL BE MAINTAINED AND OPERATED BY FPL/FPL CONTRACTORS.
3. UNLESS OTHERWISE APPROVED BY THE ENGINEER, PUMPS SHALL BE SUPPLIED WITH CONTROLS (A VFD OR SIMILAR DEVICE) TO CONTROL PUMP FLOW AND ALLOW FOR GRADUAL STARTUP AND SHUTDOWN.
4. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE PUMPS AGAINST DAMAGE DURING OPERATIONS. THE CONTRACTOR SHALL PROVIDE GAUGES, PRESSURE RELIEF VALVES, CHECK VALVES, AIR RELEASE VALVES, AND OTHER EQUIPMENT NECESSARY TO PROTECT THE PUMPS AND PIPING SYSTEM AGAINST DAMAGE DUE TO SURGE, CAVITATION, BACKPRESSURE, OVERPRESSURE, VACUUM PRESSURE, DEBRIS, AND OTHER CONDITIONS THAT COULD CAUSE DAMAGE TO THE PUMPS OR THE PIPING SYSTEM.
5. VALVES SHALL BE CAPABLE OF WITHSTANDING THE MAXIMUM ANTICIPATED WORKING PRESSURES AND SURGE PRESSURES. VALVES SHALL COMPLY WITH APPLICABLE ISO, AWWA, OR ASME STANDARDS.
6. THE CONTRACTOR SHALL PROVIDE TURBIDITY CURTAINS AND SCREENS AS NECESSARY TO CONTROL DEBRIS AND VEGETATION AND PREVENT FOREIGN MATERIAL FROM ENTERING THE PUMP INTAKES.

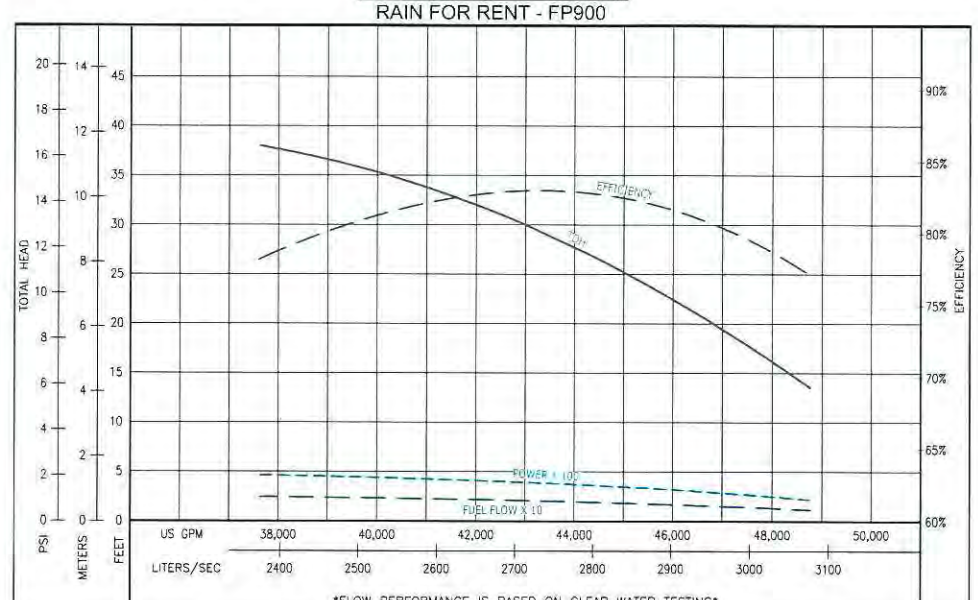
PUMP SUBMITTALS

1. SUBMIT PUMP DATA TO THE ENGINEER FOR APPROVAL.
2. SUBMIT VALVE DATA AND LOCATION PLAN TO THE ENGINEER FOR APPROVAL.
3. SUBMIT PIPE ANALYSIS UPDATED WITH ALL VALVE LOCATIONS AND DETERMINE REQUIRED PUMP HEAD AND MAXIMUM DESIGN PRESSURE FOR PIPES.
4. PUMP STARTUP AND SHUTDOWN PLAN: SUBMIT A WRITTEN PLAN DESCRIBING THE PRECAUTIONS THE CONTRACTOR WILL TAKE DURING STARTUP, PIPE FILLING, CONTROLLED SHUTDOWN, AND (IF PRACTICAL) EMERGENCY SHUTDOWN TO PREVENT SURGE, VACUUM PRESSURE, AND TRAPPED AIR IN LINE.

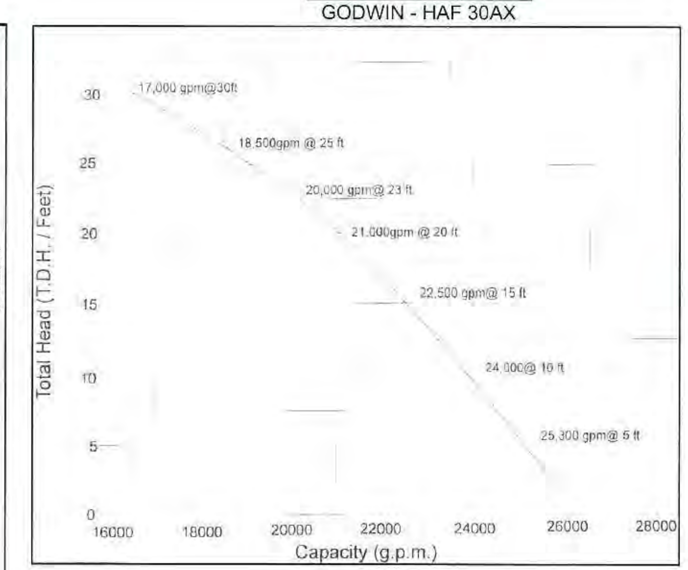
OPERATIONS

1. FPL OR FPL CONTRACTORS SHALL PROVIDE INSPECTORS AND OPERATORS 24 HOURS PER DAY TO MONITOR THE PUMPS PIPING SYSTEM, AND CONVEYANCE THROUGH THE CANAL. INSPECTORS AND OPERATORS SHALL MONITOR THE PIPELINES, PUMPS, CANAL, AND ROADWAY CROSSING FOR EVENTS THAT COULD AFFECT PUMPING OPERATIONS OR CAUSE DAMAGE TO THE ENVIRONMENT OR PROPERTY. THIS INCLUDES BUT IS NOT LIMITED TO: UNANTICIPATED PUMP SHUT-DOWNS, FUEL FILLING, FUEL LEAKS, PIPE LEAKING, PIPE BURST, SHORE EROSION, EXCESSIVE PIPE MOVEMENT, ETC.
2. INSPECTORS AND OPERATORS SHALL BE EQUIPPED WITH RADIO/WIRELESS COMMUNICATION. THE CONTRACTOR SHALL STATION AT LEAST ONE RADIO/WIRELESS EQUIPPED OPERATOR AT EACH SET OF PUMPS 24 HOURS PER DAY WHEN PUMPS ARE OPERATING TO EXECUTE AN EMERGENCY PUMP SHUT DOWN IF REQUIRED.
3. PUMPS SHALL BE STARTED UP AND SHUT DOWN AND OPERATED IN ACCORDANCE WITH THE FPL APPROVED AND OPERATION PLANS AND DAILY INSTRUCTION.
4. THE CONTRACTOR SHALL INSTALL AND MONITOR STAFF GAUGES AT ALL THREE CANAL LOCATIONS AS DIRECTED BY THE ENGINEER.

DISCHARGE SYSTEM PUMP
RAIN FOR RENT - FP900



INTAKE SYSTEM PUMP
GODWIN - HAF 30AX



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(561)-640-7310
CERTIFICATE OF AUTHORIZATION # 4815

SEAL
JONATHAN T. ARMBRUSTER No 57959 LICENSE STATE OF FLORIDA PROFESSIONAL ENGINEER
8-27-2014
JONATHAN T. ARMBRUSTER P.E.# 57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

NO | ZONE | REVISIONS / SUBMISSIONS | DATE

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

DRAWING TITLE
CONSTRUCTION NOTES

C-2
SHEET 2 OF 12

CATHY SHELL, 8/27/2014 6:24:14 PM, X:\sys\Projects\P2014-130 FPL Turkey Point Cooling Canal\Construction\P2014-130 C-Construction Notes.dwg
Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
904.131.7900
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
561.640.7310
FBPE CERTIFICATE OF AUTHORIZATION # 8613

JONATHAN T. LAMBRUSTER
LICENSE
No 57959
STATE OF FLORIDA
PROFESSIONAL ENGINEER
8-27-2014
JONATHAN T. LAMBRUSTER P.E. #57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

DRAWING TITLE

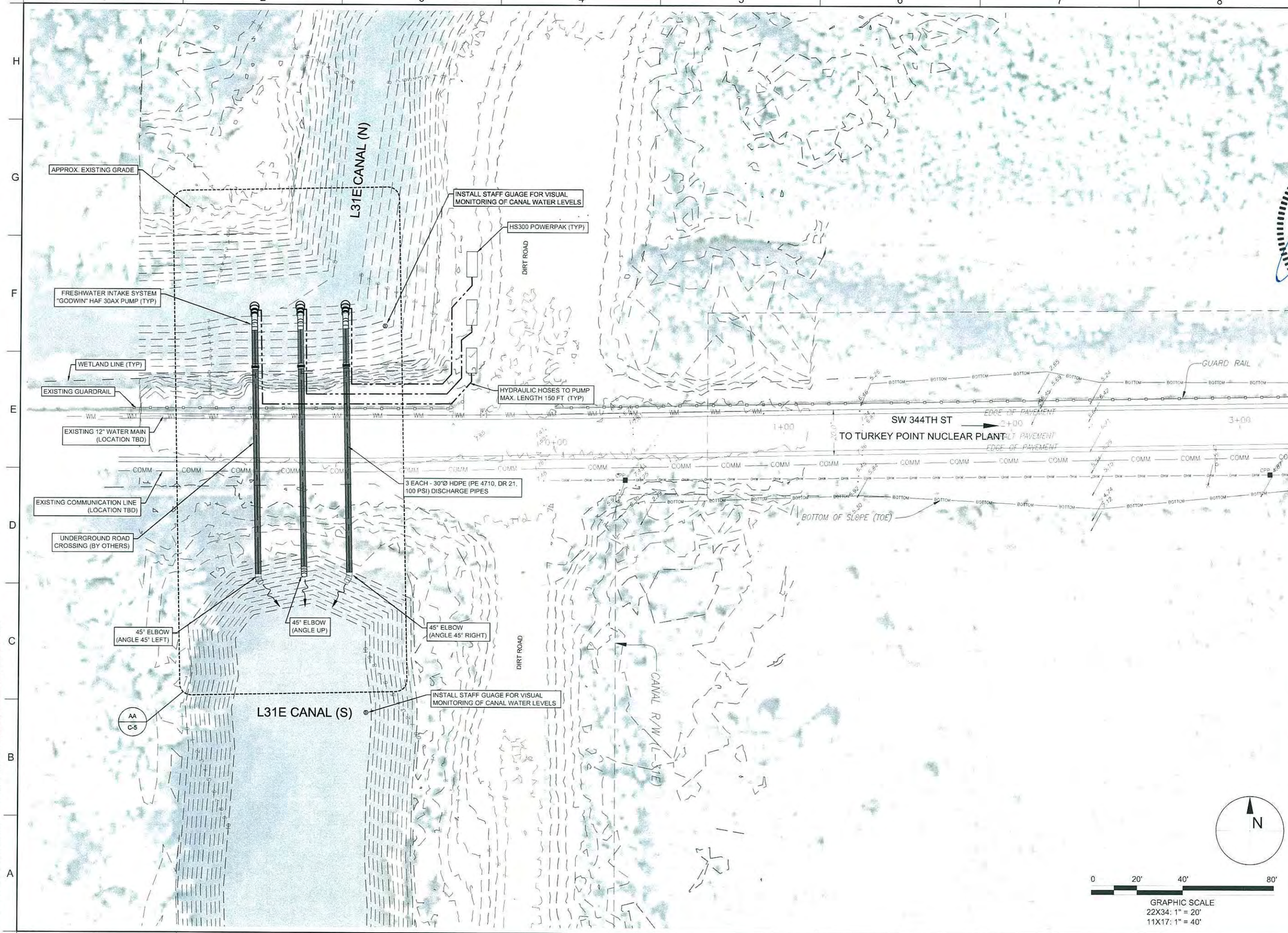
PROJECT OVERVIEW

C-3

SHEET 3 OF 12

CATHY SHELL, 8/27/2014 6:24:26 PM, X:\jobs\Projects\FP2014 130 FPL Turkey Point Cooling Canal\Construction\FP2014 130 C-Overview.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)



TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561) 640-7575
CERTIFICATE OF AUTHORIZATION #00000970

JONATHAN T. HUMBRECHT LICENSE No. 57959 STATE OF FLORIDA PROFESSIONAL ENGINEER
JONATHAN T. HUMBRECHT, P.E. # 57959
PROJECT TITLE
TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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NO.	DESCRIPTION	DATE

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

DRAWING TITLE

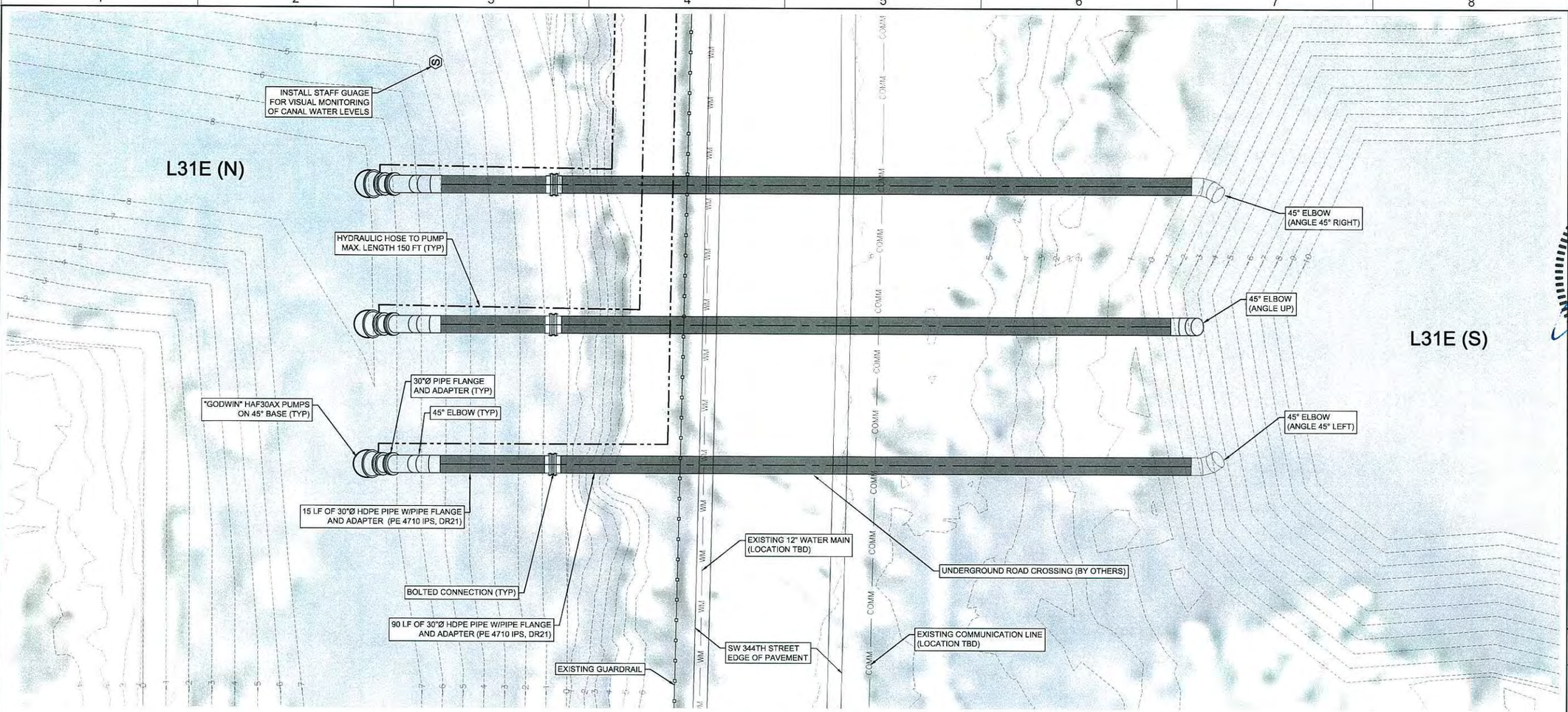
INTAKE SYSTEM SITE PLAN

C-4

SHEET 4 OF 12

CATHY SHELL 8/27/2014 6:24:35 PM X:\cyp\Projects\P2014 130 FPL Turkey Point Cooling Cutoff\Construction\P2014 130 C Intake Site Plan.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

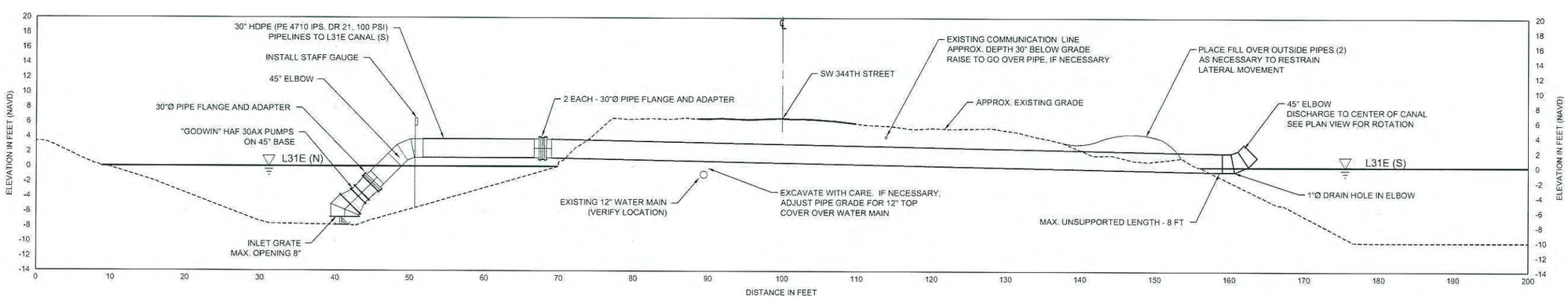


AA
C-4

TYPICAL INTAKE PIPE AND PUMP PLAN

22X34: 1" = 8'
11X17: 1" = 16'

0 8 16'



TYPICAL INTAKE PIPE AND PUMP SECTION

22X34: 1" = 8'
11X17: 1" = 16'

0 8 16'

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
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SEAL
JONATHAN R. BRUSTER LICENSE No. 57959 STATE OF FLORIDA PROFESSIONAL ENGINEER
8-27-2014

JONATHAN R. BRUSTER, P.E. #57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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REVIEWED	RLJ
SCALE	AS SHOWN

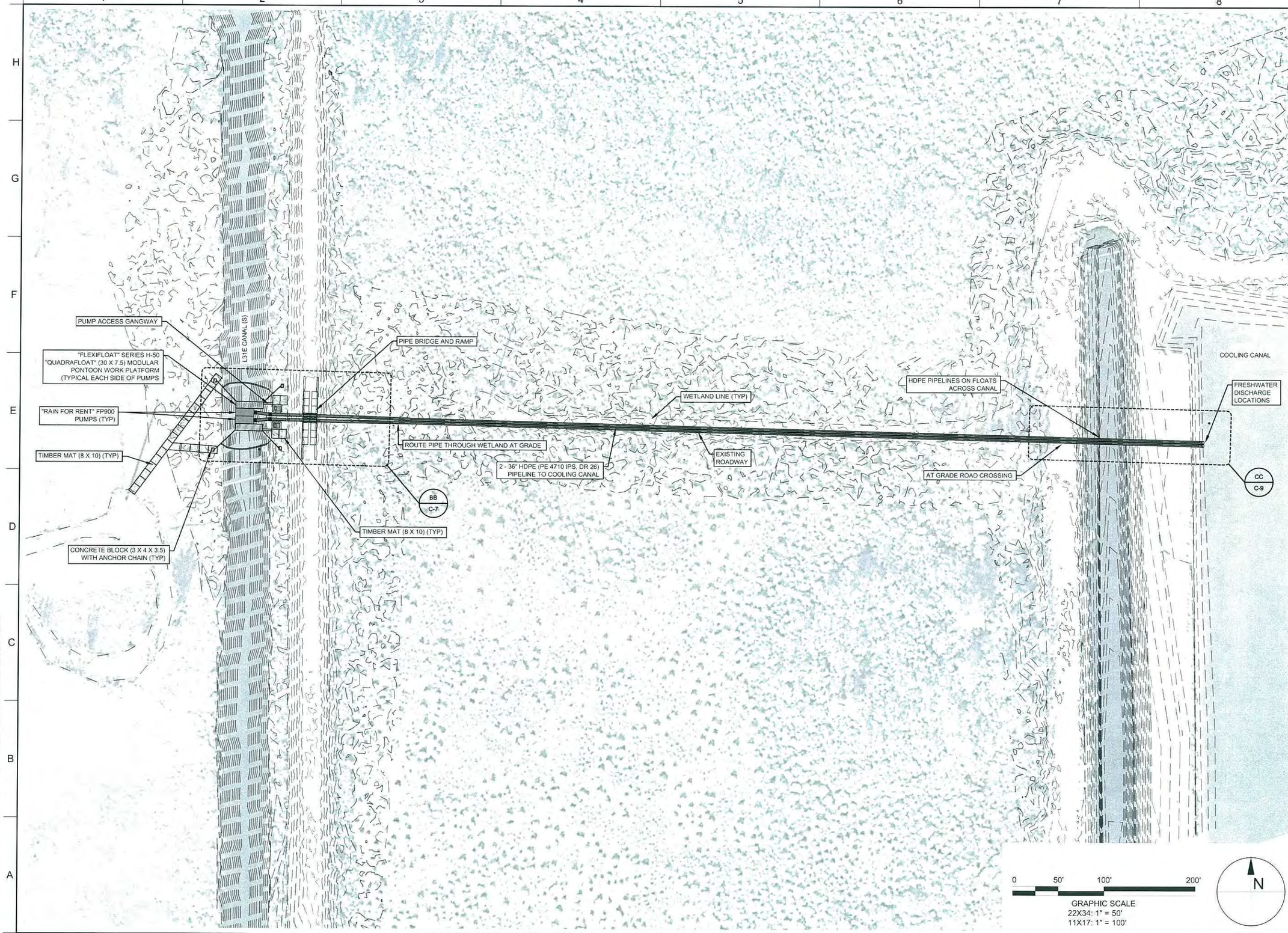
DRAWING TITLE
INTAKE SYSTEM PUMP AND UNDER ROAD CROSSING

C-5

SHEET 5 OF 12

CATHY SHELL 8/27/2014 6:24:49 PM X:\sys\Projects\P2014 130 FPL Turkey Point Cooling Canal\Construction\P2014 130 C Profiles Intake System.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)



TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
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JACKSONVILLE, FLORIDA 32256
(904)-731-7040
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WEST PALM BEACH, FLORIDA 33401
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SEAL
JONATHAN TAMBRUSTER LICENSE No 57959 STATE OF FLORIDA PROFESSIONAL ENGINEER
8-27-2014
JONATHAN TAMBRUSTER P.E. #57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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NO	ZONE	REVISIONS / SUBMISSIONS	DATE

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

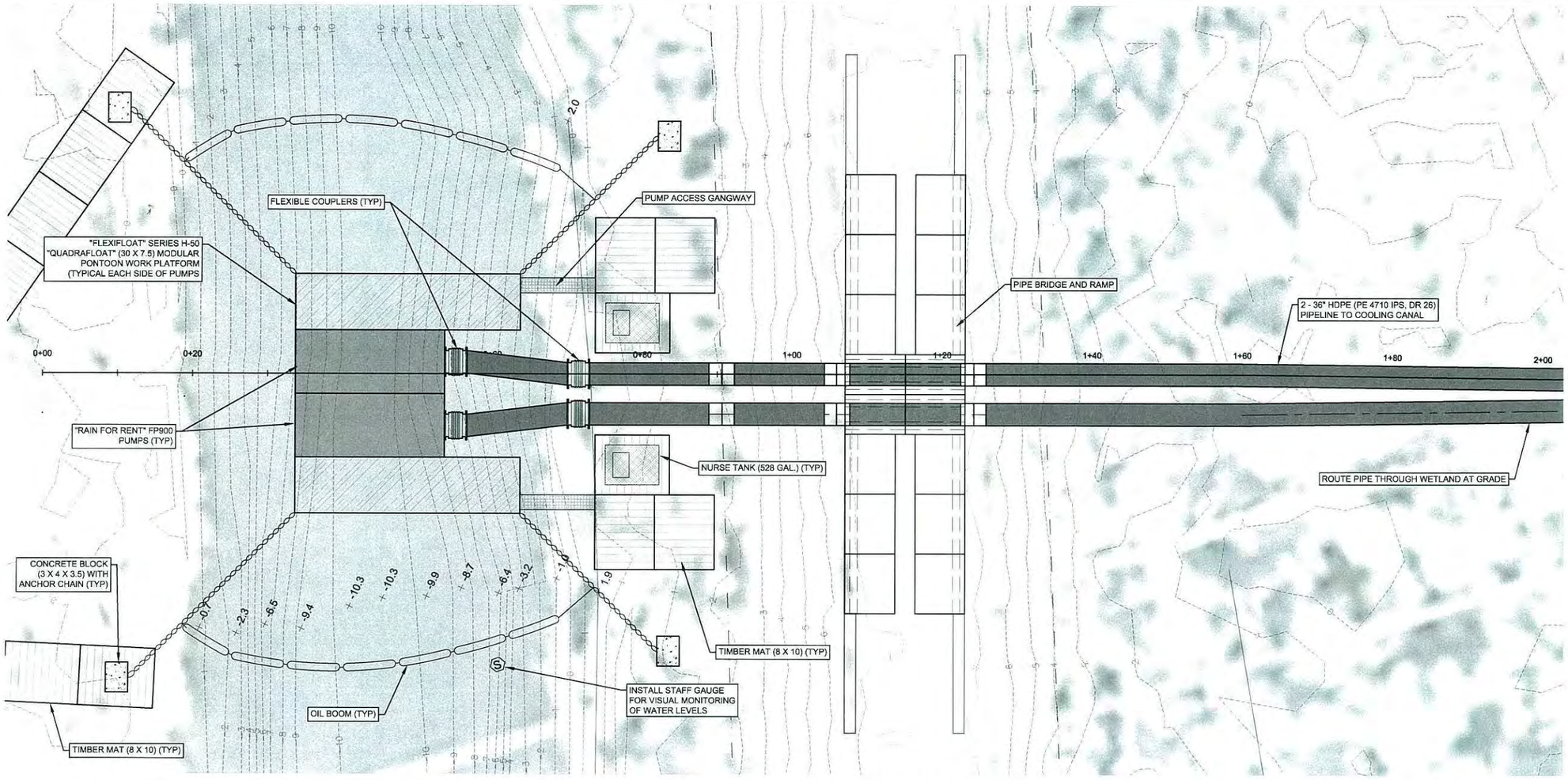
DRAWING TITLE
DISCHARGE SYSTEM SITE PLAN

C-6

SHEET 6 OF 12

CATHY SHELL, 8/27/2014 6:24:58 PM, X:\ogs\Projects\P2014 139 FPL Turkey Point Cooling Canal\Construction\P2014 139 C Discharge Site Plan.dwg

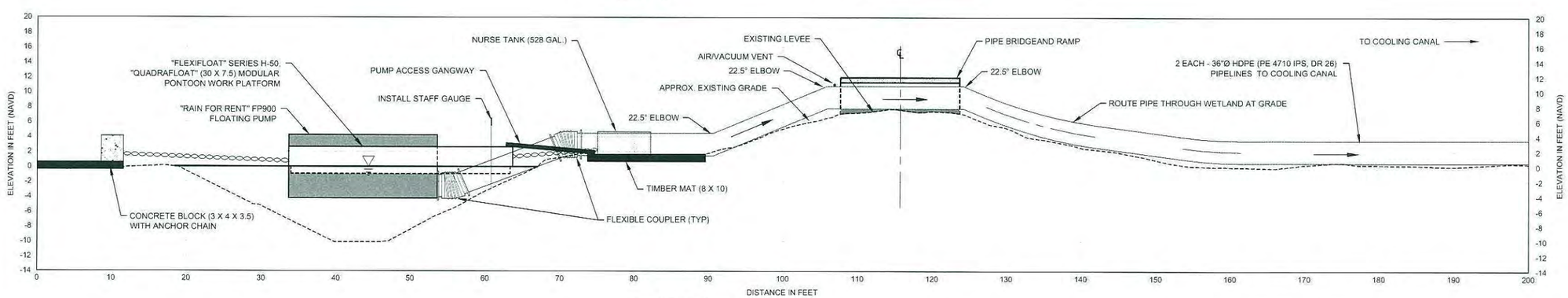
Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)



BB
C-6

PIPE CROSSING OVER LEVEE PLAN

22X34: 1" = 8'
11X17: 1" = 16'



TYPICAL SECTION
PIPE CROSSING OVER LEVEE

22X34: 1" = 8'
11X17: 1" = 16'

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
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(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
T. (561) 697-7810
CERTIFICATE OF AUTHORIZATION NO. 00000970
SEAL
JONATHAN T. AMBRUSTER
LICENSED
No. 57959
STATE OF FLORIDA
PROFESSIONAL ENGINEER
8-27-2014
JONATHAN T. AMBRUSTER PE # 57959
PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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NO.	DATE	REVISIONS / SUBMISSIONS

PROJECT NO	C2014-066
DATE	08-27-2014
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DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

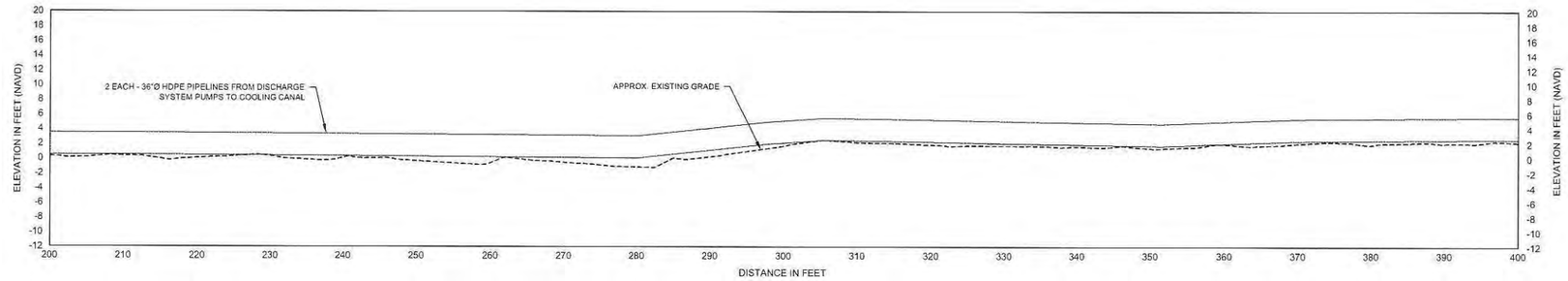
DRAWING TITLE
DISCHARGE SYSTEM PUMP AND LEVEE CROSSING

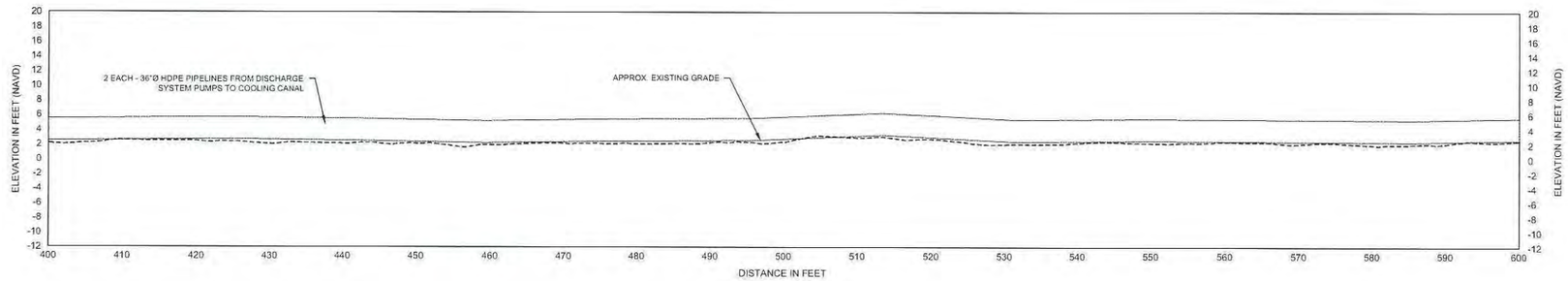
C-7

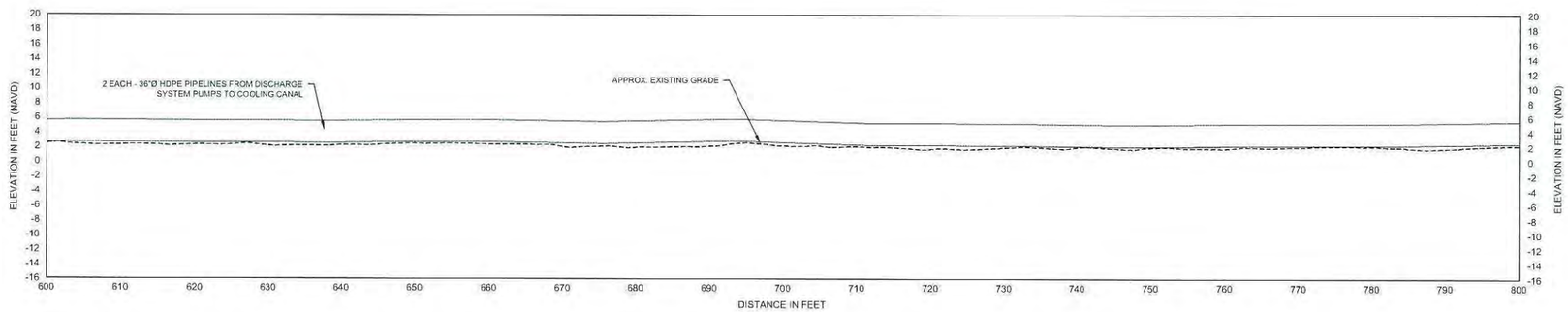
SHEET 7 OF 12

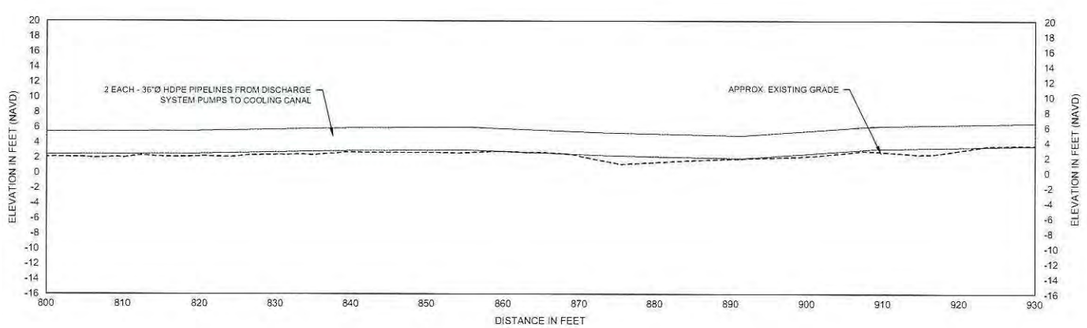
CATHY SHELL, 8/27/2014 6:26:13 PM, X:\cyd\Projects\P2014-130\FPL Turkey Point Cooling Canal\Donschrono\P2014-130 C-Profiles-Discharge\A.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)









PIPELINE PROFILES
DISCHARGE A - STA. 2+00 THRU 9+30

22X34: 1" = 10'
11X17: 1" = 20'

0 10 20'

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WEST PALM BEACH, FLORIDA 33401
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CERTIFICATE OF AUTHORIZATION NO. 8816

SEAL
JONATHAN T. ARMBRUSTER
LICENSE No 57959
STATE OF FLORIDA
PROFESSIONAL ENGINEER
8-27-2014
JONATHAN T. ARMBRUSTER P.E. # 57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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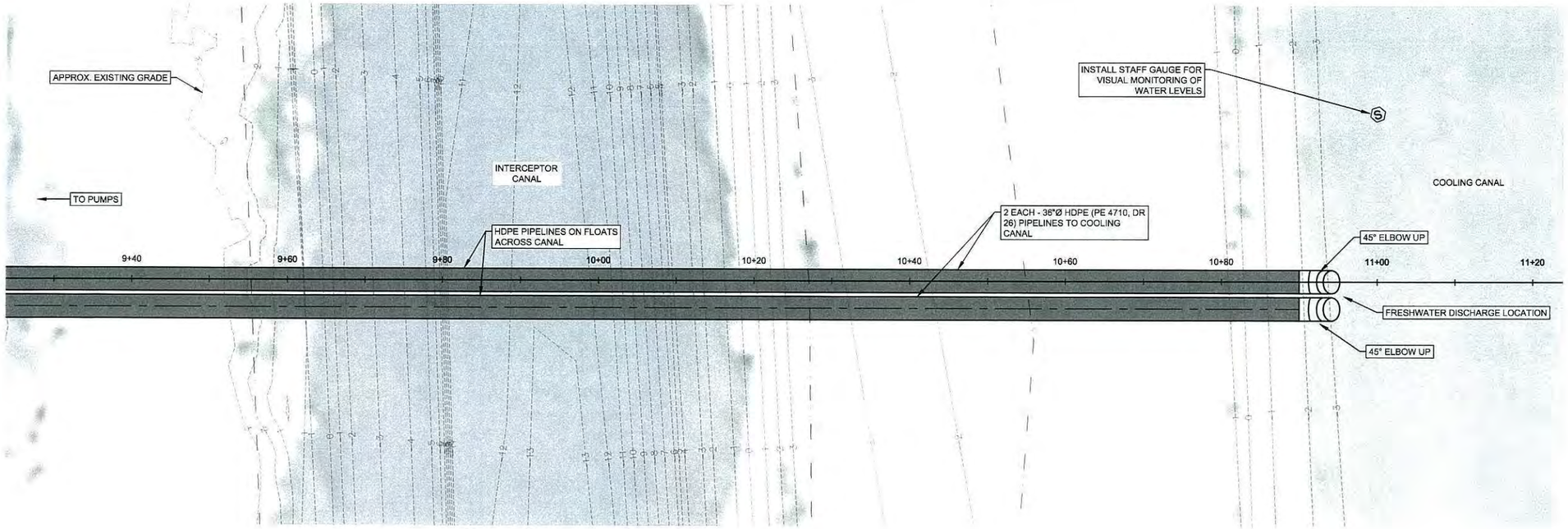
DRAWING TITLE
DISCHARGE SYSTEM PROFILES

C-8

SHEET 8 OF 12

CATHY SHELL, 8/27/2014 6:25:18 PM, X:\cyb\Projects\P2014 130 FPL Turkey Point Cooling Canal\Construction\P2014-130 C-Profiles Discharge A.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

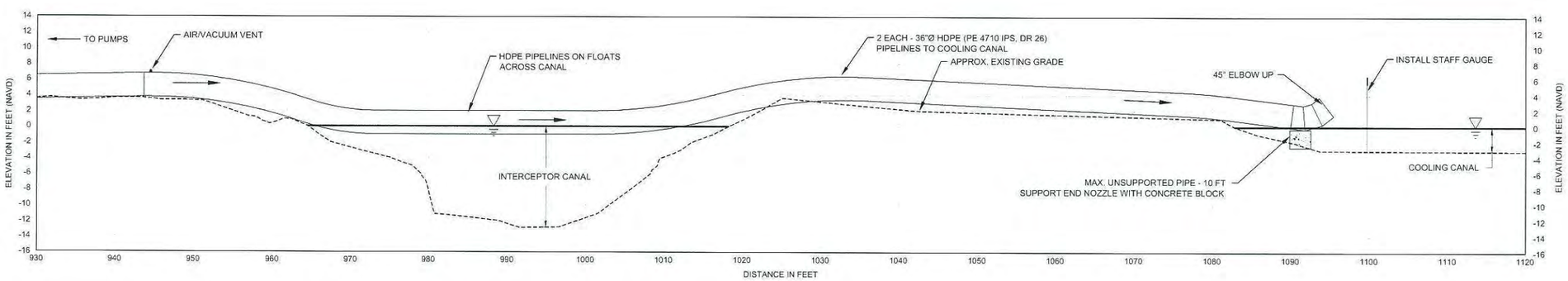


CC C-6

PIPE CROSSING OVER INTERCEPTOR CANAL PLAN

22X34: 1" = 8'
11X17: 1" = 16'

0 8 16'



TYPICAL SECTION
PIPE CROSSING OVER INTERCEPTOR CANAL

22X34: 1" = 8'
11X17: 1" = 16'

0 8 16'

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
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1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-7810
CERTIFICATE OF AUTHORIZATION #8915

SEAL
JONATHAN T. CAMBRUSTER
LICENSE No 57959
STATE OF FLORIDA
8-27-2014
JONATHAN T. CAMBRUSTER P.E. # 57959
PROFESSIONAL ENGINEER

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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REVIEWED	RLJ
SCALE	AS SHOWN

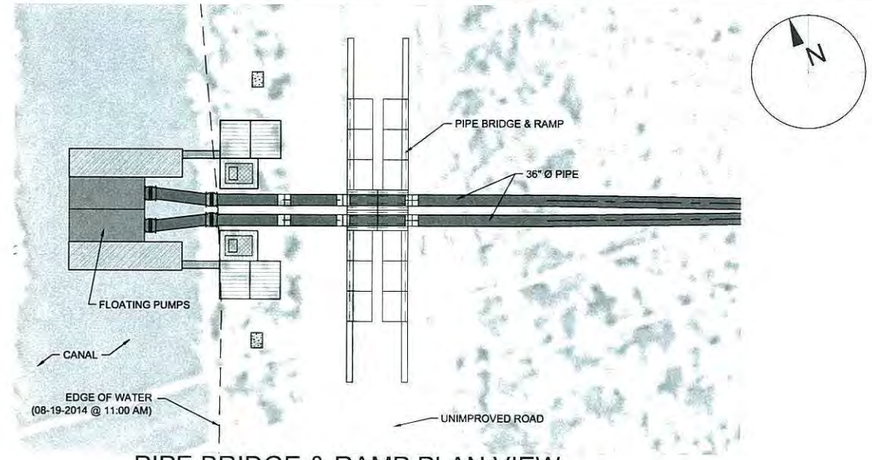
DRAWING TITLE
DISCHARGE SYSTEM PIPE CROSSING OVER INTERCEPTOR CANAL

C-9

SHEET 9 OF 12

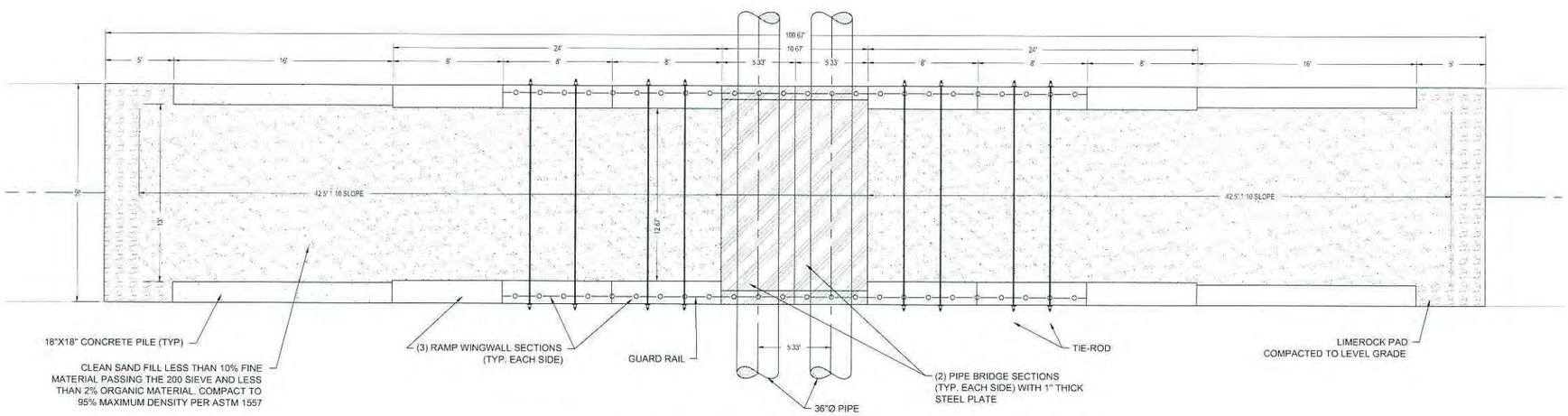
CATHY SHELL, 8/27/2014 6:25:22 PM, X:\sys\Projects\P2014 130 FPL Turkey Point Cooling Canal\Construction\P2014 130 C-Profiles Discharge\A.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)



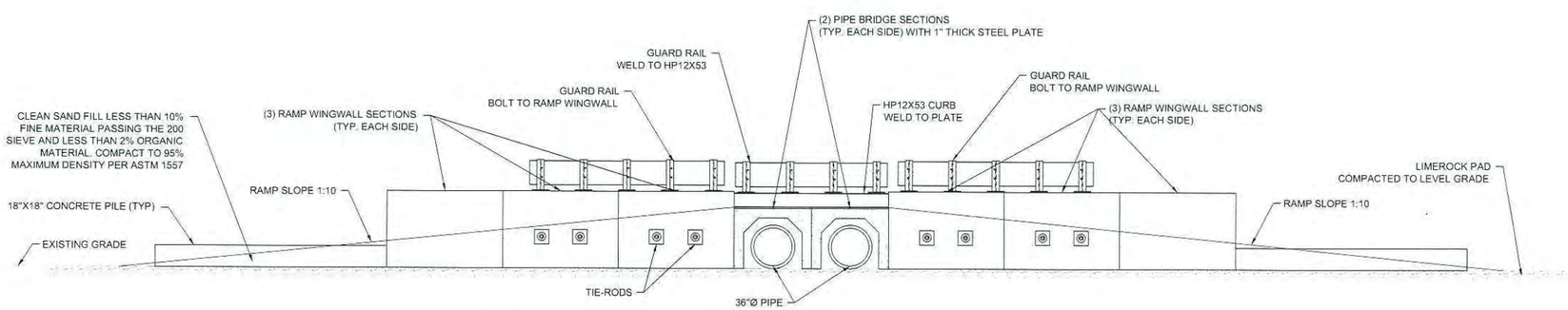
PIPE BRIDGE & RAMP PLAN VIEW

22X34: 1" = 20'
11X17: 1" = 40'
0 20 40'



PIPE BRIDGE & RAMP DETAIL PLAN VIEW

22X34: 1" = 5'
11X17: 1" = 10'
0 5 10'



PIPE BRIDGE & RAMP DETAIL ELEVATION VIEW

22X34: 1" = 10'
11X17: 1" = 20'
0 10 20'

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1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-1963
CERTIFICATE OF AUTHORIZATION #8191

SEAL
JONATHAN R. LAMBRUSTER LICENSE No 57959 STATE OF FLORIDA PROFESSIONAL ENGINEER
8-27-2014
JONATHAN R. LAMBRUSTER P.E. # 57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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REVIEWED	RLJ
SCALE	AS SHOWN

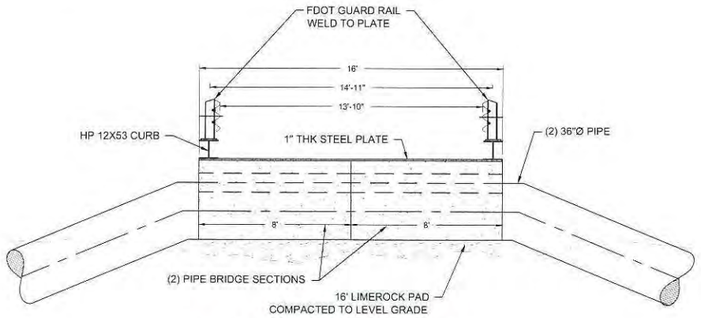
DRAWING TITLE
PIPE BRIDGE PLAN AND ELEVATION

C-10

SHEET 10 OF 12

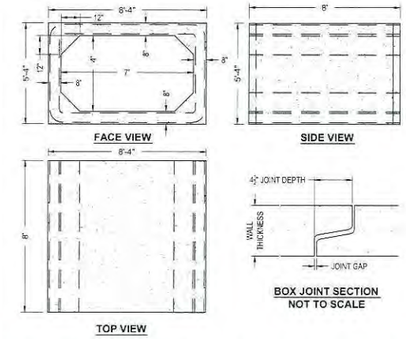
CATHY SHELL - 8/27/2014 6:25:30 PM X:\pw\Projects\P2014 130 FPL Turkey Point Cooling Canal\Construction\P2014 130 C-Pipe Bridge.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)



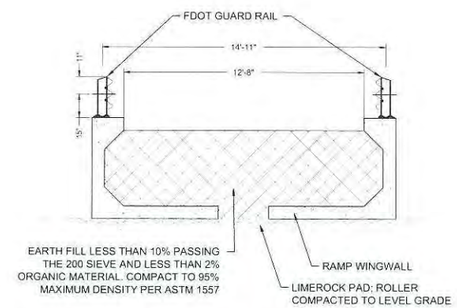
PIPE BRIDGE SECTION

22X34: 1" = 4'
11X17: 1" = 8'



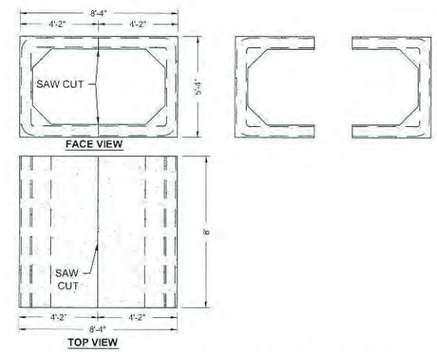
BOX CULVERT DETAIL (RINKER MATERIALS) 7'X4' PRECAST REINFORCED CONCRETE

22X34: 1" = 4'
11X17: 1" = 8'



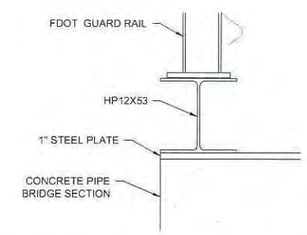
RAMP WINGWALL SECTION

22X34: 1" = 4'
11X17: 1" = 8'



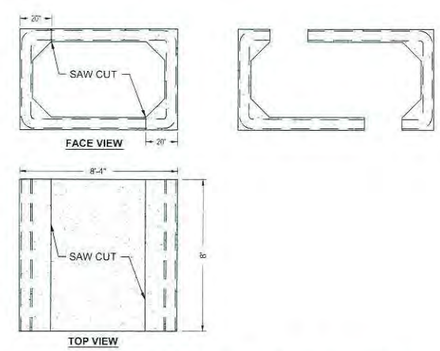
PIPE BRIDGE CUT DETAIL

22X34: 1" = 4'
11X17: 1" = 8'



GUARDRAIL & CURB DETAIL

22X34: 1" = 1'
11X17: 1" = 2'



RAMP WINGWALL CUT DETAIL

22X34: 1" = 4'
11X17: 1" = 8'

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
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WEST PALM BEACH, FLORIDA 33401
(561)-640-4119
CERTIFICATE OF AUTHORIZATION #00001870

SEAL
JONATHAN T. AMBRUSTER
LICENSE
No. 57959
STATE OF FLORIDA
PROFESSIONAL ENGINEER
8-27-2014

JONATHAN T. AMBRUSTER P.E. # 57959

PROJECT TITLE
FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

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NO.	DATE	REVISIONS

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

DRAWING TITLE
DETAILS

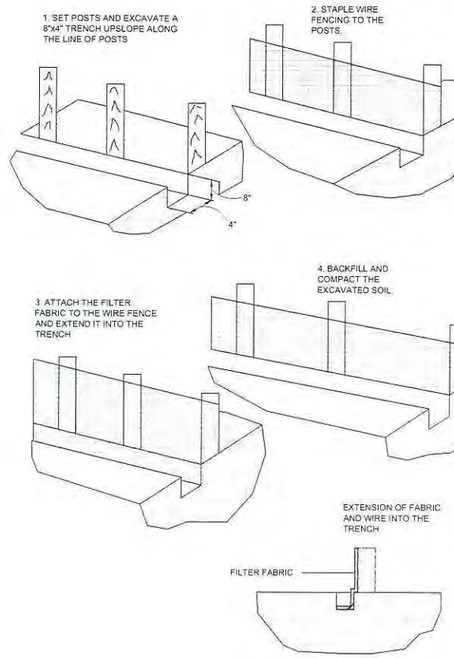
C-11

SHEET 11 OF 12

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

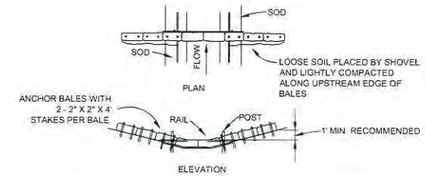
EROSION CONTROL AND GRASSING/SODDING NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN EROSION CONTROL MEASURES AS NECESSARY TO COMPLY WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS AND COMPLY WITH STATE WATER QUALITY CRITERIA FOR STORMWATER DISCHARGE. EROSION CONTROL MEASURES INCLUDE BUT ARE NOT LIMITED TO TURBIDITY SCREENS, MULCHING, HAY BALES, AND SILT FENCE. IF A WATER QUALITY VIOLATION OCCURS, THE CONTRACTOR SHALL BE WHOLLY RESPONSIBLE FOR ALL DAMAGE AND ALL COSTS WHICH MAY RESULT INCLUDING LEGAL FEES, CONSTRUCTION COSTS, AND FINES.
2. DISTURBED AREAS SHALL BE MAINTAINED IN ACCORDANCE WITH CITY, COUNTY, STATE, AND FEDERAL REQUIREMENTS UNTIL A PERMANENT VEGETATIVE COVER IS ESTABLISHED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING PERMANENT VEGETATION AT ALL DISTURBED AREAS PER DRAWINGS AND MEETING THE NPDES FINAL STABILIZATION REQUIREMENTS.
4. EROSION CONTROL MEASURES SHALL BE MAINTAINED FOR THE ENTIRE DURATION OF THE PROJECT OR UNTIL VEGETATION IS ESTABLISHED.
5. EROSION CONTROL MEASURES SHALL BE PLACED TO CONTAIN ALL POINTS OF DISCHARGE TO SURFACE WATERS OR WETLANDS INCLUDING SURFACE RUNOFF, CURB INLETS, DITCH BOTTOM INLETS, DITCHES, AND DOWNSTREAM PORTIONS OF STREAMS, CANALS, AND TIDAL WATERS ADJACENT TO CONSTRUCTION.
6. 48 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR WILL SUBMIT A "NOTICE OF INTENT" TO THE EPA IN ACCORDANCE WITH NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM RULES AND REGULATIONS.
7. THE CONTRACTOR SHALL WRAP STORM GRATES IN FILTER FABRIC TO PREVENT SEDIMENTATION OF THE STORM SEWER SYSTEM. CONTRACTOR SHALL MAINTAIN THE FILTER FABRIC UNTIL PROJECT COMPLETION.
8. THE SITE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES AFTER COMPLETION OF CONSTRUCTION AND ONLY WHEN AREAS HAVE BEEN STABILIZED.
9. SILT FENCES AND FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



CONSTRUCTION DETAILS FOR SILT FENCES

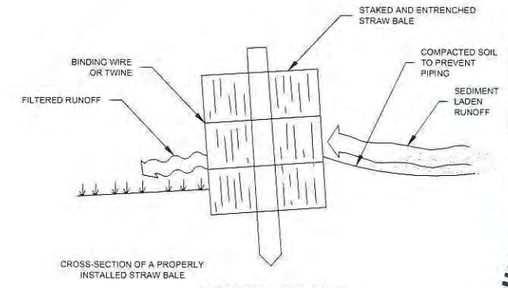
SCALE: N.T.S.



SPACING: BALE BARRIERS FOR PAVED DITCHES SHOULD BE SPACED IN ACCORDANCE WITH CHART I, SHEET 1 OF 3, INDEX NO. 102 OF F.D.O.T. ROADWAY AND TRAFFIC DESIGN STANDARDS.

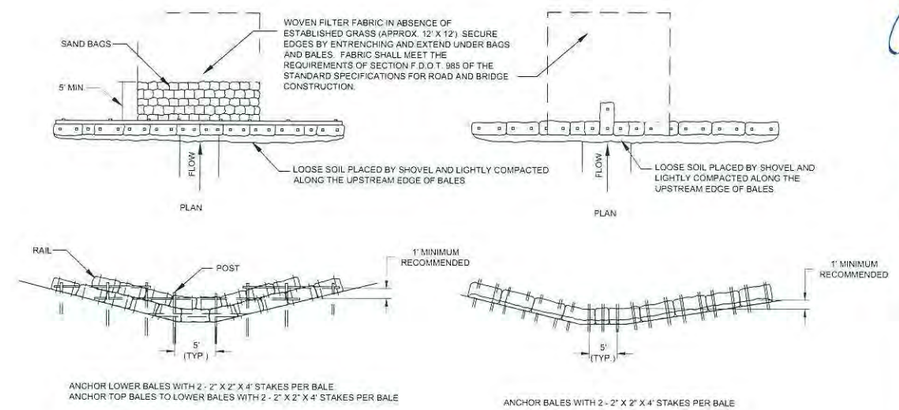
BARRIER FOR PAVED DITCH

SCALE: N.T.S.



STAKED HAY BALE

SCALE: N.T.S.



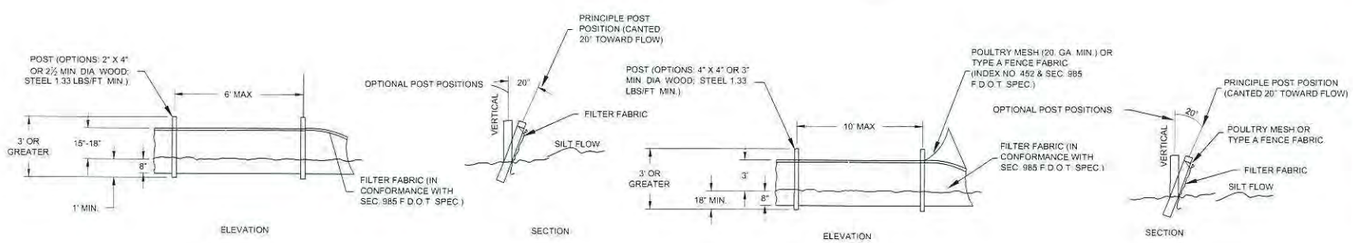
APPLICATION AND SPACING OF TYPES I & II HAY BALE BARRIERS SHELL BE IN ACCORDANCE WITH SHEET 1 OF 3, F.D.O.T. INDEX NO. 102.

TYPE II

HAY BARRIERS TYPE I & II

SCALE: N.T.S.

TYPE I



TYPE III SILT FENCE

TYPE IV SILT FENCE

TYPE III OR TYPE IV SILT FENCE

TYPE III OR TYPE IV SILT FENCE PROTECTION AROUND DITCH BOTTOM INLETS.

TYPE IV SILT FENCE

TYPE III SILT FENCE

DITCH INSTALLATION AND SPACING FOR TYPE III & TYPE IV FENCE TO BE IN ACCORDANCE WITH SHEET 1 OF 3, F.D.O.T. INDEX NO. 102.

DO NOT DEPLOY IN A MANNER THAT SILT FENCES WILL ACT AS A DAM ACROSS PERMANENT FLOWING WATERCOURSES. SILT FENCES ARE TO BE USED AT UPLAND LOCATIONS AND TURBIDITY BARRIERS USED AT PERMANENT BODIES OF WATER.

SILT FENCE TYPE III & IV

SCALE: N.T.S.

TAYLOR ENGINEERING INC
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-1010
CERTIFICATE OF AUTHORIZATION

SEAL: JONATHAN T. AMBRUSTER LICENSE No. 57959 STATE OF FLORIDA PROFESSIONAL ENGINEER

JONATHAN T. AMBRUSTER, P.E. #57959

PROJECT TITLE:

FPL TURKEY POINT
COOLING CANAL
FRESHWATER RECHARGE
MIAMI-DADE COUNTY, FLORIDA

Always call 811 two full business days before you dig

Sunshine811.com

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

PROJECT NO	C2014-066
DATE	08-27-2014
DESIGNED	JTA
DRAWN	CAS
CHECKED	HCV
REVIEWED	RLJ
SCALE	AS SHOWN

DRAWING TITLE

EROSION CONTROL DETAILS

C-12

SHEET 12 OF 12

CATHY SHELL, 8/27/2014 6:25:38 PM, X:\cps\Projects\P2014 130 FPL Turkey Point Cooling Canal\Common\dwg\P2014 130 C Erosion.dwg

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Attachment D

PUMPING DESCRIPTION AND EXPECTED DISTRICT REQUIREMNTS

1. Bridge over pipes on levee concrete box culvert design with soil ramps. No modification to the dam will be required.

2. A pre-construction survey of the dam crest will be performed before bridge installation and dam crest will be restored to as good as or better condition when the bridge is removed.

3. Prior to commencement of construction within any south Florida water management district (the district) right of way (row), FPL shall contact the district's field representative Mike Worley at the homestead field station (954) 410-7383 to schedule a pre-construction meeting and final inspection.

4. FPL shall comply with the following row conditions:
   A. All equipment shall be skid mounted or lie above ground and be capable of being removed from the district's row within 24 hours of the district's request to do so.
   B. The HDPE pipes buried under 344th Ave shall be blanked at the north end, but left in place, in the event of district notification to remove equipment.
   C. The HDPE pipes between the L-31E canal and the south pumping station shall be blanked at the canal end, but left in place, in the event of district notification to remove equipment within 24 hours. These pipes shall be capable of being removed from the district's row within 30 days of the district's request to do so.
   D. All district rows shall remain in a condition to allow access for district's normal and emergency use at all times.

5. FPL's monitoring and control plan for pumping operations shall comply with the following constraints:
   A. The pumps at the L-31E withdrawal location north of 344th Ave (the north station) shall be manned continuously during pumping operations. The site will be guarded 24 hours per day/ seven days per week while the equipment other than the pipe is on SFWMD right of way.
   B. The pumps at the southern withdrawal location (approximately one mile south of 344th Ave) shall be manned continuously.
   C. Personnel at both pump locations will be provided contact information, means of communication, and training to utilize the Emergency Response Team for spill containment or security at the Turkey Point Facility.
   D. The pumps at the southern withdrawal location shall be installed, manned and operated by trained personnel from the pump supplier.
   E. Each day prior to 10am, the FPL operators shall contact the district's operation control center, via email, to determine the rate and volume of FPL withdrawals for the 24-hour period from 10am to 9:59am the following calendar day.
   F. FPL shall monitor pump starts and pump stops at both pumping locations (north station and south station). FPL shall also monitor and data log flow rates of the L-31E water pumped at both locations.
   G. FPL shall generate a weekly report, delivered via email by noon Tuesday, which reports the following to the district for the preceding week:
      a. Id of pumps that ran

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

b. On and off times for each pump
c. Rpm setting, per pump, if variable
d. Calculated volume of water per pump
e. Logged flows at each pump station, from totalizing hour flow meters.
f. The official Tuesday reports shall be sent from matthew.raffenberg@fpl.com (or delegate) to both llindahl@sfwmd.gov and to tbates@sfwmd.gov (or their delegates).

H. FPL shall be capable of supplying the above data upon request at any time between Tuesday reports, within 2 hours of the district's request.
I. FPL shall be capable of terminating all pumping at any time, within 2 hours an emailed request from either district party identified in 5.F.f.
J. Each pump shall be operated by trained pump operators which will be on site 24 hours per day during operation. Security will be provided 24/7 while equipment, other than the pipes, is in the SFWMD right of way. The pump operators will have wireless communication to provide immediate response if required and this shall be verified as operable prior to pumping.
K. FPL shall wirelessly coordinate the pumping at both stations to assure that:
    a. From a non-flow condition, the north station pumps shall be started first.
    b. From a flow condition, the south station pumps shall be stopped first.
    c. South station pumps shall be started after 5 minutes or more of north station pumps' starts, with equivalent flow maintained at both stations during operation.
    d. North station pumps shall be stopped after 5 minutes or more following south station pumps' stops.
    e. FPL shall provide the pump curves used to determine discharge rates to the district, for each pump, prior to their operation.
    f. FPL shall monitor the canal water level utilizing staff gauges to assure that under no conditions, the water level in the south end of the L-31E canal is lower than the point at which the pumps are first started. Control of the pump output to guarantee this will include shutting one or both south pumps down and/or throttling the pumps back to match flows.
L. FPL shall ensure that the totalizing hour flow meters used at each pump station are available for periodic district inspection and verification.

6. Spill prevention
    A. All equipment will be bermed in accordance with FPL's Hazardous Material Emergency Response Plan and Oil Spill Prevention, Control and Countermeasure (SPCC) Plan (Procedure No. 0-ADM-034).
    B. All equipment, hoses, and tanks shall be designed for use on or near water. Condition checks of all fluid containing devices shall be monitored continuously as a part of the 24 hour pump coverage.
    C. Hydraulic hoses used on the pumps north of 344th Ave shall be installed according to manufactures recommendations. The hoses shall utilize the shortest path out of the water that is available to assure good visibility for monitoring. The hoses shall be secured in place to prevent over tensioning and allow for continuous inspection.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

D. The hydraulic pumps north of 344th Ave will contain only biodegradable hydraulic oil designed for use over water.
E. All fuel tanks used for the southern pumps have built in secondary containment. All fuel lines will be provided with secondary containment.
F. The pumps north of 344th Ave. will be fueled twice per day or as needed. No additional fuel storage will be in the SFWMD right of way.
G. The pumps south of 344th Ave will be fueled through nurse tanks on shore as needed. The transfer lines between the pump and the nurse tanks will not be charged when not in use.
H. Floating boom will be staged on site for immediate deployment if needed. Enough boom to cross the canal a minimum of two times will be provided. Pump operators will be provided emergency numbers to immediately dispatch a cleanup and boom crew from the turkey point facility.
I. A fixed oil boom will be installed both north and south of the floating pumps in the southern reach.
J. Oil absorbent booms and pads designed to clean up petroleum spills on water will be located on site. Pump operators will be trained in the use of these materials.
K. A detected leak of any petroleum products (fuel or hydraulic oil) will result in the immediate shutdown of the pumps at both ends. The pumps will not be restarted until all issues have been resolved and the equipment cleaned to allow for continuous monitoring. Restarting will be contingent on both approval by the FPL spill response team and the SFWMD representative.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

July 23, 2014

Mr. Michael Kiley
Turkey Point Nuclear Plant Vice President
Florida Power & Light Company
9760 SW 344th St.
Florida City, FL 33035

SUBJECT: NOTICE OF ENFORCEMENT DISCRETION (NOED) FOR FLORIDA POWER AND LIGHT COMPANY REGARDING TURKEY POINT NUCLEAR GENERATING STATION UNITS 3 AND 4 [NOED NO. 14-2-001]

Dear Mr. Kiley:

By letter dated July 21, 2014, you requested that the NRC exercise discretion to not enforce compliance with Technical Specification (TS) 3.7.4. Your letter documented information previously discussed with the NRC in a telephone conference on July 20, 2014. The principal NRC staff members who participated in that telephone conference are listed in the enclosure. The NRC staff determined that the information in your letter requesting the NOED was consistent with your verbal request.

You stated that on July 20, 2014, at 2:54 p.m. (all times reference Eastern Standard Time), Units 3 and 4 entered TS 3.7.4 Required Action for ultimate heat sink (UHS) average supply water temperature exceeding 100°F and if not restored, you would be required to place the units in Mode 3 within 12 hours, and in Mode 5 within 36 hours. This would result in an unnecessary shutdown of Turkey Point Units 3 and 4 without a corresponding health and safety benefit during a period of high system load demand when the operation of the units is essential for grid voltage stability. You requested that a NOED be granted pursuant to the NRC's policy regarding exercise of discretion for an operating facility, set out in Section 3.8 of the NRC Enforcement Policy. The requested enforcement discretion would end after meeting one of the following conditions: (a) 10 days, or (b) the UHS temperature exceeds 103°F; or (c) the UHS peak temperature drops below 96°F for three consecutive days and is on a declining trend; or (d) receipt of approval of the requested license amendment; or (e) if the loss of Turkey Point Units 3 and 4 will not result in a North American Electric Reliability Corporation (NERC) Emergency Alert Level (EEA) 3 alert. This letter documents the NRC's decision conveyed to you during the telephone conversation on July 20, 2014, at 6:00 p.m., when the NRC verbally granted this NOED request. I understand that the condition causing the need for this NOED has not yet been corrected and that you will continue to monitor UHS conditions.

In June 2014, peak UHS temperatures approached the TS limit of 100°F. Your engineering and environmental analysis determined that the cooling canal system water was absorbing unusual amounts of solar energy due to a higher than normal algae content. You stated that the algae concentration has recently been as high as 1.8 million cells per milliliter as compared to historic average values of 50,000 cells per milliliter. While immediate eradication of the algae was possible, the side effects on the canal ecosystem would be unacceptable.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

A controlled chemical treatment of the canal system was initiated and is continuing to gradually restore the normal algae content and improve heat transfer efficiency. This has reduced the algae concentration to 1.5 million cells per millimeter in the last two weeks. Additionally, the much lower than average annual rainfall and consequentially the very low canal water level has also tended to increase UHS temperature. You stated that you have performed multiple analyses that demonstrate the continued operability of Turkey Point Units 3 and 4 at cooling canal temperatures as high as 104°F. The component cooling water (CCW) heat exchanger performance monitoring program required by TS 3/4.7.2 (Surveillance Requirements 4.7.2.a and 4.7.2.b(2)) ensures that at all UHS temperatures at or below 104°F, the CCW heat exchangers are capable of removing more heat than is required by the safety analysis. It is noted that Florida Power and Light (FPL) requested amendments to TS 3/4.7.4 on July 10, 2014, to increase UHS average temperature limit to 104°F. On July 17, 2014, FPL requested that the amendment be approved on an emergency basis.

The NRC staff considered information obtained from the independent entity (Florida Reliability Coordinating Council) in determining if placing Turkey Point Units 3 and 4 in Mode 3 would challenge the ability to maintain an adequate voltage profile throughout the system due to transmission constraints in specific areas and could result in adverse consequences to the health and safety of the public.

To evaluate this NOED request, NRC staff considered your following commitments: (1) to keep a third CCW heat exchanger in service which will only be removed from service for critical maintenance activities or as part of planned compensatory measures during night time hours; (2) the monthly CCW heat exchanger performance test required by TS SR 4.7.2.b(2) has been increased to weekly and will be performed at least twice weekly during the period of enforcement discretion; (3) the CCW heat exchanger cleaning frequency has been increased from one per unit bi-weekly to one per unit weekly with the time that the specified CCW heat exchanger will be out of service minimized; (4) to perform TS SR 4.7.2.a once every hour during the period of enforcement discretion when the UHS temperature is greater than 99°F and will revert to once per shift when the UHS temperature is less than 98°F; (5) verification of UHS temperature will be performed at least once per hour when UHS temperature exceeds 100°F; (6) to perform Just in Time training via tabletop discussion of the "Restoration of Intake Cooling Water" and "Align Service Water to Charging Pumps" procedures; (7) switchyard work that would impact grid reliability will be restricted during the NOED period and grid conditions will be verified at least once every 24 hours; (8) performance of other surveillance requirements will be minimized to the extent possible without creating a situation of a missed surveillance, and elective maintenance activities that are classified as high risk due to generation threat will be minimized; (9) PRA risk for both Units 3 and 4 will be maintained GREEN during planned maintenance activities; and (10) to increase management oversight to resolve any issues in a timely manner. NRC staff also considered that your calculated Incremental Conditional Large Early Release Probability values for Units 3 and 4 did not exceed the threshold guidance provided in Inspection Manual Chapter 0410, "Notices of Enforcement Discretion" and were consistent with values calculated by NRC regional analysts. In addition, the conditions and actions noted above have been, and will be, subject to independent verification by NRC inspectors.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

On the basis of the NRC staff's evaluation of your request, I have concluded that granting this NOED is consistent with the Enforcement Policy and NRC staff guidance and has no adverse impact on public health and safety or the environment. This determination was qualitative and based upon balancing the effect on public health and safety of not operating, against the potential radiological or other hazards associated with continued operation (Inspection Manual Chapter 0410, Section 06.02.b, (i.e., natural event NOED)). Therefore, it is our intention to exercise discretion to not enforce compliance with TS LCO 3.7.4 from 6:00 p.m., on July 20, 2014 until one of the previously mentioned end conditions is met. It is also noted that your emergent license amendment is being reviewed by NRC staff.

As stated in the Enforcement Policy, action will be taken, to the extent that violations were involved, for the root cause that led to the non-compliance for which this NOED was necessary.

Sincerely,

/RA/

Victor M. McCree
Regional Administrator

Docket Nos.: 50-250, 50-251
License Nos.: DPR-31, DPR-41

Enclosure: List of Participants

cc: Distribution via Listserv

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

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Regional Administrator

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cc Distribution via Listserv

X PUBLICLY AVAILABLE ☐ NON-PUBLICLY AVAILABLE ☐ SENSITIVE X NON-SENSITIVE
ADAMS: X Yes ACCESSION NUMBER: ML14204A652 X SUNSI REVIEW COMPLETE

OFFICE	RII:DRP	RII:DRP	RII:RDP	DORL	RII:ORA	RII:ORA	
SIGNATURE	PJM /RA/	MSL /RA/	JTM /RA/	PJM /RA for/	LDW /RA/	VMM /RA/	
NAME	PMcKenna	MLesser	JMunday	RLantz	LWert	VMcCree	
DATE	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/23/2014	07/23/2014	
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY DOCUMENT NAME: G:\DRPII\RPB3\TURKEY POINT\NOEDS\NOED 14-2-001 APPROVAL LETTER.DOCX

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Letter to Michael Kiley from Victor M. McCree dated July 23, 2014

SUBJECT: NOTICE OF ENFORCEMENT DISCRETION (NOED) FOR FLORIDA POWER AND LIGHT COMPANY REGARDING TURKEY POINT NUCLEAR GENERATING STATION UNITS 3 AND 4 [NOED NO. 14-2-001]

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L. Douglas, RII EICS
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Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

List of Participants

NRC Region II
Victor McCree, Regional Administrator
Joel Munday, Director, Division of Reactor Projects (DRP)
Mark Lesser, Deputy Director, DRP
Mark Bates, Acting Chief, Reactor Projects Branch (RPB) 3, DRP
George McDonald, Senior Risk Analyst, DRP
Timothy Hoeg, Turkey Point Senior Resident Inspector, DRP
Matthew Endress, Turkey Point Resident Inspector, DRP

NRC Headquarters
Louise Lund, Director, Division of Operating Reactor Licensing (DORL), Office of Nuclear Reactor Regulation (NRR)
Ryan Lantz, Deputy Director, (DORL), NRR
Lisa Regner, Chief, Plant Licensing Branch II-2, DORL, NRR
Jacob Zimmerman, Chief, Electrical Engineering Branch (EEEB), Division of Engineering (DE), NRR
Audrey Klett, Project Manager, Plant Licensing Branch II-2, DORL, NRR
Holly Cruz, Project Manager, Licensing Processes Branch (PLPB), Division of Policy and Rulemaking, NRR
Timothy McGinty, Director, Division of Safety Systems (DSS), NRR
Nathan Sanfilippo, Chief, Performance Assessment Branch, Division of Inspection and Regional Support (DIRS), NRR
Robert Taylor, Deputy Director, DSS, NRR
Greg Casto, Chief, Balance-of-Plant Branch (SBPB), DSS, NRR
Robert Dennig, Chief, Containment and Ventilation Branch (SCVB), DSS, NRR
Tony Zoulis, Risk Analyst, PRA Licensing Branch, Division of Risk Assessment, NRR
Gerald Purciarello, Senior Reactor Systems Engineer, SBPB, DSS, NRR
Ahsan Sallman, Senior Reactor Systems Engineer, SCVB, DSS, NRR
Roy Mathew, Team Leader, EEEB, DE, NRR
Gurcharan Matharu, Senior Electrical Engineer, EEEB, DE, NRR

Enclosure

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

Right-of-Way Conditions

FPL shall be bound by the following conditions:

1. FPL shall install off-ramps from their ramp to the levee on the northwest and southwest corners to provide access to the District's right of way for emergency construction, operation and maintenance activities. FPL shall anchor the floating pumps depicted in Exhibit D by cables to the canal banks to keep the pumps from moving.

2. FPL shall be responsible for the routine levee maintenance, such as, but not limited to, mowing of the overbank and side slopes.

3. FPL shall be responsible for the removal of all materials and debris from the District's canal and right of way, and, for the repair, replacement and restoration of any sections of the District's right of way damaged or disturbed resulting from the authorized activity. Restoration shall be to the satisfaction of the District and may include placement of filter fabric cloth, rip-rap and/or grading/re-shaping, seeding, re-sodding with Bahia, Argentine or other species recognized by the District as drought tolerant species.

4. Should the authorized activities or placement of the authorized facilities within the District's right of way attribute to shoaling, erosion or wash-outs of the District's right of way, berm or side slope of the canal, FPL is responsible and expense to, upon notification from the District, immediately take appropriate steps to restore the right of way to the satisfaction of the District.

5. All structures on District works or lands constructed by FPL shall remain FPL's property, who shall be solely responsible for ensuring that such structures and other uses remain in good and safe condition. Other federal, state and local safety standards may govern the occupancy and use of the District's lands and works. The District assumes no duty with regard to ensuring that such uses are so maintained and assumes no liability with regard to injuries caused to others by any such failure.

6. FPL solely acknowledges and accepts the duty and all associated responsibilities to incorporate safety features, which meet applicable engineering practice and accepted industry standards, into the design, construction, operation and

EXHIBIT E

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

continued maintenance of the authorized facilities/authorized use. This duty shall include, but not be limited to, FPL's consideration of the District's regulation and potential fluctuation, without notice, of water levels in canals and works. FPL acknowledges that the District's review and issuance of this Order, including, but not limited to, any field inspections performed by the District, does not in any way consider or ensure that the authorized facilities/authorized use is planned, designed, engineered, constructed, or will be operated, maintained or modified so as to meet applicable engineering practice and accepted industry standards, or otherwise provide any safety protections. FPL further acknowledges that any inquiries, discussions, or representations, whether verbal or written, by or with any District staff or representative, including, any field inspections, shall not in any way be relied upon by FPL as the District's assumption of any duty to incorporate safety features, as set forth above, and shall also not be relied upon by FPL in order to meet FPL's duty to incorporate safety features, as set forth above.

7. FPL agrees to pay all removal and restoration costs, investigative costs, court costs and reasonable attorney's fees, including appeals, resulting from any action taken by the District to obtain compliance with the conditions of the Order or removal of the authorized use. If District legal action is taken by staff counsel, "reasonable attorney's fees" is understood to mean the fair market value of the services provided, based upon what a private attorney would charge.

8. FPL bears all risk of loss as to monies expended in furtherance of this Order.

9. This Order does not convey any property rights nor any rights or privileges other than those specified herein and this Order shall not, in any way, be construed as an abandonment or any other such impairment or disposition of the District's property rights. The District approves the authorized use only to the extent of its interest in the works of the District. FPL shall obtain all other necessary federal, state, local, special district and private authorizations prior to the start of any construction or alteration authorized by the Order. FPL shall comply with any more stringent conditions or provisions which may be set forth in other required permits or other authorizations. The District, however, assumes no duty to ensure that any such authorizations have been

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obtained or to protect the legal rights of the underlying fee owner, in those instances where the District owns less than fee.

10. Unless specifically prohibited or limited by statute, FPL agrees to indemnify, defend and save the District (which used herein includes the District and its past, present and future employees, agents, representatives, officers and Governing Board members and any of their successors and assigns) from and against any and all lawsuits, actions, claims, demands, losses, expenses, costs, attorneys fees (including but not limited to the fair market value of the District's in-house attorneys' fees based upon private attorneys' fees/rates), judgments and liabilities which arise from or may be related to the ownership, construction, maintenance or operation of the authorized use or the possession, utilization, maintenance, occupancy or ingress and egress of the District's right of way which arise directly or indirectly and are caused in whole or in part by the acts, omissions or negligence of FPL, it's employees, agents, representatives, contractors and subcontractors, District or of third parties. FPL agrees to provide legal counsel acceptable to the District if requested for the defense of any such claims.

11. The District does not waive sovereign immunity in any respect.

12. FPL shall not engage in any activity regarding the authorized use which interferes with the construction, alteration, maintenance or operation of the works of the District, including:

a. discharge of debris or aquatic weeds into the works of the District;

b. causing erosion or shoaling within the works of the District;

c. planting trees or shrubs or erecting structures which limit or prohibit access by District equipment and vehicles, except as may be authorized by the Order. FPL shall be responsible for any costs incurred by the District resulting from any such interference, as set forth in (a), (b), and (c), above;

d. leaving construction or other debris on the District's right of way or waterway;

e. damaging District berms and levees;

f. the removal of District owned spoil material;

g. removal of or damage to District locks, gates, and fencing; or,

h. opening of District rights of way to unauthorized vehicular access.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

13. The District is not responsible for any personal injury or property damage which may directly or indirectly result from the use of water from the District's canal or any activities which may include use or contact with water from the District's canal, since the District periodically sprays its canals for aquatic weed control purposes and uses substances which may be harmful to human health or plant life.

14. FPL shall allow the District to inspect the authorized use at any reasonable time.

15. FPL shall allow, without charge or any interference, the District, its employees, agents, and contractors, to utilize the authorized facilities before, during and after construction for the purpose of conducting the District's, routine and emergency, canal operation, maintenance, and construction activities. To the extent there is any conflicting use, the District's use shall have priority over FPL's use.

16. FPL shall not interfere with any other existing or future permitted uses or facilities authorized by the District.

17. The District has the right to change, regulate, limit, schedule, or suspend discharges into, or withdrawals from, works of the District in accordance with criteria established by the District or the U. S. Army Corps of Engineers for the works of the District.

18. FPL shall be responsible for the repair or replacement of any existing facilities located within the District's right of way which are damaged as a result of the installation or maintenance of the authorized facility.

19. It is FPL's responsibility to make prospective bidders aware of the terms and conditions of this Order. It shall be the responsibility of FPL's contractors to understand the terms and conditions of this Order and govern themselves accordingly.

20. It is FPL's responsibility to bring to the attention of the District any conflict in the Order so that they may be resolved prior to the start of construction. In resolving such conflicts the District's determination will be final.

Attachment: FPL Emergency Final Order (2043 : Final Order (SFWMD 2014-078-DAO-WU/ROW/ERP) issued to Florida Power and Light)

NOTICE OF RIGHTS

Pursuant to Section 120.569(2)(n), Florida Statutes, any party adversely affected by this Order has the right to seek an injunction of this Order in circuit court or judicial review of it under Section 120.68, Florida Statutes. Judicial review must be sought by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the Clerk of the District, 3301 Gun Club Road, West Palm Beach, FL 33406 and by filing a copy of the notice of appeal, accompanied by the applicable filing fees with the appropriate district court of appeal. This notice of appeal must be filed within thirty (30) days after this Order is filed with the Clerk of the District.

Pursuant to Section 373.119(3), Florida Statutes, any person to whom an emergency order is directed pursuant to subsection 373.119(2), Florida Statutes, shall comply therewith immediately, but on petition to the board shall be afforded a hearing as soon as possible.

Pursuant to Section 373.114, Florida Statutes, review of this Order by the Governor and Cabinet sitting as the Land and Water Adjudicatory Commission may be sought in accordance with the procedures stated in Section 373.114, Florida Statutes, and Chapter 42-2, Florida Administrative Code.

DISTRICT FILING INSTRUCTIONS

Filings with the District Clerk may be made by mail, hand-delivery, or e-mail. **Filings by facsimile will not be accepted after October 1, 2014.** Documents are deemed filed upon receipt during normal business hours by the District Clerk at SFWMD headquarters in West Palm Beach, Florida. Any document received by the office of the District Clerk after 5:00 p.m. shall be filed as of 8:00 a.m. on the next regular business day. Additional filing instructions are as follows:

- Filings by mail must be addressed to the Office of the District Clerk, P.O. Box 24680, West Palm Beach, Florida 33416.
- Filings by hand-delivery must be delivered to the Office of the District Clerk. **Delivery of a document to the SFWMD's security desk does not constitute filing. To ensure proper filing, it will be necessary to request the SFWMD's security officer to contact the Clerk's office**. An employee of the SFWMD's Clerk's office will receive and file the document.
- Filings by e-mail must be transmitted to the District Clerk's Office at clerk@sfwmd.gov. The filing date for a document transmitted by electronic mail shall be the date the District Clerk receives the complete document. A party who files a document by e-mail shall (1) represent that the original physically signed document will be retained by that party for the duration of the proceeding and of any subsequent appeal or subsequent proceeding in that cause and that the party shall produce it upon the request of other parties; and (2) be responsible for any delay, disruption, or interruption of the electronic signals and accepts the full risk that the document may not be properly filed.

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EXHIBIT F

M E M O R A N D U M

TO: Governing Board Members

FROM: Terrie Bates, Director, Water Resources Division

DATE: September 11, 2014

SUBJECT: Enter a Final Order Approving the 2014 Lower Kissimmee Basin Water Supply Plan

Summary

Regional water supply plans are required to be updated at least every five years pursuant Chapter 373, F.S. With the advent of the Central Florida Water Initiative, the Kissimmee Basin was divided into the Upper Basin, which is part of the CFWI, and the Lower Kissimmee Basin (LKB) which includes portions of Okeechobee, Highlands and Glades counties. This *2014 Lower Kissimmee Basin Water Supply Plan* builds on the previous Kissimmee Basin plans.

The LKB Plan provides demand projections through 2035, and identifies sources to meet these demands pursuant to Chapter 373, F.S. The 2014 LKB Plan concludes that the future water needs of the LKB Planning Area can continue to be met through the 2035 planning horizon with appropriate management and continued development of available groundwater sources. The Draft Plan was released for public review in mid-June and comments were received and considered in the final plan draft.

Staff Recommendation

Staff recommends the Governing Board issue a final order approving the 2014 LKB Water Supply Plan.

Additional Background

Consistent with the Lower West and Lower East Coast Plans, the LKB Plan finds that additional water stored in Lake Okeechobee could return the Lake to an MFL prevention status, enhance existing permitted users level of service, and support environmental needs. Based on projections, public water supply utilities have sufficient water to meet their demands without building additional projects. The Plan also includes information regarding MFL prevention and recovery strategies for MFL water bodies.

The LKB Plan Update was developed in an open public forum with participation by agricultural interests, water utilities, local governments, environmental organizations, the Seminole Tribe of Florida, and other stakeholders through the District's Water Resources Advisory Commission. Two workshops were held during the plan development process to solicit input and to provide information about planning results and progress and other meetings were also held with stakeholders. Comments submitted by stakeholders were considered in final Plan. Approval of this LKB Plan Update will trigger actions by local governments, in coordination with utilities, to consider these recommendations for incorporation into their required 10-Year Facilities Work Plans.

Core Mission and Strategic Priorities

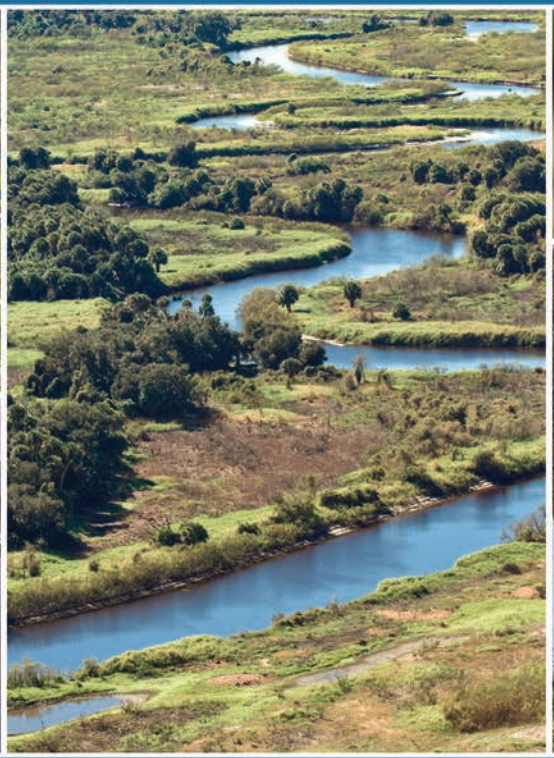
Water Supply is one of the District's core missions. Developing and updating regional water supply plans in coordination with local governments and other stakeholders to meet the current and future demands of the water users and the environment is a strategic priority.

Funding Source
Implementation of the water resource development projects identified in the LKB Plan would be funded through a combination of local, District, and state funds, as appropriate and available. Some of these projects are subject to cost-sharing with the federal government.

Staff Contact and/or Presenter
Cynthia Gefvert, cgefvert@sfwmd.gov, (561) 682-2610

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Planning Document/Appendices



LOWER KISSIMMEE BASIN
WATER SUPPLY PLAN

2014

Attachment: 2014_lkb_wsp (2054 : Enter a Final Order Approving the 2014 Lower Kissimmee Basin Water Supply Plan)

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2014

LOWER KISSIMMEE BASIN

Water Supply Plan

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Acknowledgements

The South Florida Water Management District recognizes and thanks the Water Resources Advisory Commission Regional Water Supply Workshop participants for their contributions, comments, advice, information, and assistance throughout the development of this *2014 Lower Kissimmee Basin Water Supply Plan.*

Furthermore, the South Florida Water Management District expresses appreciation to all staff who contributed to the development and production of this plan.

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sfwmd.gov

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Executive Summary

The South Florida Water Management District's (SFWMD or District) strategic goal for each regional water supply plan is to identify options for an adequate supply of water to meet existing and future reasonable-beneficial uses while ensuring protection of the natural systems. This document is the District's first water supply plan for the Lower Kissimmee Basin (LKB). It provides population and water demand estimates and projections, identifies local and regional efforts completed since the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update), reviews water supply development issues, and identifies options to meet water demands through the 2035 planning horizon.

The LKB Water Supply Planning Area includes portions of Okeechobee, Highlands, and Glades counties, which were formerly included in the Kissimmee Basin Water Supply Planning Area. Since the 2005–2006 KB Plan Update, the Kissimmee Basin Water Supply Planning Area was divided into the LKB and Upper Kissimmee Basin planning areas. The Upper Kissimmee Basin is included in the Central Florida Water Initiative (CFWI) Planning Area. A water supply plan for the CFWI area is being developed by a collective effort of the three water management districts that have jurisdiction in the area – South Florida Water Management District, Southwest Florida Water Management District, and St. Johns River Water Management District and other state agencies, utilities, and stakeholders.

The LKB Planning Area is generally defined as the drainage basins of the Kissimmee River south of the S-65A Structure, Taylor Creek/Nubbin Slough, Lake Istokpoga–Indian Prairie Basin, and Fisheating Creek. This area includes the city of Okeechobee, the Seminole Tribe of Florida's Brighton Reservation, and extensive agricultural lands including portions of the Lake Okeechobee Service Area north of the lake. Lake Istokpoga, Lake Okeechobee, the Kissimmee River, and extensive canal networks and related water works are in the region. The western and northern shore of Lake Okeechobee forms the southeastern boundary of the LKB Planning Area.

This 2014 LKB Plan was developed in an open, public forum with agricultural interests, water supply utilities, local governments, environmental organizations, the Seminole Tribe of Florida, and other stakeholders through the SFWMD's Water Resources Advisory Commission. The process to develop the population and water demand estimates and projections began in 2010. Meetings and workshops were held with water users, local governments, utilities, agriculture and other industry representatives, environmental representatives, and agencies to solicit input, provide information about planning results, and receive comments on the draft plan.

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FUTURE WATER DEMAND

Total average water demand in the LKB Planning Area is projected to increase more than 15 percent to 222 million gallons per day (MGD) by 2035. Agricultural Self-Supply is the largest water use category and is projected to remain so through 2035 when the demand is expected to be 185 MGD or 83 percent of the planning area's total water demand. Total water use is projected to increase 30 MGD over 2010 water demands.

Irrigated agricultural acreage is projected to increase from about 142,000 acres in 2010 to approximately 151,000 acres in 2035. The estimated 2010 acres includes nearly 75,000 acres of permitted, improved pasture that were not included in the 2005–2006 KB Plan Update. Much of this projected agricultural growth has already been permitted in the basin.

While the population served by Public Water Supply (PWS) and Domestic Self-Supply (DSS) in the planning area increased by more than 5,300 people between 2000 and 2010, the volume of water used decreased slightly during that period. The population of the planning area is expected to continue to increase, growing from an estimated 52,967 in 2010 to 65,356 in 2035. Total PWS and DSS water demands are expected to increase from 4.9 MGD in 2010 to 6.0 MGD by 2035.

The remaining water use categories, Industrial/Commercial/Institutional Self-Supply, Power Generation Self-Supply, and Recreational/Landscape Self-Supply, are projected to grow modestly from 24.5 MGD to 31.0 MGD by 2035.

PROTECTION OF NATURAL SYSTEMS

The natural surface water systems of the LKB Planning Area include Lake Okeechobee, Lake Istokpoga, and the Kissimmee River and its floodplains. The water supply needs for these natural systems limit water available for allocation and are addressed through regulatory mechanisms (such as minimum flows and levels [MFLs], water reservations, and restricted allocation areas) and water resource development projects. Construction of ecosystem restoration projects is vital to the health of the region's water resources, including elements identified in MFL recovery and prevention strategies. Protection of the LKB natural systems has been addressed through a number of rules including restricted allocation area criteria for the Lake Okeechobee Service Area (LOSA), the Indian Prairie Basin, and the Lake Istokpoga MFL.

In addition, the SWFWMD established MFLs for several lakes just west of the planning area. The evaluation of projected increases in groundwater withdrawals within the SFWMD were evaluated and found to have no increased impact on MFL lakes within the SWFWMD that have been identified as affected by water use.

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Lake Okeechobee

In the Lake Okeechobee Service Area, local conditions limit the volume of available fresh water. Specifically, Lake Okeechobee and hydraulically connected water bodies are limited sources as a result of the United States Army Corps of Engineers' (USACE) implementation of the 2008 Lake Okeechobee federal regulation schedule. The schedule change is intended to operate the lake at lower levels than recent regulation schedules to reduce the risk that the lake's dike might fail, as well as impacts to the lake ecology.

Studies supporting the 2008 Lake Okeechobee Regulation Schedule change assessed impacts on water supply performance. The analysis projected a decline in the physical level of certainty of agricultural users reliant on lake water supplies, from a 1-in-10 year to a 1-in-6 year drought return frequency. The new schedule also was expected to cause Lake Okeechobee to exceed its minimum flows and levels (MFL) criteria more frequently. In response, SFWMD developed a MFL recovery strategy in 2008. As one part of that strategy, SFWMD adopted regulatory criteria to limit future additional withdrawals from Lake Okeechobee and connected water bodies to protect the lake and prevent further erosion to the level of certainty for existing legal users.

The USACE has started the rehabilitation of the Herbert Hoover Dike. The initial step—construction of a 21.4-mile cutoff wall component in Reach 1—was completed in 2012, and satisfies the majority of the risk reduction goals. As part of this risk reduction approach, the 32 water control structures (culverts) operated by the USACE will be replaced, removed, or abandoned by 2019. Rehabilitation of Reaches 2 and 3 is scheduled for completion by 2022. The USACE has indicated it will consider revisions to the lake regulation schedule at that time. Any increase in the lake's regulation schedule as a result of the repairs will likely be evaluated by the USACE through a National Environmental Policy Act analysis of multiple objectives including flood protection, water supply, and the ecological health of the lake and downstream ecosystems.

Lake Istokpoga and the Indian Prairie Basin

Lake Istokpoga and its canals have long been used to meet agricultural water demands in the Indian Prairie Basin. During normal rainfall years, the water demands from the lake are sustainable with releases made for flood control. However, during drought years and when the preceding winter and spring rainfall is lacking, releases from the lake become problematic and efforts are made to maintain the Lake Istokpoga minimum operating schedule. During these years, the District has had to ration the available supply.

The Seminole Tribe of Florida has surface water entitlement rights in accordance with the 1987 Water Rights Compact among the Seminole Tribe of Florida, State of Florida, and SFWMD (Second Amendment to the Seventeenth Annual Work Plan) and subsequent additional documents addressing the compact entitlement provisions. One of these documents is an agreement between the Tribe and the SFWMD that ensures water delivery to the Brighton Reservation, which is in the Indian Prairie Basin. The agreement outlines

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releases from Lake Istokpoga and withdrawals from Lake Okeechobee when the water level in Lake Istokpoga is low

Because of water shortages in the Lake Istokpoga-Indian Prairie Basin area, the District established a restricted allocation area in the Indian Prairie in the early 1980's. This restricted the use of additional surface water in the area. In December 2005, the District's Governing Board adopted a minimum flow and level (MFL) rule for Lake Istokpoga and the associated canal systems. The prevention strategy for this MFL included the previously established restricted allocation area. These regulations are intended to reduce the potential of the District declaring a water shortage for the basin and ensuring water delivery for the Brighton Reservation.

Kissimmee Basin

The Kissimmee Basin forms the headwaters of Lake Okeechobee and the Everglades with the Kissimmee River contributing about half of the inflow to the lake. In the 1960s, the river was channelized into the C-38 Canal, which caused extensive environmental damage. In response, the Kissimmee River Restoration Project is a multi-phase project with the goal of reestablishing the river and floodplain system's ecological integrity while maintaining existing flood protection. The District is integrating the restoration project with various management strategies for the Kissimmee Basin and Northern Everglades region, including the Kissimmee Chain of Lakes Long-Term Management Plan, Kissimmee Basin Water Reservations, and the Lake Okeechobee Watershed Protection Program. The Kissimmee River Basin Water Reservation, which includes the Kissimmee Chain of Lakes and the Kissimmee River and its floodplain, is on the District's 2014 Priority Water Bodies List and Schedule for future adoption. The District anticipates adoption of the reservation rule by December 2015. This reservation may create water supply limitations from this source in the future.

WATER SOURCES

The LKB Planning Area historically has relied on surface water from Lakes Istokpoga and Okeechobee, their connected canals, and fresh groundwater from the surficial and Floridan aquifer systems as the primary water sources for urban, agricultural, and industrial uses. It is anticipated that these uses will continue. However, restricted allocation area criteria limit increased allocations from Lake Okeechobee and Lake Istokpoga and the hydraulically connected canals.

Fresh groundwater sources (i.e., surficial, intermediate, and Floridan aquifers) and surface water sources (i.e., Lake Istokpoga, Lake Okeechobee, canals) are considered traditional water sources whereas nontraditional or alternative water sources include brackish groundwater, reclaimed water, and water stored in aquifer storage and recovery (ASR) systems and reservoirs. It appears the projected water demand of the LKB Planning Area can be met using traditional ground and surface water sources. At individual locations, alternative sources and conservation may be appropriate.

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CONCLUSION

This water supply plan provides an assessment of the water demands and available sources for the LKB Planning Area through 2035. With the advent of District regulations effectively limiting most of the surface water resources in the planning area, there has been a shift to an increased reliance on groundwater from the surficial and Upper Floridan aquifers. Based upon the estimated locations of the proposed increases in withdrawals from these wells, there appears to be adequate supply to meet the meet the 1-in-10 year drought demands for most water users in the basin during the planning horizon. This level of certainty is reduced to a 1-in-6 year drought condition for those surface water users located within the Lake Okeechobee Service Area. Meeting the 1-in-10 year level of service for this area is not likely within the next five years due to the interrelationship of the federal and state projects outlined in this plan and current operations under the 2008 Lake Okeechobee Regulation Schedule. The SFWMD anticipates any additional water from Lake Okeechobee resulting from operational changes or a revised regulation schedule could return the lake to MFL prevention status, enhance the level of certainty to existing permitted users, and support other environmental objectives.

Successful implementation of this 2014 LKB Plan requires close coordination with agricultural stakeholders, local governments, and utility water supply planning entities. Collaboration with stakeholders is also essential for directing the implementation of the preceding recommendations and guidance. This partnering should ensure that water resources in the LKB Planning Area continue to be prudently managed and available to meet future demand.

Future LKB plan updates will address the progress of the water resource development projects based on project sequencing, project funding, and implementation partnerships as applicable. Until this occurs, this 2014 LKB Plan continues to rely upon existing programs and regulations and their correlation with water supply demands and available sources.

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Acronyms and Abbreviations

2000 KB Plan	*Kissimmee Basin Water Supply Plan*
2005–2006 KB Plan Update	*2005–2006 Kissimmee Basin Water Supply Plan Update*
2008 LORS	2008 Lake Okeechobee Regulation Schedule
2014 LKB Plan	*2014 Lower Kissimmee Basin Water Supply Plan*
ac-ft	acre-feet
AFSIRS Model	Agricultural Field Scale Irrigation Requirements Simulation Model
AGR	Agricultural Self-Supply
Applicant's Handbook	*Applicant's Handbook for Water Use Permit Applications*
ASR	aquifer storage and recovery
AWS	Alternative Water Supply
BEBR	Bureau of Economic and Business Research
bls	below land surface
BMP	best management practice
CERP	Comprehensive Everglades Restoration Plan
CFWI	Central Florida Water Initiative
District	South Florida Water Management District
DSS	Domestic Self-Supply
DWM	Dispersed Water Management
ET	evapotranspiration
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
FAS	Floridan aquifer system
FAWN	Florida Automated Weather Network
FDACS	Florida Department of Agriculture and Consumer Services
FDEO	Florida Department of Economic Opportunity

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FDEP	Florida Department of Environmental Protection
FPL	Florida Power & Light
FRESP	Florida Ranchlands Environmental Services Pilot
FY	Fiscal Year
GIS	Geographic Information System
GPD	gallons per day
GPM	gallons per minute
IAS	intermediate aquifer system
ICI	Industrial/Commercial/Institutional Self-Supply
ICU	intermediate confining unit
IMWID	Istokpoga Marsh Watershed Improvement District
KB	Kissimmee Basin
KBMOS	Kissimmee Basin Modeling and Operations Study
LFA	Lower Floridan aquifer
LKB	Lower Kissimmee Basin
LKBGWM	Lower Kissimmee Basin Groundwater Model
LOER Program	Lake Okeechobee and Estuary Recovery Program
LOPP	Lake Okeechobee Protection Plan
LOSA	Lake Okeechobee Service Area
MFL	minimum flows and levels
MG	million gallons
mg/L	milligrams per liter
MGD	million gallons per day
MIL	Mobile Irrigation Lab
NE-PES	Northern Everglades – Payment for Environmental Services
NGVD	National Geodetic Vertical Datum of 1929
OCI	Okeechobee Correctional Institute
OUA	Okeechobee Utility Authority
PCUR	per capita use rate
PWR	Power Generation Self-Supply
PWS	Public Water Supply

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RAA	restricted allocation area
REC	Recreational/Landscape Self-Supply
RO	reverse osmosis
S.R.	state road
SAS	surficial aquifer system
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
STA	stormwater treatment area
STOF	Seminole Tribe of Florida
Support Document	*2011–2014 Water Supply Plan Support Document*
SWFWMD	Southwest Florida Water Management District
TDS	total dissolved solids
TECO	Tampa Electric Company
Tribe	Seminole Tribe of Florida
UF/IFAS	University of Florida/Institute of Food and Agricultural Services
UFA	Upper Floridan aquifer
UKB	Upper Kissimmee Basin
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDA-NASS	United States Department of Agriculture–National Agriculture Statistics Service
USDA-NRCS	United States Department of Agriculture–Natural Resources Conservation Service
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
Water CHAMP	Water Conservation Hotel and Motel Program
WaterSIP	Water Savings Incentive Program
WRAC	Water Resources Advisory Commission
WTP	water treatment plant
WWTF	wastewater treatment facility

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2014

LOWER KISSIMMEE BASIN

Water Supply Plan

Planning Document

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1 Introduction

The South Florida Water Management District (SFWMD or District) develops or updates regional water supply plans to provide for current and future water needs while protecting central and south Florida's water resources. This *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan) assesses 2010 and projected water needs and water sources to meet those needs through 2035 for the portions of Glades, Okeechobee, and Highlands counties located within the Lower Kissimmee Basin (LKB) Planning Area. This 2014 LKB Plan presents population estimates, water demands and projections, water resource and water supply development projects, and related water supply planning information for the 2010–2035 planning horizon. Designed to be a planning guide for local governments and other water users, this water supply plan provides a framework for water supply planning and management decisions in the LKB Planning Area.

TOPICS

- Plan Description
- Legal Authority and Requirements
- Objectives
- Planning Process
- Planning Area Description
- Factors Impacting the 2014 LKB Plan
- Progress
- Outlook on Climate Change
- Planning for the Next 20 Years

PLAN DESCRIPTION

Since the publication of the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update, SFWMD 2006), the Kissimmee Basin (KB) Planning Area was divided into the LKB and Upper Kissimmee Basin (UKB). As previously mentioned, the LKB includes portions of Glades, Okeechobee, and Highlands counties. The portions of Polk, Osceola, and Orange counties that were in the KB Planning Area are now in the UKB. Water planning for the UKB is part of a cooperative and parallel effort known as the Central Florida Water Initiative (CFWI), which also includes portions of the St. Johns River Water Management District (SJRWMD) and Southwest Florida Water Management District (SWFWMD). The CFWI will generate a separate water supply plan that is the collective effort of the SFWMD, SJRWMD, SWFWMD, Florida Department of Environmental Protection (FDEP), utilities, and other stakeholders.).

This 2014 LKB Plan consists of two documents: a combined Planning Document with Appendices and the *2011–2014 Water Supply Plan Support Document* (Support Document) (SFWMD 2014b). The Planning Document and Appendices focus on the LKB Planning Area

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while the Support Document addresses issues related to all five SFWMD regional planning areas. The Support Document contains background material such as relevant legislation, rainfall information, and information on water resource technologies. These documents are available on-line through http://www.sfwmd.gov/watersupply.

LEGAL AUTHORITY AND REQUIREMENTS

The legal authority and requirements for water supply planning are included in Chapters 373, 403, and 187, Florida Statutes (F.S.). In accordance with Florida's Water Protection and Sustainability Program, regional water supply plans and local government comprehensive plans must ensure that adequate potable water facilities are constructed and concurrently available with new development. The water supply planning region identified in this plan shall be considered a Water Resource Caution Area for the purposes of Section 403.064, F.S., and affected parties may challenge the designation pursuant to Section 120.569, F.S.

GOAL AND OBJECTIVES

The goal for this water supply plan is to identify water supply sources and future projects to meet existing and future reasonable-beneficial uses during a 1-in-10 year drought condition through 2035 while sustaining water resources and natural systems.

The objectives for the 2005–2006 KB Plan Update were reviewed and modified to develop the following objectives for this 2014 LKB Plan:

1. **Water Supply** – Identify sufficient water resource and water supply development options to meet 2035 demands during a 1-in-10 year drought event.
2. **Natural Systems** – Protect and enhance the environmental systems including the Everglades, Kissimmee River, and other federal, state, and locally identified natural resource areas.
3. **Conservation** – Promote increased levels of conservation and improve efficiency of existing and future water use.
4. **Linkage with Local Governments** – Provide information to support local government comprehensive plans. Promote compatibility of plan with tribal and local government land use decisions.
5. **Compatibility and Linkage with Other Efforts –** Promote compatibility and integration with the following:
   - Other state and federal water resource initiatives in the planning region
   - Existing and proposed environmental projects
   - Modifications to operating schedules for the regional systems, including Lake Okeechobee
   - Water use permitting process, minimum flow and level (MFL) criteria, and water reservations

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PLANNING PROCESS

This 2014 LKB Plan describes how anticipated water supply needs will be met in the LKB Planning Area through 2035. The planning process used to develop this plan is outlined in **Table 1**.

Table 1. Planning process for developing the 2014 LKB Plan.

PLANNING PROCESS			
1	2	3	4
Planning and Assessment	**Data Collection, Analysis, and Issue Identification**	**Evaluation of Water Resources and Water Source Options**	**Identify Water Resource and Water Supply Development Projects**
The process incorporated extensive public participation and coordination with tribal and local governments, the Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, and other appropriate state and federal agencies. A review of previous planning efforts in the region and documentation of activities since the approval of the 2005–2006 KB Plan Update were key starting points.	Using the 2005–2006 KB Plan Update as a foundation, developing this plan involved collecting the latest information about population, water demand, (**Chapter 2**), water resources, water conservation, and land use. Groundwater and surface water evaluations and a review of regulatory information, and other related data (**Chapter 3**) confirmed the validity of previously identified issues and helped identify new issues.	The next phase of the planning process involved reviewing existing solutions or developing new solutions to address the identified issues (**Chapter 4**). In areas where projected demand exceeds available supplies, solutions included alternative water supplies and water conservation (**Chapter 5**).	Water supply development projects completed since the previous water supply plan were reviewed (**Chapter 6**).The need for future water supply development projects was examined; none are required because the 2035 projected demands are able to be met with the current infrastructure.

Public Participation

Public participation is a key component in the water supply planning process. Public participation for this plan was primarily conducted under the auspices of the SFWMD's Water Resources Advisory Commission (WRAC). The WRAC serves as an advisory body to the District's Governing Board and is the primary forum for conducting public workshops,

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presenting information, and receiving public input on water resource issues affecting central and south Florida. Commission members represent environmental, urban, tribal, recreational, local government, and agricultural interests from each of the District's water supply planning areas.

The SFWMD held WRAC Issue Workshops during the water supply planning process. Stakeholders representing a variety of interests in the LKB—agriculture, tribal, industry, environmental protection, utilities, local government planning departments, and state and federal agencies—were invited to attend the workshops. During the workshops, participants reviewed information and provided comments regarding projected demands compiled by SFWMD staff.

Individual meetings were also held with local government planning departments, utilities, the Seminole Tribe of Florida, other planning agencies, and agricultural industry representatives to discuss water demand projections and coordinate planning processes.

PLANNING AREA DESCRIPTION

The LKB Planning Area consists of four tributary basins: Kissimmee River (south of Structure S-65A), Taylor Creek/Nubbin Slough, Lake Istokpoga–Indian Prairie/Harney Pond, and Fisheating Creek (**Figure 1** and **Figure 2**). The planning area covers approximately 1,805 square miles. To the northeast of the planning area is the SJRWMD and to the east is the SFWMD's Upper East Coast Planning Area. The western boundary is adjacent to the SWFWMD. Additional information about the physical features of the LKB Planning Area is provided in the Support Document.

The following characteristics describe the LKB Planning Area:

- Agriculture dominates the economic and water use patterns in the region. More than 140,000 acres were devoted to agricultural activities in 2010 with citrus being the largest commodity. Most of the projected increase in water demand by 2035 will support agriculture.
- Population is projected to increase 23 percent, from an estimated 52,967 in 2010 to about 65,356 by 2035. The City of Okeechobee has the largest population.
- The Seminole Tribe of Florida's Brighton Indian Reservation is centrally located within the planning area.
- The region has extensive natural systems including watersheds for Lake Istokpoga, portions of the Kissimmee River, and substantial portions of the headwaters for Lake Okeechobee. A number of environmental restoration projects are expected to occur within the basin during the planning horizon.

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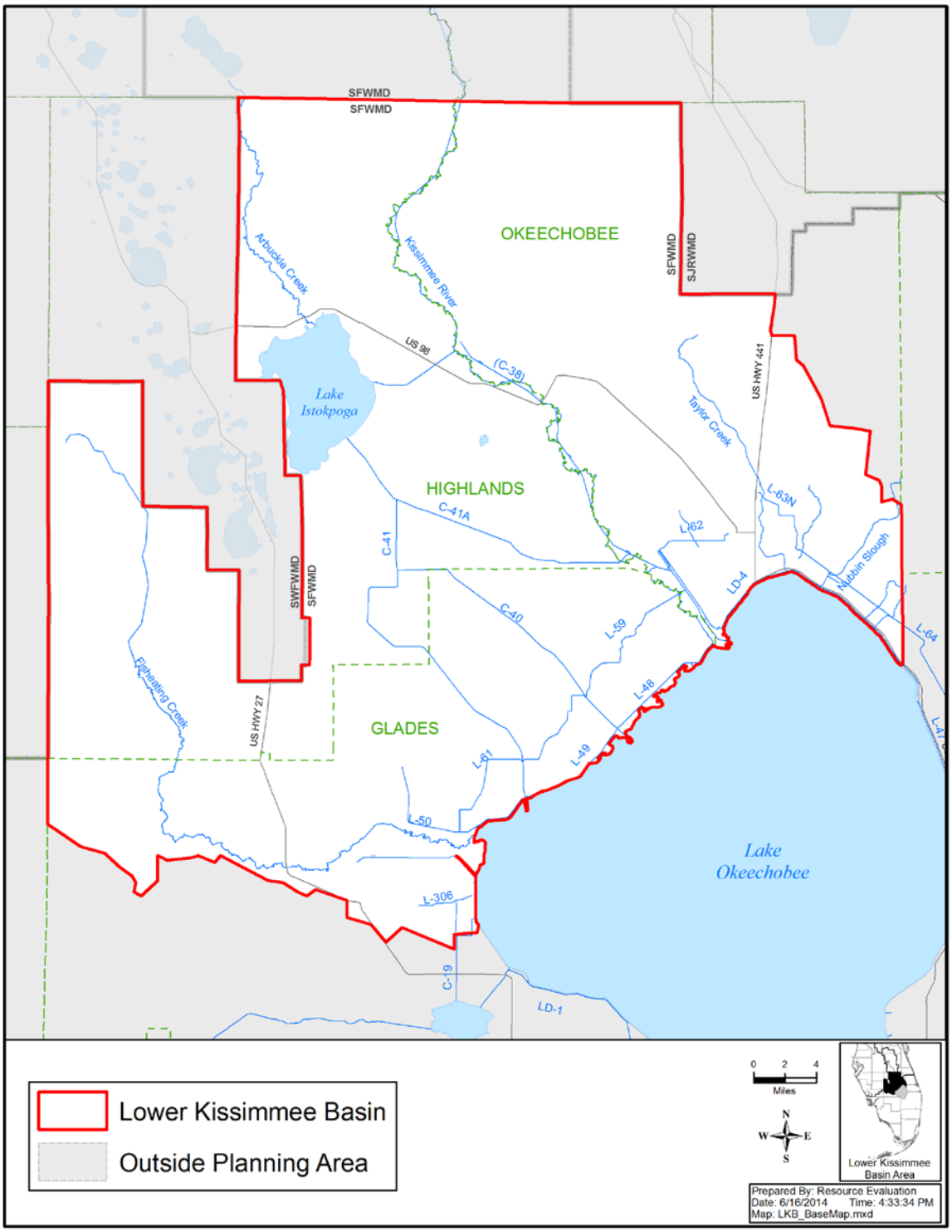

Figure 1. Lower Kissimmee Basin Water Supply Planning Area.

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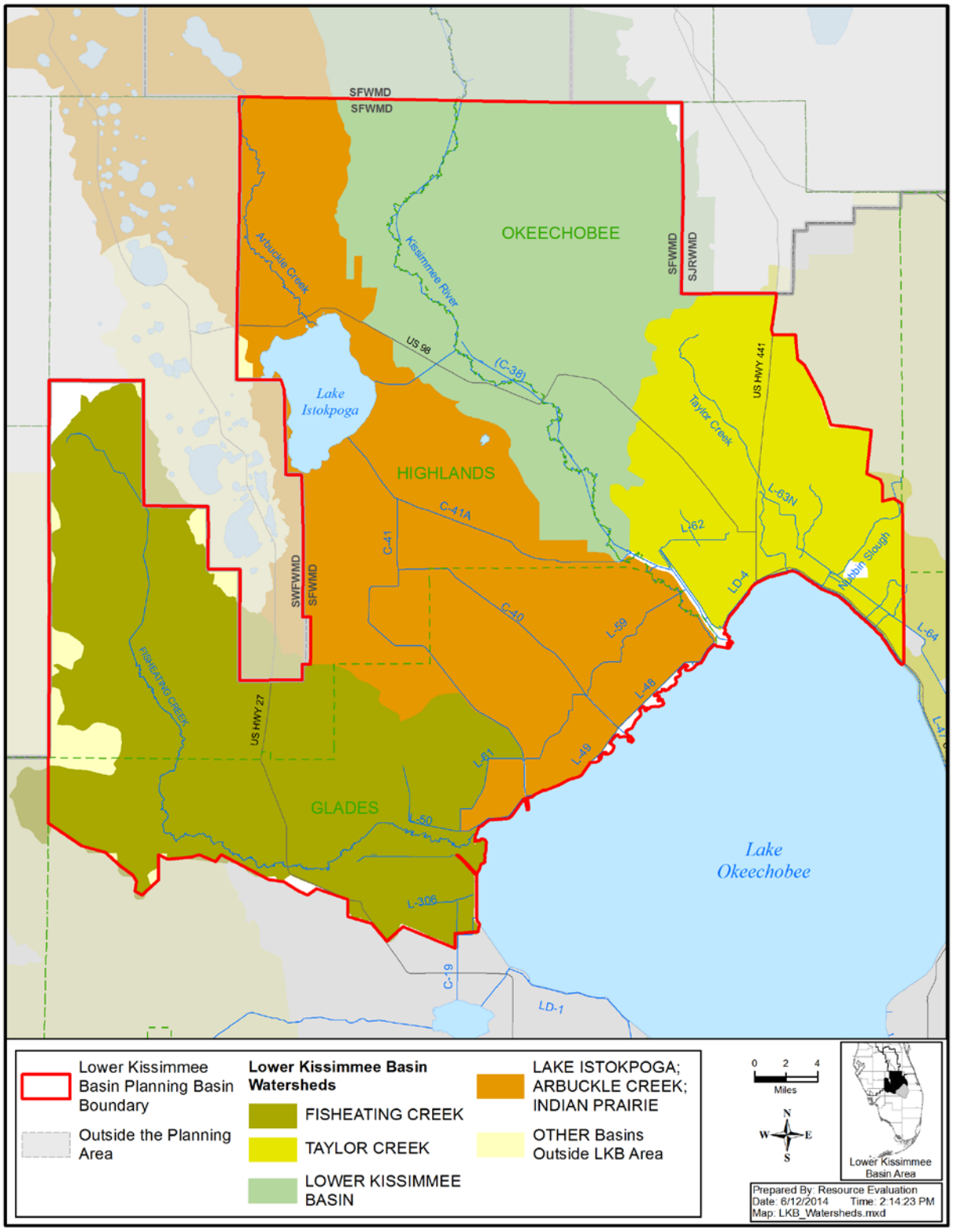

Figure 2. Major watersheds within the LKB Planning Area.

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Water Demand

Total water demand in an average year is expected to increase from 192 MGD in 2010 to 222 MGD in 2035. Agricultural activities are projected to remain the LKB Planning Area's single largest water use category through 2035. Average demand for Agricultural Self-Supply (AGR) is expected to increase from 162 million gallons per day (MGD) in 2010 to 185 MGD by 2035, representing more than 83 percent of the region's gross demand. Projections for most crop types in the region are expected to remain at their 2010 levels with the exception of continuing declines in citrus and the introduction of strawberry, blueberry, and biofuel production crops.

The 2014 LKB Plan uses the 2010 United States census information as part of the baseline data to make population-related projections for the LKB Planning Area through 2035. The planning area population is expected to increase modestly from 52,967 residents in 2010 to 65,356 by 2035. This population projection is based on Bureau of Economic and Business Research growth projections from July 2011. These projections reflect the LKB Planning Area's rural and agricultural character. The estimated Public Water Supply (PWS) and Domestic Self-Supply (DSS) demands combined was 4.91 MGD in 2010 and projected to increase to 6.02 MGD by 2035. Population and water demand estimates are discussed in detail in **Chapter 2** and **Appendix A**.

Overview of Lower Kissimmee Basin Water Resources

Determining the availability of water needed to meet projected demand requires consideration of the area's available water resources. The primary sources of water throughout the LKB Planning Area are groundwater and surface water. To a much lesser extent, reclaimed water is also used. The following is a brief description of the groundwater and surface water sources and their historic use. **Chapter 3** and **Chapter 5** discuss the evaluation of these resources in more detail. In addition, information related to the LKB Planning Area and its water resources is included in the Support Document.

Groundwater Sources

The LKB Planning Area uses water from three hydrogeologic units: the surficial aquifer system (SAS), intermediate aquifer system (IAS), and Floridan aquifer system (FAS). The FAS is the primary groundwater source and includes the Upper and Lower Floridan aquifers. **Figure 3** shows the cross-section of these hydrogeologic units within the UKB and LKB planning areas.

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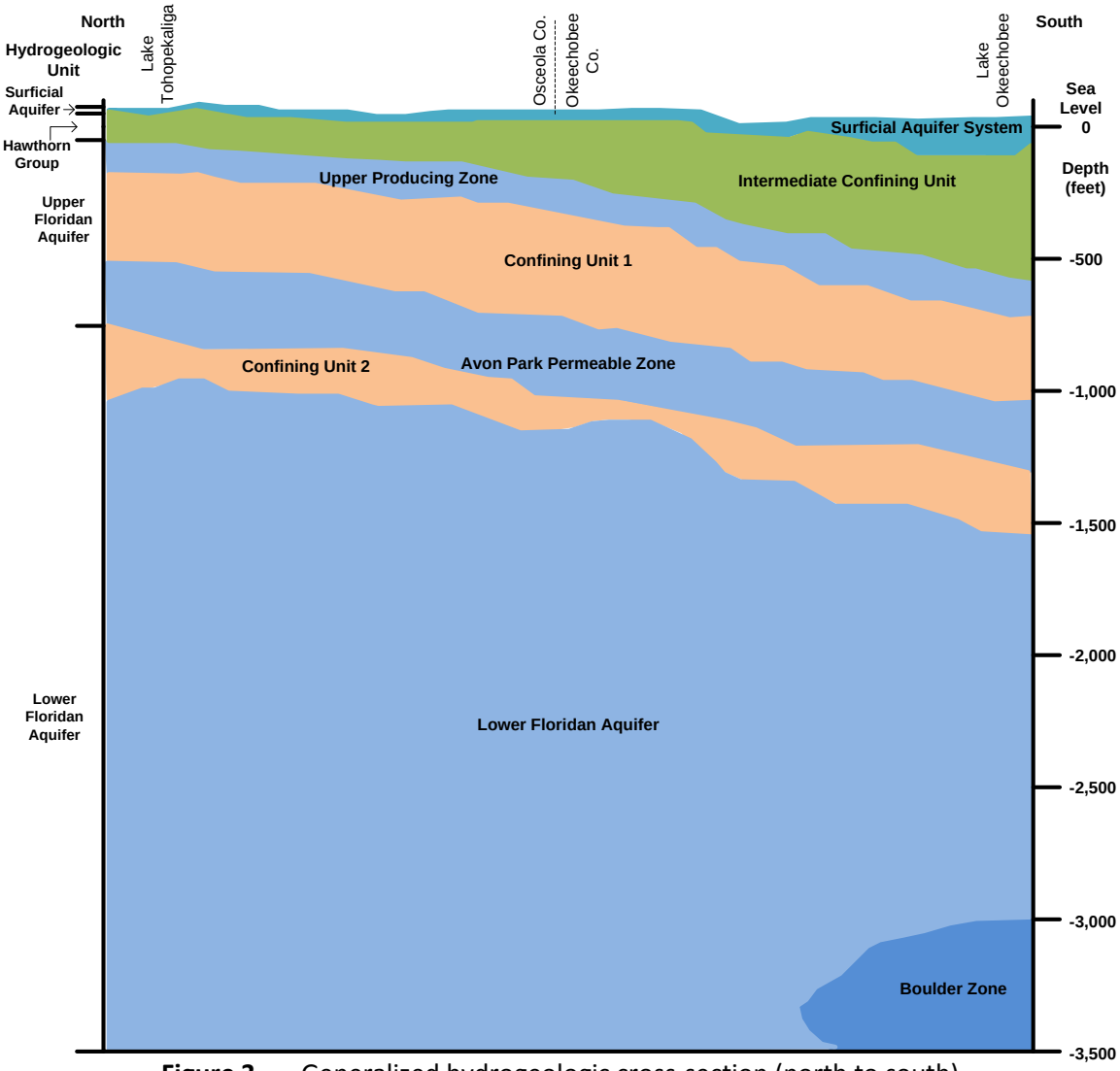

Figure 3. Generalized hydrogeologic cross-section (north to south) of the Upper and Lower Kissimmee Basin planning areas.

Surficial Aquifer System

The SAS, an unconfined aquifer, produces small quantities of good-to-fair quality water. Within the LKB Planning Area, it is used for PWS, Domestic Self-Supply (DSS), lawn irrigation, and small-scale agricultural irrigation. Okeechobee County Utilities and the Seminole Tribe operate SAS wellfields.

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Intermediate Aquifer System / Intermediate Confining Unit

The IAS acts as a semiconfining unit between the SAS and FAS in the LKB Planning Area. While a few locally occurring water producing zones within the IAS exist, they generally do not produce large amounts of water. For example, some portions of southern Okeechobee County and the far western portion of the planning area along the Lake Wales Ridge have wells that exhibit moderate yields from the IAS due to local sand beds in the aquifer. The IAS's confining properties are less effective in some locations closer to the ridge due to geologic features that allow an enhanced connection between the SAS and FAS.

Floridan Aquifer System

The FAS is a high-yield aquifer that provides substantial volumes of good quality water for a wide variety of uses within the LKB Planning Area. The FAS is the primary groundwater producing aquifer in the area and is often broken into upper and lower sections due to a less productive horizon separating the two aquifers. The yield of the Upper Floridan aquifer (UFA) is sufficient and of suitable quality for PWS and AGR. The water quality and aquifer yield deteriorate southward near Lake Okeechobee. The UFA is further divided by confining units into the upper producing zone and the Avon Park permeable zone. These zones can also vary in water yield and quality. The water quality within the Lower Floridan Aquifer (LFA) is thought to be saline throughout most of the LKB Planning Area. The production characteristics of the LFA are less documented but it is thought to be able to yield large quantities of water.

Surface Water Sources

Hydrologically, the entire LKB Planning Area lies within the Lake Okeechobee Watershed and consists of four tributary basins: Kissimmee River, Taylor Creek/Nubbin Slough, Lake Istokpoga–Indian Prairie/Harney Pond, and Fisheating Creek (**Figure 2**). With the exception of Fisheating Creek, all major inflows to Lake Okeechobee are controlled by gravity-fed or pump-driven water control structures.

Surface waters from Lake Istokpoga and Lake Okeechobee are significant water sources for water users in Okeechobee, Glades, and Highlands counties. Historically, these lakes have met the agricultural demands of the Indian Prairie Basin, which is located between the lakes. A water budget analysis completed as part of the *Kissimmee Basin Water Supply Plan* (SFWMD 2000b), changing lake regulation schedules, and a number of water shortages in the Indian Prairie Basin and the Lake Okeechobee Watershed demonstrated the need to limit further withdrawals of water from Lake Istokpoga and Lake Okeechobee. **Chapter 3** and the Support Document provide more detail on the recent regulatory actions that have limited additional supply from these lakes.

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Lower Kissimmee River Basin

The Kissimmee River is the longest surface water feature in the LKB and contributes close to 50 percent of the total flow to Lake Okeechobee (SFWMD, FDEP, and FDACS 2011). The portion of the river between the S-65 and S-65E structures is the focus of restoration and protection efforts. Lake Istokpoga is connected to the Kissimmee River by the Istokpoga Canal. The flow from this canal to the river is controlled by the S-67 Structure. The portion of the Istokpoga Canal spanning the Kissimmee River floodplain is also undergoing restoration.

Taylor Creek / Nubbin Slough

Taylor Creek and Nubbin Slough are interconnected basins that drain into Lake Okeechobee from the north and northeast. The Nubbin Slough Basin includes three tributaries: Lettuce Creek, Henry Creek, and Mosquito Creek, which, along with Nubbin Slough, are intercepted by the L-63, L-64, and C-59 canals and enter Lake Okeechobee through the S-191 Structure.

Two pilot projects for the construction and operation of stormwater treatment areas (STAs) in the Lake Okeechobee Watershed are being conducted in the Taylor Creek and Nubbin Slough basins. These STAs are a major component of the Lake Okeechobee Protection Plan (LOPP), which seeks to restore and protect Lake Okeechobee by achieving and maintaining compliance with water quality standards in the lake and its tributaries.

Lake Istokpoga – Indian Prairie Basin

The Indian Prairie Basin, located in the northeastern corner of Glades County and the southeastern corner of Highlands County, drains the northwestern portions of the Lake Okeechobee Watershed. Four canals, C-39A, C-41A, C-40 (Indian Prairie Canal), and C-41 (Harney Pond Canal), connect Lake Istokpoga to Lake Okeechobee. As previously mentioned, the Istokpoga Canal connects Lake Istokpoga to the Kissimmee River through the S-67 Structure. Major tributaries to Lake Istokpoga are Josephine Creek and Arbuckle Creek, located west and north of the lake, respectively.

Fisheating Creek

The Fisheating Creek Basin originates in western Highlands County and flows south through Cypress Swamp into Glades County. From central Glades County, the water leaves the creek channel and flows east through Cowbone Marsh into Lake Okeechobee. Recent studies in the Fisheating Creek Watershed have focused on creating water storage and improving water quality discharges to Lake Okeechobee. These are discussed in detail in **Chapter 3**.

Fisheating Creek

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Lake Okeechobee

Lake Okeechobee is a key component of the south Florida hydrologic system. The lake is critical for flood control during wet seasons and water supply during dry seasons. Its other functions include navigation, fisheries, and wildlife habitat.

The SFWMD's Lake Okeechobee Basin consists of several agricultural irrigation basins surrounding Lake Okeechobee and includes areas southeast of the L-59, L-60, and L-61 canals within the LKB Planning Area. Surface water withdrawals from Lake Okeechobee and all surface water hydraulically connected to the lake are currently limited due to restricted allocation area criteria.

PROGRESS SINCE THE 2005–2006 KB PLAN UPDATE

Following the original *Kissimmee Basin Water Supply Plan* (SFWMD 2000b), significant progress was made identifying surface water availability in the Lake Istokpoga–Indian Prairie Basin and by advancing the understanding of groundwater availability in the basin. This was included in the 2005–2006 KB Plan Update. Several of the projects were not within the LKB Planning Area, but the findings and data are relevant as they provide useful information for LKB groundwater models. Programs having a direct influence on the LKB water resources since the 2005–2006 KB Plan Update include:

Kissimmee River Restoration Project and Initiatives

- In partnership with the United States Army Corps of Engineers (USACE), three of five phases of the Kissimmee River Restoration Project are complete. Work on the final two phases is scheduled to begin in 2015. The District is integrating the restoration project with various management strategies for the Kissimmee Basin and Northern Everglades region, including the Kissimmee Chain of Lakes Long-Term Management Plan, Kissimmee Basin Water Reservation, and the Lake Okeechobee Watershed Protection Program. The Kissimmee River Restoration Project will culminate with the implementation of a new regulation schedule, called the Headwaters Revitalization Schedule, to guide operation of the S-65 Structure.

Restoration work on the Kissimmee River

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Modeling and Hydrologic Studies

- The Kissimmee Basin Modeling and Operations Study (KBMOS) was a District initiative to identify alternative water control structure operating criteria for the Kissimmee Basin and its associated water resource projects. The goal of KBMOS was to achieve a more acceptable balance between flood control, water supply, aquatic plant management, and natural resources for the Kissimmee Chain of Lakes, as well as reduce impacts on Lake Okeechobee.. These efforts were put on hold in October 2013, due to Kissimmee River Restoration Project cost-sharing issues between the SFWMD and the USACE. In November 2013, the SFWMD and USACE agreed to instead move forward implementing the Headwaters Revitalizations Schedule as outlined in the 1996 Headwaters Revitalization Report. The system will be operated for several years and it will then be determined if further refinements are needed to meet river restoration hydrologic targets.
- Between 2006 and 2013, the District and its partners completed the following hydrogeologic investigations relevant to the LKB Planning Area:
  - The United States Geological Survey (USGS) study *Hydrogeology and Groundwater Quality of Highlands County, Florida* (Spechler 2010)
  - The USGS and District report *Synthesis of the Hydrogeologic Framework of the Floridan Aquifer System and Delineation of a Major Avon Park Permeable Zone in Central and Southern Florida* (Reese and Richardson 2007)
  - Construction of a Lower Floridan aquifer test well in southeastern Polk County in partnership with Polk County Utilities (2010)
  - A hydrogeologic investigation of the Lower Floridan aquifer at Site B located in southern Polk County (2013)
  - Construction and testing of an Upper Floridan aquifer monitor well at the L-63N Canal Aquifer Storage and Recovery site near Okeechobee, Florida (2008)
- The Fisheating Creek Feasibility Study is being conducted by the SFWMD, FDEP, and Florida Department of Agriculture and Consumer Services (FDACS). The goal of the study is to identify the most appropriate mix of features to improve the hydrology and water quality in the watershed to reduce nutrient loads entering Lake Okeechobee. Phase I of the Fisheating Creek Feasibility Study was completed in March 2009. Implementation of Phase II will identify alternative sites for water quality improvement and to meet storage and water quality goals for the Fisheating Creek Sub-watershed.
- The Lower Kissimee Basin Groundwater Model (LKBGWM) was updated for use in this water supply plan.
- The District constructed an exploratory well (OKF-105) in Okeechobee County near the S-65C structure to evaluate the hydrogeologic conditions of the FAS for

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water supply and aquifer storage and recovery (ASR) potential and as a high quality data source for groundwater model calibration.

Regulatory Protection and Water Quality Efforts

- In 2007, the USACE designated the Herbert Hoover Dike to be a Class I risk, the highest risk for dam failure. The construction of a 21.4-mile cutoff wall in Reach 1 was completed in 2012. The 32 water control structures (culverts) operated by the USACE are being replaced, removed, or abandoned with a scheduled completion in 2019. Rehabilitation of an additional section of the dike is planned to be completed by 2022.
- The USACE implemented the 2008 Lake Okeechobee Regulation Schedule (2008 LORS) to address concerns about the integrity of the Herbert Hoover Dike surrounding Lake Okeechobee as well as high water impacts to the lake ecology. This regulation schedule is designed to maintain lake levels at a lower elevation, between 12.5 and 15.5 feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD), than previous regulation schedules (USACE 2007). Analyses for the supplemental environmental impact statement for 2008 LORS indicated that existing legal users in the Lake Okeechobee Service Area (LOSA) would experience more frequent water shortages than those experienced under the previous schedule. The analysis projected a decline in the physical level of certainty of agricultural users reliant on lake water supplies, from a 1-in-10 year to a 1-in-6 year drought return frequency.

Herbert Hoover Dike

- Analyses indicated that implementation of 2008 LORS would cause MFL criteria for Lake Okeechobee to be violated. Therefore, the SFWMD changed the Lake Okeechobee MFL status from prevention to recovery. In October 2008, the SFWMD adopted restricted allocation criteria for the LOSA as part of the lake's MFL recovery strategy.
- Shortly after implementation of 2008 LORS, the SFWMD updated its Water Shortage Management Plan (Rule 40E-21, Florida Administrative Code [F.A.C.]) to ensure equitable distribution of available water resources among all permitted water users of the lake during times of water shortage.
- Adaptive protocols for Lake Okeechobee operations were updated in 2010 (SFWMD 2010) in response to 2008 LORS implementation. The protocols provide guidance to staff and the District's Governing Board when making recommendations to the USACE about Lake Okeechobee water releases when

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lake levels are in the base flow and beneficial use bands of the regulation schedule. Adaptive protocols are designed to identify "win-win" or "win-neutral" situations in which one or more environmental resources may benefit from a lake release and where minimal or no adverse effects on meeting permitted agricultural and urban water supply needs or impacts on Seminole Tribe of Florida water rights are anticipated.

- In June 2014, the District Governing Board reinitiated rule development to reserve water for the Kissimmee River Basin (Kissimmee River, its floodplain, and the Kissimmee Chain of Lakes). The initial effort culminated in 2009 prior to rule adoption. The reservation was relisted on the 2014 Priority Water Bodies List and Schedule and adoption is expected by December 2015.
- In December 2005, the District's Governing Board adopted an MFL for Lake Istokpoga (Rule 40E-8.351, F.A.C.). The rule was established in the Florida Administrative Code in January 2006 (see **Chapter 3** for more details).

Water Storage

- Numerous studies evaluating ASR technology have been completed as part of the Comprehensive Everglades Restoration Plan (CERP). Additional District efforts continue to expand the understanding of regional-scale ASR implementation. Details about the District's efforts to explore ASR technologies can be found in **Chapter 4**.

ASR test well

Water Conservation

- In September 2008, the SFWMD adopted the Comprehensive Water Conservation Program to foster demand management and save water throughout the District.
- The Districtwide Year-Round Landscape Irrigation Conservation Measures Rule became effective in March 2010 (Chapter 40E-24, F.A.C.). Consistent with the Comprehensive Water Conservation Program, the rule limits landscape irrigation to two days per week in Okeechobee and Highlands counties and three days per week in Glades county.
- The Water Savings Incentive Program (WaterSIP) provides cost-sharing funds for non-capital projects, such as the purchase and installation of high-efficiency indoor plumbing fixtures, outdoor irrigation retrofits, and automatic distribution system line-flushing devices. Utilities, municipalities, property owner associations, and large water users may participate in this ongoing

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program. Funds from WaterSIP helped support a program to replace indoor plumbing fixtures in Highlands County in Fiscal Year (FY) 2006.

- Additional information about water conservation programs can be found in **Chapter 5**.

Alternative Water Supply

- Through the Alternative Water Supply (AWS) Funding Program, the District assisted water users in developing alternative water supply projects, including reclaimed water, surface water, storm water capture and storage, ASR, and desalinated brackish or saline water. Within the LKB Planning Area, between FY 2006 and FY 2013, the District helped fund six AWS projects, saving an estimated 2.9 MGD. These projects included stormwater retrofit and reclaimed water expansion efforts. More information on the AWS Program is available in **Chapter 6**.

OUTLOOK ON CLIMATE CHANGE

Because a reliable and economical supply of water is necessary for a strong Florida economy, climate change and its effects on hydrologic conditions should be considered in water supply planning. Long-term data and modeling have been used to predict changes to air temperatures, weather patterns (including the frequency and intensity of rain), droughts, evapotranspiration rates, stream flow, sea levels, and other parameters that will affect water availability and water quality. Florida is especially vulnerable to the effects of climate change and sea level rise due to its low topography. Additional discussion of climate change is provided in **Chapter 3**.

WATER SUPPLY PLANNING FOR THE NEXT 20 YEARS

The stronger statutory link between local governments' comprehensive plans and the SFWMD's regional water supply plans, data sharing, and collaborative planning are credited with strengthening the water supply planning process. Updates to local governments' water supply facilities work plans, comprehensive plans, and the SFWMD's next 5-year water supply plan update will continue to refine 20-year Public Water Supply demand estimates and projections. Based on Chapter 570, F.S., the FDACS will develop the agricultural demand projections. These will be considered for use in future water supply plans prepared by all water management districts. Moreover, the SFWMD's Water Supply Planning staff closely coordinates with Water Use Permitting staff during the water supply planning process. Coordination also increased through implementation of the Florida Department of Environmental Protection 2012 guidance memorandum addressing coordination between water management districts' water supply planning and permitting staff regarding projects included in water supply plans.

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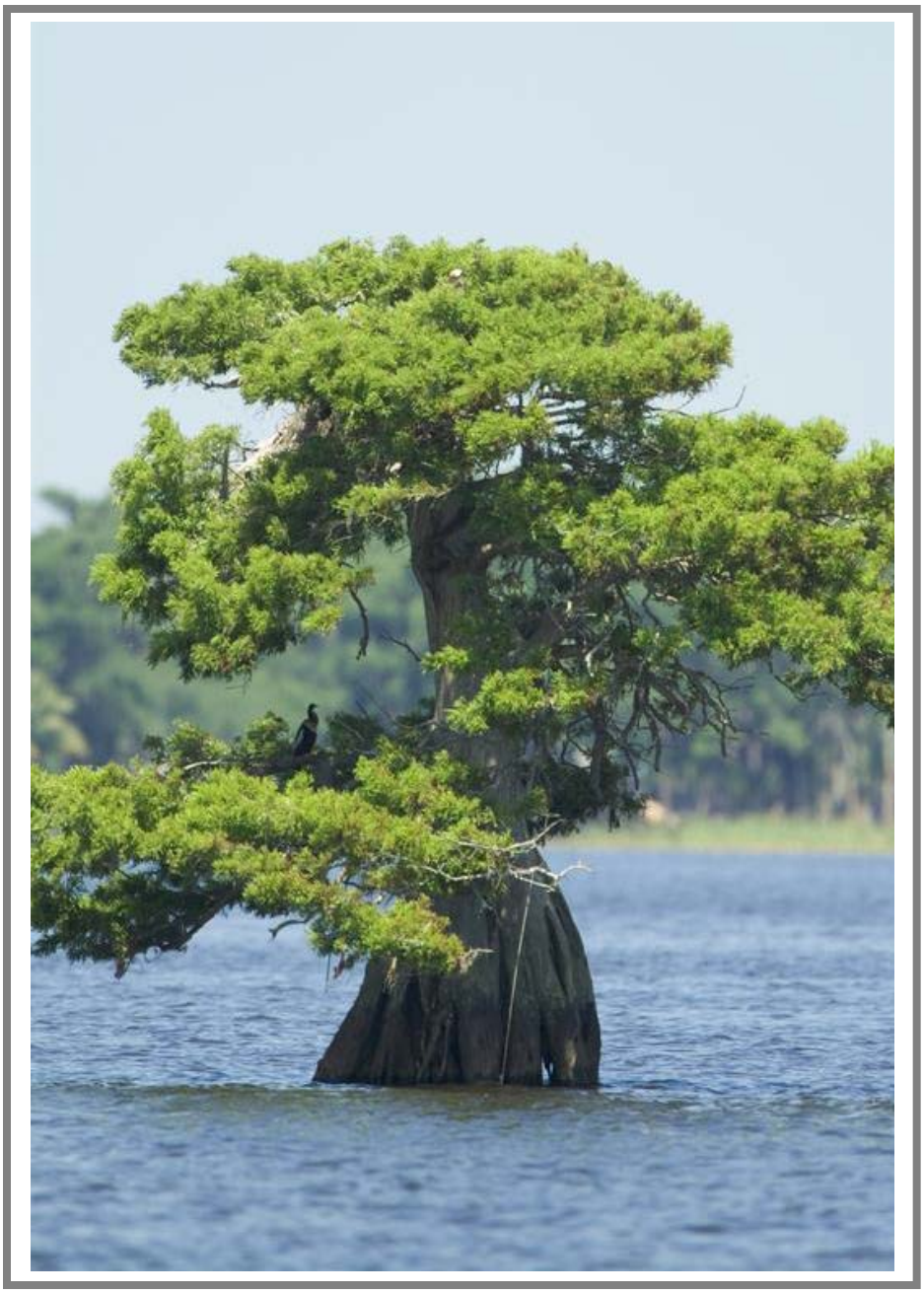

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2

Demand Estimates and Projections

This chapter provides a summary of water demand estimates and projections for the Lower Kissimmee Basin (LKB) Planning Area by water use categories for the planning horizon of 2010 through 2035. These water demand projections were developed through a process coordinated with stakeholders from agriculture, industry, local governments, utilities, the Seminole Tribe of Florida, and other interested groups. A detailed discussion of data collection and analysis conducted in support of this *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan) can be found in **Appendix A**.

TOPICS

- Net versus Gross Demand
- Water Use Categories
- Population and PWS Trends
- Estimated Water Demands
- Summary
- Projections in Perspective

Previous estimates and projections for the Kissimmee Basin Planning Area were published in the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update, SFWMD 2006). For this 2014 LKB Plan, data from the year 2010 were used as the baseline to estimate demand projections. This baseline provides a starting point from which to assess future water demands and determine whether new water supply development projects are required to meet the water needs of this planning area over the planning horizon. The baseline was developed from various sources including the 2010 United States Census (U.S. Census Bureau 2010), aerial photography land use identification, industry reports on crop production, irrigation system efficiency data, historical water use, and the South Florida Water Management District (SFWMD or District) Water Use Regulatory Database. Projections from the baseline were made using additional data, including the University of Florida's Bureau of Economic and Business Research (BEBR) county-level population projections, site-specific variables, and regional climatic conditions.

Water demand trends in the LKB Planning Area are largely driven by population and agriculture. The population within the LKB Planning Area continues to increase, which has broad impacts on water demand. Total irrigated agriculture in this planning area is anticipated to increase slightly with the introduction of new crops. While citrus acres continue to decline because of citrus greening and canker, agricultural acreage is expected to increase.

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NET VERSUS GROSS WATER DEMAND

Water demand can be described as either gross or net values. Gross water demand is the total amount of water required and accounts for treatment, distribution, and irrigation system losses. Gross water demand is also referred to as raw water or water withdrawal demand and is commonly associated with water use permits. Net demand is the volume of water needed by an end user/customer or agricultural activity and does not include treatment or delivery system inefficiencies. Net water demand represents the user/customer demand or plant growth requirements to sustain yield. Gross demands are most typically used because the value reflects the actual water required to be produced to meet the projected need and is the value most often referred to in this plan. Both gross and net water demands are calculated in million gallons per day (MGD) and are presented in **Appendix A** for each water use category.

DESCRIPTIONS OF WATER USE CATEGORIES

Water demands for 2010 and projections through 2035 are estimated in five-year increments for each of the following six water supply categories established by the Florida Department of Environmental Protection (FDEP):

- **Public Water Supply (PWS)** – Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages equal to or greater than 100,000 gallons per day (GPD) or 0.1 MGD.
- **Domestic Self-Supply (DSS)** – Water used by households served by small utilities (less than 0.1 MGD) or private wells.
- **Agricultural Self-Supply (AGR)** – Water used for commercial crop irrigation, nurseries, livestock watering, pasture, and aquaculture.
- **Industrial/Commercial/Institutional Self-Supply (ICI)** – Self-supplied water consumed by business operations of 0.1 MGD or more.
- **Recreational/Landscape Self-Supply (REC)** – Water used for irrigation of golf courses, parks, cemeteries, large common areas (such as homeowner associations and commercial developments), and other self-supplied irrigation uses with demands of 0.1 MGD or greater.
- **Power Generation Self-Supply (PWR)** – Water consumed by power plants in the production of electricity, excluding use of seawater sources.

Projections for each water use category are based on demand under average annual rainfall conditions and anticipated growth in the LKB Planning Area through 2035. As water use is impacted by weather, particularly rainfall, demands for 1-in-10 year drought conditions are estimated and projected. A 1-in-10 year drought event is a rainfall deficit that would have a 10 percent probability of occurring during any given year. Section 373.709(2)(a), Florida Statutes (F.S.), states the level of certainty planning goal associated with identifying demands shall be based on meeting demands during a 1-in-10 year drought event. **Appendix A** presents both net and gross demands under average rainfall year and 1-in-10

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year drought conditions through the 2035 planning horizon. **Appendix A** also contains additional details about the methods to estimate and project water demands for each water use category. For PWS and DSS, permanent population and, for PWS, demand by each utility are provided. For AGR, irrigated acreage and demand for each crop type are provided. Although not quantified in this chapter, environmental demand is addressed through resource protection criteria (**Chapter 3**).

Figure 4 compares estimated water use by category in the LKB Planning Area in 2010 to projections for 2035.

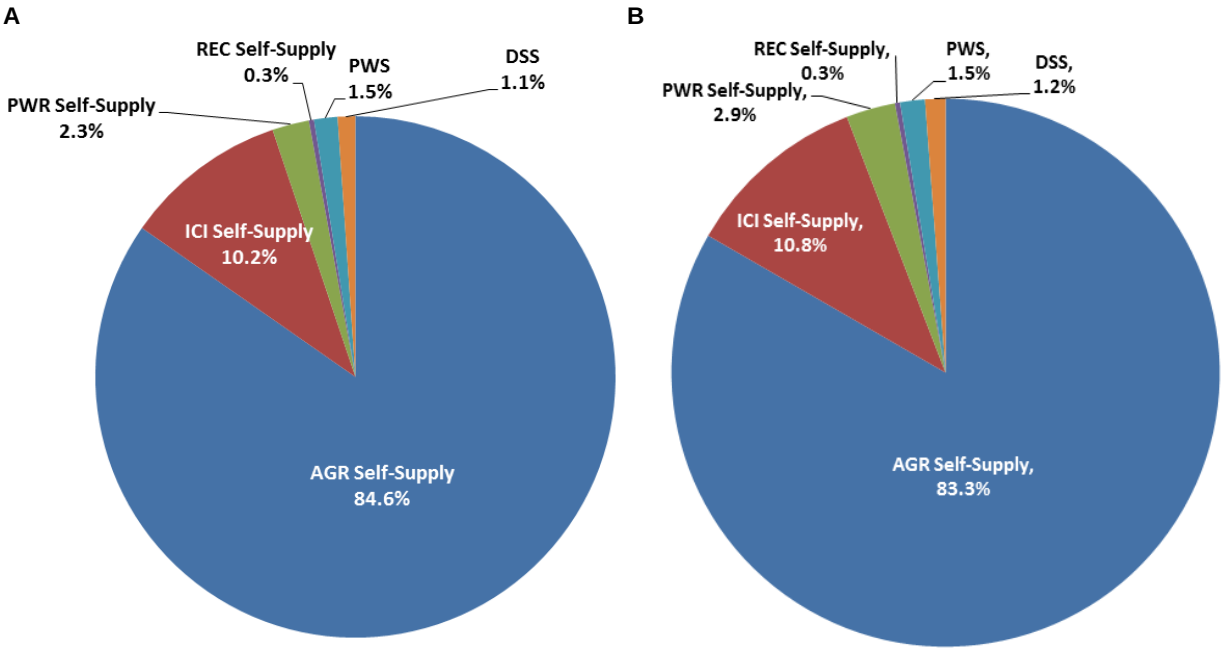

Figure 4. **A.** Water use by category in 2010; **B.** Projected water use by category in 2035.

POPULATION AND PWS WATER USE TRENDS

Population estimates for this plan include permanent populations of the portions of Highlands, Glades, and Okeechobee counties in the LKB Planning Area. Overall, the population is expected to increase by 12,389 residents, or about 23 percent, by the year 2035. The part of Okeechobee County within the LKB will experience the region's greatest increase in population with 8,280, or almost 22 percent, more residents. The population of the sections of Glades and Highlands counties in the LKB Planning Area will increase by 1,368 (34 percent) and 2,741 (26 percent) residents respectively over the planning horizon.

Estimates of population growth in this plan are slightly higher than previously projected. Comparison of the 2025 population projections in this 2014 LKB Plan to the 2005–2006 KB Plan Update shows an increase in basinwide population of about 3 percent or 1,989 people.

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ESTIMATED WATER DEMAND

Public Water Supply and Domestic Self-Supply

PWS is water supplied by water treatment facilities to homes, office and retail facilities, schools, institutions, and similar users for potable use (drinking quality). Utilities with projected average pumpage equal to or greater than 0.1 MGD through 2035 are included in the PWS category. Water used by households or facilities served by small utilities (less than 0.1 MGD) or individual wells are categorized as DSS.

Developing PWS water demand projections for the LKB Planning Area was a multistep process. The first step was creating updated maps showing the areas currently served by each utility (PWS service areas). An additional map was prepared for utilities planning to expand their service area by 2035. Populations were then assigned to the currently served areas using census block data from the 2010 United States Census to establish a draft 2010 PWS utility population (U.S. Census Bureau 2010). These 2010 populations were then projected to change at the medium BEBR county growth rate to provide a preliminary 2035 population projection for each PWS utility service area (BEBR 2011). When utility service area populations were expected to change at rates that were different from the BEBR county rates, the population projections were adjusted appropriately. Throughout the process, the service area maps and draft projections were discussed with each utility to coordinate final projections. DSS populations represent the difference between the county population in the planning area and the PWS utility service area populations for the same county. Projections were also coordinated with the surrounding water management districts to ensure consistency in county population distributions.

The population information was combined with 2009–2010 historic water use information from each major utility to develop a per capita use rate (PCUR). The PCUR and population projections were used to develop a projected PWS gross water demand for each utility. The PCURs for DSS within each LKB county were assumed to be the same as the state average PCUR reported by the FDEP. Water conservation measures were not factored into the demand projections used in this plan; rather, water conservation is considered a water source option and is discussed in **Chapter 5**.

Table 2 provides a summary of the population estimates for the portions of each county located in the LKB Planning Area, and **Table 3** lists the estimated and projected PWS and DSS water demand for 2010 and 2035.

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Table 2. Permanent resident population in the LKB Planning Area, 2010–2035.

County Area	2010 Estimated Population			2035 Projected Population		
	PWS	DSS	Total	PWS	DSS	Total
LKB Highlands	3,230	7,258	10,488	4,074	9,155	13,229
LKB Glades	2,758	1,233	3,991	3,636	1,724	5,359
LKB Okeechobee	23,327	15,161	38,488	27,936	18,831	46,768
Total	**29,315**	**23,652**	**52,967**	**35,646**	**29,710**	**65,356**

Source: U.S. Census, 2010.

Table 3. Average PWS and DSS water demands in the LKB Planning Area in MGD, 2010 and 2035.

	2010 Estimated	2035 Demand
LKB Glades County PWS	0.21	0.29
LKB Glades County DSS	0.11	0.15
LKB Glades County Total	0.32	0.44
LKB Highlands County PWS	0.33	0.38
LKB Highlands County DSS	0.65	0.81
LKB Highlands County Total	0.98	1.19
LKB Okeechobee County PWS	2.26	2.71
LKB Okeechobee County DSS	1.35	1.68
LKB Okeechobee County Total	3.61	4.39
LKB Planning Area Total	4.91	6.02

Note: Perceived discrepancies in table totals are due to rounding.

Agricultural Self-Supply

Agriculture is the largest water use category in the LKB Planning Area and the main crops include citrus, sugar cane, sorghum, small vegetables, and berries. Cow/calf operations are also common in the area. Agriculture is expected to continue as a key industry in the area despite economic challenges and damage from hurricanes and diseases, such as citrus canker and greening. The agricultural acreage of 141,821 acres in 2010 is projected to increase to 151,304 acres by 2035. The respective water use is 162.5 MGD in 2010 and projected to be 185.0 MGD in 2035.

AGR includes water used for commercial crop irrigation, livestock watering, irrigating pasture, and aquaculture. In the 2005–2006 KB Plan Update, agricultural acreage was projected to increase about 8 percent over the planning horizon in the three counties of the

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LKB Planning Area. In this 2014 LKB Plan, similar growth is anticipated with increases in sorghum, strawberry, and blueberry crops.

Citrus grove in Highlands County

Agricultural water use projections are based on the following commercially grown crop categories as generally developed by the FDEP for use in water supply plans: 1) citrus, 2) other fruits and nuts, 3) vegetables, melons and berries, 4) field crops, sugarcane and sorghum, 5) sod, 6) greenhouse/nursery, 7) irrigated pasture, and 8) miscellaneous uses, such as cattle water and aquaculture.

Agricultural acreage and associated water demand are challenging to project because of changes in land use patterns, water management projects, environmental restoration activities, domestic macroeconomic developments (such as the pace of recovery in the housing market), global commodity market forces influencing supply and demand, weather, and disease issues that can impact distribution, acreage, and production/yield over the planning horizon. The proposed addition of nearly 9,800 acres of sorghum for the production of biofuel by 2035 is an example of such changing crops. Intensive research into occurance and treatment of citrus greening, canker, and other diseases is being conducted by a variety of agencies and industry groups. The results of this research could affect the number of acres in citrus production in the future. During this planning period, agricultural acreage in the LKB Planning Area is not expected to fluctuate due to the conversion of agricultural land use to residential projects that has affected other parts of Florida.

Agricultural water demand was determined using estimated irrigated acreage, crop and soil types, growing seasons, and irrigation methods. AGR demand calculations for this plan were made using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model. The model calculates water demands under average rainfall and 1-in-10 year drought conditions based upon local historic daily rainfall and evaporation data (Smajstrla 1990).

Acreage projections were compared to the data and methods contained in the land use projection analysis completed by the SFWMD. Agricultural acreage estimates from the United States Department of Agriculture (USDA) and the SFWMD Water Use Regulatory Database were also used to inform and reveal key patterns and confirm or revise previous analyses where warranted. Agricultural industry experts reviewed and provided input for the agricultural acreage estimates and their comments were considered in the overall analysis. Industry information sources included the following:

- USDA – National Agricultural Statistics Service (USDA–NASS)
- Florida Department of Agriculture and Consumer Services (FDACS)
- SFWMD Water Use Regulatory Database
- Local agricultural extension offices
- University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS)

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- USDA – Natural Resources Conservation Service (USDA–NRCS)
- Florida Department of Economic Opportunity (FDEO)
- Florida Farm Bureau and other SFWMD agricultural stakeholders
- SFWMD acreage estimates developed as part of GIS agricultural land use/crop type analysis

Within the LKB Planning Area, the counties of Okeechobee, Glades, and Highlands steadily increased citrus production acreage from the late 1960s to 2000. After 2000 however, citrus production in these counties leveled off or decreased slightly. In the LKB Planning Area, total irrigated active citrus acreage is expected to decrease from approximately 35,000 acres in 2010 to just over 26,000 acres in 2035. Citrus greening and canker have affected groves throughout the area. However, the lands are not remaining fallow but are being converted to other crops. In Highlands County, a permit modification was requested to convert 9,800 acres of former citrus to sorghum, which is expected to be used for biofuel production. Strawberries have expanded in the LKB Planning Area. The Greenhouse/Nursery category is expected to see a small increase in planted acres.

Overall, total agricultural acres are expected to increase by 9,483 acres by 2035 and total AGR water demand is projected to increase by 22.5 MGD or 13.8 percent. **Table 4** shows the acreage and gross irrigation requirements under average rainfall conditions by crop type for 2010 and 2035. The increase in demand is due to overall expansion of acres in agricultural production as well as conversion of citrus and existing crops to crops with higher water use demand. More detailed information, including both gross and net irrigation demands by crop type under average rainfall and 1-in-10 year drought conditions for five-year increments from the 2010 baseline through the 2035 planning horizon is available in **Appendix A**.

Table 4. Estimated agricultural irrigated acreages and average-year gross water demands by crop type for 2010 and 2035.

	2010		2035	
Category	**Acres**	**Demand (MGD)**	**Acres**	**Demand (MGD)**
Citrus	35,487	38.8	26,187	29.0
Sugarcane and Sorghum	13,919	38.4	23,719	57.8
Vegetables, Melons, and Berries	8,313	14.1	16,573	25.4
Field Crops: Other	1,207	3.4	1,162	3.2
Greenhouse/Nursery	3,609	7.7	4,377	9.5
Sod	4,525	12.8	4,525	12.8
Irrigated Pasture	74,762	37.8	74,762	37.8
Miscellaneous		9.5		9.5
Total	141,821	162.5	151,304	185.0

Note: Perceived discrepancies in table totals are due to rounding.

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Industrial / Commercial / Institutional Self-Supply

As in the 2005-2006 KB Plan Update, population growth rates for each county were used to project ICI growth. ICI demands are projected to increase by approximately 4.4 MGD from 2010 to 2035. This self-supplied use category includes industrial and commercial facilities for production processing, manufacturing, and technical needs such as concrete, citrus and vegetable processing, and mining operations. Some industrial, commercial, and institutional facilities receive water from PWS utilities and are therefore included under the PWS category. Information from the SFWMD Water Use Regulatory Database was used to estimate 2010 water demand. It is presumed that growth in ICI water demands will remain proportional to the county population growth. Currently the largest amount of ICI use is in Glades County for the operation of the Palmdale sand mine.

Interest in biofuel/ethanol production has increased in the LKB Planning Area. Water demands discussed in this section relate only to fuel generation and not its agricultural production (i.e., sorghum).

Table 5 shows the estimates of existing and future water demand for ICI use through the 2035 planning horizon.

Table 5. Water demand (MGD) for ICI within the LKB Planning Area.

County Area	2010	2015	2020	2025	2030	2035
LKB Glades	12.1	12.7	13.2	13.8	14.3	14.9
LKB Highlands	4.6	4.8	5.0	5.2	5.4	5.6
LKB Okeechobee	2.8	2.9	3.0	3.1	3.2	3.4
Total	**19.5**	**20.4**	**21.2**	**22.1**	**23.0**	**23.9**

Recreational / Landscape Self-Supply

Gross water demand for REC is projected to increase minimally from 2010 to 2035. The 2010 demand was 0.61 MGD and the projected 2035 demand is 0.65 MGD. Water demands in this category include landscape and golf course irrigation as well as water needs for parks, homeowner associations with common areas or consolidated irrigation systems, and areas with green space such as cemeteries, parks, and ball fields. Recreational and landscape demands supplied by PWS utilities are included in the PWS demand. Estimated landscape and golf course acreages for 2010 were determined through permits found in the SFWMD Water Use Regulatory Database.

Landscape and golf course growth were projected separately because their rates of expansion are calculated differently. Landscape areas are estimated to grow at a rate proportional to the population growth. Golf course acreage is projected to change at a lesser rate related to market fluctuations. Additionally, the associated demand for golf courses

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may be met with the use of reclaimed water for irrigation. The estimated growth rates were reviewed by local planning officials and industry professionals where available.

Table 6 presents the estimated increase in REC uses from 2010 to 2035. **Appendix A** provides additional detail on how each of these water demands estimates were made.

Table 6. Water demand (MGD) for REC within the LKB Planning Area.

County Area	2010	2015	2020	2025	2030	2035
LKB Glades	0	0	0	0	0	0
LKB Highlands	0.20	0.20	0.21	0.21	0.21	0.22
LKB Okeechobee	0.40	0.41	0.41	0.42	0.42	0.43
LKB Planning Area Total	**0.61**	**0.61**	**0.62**	**0.63**	**0.64**	**0.65**

Note: Perceived discrepancies in table totals are due to rounding.

Power Generation Self-Supply

Within the LKB Planning Area, water used by thermoelectric power plants is primarily for cooling purposes. Other water use occurring at power plant facilities includes boiler make-up water and ancillary uses, such as domestic-type use by employees. The Tampa Electric Company (TECO) is the only power company currently operating within or just outside the LKB Planning Area. TECO operates a small power station in Highlands County near the City of Sebring. In 2010, this facility withdrew between 0.1 MGD and 0.5 MGD of fresh water for power generation and cooling purposes. Use of water at the facility is demand-driven and the recent economic downturn has caused extreme fluctuations in use of the power station, which makes estimating future use difficult. The facility is currently permitted for 1.0 MGD. Water use reported in **Table 7** represents an estimate of potential use at the facility assuming reasonable population growth for Highlands County. According to TECO, the plant is currently on standby and will be used in the future as demands require operation.

The Indiantown Cogeneration Plant is in Martin County but relies on surface water from the L-63N Canal (Taylor Creek) in Okeechobee County. **Table 7** includes the water that is and is projected to be used by this plant in Okeechobee County.

Florida Power & Light (FPL) has proposed constructing a new facility in northeast Okeechobee County just outside the LKB within the St. Johns River Water Management District (SJRWMD). If approved, FPL expects water demands may increase to 9 MGD by 2019 and gradually increase to a total projected demand of 27 MGD by 2035. Demands for this potential facility are not included in this plan.

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Table 7. Water demand (MGD) for PWR within the LKB Planning Area.

County Area	2010	2015	2020	2025	2030	2035
LKB Glades	0.0	0.0	0.0	0.0	0.0	0.0
LKB Highlands	0.15	0.25	0.45	0.65	0.85	1.05
LKB Okeechobee	4.3	4.4	4.6	4.9	5.1	5.3
LKB Planning Area Total	4.4	4.6	5.1	5.5	5.9	6.4

SUMMARY OF DEMAND ESTIMATES

In 2010, average annual gross water demand for all categories in the LKB Planning Area totaled roughly 192 MGD. By 2035, the projected average annual gross water demands are expected to total 222 MGD, an increase of approximately 16 percent. **Table 8** presents the estimated 2010 and 2035 average water demands for all water use categories.

Average annual estimates are used to demonstrate general projected trends, including these key highlights:

- PWS and DSS gross demands are expected to increase by 22 percent, from 4.9 MGD in 2010 to 6.0 MGD by 2035. PWS will remain one of the smallest water use categories in the LKB Planning Area in 2035.
- AGR gross demands are projected to increase from 162.5 MGD in 2010 to 185.0 MGD by 2035. The growth is related to the projected conversion of existing crops to crops with a higher water use demand and increased acres
- ICI gross demand is anticipated to increase 4.4 MGD over the planning horizon. The projected growth is related to population growth in the planning area.
- REC gross demands are projected to remain generally flat.
- PWR gross demands are anticipated to increase by 2.0 MGD by 2035.

Table 8. Estimated average water demands for all water use categories for 2010 and 2035.

	PWS	DSS	AGR	ICI	REC	PWR	Total
Estimated 2010 (MGD)	2.8	2.1	162.5	19.5	0.61	4.4	192.0
Projected 2035 (MGD)	3.4	2.6	185.0	23.9	0.65	6.4	222.0
% Change	21.4%	23.8%	13.8%	22.6%	6.6%	45.5%	15.6%
% of Projected 2035 Total	1.5%	1.2%	83.3%	10.8%	0.3%	2.9%	100.0%

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DEMAND PROJECTIONS IN PERSPECTIVE

The demand projections presented in this 2014 LKB Plan are based on the best information available. These projections reflect trends, circumstances, and industry intentions that change over time. Like any predictive tool based on past assumptions, there is uncertainty and a margin for error.

Table 9 shows the 2025 average gross demands projected for this area in the 2005–2006 KB Plan Update compared to the 2035 demands projected in this 2014 LKB Plan.

Table 9. Water demands under average rainfall conditions projected in the 2005–2006 KB Plan Update versus this 2014 LKB Plan.

Water Use Category	Projected 2025 Demand from 2005–2006 KB Plan Update (MGD)	Projected 2035 Demand (MGD)	Percent Difference
PWS	4.9	3.4	-30.6%
DSS	4.1	2.6	-36.6%
AGR*	96.4	185.0	92.0%
ICI	9.7	23.9	146.4%
REC	0.5	0.7	30.0%
PWR	0.0	6.4	
Total	**115.6**	**222.0**	**92.0%**

*Did not include irrigated pasture in the 2005–2006 KB Plan Update. Irrigated pasture represents an estimated 20% of total agricultural demand.

The 2035 AGR demands are projected to increase by about 92 percent as compared to the 2025 AGR demands in the 2005–2006 KB Plan Update. There are a number of reasons for this. Nearly 75,000 acres of irrigated pasture are now included in the water supply plan. This pasture represents about 20 percent of the 2035 AGR projected demand. Additionally, the potential conversion of 9,800 acres of citrus to sorghum was not anticipated in the previous plan update. ICI demands are also expected to increase. This is related to sand mine expansion and growth in proportion to expected population increases. As noted, the other use categories have demands that are increasing minimally. In summary, the agricultural industry has and will continue to be the predominate water use category in this region, accounting for over 80 percent of the demands.

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3

Water Resource Analyses – Current and Future Conditions

This chapter provides an overview and status of the water resources within the Lower Kissimmee Basin (LKB) Planning Area. Water supply to meet the demands described in **Chapter 2** is largely dependent on the availability of water resources. Understanding the relationship and effect of meeting water demands via withdrawals from water resources is critical to water supply planning. The issues identified in this chapter potentially affect the use of existing water resources and development of new supplies to meet projected water demands through 2035 in the LKB Planning Area.

TOPICS

- Summary of Issues
- Regulatory Protection
- Overview of Water Resources
- Evaluation and Analysis
- Climate Change

Additionally, this chapter summarizes the protections afforded to water resources through regulatory criteria and reviews water resource evaluations that support the water supply planning strategies outlined in this *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan).

SUMMARY OF 2014 LKB PLAN ISSUES

Several issues are expected to affect the availability of water in the LKB Planning Area over the planning horizon of this water supply plan. These issues include regulatory limitations on surface waters from Lake Istokpoga and Lake Okeechobee, future water needs of the Kissimmee River Restoration Project, and the effects of groundwater withdrawals on Lake Wales Ridge water bodies.

Past analyses demonstrated that surface water from Lakes Istokpoga and Okeechobee and their hydraulically connected canals is unavailable beyond current permitted capacities due to potential impacts on wetlands, endangered species, and existing legal water users. Regulations have been put in place for these surface water bodies that limit further increased withdrawals. This also includes downstream connections to these lakes that require releases of water to meet water demands.

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The Kissimmee Chain of Lakes is north of the LKB Planning Area and is the headwaters of the Kissimmee River. Water delivered from Lakes Kissimmee, Cypress, and Hatchineha of the Kissimmee Chain of Lakes is needed to meet the hydrologic requirements of the Kissimmee River Restoration Project, which aims to restore ecological integrity to the Kissimmee River and its floodplain, while providing an equivalent pre-project level of flood control. The South Florida Water Management District (SFWMD or District) is developing a water reservation rule.

This proposed rule will prevent water needed for the protection of fish and wildlife from being allocated to consumptive uses. Adoption of the reservation rule is expected by December 2015.

Analyses of the LKB Planning Area indicate that groundwater in conjunction with currently permitted surface water is adequate to meet existing and future needs of the LKB Planning Area during a 1-in-10 year drought condition. However, surface water users within the Lake Okeechobee Service Area (LOSA) have only a 1-in-6 year drought level of certainty.

Several lakes along the Lake Wales Ridge in Highlands County, such as Lakes Placid, June in Winter, and Jackson, which are under the jurisdiction of the Southwest Florida Water Management District (SWFWMD), have established minimum flows and levels (MFL). These lakes may have enhanced connections to the underlying aquifer systems. Due to these connections, there is the potential that increasing water supply withdrawals from the Upper Floridan aquifer could affect water levels in the lakes.

Additional water supply considerations for the region include:

- Complying with the water supply agreement in the Water Rights Compact with the Seminole Tribe of Florida
- Declining water levels and increasing chloride concentrations in the Upper and Lower Floridan aquifer

REGULATORY PROTECTION OF WATER RESOURCES

The purpose of Chapter 373, Florida Statutes (F.S.), is to manage Florida's water resources to ensure their sustainability. The SFWMD developed water resource protection standards consistent with the legislative direction. The levels of harm—*harm*, *significant harm*, and *serious harm*—are relative resource protection terms, each playing a role in the ultimate goal of achieving a sustainable water resource. For instance, programs regulating surface water management and water use permitting must prevent harm to the water resource.

To ensure the sustainability of Florida's water resources, Chapter 373, F.S., provides water management districts with several water resource protection tools, as described in **Table 10**. A diagram showing the conceptual relationship among the water resource protection standards and the levels of harm is provided in **Figure 5**.

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Table 10. Summary of statutory resource protection tools.

Tool	Description
Water Use Permitting	The right to use water is authorized by permit. The conditions of permit issuance are more specifically enumerated in Chapter 40E-2, Florida Administrative Code (F.A.C.). In order to provide reasonable assurances that the conditions of permit issuance are met, applicants must also meet the technical criteria in the *Applicant's Handbook for Water Use Permit Applications* (SFWMD 2014a). The technical criteria used to evaluate the quantity and the proposed water uses' impact on the source include: • Saltwater intrusion • Wetland and other surface water body impacts • Pollution • Impacts to off-site land uses • Interference with existing legal users • MFLs and their regulatory components
Minimum Flows and Levels	MFL criteria are the flows or levels at which the specific water resource would experience significant harm from further withdrawals. If water flows or levels are below the MFL criteria, or projected to fall below the MFL criteria within the next 20 years, the SFWMD must expeditiously implement a recovery or prevention strategy (Section 373.0421[2], F.S.). These strategies may include the construction of new or improved water storage facilities, development of additional water supplies, implementation of water conservation, etc. The strategy is to be developed in concert with the water supply planning process and coincide with the 20-year planning horizon for the area.
Water Reservations	A water reservation sets aside water for the protection of fish and wildlife or the public health and safety. When a volume of water is reserved, it is not available for allocation to consumptive uses (Section 373.223[4], F.S.). Water reservations can be developed based on existing water availability and/or consideration of future water supplies made available by water resource projects. The Water Resources Development Act of 2000 requires the SFWMD to use its reservation or allocation authority to protect water made available by Comprehensive Everglades Restoration Plan projects as necessary for the natural system. Any volume of water not necessary for the protection of fish and wildlife or public health and safety may be certified as available and allocated to consumptive uses.
Water Shortage	Water shortages are declared by the District's Governing Board when available groundwater or surface water is not sufficient to meet users' needs or when conditions require temporary reduction in total use within the area to protect water resources from serious harm. The SFWMD's Water Shortage Plans are contained in Chapters 40E-21 and 40E-22, F.A.C. The plans seek to protect the water resources of the SFWMD from serious harm; assure equitable distribution of available water resources among all water users during times of shortage consistent with the goals of minimizing adverse economic, social, and health related impacts; provide advance knowledge of the means by which water apportionments and reductions will be made during times of shortage; and promote greater security for water use permittees.

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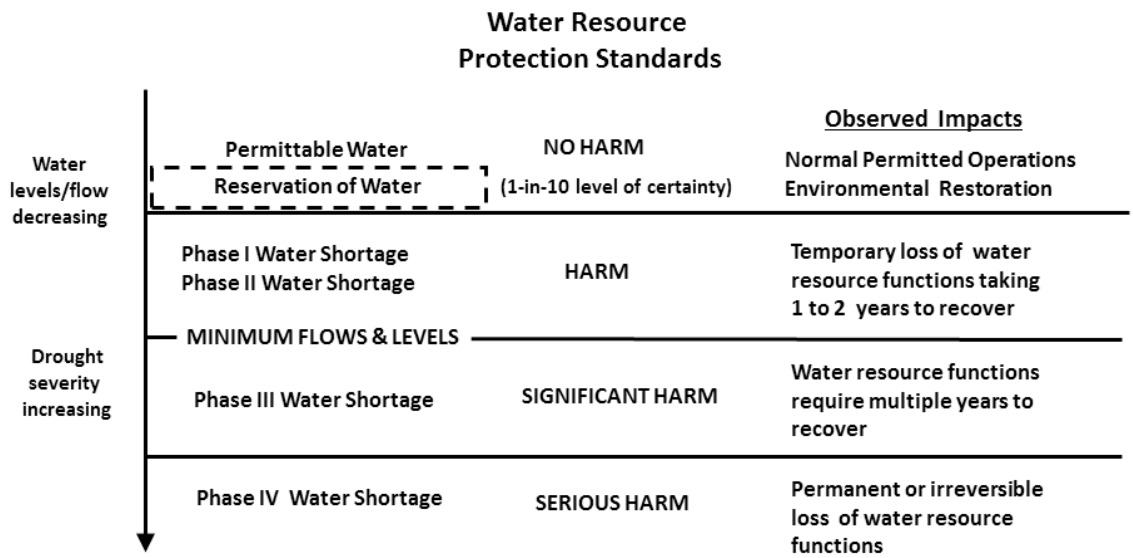

Figure 5. Conceptual relationship among water resource protection standards at various levels of harm.

Changes to Water Use Permitting

During the 2000 water supply planning process, key regional issues affecting water resource management, and strategies for resolving them, were identified. Consumptive use permitting rules were subsequently revised regarding the 1-in-10 year drought event level of certainty, resource protection criteria, water shortage triggers, saltwater intrusion, special designations, and permit duration. A series of rulemaking efforts was completed in September 2003, resulting in amendments to Chapters 40E-1, 40E-2, 40E-5, 40E-8, 40E-20, and 40E-21, Florida Administrative Code (F.A.C.) and the *Basis of Review for Water Use Permit Applications within the South Florida Water Management District* (since replaced by the *Applicant's Handbook for Water Use Permit Applications* [Applicant's Handbook, SFWMD 2014a]). Among the most significant changes were amendments to permit duration, permit renewal, wetland protection, supplemental irrigation requirements, saltwater intrusion, aquifer storage and recovery, and model evaluation criteria.

LOSA permit renewals began in 2009, with most permits issued by 2011. Other irrigation permit renewals in the LKB Planning Area began in 2008 and most permits were issued by 2010. Many of the renewed permits are for 20-year durations. The processing of permit applications, and the associated data and analysis to support and evaluate them, benefited the evaluation of current conditions for this plan.

Additional Protection Afforded Water Resources

The SFWMD continues to fulfill its statutory obligation to identify key water bodies for which MFLs should be developed or updated. Section 373.042(2), F.S., requires each of the five water management districts to provide an annual MFL priority list and schedule to the Florida Department of Environmental Protection (FDEP). The statute was modified in 2013

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to require identification of proposed reservations. The SFWMD's 2014 Priority Water Bodies List and Schedule (Edwards 2014) complied with these statutory changes to include both MFL and reservation water bodies and is available in the *2014 South Florida Environmental Report* (www.sfwmd.gov/sfer).

The priority list is based on the importance of the waters to the state or region and the existence of, or potential for, significant harm to the water resources or ecology of the state or region, and includes those waters that are experiencing or may reasonably be expected to experience adverse impacts.

In addition, the SFWMD considers the CERP project schedule and the related federal and state requirements to protect water for the natural system using its reservation or allocation authority. The United States Army Corps of Engineers (USACE) has verified that federal requirements have been met for several CERP projects by virtue of the SFWMD's adoption of water reservations and restricted allocation area rules. Taken together, these rules afford protection for water resources across significant portions of the planning area.

Minimum Flows and Levels

MFL criteria define the point at which further withdrawals will result in significant harm to the water resources or the ecology of the area. These criteria are applied individually to affected water bodies and define the minimum flow or level for surface water bodies, or minimum level of groundwater in aquifers. When setting MFL criteria, the District Governing Board considers changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of an affected watershed, surface water, or aquifer (Section 373.0421[1], F.S.).

When the SFWMD establishes an MFL, it must determine whether the existing flow or level in the water body is below or projected to fall below the MFL criteria within the next 20 years. If it will, the SFWMD must develop and expeditiously implement a recovery or prevention strategy. The strategy, when appropriate, should include development of additional water supplies, water conservation, and other efficiency measures consistent with the provisions of Sections 373.0421 and 373.709, F.S.

The SFWMD develops a recovery strategy when a water body currently exceeds the MFL criteria. The goal of a recovery strategy is to achieve the established MFL as soon as practicable. The recovery strategy must include the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses and may include the development of additional supplies, construction of new or improved storage facilities, and implementation of conservation or other efficiency measures.

A prevention strategy is developed when the MFL criteria is not currently violated, but is projected to be exceeded within the next 20 years. The goal of a prevention strategy is for the water body to continue to meet the established MFL in the future.

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Within the Lower Kissimmee Basin, MFL criteria have been adopted for two water bodies: Lake Istokpoga (Rule 42E-8.351, F.A.C.; SFWMD 2005) and Lake Okeechobee (Rule 40E-8.221[1], F.A.C.; SFWMD 2000a). A prevention strategy has been adopted for Lake Istokpoga (Rule 40E-8.421[7], F.A.C.) and a recovery strategy has been adopted for Lake Okeechobee (Rule 40E-8.421[2], F.A.C.). The prevention and recovery strategies for these water bodies are described in **Appendix B**. More details and the status of these projects and programs can be found later in this chapter and in **Chapter 4**. Further details on MFLs are available on SFWMD's website at www.sfwmd.gov/mfls.

Water Reservations

Section 373.709(2)(h), F.S., requires regional water supply plans to include water reservation rules adopted for the planning area. A water reservation rule sets aside a volume of water for the protection of fish and wildlife or public health and safety. When water is reserved, it is unavailable to be allocated for consumptive uses. Water reservations are established based on existing water availability and/or consideration of future water supplies that water resource projects make available. The Water Resources Development Act of 2000 and Section 373.470, F.S. require increased water supplies identified in CERP project implementation reports to be reserved or allocated by the SFWMD.

A water reservation rule defines the volume of water being set aside for the associated natural system and any unreserved water remaining is available for allocation to consumptive uses. To date no reservations have been established for any water bodies in the LKB Planning Area. However, the SFWMD is in the process of developing a water reservation rule for the Kissimmee River, its floodplain, and the Kissimmee Chain of Lakes. Five water reservations have been adopted for water bodies in other planning areas of the SFWMD. These are Fakahatchee Estuary, Picayune Strand, the North Fork of the St. Lucie River (in support of the CERP Indian River Lagoon–South Project), Nearshore Central Biscayne Bay, and Caloosahatchee River (C-43) West Basin Storage Reservoir. Further details on water reservations are available at www.sfwmd.gov/reservations and in Chapter 40E-10, F.A.C.

Restricted Allocation Area Criteria

Restricted allocation area (RAA) criteria limit allocations from water resources (e.g., lakes, wetlands, and canals) in defined geographic areas. RAA criteria for specific areas of the SFWMD are listed in Section 3.2.1 of the Applicant's Handbook (SFWMD 2014a), which is incorporated by reference into Chapter 40E-2, F.A.C. RAA criteria may be established as part of MFL recovery or prevention strategies required in Section 373.0421(2), F.S. **Figure 6** shows the locations of water bodies in the LKB Planning Area for which RAA criteria have been adopted.

Due to limited surface water availability, the Indian Prairie Basin is designated a RAA (Rule 40E-2.091, F.A.C.; Section 3.2.1[A], Applicant's Handbook). The RAA criteria for the Lake Istokpoga–Indian Prairie Canal System states that no additional surface water will be allocated from District-controlled surface water bodies over and above existing allocations,

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and no increase in surface water pump capacity will be recommended. The rule was implemented to minimize the potential that the District would declare additional water shortages for the basin during periods of drought. The RAA for Lake Istokpoga also ensures water for delivery to the Seminole Tribe of Florida's Brighton Reservation pursuant to the Water Rights Compact and implementing agreements.

In October 2008, the District Governing Board adopted RAA criteria for the LOSA (Section 3.2.1[F], Applicant's Handbook). These criteria limit surface water withdrawals from Lake Okeechobee and all surface water hydraulically connected to the lake. The change in permit criteria was necessitated by the impacts to water supply and increased exceedances of the lake MFL criteria from implementation of the 2008 Lake Okeechobee Regulation Schedule (2008 LORS). When repairs by the USACE to the Herbert Hoover Dike are complete and the lake's regulation schedule is revised, the expectation is that the resulting schedule will raise lake levels. The additional water held in the lake is expected to return the lake from MFL recovery status to MFL prevention status, enhance the level of certainty to existing permitted users now receiving less than 1-in-10 level of certainty, and support environmental objectives. In the meantime, these criteria are part of the MFL recovery strategy for the lake.

Water Shortage Rules

In accordance with Sections 373.175 and 373.246, F.S., water shortages are declared to prevent serious harm from occurring to water resources. Serious harm is defined as the long-term loss of water resource functions resulting from a change in surface water or groundwater hydrology, which can result in long-term, irreversible, or permanent loss of water resource functions (Rule 40E-8.021[30], F.A.C.).

The Water Shortage Plan laid out in Chapter 40E-21, F.A.C., is applied to manage water use when insufficient groundwater or surface water is available to meet user needs or when conditions require temporary reduction in use. Chapter 40E-22, F.A.C., contains regional water shortage plans and restrictions related to specific water bodies, including Lake Istokpoga and Lake Okeechobee. Further information on water shortage management is available in the *2011–2014 Water Supply Plan Support Document* (SFWMD 2014b).

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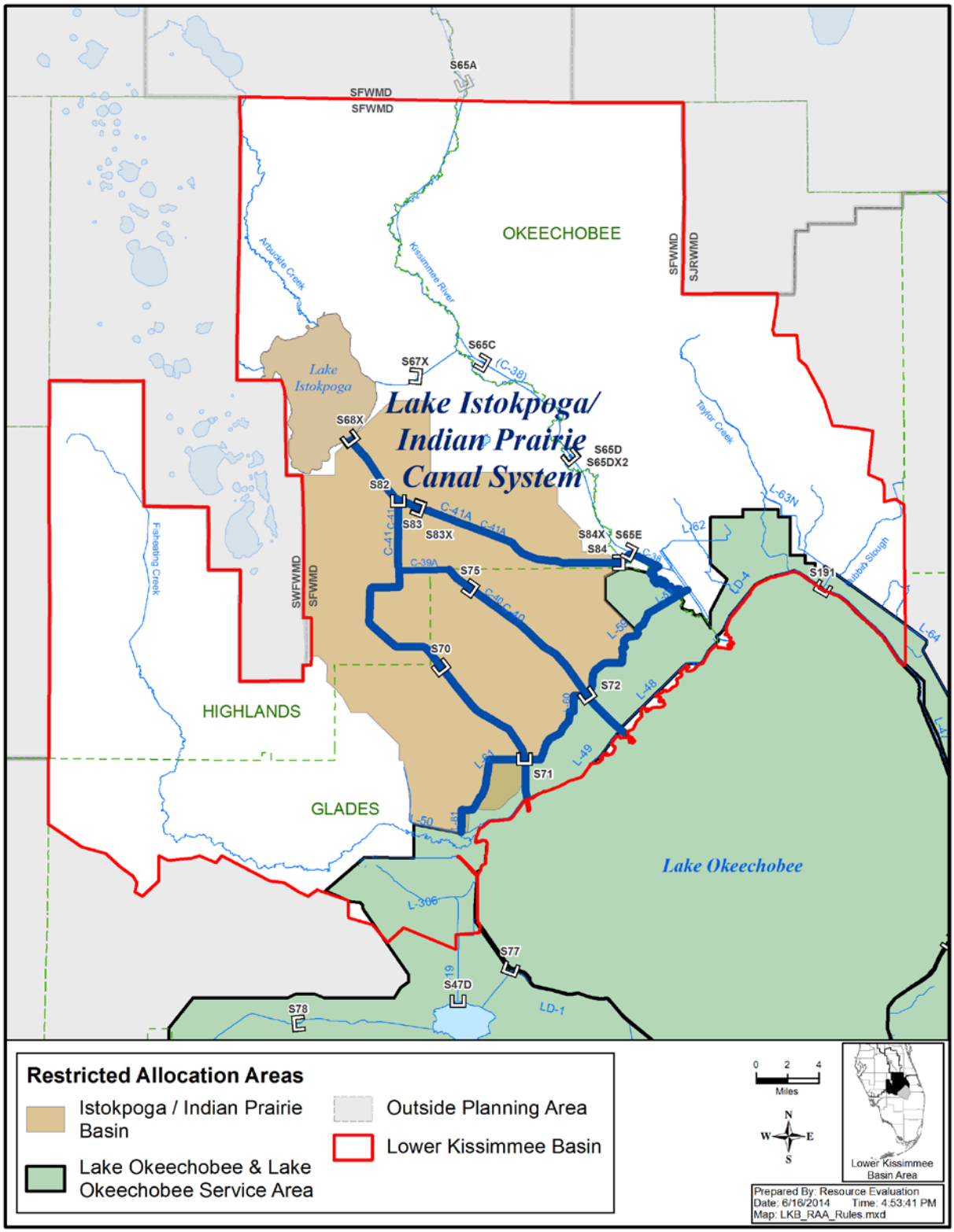

Figure 6. Restricted allocation areas in the LKB Planning Area.

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Water Rights Compact Among the Seminole Tribe of Florida, the State of Florida, and the South Florida Water Management District

The Seminole Tribe of Florida (Tribe), the State of Florida, and the SFWMD executed a Water Rights Compact in 1987. The compact provides a framework for harmonizing the relationship among the Tribe, the State of Florida, and the District on water resource issues. Of particular importance for this 2014 LKB Plan are the compact's provisions concerning the water entitlement for the Tribe's Brighton Reservation in Glades County.

The Brighton Reservation water entitlement was further detailed in an agreement executed by the Tribe and the SFWMD in November 1992. This agreement outlines surface water control strategies to assure maximum reliability for delivering the water entitlement set forth in the 1987 compact.

The agreement also outlines the schedule of releases from Lake Istokpoga and operation schedules for pump stations G-207 and G-208. These pumps withdraw water from Lake Okeechobee and deliver it to the southern portion of the Indian Prairie Basin when the water level in Lake Istokpoga is low and a water shortage has been or may be declared. Securing a dependable source of water for the reservation is particularly important given the Tribe's federal surface water entitlement rights.

SWFWMD MFLs in Highlands County

The SWFWMD has determined that several lakes within its jurisdiction along the Lake Wales Ridge are showing signs of stress. These lakes are in the Southern Water Use Caution Area (SWUCA) and lie in Highlands County to the west of the LKB Planning Area. In 2006, the SWFWMD developed lake level protection criteria and a recovery strategy for these lakes to address concerns over declining lake levels. The SWFWMD's Governing Board adopted MFLs for lakes Angelo, Anoka, Denton, Jackson, June in Winter, Letta, Little Jackson, Lotela, Placid, Tulane, and Verona between 2006 and 2009 (**Figure 7**). Reevaluation of the MFLs for lakes Jackson, Letta, Little Jackson, and Lotela is planned for Fiscal Year 2015. The SWFWMD's priority water bodies scheduled for MFL adoption in Fiscal Year 2016 include lakes Damon, Pioneer, Pythias, and Viola. Currently lakes Angelo, Anoka, Denton, Jackson, Letta, Little Jackson, Lotela, Tulane, and Verona are considered to be in recovery. The remaining lakes are in prevention.

Previous studies by the SWFWMD have concluded that Floridan aquifer groundwater levels have an enhanced relationship with the water levels observed in these lakes due to the underlying karst connectivity. Several of these existing MFL lakes are near the boundary between the SFWMD and SWFWMD, making it likely that increased groundwater withdrawals within the SFWMD could contribute to changes in lake levels within the SWFWMD.

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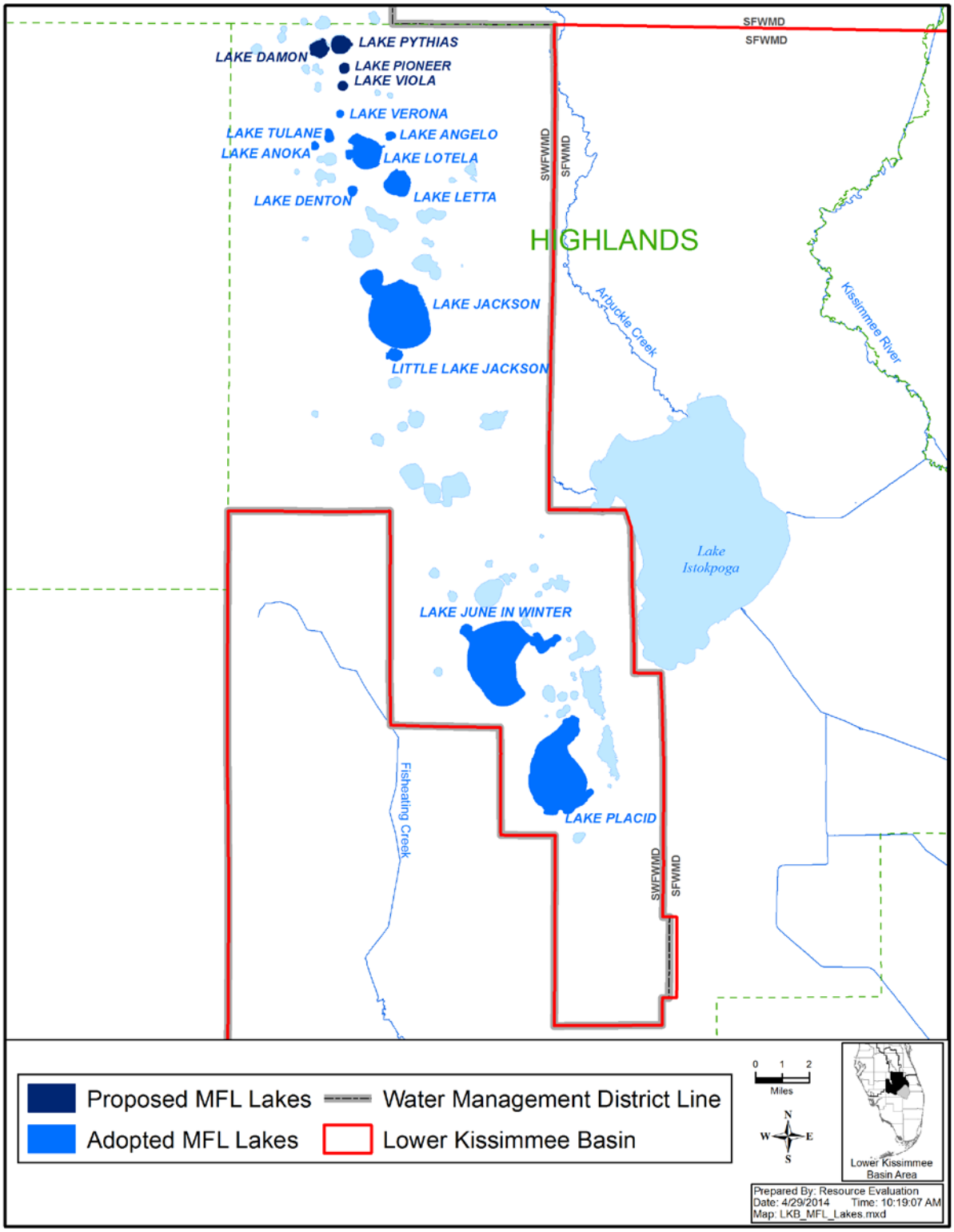

Figure 7. MFL lakes in the SWFWMD adjacent to LKB Planning Area.

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OVERVIEW OF MAJOR WATER RESOURCES

Major water resources of the LKB Planning Area include Lake Istokpoga and its associated canals, Lake Okeechobee and its hydraulically connected surface water bodies, the Kissimmee River, the surficial aquifer system, and the Floridan aquifer system.

Lake Istokpoga and Indian Prairie System

Lake Istokpoga covers 27,692 acres and is the fifth largest lake in Florida. The lake is generally shallow, averaging only 4 to 6 feet in depth and its water levels are maintained in accordance with the USACE regulation schedule (**Figure 8**). Surface water from Lake Istokpoga and its associated canals have been a primary water source to meet agricultural irrigation demands in the Indian Prairie Basin (Highlands, Glades, and Okeechobee counties), including the Brighton Reservation. The Lake Istokpoga–Indian Prairie Basin is defined as those areas with access to the C-40, C-41, and C-41A canals and Lake Istokpoga, either directly or via other canals. The Istokpoga Canal is an additional canal/river that connects Lake Istokpoga to the Kissimmee River through the S-67 Structure.

Lake Istokpoga

The Istokpoga Marsh Watershed Improvement District (IMWID) is located southeast of Lake Istokpoga. The IMWID began in 1962, prior to water management district regulatory requirements. It consists of about 22,000 acres, has a 28-mile internal canal system that provides water supply and drainage, and obtains water from Lake Istokpoga. The IMWID withdraws water from Lake Istokpoga pursuant to an agreement with the SFWMD. Additionally, about 10,000 acres of agricultural lands within the IMWID have SFWMD individual water use permits.

Most of the irrigation demands in the portions of Highlands and Glades counties within the Indian Prairie Basin are traditionally met with surface water from Lake Istokpoga. Historically, water availability has been limited during periods of drought resulting from a lack of storage capacity in the watershed and challenges of flood control management that cause temporary water shortages. As seen in **Figure 9**, the water levels in Lake Istokpoga have been maintained in accordance with the regulation schedule since December 2005. Issues of water availability have generally occurred when a late summer drought has caused rainfall to be insufficient to maintain the lake above Zone C of the schedule (**Figure 8**). During these periods, the District issued water shortage declarations and rationed the available supply. As stated previously, a RAA was implemented that restricts additional surface water allocations in this basin to help manage water supplies. Since implementing the RAA, additional water demand in the area has been met through water conservation and allocations of groundwater, which is subject to permitting requirements but not impacted by the RAA criteria.

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A violation of the Lake Istokpoga MFL occurs when surface water levels fall below 36.5 feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD) for 20 or more weeks within a calendar year more than once every four years. Since adoption of the Lake Istokpoga MFL in 2005, there have been no exceedances or violations of MFL criteria (**Figure 9**). However, during the 2006–2011 period, water shortage restrictions were implemented each year within the downstream Indian Prairie Basin.

Lake Istokpoga MFL Prevention Strategy

The present prevention strategy for Lake Istokpoga consists of continuing the current operational plan and regulation schedule, and planning and operation of extreme lake drawdowns for environmental purposes in a manner that avoids an MFL violation. It should be noted that Rule 40E-8.421(7), F.A.C., states "if significant changes to the Lake's water level management occurs due to new information, altered operational plans, or regulation schedule, a re-evaluation of the minimum level criteria will be conducted." This reevaluation will occur as part of the next Lake Istokpoga MFL update, or sooner, if significant changes to lake management are proposed.

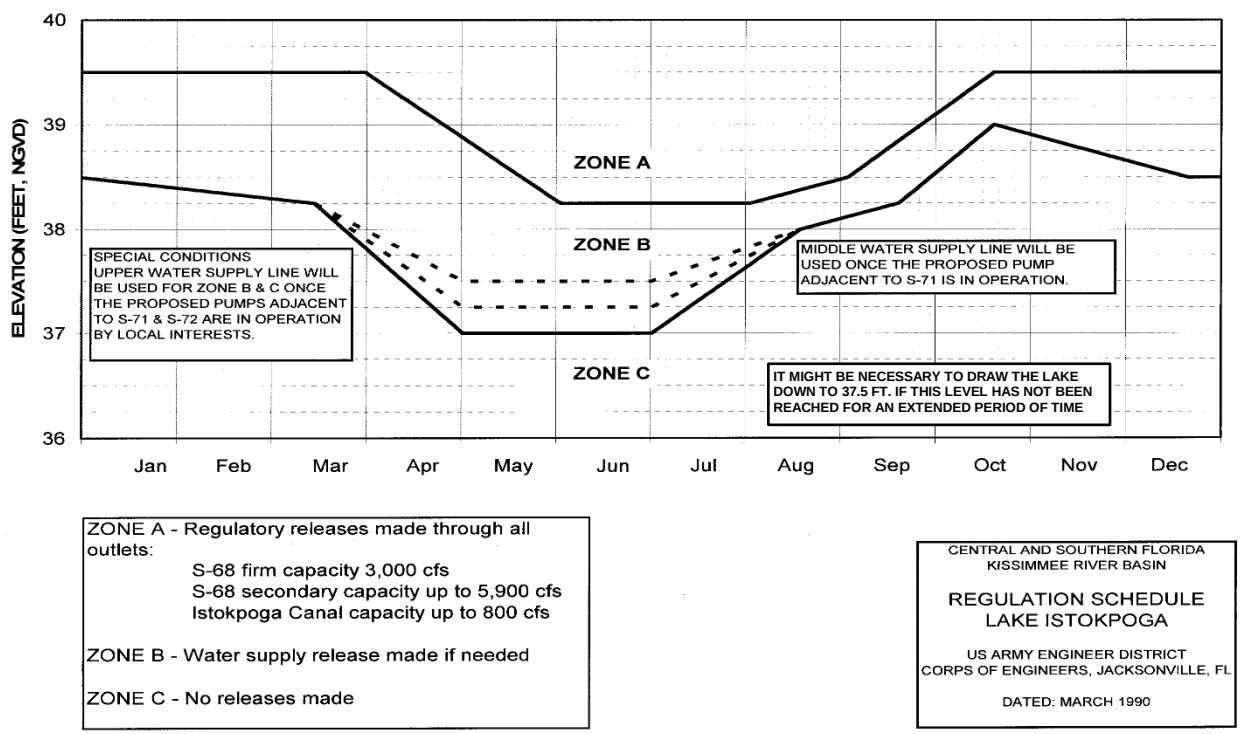

Figure 8. Lake Istokpoga regulation schedule.

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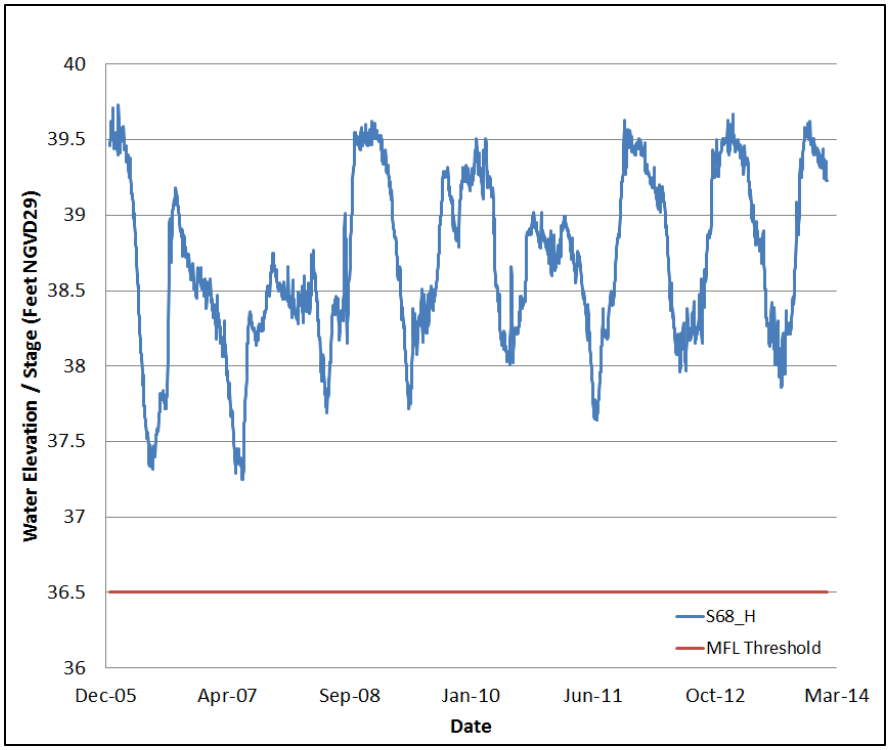

Figure 9. Water elevations in Lake Istokpoga (at the S-68 Structure) from MFL adoption to March 2014 showing no MFL exceedances or violations.

Lake Okeechobee

Lake Okeechobee is used for multiple purposes including urban, agricultural and environmental water supply, flood control, navigation, and commercial and recreational fisheries. It is also a key ecological component of the Greater Everglades ecosystem. The lake has multiple inflows, including the Kissimmee River, and receives water from a watershed in excess of 4,600 square miles. However, the lake has two major outlets for flood control purposes: one to the east coast via the St. Lucie Canal and another to the west coast via the Caloosahatchee Canal. Additional limited flood control discharges from Lake Okeechobee to the lower east coast are possible via the West Palm Beach Canal, Hillsboro Canal, North New River Canal, and Miami Canal. The 143-mile long Herbert Hoover Dike encircles the lake to protect the surrounding communities from flooding.

MFL criteria and a prevention strategy were established for Lake Okeechobee in 2001. Significant harm criteria associated with the MFL were based on the relationship between water levels in the lake and the abilities to 1) protect the coastal aquifer against saltwater intrusion, 2) supply water to Everglades National Park, 3) provide littoral zone habitat for fish and wildlife, and 4) ensure navigational and recreational access (SFWMD 2000a).

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2008 LORS and Adaptive Protocols

Due to concerns about the integrity of the Herbert Hoover Dike, the USACE adopted a new lake schedule, 2008 LORS, to reduce the risk of the Herbert Hoover Dike failing before it is rehabilitated (USACE 2007). The schedule includes operating guidelines designed to maintain Lake Okeechobee water levels primarily between 12.5 and 15.5 feet NGVD, which is approximately one foot lower than the previous schedule. Overall, the changes under 2008 LORS result in an average loss of approximately 430,000 acre-feet of water storage. The new schedule also increased the frequency of low lake stage exceeding the MFL criteria.

Due to the impacts of 2008 LORS, the SFWMD changed the lake's MFL status from prevention to recovery and developed a recovery strategy**.** The strategy includes a regulatory component that limits future additional withdrawals from Lake Okeechobee and all surface waters hydraulically connected to the lake (referred to as the "Lake Okeechobee Waterbody") to prevent further degradation of the level of certainty for existing legal users as well as change in lake MFL performance.

To assist managing the lake under 2008 LORS, the Adaptive Protocols for Lake Okeechobee Operations were revised in 2010 (SFWMD 2010). The adaptive protocols describe how the SFWMD staff and Governing Board make recommendations to the USACE concerning 2008 LORS and the Water Control Plan (USACE 2008) provisions while considering the SFWMD's multiple statutory objectives and responsibilities outlined in Chapter 373, F.S. The protocols are not intended to establish, dictate, or regulate water levels or operations. Instead, they provide operational guidance to SFWMD staff, as local sponsor, when making operational recommendations to the USACE. This protocols are not self-executing, and do not bind the SFWMD or any other person to take, or not to take, any specific action. The key goals of the protocols are to improve water supply, flood protection, and ecosystem benefits within the constraints of 2008 LORS and the Central and Southern Florida Project Water Control Plan (USACE 2008). For further discussion of the lake's MFL recovery strategy and adaptive protocols, see **Appendix B** and the *2013 Lower East Coast Water Supply Plan Update* (SFWMD 2013b).

Kissimmee River

The Kissimmee River and Kissimmee Chain of Lakes represent the largest surface water basin within the Kissimmee Basin Planning Area. Therefore it is a potential water supply source for the Lower Kissimmee Basin Planning Area. The Kissimmee Chain of Lakes in the upper basin is the primary source of water for the river. The river downstream of the S–65A Structure is within the LKB Planning Area. Currently, the Kissimmee River system is undergoing a major restoration. To date continuous water flow has been reestablished to 24 miles of the meandering river. When complete the project will enhance 40 miles of Kissimmee River historic river channel and floodplain ecosystem. After restoration is fully implemented, water will be stored in and released from the Kissimmee Chain of Lakes and its tributaries as part of a management strategy to balance water needs of the restored river, flood control, and necessary flows into Lake Okeechobee.

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The District is developing performance criteria and completing the analysis needed for a water reservation in support of the Kissimmee River Restoration Project. The Kissimmee River Basin Water Reservation was placed on the District's 2014 Priority Water Bodies List and Schedule and the District anticipates adoption of the reservation rule by December 2015.

Surficial Aquifer System

Low to moderate quantities of good to fair quality water can be found within the surficial aquifer system (SAS) in the planning area. It is generally used for Public Water Supply (PWS), Domestic Self-Supply (DSS), landscape irrigation, and small-scale agricultural irrigation. The Okeechobee Utility Authority and the Seminole Tribe of Florida both use the SAS as a PWS source.

The SAS is primarily recharged by rainfall and excess use can impact the natural system, including wetlands. **Figure 10** shows the relationship between rainfall and water levels in an SAS monitoring well (SEBRNG G). As shown here, water levels in the SAS have remained steady since 2005 and appear most responsive to local rainfall conditions.

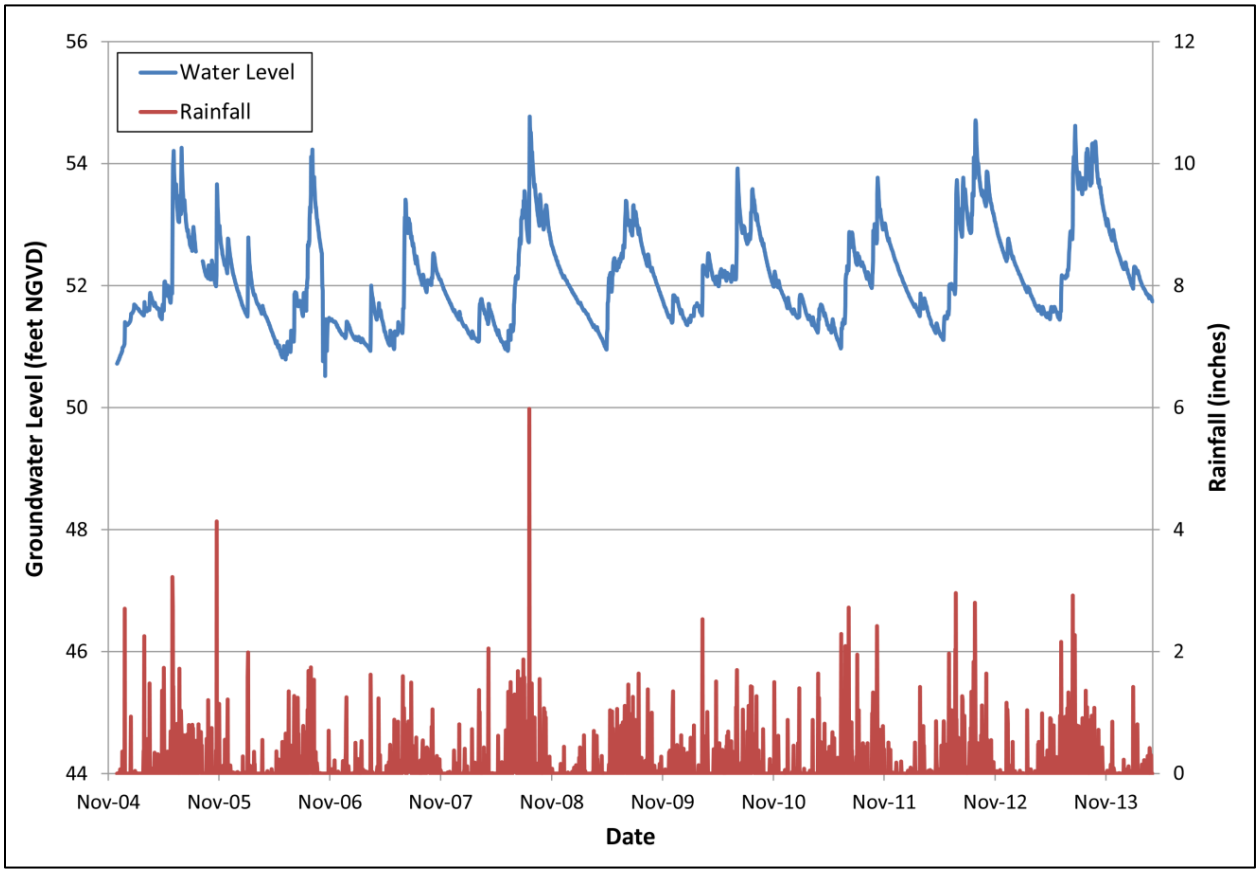

Figure 10. SAS water levels and rainfall amounts near the Sebring Airport.

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Floridan Aquifer System

After surface water, the Floridan aquifer system is the second largest utilized source in the basin. As mentioned in **Chapter 1**, the Floridan aquifer system (FAS) consists of the Upper Floridan aquifer and the Lower Floridan aquifer. The Upper Floridan aquifer (UFA) is a primary source of water for many use categories in the LKB Planning Area and has demonstrated a high yield. The UFA is thickest in Glades and Okeechobee counties, averaging more than 1,000 feet. Chlorides, total dissolved solids (TDS), and sulfate concentrations increase with depth and distance to the south and west. Recharge to the FAS occurs along the central highlands of Florida including the Lake Wales Ridge. Due to the highly transmissive nature of the FAS, the effects of withdrawals from this aquifer may extend for long distances from the point of withdrawals. Utilization of the Lower Floridan aquifer (LFA) as a water source has been historically limited in the region due to TDS levels that are generally too high for crop production and PWS without membrane treatment.

Upper Floridan Aquifer Water Levels

A hydrogeologic and water quality investigation of the SAS, intermediate aquifer system (IAS), and FAS in Highlands County was completed in 2010 by the USGS. The resulting report, *Hydrogeology and Groundwater Quality of Highlands County, Florida* (Spechler 2010), provides a summary of the historical aquifer conditions in the area. The report discusses long-term statistical water level trends for wells penetrating the UFA. Water levels in one UFA well (HIF-37) located near the intersection of the C-41 Canal and State Road (S.R.) 70 have declined approximately 4 feet since the 1980s. However, water levels in a SFWMD UFA well (HIF-13) close to Lorida, FL showed no significant water level change in the same time frame. **Figure 11** shows the water levels for these two wells during the study's reporting period. Understanding the Floridan aquifer's response to water supply utilization has been and will continue to be an important focus of the SFWMD's drilling and testing program.

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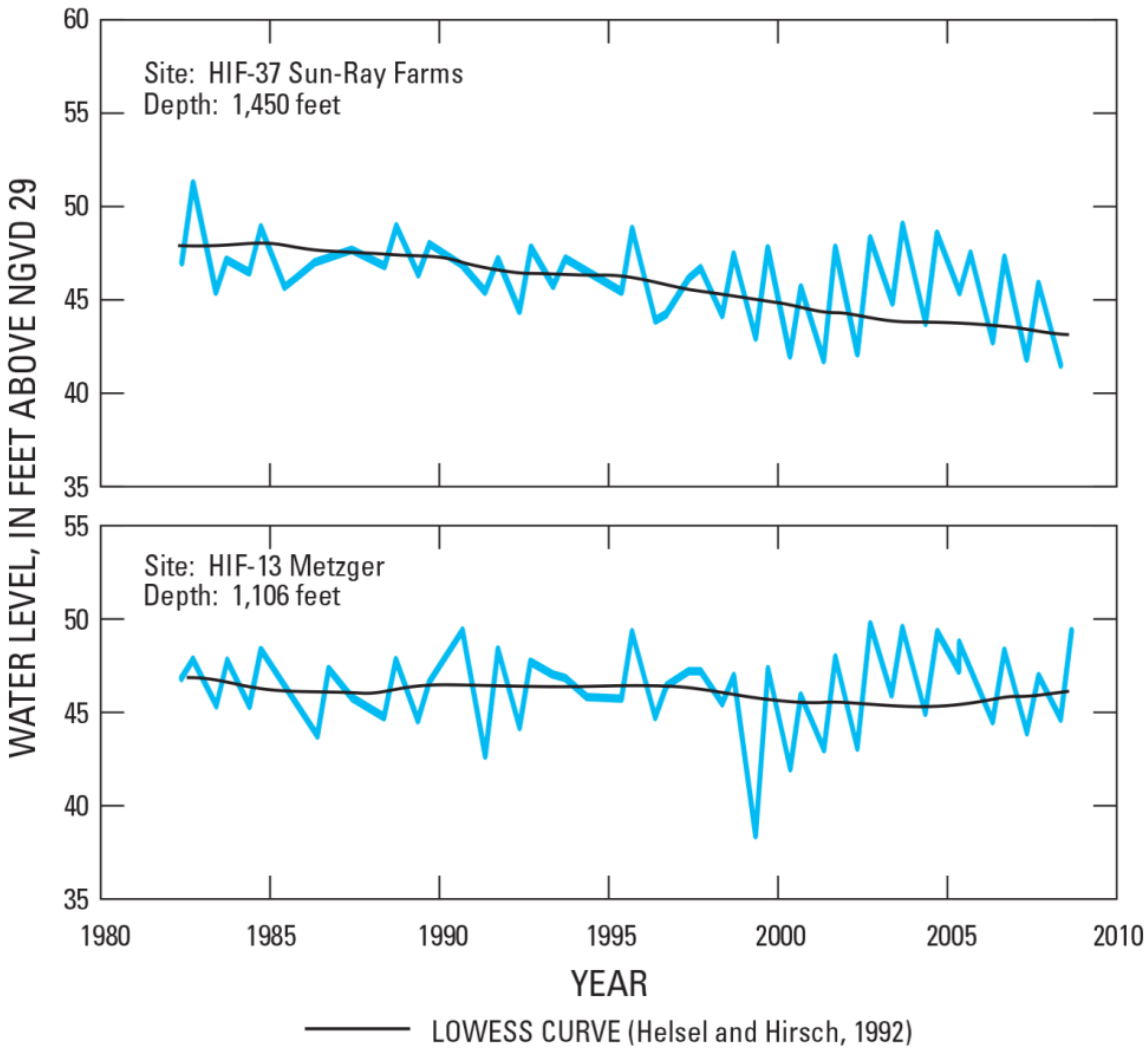

Figure 11. Water levels in two UFA monitoring wells in the LKB; Sun Ray Farms near S.R. 70 and Metzger Well near Lorida in Highlands County (modified from Spechler 2010).

Water Quality in the Floridan Aquifer

Most of the water withdrawn from the FAS comes from the Upper Floridan aquifer because it is less mineralized than water from deeper portions of the aquifer. Concentrations of chlorides and sulfates, as well as water hardness, may require advanced treatment prior to use, which adds to operating costs. TDS concentrations provide a reasonable indicator of water quality and are mapped for the UFA's upper producing zone and Avon Park permeable zone in **Figure 12**. In the recent periods of increasing withdrawals, the TDS concentration of water withdrawn from the UFA generally remained stable; however, TDS concentrations within the aquifer are geographically variable. Large-scale uses drawing on the FAS need to be carefully evaluated, designed, and operated to minimize the potential for water quality degradation over time due to saline water migration and possible cross-contamination between aquifers.

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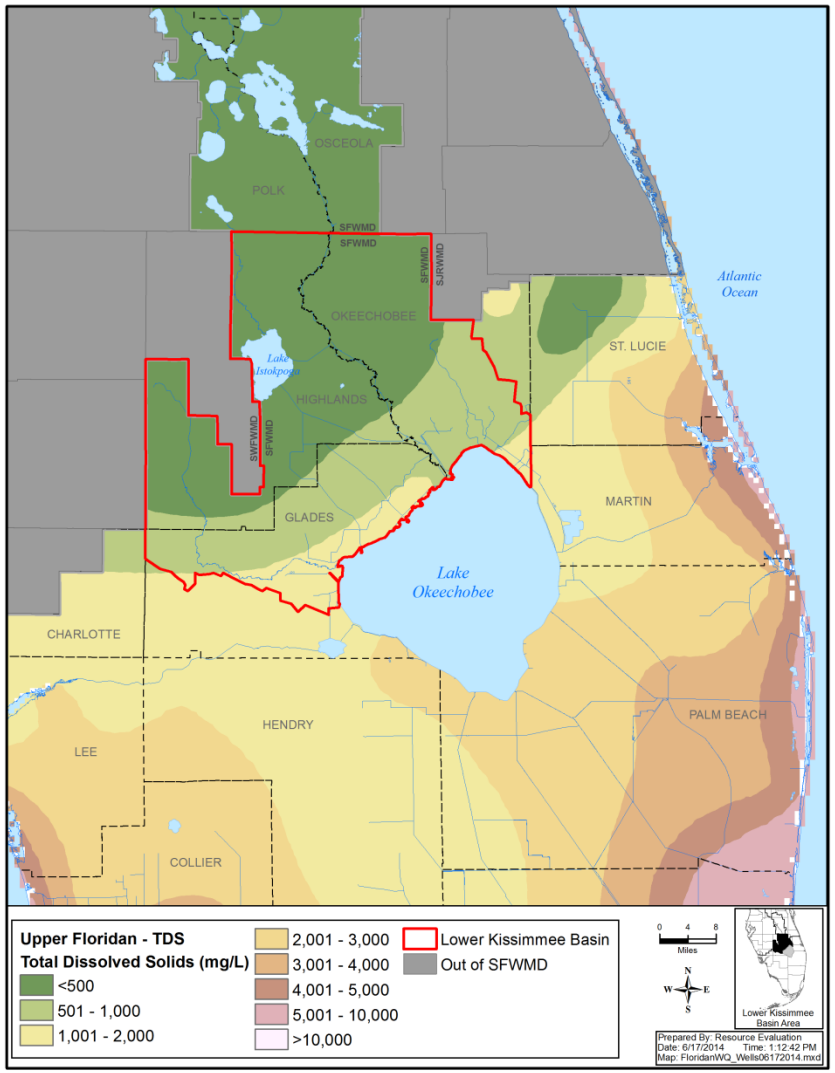
A



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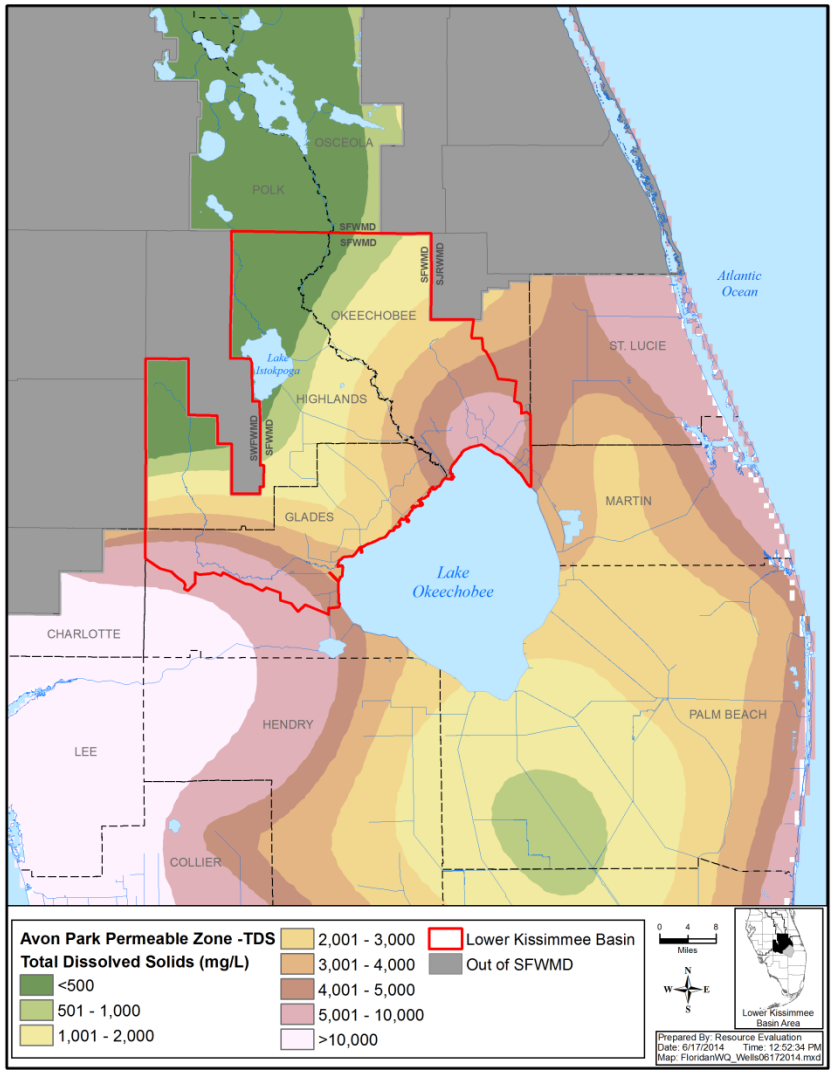

Figure 12. TDS concentrations in the UFA (**A**) upper producing zone and (**B**) Avon Park permeable zone. (Note: mg/L – milligrams per liter.)

EVALUATION AND ANALYSIS

Previous water supply plans incorporated regional groundwater and surface water modeling as part of the analysis process. The demand projections, assumptions, and resource protection criteria used in those analyses were reviewed and compared to current information. Where appropriate, the SFWMD recognized the findings and conclusions of the previous work conducted as part of the *Kissimmee Basin Water Supply Plan* (2000 KB Plan, SFWMD 2000b) and *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update, SFWMD 2006) as still representative of the issues necessary to address to meet the 2035 projected water demands for the LKB Planning Area. As part of this 2014 LKB Plan effort, an update to the previous groundwater modeling work was conducted to address the potential of groundwater withdrawals to impact MFL surface water bodies in the region. This new groundwater analysis and other studies used in the water resources evaluations are summarized here.

Groundwater Availability

As discussed in **Chapter 1**, there are three aquifer systems in the region: the surficial aquifer system (SAS), the intermediate confining unit/intermediate aquifer system (ICU/IAS), and the Floridan aquifer system (FAS). In some locations, these systems are isolated from each other by confining sediment units, while in others they are hydraulically connected. Additionally, in some places, these systems are well connected to surface water features such as lakes and wetlands, but in others they are separated. The relationship between a surface water feature and the underlying groundwater system can be complex. The LKB Planning Area contains both well-confined aquifers near Lake Okeechobee and more hydraulically connected aquifers adjacent to the Lake Wales Ridge area. Groundwater availability could be limited by the production capacity of the aquifer itself, or by harmful declines in water levels under lakes and wetlands as a result of groundwater withdrawals.

Model simulations were conducted for 2010 and 2035 using the Lower Kissimmee Basin Groundwater Model (LKBGWM). The LKBGWM was updated since the 2005–2006 KB Plan Update to improve calibration and update groundwater use information. The LKBGWM model is a steady-state model and is used to generally predict water levels and flow conditions under various assumptions that do not change with time. This model does not evaluate changes in water quality. In general, the model results can be used to indicate trends and relative changes between different scenarios, but should not be used to predict exact values. The model generalizes more specific flow patterns and aquifer characteristics and is limited by the availability of input data. There is little hydraulic, water level, or water quality data for the Lower Floridan aquifer in the study area. The LKBGWM and the analysis conducted for the 2010 and 2035 water use conditions are summarized in the *Lower Kissimmee Basin Groundwater Model Update Summary Report* (Butler et al. 2014).

In previous groundwater modeling efforts for the LKB Planning Area, the differences between water use in the baseline condition and projected water use simulations were

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minimal and the potential for increased risk to lakes and wetlands, including areas along the Lake Wales Ridge, were shown to be small. As stated previously, increased water use over the planning horizon is again projected to be relatively small. In discussions with the SWFWMD, it was determined that a simple steady-state model could be used to assess the potential risks of increased groundwater withdrawals occurring within the LKB on the SWFWMD's MFL lakes in Highlands County along S.R. 27. Results of the simulations indicate that Floridan aquifer levels beneath those MFL lakes currently in prevention or recovery status will not be reduced. Therefore, the risk of adversely impacting the SWFWMD's recovery and prevention strategies resulting from the LKB projected demands is considered low. The risk of impacts to Lakes Istokpoga and Okeechobee from increased groundwater use is believed to be minimal due to the existence of sufficient aquifer confinement surrounding these lakes.

The locations and amounts of projected withdrawals simulated in the model were based on information collected from water users and contained in current water use permits. There are some risks to increasing groundwater use in the basin if the demands or the locations of the withdrawals were to change from those simulated in the model. Water withdrawal locations near the SFWMD and SWFWMD boundary are closer to the MFL lakes of concern and thereby inherently have an increased risk of impacting them.

TDS concentrations in the LFA may limit its suitability for some purposes. While water quality in the SAS and UFA is generally suitable for Public Water Supply and Agricultural Self-Supply (AGR) purposes, water quality issues such as high iron or TDS concentrations may limit their use in certain parts of the LKB Planning Area.

Surface Water Availability

Kissimmee River

Surface water availability from the Kissimmee River will be evaluated as part of the establishment of the Kissimmee River Basin Water Reservation needed to protect fish and wildlife in the Kissimmee River, its floodplain, and the Upper Chain of Lakes. The reservation is expected to be adopted by December 2015. The tools developed for the reservation will then be available to assess water use alternatives from the river and its tributaries.

Lake Okeechobee

With the development of 2008 LORS, the SFWMD changed Lake Okeechobee's MFL status from prevention to recovery and developed a recovery strategy**.** The regulatory component of the recovery strategy effectively limits future additional withdrawals from Lake Okeechobee and all surface waters that are hydraulically connected to the lake to prevent further degradation of the level of certainty for existing legal users or change in lake MFL performance.

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Lake Istokpoga and Indian Prairie Basin

The history of water use for the Lake Istokpoga–Indian Prairie Basin has been one of water shortages and legal rights. The 2000 KB Plan evaluated the amount of surface water in the basin and found that the water demands of the users at that time could be met during a 1-in-10 year drought, but meeting water demands during more extreme drought conditions presented a problem. As previously mentioned, the District implemented RAA criteria (Section 3.2.1[A], Applicant's Handbook) for the Lake Istokpoga–Indian Prairie Canal System. No additional surface water will be allocated from District-controlled surface water bodies over and above existing allocations and no increase in surface water pump capacity will be recommended. This effectively limits future increased use of surface water in the basin.

OUTLOOK ON CLIMATE CHANGE

The uncertainties of climate change challenges water users and water managers as they plan for the future. Precipitation patterns are uncertain primarily because they are affected by large-scale global weather systems, such as El Niño and La Niña. For Florida, El Niño conditions tend to create above-normal rainfall in the dry season months and La Niña conditions generally form dry and somewhat warmer conditions (Koch-Rose et al. 2011).

Climate change can create additional complexities in planning. Traditionally, water resource planning used climate data from the past and current hydrology to represent future supply conditions because it was assumed the parameters of water resources (e.g., temperature, precipitation, stream flow, groundwater, and evaporation) would be the same as they had been in the past. While large variations in observed weather were experienced in the past, it was assumed that climate statistics would stay the same and variability would not increase in the future. With climate change, planning must consider additional uncertainties and larger variability (Water Utility Climate Alliance 2010).

Changes to evapotranspiration and weather patterns will likely affect water supply and demand. If temperatures and evapotranspiration increase as many experts expect, both PWS and AGR water demands may increase. More frequent intense rainfall events with longer interim dry periods could increase the total annual rainfall, but decrease effective rainfall as more water may be lost to runoff (Scavia et al. 2002).

Despite the uncertainties, climate change and its effects on surface water and freshwater aquifers should be included as a consideration in water supply planning. The SFWMD is developing models and evaluating water management scenarios of precipitation and sea level rise. To better understand the potential effects of changing weather patterns, it could be helpful if the SFWMD could investigate the ability to extend the climate data used in modeling more often than the typical frequency of every five years.

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Climate Change Evaluation Efforts

Efforts to understand the effects of climate change and the approaches to deal with it are under evaluation by many agencies. At the national level, the United States Environmental Protection Agency (USEPA) developed the *National Water Program 2012 Strategy: Response to Climate Change* (USEPA 2012). In this document, the USEPA states that many actions that could be taken to adapt to climate change will add value absent climate change. The best management practices used by PWS utilities include water conservation and other efficiencies and have the ability to deal with climate change impacts as well as meeting increasing demand caused by population growth. Three of the goals from this strategy relate to water supply planning:

- Efficiency in the use of energy and water should form the foundation of how energy and water are developed, distributed, recovered, and used
- Wastewater treatment facilities, which treat human and animal waste, should be viewed as renewable resource recovery facilities that produce clean water, recover energy, and generate nutrients
- The water and energy sectors—governments, utilities, manufacturers, and consumers—should move toward integrated energy and water management from source, production, and generation to end user

SUMMARY

The findings and conclusions of the 2000 KB Plan and 2005–2006 KB Plan Update continue to represent the issues needing to be reviewed to meet the 2035 projected water demands within the LKB Planning Area. Increasing water demands require the development of additional groundwater supplies due to use limitations on surface water from Lake Istokpoga, Lake Okeechobee, and their surrounding tributaries.

The following findings have been made regarding the availability of water resources within the LKB to meet the projected 2035 water demands:

- The SAS will remain the primary source for DSS. New or increased use of the SAS for other uses including PWS and AGR will be determined on an application-by-application basis. The SAS is currently used by the Okeechobee Utility Authority and Seminole Tribe of Florida for PWS.
- The UFA will likely remain the primary source of water to meet additional demands. As such, monitoring aquifer water levels and water quality needs to continue to ensure there is no impact to existing legal users or surface water bodies. Impacts resulting from future use of the UFA is dependent upon the location and amount of the withdrawals.
- New uses of surface water from Lake Okeechobee are limited in accordance with the LOSA Restricted Allocation Area. The LOSA Water Availability Rule effectively limits future additional withdrawals from Lake Okeechobee and all surface waters that are hydraulically connected to the lake to prevent further

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degradation of the level of certainty for existing legal users or change in the lake's MFL performance.

- The 2000 KB Plan evaluated the amount of surface water in the basin and found that water demands of the current users in the basin could be met during 1-in-10 year drought conditions, but drought conditions beyond that presented a problem in meeting all of the estimated demands. The District implemented restricted allocation area criteria for the Lake Istokpoga–Indian Prairie Canal system that effectively limits additional surface water will be allocated from District-controlled surface water bodies over and above existing allocations, and no increase in surface water pump capacity will be recommended.
- Water quality concentrations in the UFA near Lake Okeechobee and in portions of the LFA will limit their use as a water supply source without treatment and/or blending with other sources.
- The development of a water reservation for the Kissimmee River Basin was placed on the 2014 SFWMD Priority Water Bodies List and Schedule and reservation rule adoption is anticipated by December 2015.
- The SFWMD should coordinate with the SWFWMD to identify tools and a process to assess the impacts of potential future demands on MFL lakes in the Lake Wales Ridge region. The agreement on the process will occur subsequent to SWFWMD's review of the MFLs along the Lake Wales Ridge and the completion of updates to their Southern Water Use Caution Area groundwater model.
- To better understand the potential effects of changing weather patterns, the SFWMD should investigate the ability to extend the climate data used in modeling more often than the typical frequency of every five years.

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4

Water Resource Development Projects

This chapter addresses the roles of the South Florida Water Management District (SFWMD or District) and other parties in water resource development projects and provides a summary of projects in the Lower Kissimmee Basin (LKB) Planning Area. The project summaries serve as an overview of water resource-related activities in the region. An update on the status of Districtwide water resource development projects is also provided since many contribute to the understanding of water resources in the LKB Planning Area. Additional detail on the status of these projects can be found in Volume II, Chapter 5A of the annual *South Florida Environmental Report* (available from www.sfwmd.gov/sfer).

TOPICS

- Lower Kissimmee Basin Projects
- Districtwide Projects
- Water Quality Projects
- Summary

Florida water law identifies two types of projects to meet water needs: water resource development projects (subject of this chapter) and water supply development projects. (subject of **Chapter 5**). Water resource development projects are generally the responsibility of water management districts and often by themselves do not yield specific quantities of water. Instead, these projects support water supply development and are intended to ensure the availability of an adequate supply of water for all existing and future uses, including maintaining the functions of natural systems. For example, hydrologic investigations and groundwater monitoring and modeling provide important information about aquifer characteristics, such as hydraulic properties and water quality, which are useful for appropriate facility design, identifying safe yields, and evaluating the economic viability of water supply development projects.

Water resource development is defined in Section 373.019(22), Florida Statutes (F.S.), as:

> *the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation; and*

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related technical assistance to local governments, and to government-owned and privately owned water utilities.

Water resource planning in the LKB Planning Area is influenced by the Comprehensive Everglades Restoration Plan (CERP). Authorized by the United States Congress in 2000, CERP builds upon and complements other state and federal initiatives to revitalize south Florida's ecosystem. There are multiple implementation phases to these efforts, which are supported by modeling, land acquisition, project controls, and technical services performed throughout the process. An overview of some of these efforts is provided in this chapter and more detail on CERP projects can be found by region in the *2011–2014 Water Supply Plan Support Document* (Support Document, SFWMD 2014b).

LOWER KISSIMMEE BASIN-SPECIFIC PROJECTS

Projects that are contained wholly or partially within the Lower Kissimmee Basin are described in this section. These include:

- Lake Okeechobee Related Projects
- Istokpoga Marsh Watershed Improvement District Stormwater Project
- Nicodemus Slough Storage Project
- Fisheating Creek Watershed Feasibility Study
- Lower Kissimmee Basin Groundwater Modeling
- Exploratory Well OKF-105
- Hydrogeologic Investigation of Aquifer Systems in Highlands County

Lake Okeechobee Related Projects

In this section, the following projects related to Lake Okeechobee are discussed:

- CERP Lake Okeechobee Watershed Project
- Herbert Hoover Dike Major Rehabilitation
- Lake Okeechobee Habitat Enhancements

The locations of these projects and the specific habitat enhancement projects are shown in **Figure 13**.

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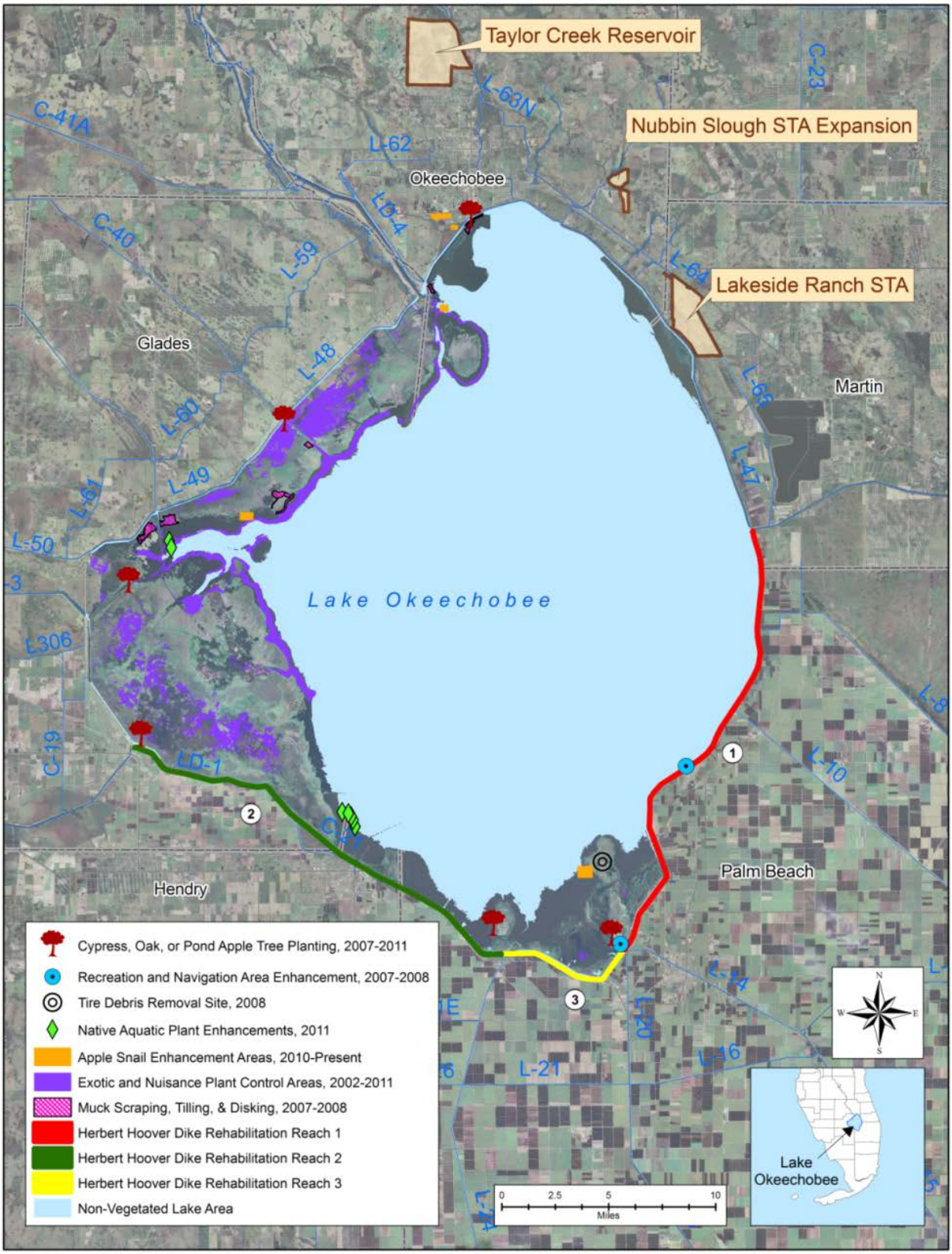

Figure 13. Projects and habitat enhancements in the Lake Okeechobee region.

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CERP Lake Okeechobee Watershed Project

The CERP Lake Okeechobee Watershed Project area covers approximately 1,800 square miles and incorporates the four major tributary systems that drain the lower portion of the watershed into Lake Okeechobee. The purpose of this project is to reduce damaging Lake Okeechobee water releases to the surrounding estuaries, increase aquatic and wildlife habitat, regulate extreme highs and lows in lake stages, and reduce phosphorus loading. In addition, this project will focus on rehydrating wetlands in and around the areas north of Lake Okeechobee and improving the ecological health of Lake Istokpoga. This project includes additional storage that will provide water supplies needed for Lake Okeechobee minimum flows and levels (MFL) recovery.

Taylor Creek
Stormwater Treatment Area

The key components of the CERP Lake Okeechobee Watershed Project proposed tentatively selected plan consist of a recommended revised Lake Istokpoga regulation schedule and the following six structural water storage and treatment features:

- **Reservoir in the Taylor Creek/Nubbin Slough Basin** – a 1,984-acre reservoir will store up to 32,000 acre-feet (ac-ft) of water. It will receive flows from and discharge back to Taylor Creek.
- **Stormwater Treatment Area (STA) in the Taylor Creek/Nubbin Slough Basin –** a 3,975-acre treatment area will receive inflow from the L-64 Canal and discharge back to the L-47 Canal. It is projected to reduce total phosphorus loads by 15.8 metric tons per year.
- **Reservoir in the Kissimmee River Basin –** a 10,281-acre aboveground reservoir with a maximum storage capacity of 161,263 ac-ft. It will receive flow from and discharge back to the Kissimmee River.
- **Reservoir in the Lake Istokpoga Basin –** a 5,416-acre reservoir will store up to 79,560 ac-ft. It will receive flow from and discharge back to the C-41A Canal.
- **STA in the Lake Istokpoga Basin –** an 8,044-acre treatment area will receive flow from the C-41 Canal and discharge treated water to Lake Okeechobee. It is expected to reduce total phosphorus loads by approximately 29.1 metric tons per year.
- **Restored Wetland in Paradise Run** – a 3,730-acre wetland restoration site located at the confluence of Paradise Run, oxbows of the Kissimmee River, and Lake Okeechobee.

Implementation of the CERP Lake Okeechobee Watershed Project has been delayed primarily due to unresolved federal/state cost-sharing issues for project water quality components. However, pilot projects at Taylor Creek, Nubbin Sough, and Lakeside Ranch have been constructed and continue to be tested. These projects are being developed to

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improve water quality and provide stormwater attenuation for Lake Okeechobee and are not water supply oriented. However, improved water quality and regional upper basin storage have incidental benefits for future supply even though the projects are not developed for that purpose.

USACE Herbert Hoover Dike Major Rehabilitation

The United States Army Corps of Engineers (USACE) is rehabilitating the Herbert Hoover Dike, a 143-mile series of levees and structures surrounding Lake Okeechobee, to address structural integrity concerns with the embankment and internal culvert structures. In 2007, the USACE designated the Herbert Hoover Dike a dam safety action classification risk of Class I, which is the highest risk of failure rating and requires remedial action.

Construction to reinforce the Herbert Hoover Dike

The ongoing remediation measures are addressing the highest points of potential failure in the system based on known areas of concern. The construction of a 21.4-mile cutoff wall in Reach 1 (see **Figure 13**) was completed in 2012. In addition, 32 culverts operated by the USACE are being replaced, removed, or abandoned with a scheduled completion in 2019.

The USACE is conducting a dam safety modification study. It is expected to be complete in 2015. This systemwide study is intended to identify risks within the system and recommend measures that can reduce the risk of failure. Additional remediation measures being considered include the construction of a cutoff wall and/or seepage management systems throughout all areas of the dike. The first phases of remediation addressing the highest risks from the study are scheduled for completion by 2022.

The USACE expects to operate under the 2008 Lake Okeechobee Regulation Schedule (2008 LORS) until either 1) a new Lake Okeechobee schedule is implemented as a component of the systemwide operating plan to accommodate CERP projects, or 2) the Herbert Hoover Dike seepage management system is completed as determined necessary to lower the dam safety action classification rating. The USACE intends to implement a new schedule or any necessary schedule modifications or deviations concurrent with the completion of either of those items (USACE and SFWMD 2013). A revised regulation schedule could provide the additional water supplies needed for Lake Okeechobee MFL recovery, enhance the level of certainty to existing permitted users, and support other environmental objectives. For more information see www.saj.usace.army.mil/Missions/CivilWorks/LakeOkeechobee/HerbertHooverDike.aspx.

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Lake Okeechobee Habitat Enhancements

The 2007 drought lowered Lake Okeechobee water levels, which allowed the SFWMD to perform a series of activities to protect and manage this water resource. Continued low water levels in Lake Okeechobee and Lake Istokpoga during 2008 prompted the SFWMD to garner input from various agencies to plan restoration projects for low lake stages during the coming dry seasons, as well as helping to mitigate the frequent low lake stages anticipated under the 2008 LORS. The restoration activities include muck scraping and disking/plowing, native aquatic plant enhancement, exotic and nuisance plant control, recreation and navigation area enhancement, in-lake debris removal, and initiation of an apple snail nursery. These activities are a part of the Lake Okeechobee MFL Recovery Strategy and aided further research and future project formulation.

Istokpoga Marsh Watershed Improvement District Stormwater Project

As described in **Chapter 3**, the Istokpoga Marsh Watershed Improvement District (IMWID) is a 22,000-acre agricultural area located southeast of Lake Istokpoga. The IMWID canal system serves as both a water supply from and a drainage system to Lake Istokpoga. The SFWMD is working with the IMWID, Highlands County, and the Florida Department of Agriculture and Consumer Services (FDACS) to initiate a dispersed water management and stormwater recycling project. The project will consist of approximately 1,200 acres of aboveground impoundments that will reduce the amount of storm water and phosphorus discharged by the IMWID by 60 to 70 percent. The collected storm water should also reduce the need for releases from Lake Istokpoga for irrigation.

Nicodemus Slough Storage Project

The Nicodemus Slough storage project is a cooperative agreement between the SFWMD and the property owner to retain excess water from Lake Okeechobee during periods when lake discharges to the Caloosahatchee River exceed desirable levels. The 16,000-acre project will pull excess water from the lake's rim ditch near Fisheating Creak through two pump stations. The pump stations will move the water over 7.5 miles west to the upstream end of the property where the water will be stored behind three internal berms and allowed to sheet flow through culverts located in those berms. It is anticipated that 34,000 acre-feet of water annually will be retained by the project.

Fisheating Creek Watershed Feasibility Study

Fisheating Creek is the only Lake Okeechobee tributary where no structure controls its discharge to the lake. It is characterized by extremely flashy flows and is one of the major sources of total phosphorus loading to the lake (SFWMD et al. 2011). The Fisheating Creek Feasibility Study is being conducted by the SFWMD, Florida Department of Environmental Protection (FDEP), and FDACS. Its objective is to identify the most appropriate mix of

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features to improve the hydrology and water quality in the watershed to reduce nutrient loads entering Lake Okeechobee. Planning targets for achieving surface water storage and water quality improvements have been established. The next step is to locate conceptual water quality and storage features. Completion of the study has been postponed and may resume once the hydrological benefits of the proposed Fisheating Creek Special Wetland Reserve Project are quantified by the United States Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS) and proposed Watershed Assessment Model enhancements are completed.

Lower Kissimmee Basin Groundwater Modeling

As part of the *2005–2006 Kissimmee Basin Water Supply Plan Update*, the District completed the Lower Kissimmee Basin Groundwater Model (LKBGWM, Radin et al. 2005). The LKBGWM was developed as a quasi-three-dimensional, steady-state groundwater flow model simulating the surficial aquifer system (SAS), the intermediate aquifer system (IAS), the Upper Floridan aquifer (UFA), and the Avon Park Permeable Zone, which are the uppermost producing zones of the Floridan aquifer system (FAS). The LKBGWM was updated for use in this *2014 Lower Kissimmee Basin Water Supply Plan*. The model was calibrated to 1995 and 2004 climatic and water use conditions and was validated using 2010 climatic and water use conditions. A uniform cell size of 2,640 square feet was used, resulting in a grid consisting of 130 rows and 130 columns.

As previously mentioned in **Chapter 3**, the model was used to evaluate potential impacts of projected 2035 water demands under average climatic conditions on the planning area and on some surface water bodies that have established MFLs. These MFL water bodies are located in the Southwest Florida Water Management District (SWFWMD), but are potentially within the area of influence of groundwater withdrawals in the SFWMD. Prior to the next water supply plan, and in coordination with the SWFWMD, the SFWMD should develop a process to refine modeling of the impacts of potential future demands on the MFL lakes in the Lake Wales Ridge region. Updating to a transient model should also be considered.

SFWMD Exploratory Well OKF-105

The SFWMD constructed an exploratory well (OKF-105) in Okeechobee County near the S-65C Structure to evaluate the hydrogeologic conditions of the FAS for water supply and aquifer storage and recovery (ASR) potential, and as a high-quality data source for groundwater model calibration. The finished well consists of three monitor zones, spanning intervals from 372 feet below land surface (bls) to 2,251 feet bls (Sunderland et al. 2011). Construction and testing of the well were useful for determining the vertical extent of transmissive and confining intervals within the FAS, as well as water quality stratification. The location of this well can be seen in **Figure 14**.

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Hydrogeologic Investigation of Aquifer Systems in Highlands County

A hydrogeologic and water quality investigation of the SAS, IAS, and FAS in Highlands County was completed in 2010 by the USGS. The resulting report, *Hydrogeology and Groundwater Quality of Highlands County, Florida* (Spechler 2010), will enable water resource managers to better evaluate current hydrologic conditions, define present-day baseline conditions, and identify additional hydrologic data needs. The report compiles geologic and hydrogeologic data and uses that information to examine long-term patterns within the respective aquifers. The findings were also used in the development of the 2014 LKBGWM update.

DISTRICTWIDE PROJECTS

Water resource development projects encompassing more than one planning area are considered Districtwide projects. Aspects specifically pertaining to or having relevance to the LKB Planning Area are identified within the context of these Districtwide projects.

The following projects have been completed since the 2005-2006 KB Plan Update and are discussed in this section:

- Transport and Reaction Simulation Engine for Modeling of Water Quality
- Evapotranspiration Measurement Project
- Water Supply Cost Estimation Study
- Lake Okeechobee ASR Pilot Project/Kissimmee River ASR Pilot Project
- Paradise Run ASR Project
- Seminole Tribe Brighton Reservation ASR Project
- L-63N Canal ASR Project

The following ongoing and future projects are discussed in this section:

- Minimum Flows and Levels, Water Reservations, and Restricted Allocation Area Criteria Activities
- CERP ASR Regional Study
- Comprehensive Water Conservation Program
- Alternative Water Supply
- Drilling and Testing
- Groundwater Assessment

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Completed Districtwide Projects

Transport and Reaction Simulation Engine for Modeling of Water Quality

A Fiscal Year (FY) 2009 study developed water quality modeling components and applied them to the SFWMD Regional Simulation Model. As a result of this study, a spatially distributed water quality model for phosphorus transport and cycling in wetlands was developed for application throughout the District (Jawitz et al. 2008).

Evapotranspiration Measurement Project

Evapotranspiration (ET) is a large part of the hydrologic budget in Florida, ranging from 30 to over 100 percent of average precipitation. In the past, the accuracy of hydrologic models, basin-scale studies, water budgets, and other hydrologic analyses throughout the state was limited because of the lack of accurate estimates for this large water loss. The Evapotranspiration Measurement Project was a response to this need and collected information to improve the methods for computing potential and reference ET. Potential ET data are necessary for most hydrologic simulation models. Reference ET is a necessary input for SFWMD permit applications.

The United States Geological Survey (USGS), in cooperation with the SFWMD, has completed numerous specialized hydrologic studies to address specific SFWMD needs related to ET measurement. The information provided from these studies was necessary to enhance the understanding of ET rates in various wetland and upland plant communities, and similar issues. The objectives of the studies were to measure actual ET from representative land covers, develop models to estimate projected ET, and provide 2-kilometer gridded satellite-based estimates of potential and reference ET on a daily timescale for all of Florida. The resulting data products from these studies include daily values of ET, which are archived in the USGS National Weather Information System database, and the daily potential and reference ET data sets by year and county from 1995 through 2010 (accessible at fl.water.usgs.gov/et).

Water Supply Cost Estimation Study

The objective of this project was to develop engineering cost estimation relationships for evaluating water supply alternatives for the SFWMD's regional planning areas. The study evaluated options using groundwater, surface water, seawater, ASR, and reclaimed water. The final cost study was published in two reports.

The Phase I report included probable costs for various water treatment and disinfection technologies, water treatment plant and distribution components, and various wastewater treatment technologies for capacities of 5, 10, 15, and 20 million gallons per day (MGD) based on project records. The report provides estimates of costs for wells, well treatment methods, wastewater treatment methods, deep injection well disposal, ASR, and surface water storage projects. This report (CDM 2007a) is available at: www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/water%20supply%20cost%20estimation%20study%202-2007_cdm.pdf.

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The Phase II addendum complements Phase I and provides cost estimates for additional capacities of 1 and 3 MGD, as well as estimates for wastewater granular filters and chlorine disinfection using onsite generation of hypochlorite. The Phase II report (CDM 2007b) is available at:
www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/wtrsupply_costestudy_phaseii_add_21-2007.pdf.

Aquifer Storage and Recovery Projects

CERP Lake Okeechobee ASR Pilot Project/Kissimmee River ASR Pilot Project

The Lake Okeechobee ASR pilot project initially consisted of up to five ASR wells, each with an estimated capacity of 5 MGD. Three ASR pilot projects were to be located around Lake Okeechobee to demonstrate ASR performance in geographically different areas: Moore Haven, Port Mayaca, and the Kissimmee River just north of Lake Okeechobee. The facilities at Moore Haven and Port Mayaca were deferred due to funding limitations, but the Kissimmee exploratory well became a pilot project.

The Kissimmee River ASR pilot project was designed, permitted, constructed, and tested by the USACE as part of CERP. The 5-MGD ASR well system is located along the eastern bank of the Kissimmee River (C-38 Canal) in Glades County (**Figure 14**). During four complete cycles of recharge, storage, and recovery conducted from 2010 through 2012, the system demonstrated high recovery efficiency and source water treatment via media filtration and ultraviolet disinfection processes. Responses to ASR activity within the FAS were monitored from four storage zone monitoring wells plus a surficial aquifer well. A technical data report for the project was published in December 2013 (SFWMD and USACE 2013).

ASR facility along the Kissimmee River

LOER Paradise Run ASR Project

The SFWMD evaluated the potential for ASR development in Glades County in the area of Paradise Run, on the western side of the Kissimmee River, south of the S-65E Structure (**Figure 14**). The project site is within a former alluvial plain wetland and meander belt of the Kissimmee River. An exploratory well (HIF-42) was constructed in 2008 to evaluate hydrogeological conditions in the FAS for a conceptual 10-well ASR system as a component of the Lake Okeechobee and Estuary Recovery (LOER) Program. The exploratory well defined the thickness and hydrogeological characteristics of potential storage zones in the Upper Floridan aquifer and the deeper Avon Park Permeable Zone. Conceptual designs for a one-well pilot project and a full-scale 10-well ASR system were completed.

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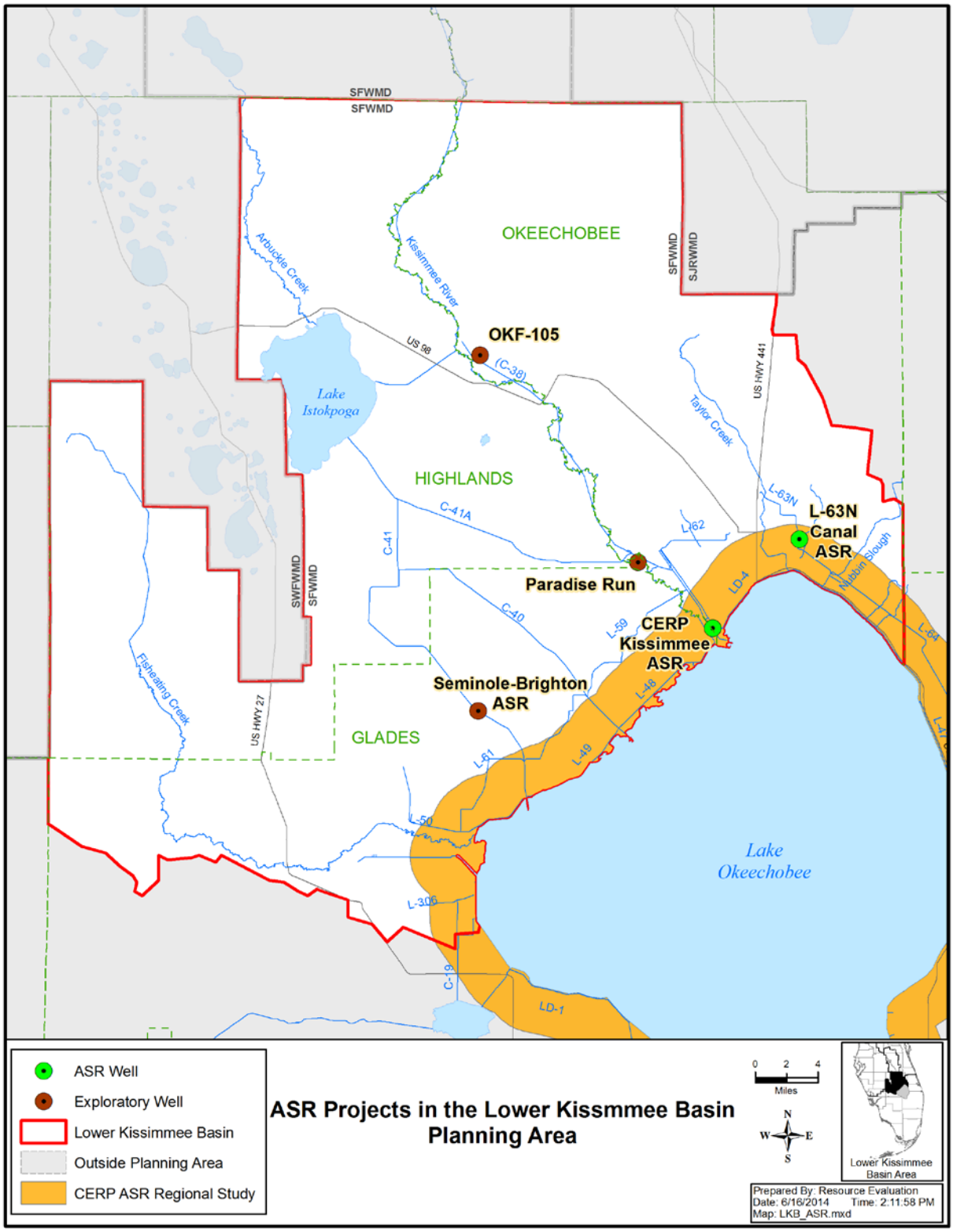

Figure 14. ASR projects in the LKB Planning Area.

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LOER Seminole Tribe Brighton Reservation ASR Project

The SFWMD partnered with the Seminole Tribe of Florida to evaluate the potential for ASR technology at the Brighton Reservation as a component of the LOER Program (**Figure 14**). In 2007, an exploratory well was constructed to evaluate hydrogeological conditions in the FAS. Aquifer performance testing indicated that conditions in the FAS were suitable for ASR. A conceptual design for a one-well ASR pilot project, including the use of "in-bank" filtration was developed. Geotechnical and hydraulic evaluations of the shallow sediments along the bank of the C-41 Canal were conducted and determined the site to be unfavorable for high-capacity water transmittance to an ASR system.

LOER L-63N Canal ASR Project

This project involves the reactivation of the L-63N ASR system in Okeechobee County (**Figure 14**), which was permitted, constructed, and cycle tested by the SFWMD (CH2M Hill, 1989). The system originally consisted of a 24-inch diameter, high capacity ASR well, a dual-zone monitoring well, an intake/outfall structure, pumps, piping, a holding pond, and an aeration and chlorination system. An aquifer exemption was petitioned for and granted by the USEPA for coliform bacteria to facilitate testing with non-disinfected water. Since that time, an additional monitor well has been installed. Pending regulatory approval and identification of funding, the system will be used to store excess surface water during wet periods for subsequent recovery of stored water during dry periods.

CERP ASR Regional Study

The results of the CERP ASR pilot projects are being integrated into the CERP ASR Regional Study. This study is designed to address technical issues associated with the CERP ASR Program beyond the scope and budget of the pilot projects. In the study, the final number and disposition of all proposed ASR wells will be determined through scientific investigations conducted under the ASR Regional Study, and the associated ASR pilot projects. This project's major elements are a technology inventory, field data collection, geotechnical and geophysical evaluations, laboratory analysis, groundwater modeling, surface water modeling, water quality monitoring, and ecological assessments. The report will include conclusions regarding the actual quantity of ASR wells that may be feasible and recommendations on implementation of future components of the CERP ASR program. The ASR Regional Study is expected to be completed in December 2014.

Ongoing and Future Districtwide Projects

This section describes ongoing and planned projects in the SFWMD that affect the LKB Planning Area. The budget for these projects (with the exception of the CERP ASR Regional Study) for FY 2014 through FY 2018 is provided in **Table 11** and include costs for contracts (such as ecological monitoring) and staff time.

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Water Supply Planning

Water supply planning is the process to determine a region's water needs and develop solutions to ensure an adequate supply of water to protect natural systems and to meet existing and future reasonable-beneficial uses, while sustaining water resources for future generations. The development of each regional water supply plan is a multiyear process. During this time, SFWMD coordinates with other agencies, local governments and utilities, the agricultural industry, environmental interests, and other stakeholders and holds public workshops and meetings and solicits input. Each regional water supply plan is updated every five years.

Table 11. Implementation schedule and costs for ongoing Districtwide water resource development projects that pertain to the LKB Planning Area (Modified from Martin 2014).

Districtwide Water Resource Development Projects	Plan Implementation Costs ($ in thousands)					
	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	Total
Water Supply Planning (DA01) Est. finish date: Ongoing	1,330	1,000	1,200	1,300	1,300	6,130
Alternative Water Supply Implementation (DB01) Est. finish date: Ongoing	325	325	325	325	325	1,625
MFL, Water Reservation and Restricted Allocation Areas Activities (DC01, DC05, DC08, DC09) Est. start date: 1995 Est. finish date: Ongoing	637	401	380	380	380	2,178
Comprehensive Water Conservation Program (DD01, DD07, DD08) Est. start date: 1977 Est. finish date: Ongoing	668	395	395	395	395	2,248
Drilling and Testing (DF01, DF05) Est. start date: 1990 Est. finish date: Ongoing	287	20	20	20	20	367
Groundwater Monitoring (DF01, DF06) Est. start date: 2002 Est. finish date: Ongoing	1,465	1,400	1,400	1,400	1,400	7,065
***Estimated* Portion of Central and Southern Florida Project Operation and Maintenance Budget Allocated to Water Supply**	104,000	104,000	104,000	104,000	104,000	520,000
Total	**108,712**	**107,541**	**107,720**	**107,820**	**107,820**	**539,613**

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Alternative Water Supply

Development of alternative water supplies and source diversification is important to meeting Florida's future water needs and can reduce the effects of droughts in many areas. Through the Alternative Water Supply Funding Program, the SFWMD assists permittees in the development of reclaimed water projects, water reclamation facilities, brackish water wellfields, reverse osmosis treatment facilities, and ASR well systems. From FY 2007 through FY 2013, the SFWMD, in cooperation with the State of Florida, provided more than $92.7 million in alternative water supply funding for 219 projects. Three of these projects were within the LKB Planning Area and created 2.35 MGD of new water capacity. The water sources included stormwater recycling and reclaimed water efforts. A full description of Alternative Water Supply-related projects and associated funding is contained in the SFWMD's Alternative Water Supply Annual Reports, prepared pursuant to Section 373.707(7), F.S., and published in Volume II of the annual South Florida Environmental Report (www.sfwmd.gov/sfer).

Minimum Flows and Levels, Water Reservations, and Restricted Allocation Area Criteria Activities

MFLs, water reservations, and restricted allocation area rules are water resource protection measures that have been developed to help ensure the sustainability of water resources within the SFWMD (see **Chapter 3** for an introduction to these regulatory measures).

The establishment of a water reservation for the Kissimmee River Basin is on the District's 2014 Priority Water Bodies List and Schedule. The process of developing the reservation rule includes scientific research and technical evaluations to characterize the water resources involved, link their functions to water needs, and establish scientifically based criteria for meeting the needs of fish and wildlife. Prior to rule adoption, a public process will occur through a series of workshops, dedicated web pages, and notifications. The draft rule will be presented to the District's Water Resources Advisory Commission (WRAC) for discussion and additional stakeholder input. Adoption is expected by the District Governing Board by December 2015.

Currently there are no new MFL or restricted allocation area rulemaking efforts for areas located within the LKB Planning Area.

Comprehensive Water Conservation Program

The long-standing conservation goal of the SFWMD is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable uses of water resources. This is addressed through planning, regulation, the use of alternative sources (such as reclaimed water), public education, and demand reduction through conservation technology, best management practices, and water-saving funding programs.

The Comprehensive Water Conservation Program is a series of implementation strategies designed to create an enduring conservation ethic and permanent reduction in water use. It

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was approved in 2008 and developed in conjunction with stakeholders through the SFWMD's WRAC. The program is organized into regulatory, voluntary and incentive-based, and educational and marketing initiatives. More detailed information about the Comprehensive Water Conservation Program is found in **Chapter 5**. Additional supporting information can be found in Chapter 5 of the Support Document.

Drilling and Testing

Drilling and testing includes the installation of wells for short- to long-term monitoring of aquifer water levels. The SFWMD's knowledge of south Florida hydrogeology is enhanced whenever exploratory/test wells are constructed. Such increased understanding has improved the accuracy of groundwater modeling and decision making regarding the approval of consumptive use permits. As an example of this work the SFWMD constructed Well OKF-105 (**Figure 14**) to evaluate multiple zones within the FAS for the feasibility of water supply, ASR, and collection of data in support of groundwater models and monitoring.

Groundwater Monitoring

Information regarding groundwater levels is essential to managing and protecting south Florida's water resources. Real-time data combined with historical information about water levels, weather, rainfall, and water quality changes help managers make water resource decisions.

Water level and water quality monitoring at existing wells provide critical information to aid the SFWMD in developing groundwater models, assessing groundwater conditions, and managing the water resources. The District maintains extensive groundwater monitoring networks and partners with the USGS for additional ongoing monitoring. The resulting data are archived in DBHYDRO, the SFWMD's corporate environmental database (www.sfwmd.gov/dbhydro).

Districtwide groundwater monitoring activities related to the LKB Planning Area include:

- **USGS Contract for Water Level Monitoring –** An ongoing effort to collect data from groundwater level monitoring. The project includes well and recorder maintenance as well as archiving data in the USGS database for sites throughout the District.
- **Groundwater Monitoring –** An ongoing effort to monitor groundwater levels in all water supply planning areas of the SFWMD. As of 2012, Districtwide monitoring includes 760 groundwater stations for the SAS, IAS, and FAS. Data are collected, analyzed, validated, and archived in DBHYDRO.
- **Regional FAS Exploration and Well Maintenance –** Water level and water quality monitoring is ongoing at 61 FAS well sites Districtwide. Well maintenance is conducted as needed. Data are collected, analyzed, validated, and archived in DBHYDRO.
- **Hydrogeologic Database Improvements –** Backlogged data are being uploaded and miscellaneous database corrections are being made.

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- **Monthly Groundwater Level Measurements** – Continued water level monitoring at select sites, including data collection, data analysis, and validation to supplement the existing groundwater level network.

Portion of Central and Southern Florida Project

The SFWMD's history and functions are closely linked to water resource development activities. District responsibilities include managing and protecting the water resources of South Florida by balancing and improving water quality, flood control, natural systems, and water supply.

WATER QUALITY AND STORAGE PROJECTS

Shallow water retention projects provide local groundwater recharge, opportunities for water quality improvement, storage for excess flows, and rehydration of drained systems. While these projects are not constructed for water supply development, there are potential benefits towards offsetting seasonal impacts to water sources. The following summarizes these projects in the LKB Planning Area.

Dispersed Water Management

Since 2005, the SFWMD has been working with a coalition of governmental agencies, environmental organizations, ranchers, and researchers to enhance opportunities for storing excess surface water on private and public lands. Over the years, these partnerships have made thousands of acre-feet of water retention and storage available throughout the Greater Everglades system. The effort is known under a number of names including Dispersed Water Management (DWM), Northern Everglades Payment for Environmental Services (NE-PES), and the Florida Ranchlands Environmental Services Project (FRESP). These programs encourage property owners to retain water on their land rather than drain it, accept and detain regional runoff, or do both. Managing water on these lands reduces wet-season water flow into Lake Okeechobee and subsequent discharge to coastal estuaries.

These projects are constructed to improve water quality and attenuate water releases and are not constructed with the purpose of water supply development. Project locations are displayed in **Figure 15** and more information can be found at www.sfwmd.gov/storage.

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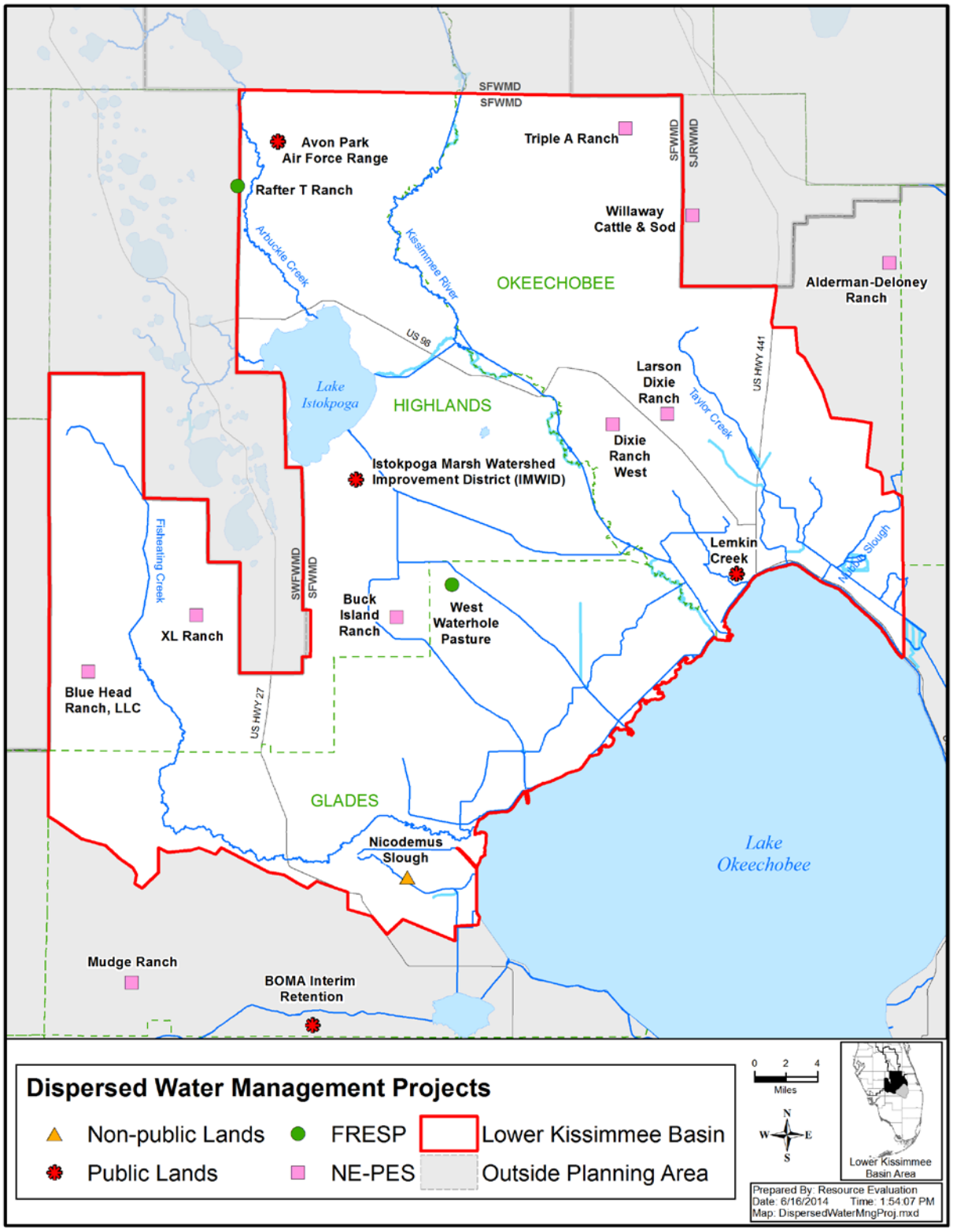

Figure 15. Dispersed Water Management projects.

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Florida Ranchlands Environmental Services Project

FRESP is a program in which ranchers in the Northern Everglades are compensated for providing water retention, total phosphorus load reduction, wetland habitat expansion, or other environmental services. This program is a collaboration among the World Wildlife Fund, participating ranchers, USDA-NRCS, FDACS, SFWMD, and FDEP. A number of original FRESP pilot projects have been converted to NE-PES projects. There are two remaining participants in the LKB Planning Area during FY 2014.

Northern Everglades – Payment for Environmental Services

Based on the success of the FRESP pilot projects, the NE-PES program was developed as a partnership between water managers and private landowners to achieve water storage, water quality, and habitat improvement benefits in the Northern Everglades. The first eight NE-PES projects were approved by the District Governing Board in 2011 and two additional projects were approved in 2013.

Water management on Dixie Ranch

SUMMARY

Water resource development projects are intended to ensure the availability of an adequate supply of water. The SFWMD expanded groundwater monitoring and testing efforts, completed hydrogeologic studies, conducted groundwater modeling, and implemented outreach and educational programs to encourage efficient use of water resources in the LKB Planning Area through conservation and reuse. Additionally, the District performed studies, such as the Supply Cost Estimation Study to determine the viability of water resource development options to increase water supply through water resource alternatives. Due to severe budget constraints, funding for future water resource development projects is generally limited to staff time. As funds become available, projects will be prioritized based on the needs at the time. Past and future benefits of the water resource development projects reviewed in this chapter include:

- Improved understanding of the hydrogeology and water availability of the region
- Increased future supply availability
- Preservation of existing supplies through better understanding, management, and continued monitoring of resources
- Prevention of the loss of the natural system
- Coordination with other agencies and stakeholders to exchange hydrogeologic knowledge and data

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5

Evaluation of Water Source Options

This chapter presents an overview of water supply options and water conservation measures available within the Lower Kissimmee Basin (LKB) Planning Area through 2035. Relatively small growth in water demands is projected for the area over the planning horizon. Because traditional water resources, such as surface water and, to a smaller degree, groundwater, in the basin are limited, alternative sources are identified and discussed in this chapter. Some examples of alternative or nontraditional sources include brackish groundwater, new storage capacity (aquifer storage and recovery and reservoirs), reclaimed water, and storm water for consumptive uses. These options may make additional water available from historically used sources by providing improved management of the resource, or there may be a previously undeveloped or underutilized source of water in the region. Information is provided for the following options:

TOPICS

- Surface Water
- Groundwater
- Reclaimed Water
- New Storage Capacity
- Water Conservation
- Summary

- Surface water
- Groundwater
- Reclaimed water
- New storage capacity

To evaluate the water source options, consideration must be given to several factors. These include future water needs, source availability, water quality requirements for the intended uses, and cost. Water use within the LKB Planning Area is expected to increase from approximately 192 million gallons per day (MGD) in 2010 to more than 222 MGD by 2035. **Chapter 2** summarizes the gross water demand for each water use category.

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WATER SOURCES

The evaluations of water source options are made within the context of the issues identified in **Chapter 3**. In this chapter, each water supply option includes a brief discussion on the availability of the resource and potential impacts to the natural systems. The *2011–2014 Water Supply Plan Support Document* (Support Document) contains detailed information on aquifers and aquifer yield specific to the LKB Planning Area as a whole (Chapter 7), water source options including water conservation and related costs (Chapter 5), and water treatment technologies and associated costs (Chapter 6). Information about water treatment technologies is also provided in the *Water Supply Cost Estimation Study* (CDM 2007a, 2007b). These costs are not a substitute for the detailed evaluations and feasibility and design studies needed to plan and build such facilities.

Surface Water

Creeks, lakes, canals, and rivers in the Kissimmee Basin form an integrated water management system that directs surface water flow from the Upper Kissimmee Basin to the Lower Kissimmee Basin and into Lake Okeechobee. The LKB Planning Area's major surface water sources include Lake Istokpoga, Fisheating Creek, the Kissimmee River (C-38 Canal), and Taylor Creek/Nubbin Slough. All of these surface water features flow into Lake Okeechobee either directly or indirectly.

Lake Okeechobee

Lake Okeechobee provides water supply throughout the year and is critical for flood control during wet periods. The lake serves as a supplemental water supply source for agriculture when rainfall is insufficient and can be used as a backup source for agricultural areas directly adjacent to the L-59, L-60, and L-61 canals on the north and west sides of the lake during dry periods. Additionally, pumps G-207 on the C-41 Canal (Harney Pond) and G-208 on the C-40 Canal (Indian Prairie) allow for water deliveries to the Seminole Tribe of Florida's Brighton Reservation during periods of extended drought. The Okeechobee Utility Authority (OUA) is the only Public Water Supply (PWS) utility using water directly from Lake Okeechobee. Further increased withdrawals from the lake are limited due to the implementation of the 2008 Lake Okeechobee Regulation Schedule by the United States Army Corps of Engineers.

Lake Okeechobee

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Lake Istokpoga

Surface water from Lake Istokpoga has traditionally been used to meet irrigation demands within the Indian Prairie Basin, which is between Lake Istokpoga and Lake Okeechobee in Highlands and Glades counties. Water is delivered via the S-68 Structure to the C-41A Canal and then distributed to the C-39A, C-40, and C-41 canals. The Istokpoga Marsh Watershed Improvement District receives water directly from Lake Istokpoga. Water flows into Lake Istokpoga from the Arbuckle Creek watershed to the north and the Josephine Creek watershed, which includes areas within the Southwest Florida Water Management District (SWFWMD).

Historically, water availability was limited by storage issues and the conflicts inherent in managing surface waters for flood control. This caused numerous temporary water shortages in the basin. As a result, the Indian Prairie Basin area was designated a restricted allocation area (see **Chapter 3**), which limits the use of surface water resources over and above existing conditions (SFWMD 2014a). In recent years, some permittees have increased use from Floridan aquifer wells as groundwater is a more reliable source of water during extended dry periods.

Fisheating Creek

Fisheating Creek is the second largest natural water source for Lake Okeechobee. Much of the land surrounding the creek is publicly owned or under conservation easements. The lower reach of the creek remains in a largely natural state. Plans are under way to restore the upper section. Past efforts in the basin have focused on improving water quality by reducing total phosphorus loads going into Lake Okeechobee. Mutually beneficial water quality and water supply opportunities might be achieved from the construction of stormwater runoff storage areas identified as part of the Fisheating Creek Feasibility Study (see **Chapter 4**). The development of these storage areas is not expected to begin for several years and the potential for water supply opportunities will be reviewed at that time.

Fisheating Creek

Kissimmee River

The Kissimmee Basin south of the S-65 Structure on Lake Kissimmee encompasses approximately 670 square miles and represents, along with inflows from the Upper Kissimmee Basin, approximately 50 percent of the surface water flow into Lake Okeechobee (SFWMD, FDEP, and FDACS 2011). This basin forms the headwaters of Lake Okeechobee

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and the Everglades, and is identified as the Northern Everglades portion of the South Florida Water Management District (SFWMD or District).

The Kissimmee River Restoration Project is a large-scale, multi-phased, ecosystem restoration effort. The project aims to reestablish the river/floodplain system's ecological integrity while maintaining existing flood protection. To achieve these goals, additional water storage will be generated in the headwater lakes of Kissimmee, Cypress, and Hatchineha through regulation schedule modifications needed to approximate the system's historical inflows to the river. The regulation schedule modifications also will increase the quantity and quality of shoreline habitat in the three headwater lakes for the benefit of fish and wildlife. When fully implemented, the project is expected to require water to be stored in and released from the Kissimmee Chain of Lakes and its tributaries as part of a management strategy for balancing flood control and environmental restoration.

The SFWMD began technical work to establish a water reservation for the Kissimmee Basin in 2008. Ecologic and hydrologic analyses were conducted and documented in the draft *Technical Document to Support Water Reservations for the Kissimmee River and Chain of Lakes* (SFWMD 2009a), which included hydrologic modeling of the Kissimmee River and its tributaries. In June 2014, the District Governing Board reinitiated rule development, to include updated analyses, and adoption of the rule is expected by December 2015.

Taylor Creek / Nubbin Slough

Taylor Creek and Nubbin Slough are interconnected and drain into Lake Okeechobee from the north and northeast. The combined basin includes three tributaries: Lettuce Creek, Henry Creek, and Mosquito Creek, which are intercepted by canals L-63, L-64 and C-59. Surface water use in the basin is primarily for agriculture including pasture and dairies. This region was identified as contributing large amounts of phosphorus to Lake Okeechobee and as such a number of stormwater treatment areas (STA) and reservoir projects are ongoing in the basin (see **Chapter 4**). The southern portions of this basin are included in the Lake Okeechobee Service Area (LOSA), which is under restricted allocation area criteria that limit additional surface water withdrawals.

Groundwater

Groundwater sources in the LKB Planning Area are fresh groundwater from the surficial aquifer system (SAS), the intermediate confining unit/intermediate aquifer system (ICU/IAS), and the Upper Floridan aquifer (UFA). Brackish water is also available from the Lower Floridan aquifer (LFA) and the portions of the UFA near Lake Okeechobee. More information about these aquifers is provided in **Chapters 1** and **3** of this document and Chapter 8 of the Support Document.

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Surficial Aquifer System

The SAS has low productivity in the LKB Planning Area but is sufficient to be the major water supply source for Domestic Self-Supply (DSS). Additionally, the SAS has been used for PWS, lawn irrigation, some industrial and commercial use, and small-scale agricultural irrigation. Both the Okeechobee Utility Authority and the Seminole Tribe of Florida's Brighton Water Treatment Plant have 1.0-MGD wellfields that withdraw water from the SAS. It is anticipated that the future additional demand for DSS, lawn irrigation, and some agricultural use will be met from this source.

Intermediate Confining Unit / Intermediate Aquifer System

The ICU/IAS acts as a semi-confining unit between the SAS and FAS in the LKB Planning Area. While a few locally occurring water producing zones within the IAS exist, they generally do not produce large amounts of water. Some wells located in southern Okeechobee County and the western portions of the planning area along the Lake Wales Ridge have exhibited moderate yields due to local sand beds in the aquifer. The IAS is not seen as a largely viable source of water in the LKB region.

Floridan Aquifer System

In the LKB Planning Area, fresh groundwater from the UFA has historically been a reliable source of water for Agricultural Self-Supply (AGR) and some PWS. In the northern parts of the planning area, the UFA is generally fresh, but it becomes brackish closer to Lake Okeechobee (see **Figure 12** in **Chapter 3**). It is expected that future AGR demands will be primarily met with water from the UFA. Groundwater modeling simulations were conducted to assess the possible impacts of the estimated increases in demand through 2035 (Butler et al. 2014). As described in **Chapter 3**, results of the simulations project no additional reductions in Floridan aquifer system (FAS) levels beneath MFL lakes of concern along the Lake Wales Ridge; therefore, the risk to SWFWMD MFL recovery and prevention strategies resulting from withdrawal of the projected 2035 demand is low. Sufficient aquifer confinement is believed to exist around Lakes Istokpoga and Okeechobee that the risk of negatively impacting them through increased FAS groundwater use is minimal. Based on the analysis, it appears that supplies from the UFA are adequate to meet the projected needs within the LKB over the planning horizon. It should be noted however that there are certain risks to increasing groundwater use in the basin if the demands or the locations of the withdrawals were to change.

The LFA generally contains brackish to saline water throughout much of the Lower Kissimmee Basin; however, fresh water has been found in the northwestern portion of Highlands County close to the Lake Wales Ridge. Water derived from the brackish portions of the LFA might be useful for blending with other freshwater sources.

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Reclaimed Water

Reclaimed water is water that received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility. Reclaimed water can be used for many purposes including groundwater recharge, irrigation of golf courses, residential lots, medians, agriculture, if suitable, and other green space, industrial uses such as cooling and process water, and environmental enhancement. The State of Florida's Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code [F.A.C.]) requires the Florida Department of Environmental Protection (FDEP) and water management districts to advocate and direct the use of reclaimed water as an integral part of water management programs, rules, and plans. The SFWMD requires all applicants for water use permits to use reclaimed water unless the applicant demonstrates it is not feasible.

Wastewater reuse conserves water resources and is an environmentally sound alternative to deep well injection and other traditional disposal methods. Although disposal methods will always be needed in wet periods, the use of reclaimed water during normal to dry periods minimizes wasteful disposal of water resources. In addition, reclaimed water provides an acceptable alternative to potable water for uses like irrigation, normally at a lower cost.

Currently, the OUA, Okeechobee Correctional Institute (OCI), and Sebring Airport provide reclaimed water within the LKB Planning Area. In 2010, the three utilities generated an average of 0.86 MGD of reclaimed water. Sebring Airport irrigated one small agricultural operation while most of OUA's reclaimed water (0.5 MGD) was delivered to Williamson Cattle Company to irrigate 761 acres of citrus. The remaining 0.22 MGD produced by the OUA was used at the plant for irrigation or other internal uses. In 2010, the OCI utilized 0.09 MGD of reclaimed water for spray field irrigation. The Spring Lake wastewater treatment plant, owned by the development, also produces a small amount of treated wastewater that is used to augment the golf course's irrigation supply. The capacity of the wastewater treatment plant at Spring Lake is below the 0.1 MGD reporting requirement for the FDEP inventory.

New Storage Capacity for Surface Water or Groundwater

Storage is an essential component of any water supply system that experiences fluctuations in supply and demand. Capturing excess surface water during wet conditions for use during dry periods increases the available water. In central and south Florida, two-thirds of the annual rainfall occurs in the wet season. Without sufficient storage capacity, much of this water is lost through the surface water management and flood protection systems. In the LKB Planning Area, potential types of water storage include aquifer storage and recovery (ASR) wells and reservoirs.

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Aquifer Storage and Recovery

ASR is the storage of water by injecting it into an acceptable aquifer. The aquifer acts as an underground reservoir for the injected water, reducing water loss to evaporation. Available potable water, surface water, groundwater, or reclaimed water is collected during times when plentiful (typically during the wet season), treated to meet federal and state drinking water standards, and then pumped into an aquifer through a well. The water is stored for later recovery In the LKB Planning Area, most ASR systems store treated water in the FAS, where it displaces brackish water. The percent of water that is recovered depends on subsurface conditions, and the level of treatment required after storage and recovery depends on whether the water is for public consumption, irrigation, surface water augmentation, or wetland enhancement.

The volume of water made available through ASR wells depends on several local factors, such as well yield, water availability, variability in water supply and demand, and use type. Uncertainty of storage and yield capabilities and water quality characteristics present associated risks for success, but ASR provides storage for water that would otherwise be lost and represents a water supply management option for Florida's future.

To date, 36 ASR wells have been constructed within the SFWMD. A number of these are ASR pilot studies being conducted within the LKB or adjacent regions. These include the Kissimmee River ASR, Paradise Run ASR, and the L-63N Canal ASR projects. Descriptions of these projects can be found in **Chapter 4**.

Of the existing ASR wells, some are fully permitted for operation, while most are in operational testing or are inactive. A change in the primary drinking water standard for arsenic (i.e., 50 to 10 parts per billion) added uncertainty to obtaining operational ASR permits from the FDEP. Through site testing, new treatment technology, and recent changes in regulatory criteria, ASR wells are considered a viable option for providing future water supply to meet growing demands.

Local and Regional Reservoirs

Surface reservoirs can improve water quality and provide supplemental water supply for municipalities, agricultural and industrial uses, and environmental management. They store water, primarily during wet conditions, for use in the dry season. Water is typically captured and pumped from rivers or canals and stored in aboveground or in-ground reservoirs. For example, small-scale (local) reservoirs are used by individual farms to store recycled irrigation water or collect local stormwater runoff. These reservoirs may provide water quality treatment before off-site discharge. Large-scale reservoirs (regional) are used for stormwater attenuation, water quality treatment in conjunction with stormwater treatment areas, and storage of seasonally available supplies.

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WATER CONSERVATION

Water conservation is an integral part of water supply planning and water resource management. For planning purposes, water conservation is considered a water source option because it reduces, defers, or eliminates the need to expand the water supply infrastructure. A blend of developing new alternative water supplies and increasing water conservation may be required to meet future water demands. Using conservation measures to decrease demands is usually the least costly option when compared to water supply development projects, which may require significant upfront investments and ongoing maintenance. This section describes water conservation opportunities, programs, and tools available to users in the LKB Planning Area.

In 2008, the District Governing Board approved the Comprehensive Water Conservation Program which covers all planning regions of the District. The overarching vision of the program is to achieve a measurable reduction in water use, inspire governments, citizens and businesses to value and embrace a conservation ethic, and serve as a model for water conservation (SFWMD 2008). Chapter 5 of the Support Document provides more information about the program.

Agricultural Irrigation

Agricultural irrigation is the largest water use sector in the LKB Planning Area and offers significant water conservation potential. The water use permitting process bases water allocations for agriculture on numerous factors including acreage, crop type, growing and irrigation methods, and site-specific parameters such as soil type and anticipated rainfall. Demand reduction must be based on those aspects that can be changed, such as irrigation and growing methods. Generally, these types of changes are expensive and require extensive planning and consideration.

Irrigation efficiency can be improved by either replacing an outdated or inefficient irrigation system or by optimizing the operation and maintenance of an existing system. The selection of a new system depends on the type of crop, soil, water source, and water availability. Reviewing irrigation scheduling (time between irrigation events and amount of water applied) may also increase efficiency. Farmers can also use soil moisture sensors to understand soil conditions for particular fields and crops and improve agricultural irrigation scheduling. Tailwater recovery, a planned system to capture and recycle water that runs off the field, may also be used to conserve irrigation water supplies. Additional information on water conservation for the agricultural use sector can be found in Chapters 4 and 5 of the Support Document.

Agricultural Best Management Practices

Agricultural best management practices (BMPs) are actions agricultural businesses can take to protect or improve water quality or quantity while maintaining or even enhancing agricultural production. The Florida Department of Agriculture and Consumer Services

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(FDACS) and FDEP develop and adopt BMPs by rule for different types of agricultural operations, specific regions, or statewide. Most BMPs in the LKB are established to improve water quality; however, some contain an implicit water conservation component. For example, tailwater recovery and irrigation efficiency are BMPs identified as having implicit water conservation benefits. The District recommends agricultural users investigate and implement the BMPs appropriate for their crop type and region.

Mobile Irrigation Labs

The Mobile Irrigation Lab (MIL) is a voluntary program, supported by the water management districts, FDACS, and the United States Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS), that performs free evaluations of irrigation systems and encourages the adoption of efficient irrigation management practices that conserve water. During a MIL visit, trained technicians analyze irrigation system efficiency and make recommendations for physical and operational improvements that may include modification of irrigation systems and equipment, alteration of irrigation scheduling, and other aspects of system management. In the LKB, the Highlands Soil & Water Conservation District operates a MIL program.

Florida Automated Weather Network

The Florida Automated Weather Network (FAWN), operated by the University of Florida/ Institute of Food and Agricultural Sciences (UF/IFAS), provides weather information from locations throughout the state at 15-minute intervals. FAWN management tools provide decision support functions to growers using historical weather data and crop modeling technology to help in short- and long-term planning, thereby maximizing the efficiency of their irrigation practices. Access to FAWN is available from http://fawn.ifas.ufl.edu/data/.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program, implemented through the USDA-NRCS, provides a voluntary conservation program for farmers and ranchers. The program promotes agricultural production and environmental quality as compatible national goals. Financial and technical assistance is offered to participants to install or implement structural and management practices that address impaired water quality and conservation of water resources on eligible agricultural land.

Public Water Supply

Considerable water savings can typically be attained through conservation efforts targeting PWS users. However, unlike other planning areas in the District, the PWS use sector for the LKB does not make up a very large percentage of the region's demands. For that reason, conservation information on the PWS sector is abbreviated in this plan. A list of the conservation measures being implemented by the PWS utilities and their associated local

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governments are shown on **Table 12**. Each of these measures is explained in detail in Chapters 4 and 5 of the Support Document.

Typically, PWS-sponsored water conservation programs may also support the purchase and installation of high-efficiency plumbing and irrigation fixtures. Additionally, many of the conservation measures available for PWS users are also applicable for DSS users. The SFWMD supports PWS water conservation efforts through the implementation of programs such as the Water Savings Incentive Program (WaterSIP), Water Conservation Hotel and Motel Program (Water CHAMP), and Florida Water Star program. The SFWMD also supports the Florida-Friendly Landscaping and Florida-Friendly Yard recognition programs and the United States Environmental Protection Agency (USEPA) WaterSense programs. Additionally, PWS utilities are strongly encouraged to use a water conservation planning tool, such as the Conserve Florida Water Clearinghouse's EZ Guide (EZ Guide) or the Alliance for Water Efficiency's Conservation Tracking Tool, when creating a water conservation program. Detailed descriptions and explanations of the above-mentioned programs and tools can be found in Chapter 5 of the Support Document.

Table 12. LKB PWS conservation implementation status.

Utility	Irrigation Hours Ordinance	Florida-Friendly Landscape Ordinance[a]	Ultra Low Volume Fixtures Ordinance	Rain Sensor Ordinance	Water Conservation Rate Structure	Leak Detection and Repair Program[b]	Public Education Program[c]
Highlands County							
Sebring, City of – Utilities Dept. (Sebring Airport)	Yes[d]	No	No	Yes	No	Yes	No
Spring Lake Development District[e]	Yes[f]	No	Yes	No	Yes	Yes	Yes
Okeechobee County							
Okeechobee Utility Authority[g]	Yes[d]	Yes	No	Yes	Yes	Yes	Yes

Note: Section 4.1.2, Applicant's Handbook (SFWMD 2014a) does not apply to the Brighton Reservation, which is under the jurisdiction of the Seminole Tribe of Florida.

a. Includes Xeriscape ordinances that have not been updated to reflect Florida-friendly Landscaping principles.
b. Program initiated when unaccounted for water greater than 10 percent.
c. Program can vary depending on permit requirements and other factors.
d. Upon declaration of a water shortage or water shortage emergency by the SFWMD or SWFWMD.
e. Follows Highlands County water conservation measures.
f. Follows SWFWMD year-round water conservation measures.
g. Follows Okeechobee County and/or city of Okeechobee water conservation measures.

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Landscape Irrigation

Recreational and landscape water is used to irrigate parks, athletic fields, golf courses, landscaped areas (e.g., homeowner association common areas and the areas around commercial centers and office buildings), roadway medians, and cemeteries. Demand reduction is possible by employing best management and design practices and new irrigation technologies, including rain sensors or soil moisture sensors and weather-based irrigation system controllers, to maintain a high degree of water use efficiency. Properties using antiquated equipment should consider upgrading to the latest irrigation control technology and the use of Florida-friendly landscaping principles where feasible. Smaller properties may be able to incorporate the capture of storm water in rain barrels or cisterns. The deployment of mobile irrigation labs can help identify ways to improve irrigation efficiencies. Funding assistance from the SFWMD through the WaterSIP program may be available for hardware-based water use efficiency projects. Information on smart irrigation technologies, MILs, and the WaterSIP program can be found in Chapter 5 of the Support Document.

Year-Round Landscape Irrigation Conservation Measures

In March 2010, the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.) became effective. Within the LKB Planning Area, this rule limits irrigation of existing landscapes to two days per week in Okeechobee and Highlands counties and three days per week in Glades County. Irrigation using reclaimed water, cisterns, rain barrels, and various low-volume methods (e.g. microirrigation, container watering, and hand watering with a hose equipped with an automatic shut-off nozzle), may be used at any time. For new lawns and landscapes, additional watering days are permitted for up to 90 days following installation. For more information on this irrigation rule please refer to Chapter 4 of the Support Document.

Rule 40E-24, F.A.C. outlines the Year Round Landscape Irrigation Conservation measures adopted by the District. Glades county, which is located wholly within the District, follows the District's three-day-a-week irrigation schedule. Okeechobee and Highlands counties, which partially fall within the District, follow a two-day-a-week schedule. The two-day-a-week schedule was adopted to reflect the SWFWMD and the St. Johns River Water Management District (SJRWMD) schedules imposed for the remainder of those counties. Counties have the option of adopting their own year round irrigation rules, as long as they are equal to or more restrictive than those imposed by the SFWMD.

Golf Course Water Conservation

As of 2014, five permitted golf courses are within the boundaries of the LKB Planning Area. Golf courses are encouraged to use appropriate irrigation inhibiting technology, such as properly functioning rain sensors or soil moisture sensors, as well as some type of weather, evapotranspiration, or soil moisture-based smart irrigation technology. These types of projects may be eligible for partial funding from the Water SIP as described in Chapter 5 of the Support Document.

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Industrial / Commercial / Institutional Use

While many industrial, commercial, and institutional users in the LKB Planning Area are self-supplied (i.e., draw water from either an on-site well, retention pond, canal, or even reclaimed water), some use potable utility-supplied water. The tools and programs mentioned in this chapter and Chapter 5 of the Support Document can increase efficiency and reduce wasteful use. To assist this use class in improving water use efficiency, the SFWMD published the *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities, A Guide for Facility Managers* (SFWMD 2013a). This guide assists facility managers through detailed self-conducted water use assessment procedures and potential conservation methods for the most common points of water use. The guidebook and its companion water use and savings calculators are available for download from the SFWMD's conservation webpage (www.savewaterfl.com) under Businesses.

SUMMARY

Overall, the future water demands in the LKB Planning Area can continue to be met during a 1-in-10 year drought over the planning horizon using traditional sources and existing alternative water supply projects. Certain surface water sources such as Lake Istokpoga, Lake Okeechobee, and the Kissimmee River do not have additional available water beyond their current permitted withdrawal amounts. Surface water users within the Lake Okeechobee Service Area have only a 1-in-6 year drought level of certainty. Groundwater modeling completed as part of this planning effort showed groundwater from the Upper Floridan aquifer is available to meet the projected new demands. However, new uses from the UFA may be limited near the Lake Wales Ridge due to potential influence on lake levels in the SWFWMD or in the southeast portion of the planning area where water quality becomes an issue.

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6

Water Supply Development Projects

This chapter summarizes the water supply development projects anticipated to meet the water needs of the Lower Kissimmee Basin (LKB) Planning Area for the 2010–2035 planning horizon. Information on demand projections is provided for each water use category (see **Chapter 2**). Additional details about water demand projections, utility information, and local government planning information can be found in **Appendices A**, **C**, and **D**, respectively.

TOPICS

- Regional and Local Planning Linkage
- Funding
- Summary
- PWS Utility Summaries

Water users, such as utilities, local governments, and self-suppliers, including Agricultural Self-Supply and Industrial/Commercial/Institutional Self-Supply users, are primarily responsible for water supply development projects. For each Public Water Supply (PWS) utility supplying 100,000 gallons per day (0.1 million gallons per day [MGD]) or greater to its service area, a utility summary is included at the end of this chapter. The utility summaries provide population and demand projections.

The South Florida Water Management District's (District or SFWMD) water supply plans typically identify proposed sources and list proposed PWS development projects to meet future demands. However, the PWS utilities in the LKB are able to meet the projected demands through 2035 and therefore have not proposed future supply projects.

REGIONAL AND LOCAL PLANNING LINKAGE

The District's water supply planning process is closely coordinated and linked to the water supply planning of local governments and utilities. Significant coordination and collaboration throughout the water supply plan development and approval process is needed among all water supply planning entities.

Since the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update), the District has worked with staff from PWS utilities in the LKB Planning Area to evaluate the need for water supply development projects for this *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan). While additional surface water supplies are

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limited in the basin, groundwater is believed to be adequate to meet all of the projected demands. For this reason, it appears that additional water supply development projects are not needed at this time.

Although comprehensive plans, facilities work plans, and consumptive use permits are prepared at different times, each use the latest and best available data. Local governments' future projects should generally be consistent among plans and permits, and meet projected water demands.

Appendix B provides information and statutory requirements relevant to local government comprehensive plans. The regional and local water supply planning process is described as follows and illustrated in **Figure 16**.

PROCESS

Regional and Local Water Supply Planning Process

The District is required to notify each PWS utility of the projects identified in this plan for that utility to consider and incorporate into its corresponding government's required 10-Year Water Supply Facilities Work Plan in meeting future water demands. This notification must occur within six months following approval of the water supply plan update. PWS utilities then must respond to the SFWMD about their intentions to develop and implement the projects identified by the plan or provide a list of other projects or methods to meet these needs (Section 373.709[8][a], Florida Statutes [F.S.]).

Within 18 months following approval of the regional water supply plan, local governments are required to adopt 10-Year Water Supply Facilities Work Plans and amendments into their comprehensive plans. The work plans contain the capital improvements element, which outlines specifics about the need for, and the location of, public facilities, principles for construction, cost estimates, a schedule of capital improvements, and other related information.

The potable water element of a local government's 10-Year Water Supply Facilities Work Plan is required by Section 163.3177(6)(c), F.S., to:

- Incorporate the water supply projects or projects selected by the local government from those projects identified in the updated regional water supply plan or proposed by the local government
- Identify water supply projects to meet the water needs identified in the updated regional water supply plan within the local government's jurisdiction
- Include a work plan, covering at least a 10-year planning period, for building public, private, and regional water supply facilities, including the development of alternative water supplies, which are identified in the potable water element to meet the needs of existing and new development

By November 15 of every year, all utilities are required to submit a progress report about the status of their water supply projects (completed, under way, or planned for implementation). By December 1 of each year, local governments are required to submit updated capital improvements project information to the Florida Department of Economic Opportunity (FDEO) and the SFWMD. **Figure 16** shows the linkage and sequence of the water supply planning process with 10-Year Water Supply Facilities Work Plans and local government comprehensive plans, beginning with the adoption of a water supply plan update.

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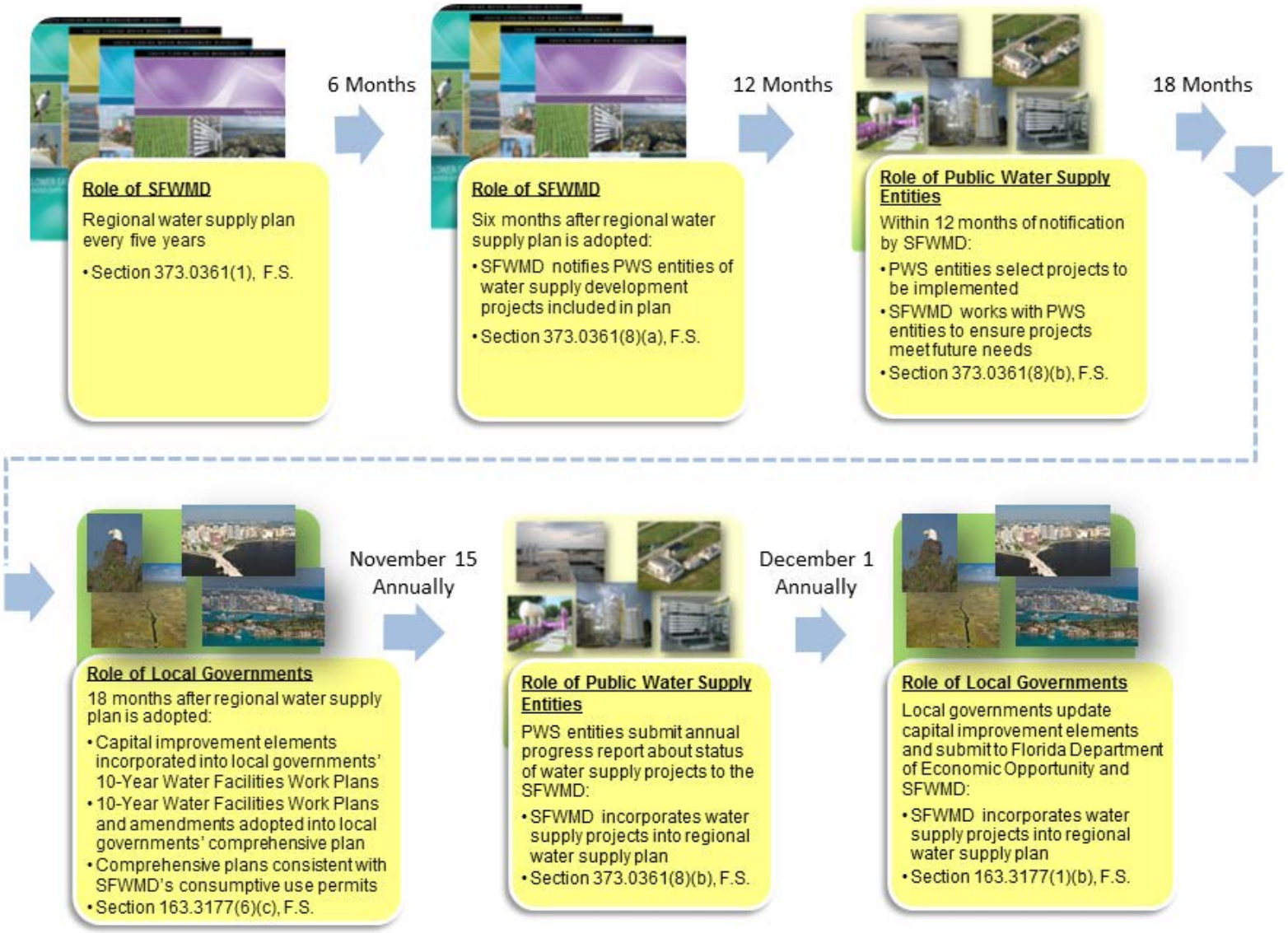

Figure 16. Linking regional water supply planning with local government comprehensive planning.

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Link to Water Use Permitting

A Florida Department of Environmental Protection (FDEP) 2012 guidance memorandum addresses coordination between the SFWMD's water use permitting and water supply planning staff on projects included in water supply plans. By increasing coordination during the water supply planning process, water use permit applicants planning an identified water supply project will be assured that SFWMD staff is familiar with the projects, have supporting data, and will be able to facilitate the permitting process. While no water supply projects were proposed for this plan, projects would have been reviewed by SFWMD staff working in water use permitting and water supply planning using the following set of questions:

- Does the proposed project use a source of limited availability?
- Is the project located in a restricted allocation area?
- Is the proposed source from a minimum flows and levels (MFL) water body or is it connected, directly or indirectly, to an MFL water body? If yes, is the proposed use consistent with MFL recovery or prevention strategies?
- What other environmental water needs (e.g., Comprehensive Everglades Restoration Plan [CERP] targets, water reservations) may be impacted?
- What resource issues have been identified in recent permit applications in the general area for the same source (e.g., wetlands, saltwater intrusion, MFLs)?
- Have existing legal users of the same source had resource-related compliance issues?
- Have any new technical studies been completed related to source availability?

However, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, Florida Statutes (F.S.), and the implementing criteria found in Chapter 40E-2, Florida Administrative Code (F.A.C.). Section 373.223, F.S., requires applicants to establish that the proposed use of water 1) is a reasonable-beneficial use as defined in Section 373.019, F.S., 2) will not interfere with any presently existing legal use of water, and 3) is consistent with the public interest. Water use permits are required for all water supply development projects, except for those using 100 percent seawater or reclaimed water under direct pressure or from a lined pond.

A discussion of the demand and supply conditions for each of the six major water use categories follows.

Agricultural Self-Supply

Agricultural irrigation is the largest water use in the LKB Planning Area and is projected to remain so over the planning horizon. Agricultural water use includes supplies for irrigated, commercially grown crops, including pasture grasses. Gross agricultural water demand is projected to rise from 162.5 MGD in 2010 to 185.0 MGD in 2035; an increase of 22.5 MGD or

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14 percent. **Chapter 2 and Appendix A** provide more information about agricultural water use and projected demands.

The traditional water sources for irrigation in the LKB Planning Area are fresh surface water and fresh groundwater. Although total agricultural water use in the planning area is projected to rise only moderately over the planning period, the restricted allocation areas of the Indian Prairie Basin and Lake Okeechobee Service Area (LOSA) limit surface water availability from these sources. The District is also responsible for ensuring maximum reliability for delivering water to the Seminole Tribe of Florida under the Seminole Water Rights Compact. The District meets this obligation using water from both Lake Istokpoga and Lake Okeechobee. Therefore, historically available freshwater sources are expected to be in very limited supply to meet additional future demands in the Indian Prairie Basin and LOSA and additional demands are expected to be met from the Floridan aquifer system.

Development of groundwater and surface water may be feasible in some areas; however, permitting new freshwater supplies will depend on local resource conditions. Potential new water may be provided through subregional storage and the capture and recycling of storm water (stormwater retention and tailwater recovery). Groundwater appears to be adequate to meet the projected 2035 demands. Projects utilizing a combination of surface and groundwater may be practical to maximize supplies of either source. Reclaimed water is currently used in a limited manner by the Okeechobee Utility Authority (OUA) at Williamson Ranch for the irrigation of hay and citrus.

The continued and increased use of best management practices (BMPs), including water conservation, could reduce the amount of water needed to meet crop demands in average to wet years. These efforts are discussed in **Chapter 5**. In addition, the Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts by rule agricultural BMPs addressing water quality and contain an implicit water conservation component. Growers who enroll in the FDACS BMP Program and implement the BMPs demonstrate their commitment to water resource protection, have a presumption of compliance with state water quality standards, and are eligible for technical and financial assistance toward meeting water resource protection goals. However, it is understood that conservation measures do not provide an additional volume of water to help meet water demands in times of drought.

Public Water Supply

Public Water Supply demand includes all potable uses served by public and private utilities with a production capacity equal to or greater than 0.1 MGD. PWS demand in the LKB Planning Area is currently met through fresh groundwater from the surficial aquifer system and Upper Floridan aquifer system, as well as surface water from Lake Okeechobee. The PWS net demand is projected to grow from 2.8 MGD in 2010 to 3.4 MGD by 2035. The projected 0.6 MGD rise is accommodated by existing consumptive use permits. No new water supply development projects are needed to meet expected demand at this time.

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Utility Summaries

Individual utility summaries are presented at the end of this chapter. The summaries provide baseline information about finished water demands, existing permitted sources and allocations, completed and proposed projects that create water capacity, and other related information. Since the 2005–2006 KB Plan Update, one new water treatment plant has been constructed in the LKB. The Seminole Tribe of Florida completed the Brighton Water Treatment Plant in 2009. It is designed to supply up to 0.8 MGD to the Brighton Reservation and to the Lakeport Water Association through a bulk water sale agreement.

The population and water demands for each utility are based on the methodology and results provided in **Appendix A**. The water demand projections represent finished water per capita use rates and net water demands. These are different from raw water per capita rates and gross demands that reflect water withdrawn at the source prior to treatment. There may be significant differences in the quantity of raw and finished water delivered due to treatment process efficiencies.

This 2014 LKB Plan uses permanent population for existing demand projections. This is consistent with the methodology used by the University of Florida Bureau of Economic and Business Research for population estimates.

Maps in **Appendix C** display utility service areas. Utilities that produce less than 0.1 MGD annually were not evaluated and do not appear on the service area maps in the appendix. The populations served by these smaller utilities are included in the Domestic Self-Supply category.

Domestic Self-Supply

Domestic Self-Supply (DSS) net demands in the LKB Planning Area are projected to increase almost 25 percent from 2.1 MGD in 2010 to 2.6 MGD in 2035. DSS includes potable water from a private supply, typically a domestic well serving a private residence and utilities that produce less than 0.1 MGD. In the LKB Planning Area, DSS needs are met almost exclusively with fresh water from the surficial aquifer or Upper Floridan aquifer.

Industrial / Commercial / Institutional Self-Supply

In the LKB Planning Area, the Industrial/Commercial/Institutional Self-Supply (ICI) use category includes large plant facilities for citrus and sugar processing plants, manufacturing, and technical needs, such as concrete and biotechnology. The projected demand for this category is expected to grow from 19.5 MGD in 2010 to 23.9 MGD by 2035.

The ICI category has sufficient fresh groundwater supplies to meet future needs. However, alternative water supply options should be considered based on location and local conditions. If reclaimed water is available to meet existing and new ICI water demands, the feasibility of such opportunities will be evaluated through consumptive use permitting.

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Recreational / Landscape Self-Supply

The Recreational/Landscape Self-Supply (REC) category includes irrigation for large landscaped areas, such as parks, golf courses, common areas, and cemeteries. Historically, irrigation supplies for this category include local fresh groundwater and surface water captured from canals or from ponds in stormwater management systems. In the LKB Planning Area, REC demand is projected to increase from 0.61 MGD in 2010 to 0.65 MGD by 2035. This 0.04 MGD increase in projected demand can be met, for the most part, by traditional sources. Treated wastewater is currently used in a limited manner at the Spring Lake community golf course. As additional reclaimed water becomes available its use should be evaluated and utilized where feasible.

Power Generation Self-Supply

The Power Generation Self-Supply (PWR) category in the LKB Planning Area is expected to experience minimal growth over the planning horizon. The area's major power generators have not identified plans for the construction of new facilities during the next 20 years in this region. PWR demand was 4.4 MGD in 2010 and is projected to be 6.4 MGD in 2035. Water use in this category typically has a recycling component, which should continue and perhaps gain efficiency to reduce water demands in the future.

FUNDING

Funding for water supply development and water conservation at the local level is the shared responsibility of water suppliers and users. The State of Florida and the water management districts have provided funding assistance to local water users to develop alternative water supplies and measurable water conservation programs. In most cases, funding is allocated to projects included in a region's water supply plan update. Some projects not in this 2014 LKB Plan, but consistent with the plan's goals, may also be funded. When the SFWMD deems appropriate, a plan may specifically identify the need for multijurisdictional approaches to project options based on analysis and permittable, financial, and technical feasibility. The SFWMD provides funding for alternative water supply and measurable water conservation through its Alternative Water Supply (AWS) Program and Water Savings Incentive Program (WaterSIP). Any AWS or water conservation project identified in a SFWMD Water Supply Plan or Plan Update would make that project eligible for future funding, although funding is not guaranteed. An application must be submitted and processed for the determination of an award.

Alternative Water Supply Program

Through the AWS Program between Fiscal Year (FY) 2006 and FY 2014, the District provided partial funding to LKB water users to develop alternative water supply projects for agricultural irrigation purposes. The completed projects included one reclaimed water project and five stormwater/irrigation capture projects. The reclaimed water project,

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Williamson Cattle Company Expanded Reuse System from the OUA, developed 0.35 MGD of new distribution capacity in FY 2009. The stormwater/irrigation projects totaled an estimated 2.91 MGD of new capacity (**Table 13**).

Table 13. Agriculture stormwater irrigation projects supported by the AWS Program.

Project Name	County	Fiscal Year	MGD
101 Ranch 17.2 Acre Reservoir	Okeechobee	2006	0.12
101 Ranch 44 Acre Reservoir	Okeechobee	2006	0.32
DHW Sod & Cattle Stormwater Irrigation	Okeechobee	2006	0.12
Raulerson & Son Ranch Stormwater Recycling Project	Okeechobee	2007	1.15
Lippincott Farm Stormwater Recycling System	Okeechobee	2008	1.20
Total			**2.91**

Water Savings Incentive Program

The WaterSIP provides cost-share funding for projects that reduce urban water use. The SFWMD provides matching funds up to $50,000 or up to 50 percent, whichever is less, to water providers and users (i.e., cities, utilities, industrial groups, schools, hospitals, homeowners associations) for water-saving technologies. These technologies include low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices, and other hardware. From FY 2006 to FY 2014, the SFWMD partially funded one project in the LKB; an allocation of $13,000 for the Highlands Soil and Water Conservation District to implement a toilet retrofit program with a potential savings of 5.5 million gallons per year.

SUMMARY

Total water demands within the LKB Planning Area, from all sources, are projected to rise by 30 MGD by 2035. Based on the evaluation undertaken for this plan, fresh groundwater and surface water supplies are believed to be adequate to meet all projected demands through the planning horizon of 2035. However, the level of certainty is reduced to a 1-in-6 year drought condition for those surface water users located within the Lake Okeechobee Service Area.

Six water utilities that distribute greater than 0.1 million gallons per day operate within the LKB Planning Area. The Okeechobee Utility Authority continues to be the largest utility in the region and is projected to serve roughly 28,000 residents by 2035. All PWS growth within the planning basin will continue to be served with existing facilities.

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LAKEPORT WATER ASSOCIATION

County: Glades

Service Area: Lakeport and areas of unicorporated Glades County

Description: Lakeport Water Association, Inc. is a Florida not-for-profit corporation that operates water supply distribution facilities in the unincorporated community of Lakeport and areas of Glades County. In 2010, the Glades County Board of County Commisioners granted an exclusive franchise to the Lakeport Water Association, which set service area boundaries. Lakeport does not maintain a water treatment plant; instead, the water supply is obtained by bulk purchase from the Seminole Tribe of Florida (Tribe). The Tribe has a surficial aquifer wellfield and a water treatment plant on the Brighton Reservation. The interconnection between Lakeport and Brighton has a design capacity of 350,000 gallons per day. In 2013, a new contract was executed between the Lakeport Water Association and the Tribe authorizing up to 300,000 gallons per day of bulk water service for the next 40 years. Lakeport's utility has indicated that the community is largely built-out.

POPULATION AND FINISHED WATER DEMAND			
	Existing	Projected	
	2010	2020	2035
Population	1,289	1,471	1,663
Per Capita (gallons per day finished water)	58	58	58
Finished Potable Water Demands (daily average annual finished water in MGD)	**0.10**	**0.11**	**0.12**
Raw Potable Water Demands (daily average annual raw water in MGD)	**NA**	**NA**	**NA**
WATER USE (MGD)			
	Existing	Projected	
Potable Water Source	**2010**	**2020**	**2035**
Bulk Purchase from Seminole Tribe of Florida	0.10	0.11	0.12
Total Use	**0.10**	**0.11**	**0.12**

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SEBRING AIRPORT

County: Highlands

Service Area: Sebring Airport

Description: The City of Sebring operates the water system at Sebring Airport to provide public water supply for an area of 2,141 acres. The service area is composed of non-residential commerical and industrial users. Given that the service area is non-residential in nature, population is not used as a basis for developing water use demand projections. Water demand of 0.12 MGD is estimated using guidance from the SFWMD's *Guidebook for the Analysis of Developments of Regional Impact* (SFWMD 1988). Annual water demand is projected to be constant over the planning horizon based on current information.

The airport reclaims an average 20,000 gallons of wastewater per day for use in agricultural irrigation.

The airport's water system is also integrated with the City of Sebring utility system via a 12-inch water main connecting to Sebring's Desoto City Water Plant. The water treatment system includes chlorination and high service pumping.

The Sebring Airport water use permit expires April 29, 2031. The water system's primary source is the Upper Floridan aquifer with a permitted annual allocation not to exceed 42.22 million gallons (MG) (approx. 0.12 MGD).

POPULATION AND FINISHED WATER DEMAND			
	Existing	Projected	
	2010	2020	2035
Population	NA	NA	NA
Per Capita (gallons per day finished water)	NA	NA	NA
Finished Potable Water Demands (daily average annual finished water in MGD)	**0.12**	**0.12**	**0.12**
Raw Potable Water Demands (daily average annual raw water in MGD)	**0.12**	**0.12**	**0.12**
SFWMD WATER USE PERMITTED (28-00139-W) ALLOCATION (MGD)			
Potable Water Source	**Existing**	**Projected**	
	2010	**2020**	**2031**
Fresh Water	0.12	0.12	0.12
Total Allocation	**0.12**	**0.12**	**0.12**
POTABLE WATER TREATMENT CAPACITY			
FDEP Permitted Capacity	**Cumulative Facility & Project Capacity (MGD)**		
	Existing	**Projected**	
	2012	**2020**	**2035**
Fresh Water	1.00	1.00	1.00
Planned Project Capacity	0.00	0.00	0.00
Total Capacity	**0.00**	**0.00**	**0.00**

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SPRING LAKE IMPROVEMENT DISTRICT

County: Highlands

Service Area: Spring Lake Improvement District

Description: The 3,359-acre Spring Lake Improvement District was created in 1971. The area is primarily residential with a golf course and with some smaller commerical development. The utility services primarily single family homes and some multifamily units. The golf course is serviced by a separate water use permit (28-00533-W), which authorizes surface water from on-site lakes for supply.

Spring Lake's water use permit limits the annual allocation to 117 MG (approximately 0.32 MGD) and expires November 13, 2018. In 2010, water use was reported at 0.21 MGD.

Spring Lake's water supply comes from three Upper Floridan aquifer wells located at the water treatment plant. The water treatment plant has a treatment efficiency of 99 percent. A water loss audit conducted for the year 2012 estimated loss of 3.1 percent during distribution.

POPULATION AND FINISHED WATER DEMAND			
	Existing	Projected	
	2010	2020	2035
Population	3,230	3,574	4,074
Per Capita (gallons per day finished water)	65	65	65
Finished Potable Water Demands (daily average annual finished water in MGD)	**0.21**	**0.23**	**0.26**
Raw Potable Water Demands (daily average annual raw water in MGD)	**0.21**	**0.23**	**0.27**
SFWMD WATER USE PERMITTED (28-00122-W) ALLOCATION (MGD)			
Potable Water Source	**Existing**	**Projected**	
	2010	**2020**	**2035**
Fresh Water	0.32	0.32	0.32
Total Allocation	**0.32**	**0.32**	**0.32**
POTABLE WATER TREATMENT CAPACITY			
	Cumulative Facility & Project Capacity (MGD)		
	Existing	**Projected**	
FDEP Permitted Capacity	**2012**	**2020**	**2035**
Fresh Water	0.50	0.50	0.50
Planned Project Capacity	0.00	0.00	0.00
Total Capacity	**0.50**	**0.50**	**0.50**
NONPOTABLE WATER TREATMENT CAPACITY			
Reclaimed Water	0.00	0.00	0.00

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OKEECHOBEE UTILITY AUTHORITY

County: Okeechobee

Service Area: City of Okeechobee and areas of unicorporated Okeechobee County

Description: The OUA has a Lake Okeechobee surface water treatment plant rated at 5.0 MGD capacity and a surficial aquifer system groundwater treatment plant with 1.0 MGD capacity. Treated water from both plants is pumped into a common water distribution system. With a combined treatment capacity of 6.0 MGD and combined permitted water use of 3.48 MGD, the OUA has existing capacity to meet projected needs through 2035.

The groundwater treatment plant uses aeration, filtration, and disinfection with an estimated treatment and distribution loss of less than 3 percent. The surface water treatment plant uses flocculation and sedimentation followed by ozonation, filtration, and disinfection. The combined losses from treatment and distribution of the two treatment systems is estimated to be 15 percent. The withdrawal from Lake Okeechobee is from five pumps on Lake Okeechobee and two pumps on the SFWMD Rim Canal. Intake structures on the lake enable access to water at surface levels down to 6.5 feet NGVD.

Since the 2005–2006 KB Plan Update, the OUA evaluated the installation of a reverse osmosis (RO) system to add capacity. The RO options were found to be cost prohibitive and in 2011 the OUA chose to seek an increased allocation from Lake Okeechobee above its base condition water use. A variance from the requirements of the restricted allocation rule was granted by the SFWMD in 2012. The following limitations to annual withdrawals were stipulated: a total of 1,269 MG (approx. 3.48 MGD) with 1,002 MG (approx. 2.75 MGD) from Lake Okeechobee and 267 MG (approx. 0.73MGD) from the surficial aquifer. The OUA water use permit expires on April 2, 2032. The OUA has no interconnections with other utilities.

The OUA operates one wastewater treatment plant that has the capacity to treat 1.0 MGD. Most of the treated effluent is used for agricultural irrigation. A small amount of treated effluent is disposed of via an on-site percolation pond and on-site spray irrigation. The residual is disposed of via a deep injection well. There are no plans to expand reuse at this time.

POPULATION AND FINISHED WATER DEMAND			
	Existing	Projected	
	2010	2020	2035
Population	22,896	25,087	28,009
Per Capita (gallons per day finished water)	84	84	84
Finished Potable Water Demands (daily average annual finished water in MGD)	**1.92**	**2.20**	**2.35**
Raw Potable Water Demands (daily average annual raw water in MGD)	**2.23**	**2.44**	**2.73**
SFWMD WATER USE PERMITTED (47-00004-W) ALLOCATION (MGD)			
	Existing	Projected	
Potable Water Source	**2014**	**2020**	**2032**
Fresh Water (SAS)	0.73	0.73	0.73
Fresh Water (Lake Okeechobee)	2.75	2.75	2.75
Total Allocation	**3.48**	**3.48**	**3.48**

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POTABLE WATER TREATMENT CAPACITY			
	Cumulative Facility & Project Capacity (MGD)		
	Existing	Projected	
FDEP Permitted Capacity	2014	2020	2035
Fresh Water (SAS)	1.00	1.00	1.00
Fresh Water (Lake Okeechobee)	5.00	5.00	5.00
Planned Project Capacity	0.00	0.00	0.00
Total Capacity	**6.00**	**6.00**	**6.00**
NONPOTABLE WATER TREATMENT CAPACITY			
Reclaimed Water	0.85	0.85	0.85

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OKEECHOBEE CORRECTIONAL INSTITUTE

County: Okeechobee

Service Area: Okeechobee Correctional Institute

Description: Okeechobee Correctional Institute (OCI) was established in 1995 and houses adult male inmates. A population of 1,900, including inmates and staff, is assumed for the planning horizon. The future projected potable water demands are expected to remain similar to the 2010 demand of approximately 0.17 MGD.

The water treatment plant has a rated capacity of 0.86 MGD and is supplied by two wells drawing from the Upper Floridan aquifer. Potable water is treated by aeration and chlorination. The permit for OCI limits groundwater use to an annual allocation of 73.25 MG (approx. 0.2 MGD) and expires January 15, 2015.The facility has its own wastewater treatment plant with effluent disposal through an on-site spray field. There is an additonal facility, the Okeechobee Work Camp, that uses surface water from lakes to irrigate agricultural fields under a separate permit (47-01052-W).

POPULATION AND FINISHED WATER DEMAND			
	Existing	Projected	
	2010	2020	2035
Population	1,900	1,900	1,900
Per Capita (gallons per day finished water)	NA	NA	NA
Finished Potable Water Demands (daily average annual finished water in MGD)	**0.17**	**0.17**	**0.17**
Raw Potable Water Demands (daily average annual raw water in MGD)	**0.17**	**0.17**	**0.17**
SFWMD WATER USE PERMITTED (47-00421-W) ALLOCATION (MGD)			
	Existing	Projected	
Potable Water Source	**2010**	**2020**	**2030**
Fresh Water	0.20	0.20	0.20
Total Allocation	**0.20**	**0.20**	**0.20**
POTABLE WATER TREATMENT CAPACITY			
	Cumulative Facility & Project Capacity (MGD)		
	Existing	Projected	
FDEP Permitted Capacity	**2012**	**2020**	**2035**
Fresh Water	0.86	0.86	0.86
Planned Project Capacity	0.00	0.00	0.00
Total Capacity	**0.86**	**0.86**	**0.86**
NONPOTABLE WATER TREATMENT CAPACITY			
Reclaimed Water	0.20	0.20	0.20

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BRIGHTON SEMINOLE INDIAN RESERVATION

County: Glades

Service Area: Brighton Seminole Indian Reservation and the unincorporated community of Lake Port.

Description: The Brighton Seminole Indian Reservation operates the Brighton Water Treatment Plant to supply potable water to users within the Brighton Reservation and to the neighboring community of Lakeport. The Seminole Tribe of Florida maintains a bulk water user agreement with Lakeport Water Association, Inc. for supply of up to 300,000 gallons of finished potable water a day. The Brighton water delivery represents the sole source for the Lakeport service area.

The Brighton Water Treatment Plant was completed in 2009 to replace a leased off-site wellfield and water treatment plant. The Brighton Water Treatment Plant, and its associated wellfield, are located on the Brighton Seminole Indian Reservation and are operated under authorizations provided in the Water Rights Compact Among the Seminole Tribe of Florida, the State of Florida, and the South Florida Water Management District (Second Amendment to the Seventeenth Annual Work Plan). Once the new treatment facility became operational, the Seminole Tribe of Florida ceased utilization of the leased water treatment plant and withdrew the related water use permit (22-00183-W).

The Brighton Water Treatment Plant's water source consists of eight wells constructed in the surficial aquifer system. The wellfield is designed to produce up to 1 MGD. The treatment train at the plant consists of coagulation, microfiltration, and nanofiltration. The filtration reject water is blended with surface water and disposed of via a sprayfield near the plant. The plant's design capacity is for an annual average demand of 0.4 MGD and maximum daily production of 0.8 MG. In 2010, the Brighton Water Treatment Plant produced 0.41 MGD finished potable water from 0.46 MGD raw water from the wellfield. Approximately one quarter of the total finished water produced in 2010 was delivered to the Lakeport Water Association.

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7

Future Direction

This chapter summarizes the future direction for water supply in the Lower Kissimmee Basin (LKB) Planning Area. The changes in water demand predicted in this *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan) remain consistent with those changes that were identified in the *2005–2006 Kissimmee Basin Water Supply Plan Update*. Water demand is expected to increase by about 30 million gallons per day (MGD) in the planning area by 2035, primarily due to the robust agricultural industry.

Fishing in the Restored Kissimmee River

Analyses conducted during this plan indicate there are sufficient sources of water to meet the 2035 projected demands despite limitations in water availability since the previous plan. Meeting the 1-in-10 level of certainty for those surface water users located within the Lake Okeechobee Service Area (LOSA) portion of the planning area is not possible within the next five years due to the interrelationship of the federal and state projects outlined in this plan and operations of Lake Okeechobee under the 2008 Lake Okeechobee Regulation Schedule (2008 LORS). The South Florida Water Management District (SFWMD or District) anticipates any additional water from Lake Okeechobee resulting from operational changes or a revised regulation schedule could return the lake from minimum flow and level (MFL) recovery to prevention status, enhance the level of certainty to existing permitted users, and support other environmental objectives.

Rehabilitation of the Herbert Hoover Dike by the United States Army Corps of Engineers (USACE) is important for protection of the citizens living near the lake and completing the project in part or wholly may enable revision of the lake operating schedule. Meeting the future surface water needs of the LOSA area depends on utilizing the flexibility within the 2008 LORS as incremental dam safety improvements are completed; and in the longer term, completion of the seepage berm construction or equivalent repairs to the Herbert Hoover Dike for Reaches 1, 2, and 3 by the USACE and implementation of a new Lake Okeechobee regulation schedule.

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The guidance offered in this plan should be considered in developing water supply options to meet future needs. Statutory requirements, existing conditions, resource constraints (including protection tools and criteria), and the needs of all water users are addressed. Because there are sufficient traditional sources of water in the region to meet 2035 projected demands, no water supply projects were proposed by water users in the region (some permittees have planned additional wells that were approved in their water use permit). However, all water users are encouraged to continue to be prudent with water use decisions and use water efficiently. The SFWMD's future direction for water supply planning in the LKB Planning Area recommends continued coordination with agricultural stakeholders, utilities and other water users, natural resource protection, and continued monitoring to develop responses to changes in water levels or water quality in surface water and groundwater.

WATER SOURCES

The LKB Planning Area traditionally has relied on surface water from Lakes Istokpoga and Okeechobee and their connected canals and fresh groundwater from the surficial aquifer system (SAS) and Floridan aquifer system (FAS) as the primary water sources for Agricultural Self-Supply (AGR), Public Water Supply (PWS), and other urban and industrial uses. It is anticipated that these uses will continue. The limitations on surface water sources in this basin will require additional reliance on groundwater for new supplies.

While projected increases in water demands are not large, a steady-state groundwater model was used to simulate the changes between the 2010 and 2035 demands and provide insight on water levels in the Floridan aquifer system. Of particular concern were the MFL lakes in the Lake Wales Ridge area of the Southwest Florida Water Management District (SWFWMD). Results of the groundwater simulations indicate that Floridan aquifer levels beneath those lakes currently in prevention or recovery status will not be reduced as a result of the 2035 projected demands. Therefore, the risk of the increased demands of the LKB Planning Area adversely impacting the SWFWMD's recovery and prevention strategies is considered low.

Restricted allocation area criteria limit future additional withdrawals from Lake Okeechobee and Lake Istokpoga and the hydraulically connected canals. These criteria provide important protection to the existing legal users in the restricted allocation areas. In the Lake Istokpoga–Indian Prairie Basin area, existing legal users are provided assurances that their water supplies will not be interrupted during 1-in-10 year drought conditions. However, as stated above, in the LOSA, the current level of certainty is for 1-in-6 year drought conditions.

Water storage features such as reservoirs, aquifer storage and recovery, and impoundments can be used to capture storm water, groundwater, and surface water during wet weather periods and provide supplemental water supply for AGR, PWS, natural systems, and other needs. Conservation is an important component in integrated water resource management and may reduce, defer, or eliminate the need to expand the water supply infrastructure.

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Reclaimed water can be used to meet new uses or replace traditional freshwater sources currently used for irrigation or industrial purposes but its availability in the LKB Planning Area is very limited.

The SFWMD offers recommendations and guidance in the following sections for consideration by local governments, utilities, agricultural entities, other water users, and SFWMD water supply managers and staff as a basis for the future direction of water supply planning in the LKB Planning Area.

Groundwater

Surficial Aquifer System

At current use rates and locations, water levels in the SAS appear to be stable. The potential use of the SAS is projected to be minor and new uses will be evaluated on an application-by-application basis through the District's consumptive use permitting process. The following actions are recommended:

- All local water users are encouraged to coordinate with the SFWMD to determine if the SAS is an appropriate source for their intended use.
- Design of well/wellfield locations, configurations, and pumping regimes should maximize withdrawals while avoiding harm to natural systems or pollution sources as demonstrated through modeling that meets water use permitting criteria.

Floridan Aquifer System

The FAS is typically productive in the LKB Planning Area and expected to be the primary source to meet the 2035 demands. While generally fresh, the upper portions of the FAS become brackish as the point of withdrawal nears Lake Okeechobee. In addition, points of withdrawal in the FAS near the boundary between the District and the SWFWMD increase the potential to impact lakes along the Lake Wales Ridge. Brackish groundwater, particularly in the Lower Floridan aquifer, is not considered a limited resource in the LKB Planning Area. The following future actions are recommended:

- Brackish water from the FAS may be blended with fresh groundwater and/or surface water to produce acceptable irrigation-quality water. Blended water supplies depend on crop requirements, water sources, volume of stored water, and natural system requirements. They also require monitoring to ensure acceptable water quality.
- All local water users installing FAS wells are encouraged to collaborate with the SFWMD to gather and share hydrogeologic data. These data increase knowledge of the FAS and could be used to support future groundwater modeling efforts.
- Local water users, other agencies, local governments, and utilities are encouraged to coordinate with the SFWMD to improve ongoing water level and water quality monitoring of the FAS.

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- Landowners are encouraged to plug and abandon inactive or dysfunctional FAS wells in accordance with existing rules and regulations. This will prevent loss of water via free-flowing wells and contamination of the SAS and intermediate confining unit/intermediate aquifer system with more saline water from the FAS.
- Potential FAS withdrawals located near the SWFWMD/SFWMD boundary may have limitations due to the SWFWMD's prevention and recovery strategies for the MFL lakes along the Lake Wales Ridge.
- The SFWMD should coordinate with the SWFWMD to identify the appropriate tool(s) and develop a process to assess the impacts of potential future demands on MFL lakes in the Lake Wales Ridge region. The agreement on the process will occur subsequent to SWFWMD's review of the MFLs along the Lake Wales Ridge and the completion of updates to their Southern Water Use Caution Area groundwater model.
- The SFWMD should consider transitioning the current steady-state groundwater model to a transient model.

Surface Water

Istokpoga Canal

Primary surface water sources in the LKB Planning Area include Lake Istokpoga, Lake Okeechobee, and the connected canals. Agriculture is the largest water use category in the planning area and agricultural irrigation is the primary user of surface water. Users of surface water from Lake Istokpoga and its associated canals and Lake Okeechobee and its hydraulically connected canals are subject to restricted allocation area criteria that limit increases in surface water withdrawals within the LOSA and within the Lake Istokpoga–Indian Prairie Basin. Accordingly, no additional surface water will be allocated from these areas above existing allocations (SFWMD 2014a). **Chapter 3** and the *2011–2014 Water Supply Plan Support Document* (SFWMD 2014b) provide additional detail on these rules.

The District is developing performance criteria and completing the analysis needed for a water reservation in support of the Kissimmee River Restoration Project. The Kissimmee River Basin Water Reservation was placed on the District's 2014 Priority Water Bodies List and Schedule and the District anticipates adoption of the reservation rule by December 2015. This will likely restrict future water supply from this source.

The following actions are proposed for the LKB Planning Area:

- Where appropriate, water users should look to create storage areas within their boundaries or to find outside storage areas of surface water that may be

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collected in portions of the year when flood control releases are being made from Lake Istokpoga and Lake Okeechobee.

- The SFWMD will continue to implement MFL recovery and prevention strategies for Lake Istokpoga and Lake Okeechobee and update these in conjunction with future plan updates.
- USACE should complete seepage berm construction or equivalent repairs to the Herbert Hoover Dike for Reaches 1, 2, and 3 no later than 2022 and revise the Lake Okeechobee regulation schedule, as recognized in the *Final Environmental Impact Statement including Appendices A through G – Lake Okeechobee Regulation Schedule* (USACE 2007) and the *Draft Integrated Project Implementation Report and Environmental Impact Statement – Central Everglades Planning Project* (USACE and SFWMD 2013).
- Agricultural users should reduce or augment use of surface water with projects such as stormwater and tailwater recovery, the blending of brackish groundwater with fresh water where available, and more efficient water conservation practices.
- Complete development of a reservation for the Kissimmee River.

Reclaimed Water

Currently, the total amount of wastewater treated by wastewater treatment facilities in the LKB Planning Area is less than 1 MGD. All reuse of treated wastewater as reclaimed water must meet applicable requirements.

New Storage Capacity for Surface Water or Groundwater

Potential types of water storage include aquifer storage and recovery (ASR) wells, off-stream reservoirs, and surface water impoundments and ponds. The SFWMD's Dispersed Water Management Program is designed to encourage property owners to retain storm water on their land, accept regional runoff for storage, or use both options. Additional analysis will be conducted and the results will be utilized to optimize the program as more experience is gained.

Recommended actions include:

- Construction of new or retrofitted surface water storage systems for agricultural operations could provide additional supply for irrigation.
- Continue to evaluate ASR for potential application in the LKB.

Water Conservation

The implementation of robust water conservation programs throughout the LKB Planning Area offers water use savings potential to reduce future water demand. All water users are urged to implement water conservation measures to further reduce water supply needs. The following conservation-related actions are recommended:

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- The District will continue to implement the 2008 Comprehensive Water Conservation Program (SFWMD 2008).
- Local governments can develop or enhance existing ordinances to be consistent with Florida-friendly landscaping provisions (Section 373.185, Florida Statutes [F.S.]).
- For users seeking alternative water supply options for surface water, projects using blended sources and tailwater/stormwater recovery systems may reduce agricultural water demand on freshwater supplies.
- Agricultural water users are encouraged to use the Florida Automated Weather Network (FAWN) irrigation tools.
- Installation of higher efficiency irrigation systems by agricultural water users is encouraged where applicable and appropriate for specific crop types.

Coordination

Coordination and collaboration throughout the water supply planning process is essential among regional, local government, and utility planning entities. Examples of coordination activities include:

- Water Supply Facilities Work Plans are due within 18 months of adoption of the 2014 LKB Plan. Local governments and utilities need to provide linkages and coordination between the 2014 LKB Plan and the local government water supply-related elements.
- Work with the Florida Department of Agriculture and Consumer Services (FDACS) and agricultural stakeholders on methodologies and data sources for future crop projections.
- Coordinate ongoing activities outside the basin with the SWFWMD, St. Johns River Water Management District (SJRWMD), and Central Florida Water Initiative (CFWI) planning efforts.
- Work with the Florida Department of Environmental Protection (FDEP) through the Lake Okeechobee Basin Management Action Plan on current and future water supply planning processes dealing with storm water, water quality, and water storage in the LKB Planning Area.

Climate Change

Climate change has the potential to affect hydrologic conditions, and thus water supply sources, as well as patterns of water demand. The degree of climate change in various regions and the possible impacts to those regions are highly uncertain. Despite uncertainties, the District is considering climate change phenomena and its related effect on hydrologic conditions in the water supply planning process (SFWMD 2009b). Recommendations related to climate change include:

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- Because of changing weather patterns, the SFWMD should investigate the ability to extend the climate data used in modeling more often than the typical frequency of once every five years.
- The SFWMD should continue to partner with utilities, water management districts, local government representatives, and academic organizations in the Florida Water and Climate Alliance, a stakeholder-scientist partnership committed to support decision-making in water resource management, planning, and supply operations in Florida.

CONCLUSIONS

Sufficient water appears to be available to meet the 2035 projected water demand identified for the Lower Kissimmee Basin Planning Area during a 1-in-10 year drought condition. This level of certainty is reduced to a 1-in-6 year drought condition for those surface water users located within the Lake Okeechobee Service Area portion of the planning area over the next five years. The bulk of the identified projected uses are expected to utilize groundwater as their future water source. Surface water sources in the basin are limited and future use of this source may require additional water conservation or the construction of storage facilities.

Successful implementation of this 2014 LKB Plan requires close coordination with agricultural stakeholders, local governments, and utility water supply planning entities. Collaboration with stakeholders is also essential for directing the implementation of the preceding recommendations and guidance. This partnering should ensure that water resources in the LKB Planning Area continue to be prudently managed and available to meet future demand.

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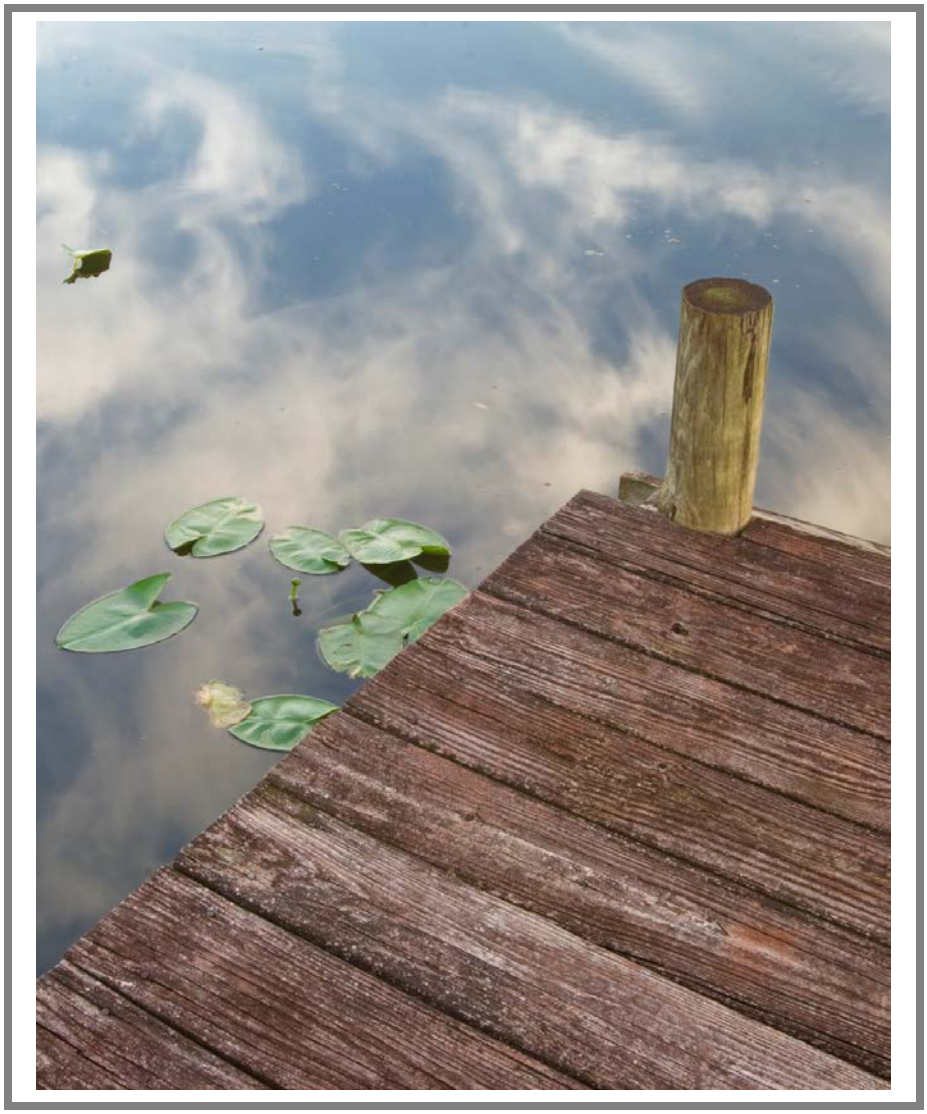

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Glossary

1-in-10 year drought A drought of such intensity that it is expected to have a return frequency of once in 10 years. A drought in which below normal rainfall occurs and has a 90 percent probability of being exceeded over a twelve-month period. A drought event that results in an increase in water demand to a magnitude that would have a 10 percent probability of being exceeded during any given year.

Acre-foot, acre-feet (ac-ft) The volume of water that covers 1 acre to a depth of 1 foot. The equivalent of 43,560 cubic feet, 1,233.5 cubic meters, or 325,872 gallons, which is approximately the amount of water it takes to serve two typical families for one year.

Agricultural best management practice (BMP) A practice or combination of agricultural practices, based on research, field testing, and expert review, determined to be the most effective and practicable means of improving water quality or quantity while maintaining or even enhancing agricultural production.

Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) A simple water budget model for estimating irrigation demands that estimates demand based on basin-specific data. The AFSIRS model calculates both net and gross irrigation requirements for average and 1-in-10 year drought irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while the gross irrigation requirement includes both the net irrigation requirement and the losses incurred in the process of delivering irrigation to the crop's root zone.

Agricultural (AGR) Self-Supply The water used to irrigate crops, water livestock, and for aquaculture (e.g., fish production) that is not supplied by a Public Water Supply utility.

Alternative water supply "Salt water; brackish surface water and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface water or groundwater, water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; storm water; and, any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan" (Section 373.019, Florida Statutes).

Applicant's Handbook *Applicant's Handbook for Water Use Permit Applications* (SFWMD 2014a). Read in conjunction with Chapters 40E-2, Florida Administrative Code, the Applicant's Handbook further specifies the general procedures and information used by SFWMD staff for review of water use permit applications with the primary goal of meeting SFWMD water resource objectives.

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Aquifer A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Aquifer storage and recovery (ASR) The underground storage of storm water, surface water, fresh groundwater or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells during wet periods. The aquifer (typically the Floridan aquifer system in South Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is stored with the intent to recover it for use during future dry periods.

Aquifer system A heterogeneous body of (interbedded or intercalated) permeable and less permeable material that functions regionally as a water yielding hydraulic unit and may be composed of more than one aquifer separated at least locally by confining units that impede groundwater movement, but do not greatly affect the hydraulic continuity of the system.

Base flow Sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced stream flows. Natural base flow is sustained largely by groundwater discharges.

Baseline condition A specified condition, defined by a period of measured background data or otherwise defined, that is used for comparison with subsequent data or simulated information.

Basin (groundwater) A hydrologic unit containing one large aquifer or several connecting and interconnecting aquifers.

Basin (surface water) A tract of land drained by a surface water body or its tributaries.

Below land surface Depth below land surface regardless of land surface elevation.

Central and Southern Florida Project (C&SF Project) A complete system of canals, storage areas, and water control structures spanning the area from Lake Okeechobee to the east and west coasts and from Orlando south to the Everglades. It was designed and constructed during the 1950s by the United States Army Corps of Engineers to provide flood control and improve navigation and recreation.

Comprehensive Everglades Restoration Plan (CERP) The federal-state partnership framework and guide for the restoration, protection, and preservation of the South Florida ecosystem. CERP also provides for water-related needs of the region, such as water supply and flood protection.

Confined aquifer Water-bearing stratum of permeable rock, sand, or gravel overlaid by a thick, impermeable stratum. An aquifer that contains groundwater that is confined under pressure and bounded between significantly less permeable materials such that water will rise in a fully penetrating well above the top of the aquifer. In cases where the hydraulic head is greater than the elevation of the overlying land surface, a fully penetrating well will naturally flow at the land surface without means of pumping or lifting.

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Confining unit A body of significantly less permeable material than the aquifer, or aquifers, that it stratigraphically separates. The hydraulic conductivity may range from nearly zero to some value significantly lower than that of the adjoining aquifers, and impedes the vertical movement of water.

Consumptive use Any use of water that reduces the supply from which it is withdrawn or diverted.

Control structure An artificial structure designed to regulate the level/flow of water in a canal or other water body (e.g., weirs, dams).

DBHYDRO The South Florida Water Management District's corporate environmental database, storing hydrological, meteorological, hydrogeological, and water quality data.

Demand management Also known as water conservation, demand management involves reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, reduce waste of water, alter land management practices, and/or alter land uses.

Desalination A process that treats saltwater water to remove or reduce chlorides and dissolved solids, resulting in the production of fresh water.

Disinfection The process of inactivating microorganisms that cause disease. All potable water requires disinfection as part of the treatment process prior to distribution. Disinfection methods include chlorination, ultraviolet radiation, and ozonation.

Dissolved oxygen The concentration of oxygen dissolved in water, sometimes expressed as percent saturation, where saturation is the maximum amount of oxygen that theoretically can be dissolved in water at a given altitude and temperature.

Domestic Self-Supply (DSS) The water used by households whose primary source of water is water treatment facilities and/or private wells with pumpages of less than 100,000 gallons per day.

Drainage basin Land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. The drainage basin is a part of the earth's surface that is occupied by a drainage system, which consists of a surface stream with all its tributaries and impounded bodies of water. It is also known as a watershed, a catchment area, or a drainage area.

Drawdown (1) The vertical distance between the static water level and the surface of the cone of depression. (2) A lowering of the groundwater surface caused by pumping.

Drought A period of below average rainfall, typically longer than a few months, that adversely affects growing or living conditions.

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Effective rainfall The portion of rainfall that infiltrates the soil and is stored for plant use in the crop root zone.

Effluent Treated water that is not reused after flowing out of any plant or other works used for treating, stabilizing, or holding wastes. Effluent is "disposed" of.

Environmental impact statement Required under United States environmental law by the National Environmental Policy Act for federal government agency actions "significantly affecting the quality of the human environment." It evaluates the positive and negative environmental effects of a proposed agency action.

Evapotranspiration (ET) The total loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Exceedance (1) The violation of the pollutant levels permitted by environmental protection standards. (2) To fall below an adopted minimum flow or level criterion for a duration greater than specified for the minimum flow and level water body, as defined in Rule 40E-8.021(17), Florida Administrative Code.

Existing legal use of water A water use authorized under a SFWMD water use permit or existing and exempt from permit requirements.

Finished water Water that completed a purification or treatment process; water that passed through all the processes in a water treatment plant and is ready to be delivered to consumers.

Finished water demand (see *Net water demand*)

Fiscal Year (FY) SFWMD's fiscal year begins on October 1 and ends on September 30 the following year.

Florida Administrative Code (F.A.C.) The Florida Administrative Code is the official compilation of the administrative rules and regulations of state agencies.

Florida-Friendly Landscaping Quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection. Additional components include practices such as landscape planning and design, soil analysis, the appropriate use of solid waste compost, minimizing the use of irrigation, and proper maintenance.

Florida Statutes (F.S.) The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

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Floridan aquifer system (FAS) A highly used aquifer system composed of the upper Floridan and lower Floridan aquifers. It is the principal source of water supply north of Lake Okeechobee. The upper Floridan aquifer is used for drinking water supply in parts of Martin and St. Lucie counties. From Jupiter to southern Miami, water from the FAS is mineralized (total dissolved solids are greater than 1,000 milligrams per liter) along coastal areas.

Gross irrigation demand or **gross irrigation requirement** (AFSIRS model) The amount of water that must be withdrawn from the source in order to be delivered to the plant's root zone. Gross irrigation demand includes both the net irrigation requirement and the losses incurred irrigating the plant's root zone.

Gross water demand (or raw water demand) is the amount of water withdrawn from the water resource to meet a particular need of a water user or customer. Gross demand is the amount of water allocated in a water use permit. Gross or raw water demands are nearly always higher than net or user/customer water demands.

Groundwater Water beneath the surface of the ground, whether or not flowing through known and definite channels. Specifically, that part of the subsurface water in the saturated zone, where the water is under pressure greater than the atmosphere.

Harm As defined in Chapter 40E-8, Florida Administrative Code, the temporary loss of water resource functions that result from a change in surface or groundwater hydrology and takes a period of one to two years of average rainfall conditions to recover.

Headwaters (1) Water that is typically of higher elevation (with respect to tailwater) or on the controlled side of a structure. (2) The waters at the highest upstream point of a natural system that are considered the major source waters of the system.

Hydrogeology The geology of groundwater, with particular emphasis on the chemistry and movement of water.

Hydrologic condition The state of an area pertaining to the amount and form of water present.

Hydrology The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Impoundment Any lake, reservoir, or other containment of surface water occupying a depression or bed in the earth's surface and having a discernible shoreline.

Industrial/Commercial/Institutional (ICI) Self-Supply Water used by industrial, commercial, or institutional operations withdrawing a water quantity of 100,000 gallons per day or greater from individual, on-site wells.

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Injection well Refers to a well constructed to inject treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage in a designated aquifer. Injection wells are generally drilled below freshwater levels, or into unused aquifers or aquifers that do not deliver drinking water.

Intermediate aquifer system This aquifer system consists of five zones of alternating confining and producing units. The producing zones include the Sandstone and Mid-Hawthorn aquifers.

Irrigation efficiency (AFSIRS Model) (1) A measure of the effectiveness of an irrigation system in delivering water to a plant for irrigation and freeze protection purposes. It is expressed as the ratio of the volume of water used for supplemental plant evapotranspiration to the volume pumped or delivered for use. (2) The average percent of total water pumped for use that is delivered to the root zone of a plant. (3) As a modeled factor, irrigation efficiency refers to the average percent of total delivered water applied to the plant's root zone.

Irrigation water use Uses of water for supplemental irrigation purposes, including agricultural lands, as well as golf courses, nurseries, recreational areas, and landscapes.

Landscape irrigation The outside watering of shrubbery, trees, lawns, grass, ground covers, vines, gardens, and other such flora, not intended for resale, which are planted and are situated in such diverse locations as residential and recreational areas, cemeteries, public, commercial and industrial establishments, and public medians and rights-of-way.

Level of certainty A water supply planning goal to assure at least a 90 percent probability during any given year that all the needs of reasonable-beneficial water uses will be met, while sustaining water resources and related natural systems during a 1-in-10 year drought event.

Million gallons per day (MGD) A rate of flow of water equal to 133,680.56 cubic feet per day, or 1.5472 cubic feet per second, or 3.0689 acre-feet per day.

Minimum flows and levels (MFL) The point at which further withdrawals will result in significant harm to water resources or ecology of the area. An MFL is established by water management districts pursuant to Sections 373.042 and 373.0421, Florida Statutes, for a given water body and set forth in Parts II and III of Chapter 373.

Mobile irrigation laboratory A vehicle furnished with irrigation evaluation equipment that is used to carry out on-site evaluations of irrigation systems and to provide recommendations on improving irrigation efficiency.

Model A computer model is a representation of a system and its operations, and provides a cost-effective way to evaluate future system changes, summarize data, and help understand interactions in complex systems. Hydrologic models are used for evaluating, planning, and simulating the implementation of operations within SFWMD's water management system under different climatic and hydrologic conditions. Water quality and ecological models are also used to evaluate other processes vital to the health of ecosystems.

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National Geodetic Vertical Datum of 1929 (NGVD) A geodetic datum derived from a network of information collected in the United States and Canada. It was formerly called the "Sea Level Datum of 1929" or "mean sea level." Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific coasts, it does not necessarily represent local mean sea level at any particular place.

Natural system A self-sustaining living system that supports an interdependent network of aquatic, wetland-dependent, and upland living resources.

Net irrigation demand or **net irrigation requirement** (AFSIRS Model) The amount of water the plant needs in addition to anticipated rainfall. This is an estimate of the amount of water (expressed in inches per year) that should be delivered to the plant's root zone.

Net water demand (or user/customer water demand) is the water demand of the end user after accounting for treatment and process losses, and inefficiencies. When discussing Public Water Supply, the term "finished water demand" is commonly used to denote net demand.

Outlet An opening through which water can be freely discharged from a reservoir.

Per capita use (1) The average amount of water used per person during a standard time period, generally per day. (2) Total use divided by the total population served.

Performance measure A scientifically measurable indicator or condition that can be used as a target for meeting water resource management goals. Performance measures quantify how well or how poorly an alternative meets a specific objective. Good performance measures are quantifiable, have a specific target, indicate when a target has been reached, and measure the degree to which the goal has been met.

Permeability The capacity of a porous rock, sediment, or soil for transmitting a fluid.

Planning Area The South Florida Water Management District is divided into five areas within which planning activities are focused: Upper Kissimmee Basin, Lower Kissimmee Basin, Upper East Coast, Lower West Coast, and Lower East Coast.

Potable water Water that is safe for human consumption.

Power Generation (PWR) Self-Supply The difference in the amount of water withdrawn by electric power generating facilities for cooling purposes and the water returned to the hydrologic system near the point of withdrawal.

Process water Water used for nonpotable industrial usage, e.g., mixing cement.

Priority Water Bodies List and Schedule Section 373.042(2), Florida Statutes, requires each of the five water management districts to provide the Florida Department of Environmental

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Protection an annual list and schedule of specific lakes and rivers with minimum flows and levels and water reservation rules that will be adopted to protect them from the effects of consumptive use allocations.

Public Water Supply (PWS) Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages greater than 0.1 million gallons per day.

Rapid infiltration basin A wastewater treatment method by which wastewater is applied in deep and permeable deposits of highly porous soils for percolation through deep and highly porous soil.

Raw water (1) Water that is direct from the source—groundwater or surface water—without any treatment. (2) Untreated water, usually that entering the first unit of a water treatment plant.

Raw water demand (see *Gross water demand*)

Reasonable-beneficial use Use of water in such quantity as is needed for economic and efficient use for a purpose, which is both reasonable and consistent with the public interest.

Recharge (groundwater) The natural or intentional infiltration of surface water into the ground to raise groundwater levels.

Recharge (hydrologic) The downward movement of water through soil to groundwater; the process by which water is added to the zone of saturation; or the introduction of surface water or groundwater to groundwater storage, such as an aquifer. Recharge or replenishment of groundwater supplies consists of three types: 1) natural recharge, which consists of precipitation or other natural surface flows making their way into groundwater supplies; 2) artificial or induced recharge, which includes actions specifically designed to increase supplies in groundwater reservoirs through various methods, such as water spreading (flooding), ditches, and pumping techniques; 3) incidental recharge, which consists of actions, such as irrigation and water diversion, which add to groundwater supplies, but are intended for other purposes. Recharge may also refer to the amount of water so added.

Reclaimed water Water that received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (Rule 62-610.200, Florida Administrative Code)

Recreational/Landscape (REC) Self-Supply Water used for landscape and golf course irrigation. The landscape subcategory includes water used for parks, cemeteries, and other irrigation applications of 0.1 million gallons per day or greater. The golf course subcategory includes those operations not supplied by a Public Water Supply or regional reuse facility.

Regional Simulation Model A regional hydrologic model developed principally for application in South Florida. It is developed on a sound conceptual and mathematical framework that allows it to be applied generically to a wide range of hydrologic situations. It simulates the coupled movement

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and distribution of groundwater and surface water throughout the model domain using a hydrologic simulation engine to simulate the natural hydrology and a management simulation engine to provide a wide range of operational capability.

Restricted allocation area An area designated within the South Florida Water Management District for which allocation restrictions are applied with regard to the use of specific sources of water. The water resources in these areas are managed in response to specific sources of water in the area for which there is a lack of water availability to meet the projected needs of the region from that specific source of water (Applicant's Handbook, SFWMD 2014a).

Retrofit (1) Indoor: the replacement of existing water fixtures, appliances, and devices with more efficient fixtures, appliances, and devices for the purpose of water conservation. (2) Outdoor: **t**he replacement or changing out of an existing irrigation system with a different irrigation system, such as a conversion from an overhead sprinkler system to a micro irrigation system (Applicant's Handbook, SFWMD 2014a).

Reuse The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as "reuse" or "effluent disposal" are contained in Rule 62-610.810, Florida Administrative Code. The term "reuse" is synonymous with "water reuse."

Reverse osmosis (RO) A membrane process for desalting water using applied pressure to drive the feed water (source water) through a semipermeable membrane.

Saltwater intrusion The invasion of a body of fresh water by a body of salt water due to its greater density. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by seawater, the upward migration of seawater into rivers and navigation channels, and the movement of seawater into freshwater aquifers along coastal regions.

Seawater or **salt water** Water with a chloride concentration at or above 19,000 milligrams per liter (Applicant's Handbook, SFWMD 2014a).

Self-supplied The water used to satisfy a water need, not supplied by a Public Water Supply utility.

Serious harm As defined in Rule 40E-8.021, Florida Administrative Code, the long-term, irreversible, or permanent loss of water resource functions resulting from a change in surface water or groundwater hydrology.

Service area The geographical region in which a water supplier has the ability and the legal right to distribute water for use.

Significant harm As defined in Rule 40E-8-021, Florida Administrative Code, the temporary loss of water resource functions that result from a change in surface water or groundwater hydrology and takes more than two years to recover, but which is considered less severe than serious harm.

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Storm water Water that does not infiltrate, but accumulates on land as a result of storm runoff, snowmelt runoff, irrigation runoff, or drainage from areas, such as roads and roofs.

Stormwater treatment area (STA) A system of constructed water quality treatment wetlands that use natural biological processes to reduce levels of nutrients and pollutants from surface water runoff.

Surface water Water above the soil or substrate surface, whether contained in bounds, created naturally or artificially, or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Surficial aquifer system (SAS) Often the principal source of water for urban uses within certain areas of South Florida. This aquifer is unconfined, consisting of varying amounts of limestone and sediments that extend from the land surface to the top of an intermediate confining unit.

Tailwater Water that is typically of lower elevation or on the discharge side of the structure.

Treatment facility Any facility or other works used for the purpose of treating, stabilizing, or holding water or wastewater.

Turbidity The measure of water clarity caused by suspended material in a liquid.

Unconfined aquifer (1) A permeable geologic unit or units only partly filled with water and overlying a relatively impervious layer. Its upper boundary is formed by a free water table or phreatic surface under atmospheric pressure. Also referred to as water table aquifer. (2) An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.

Utility Any legal entity responsible for supplying potable water for a defined service area.

Violation (MFL) As defined in Rule 40E-8.021(18), Florida Administrative Code, to fall below an adopted minimum flow or level criterion for a duration and frequency greater than specified for the MFL water body. Unless otherwise specified herein, in determining the frequency with which water flows and levels fall below an established MFL for purposes of determining an MFL violation, a "year" means 365 days from the last day of the previous MFL exceedance.

Wastewater The combination of liquid and water carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any groundwater, surface runoff, or leachate that may be present.

Water budget An accounting of total water use or projected water use for a given location or activity.

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Water Conservation Areas (WCAs) Part of the original Everglades ecosystem that is now diked and hydrologically controlled for flood control and water supply purposes. These are located in the western portions of Miami-Dade, Broward, and Palm Beach counties, and preserve over 1,350 square miles, or about 50 percent of the original Everglades.

Water conservation rate structure A water rate structure designed to conserve water. Examples of conservation rate structures include, but are not limited to, increasing block rates, seasonal rates, and quantity-based surcharges.

Water reservation As described in Section 373.223(4), Florida Statutes, a legal mechanism to set aside water for the protection of fish and wildlife or the public health and safety from consumptive water use. The reservation is composed of a quantification of the water to be protected, which includes a seasonal and a location component.

Water Resources Advisory Commission A commission of the South Florida Water Management District that serves as an advisory body to the Governing Board. The WRAC is the primary forum for conducting workshops, presenting information, and receiving public input on water resource issues affecting Central and South Florida.

Water resource development The formulation and implementation of regional water resource management strategies, including collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage the water resources; development of regional water resource implementation programs; construction, operation and maintenance of major public works facilities to provide for flood control, surface and groundwater storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities (Section 373.019, Florida Statutes).

Water Shortage Plan This effort includes provisions in Chapters 40E-21 and 40E-22, Florida Administrative Code, and identifies how water supplies are allocated to users during declared water shortages. The plan allows for supply allotments and cutbacks to be identified on a weekly basis based on the water level within Lake Okeechobee, demands, time of year, and rainfall forecasts.

Water supply development The planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use. (Section 373.019, Florida Statutes)

Water supply plan Detailed water supply plan developed by the South Florida Water Management District under Section 373.709, Florida Statutes, providing an evaluation of available water supply and projected demands at the regional scale. The planning process projects future demand for 20 years and recommends projects to meet identified needs.

Water table The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere; defined by the level where water within an unconfined aquifer stands in a well.

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Water use permitting The issuance of permits by the SFWMD, under the authority of Chapter 40E-2, Florida Administrative Code, allowing withdrawal of water for consumptive use.

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water. Watersheds conform to federal hydrologic unit code standards and can be divided into subwatersheds and further divided into catchments, the smallest water management unit recognized by SFWMD operations. Unlike drainage basins, which are defined by rule, watersheds are continuously evolving as the drainage network evolves.

Wellfield One or more wells producing water from a subsurface source. A tract of land that contains a number of wells for supplying a large municipality or irrigation district.

Wetland An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (e.g., swamps, bogs, and marshes).

Yield The quantity of water (expressed as rate of flow or total quantity per year) that can be collected for a given use from surface or groundwater sources.

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2014

LOWER KISSIMMEE BASIN

Water Supply Plan

Appendices

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A

Water Demand Projections

The South Florida Water Management District (SFWMD or District) completes the complex process of calculating water demand usage, estimates, and projections in coordination with stakeholder groups, other agencies, utilities, and local governments. This appendix describes the methods used to compile estimates of water demands with a 25-year planning horizon using a base year of 2010 and extending to 2035 for the Lower Kissimmee Basin (LKB) Water Supply Planning Area.

> **NOTE**
>
> Perceived discrepancies in table totals are due to rounding.

This appendix presents water demand assessments for the following water use categories:

- **Public Water Supply (PWS)** – Publicly or privately held utilities producing water in amounts of 0.1 million gallons per day (MGD) or greater for distribution to its customers
- **Domestic Self-Supply (DSS)** – Individual private wells and small utilities with an average flow less than 0.1 MGD
- **Industrial/Commercial/Institutional Self-Supply (ICI)** – Self-supplied water for business operations and institutional operations
- **Recreational/Landscape Self-Supply (REC)** – Water to fulfill irrigation demands for large landscaped areas, such as community and homeowner association common grounds, ball fields, parks, cemeteries, and golf courses
- **Power Generation Self-Supply (PWR)** – Water used at power plants primarily for cooling purposes
- **Agricultural Self-Supply (AGR)** – Water demands for crop irrigation and incidental uses associated with crop production

DATA SOURCES AND METHODS

In general, preparing water demand estimates and projections is highly dependent on land use activities and population growth and dispersion. For example, estimates of irrigated acreages are fundamental to projecting water supply demand for AGR, while information about existing and future projections of population are key to projecting reasonable PWS demand.

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To meet the planning goal, the water supply needs of existing and future reasonable-beneficial uses are based on meeting those needs in a 1-in-10 year drought event (Section 373.709[2][a], Florida Statutes [F.S.]). The water demand estimates for 2010 and projections through 2035 are provided for each use category in five-year increments for average rainfall conditions and 1-in-10 year drought conditions in this appendix. Data sources for each category may include the Florida 2010 Census of Population and Housing (United States Census Bureau 2012), federal and state agency reports, water use permitting files, PWS utility information, and municipal planning documents. In some instances, reliable historical information or indicators of future activity and market studies were available to assist in predicting water use. The method used for each water use category is summarized in the appropriate section of this appendix.

NOTE

Average Rainfall and 1-in-10 Year Drought

An average rainfall year is defined as a year with rainfall equal to the mean annual rainfall for the period of record. A 1-in-10 year drought condition is defined as below normal rainfall with a 90 percent probability of being exceeded over a 12-month period. This means there is a 10 percent chance that less than this amount will be received in any given year. Section 373.0361(2)(a), F.S., states the level of certainty planning goal associated with identifying demands shall be based on meeting demands during a 1-in-10 year drought event.

The water demands in the LKB Planning Area are described and analyzed in two ways, gross and net demand. Gross or raw water demand is the water allocated in a consumptive use permit, and is the volume of water withdrawn from a source. Net demand is the volume of water needed by an end user to meet their needs after deducting treatment and process water losses, and after accounting for estimated delivery system inefficiencies. Net demand is commonly referred to as finished water in a utility system.

PUBLIC WATER SUPPLY AND DOMESTIC SELF-SUPPLY

This section describes the methodology used to estimate the 2010 and projected population and PWS and DSS raw and finished water demand estimates. The approach and assumptions used for this *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan) are similar to those used for the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update).

2010 Base-Year Estimates

The year 2010 was established as the baseline demographic condition for this plan due to data available from the 2010 United States census and to maintain consistency with the SFWMD's other regional water supply plans. The Bureau of Economic and Business Research (BEBR) estimates for the 2010 permanent resident population are used as control populations for each county within the LKB Planning Area. BEBR's medium scenario population projections were used as county control values for 5-year intervals from 2015

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through 2035 (BEBR 2011). These population estimates and projections are also provided in **Table A-1.**

One challenge in developing water use projections within the LKB Planning Area is that the region only covers portions of each of the three counties. Additionally, some utility service areas cross county lines and Okeechobee County is partially in the St. Johns River Water Management District. To address these complexities, the District completed a Geographic Information System (GIS) analysis using 2005 aerial photography, land use profile imaging, and census block data. The development of current and future (2035) potable water service area maps used in these efforts were coordinated with the PWS utilities. **Figure C-1** of **Appendix C** shows the utility service areas used for this analysis.

For the required 5-year incremental projections within the planning horizon of this plan, census block data from the 2010 census (U.S. Census Bureau 2012) were used as the principal means of distributing 2035 county control populations to the PWS future service areas within the LKB Planning Area. Five-year incremental projections for each PWS utility were based on a linear interpolation of the change in population from the 2010 estimates to 2035 adjusted projections. These results were shared with and reviewed by the Southwest Florida Water Management District (SWFWMD), St. Johns River Water Management District (SJRWMD), and local utility and county government staff and adjustments were made as appropriate. Residents not falling within the current utility service areas were recognized as DSS. **Table A-2** shows the results of the population distributions by county and by local utility service provider.

Table A-1. Lower Kissimmee Basin permanent population totals, 2010–2035.

County	2010	2015	2020	2025	2030	2035
LKB Glades	3,991	4,244	4,554	4,832	5,111	5,359
LKB Highlands	10,488	10,999	11,604	12,178	12,730	13,229
LKB Okeechobee	38,488	40,320	42,052	43,784	45,324	46,768
Total	**52,967**	**55,563**	**58,210**	**60,794**	**63,165**	**65,356**

Note: LKB Glades, LKB Highlands, and LKB Okeechobee in this and subsequent tables refers only to the portions of those counties that are in the Lower Kissimmee Basin Planning Area.

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Table A-2. Distribution of permanent population by utility.

Utility	2010 Population	2035 Population
Lakeport Water Association	1,289	1,663
Okeechobee Utility Authority[1] (Glades Co.)	1,469	1,973
Glades County Self-Served (DSS)	1,233	1,724
LKB Glades County Total	**3,991**	**5,359**
Spring Lake Improvement District	3,230	4,074
City of Sebring (Sebring Airport)	0	0
Highlands County Self-Served (DSS)	7,258	9,155
LKB Highlands County Total	**10,488**	**13,229**
Okeechobee Utility Authority[1] (w/o Glades Co)	21,427	26,036
Okeechobee Correctional	1,900	1,900
Okeechobee County Self-Served (DDS)	15,161	18,831
LKB Okeechobee County Total	**38,488**	**46,768**
LKB Total	**52,967**	**65,356**

***Note:** Perceived discrepancies in table totals are due to rounding.

[1] OUA's service area is located in two counties: Glades and Okeechobee. To calculate OUA's population served, add the OUA's Glades and Okeechobee county populations.

Per Capita Use Rate

The per capita use rate (PCUR) expresses the total annual water use divided by the number of permanent residents. This method includes all finished water used by permanent and seasonal residents, industrial, landscaping and irrigation water from PWS, and any water losses in delivery supplied or lost by the system. PCURs were calculated using the average of reported water use from 2009 and 2010. Reported water use came from either the Florida Department of Environmental Protection (FDEP) monthly reports or the District's water compliance database. In the case of utilities within the LKB, this is the same value as water withdrawn from the source due to minimal losses in the treatment process. The PCURs for DSS within each LKB county were assumed to be the same as the state average PCUR. **Table A-3** provides the calculated PCURs for individual utilities and the resulting average water demands by utility for the 5-year increments.

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Table A-3. PCURs and gross average water demand by utility within the LKB (MGD)

Facility	PCUR	2010	2015	2020	2025	2030	2035
Lakeport	58	0.07	0.08	0.09	0.09	0.10	0.10
Okeechobee Utility Authority	84	0.14	0.15	0.16	0.17	0.18	0.19
Glades County Self-Served	89	0.11	0.12	0.13	0.13	0.14	0.15
LKB Glades County Totals		**0.32**	**0.35**	**0.38**	**0.39**	**0.42**	**0.44**
Spring Lake Improvement District	65	0.21	0.22	0.23	0.24	0.25	0.26
Highlands County Self-Served	89	0.65	0.68	0.71	0.75	0.78	0.81
City of Sebring (Sebring Airport)	NA	0.12	0.12	0.12	0.12	0.12	0.12
LKB Highlands County Totals		**0.98**	**1.02**	**1.06**	**1.11**	**1.15**	**1.19**
Okeechobee Utility Authority	84	2.09	2.19	2.29	2.38	2.46	2.54
Okeechobee Correctional	NA	0.17	0.17	0.17	0.17	0.17	0.17
Okeechobee County Self-Served	89	1.35	1.42	1.49	1.56	1.62	1.68
LKB Okeechobee County Totals		**3.61**	**3.78**	**3.95**	**4.11**	**4.25**	**4.39**
LKB Public Water Supply Total		2.80	2.93	3.06	3.17	3.28	3.38
LKB Domestic Self–Supply Total		2.11	2.22	2.33	2.44	2.54	2.64
LKB Region Total		**4.91**	**5.15**	**5.39**	**5.61**	**5.82**	**6.02**

Average Rainfall and 1-in-10 Year Drought PWS Adjustments

In 1998, the SFWMD completed a Districtwide Water Supply Assessment comparing historic PWS water use during wet, dry, and average rainfall conditions. Based on this review, a general relationship was defined that characterized 1-in-10 year dry climatic conditions as requiring approximately 6 percent more water use over average conditions. Since PCURs were calculated using average conditions, a 6 percent adjustment was applied to the water use projects to address a 1-in-10 year drought condition.

INDUSTRIAL / COMMERCIAL / INSTITUTIONAL SELF-SUPPLY

This category includes self-supplied industrial, commercial, and institutional water demands not supported by a public utility. This category includes mining operations. Water supplied by utilities is included with PWS.

Projection Methodology

Demand for ICI water use is projected to change at the same rate as each county's population with minimal differences between average and 1-in-10 year drought conditions.

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Currently the largest amount of ICI use in the LKB Planning Area is in Glades County for the operation of the Palmdale sand mine.

In the past few years, interest in biofuel/ethanol production has increased in the LKB Planning Area. However, given the uncertainty about when a biofuel plant may be built in the area and after conferring with stakeholders, the ICI demand projections for planning purposes do not reflect this potential future water use.

Projection Results

Table A-4 summarizes the current and projected ICI demand in the LKB Planning Area in five-year increments during the planning horizon.

Table A-4. ICI demand projections (MGD).

County	2010	2015	2020	2025	2030	2035
LKB Glades	12.1	12.7	13.2	13.8	14.3	14.9
LKB Highlands	4.6	4.8	5.0	5.2	5.4	5.6
LKB Okeechobee	2.8	2.9	3.0	3.1	3.2	3.4
Total	19.5	20.4	21.2	22.1	23.0	23.9

RECREATIONAL / LANDSCAPE SELF-SUPPLY

The REC category includes self-supplied water for large landscaped areas such are parks and cemeteries, golf course irrigation, and aquatic parks should they exist. This acreage is typically identified through consumptive use permits. Golf course growth rates and landscape acreage by county are projected separately due to the different factors influencing their expansion. Irrigation requirement estimates for average and 1-in-10 year drought events were made for both landscape and golf course irrigation using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model (Smajstrla 1990). The irrigation requirements were calculated using a representative irrigation system/rainfall station/soil type combination for each county. Recreational demands supplied by public utilities or a homeowner on a well for their potable use are included as part of the PWS and DSS demands respectively.

Projection Methodology

Landscape and golf course acres were identified using the SFWMD's water use permit data system. These data were verified and adjusted using numerous industry sources to reflect changes since the permit was issued. Estimation of future growth was made using county population growth rates, information provided by local planning officials, and golf course industry publications. Projections for landscape irrigation and golf course acreage were prepared separately and later combined for calculating water demands.

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Recreational and landscape gross and net irrigation demand estimates during average and 1-in-10 year drought conditions were made using the AFSIRS Model. The net demand is the amount of supplemental water provided to the plant's (i.e., grass) root zone required for sustainable yields. Dividing the net demand by an Irrigation Efficiency Factor provides the gross demand or amount of total water withdrawn from the source. The demands are calculated using 36 years of rainfall and potential evapotranspiration data from appropriate meteorological stations. The analyses also consider soil types, runoff, irrigation methods, and strategies. Sprinkler irrigation system efficiency of 75 percent is applied to calculate recreational use. The AFSIRS model uses appropriate regional crop coefficients for sod to represent turfgrass, and also reflects actual irrigation practices for nurseries and landscape plants that are modeled based on types of irrigation systems identified within permits. Demands are calculated for each county.

Landscape

Demand projections for this section include irrigated acreage permitted for landscaping and recreation, excluding golf courses and areas addressed under PWS permits. Landscape acreage was projected to increase at the same rate as the county population through 2035. Projections for large-scale landscape self-supply acreage are summarized by county in **Table A-5**.

Table A-5. Landscape self-supply acreage.

County Area	2010	2015	2020	2025	2030	2035
LKB Glades	0	0	0	0	0	0
LKB Highlands	8	9	11	12	14	16
LKB Okeechobee	32	34	36	38	40	42
Total	**40**	**43**	**46**	**50**	**54**	**58**

Golf Courses

Golf course acreages were estimated for 2010 using the SFWMD Water Use Permit Information System and information from golf course publications, such as the golf course directory published by the National Golf Foundation, communication with local planning officials and golf course personnel, and GIS land use information.

Five golf courses are known to have existed in 2010 within the LKB Planning Area–two in Highlands County and three in Okeechobee County. The 2010 golf course acreage was 261 acres. One course at the Spring Lake development is at least partially irrigated with treated wastewater. Analysis indicates no increase in golf course development within the LKB region over the planning horizon (NGF 2013).

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Projection Results

Table A-6 summarizes the projected water demands for REC through 2035. No landscape or golf course acreage was identified for the portion of Glades County within the LKB Planning Area.

Table A-6. Gross irrigation demands for REC under average rainfall and 1-in-10 year drought conditions in the LKB Planning Area.

County/Acreage/Demand	2010	2015	2020	2025	2030	2035
LKB Highlands County						
Irrigated Acreage	98	99	101	102	104	106
Net Irrigation Requirements						
Annual Based on Average Rainfall Year (20.8 in.)	0.20	0.20	0.21	0.21	0.21	0.22
Annual Based on 1-in-10 Year Drought Conditions (33.7 in.)	0.33	0.33	0.34	0.34	0.35	0.35
LKB Okeechobee County						
Irrigated Acreage	203	205	207	209	211	213
Net Irrigation Requirements						
Annual Based on Average Rainfall Year (20.3 in.)	0.40	0.41	0.41	0.42	0.42	0.43
Annual Based on 1-in-10 Year Drought Conditions (26.4 in.)	0.53	0.53	0.54	0.54	0.55	0.56
LKB Total						
Irrigated Acreage	301	304	307	311	315	319
Net Irrigation Requirements						
Annual Based on Average Rainfall Year	0.61	0.61	0.62	0.63	0.64	0.65
Annual Based on 1-in-10 Year Drought Conditions	0.85	0.86	0.87	0.88	0.89	0.91

POWER GENERATION SELF-SUPPLY

The primary use of water at thermoelectric power plants is for cooling purposes. Other water uses include boiler make-up water and ancillary needs, such as domestic-type use by employees. Currently, two power plants withdraw water within the LKB Planning Area. These are the Tampa Electric Company (TECO) Phillips Power Station in Highlands County and the Indiantown Cogeneration Plant in Martin County.

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In 2010, TECO's Phillips Power Station withdrew between less than 0.1 and 0.5 MGD of fresh water for powerhouse generation and cooling purposes. Use of water at the facility fluctuates with demand, which makes it difficult to estimate future use. However, the facility is currently permitted for 1.0 MGD. Water use reported in **Table A-7** represents an estimate of potential use at the facility assuming reasonable population growth for Highlands County.

The Indiantown Cogeneration Plant relies on surface water that is withdrawn from the L-63N Canal (Taylor Creek) when the canal stage is sufficiently high. This Okeechobee County source water is transferred to the plant via a 19-mile pipeline that discharges to a 30-million gallon pond. Historic water use for plant operations has averaged approximately 4.3 MGD through 2013. To account for future power-related water demands within Okeechobee County, this 2014 LKB Plan incorporates a projected amount of surface water over the planning horizon to accommodate the Martin County plant.

Florida Power & Light (FPL) does not currently operate a facility in the LKB Planning Area, but has proposed a possible new facility for construction within the next 10 years in northeast Okeechobee County. This site is within the SJRWMD and just outside the LKB. The proposed facility is estimated to need 27 MGD of water supply for operation. Since numerous options for this potential power plant are being reviewed at by FPL, demands for this possible facility are not included nor evaluated as part of this plan.

Projection Results

Table A-7 shows that anticipated PWR water demands for the 2035 planning horizon. Power generation water demands are assumed to be the same for both average rainfall and 1-in-10 year drought conditions.

Table A-7. Estimated water needs for PWR.

County Area	2010	2015	2020	2025	2030	2035
LKB Glades	0.0	0.0	0.0	0.0	0.0	0.0
LKB Highlands	0.15	0.25	0.45	0.65	0.85	1.05
LKB Okeechobee	4.3	4.4	4.6	4.9	5.1	5.3
Total	4.4	4.6	5.1	5.5	5.9	6.4

AGRICULTURAL SELF-SUPPLY

AGR demands account for most of the water used within the LKB. The 2010 estimates indicate that agriculture accounts for 85 percent of average condition demands. In part, this accounting reflects the addition of irrigated pasture as an agricultural demand category. In past SFWMD water supply plans, this use was not specifically included in water demand projections. In the 2005–2006 KB Plan Update, agricultural acreage was projected to decrease slightly in the northern metropolitan counties and hold relatively constant in the

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more rural southern counties that now comprise the LKB Planning Area. While specific crops may decline, the overall trend indicates agricultural growth in the region. Notable changes to the projected agricultural activities within the LKB Planning Area are the introduction of new strawberry, blueberry, and sorghum production. Sorghum is planned to be used as a biofuel feedstock within Highlands County.

Many commercial agricultural activities occurred during 2010 within the LKB Planning Area. In order to organize and estimate the water use associated with irrigating commercially grown crops, the types of uses were categorized into the following groups: 1) citrus, 2) other fruits and nuts, 3) vegetables, melons and berries, 4) field crops, sugarcane and sorghum, 5) sod, 6) greenhouse/nursery, 7) irrigated pasture, and 8) miscellaneous (cattle watering and aquaculture). Water uses associated with the processing and storage of the fruit and vegetables produced is considered an industrial activity and is included with ICI projections.

Projection Methodology

The District coordinated the development of agricultural acreage estimates and water demands for the LKB Planning Area with governmental agencies, agricultural stakeholders, and other industry professionals. Crop acreages were frequently developed for the entire county and then apportioned among water management districts or planning regions

Agricultural acreage was projected using historical data, available marketing information, and statistical modeling where appropriate. Where available, market information for key crops within the LKB were assessed to examine the relative supply and demand balance, price trends, and likely profit margins for growers over the planning horizon. This information was supplemented by trends in the value per acre for key crops to examine incentives for growers to plant certain crops. In addition, market indicators were compared to recent permitting activities to determine and reinforce existing market trends, crop popularity, and market signals indicated by the grower community that would support the underlying rationale for the demand projections.

Some permits indicated where key popular and relatively profitable crops were to be grown within the LKB area. Where growth in agricultural activity was identified but not limited to specific locations, the growth was distributed for the entire county and these projections apportioned to the land area under the jurisdiction of the SFWMD. Where appropriate, this was accomplished by assuming changes in acreage proportional to acreage estimates determined by aerial land use mapping using GIS in combination with District permit locations.

Estimation of Agricultural Acreages

The information used in estimating 2010 and future agricultural acreage totals was acquired from one or more of the following sources:

- The United States Department of Agriculture–National Agriculture Statistics Service (USDA-NASS 2012a, 2012b, 2013a, 2013b, 2013c, 2013d).

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- SFWMD GIS agricultural land use/crop type analysis (2000 and 2005), 2008 land use/land cover maps, and the Water Use Regulatory Database
- University of Florida/Institute of Food and Agricultural Services Citrus Research and Education Center (UF/IFAS 2012)
- Florida Department of Agriculture and Consumer Services (FDACS 2013)
- United States Geological Survey (USGS 2009)
- Local agricultural extension offices
- Florida Farm Bureau and other SFWMD agricultural stakeholders
- Special reports from agencies such as the Florida Citrus Commission (2013)
- Media reports and agriculture industry publications (Glinksi 2013, Lambert and Lambert 2014)

Where data from these sources are insufficient for indicating trends and no empirical knowledge of future changes in a crop's acreage is available, the acreage for that crop category was projected to remain at its most recently reported level. The sections below discuss in more detail the information used to determine estimates for each crop type.

Agricultural water demand calculations for this 2014 LKB Plan are generated using the AFSIRS Model. The model uses soil types, growing seasons, irrigation system types, and irrigation system efficiencies. The AFSIRS Model calculates the net irrigation requirements for each crop category and irrigation system. The net irrigation requirement reflects an estimate of the amount of water (expressed in inches per year) that should be delivered to a plant's root zone. The gross irrigation requirement is the amount of water that must be withdrawn from the source and includes both the net irrigation requirement and the losses incurred irrigating the plant's root zone. Irrigation efficiency as a modeled factor refers to the average percent of total water applied that is delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

Gross irrigation requirements for the average rainfall and 1-in-10 year drought conditions are calculated for each crop type. Historical weather data from local rainfall stations were used to represent the average rainfall and 1-in-10 year drought conditions for each crop/county combination to calculate the irrigation requirements.

Projections of gross irrigation demands are based on an assumed or estimated irrigation system type. The most common types of irrigation systems used in central and south Florida crop production are gravity-based seepage or flood (irrigation efficiency of 50 percent), sprinkler (75 percent), and low-volume, such as micro-jet systems (85 percent). A single irrigation efficiency is calculated for each crop at the county level based on percent use of the three different irrigation systems identified in a particular use type category. The information comes from the reported type system identified in the SFWMD Water Use Regulatory Database.

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Citrus Acreage Estimates

Citrus is, and is projected to remain, the largest irrigated crop grown within the LKB Planning Area. Within the LKB, citrus accounts for an estimated 32,697 acres. Forty-three percent of the citrus acres in Glades, Highlands, and Okeechobee counties are with the LKB region. **Figure A-1** shows the distribution of active citrus acres within the LKB and across the total area of the three counties.

All categories of citrus, including oranges, grapefruit, and tangerines, are included in this category for projection purposes. Historical citrus acreage data were gathered from the annual Commercial Citrus Inventory published by the United States Department of Agriculture–National Agriculture Statistics Service (USDA-NASS), in cooperation with the Florida Department of Agriculture and Consumer Services (FDACS).

Recent trends show a slowing in the rate of loss as measured by inactive acres and stabilization in acres of fruit-bearing groves. This change is in part due to intensive research into occurance and treatment of citrus greening, canker, and other diseases currently being conducted by a variety of agencies and industry groups. . **Table A-8** shows the estimated historical citrus acreage. Okeechobee, Glades, and Highlands counties steadily increased production acres from the late 1960s to the turn of the century. However, after 2000, production in these three counties leveled off or decreased slightly. **Figure A-2** shows the inactive citrus acres since 2008 for the three counties partially within the LKB.

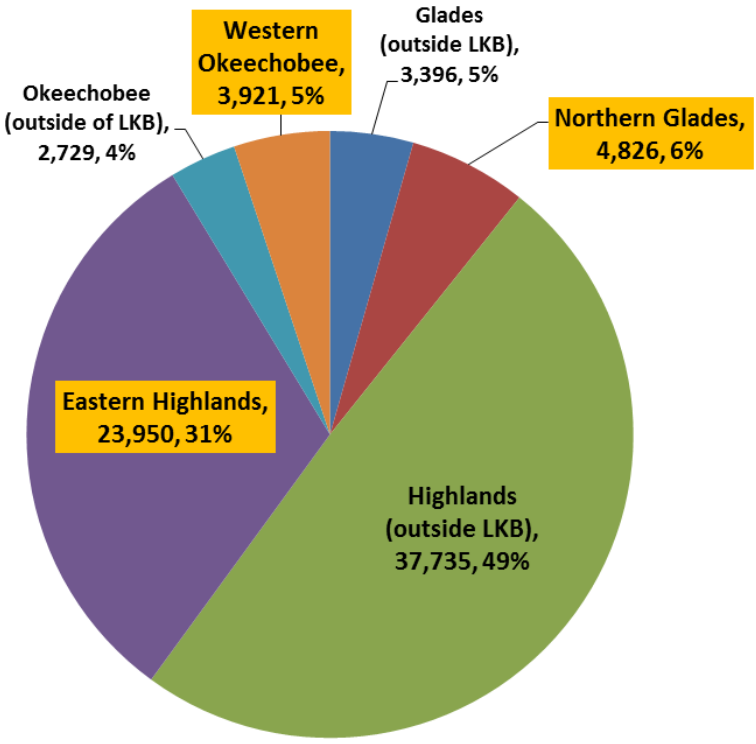

Figure A-1. 2013 citrus acres within Glades, Highlands, and Okeechobee counties (highlighted categories are within the LKB).

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Table A-8. Historic citrus acreage in Glades, Okeechobee, and Highlands counties.

Year	Glades	Okeechobee	Highlands	Total
1966	1,413	2,508	37,409	41,330
1970	1,572	3,597	38,803	43,972
1974	1,661	4,087	37,996	43,744
1978	1,613	4,171	37,105	42,889
1982	4,026	6,954	37,661	48,641
1986	6,076	7,449	46,012	59,537
1990	7,523	5,541	57,048	70,112
1994	9,270	11,270	74,035	94,575
2000	10,506	12,170	78,132	100,808
2002	10,384	12,035	77,391	99,810
2004	10,103	11,891	74,623	96,617
2008	9,052	8,327	65,599	82,978
2009	9,090	7,930	62,443	79,463
2010	8,571	7,627	62,440	78,638
2011	8,433	7,079	62,301	77,813
2012	8,149	6,850	61,525	76,524
2013	8,222	6,650	61,685	76,557

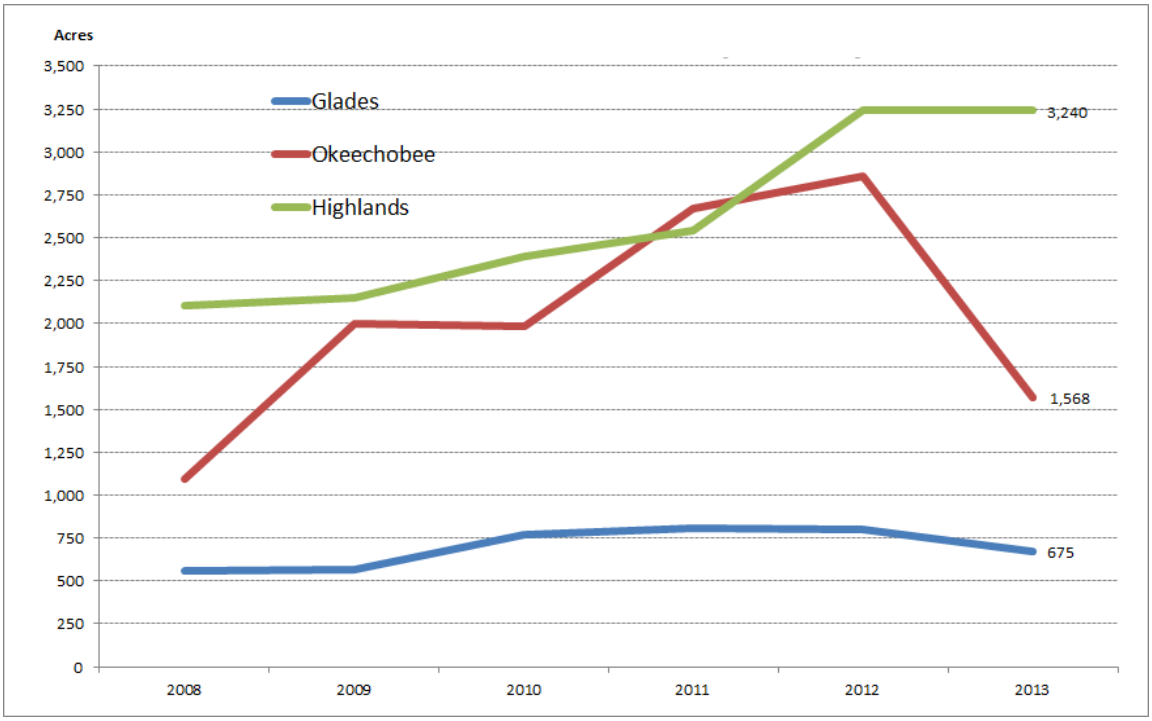

Figure A-2. Inactive citrus acres in Glades, Okeechobee, and Highlands counties (2008–2013).

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The projections assume that citrus acres will remain at the current level for the portions of Glades and Okeechobee counties in the LKB Planning Area (**Table A-9**). Citrus acres in Highlands County are expected to decline by 9,300 acres (a 9,800 reduction is partially offset by 500 acres of new citrus production) to reflect the conversion of this land to grow sorghum and other feedstock for potential biofuel use. The values presented in **Table A-8** show citrus acreages by county, but the LKB Planning Area only contains a portion of each county. Therefore, GIS analysis using 2008 land use coverage was employed to allocate acres within the LKB Planning Area for each county.

Table A-9. Estimated citrus acreage within the LKB Planning Area (2010–2035).

County	2010	2015	2020	2025	2030	2035
LKB Glades	4,826	4,826	4,826	4,826	4,826	4,826
LKB Okeechobee	3,921	3,921	3,921	3,921	3,921	3,921
LKB Highlands	26,740	22,090	17,440	17,440	17,440	17,440
Total	35,487	30,837	26,187	26,187	26,187	26,187

Other Fruits and Nuts

There is believed to be no significant production of non-citrus fruit crops (e.g., avocados, mangos, and papayas) in the LKB Planning Area.

Field Crops – Vegetables, Melons, and Berries

The main crops in this category include tomatoes, peppers, squash, melons, and tropical vegetables. A small number of acres of blueberries are also identified for commercial production in Highlands County. The USDA's agriculture census did not include any information for the acreage of vegetable crop production in the LKB Planning Area (USDA-NASS 2007). Estimates for vegetables, melons, and berries were generated using 2008 land use maps and the SFWMD's water use permit database to estimate production in 2010. Vegetable and berry acreage projections were requested from agricultural stakeholders and agencies including University of Florida/Institute of Food and Agricultural Services (UF/IFAS), FDACS, and the Florida Farm Bureau.

The projections reflect a new water use permit issued in 2010 authorizing irrigation of 8,300 acres for new strawberry production in Highlands County beginning before 2015. **Table A-10** shows the estimated acreage growth from 2010 through 2035.

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Table A-10. Estimated acreage for vegetable, melons, and berries.

County	2010	2015	2020	2025	2030	2035
LKB Glades	901	901	901	901	901	901
LKB Okeechobee	5,187	5,187	5,187	5,187	5,187	5,187
LKB Highlands	2,225	6,545	10,485	10,485	10,485	10,485
Total	8,313	12,633	16,573	16,573	16,573	16,573

Field Crops – Sugarcane and Sorghum

Historically, sugarcane has been the only significant field crop within the LKB and only within Glades and Highlands counties. In recent years there has been increased interest in planting sorghum for the generation of biofuels and energy production. Field crops including sorghum, rice, seed corn, and soybeans are estimated for about 14,000 acres throughout the planning area. Estimated amounts of sugarcane acreage were obtained from the USDA-NASS, the United States Geological Survey (USGS), and the District's 2005 land use maps combined with permit information for 2010. Historical sugarcane acreage was only available for Glades County and showed a stable number of harvested acreage from the mid-1980s through 2005. For this 2014 LKB Plan, acreage dedicated to sugarcane production was assumed to remain constant until 2035. Other identified field crops, including rice, corn, and soybeans, were also assumed to remain constant through 2035. The irrigation efficiency was estimated to be 50 percent in the LKB Planning Area.

The projections reflect the planting of 9,800 acres of sorghum for use as a biofuel feedstock within eastern Highlands County. The planting of this acreage is projected to be phased in and will likely be completed by 2020. **Table A-11** shows the estimated acreage from 2010 through 2035.

Table A-11. Estimated acreage of sugarcane and sorghum.

County	2010	2015	2020	2025	2030	2035
LKB Glades	11,432	11,432	11,432	11,432	11,432	11,432
LKB Okeechobee	2,084	2,084	2,084	2,084	2,084	2,084
LKB Highlands	403	4,903	10,203	10,203	10,203	10,203
Total	13,919	18,419	23,719	23,719	23,719	23,719

Sod Production

Estimates of sod acres refer to irrigated sod production within the LKB Planning Area. These estimates do not include sod harvested from pasture without irrigation. At least a small amount of irrigated sod is harvested in each of the three counties in the LKB Planning Area. Estimates of 2010 sod production were obtained from the USDA, District land use cover mapping, and estimates made by the USGS. Input on the estimates was provided by

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the local UF/IFAS extension agent where possible. In all counties, the irrigation efficiency was estimated to be between 50 and 60 percent for sod irrigation.

Large changes in sod production acres are linked to the business cycle and housing activity. The District examined long-term and recent trends in sod acreage in relation to the housing market and considered potential new housing developments and activity measured by building permits. In addition, the District also considers fertilizer regulations and local ordinances that can impact plantings and acres under management. Given the current market, regulatory environment, and pace of the economic and housing recovery, the demands for sod production are expected to remain relatively constant over the planning horizon. For estimating water demands for sod production, sod acreages were kept stable and consistent with historic levels over the duration of the planning horizon. **Table A-12** shows the estimated acreages per county for 2010–2035.

Table A-12. Estimated acreage for sod.

County	2010	2015	2020	2025	2030	2035
LKB Glades	300	300	300	300	300	300
LKB Okeechobee	2,874	2,874	2,874	2,874	2,874	2,874
LKB Highlands	1,351	1,351	1,351	1,351	1,351	1,351
Total	4,525	4,525	4,525	4,525	4,525	4,525

Greenhouse/Nursery

This category includes crops grown for sale in containers, such as vegetables, herbs, fruits, berries, and garden plants. It may also include cut flowers and caladium bulbs. These plants may be grown in the open or in a nursery setting where they are the product for sale. In the 2005–2006 KB Plan Update, historical irrigated greenhouse/nursery acreage data were gathered from annual reports by the FDACS Division of Plant Industry, UF/IFAS extension offices, and water use permitting files. For this 2014 LKB Plan, information from the SFWMD water use permit database and the USDA-NASS (2007) were the primary sources to estimate greenhouse/nursery acreage. **Table A-13** shows the estimated acreage for 2010 through 2035.

Table A-13. Estimated acreage for greenhouse/nursery.

County	2010	2015	2020	2025	2030	2035
LKB Glades	300	300	300	300	300	300
LKB Okeechobee	2,295	2,350	2,406	2,463	2,522	2,582
LKB Highlands	1,014	1,107	1,204	1,302	1,399	1,496
Total	3,609	3,757	3,910	4,065	4,221	4,377

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Irrigated Pasture

This plan update includes an estimate and projection of irrigated pasture. The SFWMD definition of improved pasture is any pasture with the facilities in place to carry out irrigation. The irrigated pasture acreage within the LKB was estimated from permits and is projected to remain stable over the planning horizon (**Table A-14**). The net irrigation requirement applied to estimate demands was obtained from the AFSIRS Model. There have been anecdotal reports that ranchers are also bringing livestock onto former citrus groves that have been inactive (J. Sumner, pers. comm.). These inactive citrus areas provide more opportunities for forage. With the ongoing disease strains placed on citrus groves, this trend is likely to continue over the short- to medium-term horizon.

Table A-14. Estimated acreage for irrigated pasture.

County	2010	2015	2020	2025	2030	2035
LKB Glades	21,543	21,543	21,543	21,543	21,543	21,543
LKB Okeechobee	8,715	8,715	8,715	8,715	8,715	8,715
LKB Highlands	44,503	44,503	44,503	44,503	44,503	44,503
Total	74,762	74,762	74,762	74,762	74,762	74,762

Field Crops – Other Field Crops

Other field crops in the LKB Planning Area include rice, seed corn, and soybeans, and totaled approximately 1,200 acres in 2010. Over the planning horizon from 2010 to 2035, it is anticipated that there will be only a slight net decline of 45 acres based on trends in this crop category within Glades and Okeechobee counties. The majority of field crop acreage (1,162 acres) will be retained to also support practices such as crop rotation and soil renewal in select areas (**Table A-15**). In all counties, the irrigation efficiency was calculated to be 50 percent.

Table A-15. Estimated acreage for other field crops.

County	2010	2015	2020	2025	2030	2035
LKB Glades	190	175	161	147	133	126
LKB Okeechobee	1,017	939	862	784	706	635
LKB Highlands	0	400	400	400	400	400
Total	1,207	1,514	1,423	1,331	1,239	1,162

Miscellaneous

Water required for cattle and aquaculture is included within this water use category. The water demand is calculated based on the number and type of cattle (i.e., beef or dairy) and their distribution across the service area. Demand projections for cattle watering are

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assumed to be 12 gallons per head per day for beef cattle and 185 gallons per head per day for dairy cattle (35 gallons for drinking and 150 gallons for related barn washing).

The number of beef and dairy cattle is projected to remain constant in the LKB Planning Area so demands for miscellaneous cattle acreage and water are also projected to remain at the 2010 levels (**Table A-16**). As with previous Kissimmee Basin Water Supply Plans (2000 and 2005–2006), cattle numbers were obtained from the USDA-NASS.

Table A-16. Water requirements and acreage for miscellaneous – cattle watering acreage.

County/Area	Head of Beef Cattle	Head of Dairy Cattle	MGD
LKB Glades	34,000	0	0.4
LKB Highlands	57,000	6,299	1.8
LKB Okeechobee	70,000	33,000	6.9
Total	161,000	39,299	9.1

Demands associated with aquaculture (fish and aquatic plant farming) are shown in **Table A-17**. Water withdrawals are made for recirculation purposes and to replace losses to evaporation. Demands for aquaculture were determined using existing consumptive use permits. The demands are projected to remain relatively stable at the 2010 level. One new pending permit was identified at the time of drafting this plan for 20 acres of new use and so this additional demand is included in the 2035 estimate.

Table A-17. Water requirements for miscellaneous – aquaculture.

	Acres	Permitted Use Totals (MGD)	
County	2010	2010	2035
LKB Highlands	31	0.23	0.28
LKB Okeechobee	94	0.08	0.08
Total	125	0.31	0.36

Summary of Agricultural Results

The following tables summarize projected agricultural water demands and acres. The demand tables combine all crop categories. **Table A-18** shows the total gross demands for 2010 and 2035 for average rainfall year conditions. It is anticipated that by 2035, gross average demands will increase by 22.5 MGD. The change is expected to affect the portion of Highlands County in the LKB Planning Area. This net change works out to an approximate average increase of 1.1 MGD per year through 2035. **Table A-19** shows the total summary demands for 1-in-10 year drought conditions. **Table A-20** shows the net change in demands between 2010 and 2035 by crop type by area.

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Table A-18. Gross water demands (MGD) for 2010 and 2035 under average rainfall conditions.

Average Rainfall Year Conditions Gross Demands for 2010

Category	LKB Glades	LKB Okeechobee	LKB Highlands	Total
Citrus	6.1	4.4	28.3	38.8
Field Crops – Sugarcane/Sorghum	34.4	3.2	0.8	38.4
Field Crops – Other	0.5	2.9	0.0	3.4
Vegetables, Melons & Berries	1.2	9.9	3.0	14.1
Sod	1.0	3.4	8.4	12.8
Greenhouse/Nursery	0.6	2.3	4.8	7.7
Irrigated Pasture	11.4	4.9	21.5	37.8
Miscellaneous	0.4	7.0	2.1	9.5
Total	**55.6**	**38.0**	**69.0**	**162.5**

Average Rainfall Year Conditions Gross Demands for 2035

Category	LKB Glades	LKB Okeechobee	LKB Highlands	Total
Citrus	6.1	4.4	18.5	29.0
Field Crops – Sugarcane/Sorghum	34.4	3.2	20.2	57.8
Field Crops – Other	0.3	1.8	1.1	3.2
Vegetables, Melons & Berries	1.2	9.9	14.3	25.4
Sod	1.0	3.4	8.4	12.8
Greenhouse/Nursery	0.6	3.5	5.4	9.5
Irrigated Pasture	11.4	4.9	21.5	37.8
Miscellaneous	0.4	7.0	2.1	9.5
Total	**55.4**	**38.1**	**91.5**	**185.0**

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Table A-19. Gross water demands (MGD) for 2010 and 2035 under 1-in-10 year drought conditions.

1-in-10 Year Drought Conditions Gross Demands for 2010

Category	LKB Glades	LKB Okeechobee	LKB Highlands	Total
Citrus	12.0	9.0	60.8	81.8
Field Crops - Sugarcane	44.7	4.9	1.1	50.7
Field Crops - Other	0.6	3.6	0.0	4.2
Vegetables, Melons & Berries	1.5	9.9	4.0	15.4
Sod	1.6	4.4	13.6	19.6
Greenhouse/Nursery	0.8	2.9	5.7	9.4
Irrigated Pasture	11.4	4.9	21.5	37.8
Miscellaneous	0.4	7.0	2.1	9.5
Total	**73.0**	**46.6**	**108.8**	**228.4**

1-in-10 Year Drought Conditions Gross Demands for 2035

Category	LKB Glades	LKB Okeechobee	LKB Highlands	Total
Citrus	12.0	9.0	39.7	60.7
Field Crops - Sugarcane	44.7	4.9	27.2	76.8
Field Crops - Other	0.4	2.2	1.4	4.0
Vegetables, Melons & Berries	1.5	9.9	18.8	30.2
Sod	1.6	4.4	13.6	19.6
Greenhouse/Nursery	0.8	4.3	6.5	11.6
Irrigated Pasture	11.4	4.9	21.5	37.8
Miscellaneous	0.4	7.0	2.1	9.5
Total	**72.8**	**46.6**	**130.8**	**250.2**

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Table A-20. Estimated average and change in agricultural demands (MGD) for 2010 and 2035.

Area	Citrus	Greenhouse/ Nursery	Vegetables/ Melons/ Berries	Sod	Sugarcane/ Sorghum	Field Crops (other)	Subtotal	Cattle Watering	Aqua-culture	Irrigated Pasture	Total
2010 Demands											
LKB Glades	6.1	0.6	1.2	1.0	34.4	0.5	**43.8**	0.4	0	11.4	**55.6**
LKB Highlands	28.3	4.8	3.0	8.4	0.8	0.0	**45.4**	1.8	0.23	21.5	**69.0**
LKB Okeechobee	4.4	2.3	9.9	3.4	3.2	2.9	**26.2**	6.9	0.08	4.9	**38.0**
Total	**38.8**	**7.7**	**14.1**	**12.8**	**38.4**	**3.4**	**115.3**	**9.2**	**0.31**	**37.8**	**162.5**
2035 Demands											
LKB Glades	6.1	0.6	1.2	1.0	34.4	0.3	**43.6**	0.4	0	11.4	**55.4**
LKB Highlands	18.5	5.4	14.3	8.4	20.2	1.1	**67.9**	1.8	0.28	21.5	**91.5**
LKB Okeechobee	4.4	3.5	9.9	3.4	3.2	1.8	**26.2**	6.9	0.08	4.9	**38.1**
Total	**29.0**	**9.5**	**25.4**	**12.8**	**57.8**	**3.2**	**137.7**	**9.1**	**0.36**	**37.8**	**185.0**
Change in Demands (2010 to 2035)											
Total Change	**-9.8**	**1.7**	**11.3**	**0.0**	**19.4**	**-0.2**	**22.4**	**-0.1**	**0.1**	**0.0**	**22.5**

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Most of the anticipated growth in demands reflects an expected increase in vegetables/melons and berries, and the anticipated increase in sorghum or other grass to support future biofuel facilities. These expected increases are offset by lower projected demand for water for citrus groves.

Although estimates and projections for the agricultural subsections have been discussed in terms of crop/use categories, it is also important to summarize the results in terms of total acreage and use by county. Total irrigated agricultural crop acreages are listed in **Table A-21**. Agricultural acres for the crop categories covered under this plan are expected to show a net increase of close to 9,500 acres by 2035 compared to 2010. Total agricultural irrigation demands are expected to increase by 22.5 MGD from 2010 to 2035 as shown in **Table A-22**.

Table A-21. Total agricultural acres projected for the LKB Planning Area (2010–2035)

County	2010	2015	2020	2025	2030	2035
LKB Glades	39,492	39,477	39,463	39,449	39,435	39,428
LKB Highlands	23,289	23,304	23,324	23,344	23,363	23,389
LKB Okeechobee	79,040	83,665	88,311	88,368	88,427	88,487
Total	**141,821**	**146,446**	**151,098**	**151,161**	**151,225**	**151,304**

Table A-22. Total agricultural demands (MGD) projected for the LKB Planning Area (2010–2035)

County	2010	2015	2020	2025	2030	2035
LKB Glades	55.6	55.5	55.5	55.4	55.4	55.4
LKB Highlands	38.0	38.1	38.1	38.1	38.1	38.1
LKB Okeechobee	69.0	80.1	91.3	91.3	91.4	91.5
Total	**162.5**	**173.7**	**184.7**	**184.8**	**184.9**	**185.0**

SUMMARY

Table A-23 shows the combined demands for all water use classes. It is anticipated that total water demands within the LKB will rise by 37.5 MGD between 2010 and 2035. On an average annual basis, expressed over a 21-year period (2014–2035) these average annual demands equate to about 1.8 MGD per year.

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Table A-23. Total demands by use class for the LKB Planning Area (2010–2035)

Use Category	2010 MGD	2010 % of Total	2035 MGD	2035 % of Total	Absolute Change 2010–2035 MGD	Percent Change, 2010–2035
Estimated Average Rainfall Conditions Total Water Demands in the Lower Kissimmee Basin						
Public Water Supply	2.8	1.5%	3.4	1.5%	0.6	21.4%
Domestic Self-Supply	2.1	1.1%	2.6	1.2%	0.5	23.8%
Industrial/Commercial/ Institutional Self-Supply	19.5	10.2%	23.9	10.8%	4.4	22.6%
Power Generation Self-Supply	4.4	2.3%	6.4	2.9%	2.0	45.5%
Recreational/Landscape Self-Supply	0.61	0.3%	0.65	0.3%	0.04	6.6%
Agricultural Self-Supply	162.5	84.7%	185.0	83.3%	22.5	13.8%
Total Water Use	**192.0**	**100.0%**	**222.0**	**100.0%**	**30.0**	**15.6%**
Estimated 1-in-10 Year Water Demands in the Lower Kissimmee Basin						
Public Water Supply	3.4	1.3%	4.1	1.4%	0.7	20.6%
Domestic Self-Supply	2.5	1.0%	3.2	1.1%	0.7	28.0%
Industrial/Commercial/ Institutional Self-Supply	19.5	7.5%	23.9	8.3%	4.4	22.6%
Power Generation Self-Supply	4.4	1.7%	6.4	2.2%	2.0	45.5%
Recreational/Landscape Self-Supply	0.85	0.3%	0.91	0.3%	0.06	7.1%
Agricultural Self-Supply	228.4	88.2%	250.2	89.1%	21.8	9.5%
Total Water Use	**259.1**	**100.0%**	**288.7**	**100.0%**	**29.6**	**11.4%**

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B

Minimum Flows and Levels Criteria and Recovery and Prevention Strategies

Section 373.709, Florida Statutes (F.S.), requires each regional water supply plan to be based on at least a 20-year planning period and include, among other items, the minimum flows and levels (MFL) criteria and associated recovery or prevention strategies adopted within the planning region. The plan must also identify any surface water or aquifers for which MFLs are scheduled to be adopted. This appendix provides additional and updated information for the Lower Kissimmee Basin since the development of the *2000 Kissimmee Basin Water Supply Plan* (2000 KB Plan) (SFWMD 2000b) and the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update) (SFWMD 2006).

MINIMUM FLOWS AND LEVELS CRITERIA

The overall goal of Chapter 373, F.S., is to ensure the sustainability of water resources of the state (Section 373.016, F.S.). Chapter 373, F.S., provides the South Florida Water Management District (SFWMD or District) with several tools to carry out this responsibility, including authority to establish MFLs. MFLs are the flow or level at which further withdrawals would cause significant harm to water resources or ecology of the area. Significant harm is defined as the level of harm that requires multiple years for the water resource to recover. This is considered more severe than the harm standard imposed in the water use permitting process, which relates to impacts that would occur during a 1-in-10 year drought. Therefore, MFLs in a recovered natural system would not be exceeded until conditions had already exceeded the 1-in-10 year drought level of certainty criteria. Serious harm, the ultimate harm to the water resources contemplated under Chapter 373, F.S., is defined as long-term, irreversible, or permanent loss to water resource functions. MFL water bodies approaching their MFL are a factor the District Governing Board considers when contemplating water shortage restrictions. However, the MFL criteria are not utilized to trigger water shortage restrictions during climatic conditions less severe than a 1-in-10 year level of drought. The District Governing Board may impose water shortage restrictions if an MFL exceedance occurs or is projected to occur during climatic conditions more severe than a 1-in-10 year drought, to the extent consumptive uses contribute to such exceedance.

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The levels of impacts—harm, significant harm, and serious harm—are relative resource protection terms. Each plays a role toward achieving a sustainable water resource. The role of MFL criteria is shown conceptually in **Figure B-1**.

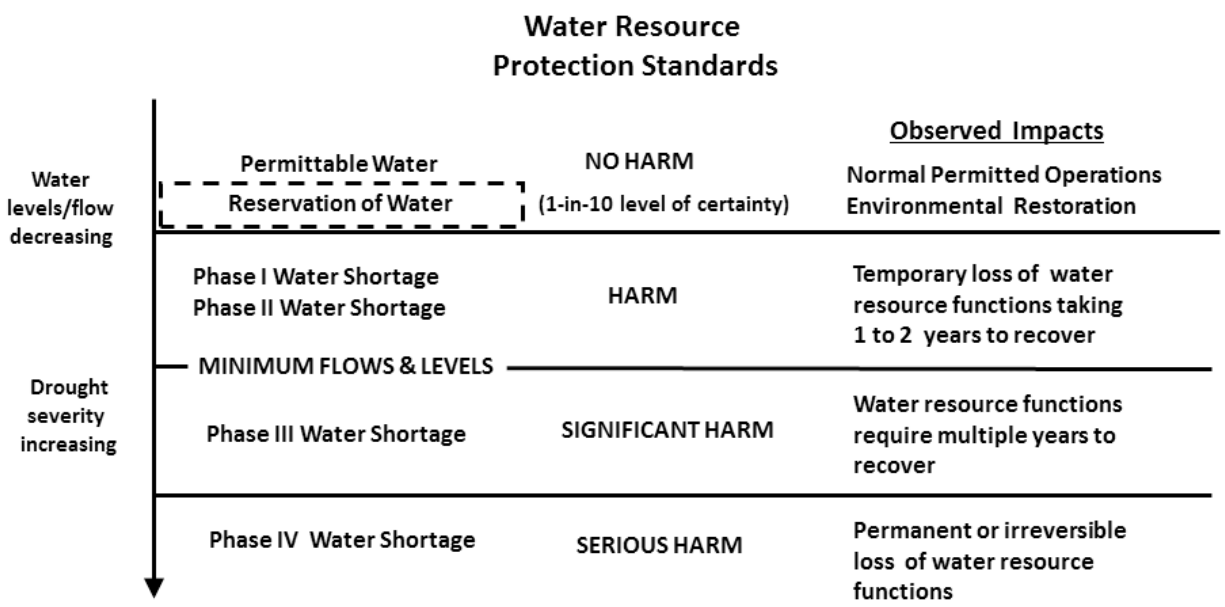

Figure B-1. Conceptual relationship among the harm, significant harm, and serious harm water resource protection standards.

Water use permitting protects water resources from harm by ensuring water use is reasonable-beneficial, does not interfere with existing legal users, and is consistent with the public interest. During the 2000 Districtwide water supply planning process, rulemaking to incorporate additional resource protection criteria, level of certainty, special designations, and permit durations were recommended as part of the plan implementations. A series of rulemaking efforts was completed in September 2003, resulting in amendments to Chapters 40E-1, 40E-2, 40E-5, 40E-8, 40E-20, and 40E-21, Florida Administrative Code (F.A.C.) and the *Basis of Review for Water Use Permit Applications within the South Florida Water Management District* (since replaced by the *Applicant's Handbook for Water Use Permit Applications* [Applicant's Handbook, SFWMD 2014]). Among the most significant changes were the amendments to permit duration, permit renewal criteria, wetland protection, supplemental irrigation requirements, saltwater intrusion, aquifer storage and recovery, and model evaluation criteria.

During this time, it was recommended that rulemaking should proceed when sufficient information was available and evaluated in the planning process. As a result, additional rules were adopted as technical information to establish MFL criteria became available. Within the Lower Kissimmee Basin (LKB) Planning Area, between 2001 and 2006, MFLs were adopted for two water bodies, Lake Istokpoga (SFWMD 2005) and Lake Okeechobee (SFWMD 2000a). The 2014 Priority Water Bodies List and Schedule submitted to the Florida Department of Environmental Protection included adoption of the reservation for

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the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project and the Kissimmee River Basin.

Lake Istokpoga

MFL criteria for Lake Istokpoga were adopted in December 2005. Significant harm criteria were based on the relationship between water levels in the lake and the health of littoral zone wetlands which provide habitat for ecologically and economically important fish and wildlife; navigational and recreational access; and maintenance of the historic runoff from Lake Istokpoga through the Indian Prairie Basin and canal system to Lake Okeechobee (SFWMD 2005). An MFL violation occurs in Lake Istokpoga when surface water levels fall below 36.5 feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD) for 20 or more weeks within a calendar year more often than once every four years (Rule 40E-8.351, F.A.C.).

As part of the management plan for the Lake Istokpoga MFL, the SFWMD installed monitoring gauges at two stations on the lake and integrated these stations into the remote monitoring network to provide data needed for operational decision-making for the S-68 Structure, the downstream discharge point for Lake Istokpoga.

Lake Okeechobee

MFL criteria for Lake Okeechobee were adopted in September 2001. Significant harm criteria were based on the relationship between water levels in the lake and the ability to 1) protect the coastal aquifer against saltwater intrusion, 2) supply water to Everglades National Park, 3) provide littoral zone habitat for fish and wildlife, and 4) ensure navigational and recreational access (SFWMD 2000a). Consideration was also given to the lake's function as a storage area for supplying water to adjacent areas, such as the Everglades Agricultural Area, the Seminole Tribe of Florida reservations, and the Lake Okeechobee Service Area. An MFL violation occurs in Lake Okeechobee when an exceedance occurs more than once every six years. An exceedance is a decline in lake level elevation below 11 feet NGVD for more than 80, nonconsecutive or consecutive, days during an 18-month period. The 18-month period is initiated following the first day Lake Okeechobee falls below 11 feet NGVD, and does not include more than one wet season, defined as May 31 through October 31 of any given calendar year (Rule 40E-8.221[1], F.A.C.).

Revised Lake Okeechobee Regulation Schedule Effects

In 2000, with the transition to the Water Supply and Environment regulation schedule, an analysis was conducted to determine whether the proposed Lake Okeechobee MFL criteria could be expected to be violated over the next 20 years. This information was needed to assess whether a prevention or recovery strategy would be needed for Lake Okeechobee. The South Florida Water Management Model was used to evaluate the proposed MFL criteria in five-year increments through 2020. The analysis considered projected growth in water use demands on the lake, the scheduled delivery and performance of the Central and Southern Florida Flood Control Project Comprehensive Review Study project components

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(USACE and SFWMD 1999), and the Water Supply and Environment regulation schedule proposed for the lake. Details regarding the modeling analysis are available in the *2000 Lower East Coast Water Supply Plan* (SFWMD 2000c).

Under these assumptions, the SFWMD found the proposed Lake Okeechobee MFL criteria would not be violated, and existing, as well as projected, users would have a 1-in-10 level of certainty provided the water shortage trigger line for Lake Okeechobee that existed in 2000 (Chapter 40E-22, F.A.C.) was lowered 0.5 feet. The proposed Water Supply and Environment regulation schedule was adopted by the United States Army Corps of Engineers (USACE) in July 2000. The SFWMD conducted rulemaking to modify the water shortage trigger line and adopted the Lake Okeechobee MFL criteria with the associated prevention strategy in 2001.

However, in response to a series of hurricanes, high lake stage events, and the resulting harmful discharges to the Caloosahatchee and St. Lucie estuaries during 2004 and 2005, the USACE initiated a process to revise the Water Supply and Environment regulation schedule to improve management of Lake Okeechobee during high water conditions. The goals of the regulation schedule modification process—known as the Lake Okeechobee Regulation Schedule Study—were later amended to address public health and safety concerns related to the structural competency of the Herbert Hoover Dike. In July 2007, after extensive public participation, the USACE published the *Final Environmental Impact Statement Including Appendices A through G – Lake Okeechobee Regulation Schedule* (USACE 2007). The revised lake regulation schedule would effectively reduce lake stages until the completion of Herbert Hoover Dike repairs for Reaches 1, 2, and 3.

In developing the environmental impact statement, the SFWMD, working with the USACE, conducted modeling to evaluate the effects of the proposed regulation schedule in terms of frequency, duration, and severity of water shortage cutbacks, and the lake's MFL performance. Results of the modeling indicated that while the regulation schedule would effectively provide protection for public health and safety, the Lake Okeechobee MFL criteria were projected to be violated and existing legal uses were projected to experience significantly greater water shortage cutbacks. Attempts to mitigate the impacts to existing legal users of Lake Okeechobee water were evaluated, including the use of portable water supply pumps (to access lake water at lower stages) and dropping the water shortage trigger line an additional foot. While lowering the water shortage trigger line would reduce the duration and severity of water shortage cutbacks associated with the proposed schedule, it was found that lowering it was inconsistent with the MFL criteria; therefore, the SFWMD rejected it as an option. Despite the increased water shortage impacts to existing legal users, the protection of public safety as related to the structural integrity of the Herbert Hoover Dike was the overarching factor. The USACE issued its record of decision approving the revised lake regulation schedule, referred to as the 2008 Lake Okeechobee Regulation Schedule (2008 LORS), on April 28, 2008.

While 2008 LORS is temporary, it is unclear when a revision can be made to the regulation schedule or what the schedule will entail. As a result, the original MFL prevention strategy

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included in the 2000 LEC Plan and Chapter 40E-8, F.A.C. was revised to a recovery strategy. The recovery strategy is discussed later in this appendix.

RECOVERY AND PREVENTION STRATEGIES

Section 373.0421, F.S. requires that once the MFL technical criteria have been established, the water management districts must develop and expeditiously implement a recovery or prevention strategy for those water bodies currently exceeding, or expected to exceed, the MFL criteria. Analyses of current and future conditions were conducted for each water body for which MFL criteria had been defined. When the evaluation showed MFL criteria were not being achieved or will not be met in the future, MFL recovery strategies were developed. When evaluations demonstrated the MFL criteria would not be expected to be violated for the next 20 years, an MFL prevention strategy was developed. The recovery or prevention strategy must include a list of projects that develop additional water supplies and other actions. The phasing or timetable for each project must be included within the strategy. Section 373.0421(2), F.S., provides the following in part:

> *The recovery or prevention strategy shall include phasing or a timetable which will allow for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures concurrent with, to the extent practical, and to offset, reductions in permitted withdrawals, consistent with the provisions of this chapter.*

Section 373.709, F.S., requires regional water supply plans to contain recovery and prevention strategies needed to achieve compliance with MFLs during the planning period. These strategies may include development of additional water supplies and implementation of conservation and other efficiency measures. The implementation of projects will allow for the orderly replacement or enhancement of existing water sources with alternative supplies to provide sufficient water for all existing and projected reasonable-beneficial uses, consistent with Section 373.0421, F.S. Additional information concerning the MFL prevention and recovery strategies can be found in Rule 40E-8.421, F.A.C.

The following sections discuss the MFL recovery and prevention strategies developed for the LKB Planning Area water bodies. These include a prevention strategy for Lake Istokpoga and recovery strategy for Lake Okeechobee. Recovery and prevention strategies consist of multiple components and may include: 1) capital projects, 2) regulatory, 3) water shortage, and 4) environmental projects.

Capital Projects Element

Projects have been identified that will provide water to meet MFL criteria, some of which have been completed and are operational. The scale of these projects ranges from relatively simple water control structures to overall rehabilitation of the Herbert Hoover Dike. Multiple agencies support the projects including Comprehensive Everglades Restoration

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Plan (CERP) projects, USACE projects, and SFWMD initiatives and programs. Details and the status of projects and programs identified can be found in **Chapter 4.**

Regulatory Element

Where a recovery strategy has been established for an MFL water body, existing permitted allocations will not be modified or revoked prior to permit expiration unless a new or alternative source is in place and operating to supply the water provided from the MFL water body or the permit use changes. When existing permits are renewed, the permittees are required to comply with all conditions of issuance. The rules implementing water resource protection tools, including Chapters 40E-2 and 40E-8, F.A.C., as well as the *Applicant's Handbook*, identify the specific factors and conditions that will be applied to evaluate consumptive uses making withdrawals from MFL water bodies. Factors considered specific to compliance with the MFL are 1) the extent of MFL shortfall directly caused by existing legal uses and 2) the practicality of avoiding the need for reductions in permitted supplies, including structural and operational measures, by maximizing the beneficial uses of the existing water source.

Water Shortage Element

Water use cutbacks during drought conditions can also be implemented (e.g., phased water shortage restrictions to prevent significant or serious harm), if necessary, to minimize or avoid MFL criteria being exceeded, to the extent consumptive uses contribute to such exceedance. The SFWMD may impose water shortage declarations to curb water use withdrawals pursuant to Sections 373.175 and 373.246, F.S. The SFWMD implemented its water shortage authority by restricting water uses based on the concept of shared adversity between users and the water resources (Chapters 40E-21 and 40E-22, F.A.C.). Under this program, different levels or phases of water shortage restrictions with varying levels of severity are imposed relative to drought conditions. The four phases of current water shortage restrictions are based on progressively increasing resource impacts leading up to serious harm. Under the current program, Phase I and II primarily reduce water use through conservation techniques and minor use restrictions that affect all users including residential, commercial/industrial, landscape/recreation, and agriculture. While each phase has cutbacks for agriculture, the latter phases, Phases III and IV, require use cutbacks associated with increased likelihood of more significant economic impact to the users, such as the potential for crop damage due to agricultural irrigation restrictions.

Established MFLs are considered in the evaluation of current water conditions (Section 40E-21.221[3][d], F.A.C.), and as one of the criteria for imposing water use restrictions (Section 40E-21-271[3][d], F.A.C.). This plan update does not propose use of Chapter 40E-21, F.A.C. as an MFL recovery strategy nor do Chapter 40E-8, F.A.C. However, when a drought occurs, the SFWMD will rely on this water shortage plan, as needed, to address regional system water availability.

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To the extent practicable, the SFWMD attempts to implement water deliveries to reduce or prevent the MFL criteria from being exceeded. In the example of Lake Okeechobee, operational guidelines needed for implementation of water supply deliveries to avoid MFL exceedances, in concert with meeting other required water demands, are identified in the *Final Adaptive Protocols for Lake Okeechobee Operations* (SFWMD 2010).

SPECIFIC MFL RECOVERY AND PREVENTION STRATEGIES

Lake Istokpoga Prevention Strategy

A prevention strategy for Lake Istokpoga was adopted simultaneously with the MFL rule to minimize the likelihood that a violation of the lake's MFL criteria would occur in the future. Based on an evaluation of future demands associated with this MFL water body, the MFL criteria are not anticipated to be exceeded in the next 20 years. The prevention strategy for Lake Istokpoga consists of continuing the current operational plan and regulation schedule, and planning and operation of extreme lake drawdowns for environmental purposes in a manner that avoids an MFL violation (Section 40E-8.421[7], F.A.C.). If significant changes to the lake's water level management occurs due to new information, altered operational plans, or regulation schedule, a re-evaluation of the MFL criteria will be conducted. The re-evaluation will occur as part of the next Lake Istokpoga MFL update, or sooner, if significant changes to lake management are proposed.

Since adoption of the Lake Istokpoga MFL in 2005, there have been no exceedances or violations of MFL criteria (**Figure B-2**). From 2006–2011, however, water shortage restrictions were implemented, occurring every year within the downstream Indian Prairie Basin. Through the implementation of these actions, the MFL for Lake Istokpoga was prevented from being exceeded.

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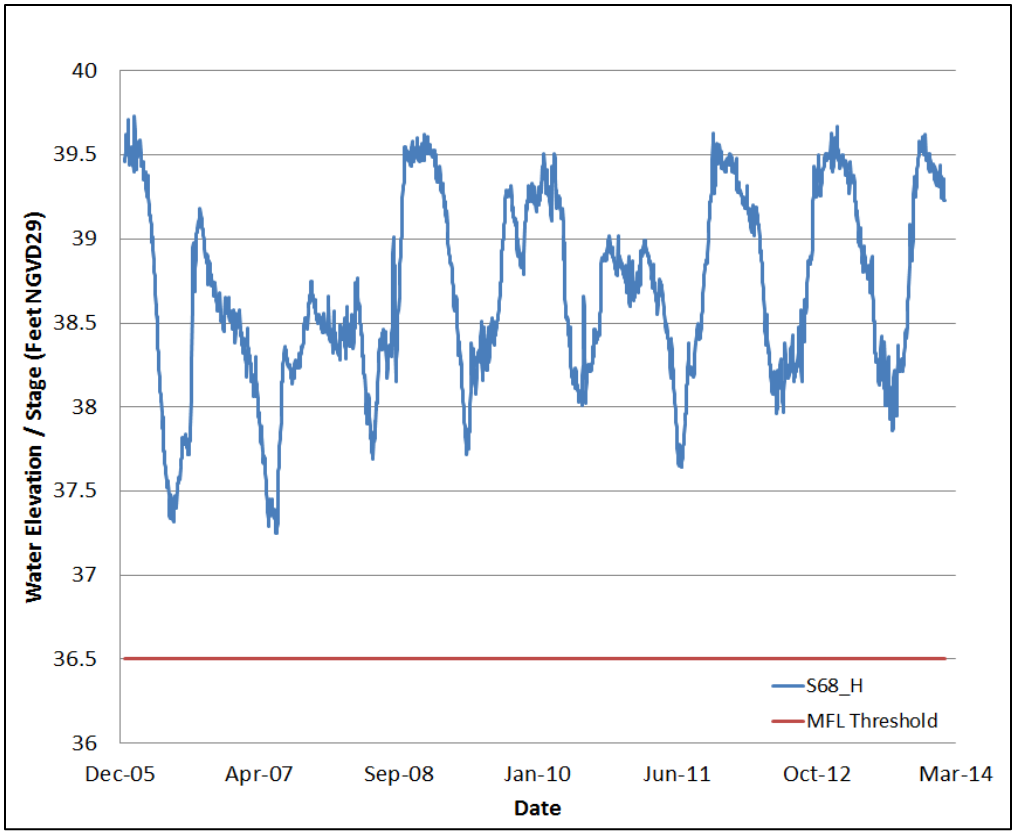

Figure B-2. Water elevations in Lake Istokpoga, from MFL adoption to the present, showing no MFL exceedances or violations.

Lake Okeechobee Recovery Strategy

As previously discussed, implementation of 2008 LORS is projected to result in MFL violations. As a result, the MFL recovery strategy is used to moderate impacts of an MFL violation during drought conditions, mitigate impacts of MFL violations during drought conditions, and depending on the USACE's lake regulation schedule in effect, minimize or avoid MFL violations. To achieve these goals, the Lake Okeechobee MFL recovery strategy includes four components, consisting of 1) environmental enhancement projects to be implemented during low lake stages, 2) regulatory constraints on consumptive use of lake water, 3) water shortage restrictions, and 4) capital projects that improve storage capacity both within and adjacent to the Lake.

Capital Project Element

The capital projects are presented in **Table B-1**. The USACE is in the process of rehabilitating the Herbert Hoover Dike. The initial step—construction of a 21.4-mile cutoff wall component in Reach 1—was completed in 2012. Completion of Reach 1 satisfies the majority of the risk reduction goals. As part of this risk reduction approach, the 32 water control structures (culverts) operated by USACE will be replaced, removed, or abandoned by 2019. Rehabilitation to Reaches 2 and 3 is scheduled for completion by 2022. The USACE

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indicated it will consider revisions to the lake regulation schedule at that time. Any increase in the lake's regulation schedule as a result of the repairs will likely be evaluated by the USACE through a National Environmental Policy Act analysis of multiple objectives including flood protection, water supply, and the ecological health of the lake and downstream ecosystems. The SFWMD anticipates any additional water resulting from a revised regulation schedule could return the lake to MFL prevention status, enhance the level of certainty to existing permitted users, and support other environmental objectives.

Additional capital projects include the construction of reservoirs north of Lake Okeechobee that will store wet season flows that would otherwise be discharged to tide under 2008 LORS.

Table B-1. Capital projects that provide water supplies for Lake Okeechobee MFL recovery strategy.[a]

Capital Projects	Program	Status
Lake Okeechobee Watershed	CERP	To be determined
Lake Okeechobee Watershed – Lakeside Ranch STA[b]	SFWMD	Phase I operational
USACE Herbert Hoover Dike Major Rehabilitation	USACE	2022 [c]

a. MFL rules identify the general programs that will be used to develop and implement prevention or recovery, rather than specific projects. The potential role of specific projects to address MFL water needs is generally considered in the respective MFL technical supporting documentation.

b. CERP project initiated by the SFWMD.

c. Time shown is for rehabilitation of Reaches 1, 2, and 3, which may be sufficient to allow additional storage in Lake Okeechobee necessary to prevent MFL violations.

Regulatory Element

The SFWMD implemented regulatory strategies for water uses of the lake that are expected to remain in effect until the Herbert Hoover Dike repairs and structural projects provide sufficient storage and adoption of an associated revised regulation schedule that minimizes or avoids Lake Okeechobee MFL violations. Since 2008 LORS effectively reduced water availability for existing users to less than the 1-in-10 year drought level of certainty and is projected to contribute to MFL violations, modifications to the water use permit application rules affecting users of Lake Okeechobee water were necessary.

A restricted allocation area rule was adopted for Lake Okeechobee in 2008. This rule protects existing legal users of Lake Okeechobee water by preventing increases in total allocations. Increased demands over the base condition water use within the Lake Okeechobee Service Area may be accommodated through reallocation of retired permits, use of alternative sources (such as groundwater), and implementation of offsets to recharge volumes equal to increased withdrawals in accordance with the rule's provisions. The rule also prevents expansion of Public Water Supply uses that exceed a specified threshold as these uses are determined incompatible with the operations, reliability, and limited availability of lake water. Temporary increases in base condition water use are allowable for limited periods as related to development of alternative water supply projects. Compliance with these rules will also assure that such uses are consistent with Everglades restoration implementation.

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Water Shortage Element

Implementation of 2008 LORS will also result in more frequent and severe lake-based water shortages. To address this, the SFWMD changed the water shortage rules pertaining to Lake Okeechobee—Lake Okeechobee Water Shortage Management (Chapter 40E-21, F.A.C.)—in November 2007 to clarify how water restrictions would be calculated and applied to agricultural uses within the Lake Okeechobee Basin. The MFL recovery strategy also includes water shortage restrictions as described in Chapter 40E-22, F.A.C.

Habitat Enhancement Element

Several lake management options can be implemented to improve Lake Okeechobee habitat and mitigate impacts from extreme low lake levels associated with droughts. Periods of low water conditions will allow the SFWMD to conduct native aquatic and tree plantings, as well as sediment scraping and other habitat enhancements, and potentially include efforts to supplement natural apple snail populations. **Table B-2** identifies some of the stage-dependent initiatives that will be undertaken by SFWMD and other agencies.

Table B-2. Habitat enhancement components of the Lake Okeechobee recovery strategy.

Lake Level	Recovery Component	Benefits
At 11 feet NGVD and stage is falling	Sediment scraping and other habitat enhancements, including removal of tussocks and other aggregations of organic material, such as the western berm.	Promote natural compaction, removal, and/or oxidation of accumulated organic muck sediments. Remove barriers to fish migration in and out of the western littoral zone.
At or below 11 feet NGVD	Conduct controlled burns if fuel load and weather conditions permit.	Facilitate the removal of exotic species, such as torpedograss (*Panicum repens*).
Below 11 feet NGVD	Allow maintenance and repair work on public boat ramps, and docking and marina facilities.	Restore original design depth of the waterways and provide navigable access.
At 10.5 feet NGVD and stage is falling	Plant native terrestrial and emergent vegetation, such as bulrush (*Scirpus* spp.) (if a method for reestablishment proves to be feasible), native pond apples (*Annona glabra*), and cypress trees (*Taxodium distichum*) on the southern shore islands and on rim canal spoil islands.	Reestablish native trees on the islands to help prevent expansion of exotic and invasive vegetation and provide essential habitat for wading birds, raptors, and endangered species, such as the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) and Okeechobee gourd (*Cucurbita okeechobeensis*).
Between 10 and 11 feet NGVD and stage is rising	Plant native vegetation species, such as SAV and emergent vegetation, such as bulrush.	Reestablish native plant species, which can prevent the expansion of exotic and invasive vegetation, assist in restoring fish and wildlife habitats, prevent uprooting of emergent and submerged plants, and reduce turbidity, which, in turn, promotes and maintains SAV growth.
At 11 feet NGVD and stage is rising	Assess the feasibility of introducing apple snail (*Pomacea paludosa*) populations via an apple snail hatchery or other techniques.	Supplement native apple snail populations for the endangered Everglade snail kite.
Nonlake stage dependent components	Investigate sediment management strategies in the tributaries and the pelagic zone of the lake.	Remove phosphorus-laden sediment that has the potential to resuspend, and thus, reduce light transparency, which discourages growth of SAV and encourages phytoplankton bloom activity.

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C

Potable Water and Wastewater Treatment Utilities

POTABLE WATER TREATMENT FACILITIES

Potable water produced in the Lower Kissimmee Basin (LKB) Planning Area is generated by large water treatment facilities, some smaller "package" water treatment facilities, and self-supply (i.e., private wells) for some individual users. This portion of the appendix focuses on the limited number of larger facilities with average pumping equal to or greater than 100,000 gallons per day (GPD) or 0.1 million gallons per day (MGD). Those facilities withdrawing 100,000 GPD or less are classified as Domestic Self Supply and are not covered in this appendix.

Descriptions of Existing Water Facilities

Raw water withdrawal sources in the LKB Planning Area include groundwater from the surficial aquifer system (SAS) and the Floridan aquifer system (FAS). Surface water from Lake Okeechobee is also used as a primary source of public supply by the Okeechobee Utility Authority. **Table C-1** describes each potable water treatment facility located in the LKB Planning Area. **Figure C-1** shows the locations of the potable water treatment facilities and their service areas in Glades, Okeechobee and Highlands counties. Additional information about each Public Water Supply utility is available from the South Florida Water Management District's (SFWMD or District) Water Use Regulatory Database (http://www.sfwmd.gov/ePermitting).

Since the *2005–2006 Kissimmee Basin Water Supply Plan Update* (2005–2006 KB Plan Update), the Seminole Tribe of Florida Brighton Reservation constructed a new water treatment plant and wellfield. The new plant supplies areas of the reservation and provides bulk water to the unincorporated community of Lakeport through the Lakeport Water Association, a private utility. The locations of other public water supply treatment plants in the LKB Planning Area remain unchanged since publication of the 2005–2006 KB Plan Update.

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Table C-1. Potable water treatment facilities in the LKB Planning Area.

Supply Entity-Facility	Water Use		Method of Treatment				Water Treatment	
	SFWMD Permit Number and Expiration Date	Annual Allocation (MGD)	Chlorination	Coagulation/ Filtration	Aeration	Nanofiltration	FDEP Permit Number	2010 Rated Capacity (MGD)
Glades County								
Brighton (STOF)	NA	NA	X	X		X	NA	0.8
Glades County Total		**NA**						**0.8**
Highlands County								
City of Sebring Utilities Dept.	28-00139W, Apr 29, 2031	0.12	X				6280250	1.0
Spring Lake Improvement District	28-00122W, Nov 13, 2018	0.32	X				5280266	0.5
Highlands County Total		**0.44**						**1.5**
Okeechobee County								
Okeechobee Correctional Institution	47-00421W, Jan 15, 2015	0.2	X		X		4474497	0.86
Okeechobee Utility Authority	47-00004W, Apr 2, 2032	3.48	X	X	X		4470257	6.0
Okeechobee County Total		**3.68**						**6.86**
LKB Planning Area Total		**4.12**						**9.16**

FDEP: Florida Department of Environmental Protection

STOF: Seminole Tribe of Florida

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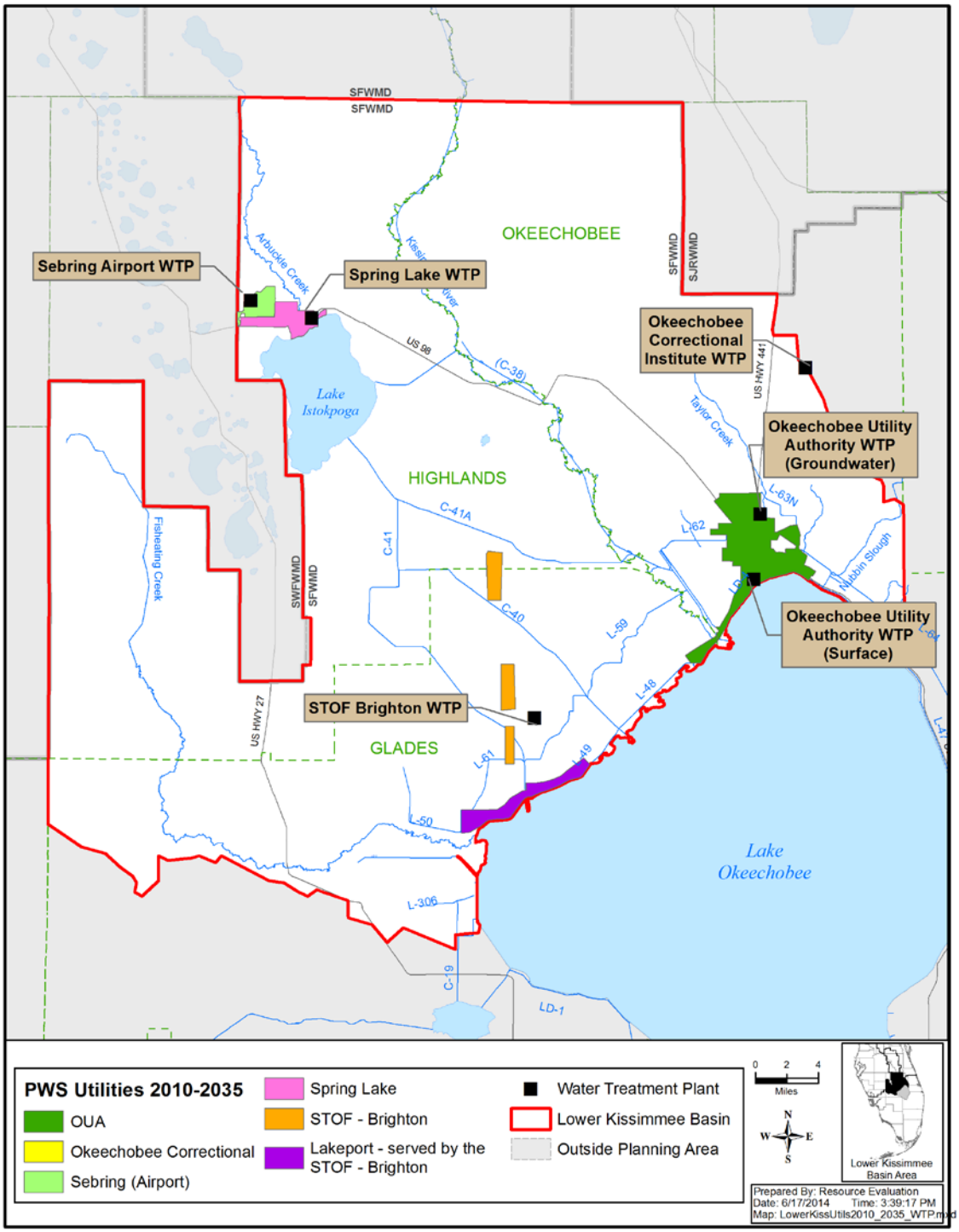

Figure C-1. PWS treatment plants and service areas in the Lower Kissimmee Basin (WTP: Water Treatment Plant; STOF: Seminole Tribe of Florida)

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Okeechobee Utility Authority Potable Treatment Facilities Descriptions

Existing Facilities

The Okeechobee Utility Authority (OUA) operates two water treatment plants that serve approximately 22,896 residents (2010 estimate) in portions of Okeechobee and Glades counties. The surface water plant withdraws water from the north shoreline of Lake Okeechobee and is rated for up to 5.0 MGD. The groundwater plant utilizes seven existing surficial aquifer wells and can withdraw up to 1.0 MGD (**Table C-2**). The OUA is currently permitted for a total of 3.48 MGD between the two facilities. The OUA's consumptive use permit expires on April 2, 2032. In 2010, water use averaged 2.23 MGD with 68 percent from the surface water plant and 32 percent from the groundwater plant.

Table C-2. Okeechobee Utility Authority potable water supply wells.

Well Number	Status	Active	Aquifer	Total Depth (ft)	Cased Depth (ft)	Well Diameter (in)	Pump Capacity (GPM)	Year Drilled
1	Existing	Yes	Surficial	155	88	10	300	1993
2	Existing	Yes	Surficial	165	98	10	400	1993
3	Existing	Yes	Surficial	155	108	10	300	1993
4	Existing	Yes	Surficial	175	108	10	250	1993
5	Existing	Yes	Surficial	175	108	10	300	1993
6	Existing	Yes	Surficial	175	108	10	300	1993
7	Existing	Yes	Surficial	175	108	10	300	1993

GPM: gallons per minute

Future Facilities

OUA has no plans to expand its current facilities.

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Okeechobee Correctional Institute Potable Treatment Facilities Descriptions

Existing Facilities

Okeechobee Correctional Institute's (OCI) water treatment plant is located on site and has a rated capacity of 0.86 MGD. It is supplied by two wells (**Table C-3**) drawing from the Floridan aquifer. Potable water is treated by aeration and chlorination. Water use at the facility averages approximately 0.17 MGD and is projected to remain at that level into the foreseeable future.

Table C-3. Okeechobee Correctional potable water supply wells.

Well Number	Status	Active	Aquifer	Total Depth (ft)	Cased Depth (ft)	Well Diameter (in)	Pump Capacity (GPM)	Year Drilled
1	Existing	Yes	Floridan	1000	550	12	1000	1994
2	Existing	Yes	Floridan	820	504	12	1000	1994

Future Facilities

There are no current plans for future facilities.

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Spring Lake Improvement District Potable Treatment Facilities Descriptions

Existing Facilities

The Spring Lake Improvement District operates a single water plant supplied by three Floridan aquifer wells. **Table C-4** provides the construction details of the utility's wells. Water use at the facility in 2010 average 0.21 MGD.

Table C-4. Spring Lake Improvement District potable water supply wells.

Well Number	Status	Active	Aquifer	Total Depth (ft)	Cased Depth (ft)	Well Diameter (in)	Pump Capacity (GPM)	Year Drilled
1	Existing	Yes	Floridan	900	300	8	300	1971
2	Existing	Yes	Floridan	1150	350	10	500	1972
3	Existing	Yes	Floridan	1000	350	10	500	1992

Future Facilities

There are no current plans for future facilities.

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Sebring Airport Potable Treatment Facilities Descriptions

Existing Facilities

The Sebring Airport water treatment plant consists of four Floridan aquifer wells (**Table C-5**) and a 200,000-gallon storage tank. The water treatment plant is also integrated with the city of Sebring's utilities system via a 12-inch water main to the Desoto City Water Plant.

The Sebring Airport system operates under Permit 28-00139-W with an allocation of 0.12 MGD. This allocation is based on projected water use demands estimated using non-residential land use water rates provided by the SFWMD's *Guidebook for the Analysis of Developments of Regional Impact* (1988). Sebring Airport's 2,141-acre service area is composed of non-residential commercial and industrial users.

Table C-5. Sebring Airport potable water supply wells.

Well Number	Status	Active	Aquifer	Total Depth (ft)	Cased Depth (ft)	Well Diameter (in)	Pump Capacity (GPM)	Year Drilled
1	Existing	Yes	Floridan	800	400	10	220	1940
2	Existing	Yes	Floridan	1060	380	10	890	1940
3	Existing	Yes	Floridan	1200	500	12	622	1997
4	Existing	Yes	Floridan	1260	500	12	1040	2002

Future Facilities

There are no current plans for future facilities.

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Seminole Tribe of Florida Brighton Reservation Potable Treatment Facilities Descriptions

Existing Facilities

The Brighton Seminole Indian Reservation operates the Brighton Water Treatment Plant to provide potable water to users within the Brighton Reservation and the neighboring community of Lakeport. The Seminole Tribe of Florida maintains a bulk water user agreement with Lakeport Water Association, Inc. for supply of up to 300,000 GPD of finished potable water.

The Tribe completed the Brighton Water Treatment Plant in 2009. It replaced a leased off-site wellfield and water treatment plant. The Brighton Water Treatment Plant and its associated wellfield are located on the Brighton Seminole Indian Reservation and are operated under authorizations provided in the Water Rights Compact Among the Seminole Tribe of Florida, the State of Florida, and the South Florida Water Management District (Second Amendment to the Seventeenth Annual Work Plan). Once the new treatment facility became operational, the Seminole Tribe of Florida ceased utilization of the leased water treatment plant and withdrew the related water use permit (22-00183-W).

The Brighton Water Treatment Plant's water source consists of eight surficial aquifer wells. The wellfield is designed to produce up to 1 MGD. The treatment train at the plant consists of coagulation, microfiltration, and nanofiltration. The filtration reject water is blended with surface water and disposed of via a sprayfield near the plant. The plant's designed capacity is for an annual average demand of 0.4 MGD and maximum daily production of 0.8 MG. In 2010 the Brighton Water Treatment Plant produced 0.41 MGD of finished potable water and withdrew 0.46 MGD of raw water from the wellfield.

Future Facilities

There are no current plans for future facilities.

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WASTEWATER TREATMENT UTILITIES/FACILITIES

Wastewater treatment is accomplished through regional wastewater treatment facilities (WWTFs), smaller "package plants," and septic tanks. The focus of this portion of this appendix is on the larger facilities with a Florida Department of Environmental Protection (FDEP) permitted capacity of 0.1 MGD or more. These larger treatment facilities allow economy of operation and have sufficient flows that could positively impact water resources through use of reclaimed water. Many facilities are located in areas close to potential reclaimed water users.

As of 2014, there are two domestic wastewater treatment facilities, the Okeechobee Utility Authority and the Okeechobee Correctional Institution (**Figure C-2**), with permitted treatment capacity of 0.1 MGD or greater. Additional wastewater treatment facilities are operated at the Sebring Airport, Spring Lakes subdivision and the Seminole Tribe of Florida, but these have capacities below 0.1 MGD. **Table C-6** lists the LKB Planning Area's WWTFs and provides the 2010 average daily reuse flows. **Table C-7** shows reuse predictions for 2035 for the same utilities. Existing reclaimed water use within the LKB Planning Area is based on FDEP's 2010 Reuse inventory (FDEP 2011) with projections for 2035 based on a ratio or percentage of the projected potable water used by the same utility. Secondary sources of information include planning documents, such as 10-Year Water Supply Facilities Work Plans prepared by the local governments (City of Okeechobee 2009, Okeechobee Utility Authority 2008).

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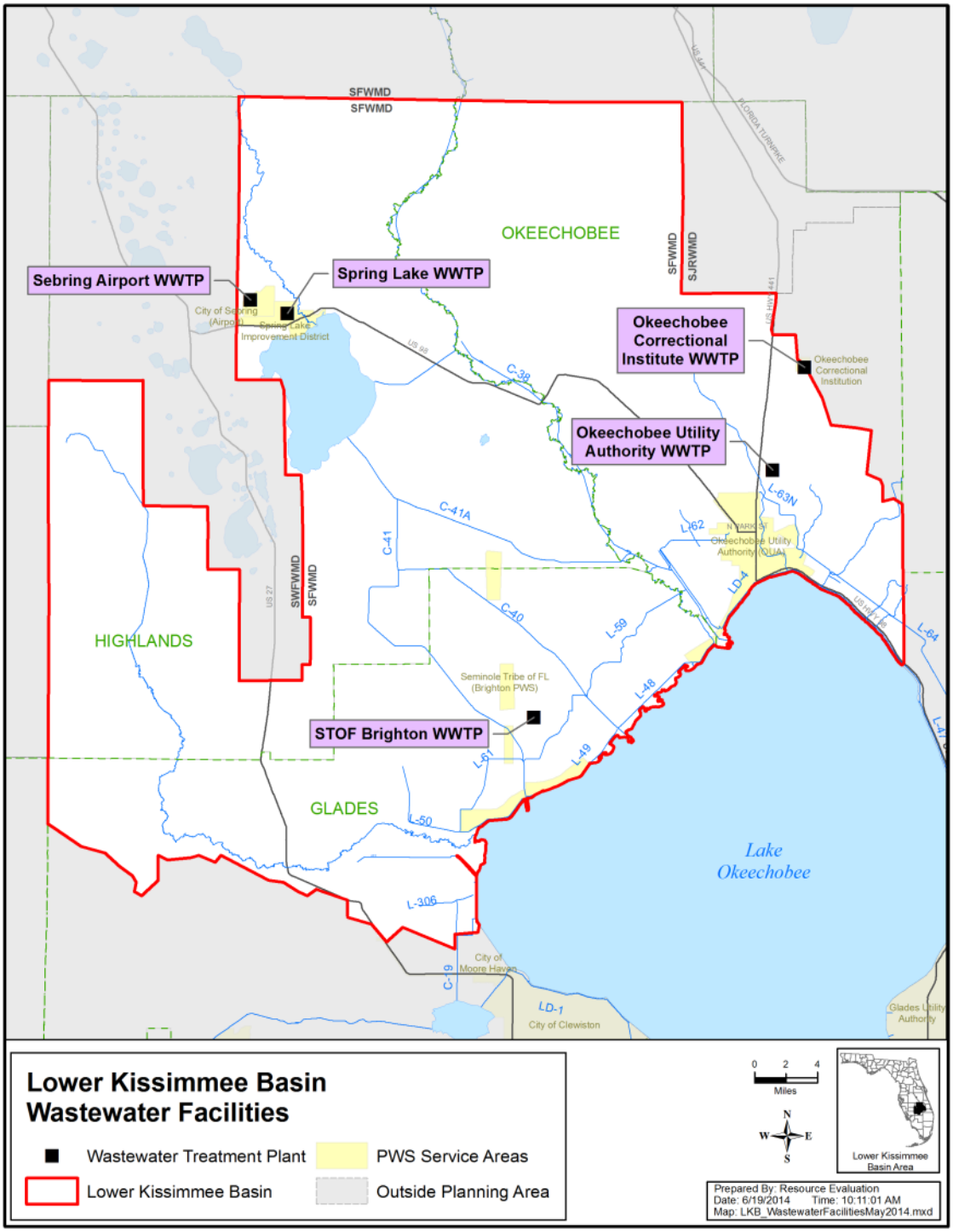

Figure C-2. Wastewater treatment facilities in the Lower Kissimmee Basin.

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Table C-6. Summary of 2010 reuse by wastewater facilities within the LKB (FDEP 2011).

Entity/Facility[a]	Residential Irrigation (MGD)	Golf Course Irrigation (MGD)	Agricultural Irrigation (MGD)	Other Public Access Irrigation[b] (MGD)	Groundwater Recharge[c] (MGD)	Other Reuse Types[d] (MGD)
Okeechobee Correctional Institution	0.00	0.00	0.09	0.00	0.00	0.00
Okeechobee Utility Authority	0.00	0.00	0.73	0.00	0.00	0.04
Total	**0.00**	**0.00**	**0.82**	**0.00**	**0.00**	**0.04**

a. Sebring Airport and the Seminole Tribe of Florida are not included as reclaimed flows were less than 0.1 MGD.
b. Other Public Access Irrigation = Parks, schools, common areas, etc.
c. Groundwater Recharge = rapid infiltration basins, percolation ponds, etc.
d. Other Reuse Types = other permitted uses, such as cooling water at the treatment facility or at other facilities, toilet flushing, etc.

Table C-7. Predicted 2035 reuse by wastewater facilities within the LKB.

Entity/Facility[a]	Residential Irrigation (MGD)	Golf Course Irrigation (MGD)	Agricultural Irrigation (MGD)	Other Public Access Irrigation[b] (MGD)	Groundwater Recharge[c] (MGD)	Other Reuse Types[d] (MGD)
Okeechobee Correctional Institution	0.00	0.00	0.09	0.00	0.00	0.00
Okeechobee Utility Authority	0.00	0.00	0.92	0.00	0.00	0.05
Total	**0.00**	**0.00**	**1.01**	**0.00**	**0.00**	**0.05**

a. Sebring Airport and the Seminole Tribe of Florida are not included as reclaimed flow are expected to be less than 0.1 MGD.
b. Other Public Access Irrigation = Parks, schools, common areas, etc.
c. Groundwater Recharge = rapid infiltration basins, percolation ponds, etc.
d. Other Reuse Types = other permitted uses, such as cooling water at the treatment facility or at other facilities, toilet flushing, etc.

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Okeechobee Utility Authority WWTF Description

Existing Wastewater/Reclaimed

The OUA WWTF has an FDEP-rated capacity of 1.23 MGD. In 2010, the average daily wastewater flow treated by the facility was 0.77 MGD, of which 0.68 MGD was reused for irrigation of an adjoining 761-acre citrus grove. According to computer-based modeling, the annual irrigation demand of the grove is estimated at 310 million gallons, which is at or more than the utility currently provides on an annual basis. Additionally the utility provides reclaimed water for on-site irrigation and other incidental uses related to production.

Future Wastewater/Reclaimed

The OUA currently has no plans to expand its reclaimed water system beyond its current design. The OUA has examined expanding its wastewater service into the remaining areas of the City of Okeechobee and surrounding unincorporated areas of Okeechobee and Glades counties. Based on projected growth, the wastewater flows at the OUA WWTF are projected to increase to 0.97 MGD by 2035 and reuse to increase to 0.92 MGD.

Okeechobee Correctional Institute WWTF Description

Existing Wastewater/Reclaimed

The OCI WWTF has an FDEP-rated capacity of 0.2 MGD. The system uses extended aeration and disposal by spray irrigation after basic disinfection. Reclaimed water use in 2010 was 0.09 MGD.

Future Wastewater/Reclaimed

The OCI currently has no plans to expand its wastewater system beyond its current design. Given that the facility is not growing, reclaimed water use is expected to remain stable at 0.09 MGD.

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REFERENCES

City of Okeechobee. 2009. *City of Okeechobee Proposed 10-Year Water Supply Facilities Work Plan 2009 – 2019*. Prepared by LaRue Planning & Management Services, Inc. for the City of Okeechobee, FL.

FDEP. 2011. *2010 Reuse Inventory.* Water Reuse Program, FDEP, Tallahassee, FL.

Okeechobee Utility Authority. 2008. *Okeechobee Utility Authority Wastewater Master Plan*. Prepared by Metzger & Willard, Inc. for the Okeechobee Utility Authority, Okeechobee, FL.

SFWMD. 1988. *Guidebook for the Analysis of Developments of Regional Impacts*. South Florida Water Management District, West Palm Beach, FL.

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D

Information for Local Government Comprehensive Plans

The SFWMD prepares water supply plans for each of its four planning areas to effectively support planning initiatives and address local issues. The regional water supply plans encompass a 20-year future planning horizon and are updated every five years. All local governments are required by statute to update their water supply facilities work plan (work plan) and adopt revisions to their comprehensive plan within 18 months following the approval of the applicable regional water supply plan.

This appendix contains water supply planning information useful to local governments in preparing and amending comprehensive plans. In addition to this appendix, the following chapters and appendices are particularly relevant for local governments:

Water Sources	Chapters 4 and 6; Appendix C
Utility Areas Served (2010 and 2035)	Chapter 6; Appendices B and D
Population Projections (2010–2035)	Chapter 2; Appendix A
Demand Projections (2010–2035)	Chapter 2; Appendix A
Water Supply Projects (2005–2035)	Chapter 6; Appendix C

This appendix includes the following information useful for the review and revision of local government comprehensive plans:

1. The SFWMD Checklist of Needed Comprehensive Plan Data
2. Relevant portions of cited statutory provisions
3. Tables identifying which utilities serve each Lower Kissimmee Basin (LKB) Planning Area jurisdiction
4. Maps of utility areas currently served (2010) and future utility service areas expected to be served (2035)

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1. CHECKLIST OF NEEDED COMPREHENSIVE PLAN DATA

Local governments are required to plan for their water and wastewater needs along with other infrastructure and public service elements of their comprehensive plan. This section provides a general checklist of the type of data and information the SFWMD water supply planning staff look for during their review of the water supply element, policies, and other topics in the local government comprehensive plans. This checklist is not all inclusive, but provides a broad, general framework for use with the more detailed Florida Department of Economic Opportunity (FDEO) related guidelines and SFWMD comments on specific water supply topics.

Checklist guidance is given for three water supply-related aspects of comprehensive plans:

A. Work plans and other potable water sub-element revisions
B. Evaluation and appraisal of comprehensive plan requirements
C. Plan amendments (future land use change)

A. Work Plan and Other Potable Water Sub-Element Revisions

(Within 18 months following publication of this 2014 LKB Plan)

Overall Guidance

For consistency in the water supply planning process, the SFWMD, local governments, and utilities work closely with the Florida Department of Economic Opportunity (FDEO), projecting demands and proposing water supply projects for the future. This 2014 LKB Plan provides water demand estimates, water source options, and water supply development projects to ensure adequate water supplies to support the region. Local governments should demonstrate consistency with the regional water supply plan and updates when developing or updating their work plans. The following guidance is provided to local governments for updating their work plans.

Review this 2014 LKB Plan and Confirm Public Water Supply Entities Providing Service within Local Government's Jurisdiction

To be consistent with the regional water supply plan and updates, the local government's work plan should be in agreement with the major Public Water Supply (PWS) entities serving most of the urban population. This 2014 LKB Plan identifies PWS entities with projected average pumpages greater than 0.1 MGD, serving most of the urban population. Some smaller communities or municipalities may not be identified. The FDEO guidance for work plans recommends including all small community systems and Domestic Self-Supply (DSS) users on private wells.

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This 2014 LKB Plan provides information about PWS entities and urban water use by PWS service area. To be consistent with the regional water supply plan, at a minimum, the local government's work plan should identify the urban water demand and adequacy of PWS water sources within the municipal boundary to meet such water demand. If appropriate, the sale or purchase of water from PWS entities with service areas outside of the municipal boundary should also be identified.

Review PWS Utility Summaries Provided in Chapter 6 of this 2014 LKB Plan

The SFWMD worked with staff from PWS entities whose withdrawals average greater than 100,000 gallons per day (GPD) to identify water supply development projects for this 2014 LKB Plan. Utility summaries were compiled using information from various sources, including input from PWS entities. The utility summaries provide baseline information about finished water demands, existing permitted sources and allocations, and recently constructed and proposed projects that create water capacity, as well as other related information. Multiple sources of water supply may be needed to accommodate projected water demand in future years. Public Water Supply entity staff should confirm the information provided in the utility summaries of this 2014 LKB Plan. Within 12 months of adoption of this plan, PWS entities must respond to the SFWMD with their intentions to develop and implement the projects identified by this plan, or provide a list of other projects or methods to meet water demands.

The local government's work plan should be in general agreement with this 2014 LKB Plan utility summaries' water sources and schedule of water sources to be made available to meet projected water demands. However, it is not necessary to use the same population projections or per capita use rates used by the regional water supply plan to project water demand. Generally accepted professional planning methods may be used as input to the local planning process, which may result in differences between the demand and supply estimates provided in this Plan's utility summaries. If planning assumptions or information differs from what is provided in the utility summaries, the work plan should identify and explain the basis for any differences.

Furthermore, consistency between a work plan and regional water supply plan does not require the same planning period. The minimum planning period for regional water supply plans is 20 years (referred to as the 20-year planning horizon). However, a minimum 10-year planning period is required (Section 163.3177[6][c][3], Florida Statutes [F.S.]) and a 20-year planning period is preferred.

Additional information about developing a work plan is available from the FDEO website, http://www.floridajobs.org/community-planning-and-development/programs/technical-assistance/planning-initiatives/natural-resource-planning/water-supply-planning.

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Checklist of Key Considerations

Water Supply Demand Projections

- Review the 2014 LKB Plan and revise the local government's adopted work plan to be consistent with the water demand estimates and population projections cited in this plan.

  The objective is to provide best available data. If the local government can provide data that improves data in this 2014 LKB Plan, then the local government data should be used in the work plan. All differences in water demand estimates and population projections used in the work plan should be identified and explained.
  - Plan for both raw and finished (i.e., water volume after any losses due to water treatment) water supply demands within the city or county jurisdiction for each supplier.
  - The projections should cover at least a 10-year planning period, but projections for the entire established local government comprehensive plan's planning period are preferred.
  - The projections should plan for the building of all public, private, and regional water supply facilities and bulk sales of water that will be necessary to provide water supply service within the local government's jurisdiction.

Water Source Identification

- Review the water supply sources identified by the local government or its water suppliers as necessary to meet and achieve the existing and projected water use demand for the established planning period.
  - Compare this information with the available sources in this 2014 LKB Plan .

- Provide separate projections for existing and future DSS.
  - Identify the general areas served by DSS.

Water Supply Project Identification

- Either incorporate water supply project(s) selected by the local government's utility or utilities providing PWS to the local government, as identified in the regional water supply plan, or propose alternatives for inclusion in the work plan.
  - All other public and private water supply capital improvements, including wells, treatment plants, distribution systems, etc., necessary to maintain level of service standards within the jurisdiction should also be included in the work plan.

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- Coordinate the work plan water supply projects with this 2014 LKB Plan and the water supplier(s) annual progress reports.
  - Update the work plan accordingly.

- Identify sufficient water conservation, reclaimed water, and water supply projects necessary to meet projected demands.

- Update the capital improvements element as required.

Water Supply Intergovernmental Coordination

- The work plan should address ongoing and future coordination with existing and future water supply and reuse providers for meeting future demands. This should occur before, during, and after the regional water supply plan update process.

- Review existing and future utility service areas for each provider within the jurisdiction. Refer to the maps provided in this appendix. Compare and update the work plan as needed.
  - Identify existing or potential service area conflicts and solutions. Include a conflict resolution policy.
  - Ensure all areas of the local government are accounted for by the local governments' own utility or other providers.

- Review and update the work plan language concerning needed coordination with water supplier(s), other local governments and entities, and others.
  - Include updates to agreements (e.g., bulk service agreements and interconnect agreements).

Related Comprehensive Plan Amendments

- If additional revisions are needed for coordination with this 2014 LKB Plan, but not listed here, incorporate changes into the comprehensive plan and work plan, as appropriate.

  This 2014 LKB Plan will require changes to the work plan and possibly other elements within the comprehensive plan. Revisions may include population projections, established planning period, existing and future water resource projects, intergovernmental coordination activities, conservation and reuse measures, and the capital improvements element.
  - Review the comprehensive plan for consistency between all elements of the work plan and other comprehensive plan elements in consideration of all proposed modifications to the comprehensive plan. Other comprehensive plan elements include, but may not be limited to, future land use, potable water, sanitary sewer, conservation, intergovernmental coordination, and capital improvements.

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B. Evaluation and Appraisal Report of Comprehensive Plans Sections 163.3191(1–3), F.S.

(Evaluation of the comprehensive plan after the adoption of a work plan)

Water Supply Project Identification and Selection

At least every seven years, local governments must evaluate whether there is a need to amend their comprehensive plan since the last comprehensive water supply plan update. The evaluation should address changes in state requirements since the last update of the comprehensive plan.

While an evaluation and appraisal report is not required, local governments are encouraged to comprehensively evaluate, and as necessary, update comprehensive plans to reflect changes in local conditions. The evaluation could address the following issues related to their work plans.

- Identify the extent to which the local government has been successful in identifying water supply projects, including water conservation and reuse, necessary to meet projected demands.
- Evaluate the degree to which the work plan has been implemented for building all public, private, and regional water supply facilities within the jurisdiction necessary to meet projected demands.
- Include recommendations for revising the work plan and the applicable comprehensive plan elements to address the conclusions of the evaluation, as necessary.

C. Plan Amendments (Future Land Use Change)

Water Supply Demand Projections

- Address both raw and finished (i.e., after any losses due to water treatment) water supply needs for both potable and non-potable (i.e., irrigation) demands, using professionally acceptable methodologies for population projections and per capita use rates.
- Address existing and future water conservation and reuse commitments, and levels of service (i.e., per capita use rates), for both the proposed future land use change and the comprehensive plan.
- Address both the build-out time frame for a proposed future land use change and the established planning time frame for the comprehensive plan.

Water Source Identification

- For existing demands, reflect water source(s) from supplier's consumptive use permit (CUP).
- For future demands covered by a supplier's commitment to provide service under remaining available capacity of an existing consumptive use permit, reflect the source(s) from the supplier's CUP, including bulk supply contracted quantities, duration, and provider.

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- For future demands not covered by an existing CUP, provide sufficient planning-level data and analysis to demonstrate the availability of a sustainable water source as identified in the appropriate SFWMD regional water supply plan.

Availability of Water Supply and Public Facilities

- Demonstrate that there is an availability of raw water supply from the proposed source(s) of raw supply for the future land use change, given all other approved land use commitments within the local government's jurisdiction over both the proposed amendment's build-out and the established planning period of the comprehensive plan (see Section 163.3167[9], F.S., and Section 163.3177[6][a], F.S.).
- Demonstrate that there is an availability of both treatment facility capacity and permitted, available finished water supply for the future land use change, given all other commitments for that capacity and supply over the proposed build-out time frame.
- If the availability of either water supply and/or public facilities is not currently demonstrable, this will require either phasing of the future land use (see Section 163.3177[6][h], F.S.), and/or appropriate amendments to the capital improvements element/potable water sub-element, to ensure the necessary capital planning and timely availability of the needed infrastructure and water supply (see Sections 163.3177[3][a], 163,3177[6][c], and 163.3177[6][h]3.b., F.S.).
- If the water provider is an entity other than the local government responsible for the comprehensive plan amendment, demonstrate that coordination of the plan amendment has occurred between the water provider and the local government (see Section 163.3177[6][h]3.b., F.S.).

Related Comprehensive Plan Amendments

- A future land use change may also require amendments to other specific elements within the comprehensive plan if it requires an adjustment to either the plan's future population or demand projections, the comprehensive plan's established planning period, the water supply sources, or water providers required to be addressed in the comprehensive plan (see Sections 163.3167[9], 163.3177[5][a], 163.3177[6][a], 163.3177[6][c], 163.3177[6][d], and 163.3180, F.S.).

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2. CITED FLORIDA STATUTE PROVISIONS (RELEVANT PORTIONS)

163.3167(9): Each local government shall address in its comprehensive plan, as enumerated in this chapter, the water supply sources necessary to meet and achieve the existing and projected water use demand for the established planning period, considering the applicable plan developed pursuant to s. 373.709.

163.3177(3)(a): The comprehensive plan shall contain a capital improvements element designed to consider the need for and the location of public facilities in order to encourage the efficient use of such facilities and set forth:

1. A component that outlines principles for construction, extension, or increase in capacity of public facilities, as well as a component that outlines principles for correcting existing public facility deficiencies, which are necessary to implement the comprehensive plan. The components shall cover at least a five-year period.

2. Estimated public facility costs, including a delineation of when facilities will be needed, the general location of the facilities, and projected revenue sources to fund the facilities.

3. Standards to ensure the availability of public facilities and the adequacy of those facilities including acceptable levels of service.

4. A schedule of capital improvements which includes any publicly funded project of federal, state, or local government, and which may include privately funded projects for which the local government has no fiscal responsibility. Projects necessary to ensure that any adopted level-of-service standards are achieved and maintained for the five-year period must be identified as either funded or unfunded and given a level of priority for funding.

163.3177(4)(a): Coordination of the local comprehensive plan with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region; with the appropriate water management district's regional water supply plans approved pursuant to s. 373.709; and with adopted rules pertaining to designated areas of critical state concern shall be a major objective of the local comprehensive planning process. To that end, in the preparation of a comprehensive plan or element thereof, and in the comprehensive plan or element as adopted, the governing body shall include a specific policy statement indicating the relationship of the proposed development of the area to the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, as the case may require and as such adopted plans or plans in preparation may exist.

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163.3177(5)(a): Each local government comprehensive plan must include at least two planning periods, one covering at least the first five-year period occurring after the plan's adoption and one covering at least a 10-year period. Additional planning periods for specific components, elements, land use amendments, or projects shall be permissible and accepted as part of the planning process.

163.3177(6)(a): A future land use plan element designating proposed future general distribution, location, and extent of the uses of land for residential uses, commercial uses, industry, agriculture, recreation, conservation, education, public facilities, and other categories of the public and private uses of land. The approximate acreage and the general range of density or intensity of use shall be provided for the gross land area included in each existing land use category. The element shall establish the long-term end toward which land use programs and activities are ultimately directed.

163.3177(6)(a)2. The future land use plan and plan amendments shall be based upon surveys, studies, and data regarding the area, as applicable including:

a. The amount of land required to accommodate anticipated growth.

b. The projected permanent and seasonal population of the area.

c. The character of undeveloped land.

d. The availability of water supplies, public facilities, and services.

e. The need for redevelopment, including the renewal of blighted areas and the elimination of nonconforming uses which are inconsistent with the character of the community.

163.3177(6)(c): A general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge element correlated to principles and guidelines for future land use, indicating ways to provide for future potable water, drainage, sanitary sewer, solid waste, and aquifer recharge protection requirements for the area. The element may be a detailed engineering plan including a topographic map depicting areas of prime groundwater recharge.

1. Each local government shall address in the data and analyses required by this section those facilities that provide service within the local government's jurisdiction. Local governments that provide facilities to serve areas within other local government jurisdictions shall also address those facilities in the data and analyses required by this section, using data from the comprehensive plan for those areas for the purpose of projecting facility needs as required in this subsection. For shared facilities, each local government shall indicate the proportional capacity of the systems allocated to serve its jurisdiction.

2. The element shall describe the problems and needs and the general facilities that will be required for solution of the problems and needs

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including correcting existing facility deficiencies. The element shall address coordinating the extension of, or increase in the capacity of, facilities to meet future needs while maximizing the use of existing facilities and discouraging urban sprawl; conserving potable water resources; and protecting the functions of natural groundwater recharge areas and natural drainage features.

3. Within 18 months after the governing board approves an updated regional water supply plan, the element must incorporate the alternative water supply project or projects selected by the local government from those identified in the regional water supply plan pursuant to s. 373.709(2)(a) or proposed by the local government under s. 373.709(8)(b). If a local government is located within two water management districts, the local government shall adopt its comprehensive plan amendment within 18 months after the later updated regional water supply plan. The element must identify such alternative water supply projects and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in s. 373.709(2)(a) within the local government's jurisdiction and include a work plan, covering at least a 10 year planning period, for building public, private, and regional water supply facilities, including development of alternative water supplies, which are identified in the element as necessary to serve existing and new development. The work plan shall be updated, at a minimum, every five years within 18 months after the governing board of a water management district approves an updated regional water supply plan. Local governments, public and private utilities, regional water supply authorities, special districts, and water management districts are encouraged to cooperatively plan for the development of multijurisdictional water supply facilities that are sufficient to meet projected demands for established planning periods, including the development of alternative water sources to supplement traditional sources of groundwater and surface water supplies.

163.3177(6)(d): A conservation element for the conservation, use, and protection of natural resources in the area, including air, water, water recharge areas, wetlands, water wells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources, including factors that affect energy conservation.

1. The following natural resources, where present within the local government's boundaries, shall be identified and analyzed and existing recreational or conservation uses, known pollution problems, including hazardous wastes, and the potential for conservation, recreation, use, or protection shall also be identified:

   a. Rivers, bays, lakes, wetlands including estuarine marshes, groundwaters, and springs, including information on quality of the resource available.

   b. Floodplains.

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2. The element must contain principles, guidelines, and standards for conservation that provide long-term goals and which:

   b. Conserves, appropriately uses, and protects the quality and quantity of current and projected water sources and waters that flow into estuarine waters or oceanic waters and protect from activities and land uses known to affect adversely the quality and quantity of identified water sources, including natural groundwater recharge areas, wellhead protection areas, and surface waters used as a source of public water supply.

   c. Provides for the emergency conservation of water sources in accordance with the plans of the regional water management district.

3. Current and projected needs and sources for at least a 10-year period based on the demands for industrial, agricultural, and potable water use and the quality and quantity of water available to meet these demands shall be analyzed. The analysis shall consider the existing levels of water conservation, use, and protection and applicable policies of the regional water management district and further must consider the appropriate regional water supply plan approved pursuant to s. 373.709, or, in the absence of an approved regional water supply plan, the district water management plan approved pursuant to s. 373.036(2). This information shall be submitted to the appropriate agencies…

163.3177(6)(h)1: An intergovernmental coordination element showing relationships and stating principles and guidelines to be used in coordinating the adopted comprehensive plan with the plans of school boards, regional water supply authorities, and other units of local government providing services but not having regulatory authority over the use of land, with the comprehensive plans of adjacent municipalities, the county, adjacent counties, or the region, with the state comprehensive plan and with the applicable regional water supply plan approved pursuant to s. 373.709, as the case may require and as such adopted plans or plans in preparation may exist…

   a. The intergovernmental coordination element must provide procedures for identifying and implementing joint planning areas, especially for the purpose of annexation, municipal incorporation, and joint infrastructure service areas.

163.3177(6)(h)3.b: Ensure coordination in establishing level of service standards for public facilities with any state, regional, or local entity having operational and maintenance responsibility for such facilities.

163.3180, F.S.: Concurrency.—

163.3180(1)(a): Sanitary sewer, solid waste, drainage, and potable water are the only public facilities and services subject to the concurrency requirement on a statewide basis…

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163.3180(1)(b): The local government comprehensive plan must demonstrate, for required or optional concurrency requirements, that the levels of service adopted can be reasonably met. Infrastructure needed to ensure that adopted level-of-service standards are achieved and maintained for the 5-year period of the capital improvement schedule must be identified pursuant to the requirements of s. 163.3177(3). The comprehensive plan must include principles, guidelines, standards, and strategies for the establishment of a concurrency management system.

163.3180(2): Consistent with public health and safety, sanitary sewer, solid waste, drainage, adequate water supplies, and potable water facilities shall be in place and available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent. Prior to approval of a building permit or its functional equivalent, the local government shall consult with the applicable water supplier to determine whether adequate water supplies to serve the new development will be available no later than the anticipated date of issuance by the local government of a certificate of occupancy or its functional equivalent…

163.3180(3): Governmental entities that are not responsible for providing, financing, operating, or regulating public facilities needed to serve development may not establish binding level-of-service standards on governmental entities that do bear those responsibilities.

163.3191: **Evaluation and appraisal of comprehensive plan.—**

163.3191(1): At least once every 7 years, each local government shall evaluate its comprehensive plan to determine if plan amendments are necessary to reflect changes in state requirements in this part since the last update of the comprehensive plan, and notify the state land planning agency as to its determination.

163.3191(2): If the local government determines amendments to its comprehensive plan are necessary to reflect changes in state requirements, the local government shall prepare and transmit within 1 year such plan amendment or amendments for review pursuant to s. 163.3184.

163.3191(3): Local governments are encouraged to comprehensively evaluate and, as necessary, update comprehensive plans to reflect changes in local conditions…

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3. UTILITIES AND JURISDICTIONS SERVED

This section contains two tables showing local government jurisdictions and the utilities that provide raw or finished water to those local governments. These utilities have treatment capacity and water use greater than 0.1 MGD.

Table D-1 identifies the local governments within the jurisdiction of the LKB Planning Area and the Public Water Supply (PWS) utilities serving those local governments. The first column in **Table D-1** lists the name of the local government, and the second column identifies whether that local government owns and operates a PWS utility (yes or no). If the local government does not own and operate a PWS utility, the third column identifies the other local government or private PWS utility or utilities providing raw or finished water to that local government.

Conversely, **Table D-2** identifies the PWS utilities providing raw or finished water to the local governments within the jurisdiction of the LKB Planning Area. The first column of **Table D-2** lists the name of the PWS utility, and the second column identifies whether the utility is local government-owned and operated (yes or no). The third column identifies the incorporated and unincorporated areas of the LKB Planning Area within that PWS utility's service area.

Table D-1. Utilities and entities that serve local governments in the LKB Planning Area.

Local Government	Local Government Utility	Other Utility Serving Local Government
Glades County		
Glades County *(unincorporated)*	No	Seminole Tribe of Florida (bulk sales from Brighton Seminole Indian Reservation to Lakeport Water Association); Okeechobee Utility Authority
Highlands County		
Highlands County *(unincorporated)*	No	Spring Lake Improvement District; City of Sebring Utilities Dept. (serving Sebring Regional Airport)
Sebring, City of	Yes	--
Okeechobee County		
Okeechobee County *(unincorporated)*	No	Okeechobee Utility Authority; Okeechobee Correctional Institution
Okeechobee, City of	Yes	Okeechobee Utility Authority

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Table D-2. Utilities and local governments that serve the LKB Planning Area.

Utility Name	Local Government Utility	Local Governments Served
Glades County		
Lakeport Water Association	No	Glades County
Highlands County		
Sebring, City of	Yes	Highlands County, City of Sebring
Spring Lake Improvement District	No	Highlands County
Okeechobee County		
Okeechobee Correctional Institution	No	Okeechobee County
Okeechobee Utility Authority	Yes	City of Okeechobee; Okeechobee County; and a portion of Glades County

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4. Map of Utility Areas Currently Served (2010) and Future Utility Area Service (2035)

The locations of the utilities listed in **Table D-2** are shown in **Figure D-1**. The map indicates the service areas listed for those potable utilities providing service in the portions of Glades, Okeechobee, and Highlands counties within the LKB Planning Area. Service areas in 2010 are not projected to significantly expand by 2035.

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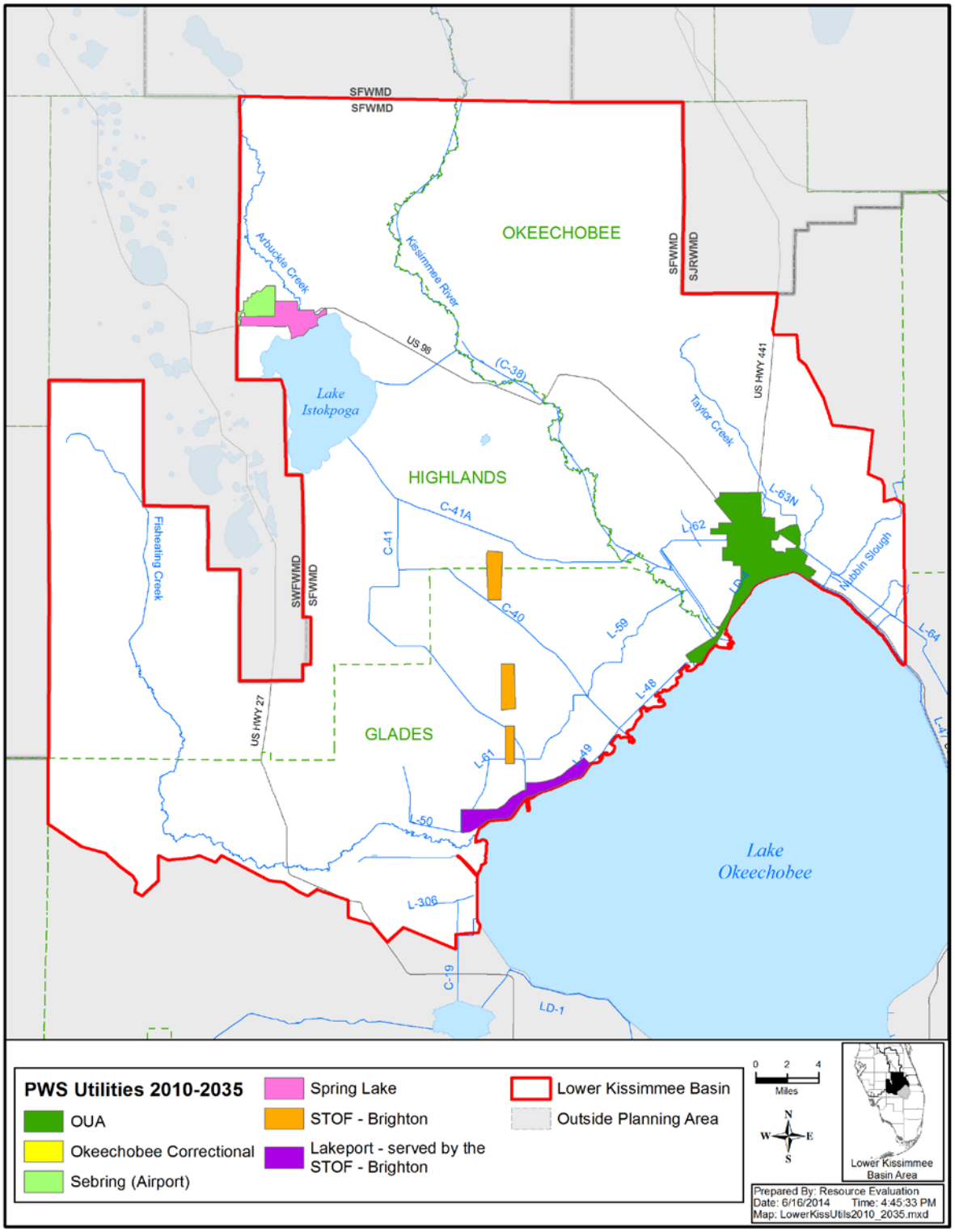

Figure D-1. 2010 Potable Utility Service Areas in LKB Planning Area.

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Meeting South Florida's water supply needs while safeguarding its natural systems requires innovative solutions, cohesive planning, and a shared vision.

South Florida Water Management District

Committed to managing and protecting our region's water resources

South Florida Water Management District
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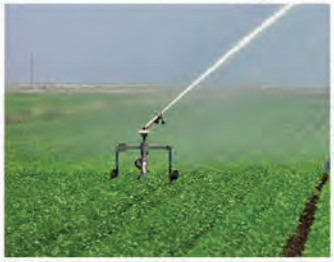
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Reference Document



SUPPORT DOCUMENT
WATER SUPPLY PLAN UPDATE

2011-14

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2011-2014

WATER SUPPLY PLAN SUPPORT DOCUMENT

2011–2014 Water Supply Plan Support Document
September 2014

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The South Florida Water Management District thanks everyone who contributed to the development and production of this 2011–2014 Water Supply Plan Support Document.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
ASR	Aquifer Storage and Recovery
AWE	Alliance for Water Efficiency
bls	below land surface
BMP	best management practice
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
CFCA	Central Florida Coordination Area
cfs	cubic feet per second
CFWI	Central Florida Water Initative
CREW	Corkscrew Regional Ecosystem Watershed
CUPCon	statewide consumptive use permit consistency effort
CWCP	Comprehensive Water Conservation Program
DBP	disinfectant/disinfection by-product
District	South Florida Water Management District
DWMP	District Water Management Plan
DWSA	Districtwide Water Supply Assessment
EAA	Everglades Agricultural Area
ERTP	Everglades Restoration Transition Plan
ET	evapotranspiration
ETp	potential evapotranspiration
F.A.C.	Florida Administrative Code
FAS	Floridan aquifer system
FAWN	Florida Automated Weather Network
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FGCU	Florida Gulf Coast University

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FPL	Florida Power & Light
F.S.	Florida Statutes
FY	Fiscal Year
gal	gallons
GPD	gallons per day
GPM	gallons per minute
IAS	intermediate aquifer system
ICU	intermediate confining unit
IOP	Interim Operating Plan
KB	Kissimmee Basin
KCOL	Kissimmee Chain of Lakes
KOE	Kissimmee-Everglades-Okeechobee
KWh	kilowatt hour
LEC	Lower East Coast
LEC Plan Update	Lower East Coast Water Supply Plan Update
LFA	Lower Floridan aquifer
LILA	Loxahatchee Impoundment Landscape Assessment
LKB	Lower Kissimmee Basin
LKB Plan	Lower Kissimmee Basin Water Supply Plan
2008 LORS	2008 Lake Okeechobee Regulation Schedule
LOSA	Lake Okeechobee Service Area
LPRO	lower pressure reverse osmosis
LWC	Lower West Coast
LWC Plan Update	Lower West Coast Water Supply Plan Update
MCL	maximum contaminant level
MDL	Maximum Developable Limit
MF	microfiltration
MFL	Minimum Flow and Level
MGD	million gallons per day
mg/L	milligrams per liter
MGM	million gallons per month
MGY	million gallons per year
MIL	Mobile Irrigation Laboratory

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MSL	mean sea level
NEEPP	Northern Everglades and Estuaries Protection Program
NF	nanofiltration
NGVD	National Geodetic Vertical Datum of 1929
NWFWMD	Northwest Florida Water Management District
O&M	operations and maintenance
PCBs	polychlorinated biphenyls
pH	potential of hydrogen
psi	pounds per square inch
RO	reverse osmosis
SAS	surficial aquifer system
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
SOR	Save Our Rivers
SRWMD	Suwannee River Water Management District
STA	Stormwater Treatment Area
SWFWMD	Southwest Florida Water Management District
TDS	total dissolved solids
TTHMs	total trihalomethanes
UEC	Upper East Coast
UEC Plan Update	Upper East Coast Water Supply Plan Update
UF	ultrafiltration
UFA	Upper Floridan aquifer
UKB	Upper Kissimmee Basin
ULV	ultralow volume
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA–NRCS	U.S. Department of Agriculture–Natural Resources Conservation Service
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

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UV	ultraviolet
Water CHAMP	Water Conservation Hotel and Motel Program
WaterSIP	Water Savings Incentive Program
WCA	Water Conservation Area

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1
Introduction

This *2011–2014 Water Supply Plan Support Document* supplements the four regional water supply plan updates produced by the South Florida Water Management District (SFWMD or District). In this volume, readers will find extensive background information helpful in understanding the SFWMD, the areas it serves, and the many considerations required for developing comprehensive water supply plans with a 20-year planning horizon.

TOPICS

- Basis of Water Supply Planning
- Significant Changes and Outlook

This Support Document is organized as follows:

- Introduction – Chapter 1
- Natural Systems Descriptions – Chapter 2
- Natural Systems Protection and Restoration Efforts – Chapter 3
- Water Supply Regulatory Overview – Chapter 4
- Water Source Options and Water Conservation – Chapter 5
- Water Quality and Treatment – Chapter 6
- Planning Area Descriptions – Chapters 7–10

Lake Okeechobee

Figure 1 represents the District's jurisdiction and planning areas.

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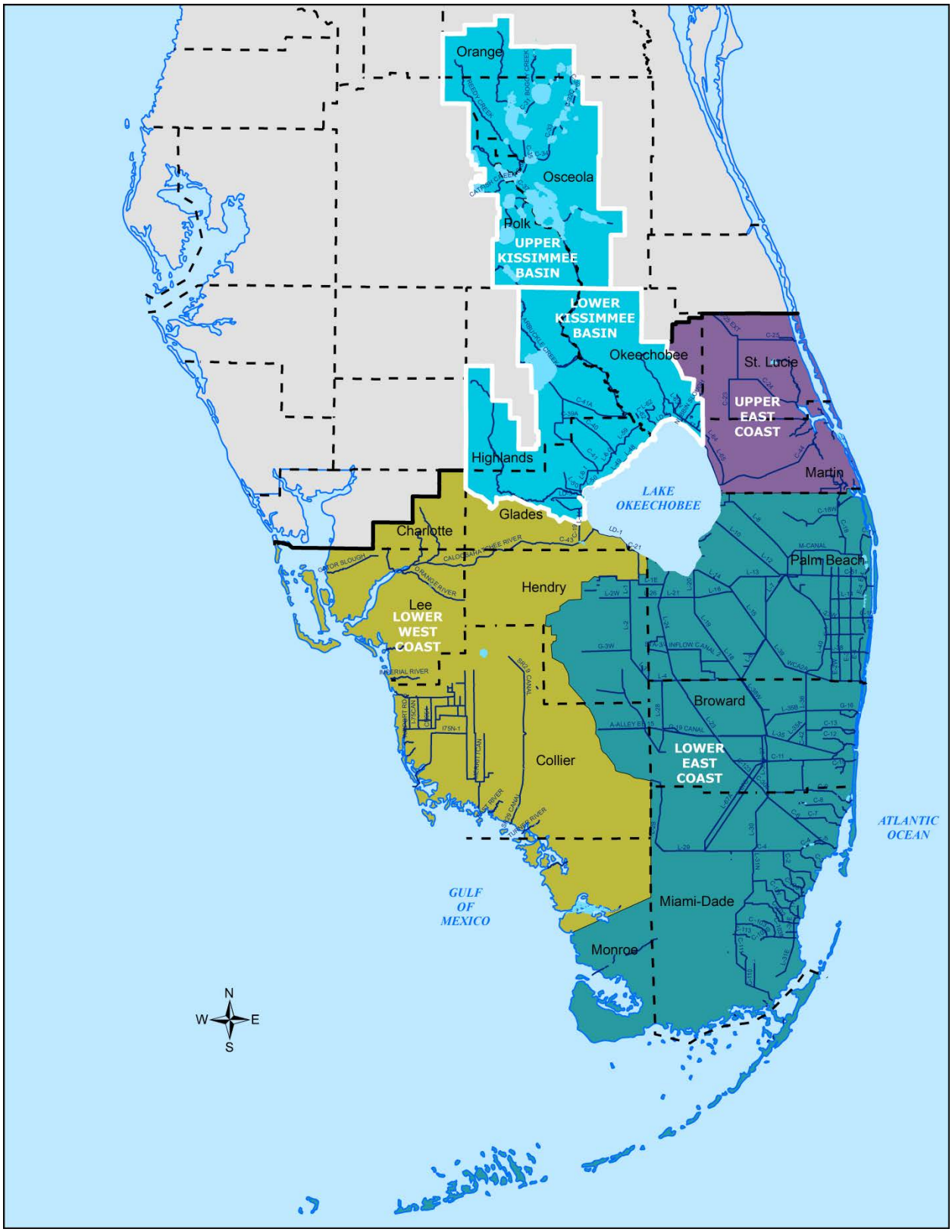

Figure 1. Planning areas of the South Florida Water Management District showing county level.

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BASIS OF WATER SUPPLY PLANNING

This section provides a brief legal and historical overview of the water supply planning process. Responsible to state governance, the District's water supply plans coordinate with local government planning to identify sustainable future water supplies. The relationship between the District's water supply plans and local governments' comprehensive plans is explained, as well as the rationale and legislative background of water supply planning.

Legal Authority and Requirements

Nearly 40 years ago, *A Model Water Code* (Maloney, Ausness, and Morris 1972) advocated a statewide, coordinated planning framework as the best way to accomplish proper water resource allocation. Subsequently, the *Florida Water Resources Development Act of 1972* [Chapter 373, Florida Statutes (F.S.)] was enacted. One outcome of this legislation was the establishment of the state's five regional water management districts. **Figure 2** shows the current legal framework for water supply planning in Florida.

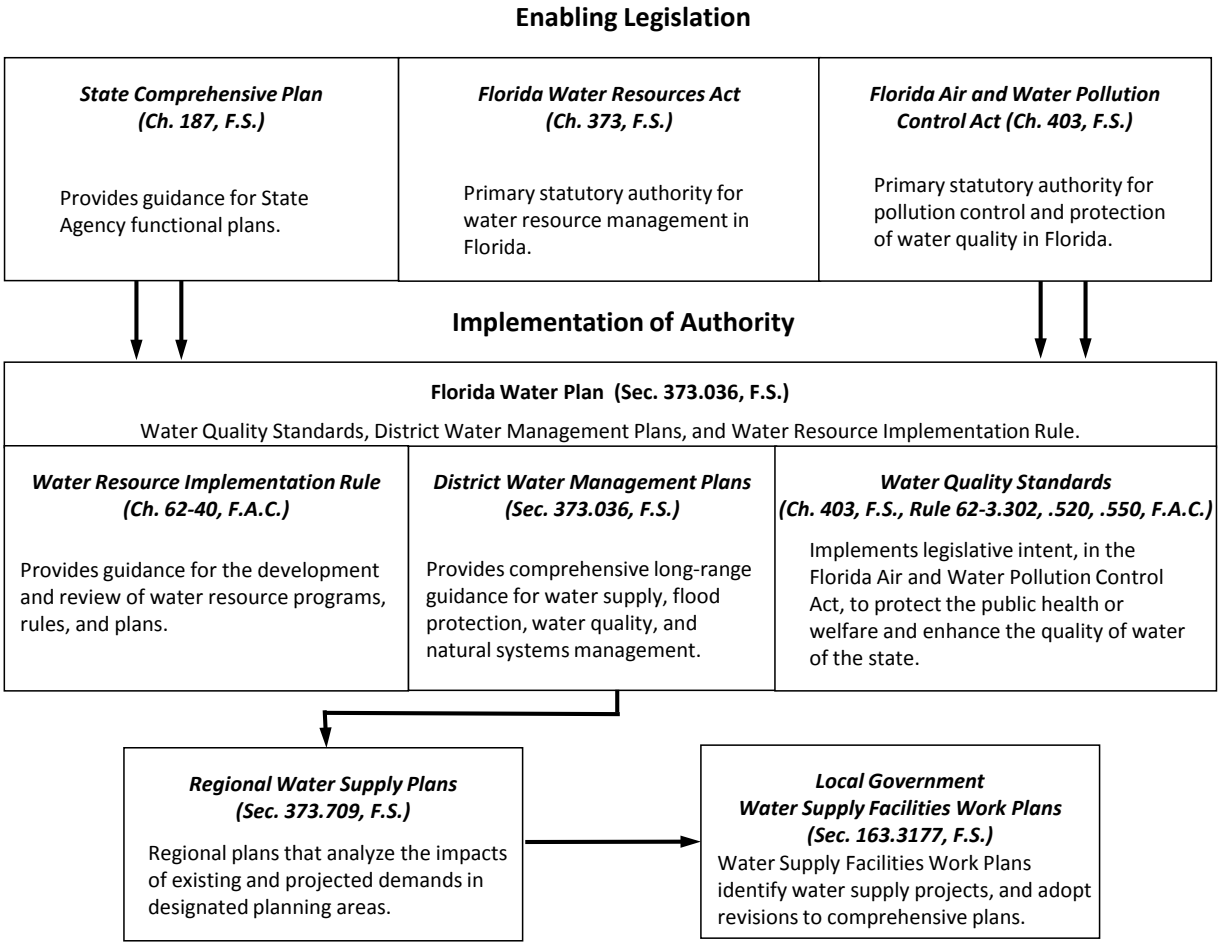

Figure 2. Legal framework for Florida water supply planning.

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In 1997, the Florida legislature enacted laws specifying the role the state's water management districts perform in water resource and water supply planning and development. The legislative intent was to provide for human and environmental water demands for a 20-year planning horizon.

The *State Comprehensive Plan* establishes:

> Florida shall assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial and shall maintain the functions of natural systems and the overall present level of surface and groundwater quality.

Initially, the *State Water Use Plan* and the *State Water Policy* were the primary documents developed to meet the state's water supply planning objectives. With the passage of later legislative amendments, the *Florida Water Plan* replaced the *State Water Use Plan*. The *Florida Water Plan* now includes the *State Water Policy* (which was renamed the *Water Resource Implementation Rule*). The *Water Resource Implementation Rule* [Chapter 62-40, Florida Administrative Code (F.A.C.)] sets forth goals, objectives, and guidance to develop and review water resource programs, rules, and plans. Relevant SFWMD documents resulting from this legislation include:

LAW / CODE

The statutes providing the basic authorities, directives, and policies for statewide water management, pollution control, and environmental protection, include:

- State Comprehensive Plan (Chapter 187, F.S.)
- Water Resources (Chapter 373, F.S.)
- Environmental Control (Chapter 403, F.S.)

- ***Water Supply Policy Document*** (SFWMD 1991).
- ***Water Supply Needs and Sources*** (SFWMD 1992).
- ***District Water Management Plan*** (DWMP) (SFWMD 1995). The District approved DWMPs in 1995 and 2000 (SFWMD 2000), as well as updates in 2001, 2002, and 2003 (SFWMD 2001, 2002, 2003). Beginning in 2004, the SFWMD chose to exercise its option to do an annual Water Resource Development Work Program report, published in the *South Florida Environmental Report – Volume II* (for example, SFWMD 2013b), in lieu of the DWMP. In addition, the SFWMD *Strategic Plan* now contains the long-range planning information formerly reported in the DWMP.
- ***Districtwide Water Supply Assessment*** (DWSA) (SFWMD 1998). In 1997, Chapter 373, F.S., was modified to require each water management district to prepare a DWSA. This was in part to identify areas that have potential for water demands to exceed available supplies over a 20-year planning horizon. The *SFWMD Districtwide Water Supply Assessment* confirmed the District's decision to prepare water supply plans that cumulatively cover the entire SFWMD.

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Water Supply Planning

Chapter 373, F.S., contains legal mandates for water supply planning and development by the water management districts, in cooperation with the Florida Department of Environmental Protection (FDEP). The FDEP has general supervisory authority over the state's water management districts.

Subsection 373.036(1), F.S., requires the FDEP to develop the *Florida Water Plan* in coordination and cooperation with local governments, regional water supply authorities, government-owned and privately owned water utilities, multijurisdictional water supply entities, self-suppliers, and other affected and interested parties.

The *Florida Water Plan* includes, but is not limited to, the following items:

- FDEP programs and activities related to water supply, water quality, flood protection and floodplain management, and natural systems
- FDEP water quality standards
- District Water Management Plans
- Goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources, based on statutory policies and directives

Regional Water Supply Plans

The SFWMD updates each of its four regional water supply plans approximately every five years. Based on a minimum 20-year planning period, current regional water supply plans include, but are not limited to, the following:

- A water supply development component
- A water resource development component
- The Minimum Flows and Levels (MFLs) established for water resources within the planning area
- A recovery strategy or a prevention strategy for addressing attainment and maintenance of MFLs in priority water bodies
- A funding strategy for water resource development projects that shall be reasonable and sufficient to pay the cost of constructing or implementing all the listed projects
- Consideration of how the options addressed serve the public interest or save costs
- The technical data and information applicable to the planning area contained in the District's *Strategic Plan* and needed to support the regional water supply plans
- Water Reservations adopted by rule pursuant to Subsection 373.223(4), F.S.

- Analysis of areas or instances in which the variance provisions of Paragraph 378.212(1)(g), F.S., or Subsection 378.404(9), F.S., may be used to create water supply development or water resource development projects

Local Government Water Supply Planning

The water supply projects proposed in the water supply plans for Public Water Supply utilities are useful to local governments in the preparation of their Water Supply Facilities Work Plans, which contain the capital improvements element. Within 18 months following the approval of the water supply plans, local governments are required to adopt or amend their Water Supply Facilities Work Plans to reflect the regional water supply plans.

As of June 2012, 90 percent of all local governments within the SFWMD have developed and formally submitted their Water Supply Facilities Work Plans, many with the technical assistance of the SFWMD. The development of these plans has assisted the SFWMD in coordinating future water supply planning and permitting with local government land use planning.

Local Government Comprehensive Plans

Chapter 163, Part II, F.S., includes The *Community Planning Act* (163.3164, F.S.), which requires each municipality and county to adopt and maintain a comprehensive plan. In Florida, all proposed and approved development in the community must be consistent with the comprehensive plan.

Residential Development in Collier County

In terms of water supply planning, additional information about state requirements for local government comprehensive plans is available in each regional water supply plan update, including checklist guidance for water supply-related aspects of local government comprehensive plans, including some of the following:

- Identify water supply sources needed to meet existing and projected water use demands for the established planning period of the comprehensive plan
- Base future land use plan and plan amendments on the availability of water supplies and associated public facilities
- Identify alternative and traditional water supply projects, water conservation, and reuse needed to meet the water needs identified in the regional water supply plan for the local government's jurisdiction

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Water Protection and Sustainability Program

Lawmakers revised state water law and created the Water Resource Protection and Sustainability Program in 2005, which requires a higher level of water supply planning coordination between water management districts and local governments. Section 373.707, F.S., details the intent and purpose of the Water Protection and Sustainability Program, and defines the responsibilities of the utilities and the water management districts.

Alternative Water Supply

The Florida legislature passed an amendment to Section 373.707, F.S., which concerns water management district funding of alternative water supply projects. The legislation added "water conservation projects that result in quantifiable water savings" to those projects eligible for funding, effective July 1, 2010.

Applicants for projects eligible to receive funding assistance are required to pay at least 60 percent of the project's construction costs. Funding for alternative water supply projects is limited to construction costs. The District's Governing Board approves the recommended projects for financial assistance based on current program guidelines. From Fiscal Year (FY) 2006 through FY 2011, the SFWMD approved more than $165 million in funding (including Water Protection and Sustainability Program funds) for 285 projects that created more than 420 million gallons per day of additional water supply capacity, reducing the reliance on freshwater sources while diversifying water supplies.

SIGNIFICANT CHANGES AND OUTLOOK SINCE THE LAST UPDATES

Since the previous water supply plan updates, the national economic downturn has slowed residential and commercial development, and in turn, overall population growth, leading to a reduced rate of increase in future urban water demands. Although population growth has been slower than previously projected, the growth is such that additional water supplies over the 20-year planning horizon will likely be required in many areas. This reinforces the need for local governments to develop alternative water sources to ensure adequate future water supplies. In central Florida, future projections indicate that groundwater availability is insufficient to meet the region's growing demand, which led to the formation of the Central Florida Coordination Area and ultimately to the Central Florida Water Initiative. Recent drought conditions and water shortages have emphasized the need for efficient water use. Water conservation continues to be an effective way to maximize existing water supplies, and to further its efforts, the District developed its Comprehensive Water Conservation Program.

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Water Shortage

South Florida experienced severe drought conditions between 2006 and 2009. In response to these dry conditions, water levels in many groundwater monitor wells in south Florida were at the lowest 10th percentile in history. The SFWMD issued water shortage orders in various basins placing water users, including public water suppliers, under water restrictions to reduce demand and stretch remaining water supplies.

After this historic water shortage, the SFWMD evaluated the water savings that resulted from phased water restrictions. A marked decrease in both indoor and outdoor water use occurred in response to water shortage restrictions, even though the restrictions mainly addressed outdoor uses. Consumer behavior changed with each subsequent water shortage order to follow the modified restrictions. The effectiveness of water shortage rules increased when messaging and enforcement were consistent on both regional and local levels. These results suggest that a consistent culture of water conservation, efficiency, and water-conserving technology is key to maximizing water savings and effecting long-term sustainable change.

Lake Okeechobee during Drought

In March 2011, a Districtwide water shortage was declared, calling for reduced use and conservation of water for some water use classes and a number of water shortage orders went into effect. The orders limited landscape irrigation to two days per week and require mandatory reductions in agricultural and other large water uses. Landscape irrigation using reclaimed water is not restricted by water management districts during a water shortage, unless requested by the utility providing reclaimed water (Chapter 373.250, F.S.). Many agricultural and diversion and impoundment systems, as well as nurseries and golf courses throughout the region are required to reduce withdrawals.

More information about water shortage is available in the *Water Shortage Management* section of **Chapter 4** of this document and from the SFWMD website at: http://www.sfwmd.gov.

Central Florida Coordination Area and Central Florida Water Initiative

The Central Florida Coordination Area (CFCA) is the region in and around metro-Orlando where the jurisdictional boundaries of the South Florida, St. Johns River, and Southwest Florida water management districts meet. Since 2006, the three water management districts have jointly concluded that sustainable quantities of groundwater in central Florida are insufficient to meet all future demands and recognized the need to develop and

implement alternative water supply projects as part of the CFCA Action Plan. In 2010, the CFCA Action Plan was modified to incorporate a broader, more collaborative approach in resolving water supply technical and policy issues, titled the Central Florida Water Initiative (CFWI). For a comprehensive review of water supply status and issues in the KB Planning Area, refer to the the Draft *Central Florida Water Initiative Regional Water Supply Plan* (SJRWMD, SWFWMD and SFWMD 2014) and the *Lower Kissimmee Basin Water Supply Plan* (LKB Plan) (SFWMD 2014). This Support Document generally describes the Kissimmee Basin Planning Area in its entirety (both Upper and Lower basins), and supports both planning documents mentioned above. In addition, information about the Central Florida Water Initiative is available from http://cfwiwater.com.

Water Conservation

Reducing future water demands before expanding water supplies and treatment facilities can be a cost-efficient way to manage resources. Therefore, employing sound water conservation measures prior to developing viable water source options is helpful to regional water supply planning efforts. The SFWMD is continuing water conservation efforts, especially by providing support to Public Water Supply utilities and other providers about the most cost-effective ways to reduce water use.

In September 2008, the District's Governing Board approved the SFWMD Comprehensive Water Conservation Program (CWCP). The CWCP is a series of recommendations and implementation strategies designed to bring about a permanent reduction in individual water use. The program is organized into 1) regulatory, 2) voluntary and incentive-based, and 3) educational and marketing water conservation initiatives. Under the umbrella of these initiatives, the SFWMD and other agencies provide numerous water conservation tools. Details on the CWCP can be found in **Chapter 5** of this Support Document.

Climate Change Impacts

To better understand climate change and provide a high-level foundation for future discussions about water management planning and operations, the SFWMD established an Interdepartmental Climate Change Group. The group's initial mission was to review scientific literature and prepare a climate change white paper to guide water management decisions. Released in November 2009, the paper is entitled *Climate Change and Water Management in South Florida* (SFWMD 2009a).

Some changes in climate and subsequent effects on hydrologic conditions are known. Long-term data show increasing temperatures and a corresponding sea level rise. For planning purposes, the District is estimating a sea level rise of 5–20 inches in south Florida by 2060.

Most coastal communities in southeastern Florida depend on shallow, freshwater wellfields for water supply. The Florida Oceans and Coastal Council believes the area from Miami to Palm Beach, located within the Lower East Coast (LEC) Planning Area, to be particularly vulnerable to saltwater intrusion into freshwater supplies. Monitoring and detailed analysis

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are needed to identify the impact of potential sea level rise on utility wellfields at risk of saltwater intrusion. Both Broward and Miami-Dade counties in the LEC Planning Area have initiated studies to help with this determination. Monitoring and studies are also needed for areas at risk within the Lower West Coast Planning Area.

Temperatures are anticipated to continue increasing at a rate of about 0.4°F per decade. This change will likely foster an increase in evapotranspiration (ET). Surface water storage from lakes, reservoirs, ponds, rivers, and canals will have higher evaporation losses than current ET levels. Water demands for most water use categories can be expected to rise as temperatures increase.

Projections for effects on average annual rainfall are varied. Some models predict a wetter south Florida and some predict a drier climate, increasing or decreasing by as much as 20 percent. A rainfall decrease will increase the demand for water, lower groundwater levels, and increase the risk of saltwater intrusion. An increase in rainfall could mean more water will be available for storage with higher groundwater and surface water levels. Changes in rainfall timing, intensity, and frequency will also affect water supply. Longer periods of dry weather could cause more frequent droughts and increased water demand. More intense, short periods of rainfall could increase total precipitation, but could result in much of the water being lost to tide.

Tropical storms and hurricanes also influence water supplies. The Interdepartmental Climate Change Group reports that hurricane and tropical storm frequency and intensity have increased since 1995, and that much of the change relates to natural cycles. One such cycle is the Atlantic Multidecadal Oscillation, a cyclic variation in the large-scale atmospheric flow and ocean currents in the North Atlantic Ocean. It is likely that hurricane and tropical storm frequency will continue to change in comparison to the historical record. A decrease in storm events could result in less rain, more frequent drought conditions, and increased water demand.

As stated in the *Climate Change and Water Management in South Florida* white paper (SFWMD 2009a), the District will continue to expand its understanding of climate change trends and develop tools to plan for these changes. The District will need to develop and implement climate change adaptation strategies to address future impacts to water supply planning.

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2

Natural Systems

This chapter introduces south Florida's natural systems (**Table 1**), specifically its major ecosystems. Natural systems that are important to water supply planning are discussed in each regional water supply plan five-year update. The regional chapters of this Support Document also describe the surface and groundwater features of each planning area.

TOPICS

- South Florida Ecosystem
- Freshwater Systems

SOUTH FLORIDA ECOSYSTEM

The south Florida ecosystem (**Figure 3**) is defined as the area consisting of the lands and waters within the boundary of the SFWMD, including the built environment, the Everglades, the Florida Keys, and the contiguous near-shore coastal waters of south Florida (Title 33 of the Code of Federal Regulations, Part 385.3).

Alligators in the Everglades

This ecosystem stretches from the Kissimmee Basin through Florida Bay and encompasses Lake Okeechobee at the heart of the system; the Loxahatchee and St. Lucie river estuaries to the east; the Caloosahatchee River and Estuary to the west; the Water Conservation Areas and most of Everglades National Park to the south, including Biscayne Bay, Florida Bay, and the Florida Keys.

Northern and Southern Everglades

The south Florida ecosystem is divided by legislative mandate into the Northern and Southern Everglades. The Northern Everglades includes the Kissimmee Chain of Lakes and Kissimmee River, Lake Okeechobee, and the Caloosahatchee and St. Lucie river watersheds. The Southern Everglades encompasses the watersheds south of Lake Okeechobee through

Florida Bay, such as Big Cypress National Preserve and Everglades National Park, and coastal bays, lagoons, and estuaries south of Lake Okeechobee, and the Loxahatchee River.

The Kissimmee Basin, comprising the Kissimmee Chain of Lakes and the Kissimmee River and floodplain, forms the headwaters of Lake Okeechobee and the Everglades. Collectively, these areas are known as the historical Kissimmee-Okeechobee-Everglades (KOE) Watershed.

Table 1. Major surface water features.

Major Surface Water Features	Planning Area
Northern Everglades	
Kissimmee Chain of Lakes	Upper Kissimmee Basin
Kissimmee River	Upper and Lower Kissimmee Basins
Lake Istokpoga	Lower Kissimmee Basin
Fisheating Creek	Lower Kissimmee Basin and Lower West Coast
Lake Okeechobee	All Planning Areas[a]
St. Lucie River	Upper East Coast
Loxahatchee River	Lower East Coast
Lake Trafford	Lower West Coast
Caloosahatchee River	Lower West Coast
Southern Everglades	
Loxahatchee River	Lower East Coast
Everglades National Park	Lower East Coast
Water Conservation Areas	Lower East Coast
Big Cypress National Preserve	Lower West Coast
Fakahatchee Strand	Lower West Coast
Picayune Strand	Lower West Coast
Estuarine Systems	
Southern Indian River Lagoon and St. Lucie Estuary	Upper East Coast
Loxahatchee River and Estuary	Upper East Coast and Lower East Coast
Lake Worth Lagoon	Lower East Coast
Caloosahatchee River and Estuary and Charlotte Harbor	Lower West Coast
Estero Bay	Lower West Coast
Fakahatchee Estuary	Lower West Coast
Naples Bay	Lower West Coast
Biscayne Bay	Lower East Coast
Ten Thousand Islands and Rookery Bay	Lower West Coast
Florida Bay	Lower East Coast

a. Analysis performed in Lower East Coast Water Supply Plan Update.

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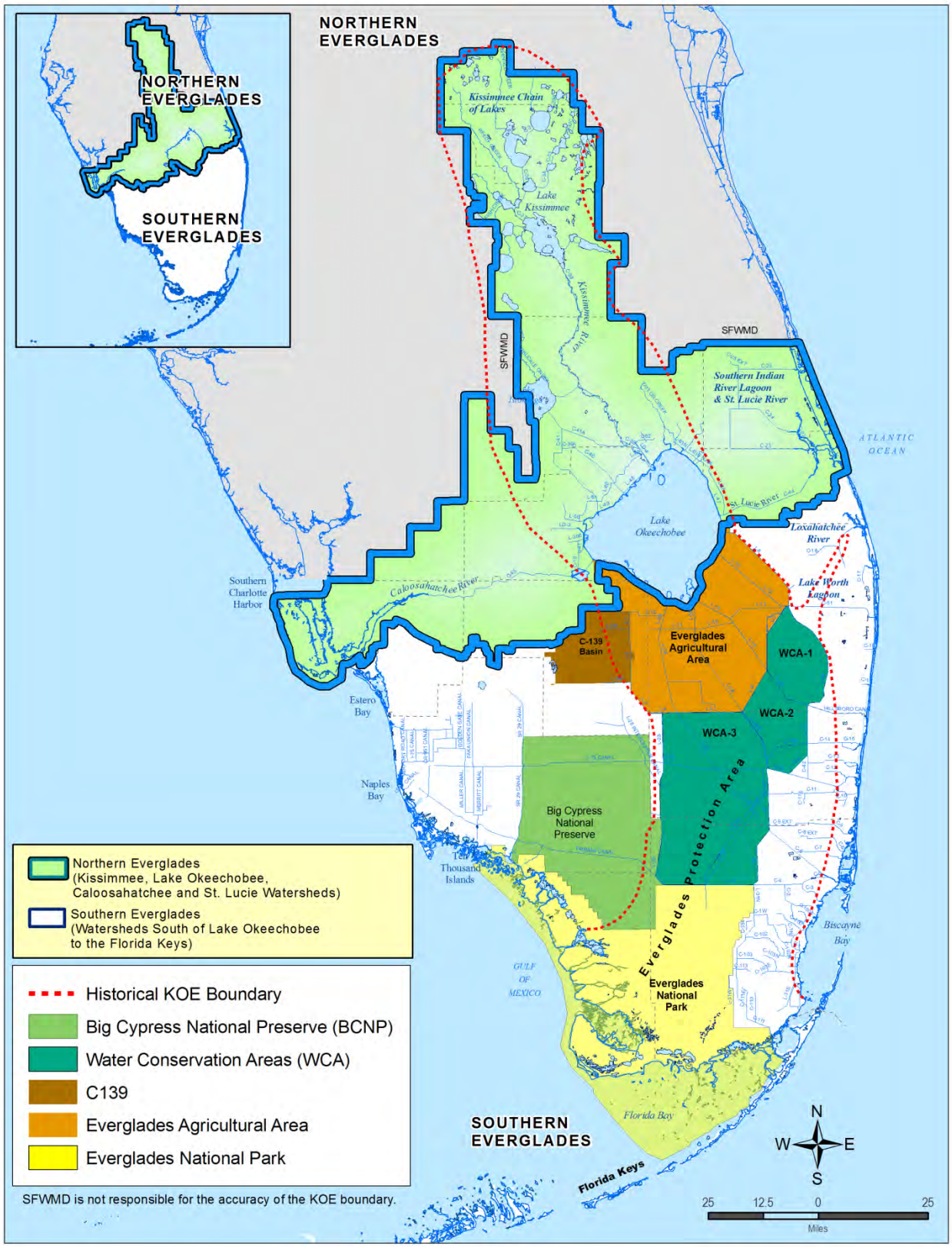

Figure 3. The south Florida ecosystem and historical Kissimmee-Everglades-Okeechobee (KOE) watershed boundary.

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In 1948, Congress authorized the construction effort, known as the Central and Southern Florida Flood Control Project (C&SF Project), to provide flood protection and water management throughout south Florida. During the 1950s and 1960s, canals, water control structures, and pumps were constructed to modify the native Kissimmee-Okeechobee-Everglades Watershed. The natural, meandering Kissimmee River and its floodplain were channelized in the 1960s for flood control improvements. The 103-mile river was replaced by a 56-mile canal.

Over the past 60 years, widespread development and increased urbanization fundamentally altered the spatial extent, hydrology, water quality, and ecology of ecosystems throughout south Florida. Today, Florida's shoreline and nearby coastal ridges are densely populated. Natural hammock and dune communities along the coast survive as unique subtropical ecosystems. In addition, at present, the remaining Everglades are less than half the natural system's original extent.

Although regional development and related water management efforts altered the local movement and balance of water, the interdependence of subregions and overall north–south movement of water still exist. Within the Lake Okeechobee Watershed, water flows from the Upper Kissimmee Basin through the Kissimmee Chain of Lakes into the Lower Kissimmee Basin, where the Kissimmee River flows into Lake Okeechobee.

Baby Gopher Tortoise

Lake Okeechobee is commonly referred to as the liquid heart of the system. The lake is linked by canals to the St. Lucie and Caloosahatchee river estuaries. Discharges through these canals influence the quantity, quality, and timing of fresh water entering the estuaries.

From Lake Okeechobee, some water moves southward through the Everglades Agricultural Area (EAA), then through the Everglades Stormwater Treatment Areas (STAs), and into tributary basins or Water Conservation Areas (WCAs). The Everglades Protection Area, which includes the WCAs and most of Everglades National Park, contains remnant Everglades marshes that provide vital surface water to sustain the natural elements of the southern part of the regional ecosystem.

Changes in hydrology, soil subsidence, exotic plant invasion, and water quality constituents have altered the historic ridge-and-slough landscape, such as sawgrass plains, aquatic sloughs (slow moving, shallow rivers), and tree islands in the WCAs and Everglades National Park. Extending downstream from the Everglades are the mangrove estuaries and coastal basins of Florida Bay and Biscayne Bay. As these bays are the receiving waters of the Everglades, changes upstream have created changes downstream, such as altered salinity.

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Initiatives to protect and restore natural systems and increase available water supplies are under way. Water-related directives from legislation or programs at federal and state levels, as well as the SFWMD, include planning, land acquisition and management, regulatory, and restoration efforts. **Chapter 3** discusses water protection and restoration Districtwide.

FRESHWATER SYSTEMS

Characteristics of ecosystems in central and south Florida include their unique mix of flora and fauna, as well as geographic location and hydrologic conditions. This section describes some of the representative ecosystems found within the boundaries of the SFWMD that are particularly dependent on freshwater flows. The planning area chapters in this Support Document also provide information about the physical features and water resources within each respective region. The list of ecosystems in **Table 2** is not all-inclusive.

Table 2. Representative ecosystems.

Ecosystems	Planning Area
Kissimmee River and Floodplain	Upper and Lower Kissimmee Basins
Lake Okeechobee	All Planning Areas
Indian River Lagoon / St. Lucie River and Estuary	Upper East Coast
Caloosahatchee River and Estuary	Lower West Coast
The Savannas	Upper East Coast
Loxahatchee	Upper East Coast and Lower East Coast
The Everglades	Lower East Coast
Okaloacoochee Slough	Lower West Coast
Corkscrew Regional Ecosystem Watershed	Lower West Coast
Fakahatchee Strand	Lower West Coast

Kissimmee River and Floodplain

The Kissimmee River and its floodplain are delineated by the 100-year floodplain boundary established by the U.S. Army Corps of Engineers (USACE) between the S-65 and S-65E structures. The area includes the historic Kissimmee River and its tributary watersheds between Lake Kissimmee, Lake Okeechobee, and the C-38 flood control canal (see **Figure 10** and **Figure 11** in **Chapter 7** of this document).

Kissimmee River

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A considerable extent of the original Kissimmee River and its floodplain was drained when the C-38 Canal was constructed. As a result, wetlands and populations of waterfowl, wading birds, fish, and other animals began to decline drastically. The ongoing Kissimmee River Restoration Project is restoring ecological integrity to a portion of the ecosystem while retaining existing levels of flood protection to surrounding communities. With the completion of each restoration phase, vegetation and densities of aquatic invertebrates, fish, wading birds, and waterfowl have shown improvement.

Birds are integral to the Kissimmee River/floodplain ecosystem. Some of the wading bird species in this region include a variety of egrets (cattle egret, great egret, and snowy egret), herons (tricolored heron, great blue heron, little blue heron, black-crowned night heron), and ibis (glossy ibis and white ibis).

Waterfowl species, such as the blue-winged teal, green-winged teal, mottled duck, hooded merganser, and wood duck, are increasing in restored areas as well. Other species observed following the completion of restoration phases include the American wigeon, northern pintail, northern shoveler, ring-necked duck, and black-bellied whistling duck.

Lake Okeechobee

The largest lake in the southeastern United States, Lake Okeechobee is a central component of the hydrology and environment of south Florida (**Figures 1** and **2**). Lake Okeechobee is a shallow, eutrophic lake that supports a crucial recreational and commercial fishery and provides important habitat for migratory waterfowl, wading birds, and several threatened and endangered plant and animal species. The lake is a component of the C&SF Project and serves multiple functions. The lake is regulated in accordance with a federally adopted regulation schedule known as the 2008 Lake Okeechobee Regulation Schedule (2008 LORS). In general, the Congressionally authorized Project purposes for Lake Okeechobee include: flood control; navigation; recreation; water supply for agricultural irrigation, municipalities, industry, the Seminole Tribe, Everglades National Park, regional groundwater control, and salinity control; and fish and wildlife preservation and enhancement.

NAVIGATE

See **Chapter 3** for additional information about the Kissimmee River Restoration Project. Read more about the Kissimmee River and Floodplain in the upcoming *Lower Kissimmee Basin Water Supply Plan* (SFWMD in process).

Lake Okeechobee receives water from a 5,400-square-mile watershed that includes the Kissimmee Chain of Lakes, the Kissimmee River, Lake Istokpoga, Fisheating Creek, and other drainage basins. Lake waters can be delivered south to the Everglades Protection Area, east to the St. Lucie River (C-44 Canal), and west to the Caloosahatchee River (C-43 Canal).

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Indian River Lagoon / St. Lucie Estuary

Indian River Lagoon is characterized by a great diversity of species compared to other North American estuaries. Approximately 2,200 species have been identified in the lagoon system, with 35 of these species listed as threatened or endangered.

Sheltered by sandy beaches and beds of seagrass, the lagoon has evolved into a nursery for young sea creatures—oysters, clams, shrimp, crabs, and hundreds of species of fish that thrive in the warm shallow waters. Species diversity is generally high in the southern end of the lagoon system and near inlets. Species diversity is lower near cities, where stormwater discharges, nutrient input, sedimentation, and turbidity are high, and where large areas of mangroves and seagrass have been lost.

> **NAVIGATE**
>
> More information about the Indian River Lagoon is provided in the *2011 Upper East Coast Water Supply Plan Update* (SFWMD 2011b).

The St. Lucie River is located in Martin and St. Lucie counties. The river is 35 miles long and has two major forks, the North Fork and the South Fork. Both forks combine in the St. Lucie Estuary (see **Figure 14** in **Chapter 8** of this document).

The Five and Ten Mile creeks form the headwaters and tributaries to the North Fork of the St. Lucie River, which is a freshwater system upstream and a brackish system near the St. Lucie Estuary. The North Fork is approximately 10 miles long and encompasses 5,000 acres.

The Port Mayaca lock and dam east of Lake Okeechobee releases water from Lake Okeechobee into the C-44 Canal (St. Lucie Canal), which discharges into the South Fork of the St. Lucie River. This connection from Lake Okeechobee to the South Fork was constructed for flood relief and navigational purposes.

Caloosahatchee River and Estuary

The Caloosahatchee River stretches from the western edge of Lake Okeechobee to San Carlos Bay on the Gulf of Mexico (see **Figure 18** in **Chapter 9** of this document).

From Lake Okeechobee, the Caloosahatchee River runs west to the Franklin Lock and Dam (Structure S-79), which separates the fresh water of the river from the brackish water of the Caloosahatchee Estuary. The river provides water supply, drainage, and conveyance of regulatory releases of water from Lake Okeechobee to tide.

Modifications to the Caloosahatchee River allowed development in the watershed, resulting in a network of secondary and tertiary canals in the Caloosahatchee River Watershed. This network provides conveyance for both drainage and irrigation to accommodate agricultural and urban needs.

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The Savannas

The Savannas is a remnant freshwater coastal wetland system located west of the Atlantic Coastal Ridge in Martin and St. Lucie counties. Today, Savannas Preserve State Park contains the largest and most ecologically intact stretch of this Florida east coast ecosystem. Encompassing 5,000 acres and stretching 10 miles from Fort Pierce to Jensen Beach, the preserve consists of marsh, pine forest, sandy ridge, and two natural deep lakes, Eden Lake and Henderson Pond.

Savannas Preserve State Park

In the Savannas, flora and fauna on the upland ridge have adapted to the dry, desert-like habitat called scrub. Many of the species in this environment, such as the threatened Florida scrub jay, cannot survive in any other habitat than scrub. The indigo snake, also considered threatened, uses abandoned gopher tortoise holes as homes, as do numerous other scrub inhabitants. The wooly cactus is a rare plant found only in the Savannas. Like some desert habitats, the scrub sand dune is one of the most fragile components of the Savannas ecosystem.

The Loxahatchee Watershed

The Loxahatchee River and Estuary and its upstream watershed are located along the southeastern coast of Florida within the Lower East Coast (LEC) and Upper East Coast (UEC) planning areas. This watershed connects to the Atlantic Ocean via the Jupiter Inlet. The Loxahatchee Watershed contains a number of natural areas that are essentially intact and in public ownership. These areas include:

- J.W. Corbett Wildlife Management Area
- Jonathan Dickinson State Park
- Hungryland Slough Natural Area
- Loxahatchee Slough Natural Area
- Hobe Sound National Wildlife Refuge
- Juno Hills Natural Area
- Jupiter Ridge Natural Area
- Pal-Mar

Jonathan Dickinson State Park, an 11,500-acre park in southeastern Martin County, contains 13 natural communities, including sand pine scrub, pine flatwoods, mangroves, and river swamps. The Northwest Fork of the Loxahatchee River, a part of which is Florida's first federally designated Wild and Scenic River, runs through the park.

NAVIGATE

See **Chapter 10: Lower East Coast Planning Area** for more information about the Loxahatchee Watershed.

Loxahatchee Slough, covering more than 14,000 acres, is one of the largest, relatively undisturbed wetlands remaining in Palm Beach County. It contains a mixture of habitats, including pine flatwoods, cypress forest, and wet prairie.

The Everglades

Once a vast, free-flowing river of grass extending from the Kissimmee Chain of Lakes to Florida Bay, the Everglades subtropical wetlands supported a rich diversity of plants, fish, and wildlife. For over a century, drainage of wetlands and changes in the natural variability of water flows have altered the Everglades. The Comprehensive Everglades Restoration Plan (see **Chapter 3**) is a framework and guide to restore, protect, and preserve much of the water resources of central and southern Florida.

NAVIGATE

More information about the Everglades is provided in **Chapter 10** of this document.

As a result of the C&SF Project, the Everglades were divided into three hydrologic units known as the Water Conservation Areas (WCAs – WCA-1, WCA-2A/WCA-2B, and WCA-3A/WCA-3B). The WCAs are shallow, diked marshes operated and maintained in accordance with federal regulation schedules. These project components serve multiple purposes, including flood control, water conservation, prevention of saltwater intrusion, recreation, fish and wildlife habitat, and environmental water supply for Everglades National Park.

Everglades National Park contains temperate and tropical plant communities, including sawgrass prairies, mangrove and cypress swamps, pinelands, and hardwood hammocks, as well as marine and estuarine environments. The park is home to rare and endangered species, including the American crocodile, Florida panther, and West Indian manatee, as well as large wading bird colonies of different species, such as the roseate spoonbill, wood stork, great blue heron, and a variety of egrets.

Okaloacoochee Slough

The Okaloacoochee Slough encompasses more than 13,000 acres in the Okaloacoochee Wildlife Management Area in Hendry County and consists of natural marsh and forest communities. The Big Cypress National Preserve and the Fakahatchee Strand are dependent on fresh water supplied by the slough. The Okaloacoochee area also provides important

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habitat for the endangered Florida panther, Florida black bear, bald eagle, roseate spoonbill, sandhill crane, wood stork, and the crested caracara.

Fakahatchee Strand

Fakahatchee Strand Estuary

Fakahatchee Strand Preserve State Park in Collier County hosts an array of habitats and forest types, from swamps and prairies to tropical hardwood hammocks and pine rock lands. Beneath a protective canopy of bald cypress and native royal palm trees flows a slough that is warmer than the ambient temperature in the winter and cooler in the summer. The buffering effect of the slough and deeper lakes enables the strand to support a variety of rare and endangered tropical plant species, including 44 native orchids and 14 native bromeliads.

The stand is also a haven for wildlife, including resident and migratory birds, Florida panthers, white-tailed deer, Florida black bears, eastern indigo snakes, Everglades minks, and diamondback terrapins.

NAVIGATE

Refer to **Chapter 9: Lower West Coast Planning Area** for more discussion about the Fakahatchee Strand.

Corkscrew Regional Ecosystem Watershed

NAVIGATE

Chapter 9: Lower West Coast Planning Area also includes Corkscrew Regional Ecosystem Watershed information.

The Corkscrew Regional Ecosystem Watershed (CREW) encompasses 60,000 acres in Collier and Lee counties. This area contains 16,000 acres of preserved land, including the Corkscrew Swamp.

The CREW shelters endangered Florida panthers, wood storks, and several species of rare orchids. Protecting the CREW is also crucial in preserving southwest Florida's water supply.

Protection of the Okaloacoochee Slough, Fakahatchee Strand, and the CREW will preserve connections between these areas, providing a corridor for both wildlife and water flows, including the natural flow-way to the headwaters of the Estero Bay Basin.

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3

Natural Systems Protection and Restoration Efforts

TOPICS

- Natural Systems Protection
- Ecosystem Restoration

Protection and restoration of natural systems are accomplished through the integration of planning, regulatory, land acquisition, and restoration programs. When discussing natural systems or ecosystem programs and projects, protection and restoration activities are often connected. Generally, natural systems protection efforts involve resource protection criteria or standards to protect the water resources necessary for the sustained health of a natural system, whereas restoration efforts focus on recovering the original characteristics of an ecosystem. This chapter defines natural systems protection efforts and identifies restoration efforts, many of which involve a combination of protection and restoration activities.

NATURAL SYSTEMS PROTECTION

The SFWMD's mission is to manage and protect south Florida's water resources by balancing and improving flood control, water supply, water quality, and natural systems. To assist in achieving the agency's mission, the Water Supply Program's goal is to ensure sustainable water supplies to protect natural systems and to meet all existing and future reasonable-beneficial uses. The District implements water resource development projects and updates water supply plans every five years to meet the water needs of central and south Florida for the next 20-year planning horizon.

Water use permits play a key role in the water supply planning process, and permit applicants must provide reasonable assurances that the proposed activity will be consistent with the overall objectives of the District and will not cause harmful impacts to the water resource. In addition, various scientific, policy, and legal tools, as well as water supply regulatory programs, are used to protect water supplies for the needs of natural systems. **Chapter 4** reviews the types of tools used to protect natural systems.

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ECOSYSTEM RESTORATION

Chapter 2 presented an overview of the Greater Everglades ecosystem, which comprises the Northern and Southern Everglades. As discussed in that chapter, changes in the region's hydrology and habitats over the past century have caused degradation of this vital subtropical wetland system. Because of development and drainage in the Greater Everglades, the right quantity and quality of water is not always available in dry periods for both the environment and the human population. Conversely, in wet times, the lack of natural storage capacity often causes damaging flooding of the Everglades and coastal estuaries.

The Comprehensive Everglades Restoration Plan (CERP) is one of the largest environmental restoration programs in history. Congress authorized the CERP in 2000, and the plan serves as a framework for modifications and operational changes to the C&SF Project to restore, preserve, and protect the land and water within the boundary of the SFWMD while providing for other water related needs of the region. The U.S. Army Corps of Engineers (USACE) is the lead federal agency and the SFWMD is the lead state agency for this multidecadal effort.

Great Egrets

In addition, the SFWMD serves as the lead state agency with the USACE for foundational projects the CERP is intended to build upon, which were assumed to be complete during the planning processes for the CERP. The full suite of benefits from the implementation of all of the CERP projects depends on the successful completion of the these foundational projects. Key among these foundational projects is the Modified Water Deliveries to Everglades National Park Project (Mod Waters), which is critical for restoration of more natural flows to Everglades National Park. Other foundational projects include the federally authorized Kissimmee River Restoration Project, Modifications to the C-111 Project, the Critical Restoration Projects, and the State of Florida's Everglades Construction Project.

Restoration scientists, planners, and engineers hope to recover many of the original characteristics of the Everglades. These characteristics would allow the Everglades to function as one cohesive ecosystem (USACE 2010). Such characteristics would include interconnected wetlands, low concentrations of nutrients in freshwater wetlands, sheetflow, healthy and productive estuaries, hardy native plant communities, and an abundance of native wetland flora and fauna (USDOI and USACE 2005).

Two examples of restoration projects are the Kissimmee River Restoration Project [see Chapter 9 of the *2013 South Florida Environmental Report, Volume I* (SFWMD 2013b)] and

the CERP Picayune Strand Restoration Project [see the *2012 Lower West Coast Water Supply Plan Update* (SFWMD 2012) for more information].

Ecosystem Restoration Initiatives and Projects

This section provides a high-level overview of some of the major initiatives and projects under way at the SFWMD. The District and its partners (e.g., USACE, FDEP) maintain updated information about each undertaking on the Internet. The links to dedicated project website pages and related documentation are included in this chapter for easy referencing.

CERP and Critical Restoration Projects

As mentioned earlier, the CERP is composed of a series of projects designed to capture, store, and redistribute fresh water and to restore the Everglades ecosystem by improving the quality, quantity, timing, and distribution of water flows. Together, the various components of the CERP will benefit the ecological functioning of the south Florida ecosystem, while improving regional water quality conditions, deliveries to coastal estuaries, urban and agricultural water supply, and maintaining existing levels of flood protection.

The SFWMD is responsible for acquiring the real estate needed for the construction and operation of the CERP projects. Land Acquisition Program activities are available from http://www.evergladesplan.org/pm/progr_land_aquisition.aspx.

Separate from the CERP, Critical Projects, were authorized in the *Water Resources Development Act of 1996*, as restoration projects designed to achieve early benefits to the south Florida ecosystem. A list of these Critical Projects is available from http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/Projects_Critical.htm

Everglades Restoration Projects

The SFWMD takes a systemwide approach to protecting and restoring the Southern and Northern Everglades. These interdependent ecosystems originate in central Florida near metropolitan Orlando and stretch southward to the coastal estuaries and bays of south Florida and involve other federal and state partners, such as the USACE, the Florida Department of Environmental Protection (FDEP), and the Florida Department of Agriculture and Consumer Services (FDACS). Everglades restoration projects are designed to address multiple concerns, such as ecosystem health, environmental protection, and water resources for fish and wildlife and consumptive use. Ongoing restoration projects are improving regional water quality, hydrology, and ecology. The latest information about Everglades Restoration Projects is available from http://www.sfwmd.gov/sferdb. Additional project information is available from http://www.evergladesplan.org.

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Kissimmee River Restoration Project

The Kissimmee River Restoration Project is a large-scale, multiphased ecosystem restoration effort. The project reestablishes the river-floodplain system's ecological integrity by recreating the river's physical form and reestablishing pre-channelization hydrologic characteristics; provides the water storage and regulation schedule modifications needed to approximate the system's historical water levels and flow; and increases the quantity and quality of shoreline habitat in Lakes Kissimmee, Hatchineha, Tiger, and Cypress for the benefit of fish and wildlife. In addition, the project ensures the maintenance of existing flood protection.

Kissimmee River Restoration

Three of four canal backfilling phases of the Kissimmee River Restoration Project are complete. Backfilling of the C-38 Canal began in 1999 with Reach I construction (completed in 2001); work continued north in two additional construction phases, which were completed in 2007 and 2009, respectively. The remaining Reach II/III construction is scheduled to begin in 2012, with overall completion in late 2014. Other construction associated with the Kissimmee River Restoration Project includes levee removal, water control structure additions/ improvements, flood protection, and various infrastructure improvements within the project area including the headwater lakes.

Construction project status is available from http://www.saj.usace.army.mil/Divisions/ProgramProjectMgt/Branches/EcoSys/Everglades/KRR/index.htm.

Northern Everglades and Estuaries Protection Program

Underscoring the state's commitment to ecosystem restoration, the Florida legislature in 2007 expanded the Lake Okeechobee Protection Act to include the protection and restoration of the interconnected Kissimmee, Lake Okeechobee, Caloosahatchee, and St. Lucie watersheds. This interagency initiative, known as the Northern Everglades and Estuaries Protection Program (NEEPP), is focusing on the water storage and water treatment needed to help improve and restore the Northern Everglades and coastal estuaries. As part of this initiative, the SFWMD and the State of Florida will expand water storage areas, construct treatment marshes, and expedite environmental management initiatives to enhance the ecological health of the lake and downstream coastal estuaries. The NEEPP requires the SFWMD, in collaboration with the FDEP and the FDACS as coordinating agencies, and in cooperation with local governments, to develop and implement protection plans for three northern watersheds: the Lake Okeechobee

Watershed, St. Lucie River Watershed, and Caloosahatchee River Watershed. While Northern Everglades projects have been conceptually identified in these plans, specific projects and activities are included in annual work plans and updates in the *South Florida Environmental Report – Volume I*, available from http://www.sfwmd.gov/sfer.

Information about the NEEPP and the *2011 Lake Okeechobee Protection Plan Update* (SFWMD 2011a) is available from http://www.sfwmd.gov/northerneverglades.

Everglades Forever Act Projects

Projects related to land acquisition and the design, permitting, and construction of Everglades Stormwater Treatment Areas (STAs) were authorized by the *1994 Everglades Forever Act* (Section 373.4592, F.S.). Annual updates for the Everglades STAs are provided in the *South Florida Environmental Report – Volume I* and *Volume III,* available from http://www.sfwmd.gov/sfer.

SUMMARY

Projects and programs to protect and restore natural resources are essential to ensure an adequate supply of water for natural systems. Natural systems protection efforts also involve resource protection criteria or standards to protect the water resources necessary for the sustained health of a natural system. Various scientific, policy, and legal tools are used to protect water supplies for the needs of natural systems, as well as water supply regulatory programs, which protect, enhance, mitigate, and monitor wetlands and water resources. These tools are discussed in detail in **Chapter 4**.

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Lotus

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4

Water Supply Regulatory Overview

The previous two chapters of this Support Document introduced the natural systems within the South Florida Water Management District (SFWMD or District) (**Chapter 2**), and several efforts related to natural systems protection and ecosystem restoration (**Chapter 3**). This chapter provides a brief overview and description of some key regulations and statutes that concern the protection of water resources and affect water supply planning.

TOPICS

- Water Use Permitting
- Water Resource Protection Standards
- Lake Okeechobee Regulation Schedule
- Water Shortage Management
- Water Conservation in Water Use Permitting

Water resource protection standards use regulatory mechanisms, such as Minimum Flows and Levels (MFLs), Water Reservations, and Restricted Allocation Areas, which are explained in this regulatory overview.

Section 373.709, Florida Statutes (F.S.), prescribes the legal authority and requirements for water supply planning with additional guidance provided in Chapters 187 and 403, F.S. The primary regulatory tools related to water supply and uses of water are contained in Chapter 373, F.S., and Chapters 40E-2 and 62-40, Florida Administrative Code (F.A.C.).

The *Applicant's Handbook for Water Use Permit Applications* (Applicant's Handbook, SFWMD 2014) contains additional SFWMD's water use permitting criteria. The Florida Department of Environmental Protection (FDEP) recently led a statewide effort called CUPCon to improve consistency in the consumptive/water use permitting programs implemented by the water management districts. CUPCon resulted in changes to SFWMD water use permitting rules and criteria that became effective in 2014.

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WATER USE PERMITTING

Consumptive use of water is broadly defined as any use of water that reduces the supply from which it is withdrawn or diverted. The SFWMD's water use permitting program protects the supply and quality of groundwater and surface water resources by requiring that permit applicants demonstrate their proposed use is reasonable, beneficial, consistent with the public interest, and will not interfere with existing legal uses.

> INFO
>
> Examples of specific regulations and water conservation initiatives can be found in each regional water supply plan update.

District rules classify water use permits for uses that include, but are not limited to, the following:

- Agricultural irrigation
- Golf course irrigation
- Landscape irrigation
- Public Water Supply
- Dewatering
- Diversion and impoundment
- Commercial and industrial uses

Water use permits are issued by the State of Florida's water management districts pursuant to Part II of Chapter 373, F.S. The specific conditions of issueance for water use permits are described in Section 373.223, F.S., and Chapter 40E-2, F.A.C.

Types of Water Use Permits

Presently, the SFWMD issues three types of water use permits:

- **General Permit by Rule** For single family/duplex landscaping, small dewatering projects, and closed-loop systems
- **Noticed General Permit** For uses with a cumulative average daily use of less than 100,000 gallons per day (GPD) on an annual basis that meet facility and geographic restrictions based on source
- **Individual** For uses with a cumulative average daily use greater than 100,000 GPD on an annual basis or otherwise do not meet Noticed General Permit thresholds

Individual permits for more than 15 million gallons per month require approval from the District's Executive Director or designee. All other permits are approved by District staff.

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Water Conservation Planning and Implementation

Existing SFWMD water use permitting rules require planning and implementation of water conservation measures by Public Water Supply utilities (and associated local governments), industrial/commercial/institutional users, landscape and golf course irrigation users, and agricultural users. Further information about the Public Water Supply conservation efforts are discussed in the *Water Conservation in Water Use Permitting* section of this chapter.

Permit Duration and Renewal

Generally, permits are issued for a period of up to 20 years, unless particular circumstances warrant a shorter or longer permit duration.

If an application for renewal is submitted before the permit expiration date, the permit remains in effect until the pending application is processed. Permits are conditioned to require compliance monitoring and reporting, which may include calibrated pumpage, wetland monitoring, saline water monitoring, 10-year compliance reports, or other project-specific restrictions.

Permitting Criteria

To obtain a water use permit, the permit applicant must provide reasonable assurances the use is "reasonable-beneficial," will not interfere with any presently existing legal use of water, and is consistent with the public interest, pursuant to Section 373.223, F.S.

In addition, the rules require consideration of relevant portions of the State Water Resource Implementation Rule (Chapter 62-40, F.A.C.) adopted by the FDEP as part of the reasonable beneficial use test. The SFWMD implements this test pursuant to rules adopted in Chapter 40E-2, F.A.C. and the Applicant's Handbook. Permits are conditioned to ensure uses are consistent with the overall objectives of the District and are not harmful to the water resources of the area (Section 373.219, F.S).

Conditions for issuance of a water use permit address multiple issues, including but not limited to:

- Saltwater intrusion
- Wetland and other surface waters
- Pollution
- Impacts to off-site land uses
- Use of reclaimed water
- Interference with existing legal uses
- Minimum Flows and Levels
- Water Reservations

- Restricted Allocation Areas

Level of Certainty

The level of certainty planning goal established by the Florida legislature is a 1-in-10 year drought event. See Paragraph 373.709(2)(a), F.S. The District implemented the level of certainty planning goal in its water use permitting program, and as such, permit applicants must demonstrate the conditions for issuance of a permit are satisfied during a 1-in-10 year drought condition. Demands are calculated, assuming the 1-in-10 year drought condition, and impacts resulting from a proposed withdrawal are analyzed during this same drought event.

Impact Evaluation Criteria

Impact evaluation criteria are applied to various resource functions and existing legal user interference criteria to establish the hydrologic change that can occur without causing harm. For the purposes of water use allocation, the harm standard [Chapter 40E-2, F.A.C.] addresses each of the following:

- Saltwater intrusion
- Wetland and other surface water body drawdown
- Aquifer mining
- Pollution movement
- Off-site land uses
- Existing legal users

Detailed criteria concerning proposed water uses and evaluation of potential impacts are contained in Section 3.0 of the Applicant's Handbook (SFWMD 2014).

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WATER RESOURCE PROTECTION STANDARDS

The purpose of the *Florida Water Resources Act* is to ensure the sustainability of state water resources (Section 373.016, F.S.). Chapter 373, F.S., provides water management districts with several tools consisting of varying levels of resource protection standards to carry out this responsibility.

Florida's *Water Resource Implementation Rule*, Chapter 62-40, F.A.C., outlines specific factors to consider in protecting natural systems, including protection of natural seasonal changes in water flows or levels, water levels in aquifer systems, and environmental values associated with aquatic and wetland ecology.

WATER RESOURCE PROTECTION STANDARDS

The terms harm, serious harm, and significant harm are defined in Rule 40E-8.021, F.A.C., and apply throughout the District's water use permit rules. The definitions are as follows:

Harm The temporary loss of water resource functions, as defined for water use permitting in Chapter 40E-2, F.A.C., that results from a change in surface or groundwater hydrology and takes a period of one to two years of average rainfall conditions to recover.

Significant Harm The temporary loss of water resource functions, which result from a change in surface or groundwater hydrology, that takes more than two years to recover, but which is considered less severe than serious harm. The specific water resource functions addressed by a MFL and the duration of the recovery period associated with significant harm are defined for each priority water body based on the MFL technical support document.

Serious Harm The long-term loss of water resource functions, as addressed in Chapters 40E-21 and 40E-22, F.A.C., resulting from a change in surface or groundwater hydrology.

Protecting Water for Natural Systems

In addition to wetland and other surface water body protection criteria, the SFWMD uses three additional rules to protect natural system water (wetlands, rivers, lakes, estuaries, and aquifers) from consumptive use:

1. Minimum Flows and Levels
2. Water Reservations
3. Restricted Allocation Areas

The District is required to annually develop and submit to the FDEP a list and schedule for MFLs. Included in this "Priority Water Bodies List and Schedule," is information about Water Reservation and Restricted Allocation Area rules under development. This list and

schedule is provided in the SFWMD's annual *South Florida Environmental Report – Volume II*, available from http://www.sfwmd.gov/sfer.

Minimum Flows and Levels

The SFWMD is responsible, within its boundaries, for implementing the provisions in Section 373.042, F.S., requiring the establishment of MFLs for surface waters. The minimum flow for a given watercourse specifies the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. Similarly, the minimum water level identifies the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources. To date, MFL criteria have been adopted for 13 surface water bodies and aquifers within the SFWMD. These water bodies include:

- Lake Okeechobee
- The Everglades (including the Water Conservation Areas, the Holey Land and Rotenberger Wildlife Management Areas, and Everglades National Park)
- Biscayne aquifer
- The Lower West Coast (LWC) aquifer system encompassing three semi-confined units (Tamiami, Sandstone, and Mid-Hawthorn)
- Caloosahatchee River
- North Fork of the St. Lucie River
- Northwest Fork of the Loxahatchee River and Estuary
- Lake Istokpoga
- Florida Bay

Protection of non-consumptive uses may also be considered and provided for when establishing MFLs (Section 373.042, F.S.). A baseline condition for the protected resource functions must be identified through consideration of changes and structural alterations in the hydrologic system [Paragraph 373.042(1)(a), F.S.]. Certain exclusions for establishing MFLs are contained in Paragraph 373.0421(1)(b), F.S.; however, the Everglades Protection Area is not subject to these exclusions.

PROTECTION

Minimum Flow and Level Criteria
Minimum Flow and Level (MFL) technical criteria are important management tools used by the District to protect major water bodies from significant harm due to reductions in water levels or flows. These criteria provide a basis for defining the point at which additional withdrawals will result in significant harm to water resources.

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MFL Recovery and Prevention Strategies

If it is determined that water flows or levels for a water body are presently below the relevant MFL, or will fall below an established MFL within the next 20 years, the District must develop and implement a recovery or prevention strategy [Subsection 373.0421(2), F.S.]. The strategy is developed in concert with the water supply planning process.

The general goal of the recovery strategy is to achieve the established MFL as soon as practicable. A prevention strategy aims to keep the existing flow or level from falling below the established minimum criteria. The recovery or prevention strategy includes the provision of sufficient water supplies for reasonable beneficial uses, and may include the development of additional water supplies, construction of new or improved storage facilities, and implementation of conservation or other efficiency measures. New or additional withdrawals may be limited until the water body is no longer experiencing significant harm.

Water Use Permitting Criteria for MFLs

As discussed in the *Water Use Permitting* section of this chapter, as a condition of permit issuance, water use permitting rules require an applicant to provide reasonable assurances that a proposed use of water is in accordance with the established MFLs and implementation rules, (See Rule 40E-2.301(1)(i), F.A.C.). Applicants for water use are reviewed based on the recovery or prevention strategy approved at the time of permit application review.

Osprey Pair – Estero Bay

Rule 40E-8.021, F.A.C., identifies two categories of impact criteria: direct withdrawals and indirect withdrawals from the MFL water body. Direct withdrawals are those from surface water facilities physically located within the boundaries of a MFL surface water body or groundwater withdrawals that cause a water table drawdown greater than 0.1 feet at any location beneath the MFL surface water body or aquifer, up through a 1-in-10 year drought. Indirect withdrawals are from a water source for a consumptive use that receives surface water or ground water from a MFL water body or is tributary to a MFL water body. The Applicant's Handbook (SFWMD 2014) describes evaluation criteria for permit renewals and new or modified permits for water bodies subject to a MFL Recovery Strategy (Section 3.9.1) or a MFL Prevention Strategy (Section 3.9.2), and whether the application requests a direct or an indirect withdrawal from a MFL water body. The detailed review criteria are contained in Section 3.9 of the Applicant's Handbook.

Water Reservations

A Water Reservation is a legal mechanism to set aside water for the protection of fish and wildlife or public health. When a volume of water is reserved, it is not available for allocation for water use permittees [Subsection 373.223(4), F.S.].

Water Reservations may be developed based on an evaluation of existing water availability for the natural system, as well as for water anticipated to become available for the natural system upon completion of water resource development projects.

PROTECTION

Water Reservations
Section 373.470, F.S. and Section 601(h)(4) of the Water *Resources Development Act of 2000* requires the District to reserve or allocate water provided by CERP projects for the natural system identified for each CERP project.

The quantification of the water to be reserved can include a seasonal component and a location component. In quantifying water to be reserved, existing legal uses of water are protected as long as they are not contrary to the public interest. Issues associated with determining whether an existing legal use of water is or is not contrary to the public interest are determined by the District's Governing Board.

In addition, reasonable assurances are provided for existing legal users, as cited in Paragraph 373.1501(d)(5), F.S.

> Consistent with this chapter, the purposes for the restudy provided in the Water Resources Development Act of 1996, and other applicable federal law, provide reasonable assurances that the quantity of water available to existing legal users shall not be diminished by implementation of project components so as to adversely impact existing legal users, that existing levels of service for flood protection will not be diminished outside the geographic area of the project component, and that water management practices will continue to adapt to meet the needs of the restored natural environment.

SFWMD Water Reservation rule activities to date include the following:

- In February 2009, the District's first water reservation rule was adopted for the Comprehensive Everglades Restoration Plan (CERP) Picayune Strand Restoration Project in the LWC Planning Area.
- In February 2010, a water reservation rule was adopted for the North Fork of the St. Lucie River in support of the CERP Indian River Lagoon – South Project in the Upper East Coast (UEC) Planning Area.
- In July 2013, a water reservation rule was adopted for Nearshore Central Biscayne Bay.
- In May 2014, a water reservation rule was adopted for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir.

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- In June 2014, the District Governing Board reinitiated rule development to reserve water for the Kissimmee River Basin and adoption is expected by December 2015.

Federally Funded Restoration Project Water

Section 373.470, F.S, and Section 601(h)(4) of the *Water Resources Development Act of 2000* require the SFWMD to reserve or allocate water made available for the natural system from each CERP project from consumptive use. The Comprehensive Everglades Restoration Plan projects may also make water available for consumptive use as identified in the plan formulation for each project.

Restricted Allocation Areas

Restricted Allocation Areas encompass large geographic areas with multiple ecosystems. Restricted Allocation Area criteria are regulatory mechanisms that protect specific water bodies for a variety of reasons, such as protecting water resources from harmful impacts due to consumptive uses of water; assuring MFL recovery strategy implementation components and availability of water for future restoration projects; protecting public health and safety; and preventing interference among and to existing legal uses. Restricted Allocation Area criteria are set forth in Section 3.2.1 of the Applicant's Handbook (SFWMD 2014).

The following geographic areas are designated Restricted Allocation Areas:

- Lake Istokpoga/Indian Prairie Canal System (1980s)
- C-23, C-24, and C-25 Canal System (1980s)
- L-1, L-2, and L-3 Canal System (1980s)
- Pumps on Floridan wells in Martin and St. Lucie counties (1980s)
- Northern Palm Beach County / Loxahatchee River Watershed Water Bodies and Lower East Coast Everglades Water Bodies (2007)
- Lake Okeechobee Service Area (including the lake) (2008)

The purpose of the individual Restricted Allocation Areas is more specifically described in the respective regional water supply plan update and Section 3.2.1 of the Applicant's Handbook (SFWMD 2014). A description of the Lake Okeechobee Service Area is provided in **Chapter 10** of this document.

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NAVIGATE

Detailed information about MFLs, Water Reservations, and Restricted Allocation Area rules are available from the District's website at http://www.sfwmd.gov/watersupply.

Status updates are provided annually in the *South Florida Environmental Report – Volume II*, available from http://www.sfwmd.gov/sfer.

Related rule development and peer-review activities can be accessed from http://www.sfwmd.gov/webboards.

Details concerning MFLs can be found in Section 3.9 of the *Applicant's Handbook for Water Use Permit Applications* (Applicant's Handbook, SFWMD 2014).

Additional information about Restricted Allocation Area criteria is described in Section 3.2.1 of the Applicant's Handbook.

LAKE OKEECHOBEE REGULATION SCHEDULE

The USACE establishes Lake Okeechobee water levels with the goal of balancing the lake's multiple purposes. In 2008, the USACE implemented a new Lake Okeechobee Regulation Schedule (2008 LORS) to optimize operations within existing structural constraints and to meet the diverse requirements of the lake, its receiving waters, and its users. The 2008 LORS is intended to be a temporary schedule that focuses on public health and general welfare considerations associated with the integrity of the Herbert Hoover Dike and impacts of high water levels on lake ecology. The current 2008 LORS is designed to operate lake levels at lower elevations than previous schedules.

The new regulation schedule has three main bands: 1) High Lake Management Band, 2) Operational Band, and 3) Water Shortage Management Band. The Operational Band is divided into High, Intermediate, Low, Base Flow, and Beneficial Use sub-bands. In the High Lake Management Band, the objective is to lower the lake rapidly with maximum discharges through the primary lake outlets (i.e., S-308 and S-77). Baseflow releases in the Low and Base Flow sub-bands (generally less than 650 cubic feet per second) are designed to keep the

Lake Okeechobee Water Control Structures

lake lower and reduce the need for maximum discharges that are damaging to the estuaries. When the lake is in the Beneficial Use sub-band, the USACE defers to the SFWMD's recommendations for lake operations.

The 2008 LORS interim schedule is anticipated to be in effect until either the risk of Herbert Hoover Dike failure is reduced with the required improvements or until CERP Band 1 projects are implemented, whichever comes first. Implementation of an alternative schedule will eventually be required to address prolonged low lake levels and the associated impacts on the lake's ecology and regional water supply.

2008 LORS Releases and Adaptive Protocols for Lake Okeechobee Operations

Updated in 2010, the Adaptive Protocols for Lake Okeechobee Operations (SFWMD, USACE, and FDEP 2010) describe how water managers can meet the intent of the 2008 LORS and the accompanying Water Control Plan provisions. The Adaptive Protocols provide SFWMD guidance when making recommendations to the USACE about Lake Okeechobee water releases during Low, Base Flow, and Beneficial Use sub-bands. A key feature of the Adaptive Protocols for Lake Okeechobee Operations is looking for opportunities to improve water supply, flood protection, ecosystem needs, and environmental protection. The process includes input from the public, other agencies, the District's Governing Board, and technical input from experts at the USACE, SFWMD, and Florida Department of Environmental Protection (FDEP). Technical information regarding the need for water releases from the lake is based on a set of quantitative performance measures of ecosystem health and water supply conditions. The adaptive protocols will be periodically assessed and adjusted as necessary to deal with potential future issues not accounted for and to reflect new knowledge. Details information about the Adaptive Protocols for Lake Okeechobee are available from the SFWMD website at: http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/ap_lo_final_20100916.pdf.

WATER SHORTAGE MANAGEMENT

The south Florida hydrologic system is driven by rainfall. Lack of sufficient rainfall and increased evapotranspiration can lead to water shortage events.

The consequences of a water shortage event within the District include increased potential of saltwater intrusion and contamination of coastal Public Water Supply wellfields; environmental impacts including MFL violations; and significant

INFO

Water shortage events can be defined for different time periods (monthly, dry season, wet season, annual, and biannual) based on a number of different criteria, including lack of sufficient rainfall, lack of adequate water levels in the aquifer, or lack of water available in the regional system.

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economic loss to agriculture, nurseries, and other water-dependent businesses.

The lack of water in Lake Okeechobee also threatens the District's ability to deliver water from the Water Conservation Areas (WCAs) to the LEC Planning Area. Lower water levels in canals and surface waters could hamper the ability to fight fires in rural areas and present the potential for organic soil (muck) fires in the Everglades.

Water Shortage Plan

The District's *Water Shortage Plan*, contained in Chapter 40E-21, F.A.C., provides guidance and direction for the management of water resources during drought conditions. The purposes of the *Water Shortage Plan* and rules are to protect the water resources of the District from harm; to assure equitable distribution of available water resources among all water users during times of shortage, consistent with the goals of minimizing adverse economic, social and health related impacts; to provide advance knowledge of the means by which water apportionments and reductions will be made during times of shortage, and to promote greater security for water use permittees (Rule 40E-21.011, F.A.C.). The District's overall water shortage management program also includes a regional water shortage plan (Chapter 40E-22, F.A.C.), as well as numerous additional considerations, such as agreements with the Seminole Tribe of Florida, operation of the C&SF Project, minimum MFLs, water use permit conditions, monitoring of resource conditions by users and the District, and compliance. The provisions of Chapters 40E-21 and 40E-22, F.A.C., are geared toward considerations such as:

- Protecting water resources from serious harm
- Assuring equitable distribution of available water resources among all water users during times of shortage
- Providing knowledge of potential conditions that can trigger the various phases of water shortage restrictions

Water Shortage Restriction Phases

The water shortage restriction phases (Phase I–Phase IV) range from moderate to critical according to severity (**Table 3**), and define the type of water use restrictions and cutbacks that will be considered by the District's Governing Board in a declared water shortage. In addition, the *Water Shortage Plan* identifies specific water-saving measures to implement with each phase by user type.

The Water Shortage Plan calls for Governing Board evaluation of water conditions including existing and projected supplies and demands prior to declaring a water shortage. (Rule 40E-21.221, F.A.C.) Some District water bodies also have water shortage triggers set forth in rules; these are water levels at which phased restrictions will be declared under the SFWMD's *Water Shortage Plan*. (See e.g., Chapter 40E-22, F.A.C) The water shortage program also considers minimum flows and levels. (See e.g., Rules 40E-8.441 and 40E-21.441, F.A.C.)

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Table 3. SFWMD phased water use restrictions.

Water Shortage Phase	Percent Reduction Goal in Overall Demand
Warning	When the Governing Board calls for voluntary reductions in demand before declaring a water shortage
Phase I, **Moderate**	**Less than** 15% reduction in overall demand
Phase II, **Severe**	**Less than** 30% reduction in overall demand
Phase III, **Extreme**	**Less than** 45% reduction in overall demand
Phase IV, **Critical**	**Less than** 60% reduction in overall demand

Note: Restrictions may be imposed when water levels fall below trigger lines.

Decision Process for Water Shortage Action

The District coordinates its water shortage activities with federal, state, and local governments, water utilities, water users, and other entities. Specific and timely water shortage action is determined based on some of the following conditions:

- Water levels in the Water Conservation Areas
- Lake Okeechobee water levels
- Water levels in system canals
- Aquifer water levels
- Climate forecast
- Environmental conditions, as described in Chapter 40E-21, F.A.C., Water Declaration Factors
- Time of year
- Demand by various use classes
- Computer model simulations of future conditions
- Geographic extent of basin(s) most affected by a water shortage

Different water management actions may be required, depending on the location, nature, and magnitude of drought conditions.

Declaration of Water Shortage Restrictions

As previously described, water shortage declarations are imposed by the District's Governing Board in phases; water use cutbacks are increased as drought conditions become more severe. The *Water Shortage Plan* and rules are used to manage water use when there is existing or projected insufficient groundwater or surface water available to meet user needs or when conditions require temporary reduction in use according to Sections 373.246 and 373.175, F.S., and Chapter 40E-21, F.A.C.

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Upon declaration of a water shortage, water users within the boundaries of the District are prohibited to use water in a manner inconsistent with the specified restrictions. It is the responsibility of each water user to stay informed about the phase of water shortage and the applicable restrictions for that specific phase. Violations of the restrictions by users are subject to enforcement action.

Water Conditions Analysis

Water conditions are analyzed throughout water shortage periods. Refer to the following *Response Mechanisms* section of this chapter for an overview of the types of analyses conducted by the District.

Water Shortage Events since 2005–2006

Starting in 2006 and extending through part of 2009, a water shortage affected much of south Florida. As a result, water shortage restrictions were imposed in the Lake Okeechobee Service Area (LOSA), and the UEC and the LEC planning areas. As conditions worsened, the first in a series of Water Shortage orders and restrictions were enacted for residential and commercial water uses throughout the District. By April 2009, the Lower East Coast had been under landscape irrigation restrictions for 25 months, and the LWC and UEC planning areas had been under landscape irrigation restrictions for 24 months.

Subsequent water shortage orders were written to focus restrictions on activities that demonstrated measurable water savings. For example, initial SFWMD orders in 2007 contained detailed rules about most types of outdoor water use, including irrigation, pressure washing, car washing, utility line flushing, and recreation. In 2007, the District held meetings with interested water users to better understand the water restriction experiences of utilities, parks and recreation facilities, and nursery growers in an effort to reduce the number of variance requests, increase compliance with the water restrictions, and focus on efforts to reduce use.

During the 2006–2009 water shortage, more than 105 billion gallons of water were saved Districtwide from March 2007 through April 2009 (SFWMD 2009b). The lower demand may be attributed, in part, to both a mandatory reduction in outdoor irrigation and voluntary indoor water consumption reductions. Although agricultural water use restrictions were eventually relaxed when drought restrictions were lifted in 2009, the urban lawn irrigation restrictions became a permanent water conservation strategy with the

Drought Effects in Water Conservation Area 2

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implementation of the Year-round Landscape Irrigation Rule (described later in the *Water Conservation for Water Use Permitting* section this chapter).

In spring 2011, Water Shortage orders were again required, imposing modified Phase I and Phase II restrictions.

Response Mechanisms

Throughout the water shortage, response mechanisms were in place to mitigate most of the adverse effects of the drought:

- The SFWMD issued water shortage orders in all basins, placing specific water users under water restrictions in an effort to reduce demand and stretch existing water supplies.
- A weekly analysis of groundwater and surface water conditions expanded monitoring during the water shortage.
- Water level and chloride concentration data from SFWMD and utility monitor wells were collected, graphed, and analyzed to evaluate saltwater intrusion potential.
- Water-level data were also gathered from the 298 Special Drainage Districts with diversion and impoundment permits to allow water managers to track conditions and determine areas with the greatest water-level decline.
- Status reporting of MFLs was provided for all affected surface water bodies and the Biscayne aquifer.
- Stormwater treatment area (STA) cells were monitored to ensure water levels were sufficient to support emergent vegetation.
- Target and drought management stages were developed to indicate optimum and declining STA performance, respectively.

To address reduced water availability due to inland movement of the saltwater interface or depleted surface water sources, the SFWMD divided utilities into three categories:

1. **Coastal Utilities at Risk** Utilities with wellfields near the saltwater interface that do not have an inland wellfield, have not developed adequate alternative sources of water, and have limited ability to meet user needs through interconnects with other utilities.

2. **Coastal Utilities of Concern** Utilities having wellfields near the saltwater interface, the ability to shift pumpages to an inland wellfield, or an alternative source that is not impacted by the drought.

3. **Surface Water Utilities of Concern** Cities relying on surface water from rivers, lakes, and impoundments for water supply (and so are highly sensitive to rainfall).

In addition, communication and data reporting requirements were increased during the water shortage for water utilities most vulnerable to drought impact. Utility reporting of

current utility contingency plans revealed that many utilities did not have formally written drought contingency plans.

WATER CONSERVATION IN WATER USE PERMITTING

Water conservation practices are required in water use permits in order for the proposed use to be considered reasonable-beneficial. The District's water use permitting rules in Section 2.3.2 of the Applicant's Handbook (SFWMD 2014) include specific water conservation requirements for Public Water Supply, Industrial/Commercial/Power Plant, and Landscape/Recreation uses. The *Water Use Permitting* section of this chapter provides information about the permitting process. **Chapter 5** of this Support Document provides more information about statewide and Districtwide conservation programs and objectives.

> NAVIGATE
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> **Chapter 5** provides an overview of the District's entire Comprehensive Water Conservation Program, including the Regulatory Initiative Programs and Implementation element.

Public Water Supply Utilities

All Public Water Supply utilities applying for a water use permit are required to develop and implement a standard water conservation plan [Section 2.3.2.F.1.a of the Applicant's Handbook (SFWMD 2014)] or a goal-based water conservation plan [Section 2.3.2.F.1.b of the Applicant's Handbook (SFWMD 2014)]. To be accepted, proposed water conservation plans must maintain or increase overall utility-specific water conservation effectiveness.

For standard water conservation plans, the applicant is required to implement the following five elements as necessary to achieve efficient use to the extent economically, environmentally, and technically feasible:

1. Implementation of a water conservation public education program
2. An outdoor water use conservation program
3. Selection of a rate structure designed to promote efficient use
4. Implementation of a water loss reduction program, if required
5. An indoor water conservation program

> NAVIGATE
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> Water conservation measures that make additional water available from existing sources are discussed in **Chapter 5** of this document.

The District reviews the conservation plan submitted by the applicant as part of the public water supply permit application. The plan will be subject to the schedule and reporting requirements specified in the permit. If implementation of the plan fails to demonstrate progress toward increasing water use efficiency, the permittee shall request a permit

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modification, if necessary, to revise the plan to address the deficiency [Section 2.3.2.F of the Applicant's Handbook (SFWMD 2014)].

A goal-based water conservation plan can be used in lieu of the standard water conservation plan. This type of plan allows the permittee to select plan elements that are different from those in the standard plan, but which are appropriate to their service area. If any standard plan elements are not included, the permittee must provide reasonable assurances that the alternative elements will achieve effective conservation at least as well as the standard plan.

Implementation of a Water Conservation Public Education Program

Utilities selecting a standard water conservation plan are required to implement a water conservation public education program to inform consumers about water conservation benefits, such as lower water bills. Some examples of program elements include:

- Public service announcements
- Speakers, posters, literature, videos, or other information provided to schools and community organizations
- Public exhibits
- Articles or reports provided to local news media
- A water audit customer assistance program to address indoor and outdoor water use
- Information provided to customers regarding year-round landscape irrigation conservation measures
- Construction, maintenance, and publication of water efficient landscape demonstration projects

See **Chapter 5** of this Support Document for more information about water conservation educational and outreach programs.

Implementation of an Outdoor Water Conservation Program

Outdoor irrigation can account for as much as 50 percent of residential water use. Watering wisely outside the home reduces water use and promotes healthier lawns and landscapes. Public Water Supply utilities can adopt conditions of service or work with local governments to develop ordinances to help reduce outdoor water use. An outdoor water conservation program has a number of elements to consider, including:

- Year-round Landscape Irrigation Rule
- Florida-friendly landscapes
- Rain sensor device or smart or advanced irrigation system
- Landscape irrigation audit program
- Outdoor irrigation education element

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Year-Round Landscape Irrigation Rule for Water Conservation

The variable rainfall the District experiences each year is a driving force behind the Governing Board's adoption of the Year-round Landscape Irrigation Conservation Measures (Year-round Irrigation Rule), Chapter 40E-24, F.A.C., that place permanent limits on landscape irrigation throughout the SFWMD's 16-county region. Highlights of the rule include:

- Up to two-day-per-week watering in Charlotte, Highlands, Okeechobee, Orange, Osceola, and Polk counties.
- Option for up to three-day-per-week watering in Broward, Collier, Glades, Hendry, Lee, Martin, Miami-Dade, Monroe, Palm Beach, and St. Lucie counties.
- No irrigation allowed on any day between 10 a.m. and 4 p.m.
- Irrigation using reclaimed water, rain harvesting systems, and various low volume methods, such as microirrigation, container watering, and hand watering with a hose and automatic shut-off nozzle, can be conducted at any time.
- Additional watering is allowed following the installation of new lawns and landscaping for up to 90 days, with specific limits.

More information about the Year-round Irrigation Rule is available from http://www.sfwmd.gov/conserve.

Florida-Friendly Landscapes

Florida-friendly landscaping requirements are found in Section 373.185, F.S. A Florida-friendly landscape conserves water, protects the environment, is adaptable to local conditions, and is drought-tolerant. Actions required by Section 373.185, F.S. include:

- Water management districts to provide model Florida-friendly landscape ordinances to local governments
- Use of Florida-friendly landscaping for public properties, highway construction, and maintenance projects
- Local governments to consider adopting Florida-friendly landscape ordinances that would be beneficial as a water conservation measure

The use of Florida-friendly landscaping principles, Florida Water Star (described in **Chapter 5**), or other generally accepted water conservation programs, guidelines, or criteria that address landscape water conservation can greatly reduce water use.

Rain Sensor Device Ordinance

An operational rain sensor device, automatic switch, or smart irrigation system will reduce unneeded landscape irrigation. The FDEP created a model ordinance to ensure the proper installation, maintenance, and operation of systems that use automatic shut-off devices (http://www.dep.state.fl.us/water/waterpolicy/docs/sb494-model-irrigordinance.pdf). Smart or advanced irrigation systems that use soil moisture sensors can save substantially

more water than conventional time-controlled irrigation systems. When smart irrigation systems that meet statutory requirements are used, individuals and entities are eligible for a variance from year-round, days-of-week water restrictions. **Chapter 5** of this Support Document contains more information about smart irrigation systems.

Smart Irrigation Sensor

Landscape Irrigation Audit Program

The Public Water Supply utility should consider developing or funding a landscape irrigation audit program for businesses and residences that includes information to assist customers in implementing the recommendations of the audit. A description of the program, including implementation details and contents of the audits, should be provided as part of the water conservation plan.

Outdoor Irrigation Education Element

The Public Water Supply utility should consider including specific educational information aimed at increasing the efficiency of outdoor irrigation use in their conservation plan.

Adoption of a Water Conservation-based Rate Structure

As part of a standard water conservation plan, Section 2.3.2.F of the Applicant's Handbook (SFWMD 2014) requires Public Water Supply utilities to consider the selection of a rate structure to provide additional economic incentives to promote the efficient use of water. The rate structure may include, but is not limited to, increasing block rates, seasonal rates, quantity-based surcharges, and/or time of day pricing as a means of reducing demands. **Chapter 5** of this Support Document contains more information about water conservation based rate structures.

Implementation of a Water Loss Reduction Program

Utilities may not have more than 10 percent unaccounted-for water losses. Utilities exceeding that threshold in unaccounted-for losses are required to implement a leak detection program [Section 2.3.2.F.2.c of the Applicant's Handbook (SFWMD 2014)]. The leak detection program must include water auditing procedures, in-field leak detection efforts, and leak repairs. The water loss reduction program description should include the number of labor hours for leak detection, the type of leak detection equipment being used, and an account of the water saved through leak detection and repair [Section 4.1.2 of the Applicant's Handbook (SFWMD 2014)].

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Implementation of an Indoor Water Conservation Program

Education and simple plumbing retrofits have been proven to reduce indoor water use. The program should consider plumbing retrofit rebates, faucet aerator and showerhead giveaways, and an educational element focusing on indoor conservation. Implementing these elements may be achieved through collaborating with other entities, including the District.

Industrial / Commercial / Power Plants Water Users

All individual industrial, commercial, and power plant water use permit applicants within the jurisdiction of the SFWMD are required to submit a water conservation plan at the time of permit application. Water conservation plans for individual permit applicants must include:

- An audit of water use
- Implementation of cost-effective water conservation measures if found to be cost-effective during an audit, such as a leak detection/repair program, recovery/recycling, and processes to reduce water consumption
- An employee awareness and consumer education program concerning water conservation
- Procedures and time frames for implementation of tasks

A well-planned and scheduled audit program is a prerequisite for improving and sustaining water use efficiency in an industrial or commercial facility. A water use audit or assessment is a systematic review of all water consumption from point of entry to discharge. A comprehensive assessment includes an examination of historic water use, the calculation of a facility's true cost of water, the measurement and/or calculation of all on-site water consumption, the detection of leaks, and the identification of on-site water sources and potential opportunities for reducing unnecessary water use.

Recreational / Landscape Water Users

New projects or modifications to existing landscaping require landscape and golf course water permit applicants to develop a water conservation plan that incorporates rain sensor devices and Florida-friendly landscaping principles. Applicants are also required to install rain sensor devices, automatic switches, or other automated mechanisms that have the ability to override operation of the irrigation system when adequate rainfall has occurred.

Agricultural Water Users

Standard irrigation system types include microirrigation, overhead sprinkler, and flood/seepage irrigation. For certain crops, such as citrus and container nursery, water use permit holders are required to use microirrigation or other systems of equivalent efficiency. Most citrus groves use the more efficient microjet or drip irrigation. This rule applies to new

installations or modification of existing irrigation systems. Flood/ seepage type systems are typically used for tomato, corn, rice, and sugarcane production.

Agricultural Irrigation Systems

Low-volume Irrigation

The most important benefit of low-volume irrigation is its potential to reduce or eliminate water waste. With low-volume irrigation, the water application can be matched to the specific needs of each plant. In addition, water application rates can be matched to the soil's infiltration rate more closely, and water can be applied directly to the plant root zones to virtually eliminate evaporation. As water is directed exactly where needed, very little water is wasted on the areas between widely spaced plants. Low-volume irrigation systems can be either drip irrigation or microirrigation. Drip systems typically use polyethylene pipe to deliver water to a small drip emitter. Emitters come in a variety of sizes, shapes, and specifications. Most are rated in gallons/hour, making it relatively easy to determine how much water is being applied at each irrigation event. Drip emitters can be spaced evenly along the delivery pipe or clustered at specific locations. Drip emitters with pressure compensation and backflow prevention provide optimum control over the volume of irrigation water supplied.

Flood/Seepage Irrigation

Flood/seepage irrigation is a method of artificially raising the water table to allow the soil to be moistened from below the root zone of plants. Flood irrigation is commonly used in the region to irrigate vegetables, sugarcane, and citrus crops. Farms that use seepage irrigation techniques often maintain it through pumping stations, canals, gates, and weirs to lower or raise the water level. Typical irrigation efficiency for these systems is about 50 percent, meaning that half of the water delivered is actually used by the plants. Classified by method of water application, two types of seepage irrigation systems are used in the region – surface ditch systems and subsurface ditch systems. Surface ditch systems use field ditches, which are called water furrows or lateral ditches.

Design of seepage systems requires calculating lateral spacing needed to maintain the required water table heights. Closer spacing produces greater uniformities, while wider spacing is less expensive.

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Pelican among Mangroves

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5

Water Source Options and Water Conservation

This chapter presents water source options and water conservation measures suitable for all the planning areas within the SFWMD. Water source options address supply management, whereas water conservation relates to demand management. The District seeks to make the best possible use of regional water resources by implementing a combination of water source options and water conservation policies and programs.

TOPICS

- Water Source Options – Supply Management
- Water Conservation – Demand Management

WATER SOURCE OPTIONS – SUPPLY MANAGEMENT

This section discusses a number of water supply sources, along with some related costs, including:

1. **Groundwater Sources** Water beneath the surface of the ground, primarily withdrawn from three south Florida aquifer systems: the surficial aquifer system (SAS), intermediate aquifer system (IAS), and Floridan aquifer system (FAS).
2. **Surface Water** Lakes, rivers, and canals are surface water bodies used to supplement water supply.
3. **Seawater** Sources of desalinated water in south Florida are the Atlantic Ocean and Gulf of Mexico.

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"Alternative water supplies" means salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater; water that has been reclaimed after one or more public, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water, storm water, and any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan (Section 373.019, F.S.).

4. **Reclaimed Water** Water reused after receiving at least secondary treatment and basic disinfection, flowing out of a domestic wastewater treatment facility.
5. **Storage Solutions** Three major types of potential storage options in the SFWMD are Aquifer Storage and Recovery (ASR), regional and local retention, and reservoirs.
6. **Utility Interconnects** Public Water Supply interconnection of treated or raw water distribution systems as a means to address local or temporary service shortfalls.

Water Source Option Cost Information

Cost information pertaining to water withdrawal, storage, and utility interconnection is introduced in this chapter. Each of these components is part of a larger multifaceted water delivery and treatment framework. The quality of the water dictates the treatment technologies and processes necessary to meet water quality standards.

Water treatment technologies, components, and processes related to the second and third phases of the water delivery and treatment process are presented in **Chapter 6** of this document.

Although the criteria for meeting drinking water standards do not vary, other variables, such as water source availability, water quality, and water source location, affect cost considerations. Therefore, the scope of this Support Document does not include a comprehensive discussion of process technologies and components. Readers must be careful to use the information as a starting point for gaining an understanding of some of the fundamental considerations and costs of incorporating new water supplies and treatment capabilities within specific localities. This chapter and **Chapter 6** support comprehension of this material, and references to specific sections for related discussions are provided throughout both chapters. Examples of utility project costs may be available in each planning area's water supply plan update. Finally, unless otherwise noted, the cost information presented in this chapter and **Chapter 6** cites the Camp, Dresser & McKee, Inc. report, *Water Supply Cost Estimation Study* (Cost Study) (CDM 2007a).

Cost Study

The Cost Study and addendum (CDM 2007a, 2007b) provide engineering cost data and cost estimation relationships and curves to evaluate various water treatment technologies for the District's four water supply planning areas. Options included are groundwater; surface water; seawater; reclaimed water; and storage, such as ASR and reservoirs. Costs are planning-level estimates.

Water Treatment Plant in Collier County

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The Cost Study includes case studies for some technologies constructed close to the time of the study, such as surface water and seawater treatment facilities. The case studies address actual facility sizes and their costs.

Where treatment technologies are addressed, the costs associated with facilities of 5 million gallons per day (MGD), 10 MGD, 15 MGD, and 20 MGD have been evaluated. For some treatment processes and technologies, the costs for 1 MGD and 3 MGD of the treatment capacity are also provided.

However, it should be noted that due to economies of scale, the capital cost per gallon per day of treatment capacity increases sharply as the facility capacity decreases from 5 MGD to 1 MGD, and the capital and operations and maintenance (O&M) costs become much larger components of the total project cost. For example, the cost of concentrate disposal for a 1 MGD lower pressure reverse osmosis (LPRO) treatment facility is essentially the same as for concentrate disposal for a 20 MGD LPRO facility. This is largely due to the fixed capital cost of a deep injection well for concentrate disposal in this capacity range. The labor component of the total O&M cost becomes much more significant for a smaller capacity facility due to typical process automation.

The Cost Study provides opinions of probable cost considered to be order-of-magnitude estimates as defined by the American Association of Cost Engineers. These costs are regarded as accurate within +50 percent or -30 percent, and presented as August 2006 dollars. After the release of the Cost Study, construction costs of water infrastructure rose significantly; then a reversal in pricing trends occurred. It was determined that the August 2006 dollar estimates were still valid for use in this planning update cycle to portray market conditions at the time this Support Document was written.

In addition, the Cost Study cites energy costs of $0.10/kilowatt hour (KWh) based on review of planning-level power costs for water utilities in both Palm Beach and Collier counties. For planning purposes, when considering plants that operate facilities, wells, and other pumps, the rate of $0.10/KWh appeared reasonable.

The costs of various water source options across the District were presented in terms of capital, O&M, and total production costs on a unit-cost basis, expressed in dollars per 1,000 gallons. The following cost definitions apply to the terms used in the study:

- **Construction Costs** The total estimated amount expected to be paid to a qualified contractor to build the required facilities, including costs for all materials, equipment, and installation.
- **Nonconstruction Capital Costs** Services such as engineering, design, permitting, and administration; and construction project contingencies associated with the constructed facilities.
- **Land and Acquisition Costs** Unless otherwise noted, the land and land acquisition costs are not included in the calculation of the total capital cost.
- **Total Capital Costs** The total capital costs for each of the water supply and wastewater system components are the sum of the construction and nonconstruction costs.

- **Operations and Maintenance Costs (O&M)** The costs of operating and maintaining the water supply system components each year, including costs for energy, chemicals, component replacement, and labor.
- **Equivalent Annual Capital Costs** To compare the costs for various technologies, capital investments are converted to equivalent annual capital costs. The parameters used in this amortization of initial capital investment are a term of 20 years and a discount rate of 7 percent. The 20-year term approximates the overall cost-weighted useful life of the capital investment in facilities and equipment.
- **Total Annual Production Costs** This cost category includes O&M costs and an annual renewal and replacement fund deposit that is not included as part of the O&M costs. The annual renewal and replacement fund deposit is equal to 10 percent of the equivalent annual capital cost, and is for replacement of major equipment during the course of the 20-year service life of the facilities.
- **Annual Production (Unit) Cost** A ratio of total annual production costs and a facility's annual finished water production rate expressed in dollars per 1,000 gallons.

Groundwater

Significant amounts of fresh water and brackish water demands within the SFWMD are met by groundwater sources, particularly urban demands. The hydrogeology of south Florida is best defined as a series of layered aquifers and aquitards that vary in thickness and depth. This includes both semi-confined and unconfined aquifers. In each of the District's planning regions, groundwater is withdrawn from three primary water producing aquifer systems: SAS, IAS, and FAS. While the FAS exists throughout the SFWMD, all of these aquifers typically vary in their extent, usability, and quality from region to region. In addition, within an individual aquifer, hydraulic properties and water quality may vary both vertically and horizontally. The District's permitted rules, including Minimum Flows and Levels and Water Reservations (see **Chapter 4** of this document) must be considered when determining groundwater availability.

Surficial Aquifer System

The SAS is typically found at depths from land surface to 200 feet below land surface (bls). This includes the Upper East Coast (UEC) and Kissimmee Basin (KB) planning areas, the Biscayne aquifer in the Lower East Coast (LEC) Planning Area, and the Water table and Lower Tamiami aquifers in the Lower West Coast (LWC) Planning Area.

Intermediate Aquifer System

The IAS is a confining unit in most of the District, producing very little water. The IAS is used for water supply on a very limited basis, except in the LWC Planning Area. Here, the IAS includes two producing zones, the Sandstone and Mid-Hawthorn aquifers. Depending on location, these aquifers can be found from 50 feet bls to almost 400 feet bls.

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Floridan Aquifer System

The FAS is the deepest of the aquifers used for water supply in the SFWMD. Within the FAS, multiple permeable intervals, or producing zones, are layered between low-permeability confining materials. In some portions of the District, the FAS is artesian (flows at land surface without a pump because the water is at a higher pressure than atmospheric). The water-producing formations of the FAS in the Orlando area can be found between 80 feet bls and 1,500 feet bls. The water-producing formations of the FAS currently used for water supply south of central Okeechobee County can be found from 600 feet bls to over 1,800 feet bls, depending on the location.

DISTRICT

Brackish groundwater is typically defined as water with a total dissolved salt concentration between 1,000 milligrams per liter (mg/L) and 10,000 mg/L. The terms fresh, brackish, saline, and brine are used to describe the quality of water. Although brackish supplies in the low range of these salinities may be used for some agricultural purposes, they do not meet public drinking water standards. Advanced treatment technologies, such as reverse osmosis (RO), electrodialysis, or electrodialysis reversal, must be employed before this type of supply is suitable for human consumption.

The water quality in the FAS decreases significantly from central Florida to south Florida, increasing in hardness and salinity. Salinity also increases with depth, making the deeper producing zones less desirable for development than shallower parts of the system.

In the Upper KB Planning Area, the FAS is the primary source of fresh water for all uses. However, water from the FAS requires desalination treatment in the Lower KB Planning Area, south of central Okeechobee County, as well as in the Upper East Coast, Lower East Coast, and Lower West Coast planning areas.

Usage and Production Capacity

As of April 2012, there are 35 Reverse Osmosis (RO) facilities located in the SFWMD with an operating capacity of approximately 245 MGD. In addition, there are seven new facilities under construction that will produce 34.5 MGD and an existing plant that will add another 2 MGD, providing a total of 36.5 MGD of additional capacity. Of the 35 facilities, 33 acquire and treat brackish water from the FAS. Two are desalination facilities (Marathon and Stock Island) are located in the Florida Keys and use seawater rather than brackish water as their source.

In addition, a number of golf courses in south Florida use RO to treat FAS water to meet irrigation needs. In the UEC Planning Area, many citrus growers also use the FAS as a backup water supply when fresh surface water availability becomes limited.

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Groundwater Estimated Costs

Floridan groundwater costs depend on the salinity of source water. Groundwater supply systems are composed of wellfields and their related features, such as pipelines and pumps. Groundwater well production is limited by the rate of water movement in the aquifers, rate of recharge, aquifer storage capacity, environmental impacts, and proximity to sources of contamination and saltwater intrusion. A combination of these factors determines the number, size, and distribution of wells that can be developed at a specific site.

The cost of a well is a function of diameter and depth. Well drilling construction costs include drilling, casing to SFWMD standards, minimal logging, aquifer testing, and the final wellhead. Equipment costs include pumps, valves, fittings, metering, a well house structure, electrical controls, installation, and taxes. The O&M costs consist of normal maintenance of the well, including equipment, energy, and labor. Cost estimates to construct a groundwater well represent only one component in the water withdrawal process. Additional process technologies and components, with some related costs for treating and delivering brackish groundwater, are included in **Chapter 6** of this document.

Surface Water

Surface water is also a water source option. Lakes, rivers, canals, and the Water Conservation Areas are surface water bodies that may be used to supplement water supply. Several potential sources of surface water have been identified in each of the SFWMD's planning areas to meet future water demands. Most of these potential sources convey water from inland areas and discharge via the Kissimmee River or other tributaries to Lake Okeechobee.

In Florida, water supply from surface water sources is usually available during the wet season and limited during the dry season. Surface water bodies can also provide aquifer recharge for groundwater. The District permitting rules, including Minimum Flows and Levels and Water Reservations (see **Chapter 4** of this document) must be considered when determining surface water availability.

Usage and Production Capacity

Surface water use and production vary from planning area to planning area within the SFWMD. The Agricultural Self-Supply category is the primary water user of surface water, including runoff. On-farm detention ponds, connections to conveyance canals, and other collection methods allow field runoff to be recovered and reused. Best management practices can augment the quality and use rates of this water, and should be executed with water recovery programs. Cost-share and other programs encouraging such surface water use are discussed in Chapters 4 and 6 of each regional water supply plan update.

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Estimated Costs

In most planning areas, agricultural operations are the largest user of surface water, through canal withdrawals or on-farm storage ponds (see the *Storage* section of this chapter). **Table 4** provides estimates of costs to install water-pumping facilities designed to divert surface water.

Table 4. Pump installation and operating costs.[a]

Pump Type	Engineering/ Design Cost	Construction Costs	O&M Cost
Electric	$50,000	$3–4 million[b]	$60/hr
Diesel	$50,000	$1.5–3 million	$40/hr

Source: Water Supply Cost Estimate Study (CDM 2007a).

Notes:

a. For estimating purposes, a pump rated at 60,000 gallons per minute (GPM) is assumed.

b. Does not include cost of installing electrical power to site.

NAVIGATE

The cost estimates provided for installing and operating a pump to process surface water represent only one water source withdrawal component. Additional process technologies and components, with some related costs for treating and delivering water, are also included in these sections:

See also the following section in this chapter:

- Reservoirs Estimated Costs

See also the following sections in **Chapter 6** of this document:

- Microfiltration and Ultrafiltration Water Treatment Technology
- Brackish Surface Water Reverse Osmosis Water Treatment Technology

Seawater

In south Florida, desalinated seawater is a potential alternative water supply. Use of seawater as a water source option involves drawing water from the Atlantic Ocean or Gulf of Mexico as raw water source and treatment through a desalination process. Seawater contains about 3.5 percent or 35,000 parts per million of dissolved salts, most of which is sodium chloride, with lesser amounts of sulfates, magnesium, potassium, and calcium. Therefore, removal of salts is required before potable or irrigation uses are feasible. To accomplish salt removal, a desalination treatment technology, such as distillation, reverse osmosis (RO), or electrodialysis reversal, is required.

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Usage and Production Capacity

In December 2006, the SFWMD completed a feasibility study for co-locating seawater treatment facilities with once-through cooling power plants in south Florida (Metcalf & Eddy 2006). The study's three highest ranked sites are co-located with Florida Power & Light (FPL) facilities in Fort Myers, Fort Lauderdale, and Port Everglades. Some discussions about building a co-located seawater desalination facility have occurred between these entities.

Reverse Osmosis Membrane

In the LEC Planning Area, the Florida Keys Aqueduct Authority (FKAA) operates two seawater desalination facilities, located on Stock Island and Marathon, which produce fresh water from seawater, and are a backup source of 3 MGD of potable water for the Lower and Middle Keys.

Estimated Costs

The cost of seawater desalination is higher than the cost of brackish groundwater desalination due to seawater's higher salt content, which requires specialized intake facilities and concentrate disposal. However, technological advancements and incremental improvements in productivity and efficiency of RO membranes, pumps, energy recovery devices, and overall system configuration have reduced the cost of production of desalinated seawater. **Table 5** shows a brackish surface or seawater desalination facility co-located with a power plant listing cost-saving features, including savings from economy of scale. The higher salt content factor reduces the efficiency of the treatment facility (fewer gallons of potable water are produced from water pumped) and results in an increased amount of concentrate/reject water disposal compared to brackish groundwater desalination.

When considering costs for using seawater, the proximity to a major potable water transmission system or network must be considered. In most areas of the SFWMD, coastal areas are highly urbanized.

Benefits of Co-location

The cost of seawater desalination appears to be reduced when the desalination facility is co-located with power generating facilities that use seawater for cooling. There are many potential benefits of co-locating desalination facilities with electric power plants, and one benefit is sharing facility components. Cost savings are also associated with using the existing intake and discharge structures of the power plant to provide raw water to the desalination facility and to provide a means for concentrate disposal. It is possible to dispose of the desalination process concentrate by blending it with the power plant's coolant water discharge. Another significant advantage of using power plant cooling water

as a source is that the temperature of the water is elevated, which reduces the pressure and associated energy needed to produce the finished water product.

Table 5 provides planning-level costs from the Technical and Economic Feasibility of Co-Located Desalination Facilities Study (Metcalf & Eddy 2006) for 10 MGD and 20 MGD facility capacities. The table shows the economy of scale with lower cost per 1,000 gallons for the larger capacity.

Table 5. Estimated project costs for developing a co-located brackish surface water or seawater treatment facility.

Candidate Site	Facility Capacity (MGD)	Water Quality (TDS) (ppm)	Total Construction Costs (millions)	Capital $ Per Gallon of Capacity	Total Annual O&M Costs (millions)	Equiv. Annual Costs ($/1000 gallons)
Fort Lauderdale	20	15,000	$148.0	$7.40	$10.40	$3.88
Fort Myers	10	15,000	$91.1	$9.11	$6.40	$4.66

Source: Technical and Economic Feasibility of Co-Located Desalination Facilities (Metcalf & Eddy 2006).
Notes: TDS=total dissolved solids, ppm=parts per million.

Capital costs for building and maintaining a seawater treatment facility were developed by sizing individual components for each candidate site. Unit prices were estimated from equipment manufacturer pricing and recent historical data from other projects. When appropriate, equipment, electrical, and instrumentation costs were added. After the construction costs were estimated and totaled, the following cost assumptions were made:

- A 25 percent contingency cost adjustment was added for items that were unanticipated expenses and uncertainties.
- The final construction cost estimate based on 2006 dollars also includes a 17 percent cost adjustment for the contractor's overhead expenses, mobilization, demobilization, bonding, and insurance.
- The final project estimate includes a 10 percent cost adjustment for engineering.

St. Lucie West Water Treatment Facility

- The capital costs are based on a finished water production quantity that is unique to each of the candidate sites.

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The costs presented in this section should be considered budget-level costs with an accuracy of +30 percent to -15 percent, and reflect capital amortized at 7 percent for 20 years.

Advances in membrane technologies have substantially reduced the cost of RO treatment, generating interest in the implementation of RO in Florida, Texas, and California. Costs can vary significantly between states due to regulatory requirements, as well as to site-specific conditions. The regulatory landscape differs vastly in the communities and states served by desalination facilities. These differences can have a profound impact on project delivery timelines, legal costs, and in some cases alter the design of the seawater RO facility (WateReuse 2012). In addition, as with any infrastructure projects, it is also important to recognize that the various components supporting the overall desalination treatment facility can vary significantly and are based on site location.

For example, the 25 MGD Tampa Bay co-located seawater facility became fully operational in 2007 and is operating at a cost of $3.38 per 1,000 gallons (Tampa Bay Water 2008). In Carlsbad, California a 50 MGD co-located seawater desalination facility is under construction and expected to be operation in 2016. Water from the plant is expected to cost between $1,849 and $2,064 per acre-foot ($5.67–$6.33 per 1,000 gallons), depending on how much is purchased (San Diego County Water Authority 2012).

Reclaimed Water

Reclaimed water is wastewater that has received at least secondary treatment and is reused after flowing out of a wastewater treatment facility (Chapter 62-610, F.A.C.). Reuse is the deliberate application of reclaimed water for a beneficial purpose, in compliance with the Florida Department of Environmental Protection (FDEP) and water management districts' rules. Potential uses of reclaimed water include landscape (e.g., medians, parks, residential lots, and golf courses) and agricultural irrigation; groundwater recharge through rapid infiltration basins and percolation ponds; industrial uses; environmental enhancement; and fire protection. High-quality reclaimed water may also be used for groundwater recharge using injection wells, although this practice is not currently in use in the SFWMD.

City of West Palm Beach Wetland-based Water Reclamation

The State of Florida encourages and promotes the use of reclaimed water. The Water Resource Implementation Rule (Chapter 62-40, F.A.C.) requires the FDEP and water management districts to advocate the use of reclaimed water as an integral part of water management programs, rules, and plans.

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Reclaimed Water Conservation

As customer demand for reclaimed water increases, supply shortages present an issue for utilities. Many water utilities have sought approval for supplemental reclaimed water supplies from the FDEP and Florida's water management districts to meet customer demands, as well as additional water supply during dry seasons and droughts.

Reclaimed Water Pipes

Reclaimed-water conservation methods are under investigation Districtwide. In areas of the SFWMD where fresh water is limited and reclaimed water supplies are committed, reclaimed water conservation is recognized as a valuable tool for extending reclaimed water supplies. A leading solution is to replace existing flat-fee reclaimed water rates with a water-conserving, volume-based rate structure, similar to what many Public Water Supply utilities have in place for potable water.

In addition to usage-based rate structures, there are several means of promoting water conservation in reclaimed water systems. Most options follow methods employed by potable water systems. A report by the Reuse Coordinating Committee (2003) provides a list of options for improving efficient use of water in reclaimed systems. Supported methods include, but are not limited to, development of storage and supplemental sources, educational programs, water audits of irrigation systems, ordinances on irrigation system efficiencies, and encouragement of aquifer recharge.

Water Reuse and Production Capacity

The *2010 Reuse Inventory* (FDEP 2011) indicates 113 wastewater facilities located with the SFWMD reused about 236 MGD of reclaimed water for a beneficial purpose. Disposal of the remaining 611 MGD of treated wastewater was by deep well injection and discharge to the ocean.

In 2006, Palm Beach County adopted a mandatory reuse ordinance requiring all new development within one mile of its Southern Water Reclamation Facility to use reclaimed water for irrigation. In the KB and LWC planning areas, which reuse 100 percent and 90 percent of wastewater flows, respectively, supplemental sources are being investigated and developed to augment reclaimed water flows. Several utilities in these regions have waiting lists for reclaimed water.

More information about existing wastewater treatment facilities, including water reuse data, is provided in Appendix D of each regional water supply plan update.

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Reclaimed Water Estimated Costs

The costs associated with implementation of a reuse program vary depending on the size of the reclamation facility, equipment needed, extent of the reclaimed water transmission system, and regulatory requirements. Some of the major costs to implement a public access reuse system also include the following:

- Secondary treatment with high level disinfection
- Reclaimed water transmission system
- Storage facilities
- Backup disposal

When reclaimed water is provided to existing facilities, the end users may need to modify their irrigation systems to receive the reclaimed water.

NAVIGATE

See also the *Wastewater Treatment Technologies* section of **Chapter 6** of this document.

Cost savings include reducing the use of alternative water disposal systems; negating or reducing the need for an alternate water supply development; and reducing fertilization costs for the end user using the system for irrigation.

Storage

Storage is required to keep water in the SFWMD water supply system instead of discharging it to tide. The three major types of potential storage options are ASR, regional and local retention, and reservoirs.

Aquifer Storage and Recovery

Aquifer Storage and Recovery is the underground storage of water. Water is stored with the intent to recover the water for use during times of need. Uses for the recovered water range from environmental to urban. The storage zone, typically within the brackish waters of the FAS in south Florida, acts as an underground reservoir for the injected water. While ASR recovery is typically less than 100 percent, losses are usually less than evapotranspiration of surface water. The stored water can be potable drinking water, fresh groundwater, storm water, surface water, or reclaimed water treated to the prescribed standards and recharged underground through wells. Current federal regulations require recharged

Hillsboro Canal ASR Pilot Project

water meet primary drinking water standards when the receiving aquifer is classified as an underground source of drinking water [U.S. Environmental Protection Agency; Title 40, Code of Federal Regulations, Section 144.3] unless an aquifer exemption is obtained. An underground source of drinking water is defined as an aquifer with a total dissolved solids (TDS) concentration of less than 10,000 mg/L.

Treatment costs for meeting the federal regulations are the main driver for the costs of ASR systems, particularly regarding disinfection technology. Disinfection is required to inactivate biologic pathogens that might enter the aquifer through an ASR well. Arsenic also remains a potential challenge for existing and future ASR systems because the injection of waters into an aquifer can release naturally occurring arsenic contained within the surrounding rock.

Although there are technologies to treat recovered water before it is used for Public Water Supply, technologies are being researched to prevent arsenic from being leached within the aquifer (SFWMD and USACE 2008) and to investigate microorganism survival and contamination (John, Rose, and Kamarainen 2004).

Usage and Production Capacity

The volume of water potentially available through ASR wells depends on many variables, such as well location, well yield, water availability, water quality, aquifer characteristics, and changes in demand. For this reason, it is difficult to provide a storage volume estimate for a specific ASR well project without examining these local factors. However, based on the ASR wells that have been tested and operated, a typical storage volume for an individual well ranges from 10 million gallons to 500 million gallons, or 31 acre-feet to 1,535 acre-feet (Pyne 2005). Potentially, where appropriate, multiple ASR wells could be operated as a wellfield, with the capacity determined from the recharge or recovery periods.

The storage time is usually seasonal for ASR systems associated with Public Water Supply, but can also be diurnal, long-term (multi-annual), or for emergencies. The potential volume of water made available to any specific user must be determined through the District's water use permitting program.

Within the SFWMD, there are several ASR wells owned by utilities with operations permits for using treated drinking water or partially treated surface water. As of May 2010, there were numerous wells under operational testing or construction. In addition to these utility uses, the SFWMD, in cooperation with the U.S. Army Corps of Engineers (USACE), is pursuing regional ASR systems as part of the Comprehensive Everglades Restoration Plan (CERP), primarily around Lake Okeechobee. A summary of progress is presented in the SFWMD and USACE (2008). Some examples of ASR are:

- **Treated Water ASR** Uses potable water as the injection water. Because potable water meets drinking water standards, this type of ASR application is easier to permit. Utilities in Collier County, Lee County, and the City of Boynton Beach are using treated-water ASR.

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- **Raw Water or Partially Treated ASR** Uses groundwater from freshwater aquifers or surface water. Some treatment may be needed before injecting the water into the aquifer to meet regulatory standards. Raw water or partially treated ASR is usually included in combination with surface water storage, such as a reservoir or canal system. The reservoir or canal system captures excess surface water quickly and in large volumes, and then provides the captured water to the ASR wells for a slower injection into the subsurface. In lieu of withdrawing water directly from a surface water body, potential projects may involve installation of vertical or horizontal wells, and use of the soil matrix between the water body and well intake for filtration, sometimes referred to as bank filtration. This type of ASR could be used as a source of water for potable needs, a supplemental source to reclaimed water, or for environmental purposes. The CERP ASR pilot projects employ this type of ASR.
- **Reclaimed Water ASR** Several communities in Florida are investigating the feasibility of a reclaimed water ASR system. Two utilities in the Southwest Florida Water Management District (SWFWMD) are conducting operational testing of ASR systems using reclaimed water. Some modifications to treatment systems or installations of additional treatment components may be needed to meet applicable standards.

Estimated Costs

Estimated costs for an ASR system depend on many factors, including hydrogeologic conditions, well depth, flow rates, water treatment process, required number of monitor wells, and other required features. **Table 6** provides estimated costs for a 2 MGD potable water ASR system and a 5 MGD surface water ASR system. For a 2 MGD drinking water ASR system, the total capital cost is estimated at $2 million, with annual O&M costs of $200,000. For a 5 MGD surface water ASR system, the total capital cost is estimated at $5 million, with annual O&M costs of $500,000.

Table 6. Aquifer Storage and Recovery cost estimates.

System Capacity (MGD)	Costs by Category					
	Capital	Non-Construction	Land Acquisition	Annual O&M	Equivalent Annual	$ per 1,000 gal
2	$2,000,000	$160,000	$0	$200,000	$134,885	$0.54
5	$5,000,000	$830,000	$0	$500,000	$644,718	$1.02

Source: Water Supply Cost Estimate Study (CDM 2007a).

The potable water cost information assumes that the hypothetical ASR well will be located at the water treatment facility site and have a 70 percent recovery rate. Because the example ASR well will be recharging highly treated potable water into the aquifer, the costs associated with monitoring are generally lower. The surface water ASR cost information assumes the ASR facilities will be located at a remote site with microfiltration treatment of the injected water and a 70 percent recovery rate. The monitoring program for the surface water ASR system scenario would be more extensive, and therefore, costs are higher.

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Related costs do not include expenses to provide a source of raw water, water treatment costs before injection, and costs for transmission between the water facility and the ASR wellfield.

Regional and Local Retention

Regional and local retention provide a way to increase water storage through the manipulation and modification of a watershed's drainage system, while maintaining an appropriate level of flood protection. Much of the land within the SFWMD was drained to support urban and agricultural development, resulting in lower groundwater tables that consequently affected natural systems and water availability in these areas. Conversely, in some areas of the SFWMD, increased water retention in canal systems has increased groundwater levels.

The regional and local retention water supply option includes structural and operational changes that allow the capture of additional runoff water to be held in secondary canal systems. One benefit of this option in coastal areas is to stabilize the salt front by holding higher surface water and groundwater levels, thereby minimizing saltwater intrusion. Higher groundwater levels should also help to recharge wellfields and decrease the impact of water shortages. Modifying secondary canal operations would be expected to improve local water use and recharge, and help to reduce the need to bring water in from regional sources. However, consideration of higher water levels must also address the potential impacts on flood protection. All modification of operations needs to be consistent with associated MFL strategies.

Usage and Production Capacity

In the SFWMD, regional and local retention projects benefit water supply by raising water levels through either system modifications or operational changes. Many water management structures have dry and wet season operational schedules that maximize retention without comprising flood protection. Many water control entities periodically review their systems to identify potential improvements to increase retention, such as the city of Cape Coral and the Big Cypress Basin.

The City of Cape Coral is using regional retention to increase water availability in the city's canal system to supplement its reuse irrigation system. Updates and modifications to the city's freshwater canals will enable the storage of an additional one billion gallons of fresh water in the canals during dry periods and in Aquifer Storage and Recovery wells during wet periods. These freshwater storage improvements will 1) provide additional irrigation water supply, 2) reduce freshwater discharges and loss to tidal waters, 3) provide water quality treatment through increased retention time of urban stormwater runoff, 4) increase freshwater wildlife habitat, and 5) reduce demands on regional groundwater sources (Citizens of Cape Coral 2010).

The Big Cypress Basin is implementing the Big Cypress Basin Watershed Management Plan (BCBWMP). The BCBWMP considers a range of alternative water management strategies to augment water supply and restore historic flow-ways by interbasin transfer through

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modifications to its primary canal network. The implementation of the BCBWMP projects (nine weirs retrofitted since 2000) and the backpumping operation of four existing pump stations have created an estimated 850 acre-feet of additional surface water storage in canals since 2000. This does not include increases in water availability due to the resulting increase in groundwater recharge. The CERP Picayune Strand Restoration Project implementation report (PIR) model indicates that the project will make 9,500 acre feet of additional groundwater available for the natural system during an average year due to recharge as result of plugging four canals and reduced freshwater discharges to the estuaries.

Estimated Costs

Regional and local retention costs vary greatly as they are site and type specific.

Dispersed Water Management Program

The Dispersed Water Management Program is an effort designed to encourage property owners to retain water on their land rather than drain it, accept regional excess runoff for storage, or both. Managing water on public, private, and tribal lands is a way to reduce the amount of water delivered into Lake Okeechobee and discharged to coastal estuaries for flood protection purposes. This program complements water storage options available through public facilities such as reservoirs, restoration projects, and stormwater treatment areas. The program consists of three approaches: 1) Easements/U.S. Department of Agriculture (USDA) Wetland Reserve and Reserved Rights Programs, 2) Payment for Environmental Services (Florida Ranchlands Environmental Services Pilot Project), and 3) Cost-Share/Water Storage.

Reservoirs

Reservoirs capture and store excess surface water during rainy periods and release water during drier periods for environmental and human uses. This water source option provides an opportunity to increase the supply of fresh water during dry periods.

The primary drawback to reservoir storage is large land parcel requirements and associated expenses. Expenses include land acquisition; construction, and O&M of large capacity pumping facilities; flood protection for existing urban and agricultural users; and water treatment costs. In addition, the availability of suitable locations, seepage losses, and the high evaporation rates of surface water bodies (reservoirs) can be problematic.

Usage and Production Capacity

In the SFWMD, reservoirs can provide multiple beneficial uses. For example, a reservoir could capture both Lake Okeechobee regulatory releases to reduce harmful estuary discharges and improve later environmental releases to the Everglades. This can be accomplished through the storage of water during the wet season and release during the dry season. Reservoir diversion and storage can improve flood control and provide regional and local water supply benefits. An example of a surface water reservoir used for Public

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Water Supply is the Tampa Bay Water's Surface Water Treatment Plant Reservoir. When available, surface water from Tampa Bypass Canal and the Hillsborough and Alafia rivers is diverted and stored in the 15.5 billion gallon regional reservoir to supply the water treatment facility during dry times.

Estimated Costs

Costs associated with surface water storage vary depending on the site-specific conditions of each reservoir. A site located near an existing waterway increases the flexibility of design and management and reduces costs associated with water transmission infrastructure. Lower site elevations allow maximum storage, while reducing costs associated with water transmission and construction excavation. Deeper reservoirs result in higher levee elevations, which can significantly increase construction costs, but can have significant savings in land acquisition costs.

Table 7 depicts costs associated with two types of reservoirs. The first is a minor facility with pumping inflow structures and levees designed to handle a maximum water depth of 4 feet. It also has internal levees and infrastructure to control internal flows and discharges. The second type is a major facility with greater depth, but an infrastructure similar to the minor facility. Costs increase significantly for construction of higher levees, but can be somewhat offset by reduced land requirements.

Table 7. Surface water storage costs.

Reservoir Type	Storage	Costs			
		Construction $/Acre-foot	Engineering/ Design $/Acre-foot	O&M $/Acre-foot	Land $/Acre
Minor Reservoir	Range	7,667–13,020	1,146-1,230	194–241	3,666–24,690
	Average	10,344	1,188	218	13,295
Major Reservoir	Range	1,867–6,295	75–513	12-111	2,702–32,533
	Average	3,440	297	52	14,188

Sources:
Costs (except for land) were obtained from the Cost Study (CDM 2007a).
Land costs were obtained from USACE and SFWMD (2005).

Related costs not included in the surface water storage option are costs for inflow and outflow transmission infrastructure, and costs for water treatment facilities, if any (depending on the end user).

Utility Interconnections

Utility interconnections involve bulk purchase of raw or treated water from neighboring utilities in lieu of expanding an existing withdrawal or treatment facility. Implementation of a utility interconnection system can be employed as a supply management tool. This water

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source option could shift withdrawals from areas deemed to be at highest risk for adverse environmental impacts to areas where the withdrawals are projected to have less impact, or allow a utility to purchase water rather than bearing the cost of construction and operation of a new or larger treatment facility.

A detailed study of distribution systems proposed for interconnection is necessary to address such issues as system pressures, physical layout of the supply mains, impacts on fire flows, and water compatibility. For example, most existing water distribution systems are constructed with the smallest diameter pipes (low volume) at the extremities. As a result, utility interconnects for the purposes of bulk transfers of water could involve connecting more than two distribution systems. Connecting distribution systems at the extremities of the system would require extension of larger water mains within the service area to extremities and connecting to similar pipes in the adjoining service area. In addition, differences in pressure and water quality will need to be addressed.

Usage and Production Capacity

Along with the development of traditional and alternative water supplies and water conservation and reuse programs, utility interconnects with bulk sales agreements proved beneficial during the 2000–2001 and 2006–2009 drought conditions, and helps serve existing and new development. These interconnections help utilities have flexibility to meet demands in their service areas by moving available water resources to where they are most needed. Bulk agreements provide the legal framework for this water sharing.

An example of utility interconnects is the Palm Beach County Water Utilities Department, which operates an interconnected distribution and production system with five water treatment facilities, five SAS wellfields, and a future FAS wellfield. In addition, Palm Beach County has several interconnects with adjoining utilities for bulk sale and emergency use.

Estimated Costs

The costs associated with Public Water Supply interconnects are difficult to estimate and could vary greatly depending on the size, distance, and potential engineering challenges. Typically, an interconnect system could include booster pump stations, transmission mains, valves, jack and bores, encasements, and tunneling. Costs are site-specific.

WATER CONSERVATION – DEMAND MANAGEMENT

Water conservation involves long-term reduction of daily water use. Reducing water demand can reduce the need for expansion of the water supply infrastructure. Permanent water use reductions require implementation of measures or technologies, such as low (or ultralow) volume fixtures indoors or smart irrigation systems outdoors, which reduce water use while satisfying consumer needs. In contrast, temporary water saving measures,

such as cutbacks mandated during water shortage conditions, address short-term problems associated with water supply system capacity.

Reducing current and future water demands before expanding water supplies is a prudent and cost-efficient way to manage resources. Employing sound water conservation measures prior to developing viable water source options is vital to regional water supply planning efforts. Working within the existing legislative framework, the SFWMD is increasing water conservation efforts, especially by providing support to Public Water Supply utilities and other providers in finding the most cost-effective ways to reduce water use.

Creation of Statewide Comprehensive Water Conservation Program

Following the 2000–2001 drought, the FDEP led a statewide water conservation initiative with a simple goal: Florida can and must do more to use water more efficiently. The *Florida Water Conservation Initiative* (FDEP 2002) identified methods to improve efficiency in all categories of water use. In addition to policy and regulatory measures, the initiative identified water conservation recommendations for Agricultural and Recreation/Landscape irrigation; water pricing; Commercial, Industrial, and Institutional users; indoor water use; and reclaimed water.

Multiple agencies and stakeholders signed the *Joint Statement of Commitment for the Development and Implementation of a Statewide Comprehensive Water Conservation Program for Public Water Supply* (FDEP 2004) to implement the recommendations of the *Florida Water Conservation Initiative*.

From these efforts, a statewide Comprehensive Water Conservation Program, known as Conserve Florida, was established to provide information and tools to improve water conservation through the development of utility-specific, goal-based water conservation programs. Through this effort, a water conservation Clearinghouse was developed, along with a web-based conservation planning and reporting software application called EZ Guide. The University of Florida's Department of Environmental Engineering Sciences hosts the Clearinghouse and EZ Guide (http://www.conservefloridawater.org).

Districtwide Comprehensive Water Conservation Program

The SFWMD's overall water conservation goal is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable uses of water resources, while instilling a year-round water conservation ethic in end users. Water savings achieved through water conservation measures are the most cost-efficient way to expand current water supplies.

The District developed its Comprehensive Water Conservation Program (CWCP) in coordination with the 2007 Water Conservation Summit hosted by the Water Resources Advisory Commission, an advisory body to the District's Governing Board. The summit was

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called to begin to develop a series of tools that could be used to create a year-round water conservation ethic in end users.

A variety of stakeholders were invited to participate in developing the CWCP, lending expert knowledge and real-world experience to the water conservation planning process. Meeting participants highlighted case studies and identified practical components, successes, and obstacles, aiding in the design and implementation of the program. These efforts culminated in the District's Governing Board approval of the CWCP in September 2008.

The CWCP is a series of recommendations and implementation strategies designed to bring about a permanent reduction in water use throughout the District. The program is organized into regulatory, voluntary and incentive-based, and educational and marketing water conservation initiatives. Under the umbrella of these initiatives, the SFWMD and other coordinating water management districts and agencies provide numerous water conservation tools. The District has implemented many programs in each category.

From a regulatory perspective, greater emphasis has been placed on water conservation in the water use permitting process, which encourages municipalities to adopt and enforce effective water conservation measures. Goal-based water conservation allows utilities to achieve a goal, such as a specified reduction in per capita use or overall reduction in pumpage, using any one of a suite of methods and practices.

From a local perspective, other regulatory measures, such as local landscape ordinances and year-round irrigation conservation measures, generally advance water use efficiency; promote water conservation as the least-cost source of new water; protect the natural environment; and result in quantifiable water savings. The SFWMD has sample ordinances available for municipalities to use in implementing such regulations in their areas. These can be found on the SFWMD's conservation website available from http://www.sfwmd.gov/conserve.

Voluntary and incentive-based initiatives, such as financial and technical assistance and recognition programs, can supplement regulations; leverage investments; bring wider environmental benefits; and significantly improve the quality of life in local communities.

Partnerships have been established with other outreach and educational sponsors, such as the Florida Section of the American Water Works Association, University of Florida/Institute of Food and Agricultural Sciences, Florida Nursery Growers and Landscape Association, and the FDEP.

Regulatory Initiative Programs and Implementation

This section presents programs supporting regulatory-driven water conservation measures. **Chapter 4** of this Support Document provides information about the mandatory requirements for water

NAVIGATE

Chapter 4 of this document describes the eight mandatory elements of a water conservation plan for Public Water Supply utilities.

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conservation in water use permitting for Public Water Supply, Commercial and Industrial, Recreation/Landscape, and Agricultural users.

Public Water Supply Utilities

All Public Water Supply utilities within the SFWMD are required to develop and implement a water conservation plan when applying for or renewing a water use permit. The following sections provide additional information about some of the water conservation ordinances and measures discussed in **Chapter 4** of this Support Document.

Adoption of an Ultralow Volume Fixtures Ordinance

Public Water Supply utilities are required to adopt an ultralow volume (ULV) fixtures ordinance for all new construction. **Table 8** shows the costs and potential water savings of retrofitting homes of various ages with ULV fixtures.

Table 8. Representative water use and cost analysis for ultralow volume fixtures by housing stock characteristics.

Housing Stock Characteristic	Water Conservation Measure	Water Savings per Retrofit Use	Annual Savings per Measure[a] (in gallons)	Cost per Fixture[b]
Homes with pre-1984 fixtures, replaced with ultralow volume fixtures of the *Energy Policy Act of 1992*	Toliet Retrofit (5 gal/flush)	3.4 gal/flush	15,570	$300
	Showerhead Retrofit (5 gal/min)	1.67 gal/min	7,930	$20
	Faucet Aerators (4 gal/min)	1.2 gal/min	8,730	$5
Homes with 1984–1994 fixtures, replaced with ultralow volume fixtures of the *Energy Policy Act of 1992*	Toilet Retrofit (3.5 gal/flush)	1.9 gal/flush	8,700	$300
	Showerhead Retrofit (4 gal/min)	1.0 gal/min	4,760	$30
	Faucet Aerators (3 gal/min)	0.5 gal/min	3,880	$5

Notes: gal/flush=gallons per flush; gal/min=gallons per minute; min=minute, ULV=ultralow volume. Fixture service lives: toilets–40 years; showerheads–40 years; and faucets–15 years. Source: *Study of Life Expectancy of Home Components*, National Association of Home Builders, 2007.

a. Savings per household assuming 2.46 persons per household. Water use for ULV plumbing devices are as follows: toilets–1.6 gal/flush; showerheads–2.5 gal/min; faucet aerators–2.5 gal/min; actual flow rates for showerheads and faucets equal to 66% of rated flows were used for calculations. Frequency rates per person per day: toilet–5.1 flushes; shower–5.3 min; faucet–8.1 min.

b. Assumes materials and installation costs.

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WaterSense

In 2006, the U.S. Environmental Protection Agency established the national WaterSense program. The SFWMD does not require WaterSense-labeled products in local fixture ordinances. However, local governments are encouraged to amend or enact local plumbing ordinances to require WaterSense fixtures in new construction and in retrofit programs.

WaterSense-labeled fixtures offer additional savings over those under the current federal standards. WaterSense-labeled fixtures must be at least 20 percent more efficient than the current federal standards without sacrificing the end user's performance expectations. Maximum flow volumes for WaterSense-approved indoor plumbing fixtures are as follows:

- Toilets, 1.28 gal/flush
- Showerheads, 2.0 gal/min
- Residential Lavatory Faucets, 1.5 gal/min
- Urinals, 0.5 gal/flush

Many WaterSense-approved models are now available at lower flow rates (more efficient than maximum flow rates). Conversely, it is possible to purchase fixtures at flow rates lower than the WaterSense standards. However, fixtures at or below the WaterSense maximum flow rates without the WaterSense label may fail to meet end user performance expectations. Therefore, the District recommends the use of WaterSense-labeled products in conservation programs. The WaterSense website maintains a search engine to identify all approved models. **Table 9** shows the costs and potential water savings of retrofitting homes of various ages with WaterSense-labeled fixtures at the maximum allowed flow rate.

Table 9. Representative water use and cost analysis for maximum allowable flow rate WaterSense fixtures by housing stock characteristics.

Housing Stock Characteristic	Water Conservation Measure	Water Savings per Retrofit Use	Annual Savings per Measure[a] (in gallons)	Cost per Fixture[b]
Homes with pre-1984 fixtures, replaced with WaterSense-labeled fixtures at the maximum allowed flow rate	Toliet Retrofit (5 gal/flush)	3.72 gal/flush	17,035	$300
	Showerhead Retrofit (5 gal/min)	2.00 gal/min	9,520	$30
	Faucet Aerators (4 gal/min)	1.67 gal/min	12,120	$5
Homes with 1984–1994 fixtures, replaced with WaterSense-labeled fixtures at the maximum allowed flow rate	Toilet Retrofit (3.5 gal/flush)	2.22 gal/flush	10,170	$300
	Showerhead Retrofit (4 gal/min)	1.33 gal/min	6,350	$20
	Faucet Aerators (3 gal/min)	1.0 gal/min	7,270	$5
Homes with post–1994 fixtures, replaced with WaterSense-labeled fixtures	Toilet Retrofit (1.6 gal/flush)	0.32 gal/flush	1,460	[c]$300
	Showerhead Retrofit (2.5 gal/min)	0.3 gal/min	1,570	$30
	Faucet Aerators (2.5 gal/min)	0.5 gal/min	3,400	$5

Notes: gal/flush=gallons per flush; gal/min=gallons per minute; min=minute, ULV=ultralow volume.

a. Savings per household assuming 2.46 persons per household. Water use for maximum flow WaterSense plumbing devices are as follows: toilets–1.28 gal/flush; showerheads–2.0 gal/min; faucet aerators–1.5 gal/min; actual flow rates for showerheads and faucets equal to 66% of rated flows were used for calculatons. Frequency rates per person per day: toilet–5.1 flushes; shower–5.3 min; faucet–8.1 min.

b. Assumes materials and installation costs.

c. Retrofitting newer toilets with some WaterSense toilets may not be cost-effective.

Adoption of a Rain Sensor Device Ordinance

All automatic sprinkler systems must have a rain sensor device or an automatic shut-off device (Section 373.62, F.S.). Rain sensor devices interrupt scheduled irrigation during or soon after it rains. A properly functioning rain sensor device can bypass between 15 percent and 34 percent of scheduled irrigation events.

Smart Irrigation Systems

Although not required, the soil moisture sensor, which is an automatic shut-off device, prevents the use of sprinkler systems when there is sufficient water content in soil. Smart irrigation systems, if properly installed and monitored, provide a more efficient irrigation method and save substantially more water than conventional time-controlled irrigation systems. A properly working soil moisture sensor can bypass a significant number of

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scheduled irrigation events, depending primarily on local weather conditions, as well as other factors (Dukes 2009).

The efficiency of an irrigation system is also affected by the design, condition, and management of the system components and the plant materials in the landscape. Assisting large area irrigators, such as homeowner associations, public parks, and commercial operations, as well as residential homeowners to improve irrigation efficiency can provide the significant returns on investment for many utilities in south Florida.

INFO

Funded in part by the SFWMD, in partnership with Orange County Utilities, the St. Johns River Water Management District, and the Water Research Foundation, a University of Florida study is currently under way in Orange County to investigate the impact of smart irrigation technology on reducing water consumption in real-world settings. A total of 160 homes and businesses were selected to participate in this three-year study. The study will evaluate two types of smart irrigation controllers: 1) evapotranspiration-based controllers, which collect temperature, relative humidity, wind, and other data to determine when to schedule irrigation events; and 2) soil moisture sensor controllers, which gauge moisture content in the soil relative to a user-selected optimum level to determine when to activate the irrigation system.

Adoption of a Water Conservation-Based Rate Structure

Most utilities use a water conservation-based rate structure to provide users with a financial incentive to reduce demands. These rates may include:

- **Increasing block rates** The marginal cost of water to the user increases in two or more steps as water use increases.
- **Seasonal pricing** Water consumed during peak season (October through May) is billed at a higher rate than water consumed in the off-peak season.
- **Quantity-based surcharges** Charges applied to users after a threshold use level is reached
- **Time-of-day pricing** Higher rates charged during the day (when evapotranspiration rates are greater) to discourage watering during those hours.

Users faced with higher rates will often achieve water conservation by implementing a number of the water conservation measures discussed in this chapter. The block rate structure is generally expected to have the largest impact on heavy irrigation users. The responsiveness of customers to the water conservation rate structure depends on the existing price structure, the water conservation incentives of the new price structure, and the customer base and their water uses.

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Implementation of a Utility Leak Detection and Repair Program

The SFWMD requires utilities to implement a leak detection program if their unaccounted-for water losses exceed 10 percent. The leak detection program must include water auditing procedures and in-field leak detection and repair. In addition, the program description should include the number of labor hours devoted to leak detection, the type of leak detection equipment used, and an accounting of the water saved through leak detection and repair.

Implementation of a Water Conservation Public Education Program

Public information as a water conservation measure involves a series of reinforcing activities or messages to educate citizens about water conservation. Such programs create awareness of water use behavior, teach water-saving techniques and technologies, and inform consumers about water conservation benefits, such as lower water bills.

Targeted education, public information, and social marketing provide opportunities to build a water conservation culture, instill a stewardship ethic, and reduce individual, industrial, and commercial water use.

The SFWMD and other participating state agencies have consistently provided assistance to a wide range of water users through outreach and educational programs. Successful efforts usually depend on cooperation between multiple agencies and organizations. For example, outreach through partnering with schools can provide a foundation for long-range acceptance of water conservation ideals and resulting action by future generations. Public Water Supply utilities can perform an important public service by including simple messages with their customer service and billing communications.

Although water saved through an educational and outreach effort may not be readily measurable, outreach and education are crucial to any successful water conservation program. The *Education, Marketing, and Outreach* section of this chapter further describes the District's efforts.

Voluntary and Incentive-Based Water Conservation Measures

Voluntary and incentive-based water conservation measures are an integral part of the CWCP. Financial and technical assistance and recognition programs often surpass the effectiveness of the traditional command-and-control approach, which relies solely on rule enforcement. In addition, initiatives can supplement regulations and build goodwill, leverage investments, bring wider environmental benefits, and improve the quality of life in local communities.

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This section describes water conservation program planning tools and incentives that Public Water Supply utilities can implement to fulfill water conservation goals. Note that individual programs are subject to annual funding availability.

Public Water Supply Planning Tools

The SFWMD encourages Public Water Supply utilities to use a water conservation planning tool to develop water conservation plans with a numerical goal for achievable water savings.

The Conserve Florida Water Clearinghouse (CFWC) EZ Guide generates estimates of indoor water use and savings for utility service areas using data from entities such as county property appraiser offices and the Florida Department of Revenue. The entities maintain detailed data on all land parcels in the state. For each parcel, these data typically include the age of a structure, number of bathrooms, total square footage of the parcel, and total square footage of the built structure on the parcel. These data, along with population estimates, are used to create estimates of water consumption for structures built during each plumbing code era and each water use sector (e.g., single- and multi-family residential, industrial, commercial, institutional). The EZ Guide output results include water savings, costs, and net benefits for each recommended conservation option, for each water use sector, sub-divided by plumbing code dates. In addition, the EZ Guide produces a ranked and optimized list of conservation actions based on cost benefits and gallons of water saved. The EZ Guide is available free from http://www.conservefloridawater.org/ez_guide.asp.

The Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool is a Microsoft® Excel-based model, which uses baseline demand data for each water use sector (customer class) and avoided-cost data to evaluate and design utility conservation programs. It contains a library of pre-defined water conservation measures that users can select for evaluation. Water savings, costs, and benefits of each measure can be examined and tracked for each year of the proposed program. The tool features comprehensive and highly developed economic analyses of each water conservation option, accounting for program costs using time-valued dollars. Yearly peak and off-peak demands and savings are calculated to identify specific point(s) of capacity deferment and present value benefits. The tool's avoided-cost calculator includes analysis of short-term avoided costs and long-term avoided or deferred capacity expenses. The analysis functions of the tool include utility revenue and rate impact calculations. The AWE tool recently concluded a beta-testing period and is now available free of charge to AWE members available from http://www.allianceforwaterefficiency.org.

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Water Savings Incentive Program

The SFWMD offers a cooperative funding program, which provides matching funds up to $50,000 to implement water saving hardware and technology-based conservation projects. Known as the Water Savings Incentive Program, or WaterSIP, the program provides seed money to foster non-capital water efficiency improvement projects, such as installation of signal and sensor-based controllers for irrigation systems; high-efficiency plumbing retrofits; automatic line flushing devices for utility distribution lines; and rain harvesting systems.

Landscape Irrigation

Nationally, 58 percent of average annual water use is for outdoor purposes (AWWA 1999), and 80–90 percent of outdoor water use is for landscape irrigation (USEPA 2011). Many landscape irrigation systems are not efficient. The WaterSIP Program encourages the purchase and installation of high-efficiency irrigation sprinklers, sensor-based devices, and smart controllers. As **Table 10** shows significant annual water savings can be realized by upgrading existing irrigation systems to these more efficient devices.

Table 10. Estimated water savings from soil moisture and rain sensors for residential irrigation systems.

Sensor Type	Cost per Device**	Water Savings per Device	Annual Water Savings* (in gallons)	Water Saved over Device Life (in gallons)
Rain Sensor	$100	15–34% Annual Irrigation Savings	35,000–80,000	175,000–400,000
Soil Moisture Sensor	$150	15–90% Annual Irrigation Savings	35,000–211,000	175,000–1,055,000

* Assumes a quarter-acre lot containing five irrigation zones, irrigating each zone for 30 minutes at 15 gallons per minute in a locality under two-day-per -week irrigation watering restrictions. Savings rates for rain and soil moisture sensors are based on Dukes (2009). Actual results may be affected by local weather and soil conditions.

** Assumes materials and installation costs.

The WaterSIP requires the use of WaterSense-approved plumbing fixtures, which are required for new construction under the *Energy Policy Act of 1992* (Public Law 102-486). A household of 2.46 persons switching from pre-1980s plumbing fixtures to WaterSense-approved fixtures can save an estimated 42,000 gallons of water per year at the following flow rates: toilets – 1.28 gallons per flush; showerheads – 1.75 gallons per minute; and faucet aerators – 1.0 gallons per minute.

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From 2003 to 2012, the WaterSIP has allocated funding to support 151 local water conservation projects, representing a total estimated water savings of approximately 2.6 billion gallons of water per year, at a cost of $4.4 million to the SFWMD. In FY 2012, the SFWMD allocated $250,000 in support of nine local projects. These projects represent more than 44 million gallons per year (MGY) in potential water savings. Details on the WaterSIP are provided for each planning area in its respective Plan Update.

Florida Water Star℠

Florida Water Star℠ is a voluntary, points-based recognition program that improves water efficiency in residential properties by encouraging the use of appropriate water-saving landscapes, irrigation systems, and household appliances and fixtures.

The Florida Water Star℠ Program offers three residential certification levels:

- Standard Silver certification
- Gold certification (for additional water savings)
- Community (for master-planned communities, currently in pilot phase)
- Commercial/Institutional buildings (offices, retail and service establishments and institutional and non-industrial commercial buildings)

Local governments that adopt Florida Water Star℠ Silver criteria as their water conservation standard for new residential properties can expect new residential homes in their jurisdictions to use as much as 35 percent less water than their current residential stock of single-family homes with permanent in-ground irrigation systems. Savings of up to 45 percent may be anticipated for homes built to Florida Water Star℠ Gold criteria.

Leading by Example

Leading by Example is a CWCP initiative to lead state and local governments in water conservation. The program aims to reduce indoor and outdoor water use in all municipal buildings within the SFWMD's jurisdiction. To lead by example, the District conducted comprehensive indoor and outdoor water audits of its own facilities in 2009. The audits evaluated water use and efficiency, and identified opportunities for water conservation. The District is phasing in the recommendations outlined in the water audits as funding is made available.

In addition, the District began an effort to have its owned-facilities achieve Florida-friendly Yard certification. Such landscapes follow and maintain Florida-friendly Landscaping principles as outlined by the University of Florida/Institute of Food and Agricultural Sciences' (UF/IFAS) Florida-friendly Landscaping Program

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Water Efficiency Improvement Guide

Developed by the SFWMD in 2011, the *Water Efficiency Self-Assessment Guide for Commercial and Institutional Building Facility Managers* (SFWMD 2011c) offers facility managers guidance to help reduce water use, lower operating costs, and protect regional water resources.

Designed as a self-conducted water use assessment tool, this guide walks facility managers through detailed, step-by-step instructions for common water use at commercial and institutional facilities. The guide covers indoor and outdoor water use and is accompanied by a series of water use and savings calculators to help facility managers quantify potential water savings and investment recovery periods. This information can then be used by facility managers to develop a plan to increase water efficiency without sacrificing performance.

INFO

One facility has already identified significant conservation opportunities. Lake Stevens Middle School in Hialeah worked with the SFWMD and Miami-Dade County Public Schools on water conservation options. In all, the assessment identified potential water savings of 1.9 million to 2.1 million gallons and an operating cost reduction of $10,785 to $12,730 annually. It was estimated the school could recoup its investment in retrofits in six to 27 months.

Utilities are encouraged to incorporate this guide into their outreach efforts for commercial and institutional water users. The manual and the companion water use and savings calculators are available for download from the SFWMD's conservation website at http://www.sfwmd.gov/conserve under "Businesses."

Water CHAMP

The Water Conservation Hotel and Motel Program (Water CHAMP) is a recognition program established specifically for the lodging industry. It was originally launched in 2002 by the Southwest Florida Water Management District. In 2009, the SFWMD implemented a pilot release of a Water CHAMP program in the Florida Keys, and in 2011, the program was expanded to Martin and St. Lucie counties. The program recognizes lodging facilities that conduct voluntary linen and towel reuse programs and install high-efficiency (1 gal/min) faucet aerators in guest bathrooms. It is estimated this program can save approximately 20 gallons of water per occupied room per night, and hotels participating in Water CHAMP are fulfilling part of the criteria needed to be a designated provider under the FDEP's Florida Green Lodging Program. Potential savings for each planning area are given as relevant in each water supply plan update's Chapter 4.

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Florida Automated Weather Network

The Florida Automated Weather Network (FAWN) is a statewide research and data project operated by the University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS) The FAWN management tools provide decision support functions to growers, using historical weather data and crop modeling technology to help farmers maximize irrigation efficiency. When funds are available, the SFWMD assists in expanding the database's scope. Access to the database is available from http://fawn.ifas.ufl.edu/data.

Agricultural Mobile Irrigation Labs

Agricultural mobile irrigation labs (MILs) evaluate the performance of irrigation systems and encourage the adoption of efficient irrigation management practices that conserve water. In 2010, four agricultural MILs dedicated to improving irrigation efficiency for agricultural water users were operating throughout the District. The agricultural MILs provide irrigation audits for St. Lucie and Martin counties in the UEC Planning Area; Lee and Collier counties in the LWC Planning Area; and Palm Beach, Broward, and Miami-Dade counties in the LEC Planning Area. In 2009, the SFWMD discontinued funding of the MIL program.

Of the 404 evaluations performed in FY 2008 by these four agricultural MILs, a potential water savings of 978 MGY is possible if all water conservation audit recommendations are implemented. Details about agricultural MILs in each planning area are provided in each water supply plan update.

Urban Mobile Irrigation Labs

Landscape water audits performed by urban MILs measure the performance of a landscape irrigation system. In addition, urban MILs provide recommendations for operation and management of the system to improve efficiency. Recommendations may include:

- Adjusting irrigation timers to assure that a water-conserving schedule is being followed
- Replacing sprinkler heads to assure that the system is providing adequate coverage and not wasting water by irrigating impervious surfaces
- Installing rainfall and soil moisture sensors

In FY 2008, eight urban MILs (excluding the MIL serving the Big Cypress Basin area) performed 1,207 MIL audits Districtwide. A potential water savings of 464 MGY is possible if all water conservation audit recommendations are implemented.

As of FY 2012, one urban MIL is in operation in the Big Cypress Basin. Although the SFWMD discontinued funding the MIL program in 2009, local municipalities are encouraged to investigate opportunities to expand the deployment of MILs.

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Education, Marketing, and Outreach

Education, marketing, and outreach are indispensable tools for accomplishing measurable changes in water use among residents and businesses.

Targeted educational and marketing initiatives and public information provide opportunities for building a water conservation culture; instilling a stewardship ethic; and reducing individual, industrial, and commercial water use.

The SFWMD has sponsored a variety of educational and marketing programs, subject to annual funding allocation. Partnerships have been established with other outreach and educational sponsors, such as the Florida Section of the American Water Works Association, University of Florida/Institute of Food and Agricultural Sciences, Florida Nursery Growers and Landscape Association, and the FDEP. The following is an overview of some of the educational and public information water conservation programs the District has supported.

Water Conservation Public Service Announcements The SFWMD entered into Water Conservation Public Service Announcement Airport Campaign partnerships with five regional airports: Southwest Florida International Airport, Orlando International Airport, Miami International Airport, Fort Lauderdale-Hollywood International Airport, and Palm Beach International Airport. The public service announcement campaign encourages visitors to conserve water during their stay in Florida.

WaterSense This U.S. Environmental Protection Agency program is designed to encourage water efficiency by affixing a special label on consumer products. As a promotional partner for the program, the SFWMD recommends the use of WaterSense-labeled products through several agency outreach efforts.

The Great Water Odyssey In a cooperative effort between the District and Florida Atlantic University's Center for Environmental Studies (FAU/CES), elementary school students use a computer-based interactive curriculum to learn about water resources and their protection and conservation. Using the Odyssey program, third-, fourth- or fifth-grade students can be taught science, history, geography, social studies, reading, and math in an engaging way that correlates to the Next Generation Sunshine State Standards. Odyssey nurtures a greater awareness and appreciation of Florida's watersheds and their ecosystems, and promotes responsible actions for the health, protection, and use of Florida's water resources.

Teacher Training The SFWMD works with school districts, local governments, and regional organizations to identify school-based curricula that educate students on water resource issues. Florida Atlantic University's Center for Environmental Studies provides teacher training workshops for elementary, middle, and high school teachers for *The Great Water Odyssey* and *Everglades: An American Treasure* science-based curricula programs. Information about the FAU/CES teacher training programs is available from http://www.ces.fau.edu/education.

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SFWMD Xtreme Yard Makeover The SFWMD Xtreme Yard Makeover Program encourages Florida-friendly landscaping. It also works to create a year-round water conservation ethic. The program shows how an unremarkable, water-hungry landscape can be turned into a lush, Florida-friendly landscape that will save time, money and water, while contributing less pollution-laden stormwater runoff.

Xtreme Makeover in Homestead

SFWMD Water Conservation Website
A repository of downloadable water conservation educational materials, the SFWMD Water Conservation website is a valuable resource. The website is available from http://my.sfwmd.gov/portal/page/portal/levelthree/Teaching%20Materials.

Big Cypress Basin Conservation Outreach In concert with the District, municipalities, and the Water Symposium of Florida, Big Cypress Basin coordinates Florida-friendly landscaping demonstration projects and other outreach programs in southwest Florida. Big Cypress Basin Service Center staff also gives presentations to civic groups and homeowner associations on basin projects, water management, water supply, irrigation restrictions, and water conservation. Another aspect of the Big Cypress Basin Conservation Outreach effort is staff participation with the Water Symposium of Florida, Inc. in presenting outreach seminars on water supply and water conservation measures.

Florida Gulf Coast University's Wings of Hope Program is funded by the SFWMD. As part of the Wings of Hope Program, college students at Florida Gulf Coast University (FGCU) learn about southwest Florida wildlife species, habitats, water conservation, and environmental sustainability (http://www.fgcu.edu/cas/wingsofhope). In turn, the students share their knowledge with elementary school students throughout Lee and Collier counties.

Student Learning at DuPuis Management Area Teaming with District management efforts, FAU/CES coordinates a student volunteer service-learning program focusing on land stewardship and water conservation projects at the DuPuis Management area. Students provide environmental service to assist partners, learn about native habitats, and develop a volunteer ethic. Student service projects include butterfly gardening, installing native plants, and maintenance of the Habitat Trail.

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Challenges to Measuring the Effects of Water Conservation Programs

The primary objectives of most water conservation programs are to use water more efficiently and curb wasteful water use. However, measuring water savings resulting from water conservation programs is difficult and needs to be done under certain conditions and constraints. This is due to numerous external factors that can artificially inflate or mask water savings outside of a controlled environment. For example, population demographics of an area constantly fluctuate (e.g., persons per household). The local economy and its effect on service area water use and vacancy rates can also affect water use independent of retrofit or replacements of water using devices.

Data have been gathered that indicate evaluations of irrigation systems by professionals, such as MIL technicians, and the use of smart irrigation technology can improve system efficiencies and reduce outdoor water use. However, measuring savings from outdoor programs also presents significant challenges. Changes to service area demographics, the local climate, and droughts can mask (or inflate) water use where outdoor efficiency improvements have taken place.

Educational/outreach initiatives and recognition programs are intended to foster changes in behavior leading to a stronger water conservation ethic. Presumably, a population with such an ethic will seize opportunities to conserve water in both predictable and unpredictable ways. These programs can work synergistically and typically in concert with other quantifiable programs, such as retrofits and rebates. These types of programs are vital to conservation planning and implementation as the effects of these qualitative programs can wane with time without subsequent renewal efforts, making savings projections over time less reliable.

While these challenges make it difficult to measure the effect of any single program from one year to the next, the effects of conservation become apparent when looking at per capita use rates of a service area over time. Per capita use rates have trended downward in areas of south Florida where local conservation programs have been active and comprehensive.

NAVIGATE

The latest information about Water Conservation is available from the SFWMD website at http://www.sfwmd.gov/conserve.

Reclaimed Water Pipes

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6 Water Quality and Treatment

Chapter 5 introduced the first phase of the Water Delivery and Treatment Process – withdrawal from the water source, along with related costs. This chapter reviews water treatment quality considerations, and the technologies and processes used to treat water supplies from each water source.

Because the chapters are closely related, reading both chapters concurrently is the recommended approach for readers unfamiliar with the subject matter. References to specific sections for related discussions are provided throughout both chapters.

TOPICS

- Water Quality Standards
- Water Treatment Technologies
- Wastewater Treatment Technologies
- Groundwater Contamination

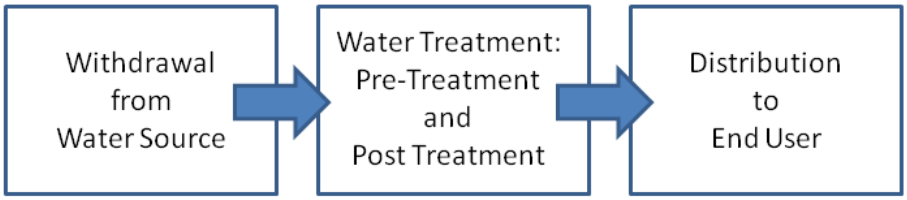

Figure 4. Treatment Process and Water Delivery.

WATER QUALITY STANDARDS

Drinking Water Standards

There are two types of drinking water standards, primary and secondary. Both standards establish maximum contaminant levels (MCLs) for public drinking water systems. Primary drinking water standards include contaminants that can pose health hazards when present in excess of the maximum contaminant level. Secondary drinking water standards, commonly referred to as aesthetic standards, are those parameters that may be characterized by objectionable appearance, odor, or taste of the water, but are not

necessarily health hazards. Current MCLs for drinking water in Florida are available from http://www.floridadep.org.

Nonpotable Water Standards

Water for potable (suitable for drinking) and nonpotable water uses have different water quality requirements and treatability constraints. Nonpotable water sources include surface water, groundwater, and reclaimed water. These nonpotable water uses include golf course, landscape, agricultural, and recreational irrigation, and may be acceptable for some industrial and commercial uses. Unlike potable water, with very specific quality standards to protect human health, water quality limits for nonpotable uses are quite variable and dictated by the intended use of the water. For example, high iron content is usually not a factor in water used for flood irrigation of food crops, but requires removal for irrigation of ornamental crops. Excessive iron must also be removed for use in microirrigation systems, which become clogged by iron precipitates.

Water Treatment

Irrigation water sources considered for a specific use must be sufficient in quantity and quality compatible with the target crop. Irrigation uses require that the salinity of the water not exceed levels damaging to crops, either by direct application or through salt buildup in the soil profile. In addition, water constituents harmful to irrigation system infrastructure or equipment, such as iron or calcium, must be at acceptable levels or economically removable. Water used for recreation/landscape irrigation purposes, including golf courses, often has additional aesthetic requirements, such as color and odor. Water for industrial use is required to meet certain criteria; e.g., the suspended solids and salinity of the water cannot be so high as to build up scales or sediments in the equipment.

In addition to water quality considerations associated with the intended use of nonpotable water, reclaimed water is subject to wastewater treatment standards ensuring the safety of its use. Problems that might be associated with reclaimed water are only of concern if they hinder the use of the water or require special management techniques to allow its use. A meaningful assessment of irrigation water quality, regardless of source, should consider local factors such as specific chemical properties, irrigated crops, climate, and irrigation practices (Water Science and Technology Board 1996).

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WATER TREATMENT TECHNOLOGIES

The technologies and processes employed to treat water for safe use are presented in the following sections of this chapter. Several water treatment processes, including chlorination, lime softening, and membrane processes, are currently employed by Public Water Supply water treatment facilities within the District's jurisdiction. The type of treatment needed is generally dependent on the quality and type of source water. Higher levels of treatment are needed to meet increasingly stringent drinking water quality standards. Water treatment is also required wherever lower quality raw water sources are pursued to meet future demand.

Potable Water Treatment Facilities

In the SFWMD, potable water is supplied by three main types of treatment facilities:

1. Public Water Supply, municipal, or privately owned facilities
2. Small developer/homeowner association or utility-owned Public Water Supply treatment facilities
3. Self-supplied domestic wells serving individual residences

It is common for smaller facilities to be constructed as interim facilities until regional potable water becomes available. Once regional water is available, the smaller water treatment facility is typically abandoned upon connection to the regional water system.

The Florida Department of Environmental Protection (FDEP) regulates Public Water Supply systems and water treatment facilities. A Public Water Supply system is a system that provides water for human consumption if the system has at least 350 persons or 150 service connections. The local health department regulates systems not regulated under the auspices of the FDEP [Chapter 62-550, Florida Administrative Code (F.A.C.)].

Water Treatment Facility – Pumps to Membrane Trains

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Water Treatment Technology Processes and Components

The goal of water treatment technology processes and components is to remove existing contaminants in the water, or reduce the concentration of contaminants so the water becomes fit for its desired end use. See *Groundwater Contamination and Impacts to Water Supply* section later in this chapter.

Lime softening is an inexpensive treatment process commonly used at water treatment facilities throughout Florida. When these facilities need to be replaced, however, utilities are building facilities that use membrane treatment technology processes. Most water treatment technology processes addressed in this chapter use membranes. Different membrane technologies are used in treating brackish water and fresh water. In membrane filtration, water passes through a thin film of semipermeable membrane, which retains contaminants according to their size. Membrane processes can remove dissolved salts and organic materials that react with chlorine disinfectant by-products (DBP) precursors. These processes can also provide softening. The most commonly used membrane processes to treat drinking water are ultrafiltration (UF), microfiltration (MF), nanofiltration (NF), and reverse osmosis (RO). Each membrane process offers a different solution for different source waters. All membrane processes are pressure-driven, with higher energy costs associated with higher pressure.

Application of a particular membrane technology is dependent on source water quality and characteristics, as well as the desired treated water quality. Membrane technology continues to improve as the U.S. Environmental Protection Agency (USEPA) adopts more stringent water quality regulations.

No single water treatment technology process is applicable for the entire range of inorganic and organic compounds. While the rejection of many inorganic compounds by RO and NF membranes is well documented, the rejection of small organic molecules within the range of the microconstituent category is much more complex. It is not viable to generalize that all organic molecules over a specific molecular weight will be highly rejected by a given RO or NF membrane. Methods to determine the actual rejection rate of a particular microconstituent or group of microconstituents by a particular membrane include bench scale and pilot testing. The process recovery rate depends on the water source and the process set-up as shown in **Table 11**.

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Table 11. General water treatment technology process recovery rates.

Process	Recovery Rate	Comments
RO seawater	30–50%	
RO brackish	70–90%	Depends on the source water's total dissolved solids (TDS) level
NF	80–95%	Can remove turbidity, microorganisms, disinfection by-product precursors, and hardness, as well as a fraction of the dissolved salts
UF and MF	85–97%	UF and MF membranes do not have the capability of removing dissolved salts from water; they typically separate larger, non-dissolved materials

Aeration Process Units

Aeration is a water treatment process used to improve water quality. In this process, air and water are brought into intimate contact with each other to transfer volatile substances to or from the water, a process referred to as desorption or stripping. Aeration in water treatment is used primarily to:

- Reduce the concentration of taste- and odor-causing substances, and to a limited extent, to oxidize organic matter.
- Remove substances that may in some way interfere with, or add to, the cost of subsequent water treatment. A prime example is removal of carbon dioxide from water before lime softening.
- Add oxygen to water, primarily for oxidation of iron and manganese, so these elements may be removed by further treatment.
- Remove radon gas.
- Remove volatile organic compounds considered hazardous to public health.

Desorption or stripping can be accomplished through packed towers, diffused aeration, or tray aerators.

- **Packed Towers** A packed tower consists of a cylindrical shell containing packing material. The packing material is usually individual pieces randomly placed into the column. The shapes of the packing material vary and can be made of ceramic, stainless steel, or plastic. Water is introduced at the top of the tower and falls down through the tower as air is passing upward.
- **Diffused Aeration** Diffused aeration consists of bringing air bubbles in contact with a volume of water. Air is compressed and then released at the bottom of the water volume through bubble diffusers. The diffusers distribute the air uniformly through the water cross-section and produce the desired air bubble size. Diffused aeration is not widely used.
- **Tray Aerators** Cascading tray aerators depend on surface aeration that takes place as water passes over a series of trays arranged vertically. Water is introduced at the top of a series of trays. Aeration of the water takes place as the water cascades from one tray to the other.

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Filtration Process Units

Filtration process units are used in water treatment to remove particulate matter from the water supply. Filtration involves the passing of water through layers of sand, coal, and other granular material to remove microorganisms, including viruses, bacteria, and protozoans, such as *Cryptosporidium*. Filtration attempts to mimic the natural filtration of water as it moves through the ground. After the water is filtered, it is treated with chemical disinfectants, such as chlorine, to kill any organisms that might have made it through the filtration process. The most common filtration methods are rapid filtration, slow sand filtration, activated carbon filtration, and membrane filtration.

- **Rapid Filtration** Rapid filters are deep beds of sand, anthracite and sand, or granular activated carbon. The particle size of the medium is usually about 1 millimeter (mm). The filters are operated at flow velocities of approximately 15–50 feet per hour. Rapid sand filtration typically follows settling basins in conventional water treatment units.
- **Slow Sand Filtration** Slow sand filtration is a biological treatment process. Typically, a slow sand filter has a depth of about 2 feet and operates at flow rates of 0.3 feet to 1.0 feet per hour. The vital process in slow sand filtration is the formation of a biologically active layer, called the Schmutzdecke, in the top 20 millimeters (mm) of the sand bed. This layer provides an effective surface filtration of very small particles, including bacteria, parasites, and viruses. Any particles that pass through the Schmutzdecke may be retained in the remaining depth of the sand bed by the same mechanisms that exist in rapid filtration.
- **Activated Carbon Filtration** Active carbon filters remove organic compounds that impart taste and odor to the water. However, these filters may also affect counts of microbial organisms, including reduction of viruses and parasites. Carbon filtering is a method of filtering that uses activated carbon to remove contaminants and impurities using chemical adsorption. The carbon filter is designed to provide a large section of surface area to allow maximum exposure to the filter media. Carbon filters are most effective in removing chlorine, sediment, and volatile organic compounds from water. They are not effective in removing minerals, salts, and dissolved inorganic compounds. The efficacy of a carbon filter is also based on the flow rate. Carbon filters are used as pre-treatment devices for RO systems and as specialized filters designed to remove chlorine-resistant cysts, such as *Giardia* and *Cryptosporidium*.

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Coagulation, Flocculation, and Sedimentation Process Units

Coagulation, flocculation, and sedimentation remove suspended material and color, and may be used as a pretreatment for other processes or technologies, such as RO.

Coagulation is the process of combining small particles into larger aggregates. During coagulation, a chemical, such as alum (aluminum sulfate), is added to the raw water. When the water is stirred, the alum forms sticky globs, or flocs, which attach to small particles composed of bacteria, silt, and other contaminants. The water is kept in a settling tank or basin where the flocs sink to the bottom. This prolonged phase of purification is called flocculation and sedimentation. Rapid filters are then used to retain most of the flocs and other particles that escape the chemical coagulation and sedimentation processes.

A high-rate ballasted flocculation/sedimentation process, consisting of a proprietary system with the trade name ACTIFLO®, has replaced the traditional rapid mix coagulation, flocculation, and sedimentation process. This process is used to treat large flow rates with variable raw water quality.

The ACTIFLO® process operates similarly to a conventional flocculation sedimentation design, with the exception that 130–150 micron sand (microsand) is added to the water during the flocculation process to enhance both coagulation and settling. The microsand adds surface area in the coagulation process, which significantly improves the frequency of collision of dispersed or colloidal particles in the raw water with oppositely charged coagulated flocculation. This action accelerates the coagulation and flocculation processes. The microsand also provides "ballast" to the flocculation, resulting in flocculation settling velocities that are 25 to 35 times faster than flocculation produced in conventional flocculation-sedimentation processes. When compared to the conventional flocculation sedimentation process, this combination of improved coagulation efficiency and rapid flocculation settling characteristics provides:

- Higher quality settled water (as measured via particle counts in the 2–4 micron range)
- More stable performance during raw water upset conditions
- Reduced coagulant demand (particularly under high algae conditions)
- Reduced process footprint

Lime Softening Process Units

Lime softening refers to the addition of lime (calcium hydroxide) to raw water to reduce water hardness. When lime is added to raw water, a chemical reaction occurs that reduces water hardness by precipitating calcium carbonate and magnesium hydroxide. While the lime softening process is effective at reducing hardness for some source water, it is relatively ineffective at controlling contaminants, such as chlorides, nitrates, total trihalomethane (TTHM) precursors, and others (Hamann, McEwen and Myers 1990). Chloride levels of raw water sources expected to serve lime-softening facilities should be

below the chloride maximum contaminant levels to avoid possible exceedance of the standard in the treated water. Lime softening facilities with raw water sources and nitrate concentrations exceeding the maximum contaminant level will probably require additional treatment. Disinfectants may be added at several places during the treatment process. To achieve better disinfection efficiency, the disinfectant is added after the lime softening process.

Many existing lime softening facilities are modifying their treatment processes because of changing *Safe Drinking Water Act* regulations for TTHMs and DBPs that require utilities to comply with the standards for these groups of compounds. With increasing safety parameters and more stringent MCLs, many utilities are using membrane water treatment processes.

Ultrafiltration and Microfiltration Processes

Ultrafiltration and microfiltration are low-pressure water treatment technology processes. Ultrafiltration removes nonionic matter, higher molecular weight substances, and colloids. Colloids are extremely fine-sized suspended materials that will not settle out of the water column. Microfiltration removes coarser materials than UF. Although MF removes micrometer and submicrometer particles, it allows dissolved substances to pass through.

Treatment technologies such as UF and MF remove suspended particles by a sieving type of filtration process. The small pore sizes in UF and MF membranes represent a physical barrier to larger-sized contaminants, such as bacteria and *Cryptosporidium*, and *Giardia* cysts. Due to the larger pore size of the membranes used for MF, the process is not as effective as the UF process for removing viruses.

Nanofiltration Process

Nanofiltration is a diffusion-controlled membrane filtration process using nominal pore size and higher pressure than UF or MF. Nanofiltration systems can remove virtually all cysts, bacteria, viruses, synthetic and organic compounds, and humic materials.

Nanofiltration membranes are generally effective for removing particles ranging from 10–100 microns in size, making them well suited for removing high molecular weight molecules (e.g., dissolved organics such as DBP precursors) and hardness ions. Nanofiltration membranes are commonly applied in softening applications; the technology is sometimes referred to as membrane softening. One significant advantage of the membrane softening technology is its effectiveness at removing organics that function as TTHMs and other DBP precursors. In recent years, utilities have been replacing their aging lime-softening facilities with NF processes to accommodate current and projected regulatory standards.

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Desalination Processes

Desalination is a process that treats saline water to remove or reduce chlorides and dissolved solids, resulting in the production of fresh water suitable for human consumption or irrigation.

Reverse Osmosis Process

Reverse osmosis is a high-pressure process that relies on forcing water molecules (feedwater) through a semipermeable membrane to produce fresh water (product water or permeate). Heavy metals, dissolved salts, and compounds such as leads and nitrates, are unable to pass through the membrane, and therefore, are left behind for disposal as concentrate or reject water.

Reverse Osmosis Treatment Facility

Reverse osmosis membranes are effective in desalination of brackish and seawater raw water supplies. In addition to treating a wide range of salinities, RO rejects naturally occurring and synthetic organic compounds, metals, and microbiological contaminants effectively.

Due to the level of removal efficiency, a typical RO application may require a raw water blend stream (bypassing the RO process) with the finished water, or the post-treatment addition of calcium hardness, alkalinity, and a corrosion inhibitor to produce a stable finished water that does not present corrosion concerns for the downstream distribution system.

Electrodialysis and Electrodialysis Reversal Process Units

Electrodialysis is an electrochemical process involving the movement of ions through anion and cation-selective membranes from a less concentrated solution to a more concentrated solution driven by an electrical current. Electrodialysis reversal is a similar process, but provides for the reversing of the electrical current, which causes a reversing in the direction of ion movement. Electrodialysis and electrodialysis reversal processes are useful in desalting brackish water with TDS concentrations of up to 10,000 milligrams per liter (mg/L). However, electrodialysis and electrodialysis reversal are generally not considered efficient and cost-effective organic removal processes and therefore usually not considered for TTHM precursor removal applications (AWWA 1988).

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Distillation Process Units

The distillation treatment process is based on evaporation. Salt water is boiled, and the dissolved salts, which are nonvolatile, remain behind. The water vapor is cooled and condensed into fresh water. Three distinct treatment processes are in use: multistage flash distillation, multiple effect distillation, and vapor compression.

- **Multistage Flash Distillation** In the multistage flash distillation process, saline feedwater is heated and the pressure is lowered, causing the water to boil rapidly, almost exploding or flashing into steam. This process constitutes one stage. Typically, a multistage flash facility can contain a series of up to 40 or more stages, set at increasingly lower pressures. The steam, generated by flashing at each stage, is converted to fresh water by being condensed on tubes of heat exchangers that run through each stage.
- **Multiple Effect Distillation** In multiple effect distillation, there are a number of evaporation stages in a series. The vapor generated in one stage is condensed in the following stage, where it can be used as a thermal source for evaporation. The series of evaporation-condensation processes constitutes an effect. This continues for several effects, with eight or 16 effects found in a typical large facility. The vapor resulting from the last stage is condensed into fresh water.
- **Vapor Compression** The vapor compression distillation process is generally used for small- and medium-scale facilities. The heat for evaporating the water comes from the compression of vapor rather than the direct exchange of heat from steam produced in a boiler.

Distillation treatment processes in Florida are uncommon.

Water Treatment Technology Costs

The following discussion serves as an overview of several water treatment technology processes and components. It includes cost estimates related to building new facilities, specifically for RO and NF.

Water Treatment Cost Information

Cost information presented in this chapter, unless otherwise noted, was obtained from the Cost Study (CDM 2007a). All costs in the Cost Study are adjusted to August 2006 dollars and are still considered valid (see **Chapter 5** of this Support Document). Costs presented throughout this chapter are considered order-of-magnitude estimates for planning purposes. These estimates are not a substitute for the detailed evaluation that should accompany utility-specific feasibility and design studies needed to assess and construct such facilities.

The total capital costs for the water supply and wastewater system components are the sum of the construction and nonconstruction costs. Probable capital costs include raw water supply; pretreatment and post treatment; process equipment; transfer pumping; plant infrastructure; residuals disposal; yard piping; electrical; instrumentation and controls; site

work; general requirements; contractor overhead and profit; project and construction contingency; technical services; and owner administration. Unless otherwise noted, total capital costs do not include costs for land and land acquisition, operations and maintenance (O&M); permitting; development-related; inflow and outflow transmission, well construction; production costs, and disinfection.

The following are additional points to consider in estimating potential water treatment costs:

- Capital costs for new facilities will be much greater than costs for facility expansions as new facilities are generally not phased; most costs are upfront and not incremental.
- Brackish water sources will incur a well cost and a desalination cost.
- Costs for raw water transmission mains are usually included in well construction costs.
- Well construction and O&M costs are difficult to estimate due to the variation in costs by planning region; various well types depending on aquifer source (differences in sizes, depths, and wellhead equipment requirements); and economy of scale (cost per well is usually reduced in multiple-well projects). Nevertheless, well construction or surface water intake costs are included in the estimation of capital costs for each water treatment technology process.
- Facility infrastructure related costs, such as yard piping, electrical, instrumentation, and controls are estimated by a factor applied to the treatment process component subtotal and included in the estimation of a treatment technology process capital cost.
- Land acquisition, permitting, and development-related costs are not provided, as these costs are site-specific and highly dependent on local conditions.
- For specific projects, refer to the appropriate regional water supply plan update for more information.

Ultrafiltration and Microfiltration Water Treatment Technology

This cost estimate for UF and MF water treatment processes includes components for a completed, functioning facility: raw water supply; pretreatment; typical UF or MF process component; post-treatment; finished water stabilization; intermediate (in-plant) storage; transfer pumping; back-up power generation; and general facility infrastructure. This estimate does not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities. Related costs do not include unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains.

The probable costs for UF or MF technology are shown in **Table 12**.

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Additional considerations:

- The intake includes slotted intake screens, pump basin, and vertical turbine intake pumps, and assumes that the intake is located on the facility site.
- The pretreatment includes automatic backwashing 300-micron screens and the addition of a coagulant aid.
- The UF or MF units include the membrane equipment; membrane basins; permeate pumps; backwash; cleaning; and integrity test systems.
- The UF or MF systems are assumed to operate at 90 percent recovery.
- The post-treatment system includes caustic soda, sodium hypochlorite, ammonia, and fluoride systems.
- Facility infrastructure includes the membrane building, as well as miscellaneous structures.
- The residuals treatment system includes an equalization basin, a residuals thickener, and a centrifuge.
- The raw water supply for the UF or MF treatment could be from a surface water source, such as a river or lake (although uncommon in south Florida).
- For cost estimation purposes, it is assumed that:
  - The new facility is built on a virgin site with no issues requiring unusual site work or foundation preparation, such as wetland mitigation, substantial site filling, demucking, pilings, etc.
  - The facility is located directly adjacent to a surface raw water source such that raw water transmission piping is considered included in the yard piping line item cost.
  - The facility is located directly adjacent to a power supply, such that the power transmission system to the facility is considered included in the electrical cost allowance.
  - Project implementation is a traditional design-bid-build approach, with owner operation.
  - O&M costs are based on an assumed unit electrical power cost of $0.10 per kilowatt-hour.
  - The equivalent annual capital cost is based on an annual interest rate of 7 percent.
  - An annual deposit equal to 10 percent of the equivalent annual capital cost is budgeted for a renewal and replacement account.

NAVIGATE

For additional information about the surface water source option, see also the *Surface Water* and *Surface Water Estimated Costs* section of **Chapter 5** of this document.

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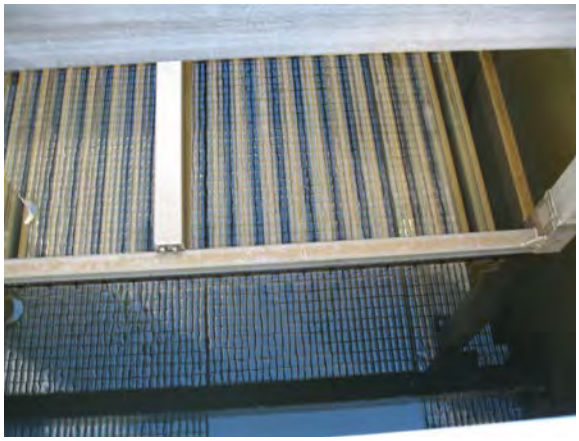
Table 12. Estimated costs associated with ultrafiltration or microfiltration treatment technology.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$9,786,990	$14,191,000	$1,339,530	$1,078,000	$2,552,000	$2.10
10	$16,825,950	$24,397,000	$2,302,904	$1,720,000	$4,253,000	$1.57
15	$22,802,950	$33,064,000	$3,121,008	$2,289,000	$5,722,000	$1.36
20	$28,293,450	$41,025,000	$3,872,470	$2,841,000	$7,100,000	$1.22

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Nanofiltration Water Treatment Technology



Nanofiltration Technology

Table 13 presents probable costs prepared by CDM for NF technology. For cost estimation purposes, the same assumptions are made as described previously for MF/UF technology. This estimate does not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains. For related groundwater source discussions and costs, see the *Groundwater* section of **Chapter 5** in this Support Document.

Considerations:

- The raw water supply for the NF treatment facility is assumed shallow aquifer wells.
- The design capacity for each well is approximately 2 MGD of raw water per well.
- The NF process is assumed to operate at an 85 percent recovery rate with no raw water blend.
- The number of wells required depends on the raw water feed to the facility at the rated capacity and assumes 20 percent will be standby wells.
- Pretreatment includes raw water acidification, antiscalant feed, and micron cartridge filtration.
- The membrane system includes stainless steel membrane feed pumps and feed piping; membrane skids (pressure vessels, skid piping, membrane elements, control valves, and instrumentation); a membrane cleaning system; and process

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piping. Post-treatment includes packed-tower type degasification, a caustic [sodium hydroxide (NaOH)] feed system for pH adjustment, and application of a corrosion inhibitor.

- Pretreatment and post-treatment chemical systems include bulk storage tanks and containment basins; day tanks; metering pumps; chemical piping; and chemical injection quills and/or diffusers.

Table 13. Estimated costs associated with nanofiltration treatment technology.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$11,073,000	$16,056,000	$1,515,573	$634,000	$2,302,000	$9.46
3	$14,262,000	$20,680,000	$1,952,046	$1,141,000	$3,288,000	$4.50
5	$16,674,000	$24,178,000	$2,282,232	$1,646,000	$4,156,000	$3.42
10	$23,156,000	$33,576,000	$3,169,337	$2,836,000	$6,322,000	$2.34
15	$28,670,000	$41,573,000	$3,924,197	$3,913,000	$8,229,000	$1.95
20	$34,612,000	$50,188,000	$4,737,392	$4,992,000	$10,203,000	$1.75

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Brackish Groundwater Reverse Osmosis Water Treatment Technology

The pretreatment, process, and post-treatment components provided for brackish groundwater RO technology are essentially the same as for the NF system. Exceptions include minor differences for items such as pipe pressure ratings. See also the *Groundwater* section of **Chapter 5**.

Considerations:

- The raw water supply for the brackish groundwater RO treatment technology is assumed for Upper Floridan aquifer wells.
- The design capacity for each well is approximately 2 MGD of raw water per well.
- The lower pressure RO process (compared to NF) is assumed to operate at a 75 percent recovery rate, with no raw water blend.
- The number of wells required depends on the raw water feed to the facility at the rated capacity and assuming 20 percent standby wells.

The probable costs for the brackish groundwater RO technology is shown in **Table 14**. This estimate does not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains.

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Table 14. Estimated costs associated with brackish groundwater reverse osmosis treatment technology.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$14,406,000	$20,889,000	$1,571,774	$588,000	$2,757,000	$11.33
3	$20,407,000	$29,590,000	$2,793,087	$1,171,000	$4,243,000	$5.81
5	$23,926,000	$34,693,000	$3,274,774	$1,758,000	$5,361,000	$4.41
10	$33,503,000	$48,579,000	$4,585,514	$3,181,000	$8,226,000	$3.04
15	$44,197,000	$64,086,000	$6,049,265	$4,526,000	$11,180,000	$2.65
20	$54,536,000	$79,077,000	$7,464,309	$5,910,000	$14,120,000	$2.42

Source: Cost Study (CDM 2007a).

Notes: Operations and maintenance cost is included in O&M facility labor. Estimated costs are planning-level cost estimates made without detailed engineering design and with a margin of error from +50 percent to -30 percent.

NAVIGATE

The cost estimates provided for developing brackish groundwater RO water treatment technology represent only one component in the water treatment process. Additional process technologies and components, with some related costs for treating and delivering brackish groundwater, are also included in this Support Document:

See also the following section in **Chapter 5** of this document:

- Seawater, Estimated Costs

See also the following sections in this chapter:

- Saltwater Intrusion
- Nanofiltration Process
- Nanofiltration Water Treatment Technology
- Reverse Osmosis Process
- Electrodialysis and Electrodialysis Reversal Process Units
- Water Treatment Technology Process Components

The District's website provides a more detailed discussion about desalination http://my.sfwmd.gov/portal/page/portal/xweb%20-%20release%203%20water%20supply/desalination.

Brackish Surface Water Reverse Osmosis Water Treatment Technology

The pretreatment, process, and post-treatment components provided are essentially the same as previously described for the groundwater NF systems, with the exception of an additional pretreatment step of media filters required upstream due to higher levels of

suspended particulate contaminants present in a surface water supply. See also the *Surface Water* section of **Chapter 5** for related background information and costs.

Considerations:

- The raw water supply for the brackish surface water RO treatment technology is assumed to be from a surface water source, such as a brackish river or estuary.
- The intake includes slotted intake screens, pump basin, and vertical turbine intake pumps and assumes that the intake is located on the facility site.
- The brackish surface water RO process is assumed to operate at a 75 percent recovery rate, with no raw water blend.

Table 15 presents the probable costs for brackish surface water RO technology. Related costs do not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains.

Table 15. Estimated costs associated with brackish surface water reverse osmosis treatment technology.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$25,927,000	$37,594,000	$3,548,608	$1,846,000	$5,750,000	$4.73
10	$33,768,000	$48,963,000	$4,621,761	$3,371,000	$8,455,000	$3.13
15	$42,883,000	$62,180,000	$5,869,352	$4,818,000	$11,274,000	$2.68
20	$52,464,000	$76,073,000	$7,180,753	$6,310,000	$14,209,000	$2.43

Source: Cost Study (CDM 2007a).

Notes: Operations and maintenance cost is included in O&M facility labor. Estimated costs are planning-level cost estimates made without detailed engineering design and with a margin of error from +50 percent to -30 percent.

Seawater Reverse Osmosis Water Treatment Technology – Surface Intake Co-Located with a Power Plant

The pretreatment, process, and post-treatment components provided are essentially the same as previously described for the brackish surface water RO system, including media filter pretreatment. There are some differences in equipment, pipe pressure ratings, etc., due to the increased operating pressure of seawater RO systems versus brackish water RO systems.

- The raw water supply for the seawater RO water treatment technology is assumed taken from a saltwater bay or Intracoastal Waterway.
- The intake uses the existing cooling water intake for the power plant, and concentrate is discharged to the cooling water outfall.
- The seawater RO process is assumed to operate at a 50 percent recovery rate.

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Probable costs for the seawater RO water treatment technology with the surface intake co-located with a power plant is shown in **Table 16**. This estimate does not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains. For more information, refer to the *Seawater* and *Seawater Estimated Costs* section of **Chapter 5**.

Table 16. Estimated costs associated with seawater reverse osmosis treatment technology.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$27,192,000	$39,429,000	$3,721,819	$3,145,000	$5,750,000	$5.95
10	$44,203,000	$64,094,000	$6,050,020	$6,230,000	$8,455,000	$4.77
15	$64,019,000	$92,828,000	$8,762,307	$9,248,000	$11,274,000	$4.48
20	$79,610,000	$115,436,000	$10,896,342	$12,432,000	$14,209,000	$4.18

Source: Cost Study (CDM 2007a).

Notes: Operations and maintenance cost is included in O&M facility labor. Estimated costs are planning-level cost estimates made without detailed engineering design and with a margin of error from +50 percent to -30 percent.

Water Treatment Technology Process Components

This section addresses water treatment process units that provide incremental treatment process capacity to an existing water treatment facility. It includes cost estimates for accommodating brackish groundwater, brackish surface water, and seawater.

Nanofiltration Process Units

Nanofiltration process units can be used as: 1) an incremental water treatment facility capacity increase for an existing facility originally designed to accommodate future capacity increases, or 2) a pretreatment process unit for a high-pressure RO treatment facility, such as a seawater desalination facility. The NF process unit consists of cartridge filters; membrane feed pumps; pretreatment chemicals (acid and antiscalant); the membrane units (membrane pressure vessels, frames, and piping); piping inside the membrane building, cleaning system, instruments and controls; and electrical equipment.

The probable costs for NF process addition are shown in **Table 17**. This estimate does not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains.

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Table 17. Estimated costs associated with nanofiltration process addition.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$10,562,000	$15,315,000	$1,445,628	$615,000	$2,206,000	$9.07
3	$12,728,000	$18,455,000	$1,742,021	$1,086,000	$3,002,000	$4.11
5	$14,389,000	$20,863,000	$1,969,320	$1,646,000	$3,812,000	$3.13
10	$18,666,000	$27,066,000	$2,554,839	$2,836,000	$5,647,000	$2.09
15	$23,050,000	$33,424,000	$3,154,989	$3,913,000	$7,384,000	$1.75
20	$26,951,000	$39,080,000	$3,688,876	$4,992,000	$9,050,000	$1.55

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Brackish Water Reverse Osmosis Process Units

The brackish water RO process unit can be used as: 1) an incremental water treatment facility capacity increase for an existing facility originally designed to accommodate future capacity increase, or 2) a replacement process unit during the conversion of an existing water treatment facility to a different water source, such as a conversion from a NF to a RO treatment facility with the source changing from a shallow freshwater aquifer to a brackish aquifer. The brackish water RO process unit consists of cartridge filters; membrane feed pumps, pretreatment chemicals (acid and antiscalant); the membrane units (membrane pressure vessels, frames, and piping); piping inside the membrane building, cleaning system, instruments and controls; and electrical equipment.

Table 18 presents probable costs for the RO process addition. Related costs do not include capital costs, such as land acquisition, rights-of-way, transmission mains, and utilities; unusual site work, such as wetland mitigation, demucking, and pilings; finished water storage and high service pumps; and distribution mains.

Table 18. Estimated costs associated with brackish water reverse osmosis process addition.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$12,959,000	$18,791,000	$1,773,737	$574,000	$2,525,000	$10.38
3	$16,065,000	$23,294,000	$2,198,789	$1,128,000	$3,547,000	$4.86
5	$18,136,000	$26,297,000	$2,482,251	$1,757,000	$4,488,000	$3.69
10	$21,923,000	$31,788,000	$3,000,562	$3,180,000	$6,481,000	$2.40
15	$26,830,000	$38,905,000	$3,672,357	$4,525,000	$8,565,000	$2.03
20	$31,379,000	$45,500,000	$4,294,878	$5,909,000	$10,633,000	$1.82

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Distribution Process Components

Distribution process components are likely to be common among the various water treatment technology processes. Process components listed in this section include finished water storage and high service pumping.

Finished Water Storage

Finished water storage facilities, such as ground storage tanks, towers, and reservoirs, provide storage of treated water before it is distributed to users. The storage provides a reserve of water to avoid service interruption during system emergencies; helps maintain uniform system pressure; permits reduction in sizes of distribution mains; and helps meet peak system demands while allowing a water treatment facility to operate at a relatively constant rate. The finished water storage requirements and associated costs are assumed the same for various treatment technologies for each facility capacity. Costs include a prestressed concrete (Crom-type) ground storage tank sized to provide approximately 50 percent of the rated facility capacity daily flow. For example, for a 10 MGD facility, a 5.0 million gallon storage tank is provided.

Probable costs for the finished water storage component are shown in **Table 19**.

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Table 19. Estimated costs for finished water storage.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$1,045,000	$1,515,000	$143,005	$143,000	$0.12
10	$1,899,000	$2,754,000	$259,958	$260,000	$0.10
15	$2,562,000	$3,715,000	$350,670	$351,000	$0.08
20	$3,036,000	$4,402,000	$415,518	$416,000	$0.07

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

High Service Pumping

High service pumps are used to pump treated water into the water distribution system. The high service pumping requirements and associated costs are assumed the same for various treatment technologies for each facility capacity. Costs include a high service pumping system with a firm pumping capacity equal to 200 percent of the facility capacity rating to meet peak hour demands. This corresponds to a peak hour demand-to-maximum day demand peaking factor of 2.0.

Table 20 presents probable costs for the high service pumping component. This cost estimate does not include distribution system piping and the finished water storage component costs.

Table 20. Estimated costs for high service pumping.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$633,000	$918,000	$86,653	$86,000	$182,000	$0.15
10	$930,000	$1,350,000	$127,430	$182,000	$327,000	$0.12
15	$1,099,000	$1,594,000	$150,462	$290,000	$455,000	$0.11
20	$1,399,000	$2,029,000	$191,523	$401,000	$612,000	$0.10

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

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Disinfection Process Components

All potable water requires disinfection as part of the treatment process before distribution. Disinfection, the process of inactivating disease-causing microorganisms, provides essential public health protection. Disinfection methods include chlorination, ultraviolet (UV) light radiation, and ozonation.

Public Water Supply facilities are required to provide adequate disinfection of the finished/treated water and to provide a disinfectant residual in the water distribution system. Disinfectant may be added at several places in the treatment process, but adequate disinfectant residual and contact time must be provided prior to distribution to the consumer.

Chlorination

Chlorine is a common disinfectant. The use of free chlorine as a disinfectant often results in the formation of unacceptable levels of TTHMs and other DBPs when free chlorine combines with naturally occurring organics in the raw water source. Existing treatment processes are being modified to comply with changing water quality standards. Add-on treatment technologies that effectively remove these compounds or prevent their formation include ozone disinfection, granular activated carbon, enhanced coagulation, membrane systems, and switching from chlorine to chlorine dioxide (Hoffbuhr 1998).

The primary disinfectant used within the SFWMD is chlorine dioxide or chlorine used with ammonia to form chloramine, and on-site generation of sodium hypochlorite. The rate of disinfection depends on the concentration and form of available chlorine residual, time of contact, pH, temperature, and other factors. Current disinfection practice is based on establishing an amount of chlorine residual during treatment and then maintaining an adequate residual to the customer's faucet.

The construction costs for a chlorination system using on-site generation of sodium hypochlorite include equipment and installation. Operations and maintenance costs include energy and chemicals, but do not include labor and normal maintenance, which are covered under the facility O&M labor (CDM 2007a).

Probable costs associated with a chlorination system using on-site generation of sodium hypochlorite are shown in **Table 21**.

Table 21. Estimated costs for chlorination disinfection by on-site generation of sodium hypochlorite.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Annual Production Cost ($/1,000 gal)
5	$1,745,000	$2,530,000	$238,814	$18,000	$281,000	$0.23
10	$2,941,000	$4,264,000	$402,491	$36,000	$478,000	$0.18
15	$3,985,000	$5,778,000	$545,402	$54,000	$654,000	$0.16
20	$4,946,000	$7,172,000	$676,986	$72,000	$817,000	$0.14

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Ultraviolet Light

The UV light disinfection process does not use chemicals. Microorganisms, including bacteria, viruses, and algae, are inactivated within seconds of radiation with UV light.

The UV disinfection process takes place as water flows through an irradiation chamber. Microorganisms in the water are inactivated when the UV light is absorbed. A photochemical effect is created and vital processes are stopped within the cells, thus rendering the microorganisms harmless. Ultraviolet light inactivates microbes by damaging their nucleic acids, thereby preventing the microbe from replicating. When a microbe cannot replicate, it is incapable of infecting a host.

Ultraviolet light is effective in inactivating *Cryptosporidium*. One major advantage of UV light disinfection is that it is capable of disinfecting water faster than chlorine, and without the need for retention tanks or potentially harmful chemicals (AWWA 2003).

The probable costs for UV disinfection were derived from technology cost estimates for complying with new drinking water regulations under the U.S. Environmental Protection Agency (USEPA) (2005). All capital cost estimates were derived directly from the USEPA capital cost tables, with appropriate adjustments for inflation, contractors, and project mark-ups. The O&M costs (except for replacement parts and materials) were developed by CDM using standard unit costs for power and labor.

Table 22 presents probable costs for UV disinfection.

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Table 22. Estimated costs for ultraviolet light disinfection.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$436,998	$633,998	$60,000	$11,800	$77,800	$0.37
3	$496,999	$720,999	$68,000	$21,200	$96,000	$0.14
5	$627,000	$909,000	$86,000	$28,200	$122,800	$0.10
10	$1,244,000	$1,804,000	$170,000	$46,700	$233,700	$0.09
15	$1,995,000	$2,893,000	$273,000	$65,400	$365,700	$0.09
20	$2,700,000	$3,915,000	$370,000	$86,300	$493,300	$0.08

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Ozonation

Ozonation is a water disinfection method that uses the same type of ozone found in the atmosphere. By adding ozone to the water supply and then sending an electric charge through the water, water suppliers inactivate disease-causing microbes, including *Giardia* and *Cryptosporidium*. Contact times required for disinfection by ozone are short (seconds to several minutes) when compared to the longer disinfection time required by chlorine. Ozonation is also an effective way to alleviate most of taste and odor issues within a Public Water Supply (AWWA 2003).

Ozonation is widely used in Western Europe. However, in the United States, use of ozonation is more limited. The Orlando Utilities Commission has been using ozonation since 2002. Other community water suppliers using ozonation are located in California, Colorado, Michigan, Maine, New Jersey, Oklahoma, Pennsylvania, Texas, Wisconsin, and Wyoming. The cost of ozonation is approximately four times higher than that of traditional chlorine disinfection because of the much greater amount of electricity needed for water treatment. Another disadvantage of this technology is that unlike chlorine, ozone dissipates quickly in water supplies; contaminants entering the water after it is disinfected and leaves the facility could go untreated. Ozonation does not produce the DBPs associated with chlorine disinfection.

The probable costs for ozonation were derived from technology cost estimates for complying with new drinking water regulations (USEPA 2005).

Considerations:

- All capital cost estimates were derived directly from the USEPA capital cost tables, with appropriate adjustments for inflation and contractor and project mark-ups.
- The O&M costs (except for replacement parts and materials) were developed by CDM using standard unit costs for power, liquid oxygen, and labor.

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- The USEPA cost tables assumed:
  - A design dose of 4.5 mg/L
  - Contact time of 12 minutes
  - N+1 equipment redundancy for achieving 0.5-log *Cryptosporidium* inactivation credit under the USEPA (2005)
- These assumptions also represent conservative design criteria for providing 3-log *Giardia* inactivation for water supplies with moderate ozone demand and decay rates, based on CDM's ozone design experience.
- The ozone generation building cost was based on a unit cost of $150 per square foot, based on CDM's design experience, which was significantly higher than the unit cost used in the USEPA estimates.
- Power and liquid oxygen chemical costs for O&M cost were calculated based on:
  - Average process flows for each design capacity
  - An average ozone dose of 2.5 mg/L
  - Constant ozone-in-oxygen concentration of 10 percent by weight
- The required O&M labor for the ozone system assumes that this process is an add-on process to a fully staffed conventional water treatment facility with no additional staff positions required.

Table 23 shows probable costs for ozonation disinfection.

Table 23. Estimated costs for ozonation.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
1	$743,998	$1,078,998	$102,000	$50,800	$163,000	$0.78
3	$1,369,999	$1,984,999	$187,000	$60,200	$265,900	$0.39
5	$1,994,000	$2,892,000	$273,000	$69,500	$369,800	$0.30
10	$3,068,000	$4,448,000	$420,000	$101,600	$563,600	$0.21
15	$4,048,000	$5,869,000	$554,000	$133,700	$743,100	$0.18
20	$4,892,000	$7,094,000	$670,000	$167,300	$904,300	$0.15

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

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WASTEWATER TREATMENT TECHNOLOGIES

Treatment facilities that use reclaimed water for public access irrigation must provide filtration and high-level disinfection (advanced secondary treatment). The following information includes an overview of advanced treatment and processes used to produce higher quality reclaimed water. It does not include related components such as transmission systems, storage, alternative disposal, and modifications to the application area for wastewater treatment. See also **Chapter 5** of this Support Document.

Wastewater Treatment Facilities

Wastewater treatment in the SFWMD is provided by:

- Regional, municipal, or privately owned wastewater treatment facilities
- Small developer/homeowner association or utility-owned wastewater treatment facilities
- Septic tanks

Many of the smaller wastewater treatment facilities are constructed on an interim basis until regional wastewater facilities become available. Upon connection to the regional wastewater system, the smaller wastewater treatment facility is typically abandoned.

Wastewater treatment in the SFWMD is regulated by the FDEP. Pursuant to Chapter 62-600, F.A.C., the following wastewater treatment facilities are exempt from the FDEP regulation and are regulated by the local health department for each county:

- Those with a design capacity of 2,000 gallons per day (GPD) or less, which serve the complete wastewater and disposal needs of a single establishment
- Septic tank drain field systems and other on-site sewage systems with subsurface disposal and a design capacity of 10,000 GPD or less, which serve the complete wastewater disposal needs of a single establishment

All of the FDEP-regulated facilities within the SFWMD use the activated sludge treatment process.

Wastewater treatment facilities use integrated processes to treat wastewater to a desired quality. At a minimum, wastewater facilities in Florida provide secondary treatment. These facilities typically dispose of effluent via deep injection wells or ocean outfalls. Ocean outfall is further discussed in the *2013 Lower East Coast Water Supply Plan Update* (SFWMD 2013a).

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Advanced Secondary Treatment

Advanced secondary treatment typically refers to the addition of filtration and high-level disinfection to a secondary treatment facility. Most of the water from these facilities is reused for irrigation of public access areas.

Granular Media Filters Followed by Ultraviolet Disinfection

Filtration is a common component of advanced secondary wastewater treatment, which provides a higher quality effluent that can be used as reclaimed water. Filtration is required of all reclaimed water used for public access irrigation. Granular media filtration, typically sand, is a polishing step that lowers the levels of suspended solids and associated contaminants in treated wastewater. This filtration, followed by UV disinfection, kills pathogenic microorganisms in the wastewater before being discharged into the environment. Types of granular media filters include slow sand, rapid sand, deep bed, upflow, pulsed bed dual, and multimedia.

To achieve high-level disinfection in an advanced secondary treatment process, monitoring and chemical feed equipment is also needed.

The costs associated with granular media filters followed by UV disinfection are presented in **Table 24**. The construction costs include all equipment, material, and installation, and the O&M costs include all energy, labor, and other maintenance.

- The following assumptions were applied to develop the cost estimates: granular media filter construction cost is based on deep bed filters. Cost includes equipment, concrete, and installation.
- UV construction cost is based on an in-vessel medium pressure system.
- The facility infrastructure includes building to house process equipment.

Table 24. Estimated costs for granular media filters followed by UV disinfection.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual CapitalCost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$4,309,000	$6,247,000	$590,000	$421,000	$1,070,000	$0.59
10	$8,376,000	$12,145,000	$1,146,000	$841,000	$2,102,000	$0.58
15	$12,485,000	$18,103,000	$1,709,000	$1,262,000	$3,142,000	$0.57
20	$15,832,000	$22,957,000	$2,167,000	$1,683,000	$4,067,000	$0.56

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

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Advanced Wastewater Treatment

Advanced wastewater treatment (AWT) involves the upgrade of an existing wastewater treatment facility from advanced secondary treatment to AWT to achieve nitrogen and phosphorus removal. Advanced wastewater treatment refers to a level of treatment that meets effluent limits of 5 mg/L total suspended solids, 5 mg/L carbonaceous biochemical oxygen demand, 3 mg/L total nitrogen, and 1 mg/L total phosphorus on an annual average basis.

In the past, AWT was associated with facilities that use stream discharge for effluent disposal. However, AWT is now employed to allow use of reclaimed water for wetland restoration, groundwater recharge systems, and other advanced uses of reclaimed water.

Five-stage Bardenpho Process

Many AWT process configurations have been developed to accomplish biological nutrient removal from advanced secondary treatment effluent. One configuration commonly used in Florida to provide high levels of nitrogen and phosphorus removal is the five-stage Bardenpho process.

Table 25 presents the costs for AWT that include a five-stage Bardenpho process and deep bed filters after secondary clarification to further remove total suspended solids.

Table 25. Estimated costs for advanced wastewater treatment – five-stage Bardenpho process.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O & M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$17,326,320	$25,123,000	$2,371,000	$1,417,000	$4,025,000	$2.21
10	$27,809,760	$40,323,000	$3,806,000	$2,738,000	$6,925,000	$1.90
15	$38,291,880	$55,524,000	$5,241,000	$4,037,000	$9,802,000	$1.79
20	$48,252,600	$69,967,000	$6,604,000	$5,322,000	$12,586,000	$1.72

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Membrane Bioreactor Process

One of the most important technological advances in biological wastewater treatment is the development and application of a membrane bioreactor process for full-scale municipal wastewater treatment. The membrane bioreactor is a suspended growth-activated sludge system that uses microporous membranes for solid and liquid separation instead of secondary clarifiers. The membrane component uses low-pressure MF or UF membranes and eliminates the need for clarification and tertiary filtration. The membranes are typically immersed in an aeration tank; however, some applications use a separate membrane tank.

One of the key benefits of a membrane bioreactor system is that it effectively overcomes the limitations of poor settling of sludge in conventional activated sludge processes.

The construction costs developed for a membrane bioreactor facility are based on the following process modules: influent pumping; preliminary treatment; aeration tanks; membrane tanks; UV disinfection; effluent pump station; and sludge treatment and handling.

Process construction cost includes estimates for anoxic and aeration tanks; process blowers; return activated sludge pumps; membrane tanks; air scour blowers; permeate pumps; and membrane cleaning system. The Modified Ludzack-Ettinger process is assumed for the membrane bioreactor configuration.

Table 26 shows the costs for the membrane bioreactor process.

Table 26. Estimated costs for advanced wastewater treatment – membrane bioreactor process.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$50,896,000	$73,799,000	$6,966,000	$2,219,000	$9,882,000	$5.41
10	$78,338,000	$113,591,000	$10,722,000	$3,645,000	$15,439,000	$4.23
15	$104,142,000	$151,006,000	$14,254,000	$5,109,000	$20,788,000	$3.80
20	$122,715,000	$177,937,000	$16,796,000	$6,890,000	$25,366,000	$3.47

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

Microfiltration/Reverse Osmosis Process

Another advanced wastewater process to treat existing secondary effluent is the addition of MF and RO systems to the secondary treatment facility.

The construction costs for the MF and RO process include pretreatment facilities, a MF system, and a RO system. The following assumptions are used to develop cost estimates for the MF and RO option:

Reverse Osmosis Trains

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- Pretreatment construction cost includes estimates for rotary drum 2 mm fine screens.
- MF system cost is based on a submerged MF system. Cost includes equipment, concrete, and installation.
- RO system cost includes membranes, break tank, in-line pump station, and chemical feed and storage systems for pH adjustment and corrosion protection. The cost estimate is based on a RO system with an 80 percent recovery rate.
- Concentrate disposal is based on a deep injection well, which is included in the cost estimate.

Table 27 presents the costs for the MF and RO process.

Table 27. Estimated costs for advanced wastewater treatment – microfiltration/reverse osmosis.

Facility Capacity (MGD)	Construction Cost	Capital Cost	Equivalent Annual Capital Cost	Annual O&M Cost	Total Annual Production Cost	Cost ($/1,000 gal)
5	$45,234,000	$65,590,000	$6,191,000	$3,311,000	$10,121,000	$5.55
10	$73,636,000	$106,772,000	$10,079,000	$6,256,000	$17,343,000	$4.75
15	$97,911,000	$141,972,000	$13,401,000	$7,194,000	$21,935,000	$4.01
20	$118,615,000	$171,992,000	$16,235,000	$9,592,000	$27,451,000	$3.76

Source: Cost Study (CDM 2007a).

Note: Operations and maintenance cost is included in O&M facility labor.

GROUNDWATER CONTAMINATION AND IMPACTS TO WATER SUPPLY

Some contaminants can be costly and difficult for water treatment facilities to remove from drinking water supplies. The cost and degree of difficulty depends upon the contaminant. Contaminant means any physical, chemical, biological, or radiological substance or matter in water (Section 403.852(9).

An effective groundwater monitoring program is critical for accurate determination of groundwater degradation. Improperly located monitor wells can result in the oversight of a contaminant plume. In addition, certain unacceptable parameters may not be observed in the groundwater for many years, depending on soil adsorption capacities and groundwater gradient.

The following discussion reviews major groundwater contamination sources.

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Groundwater Contamination Sources

Aquifers can be contaminated in several ways. Activity occurring on ground surfaces can contaminate the surficial aquifer system (SAS), while saltwater intrusion presents a potential threat to aquifers. Once a contaminant enters the aquifer, it may be difficult to remove. In many cases, leaks, spills, or discharges of contaminants result in contamination of large areas of the aquifer. Therefore, preventing contamination of the aquifer by protecting Public Water Supply wells and wellfields from activities that present a possible contamination threat is preferable. Many counties have enacted well-protection ordinances.

Saltwater Intrusion

Saltwater intrusion is the movement of saline water into fresh water aquifers and can occur laterally or vertically. This movement of saline water has the potential to occur in most coastal aquifers that are hydraulically connected to seawater. Within the District, salinity control structures have been installed in all canals that connect to tidal basins to limit saltwater encroachment and maintain freshwater heads on the inland side.

Freshwater aquifers that overlie saline aquifers also have the potential for contamination from saline water. As the freshwater aquifer is pumped, upconing of the saline water may occur. This can be a significant threat because of its potential to degrade water supplies. Public Water Supply utilities, as well as other use classes, establish monitor wells to provide information about the quality of the water in the aquifers.

In the past, cross-contamination of shallow aquifers has occurred from some of the Floridan aquifer system (FAS) wells within the District. This can occur in several ways. A number of artesian wells were drilled into the FAS for agricultural water supply and oil exploration from the 1930s through the 1950s. These wells were constructed with casings that extend to about 200 feet or less below land surface (bls). This construction method exposed shallower freshwater zones to invasion by more saline Floridan water.

Over time, some wells that were constructed properly have had their steel casings corrode, allowing interaquifer exchange through the deteriorating casings. Occasionally, an abandoned well was plugged improperly or simply left open, free flowing on the land surface and recharging the SAS with saline water. In addition, as Floridan water is used as a supplemental source for agriculture during periods of water shortage, this brackish water can infiltrate the SAS.

The *Water Quality Assurance Act* passed in 1981 requires Floridan wells to be equipped with a valve capable of controlling the discharge from the well. Property owners are responsible for wells located on their land. Permit holders are required to maintain their wells and properly abandon them when necessary.

The SFWMD Water Use Regulatory Database includes compliance data associated with respective water use permits. Saltwater intrusion data are maintained as a component of this compliance data, and include information about chlorides, specific conductance, and

water levels from the monitoring network information contained in the Water Use Regulatory Database. The monitoring network receives monitor well data supplied by Public Water Supply utilities and the U.S. Geological Survey (USGS).

The effects of saltwater intrusion, upconing, aquifer cross-contamination, and connate water can create complex and somewhat unpredictable scenarios for local groundwater quality. Although monitor wells provide a great deal of information where they exist, there are limits as to how many wells can be installed. Where more saltwater interface data are required, additional methods must be considered. Geophysical surveys can provide useful information about the extent of saltwater intrusion (Benson and Yuhr 1993).

Microconstituents

Microconstituents comprise a relatively new group of compounds whose health effects are presently unknown. The FDEP defines microconstituents as follows:

> Microconstituents, sometimes known as "emerging pollutants of concern," are chemicals found in a wide array of consumer goods, including pharmaceuticals and personal care products. Some of the microconstituents are considered "endocrine disrupters" (compounds such as synthetic estrogen, PCBs, dioxin, and some pesticides that may interfere with or modify hormone processes within an organism) (FDEP 2009).

The number of constituents that fall within the microconstituent definition is well beyond the number of contaminants currently monitored in drinking water. As technology has advanced to the point that trace quantities of these chemicals can now be detected, a significant amount of research activity is devoted to determining the distribution and occurrence of these substances in drinking water, the associated health implications, and methods of treatment for contaminants that may be considered a health risk. Microconstituent removal may become a performance standard in the future.

The USGS performed a national water quality survey of microconstituents. The survey, *Water-Quality Data for Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999–2000* (USGS 2002) is available from http://toxics.usgs.gov/pubs/OFR-02-94/index.html.

Solid Waste Sites

Although groundwater monitoring began in the early 1980s for landfills, inactive sites may still pose a potential threat to groundwater resources. Many of Florida's older landfills and dumps were used for years with little or no controls over the types of material disposed.

Leachate is the contaminant-laden liquid that drains from a landfill. Leachates often contain high concentrations of nitrogen and ammonia compounds, iron, sodium, sulfate, total organic carbon, biological oxygen demand, and chemical oxygen demand. Less common constituents, which may also be present, include metals, such as lead or chromium, and

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volatile or synthetic organic compounds associated with industrial solvents, such as trichloroethylene, tetrachloroethylene, and benzene. The presence and concentration of contaminants in the leachate depend on several factors that dictate the extent and character of the resulting groundwater impacts, including:

- Landfill size and age
- Types and quantities of wastes produced in the area
- Local hydrogeology
- Landfill design and landfilling techniques

The FDEP is responsible for rule development, solid waste policy, and implementation of Florida's solid waste management program. More information about solid waste is available from http://www.floridadep.org/waste/categories/solid_waste.

Hazardous Waste Sites

The FDEP sponsors several programs that provide support for hazardous waste site cleanup, including:

- Early Detection Incentive Program
- Petroleum Liability and Restoration Program
- Abandoned Tank Restoration Program
- Petroleum Cleanup Participation Program
- Preapproved Advanced Cleanup Program

Locations and cleanup status can be obtained through the FDEP Waste Management Section. The FDEP website provides current listings of hazardous waste sites, available from http://www.floridadep.org.

Superfund Program Sites

The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, commonly known as "Superfund," authorized the USEPA to identify and remediate uncontrolled or abandoned hazardous waste sites. The National Priorities List targets sites considered to have a high health and environmental risk. More information about the USEPA's Superfund Program is available from http://www.epa.gov.

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Septic Tanks

Septic systems are a common method of on-site waste disposal for single-family homes or small commercial facilities. Septic tanks exist throughout the District's planning areas and are a threat to groundwater resources used as drinking water sources. Older systems installed prior to regulatory separation requirements between the bottom of the tank's associated drain field and the top of the seasonal high water table are a particular threat. In many neighborhoods served by septic tanks, centralized wastewater collection systems are being installed.

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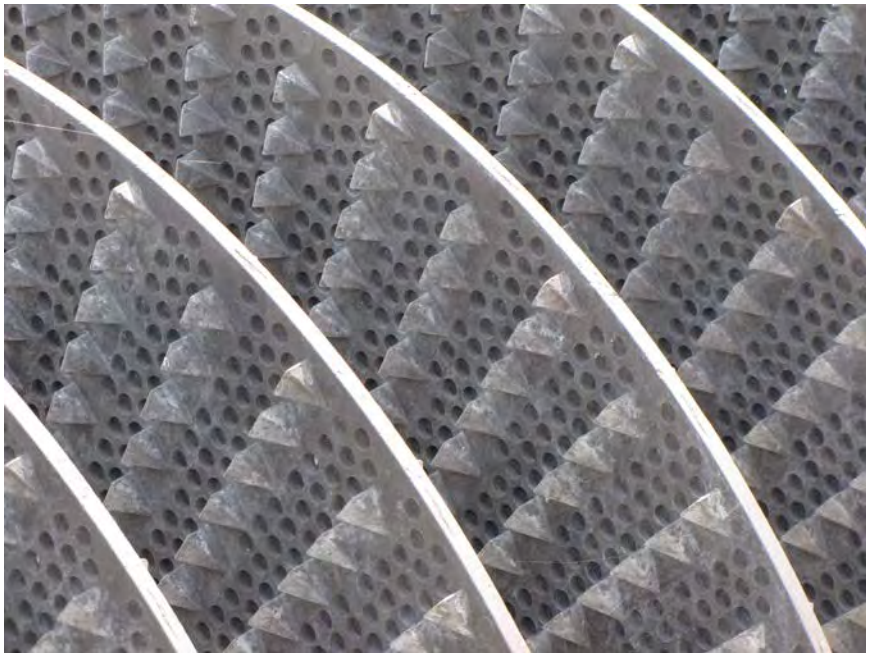

Wastewater Treatment Facility

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7

Kissimmee Basin Planning Area

This chapter describes characteristics of the Kissimmee Basin (KB) Area. For 2011–2014 planning purposes, this region is divided into two basins and addressed in two different water supply plans. The Upper Kissimmee Basin (UKB) is a part of the Central Florida Coordination Area (CFCA), which includes Seminole, Orange, and Osceola counties and south Lake County within the St. Johns River Water Management District; Orange, Osceola, and Polk counties within the South Florida Water Management District; and Polk County within the Southwest Florida Water Management District. As a part of the Central Florida Water Initiative (CFWI) mission to implement a long-term approach to water resource management in central Florida, a single water supply plan for the CFCA region is being developed, called the *2014 Central Florida Water Initiative Regional Water Supply Plan* (SJRWMD, SWFWMD and SFWMD 2014). The Lower Kissimmee Basin (LKB), which includes Glades, Highlands, and Okeechobee counties, is addressed in the *Lower Kissimmee Basin Water Supply Plan* (LKB Plan) (SFWMD in process).

TOPICS

- Planning Area Boundaries
- Physical Features
- Water Resources and System Overview
- Ecosystem Restoration Efforts

PLANNING AREA BOUNDARIES

In the SFWMD, the KB Planning Area extends from southern Orange County, south along the Kissimmee Chain of Lakes and the Kissimmee River, to the north shore of Lake Okeechobee. Located in central Florida, the area includes portions of Orange, Osceola, Polk, Highlands, Okeechobee, and Glades counties as shown in **Figure 5**. The boundary of the KB Planning Area generally reflects the drainage basin of

Lake Kissimmee, S-65 Structure

the Kissimmee River. The northern and eastern portions of the planning basin are adjacent to the St. Johns River Water Management District (SJRWMD), while the western boundary is adjacent to the Southwest Florida Water Management District (SWFWMD).

PHYSICAL FEATURES

Water bodies and wetlands together cover about a quarter of the KB Planning Area. Most wetland systems in the KB Planning Area drain into the Kissimmee River and, subsequently, into Lake Okeechobee.

Taylor Creek/Nubbin Slough Basin

Major features of the KB Planning Area include the Kissimmee Chain of Lakes, Kissimmee River and its floodplain, and Lake Istokpoga – Indian Prairie. Shingle Creek Swamp and Reedy Creek Swamp, two large forested wetlands in the northernmost reaches of the KB Planning Area, start the headwaters of the Kissimmee Chain of Lakes.

Fisheating Creek, west of Lake Okeechobee, marks the southernmost boundary of the KB Planning Area. The Fisheating Creek Basin extends from west-central Highlands County (from just south of State Road 66) southward into the northern portion of Glades County. The creek collects runoff from the Lake Wales Ridge, located in Highlands County, as well as some runoff from Glades County. Fisheating Creek is the only remaining naturally flowing tributary to Lake Okeechobee.

The Taylor Creek/Nubbin Slough Basin, located north and northeast of Lake Okeechobee, respectively, is considered within the KB Planning Area because of its hydrologic relationship to the Kissimmee River and Lake Okeechobee.

Water Bodies and Landscapes

The Upper Kissimmee Basin contains hundreds of lakes; however, the Kissimmee Chain of Lakes is the dominant hydrologic feature (see the *Kissimmee Chain of Lakes* section of this chapter). Outflow from Lake Kissimmee enters the Kissimmee River and the channelized C-38 Canal before continuing southward to Lake Okeechobee (see the *Lower Kissimmee Basin* section of this chapter).

The Kissimmee River and its floodplain are characterized by forested, wetland shrub, and marsh wetlands. The federally authorized Kissimmee River Restoration Project is modifying more than 39 square miles of river/floodplain. When completed, more than 40 miles of

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meandering river channel will once again receive reestablished flow. (See **Chapter 3** of this document, the upcoming LKB Plan (SFWMD in process), and the *South Florida Environmental Report – Volume I*, available from http://www.sfwmd.gov/sfer for more information about Kissimmee River Restoration.)

The Lake Istokpoga – Indian Prairie Basin is located within the Lower Kissimmee Basin. Lake Istokpoga is 44 square miles and the fifth-largest lake in Florida (see the *Lake Istokpoga – Indian Prairie Basin* section of this chapter). Lake Istokpoga receives water from Arbuckle and Josephine creeks, which collect runoff from the western portion of the planning area and from areas within the SWFWMD.

Encompassing 730 square miles, Lake Okeechobee is the largest lake in the southeastern United States and a central component of the hydrology and environment of south Florida.

Lake Istokpoga – Cypress

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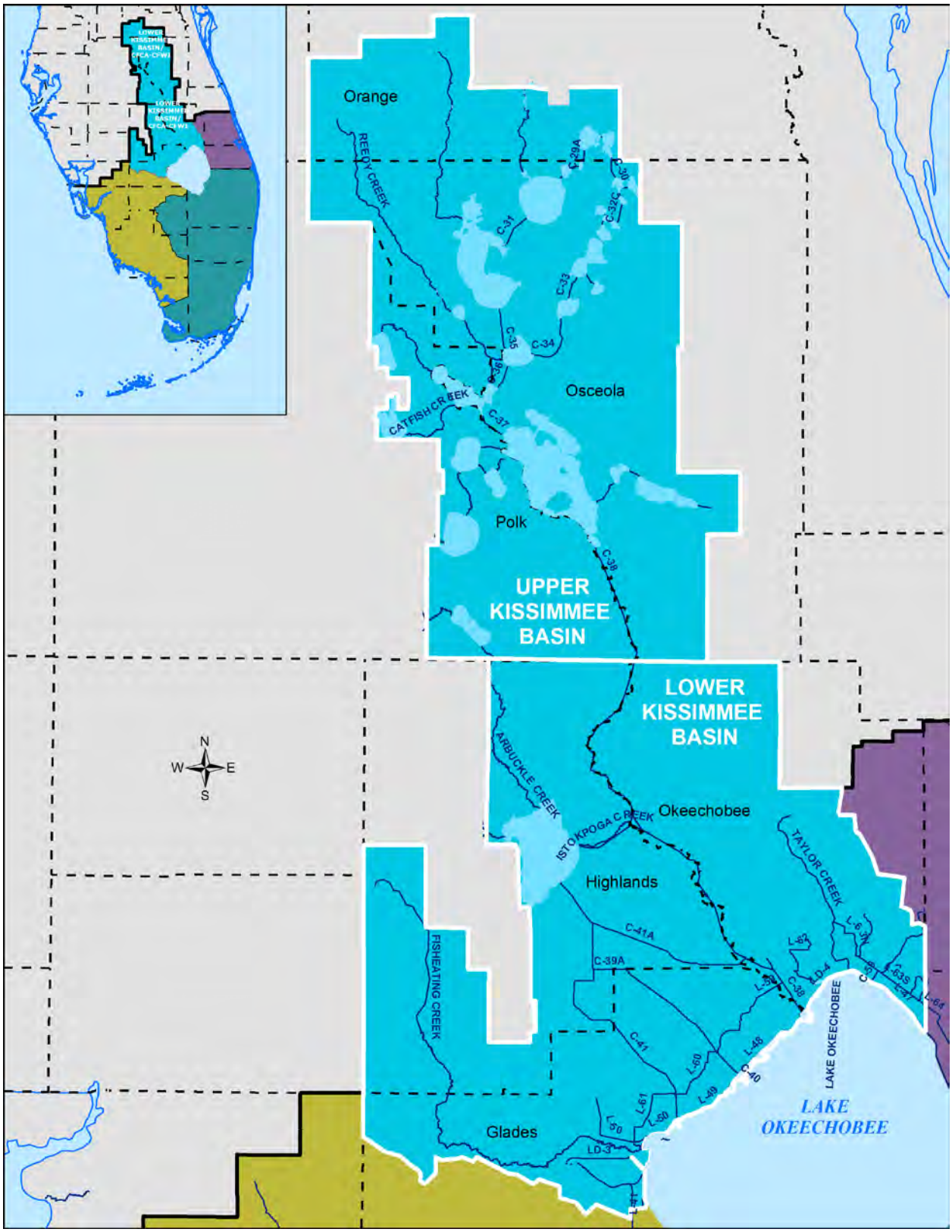

Figure 5. Kissimmee Basin Planning Area.

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Geography and Climate

The KB Planning Area encompasses 3,488 square miles in central Florida, and its average elevation is 63 feet above mean sea level (MSL).

Average seasonal temperatures for the area range from 41°F to 86°F. Annual rainfall averages between 45 inches and 50 inches (see also the *Precipitation and Evapotranspiration* section).

Physiography

The KB Planning Area has three major physiographic zones: 1) Lake Wales Ridge, 2) Osceola Plain, and 3) Okeechobee Plain (**Figure 6**). In general, the physiographic features in the region were formed as the land mass gradually emerged from a receding ocean. Several million years ago, the Lake Wales Ridge was a peninsula that existed when much of Florida was under water.

The Lake Wales Ridge is a relict beach and sand dune system that runs along the western edge of the KB Planning Area. Bounded on the east by the Osceola and Okeechobee plains, the ridge stretches approximately 100 miles from Orange County to southern Highlands County, and ranges from 4 miles to 10 miles in width.

Elevations generally exceed 100 feet above MSL, but may reach over 200 feet above MSL in portions of western Orange and Osceola counties and in eastern Polk County. The crest of the ridge forms the water divide between the SFWMD and the SWFWMD, although the base of the ridge is used as the district boundary. Most of the surface waters to the east of the ridge drain toward the Kissimmee River region.

Lake Kissimmee

Most of the KB Planning Area lies within the Osceola Plain, a broad flat area about 40 miles wide and 100 miles long. The highest elevation of the Osceola Plain, near the southern portion of Orlando, ranges between 90 feet and 95 feet above MSL. Elsewhere, the Osceola Plain elevation is between 60 feet and 70 feet above MSL with small local relief. The Osceola Plain narrows toward the southeast where it meets the northeastern edge of the Okeechobee Plain.

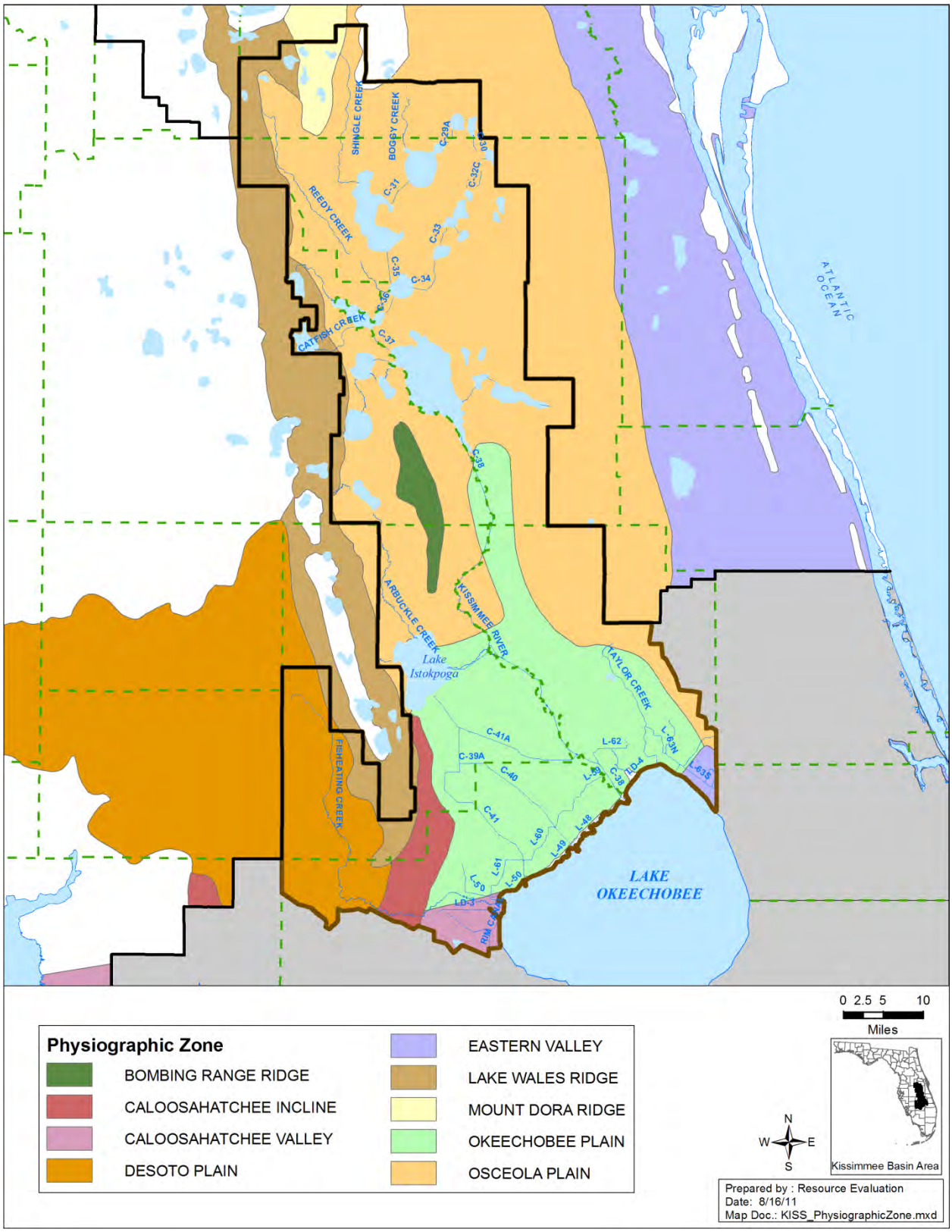

Figure 6. Physiography of the Kissimmee Basin Planning Area.

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The Avon Park Bombing Range Ridge is a distinctive feature within the Osceola Plain and part of an important conservation and recreational area within the KB Planning Area. This region is centrally located, linking the Three Lakes, Kissimmee Prairie, and Lake Wales Ridge conservation areas to create one of the largest preservation areas north of Lake Okeechobee. This north/south trending sand ridge extends from southeastern Polk County into northeastern Highlands County, where it reaches its maximum altitude of 146 feet.

Numerous lakes are located within the Osceola Plain, including the Kissimmee Chain of Lakes (see *Kissimmee Chain of Lakes* section of this chapter). Most of the area's natural lakes may have formed from depressional areas in the original limestone deposition.

The lakes on the Osceola Plain drain into the Kissimmee River. Water flows into the southern end of Lake Hatchineha, runs southward through Lake Kissimmee, and continues south through the Osceola and Okeechobee plains, before entering Lake Okeechobee. Where the Kissimmee River flows across the Osceola Plain, it occupies a floodplain valley about 1.5 miles wide. However, where the river flows in the Okeechobee Plain, the distinction between the valley and upland surface is difficult to perceive.

The Caloosahatchee Incline borders the southeastern portion of the Lake Wales Ridge and the western portion of the Okeechobee Plain. This long, narrow inclines gently slopes eastward and ranges in altitude between 30 and 40 feet above MSL.

The Okeechobee Plain is adjacent to Lake Okeechobee and spans an area about 30 miles wide and 30 miles long, with less local relief than the Osceola Plain. The Okeechobee Plain gradually slopes southward from an elevation of 30 feet to 40 feet above MSL near the top of its boundary, to about 20 feet above MSL at the north shore of Lake Okeechobee. The Fisheating Creek and Indian Prairie basins are within the Okeechobee Plain. Fisheating Creek remains largely undisturbed as a natural flow-way to Lake Okeechobee.

WATER RESOURCES AND SYSTEM OVERVIEW

In the following sections, surface water and groundwater resources are addressed as separate entities. Surface water resources in the KB Planning Area include lakes, rivers, springs, and canals. Groundwater resources include the Floridan aquifer, and to a lesser extent, the surficial aquifer.

Regional Hydrologic Cycle

The main components of the hydrologic cycle for the KB Planning Area include precipitation, evapotranspiration, and the resulting flow of surface water and groundwater. The interaction between surface water and groundwater is expressed as either recharge to, or discharge from, the aquifer system.

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Precipitation and Evapotranspiration

The region's wet season is June through October; the dry season starts in November and continues through May. The planning area's annual rainfall averages between 45 inches and 50 inches.

On average, 62 percent of the rainfall in the Upper Kissimmee Basin and 64 percent of the rainfall in the Lower Kissimmee Basin occur during the wet season. The Upper Kissimmee Basin's heaviest rainfall month is July, with monthly rainfall averaging 7.44 inches. The Lower Kissimmee Basin's heaviest rainfall month is June, with monthly rainfall averaging 7.26 inches. The lightest rainfall month for both basins is December, when monthly rainfall averages 1.73 inches (SFWMD 1999).

Hydrologic and meteorological methods are available to measure and estimate the combined rate at which water is returned to the atmosphere by transpiration and evaporation. The combined processes are known as evapotranspiration (ET). Precipitation minus ET is equal to the combined amounts of surface water runoff and groundwater recharge. The estimate of potential evapotranspiration (ETp) from open water and wetlands in the Kissimmee Basin is 49 inches (Abtew et al. 2003). Potential evapotranspiration represents the total estimated passive water use of an area under maximum conditions. While actual evapotranspiration varies due to temperature, soil moisture, and other factors, ETp estimates are important landscape-level factors in water balance calculations to determine if enough water will be available for all uses during different environmental conditions.

Surface Water Inflow and Outflow

Surface water flow includes inflow from areas adjacent to the planning basin and rainfall within the basin and storage, and outflow to Lake Okeechobee via the Kissimmee River, and Indian Prairie and Fisheating Creek basins. There are several primary surface water features providing surface water drainage for the KB Planning Area. Reedy Creek, Shingle Creek, and Boggy Creek, located in the northernmost section of the basin, are the primary drainage features for Orange and northern Osceola counties. The Kissimmee Chain of Lakes act as the primary surface water features in northern Osceola County. Each of these hydrologic features eventually connects to the Kissimmee River, which is the primary drainage feature of the basin. Lakes located along the Lake Wales Ridge generally drain internally, providing important recharge for the intermediate and Floridan aquifer systems.

In general, stormwater runoff within the KB Planning Area is directed to one of the hydrologic features mentioned previously. However, three sources of natural inflow come from areas adjacent to the planning area. These are Josephine and Arbuckle creeks, which flow into Lake Istokpoga, and surface water from the Horse Creek Basin, which flows into Lake Hatchineha via Lake Marion Creek.

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Groundwater Flow

Three major hydrogeologic units underlie the KB Planning Area: the surficial aquifer system (SAS), the intermediate confining unit (ICU), and the Floridan aquifer system (FAS). The surficial aquifer is primarily recharged by rainfall, and interacts with surface water features, such as rivers, canals, and lakes. The surficial aquifer also provides temporary storage for infiltrating water that eventually percolates down to the underlying aquifers or moves laterally to discharge areas.

Surface Water Resources

Hydrologically, the entire Kissimmee Basin lies within the Lake Okeechobee Watershed, which consists of four tributary basins: Kissimmee River, Taylor Creek/Nubbin Slough, Lake Istokpoga – Indian Prairie/Harney Pond, and Fisheating Creek. With the exception of Fisheating Creek, all major inflows to Lake Okeechobee are controlled by gravity-fed or pump-driven water control structures.

Lake Rosalie draining to Lake Kissimmee at Structure G-103

For water management and flood control purposes, the Kissimmee Basin is divided into upper and lower basins at the outlet of Lake Kissimmee (S-65) to the Kissimmee River (See **Figure 7**.)

Upper Kissimmee Basin

The Upper Kissimmee Basin covers approximately 1,633 square miles and encompasses more than two dozen lakes in the Kissimmee Chain of Lakes (KCOL), their tributary streams, and associated marshes. This basin forms the headwaters of Lake Okeechobee and the Everglades, and comprises the uppermost section of the historic Kissimmee–Okeechobee–Everglades (KOE) system. The Kissimmee Chain of Lakes (**Figure 8**) is the most prominent surface feature in the basin among central Florida's hundreds of lakes. Water released from the KCOL flows southward to Lake Kissimmee, the southernmost feature in the basin. Lake Kissimmee is the largest lake in the Upper Kissimmee Basin and acts as a buffer for flows before their release into the Kissimmee River at S-65 (**Figure 8**).

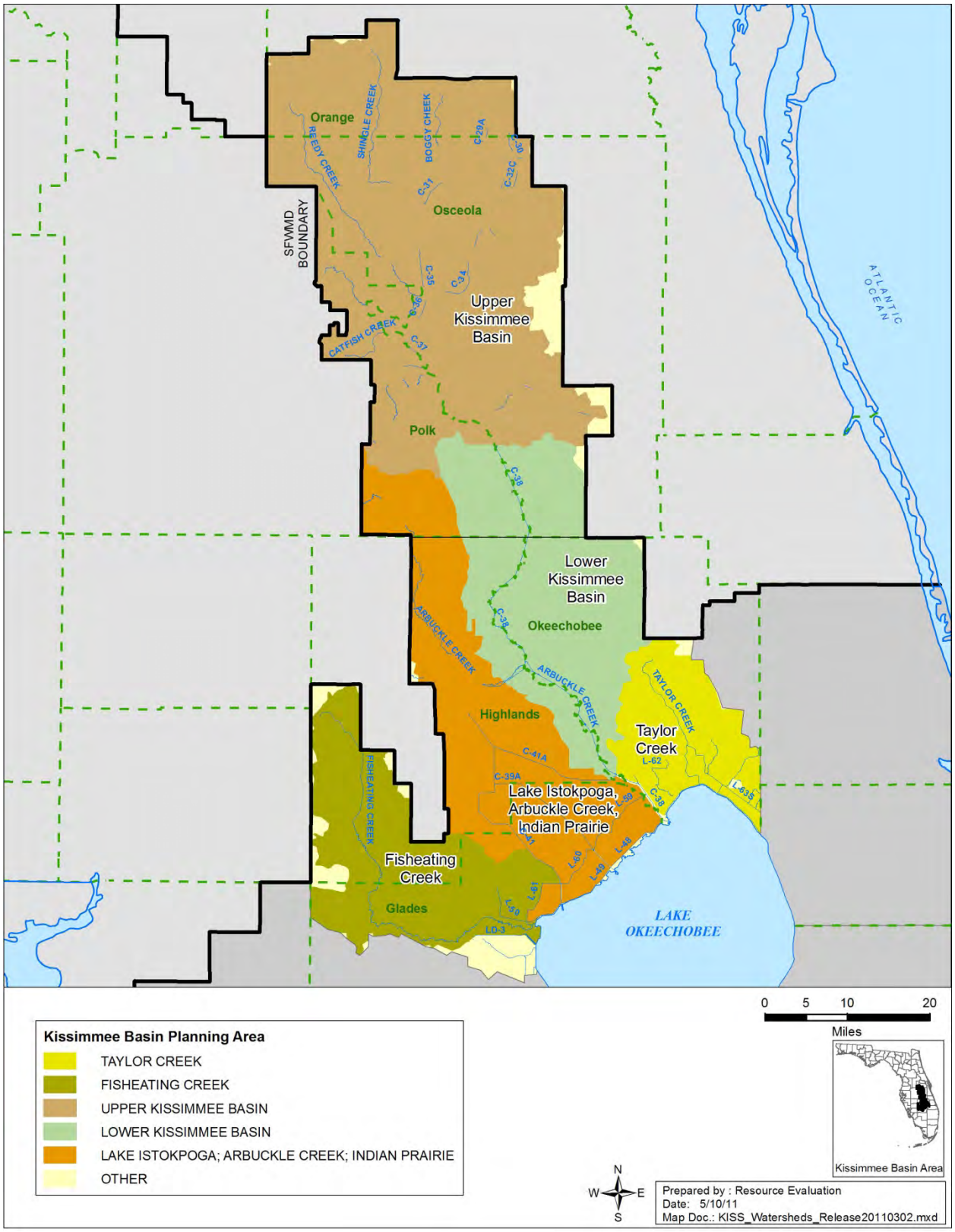

Figure 7. Kissimmee Basin watersheds.

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Kissimmee Chain of Lakes

The Kissimmee Chain of Lakes (KCOL) forms an integrated system of lakes with interconnecting canals and water control structures operated by the SFWMD to maintain seasonal fluctuations in water levels. This lake system comprises 19 controlled water bodies grouped into the following seven Lake Management Areas:

- **Alligator Chain of Lakes (Alligator, Brick, Lizzie, Coon, Center, and Trout)** Located at the topographic top of the KCOL, these lakes are linked together by canals. Water control structures direct water from the Alligator Chain to flow north or south, but generally water is discharged south through the C-33 Canal to Lake Gentry. The north end of Trout Lake acts as the drainage divide for flows through the Kissimmee Chain of Lakes.
- **Lake Gentry** Inflows from the Alligator Chain enter Lake Gentry through the C-33 Canal. Lake Gentry also receives surface water from the Big Bend Swamp along the eastern shore of the lake. Lake Gentry discharges through the C-34 Canal to Lakes Kissimmee, Hatchineha, and Cypress.
- **Lakes Kissimmee, Hatchineha, and Cypress** This group comprises the largest Lake Management Area, and is tied to a number of secondary lakes including Lake Russell, Tiger Lake, Lake Marion, Lake Pierce, Lake Rosalie, Lake Weohyakapka, Lake Jackson, and Lake Marian—through natural and artificial conveyances. These lakes receive inflows from Reedy Creek, the largest tributary, and via the C-35 Canal from Lake Tohopekaliga. Lake Kissimmee discharges to the Lower Kissimmee Basin through the C-38 Canal.

Sandhill Crane on Lake Cypress

- **Lakes Myrtle, Preston, and Joel** At the northern end of the Alligator Chain, the C-32 Canal connects Trout Lake to Lake Joel. However, the main source of water to these lakes is rainfall and runoff from the surrounding watershed. Water levels in these lakes are controlled to flow north through the C-30 Canal toward Lake Mary Jane.
- **Lakes Hart and Mary Jane** Inflows from Lakes Myrtle, Preston, and Joel are directed through the C-30 Canal to Lakes Mary Jane and Hart. Water is discharged from these lakes through the C-29A Canal to the East Lake Tohopekaliga, Fells Cove, and Lake Ajay Lake Management Area.
- **East Lake Tohopekaliga, Fells Cove, and Lake Ajay** Major inflows come from Boggy Creek, which enters the lake in the northwestern corner, and the C-29A Canal from Lakes Hart and Mary Jane. Discharge is through the C-31 Canal to Lake Tohopekaliga.

- **Lake Tohopekaliga** Inflows to this lake come from Shingle Creek and the C-31 Canal from East Lake Tohopekaliga. Lake Tohopekaliga discharges into Lakes Cypress, Hatchineha, and Kissimmee through the C-35 Canal.

Kissimmee Chain of Lakes Regulation Schedules

Water control structures in the Kissimmee Chain of Lakes direct flows according to regulation schedules established by the U.S. Army Corps of Engineers (USACE) and managed by the SFWMD. **Figure 8** shows the location of the water control structures and the primary direction of the flow through the Kissimmee Chain of Lakes.

Kissimmee River at Mouth of Lake Okeechobee

Outflows from the Alligator Chain of Lakes (Alligator, Brick, Lizzie, Coon, Center, and Trout) are controlled by the S-58 Structure (northern structure) and S-60 Structure (southern structure). The S-58 Structure is located in the C-32 Canal, which connects Trout Lake and Lake Joel. North of Trout Lake, the S-57 Structure in the C-30 Canal regulates Lakes Joel, Myrtle, and Preston. The C-30 Canal connects Lake Myrtle to Lake Mary Jane in the next lake group. Lakes Mary Jane and Hart are regulated by the S-62 Structure, located in the C-29 Canal, which discharges into Lake Ajay. East Lake Tohopekaliga and Lake Ajay are regulated by the S-59 Structure, located in the C-31 Canal between East Lake Tohopekaliga and Lake Tohopekaliga. Lake Tohopekaliga is regulated by the S-61 Structure, located in the C-35 Canal at the south shore of the lake.

At the southern end of the Alligator Chain, the S-60 Structure in the C-33 Canal connects Alligator Lake to Lake Gentry. Lake Gentry is regulated by the S-63 and S-63A structures, located in the C-34 Canal that connects Lake Gentry to Cypress Lake. Lakes Kissimmee, Hatchineha, and Cypress are regulated by S-65, located at the outlet of Lake Kissimmee and the head of the Kissimmee River (C-38 Canal).

The C-37 Canal Widening Project is part of the Kissimmee River Restoration Project. The project is located between Lake Hatchineha and Lake Kissimmee, and when completed, will increase the conveyance capacity of water between the two lakes to maintain the authorized flood reduction benefits of the Central and Southern Florida Flood Control Project (C&SF Project) under the Kissimmee River Restoration Project. This project is expected to be completed in late 2014.

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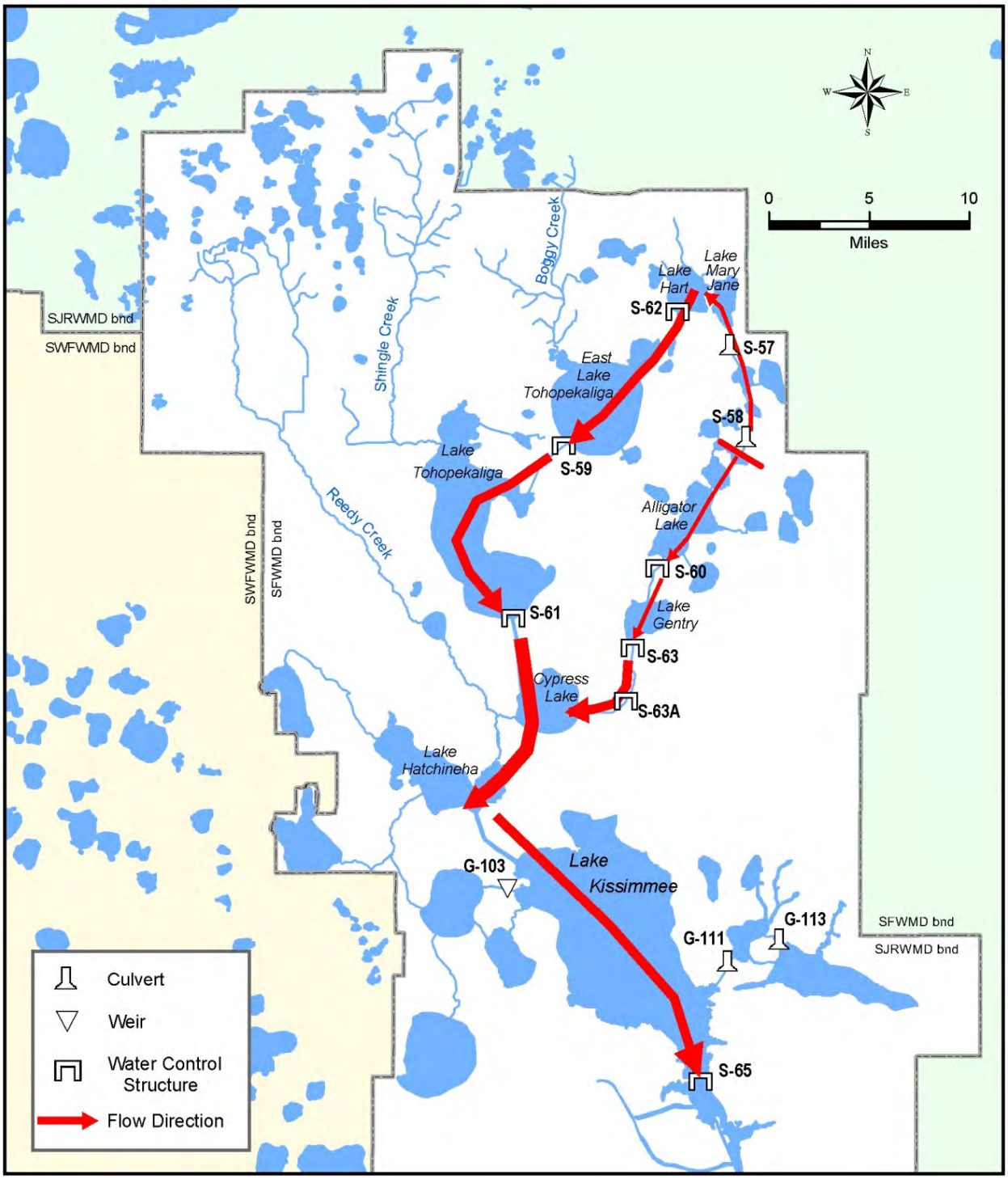

Figure 8. Water control structures that regulate flows in the Kissimmee Chain of Lakes. The line at the S-58 Structure indicates where water is discharged south from the Alligator Chain of Lakes. The S-57 Structure controls water levels north of the Alligator Chain of Lakes.

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The details of the plan for the Kissimmee River are contained in the *Master Water Control Manual for Kissimmee River – Lake Istokpoga* (USACE 1994) with the exception of operations for the S-65 Structure. The USACE approved an interim operating schedule for S-65 that provides for environmental releases to the Kissimmee River when water levels in Lake Kissimmee are within Zone B of the regulation schedule. The interim schedule maintains flow through the restored portion of the Kissimmee River. It will be in use until completion of the restoration project in late 2014. The Headwaters Revitalization Schedule (or a revision) for S-65 is expected to be implemented in 2015. Environmental (Zone B) releases according to the interim schedule were approved by the USACE in August 2000 and began in July 2001 after Phase I of the Kissimmee River Restoration Project was completed (see **Chapter 3** of this Support Document).

Tributary Creeks

The major streams feeding into the Kissimmee Chain of Lakes are Shingle Creek, Reedy Creek, and Boggy Creek. The headwaters for these creeks are located in urbanized portions of metro-Orlando. Flow moves southward through open channels and wetlands into their respective lakes. In addition to these creeks, the Lake Mary Jane/Lake Hart Basin contributes surface water flows to the Kissimmee Chain of Lakes for the most northeastern portion of the basin. Flows from these areas are directed to the Alligator Chain of Lakes or directly to East Lake Tohopekaliga.

Shingle Creek

The headwaters of Shingle Creek form in the City of Orlando. The creek runs southward for 24 miles through Shingle Creek Swamp and the City of Kissimmee before discharging into Lake Tohopekaliga. Natural flow in Shingle Creek was substantially modified in the 1920s with channelization of 13 miles and subsequent crossing of utility transmission lines and access roads. The SFWMD began an aggressive land purchase program in the Shingle Creek Basin in the 1980s after the State of Florida established the Save Our Rivers (SOR) Program.

Shingle Creek – Lake Tohopekaliga

The District has undertaken several successful restoration projects within Shingle Creek Swamp funded as mitigation sites to offset wetland impacts associated with the construction of the Orlando Beltway. The District manages the Shingle Creek Management Area with Osceola County. See the *Shingle Creek Management Area Five-Year General Management Plan (2005–2010)*, (SFWMD 2005) for additional information. The plan is available from http://www.sfwmd.gov.

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Reedy Creek

Reedy Creek in Osceola County is the least disturbed of the area's three major creeks. Originating on the grounds of Walt Disney World, Reedy Creek runs southeast for 29 miles before splitting into two branches near Cypress Lake. One branch enters Cypress Lake and the other enters Lake Hatchineha. For most of its course, the creek flows through Reedy Creek Swamp. Reedy Creek also receives water from the Butler Chain of Lakes during periods of high lake levels.

Boggy Creek

Boggy Creek consists of east and west branches. The 12-mile-long east branch is the main watercourse, and its headwaters form in metro-Orlando in the southern part of Lake Conway. The east branch runs through Boggy Creek Swamp and empties into East Lake Tohopekaliga. The headwaters of the west branch originate in Lake Jessamine, located in another highly urbanized area of Orlando, and extend to Boggy Creek Swamp.

Lower Kissimmee Basin

The Lower Kissimmee Basin covers 758 square miles and includes the tributary watersheds of the Kissimmee River between the outlet of Lake Kissimmee (S-65 Structure) and Lake Okeechobee. The Kissimmee River is the major surface water feature in the lower basin.

Restored Kissimmee River at Filled-in Section of C-38

Kissimmee River

The Kissimmee River was originally 134 miles long, which included a 103-mile span between Lake Kissimmee and Lake Okeechobee. Construction of the C&SF Project to improve flood protection in the Kissimmee Basin took place between 1962 and 1971. This effort resulted in channelizing the Kissimmee River into a 56-mile canal. Today, a series of combined locks and water control structures manage the canal's flow into Lake Okeechobee. The restoration effort currently in progress will ultimately restore the ecological function of about one-third of the historic river/floodplain ecosystem.

Lower Kissimmee Basin Regulation Schedules

The Lower Kissimmee Basin system includes the Kissimmee River and the C-38 Canal, and four water control structures (S-65A, S-65C, S-65D, and S-65E), (**Figure 9**). The C-38 structures are operated in conjunction with S-65 at the outlet of Lake Kissimmee. Structures S-65A, S-65D, and S-65E are operated to maintain optimum stages; S-65C is used to vary

stages in the lower end of Phase I of the restoration project. The optimum stages for S-65A, S-65C, S-65D, and S-65E are 46.3, 34.0, 26.8, and 21.0 feet above MSL, respectively.

The Kissimmee River Restoration Project is being implemented in four phases. Three of the four restoration phases of the project have been completed. These phases have backfilled 14 miles of the C-38 flood control canal, recarved six miles of river channel, and removed a water control structure (S-65B). These efforts have reestablished flow to 24 miles of continuous river channel and allowed intermittent inundation of 7,710 acres of floodplain. The final construction phase is scheduled to begin in 2012 and be complete in late 2014. A revised regulation schedule to operate the S-65 Structure is expected to be implemented in 2015.

Lake Istokpoga – Indian Prairie Basin

The 613-square-mile Lake Istokpoga Basin is located to the west and north of Lake Istokpoga, and is the source of all surface water inflows to Lake Istokpoga, one of the largest lakes in Florida. Extending approximately 27,700 acres, the lake is shallow, averaging between 4 feet and 6 feet in depth. Major tributaries to Lake Istokpoga are Josephine Creek and Arbuckle Creek, located in the northwestern and northern areas of the lake, respectively. Outflows from Lake Istokpoga are directed either to the Kissimmee River or Lake Okeechobee through a system of canals and water control structures. The 622-square-mile Indian Prairie Basin drains the area south of Lake Istokpoga to Lake Okeechobee.

Lake Istokpoga

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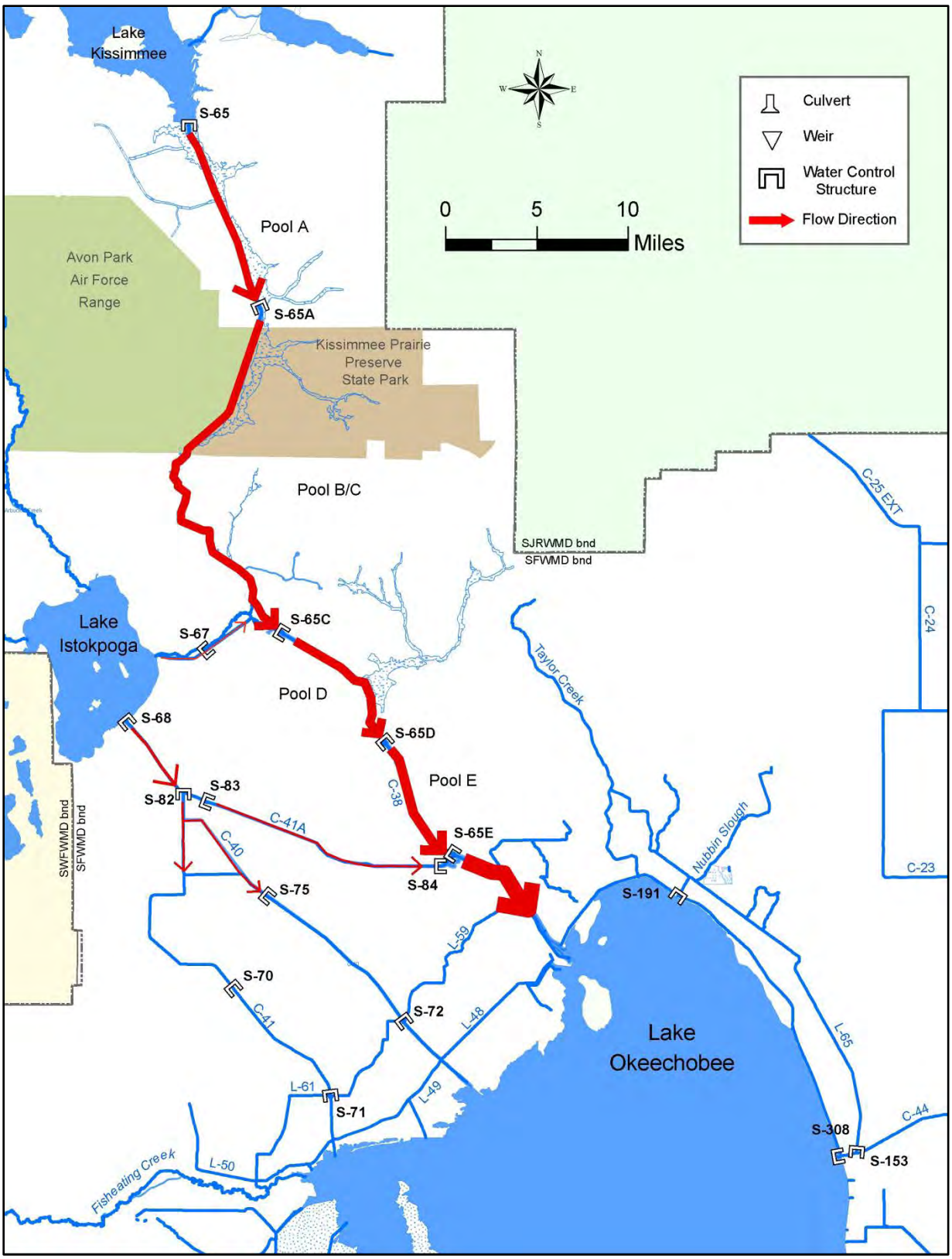

Figure 9. Water control structures that regulate flows out of Lake Kissimmee and Lake Istokpoga and in the Kissimmee River.

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Lake Istokpoga Regulation Schedule

Stages in Lake Istokpoga are primarily regulated by the S-68 Structure at the southern end of the lake in accordance with a regulation schedule that varies seasonally, ranging from 37.5 feet to 39.5 feet above MSL. The canals and structures are shown in **Figure 9**.

The S-68 Structure discharges water from Lake Istokpoga to the C-41A Canal (the Slough Canal). The C-41 Canal (Harney Pond Canal), the C-40 Canal (Indian Prairie Canal), and the C-39A Canal (State Road 70 Canal) provide secondary conveyance capacity for the regulation of floods in the Lake Istokpoga water management basin. The C-40 and C-41 canals flow into Lake Okeechobee, and the C-41A Canal discharges to the C-38 Canal south of S-65E, the southernmost structures in the Kissimmee River.

When high water levels in the Kissimmee River restrict Lake Istokpoga Basin discharges via the Istokpoga Canal, the new addition to the S-68 Structure offsets the loss of discharge capacity by re-routing flows down the C-41A Canal. This additional structure was constructed adjacent to and northeast of the existing S-68 Structure to increase conveyance capacity. The USACE also constructed the S-67 Structure to replace the G-85 Structure, which controls water discharges from Lake Istokpoga through the Istokpoga Canal to the C-38 Canal. As of July 2012, the USACE completed work on the S-67 Structure. Transfer of the structure from the USACE to the SFWMD is expected in the fall of 2012.

The details of the Lake Istokpoga plan are contained in the *Master Water Control Manual for the Kissimmee River – Lake Istokpoga* (USACE 1994). The regulation schedule also takes into consideration the Minimum Flow and Level (MFL) established by the District in December 2005.

Taylor Creek / Nubbin Slough Basin

Taylor Creek and Nubbin Slough are interconnected basins that cover 104 and 84 square miles, respectively, which drain into Lake Okeechobee from the north and northeast. The Kissimmee River and its floodplain lie directly west of these natural systems. Land use in this basin is primarily agricultural, consisting of intensive dairy and beef cattle farms whose animals graze on improved pastures that are surface drained and fertilized. More information about water storage projects in the Taylor Creek/Nubbin Slough Basin can be found in the upcoming LKB Plan.

Fisheating Creek Basin

The 440-square-mile Fisheating Creek Basin originates in western Highlands County and flows south through Cypress Swamp and into Glades County, where it marks the southernmost boundary of the KB Planning Area. From central Glades County, the water leaves the creek channel and flows east through Cowbone Marsh into Lake Okeechobee. Fisheating Creek is the only basin with an uncontrolled “natural” discharge to Lake Okeechobee.

Groundwater Resources

The Kissimmee Basin consists of three major hydrogeologic units: the surficial aquifer system (SAS), the intermediate confining unit, and the Floridan aquifer system (FAS), as shown in **Figure 10** and **Figure 11**. The FAS includes the Upper Floridan aquifer (UFA), composed of two production zones separated by lower permeability strata (confining unit 1) and the Lower Floridan aquifer (LFA), composed of two or more productive units separated by less permeable materials. The UFA and LFA are separated by a much less permeable middle confining unit (confining unit 2). **Table 28** presents the groundwater systems, hydrogeologic units, and relative aquifer yields in the KB Planning Area.

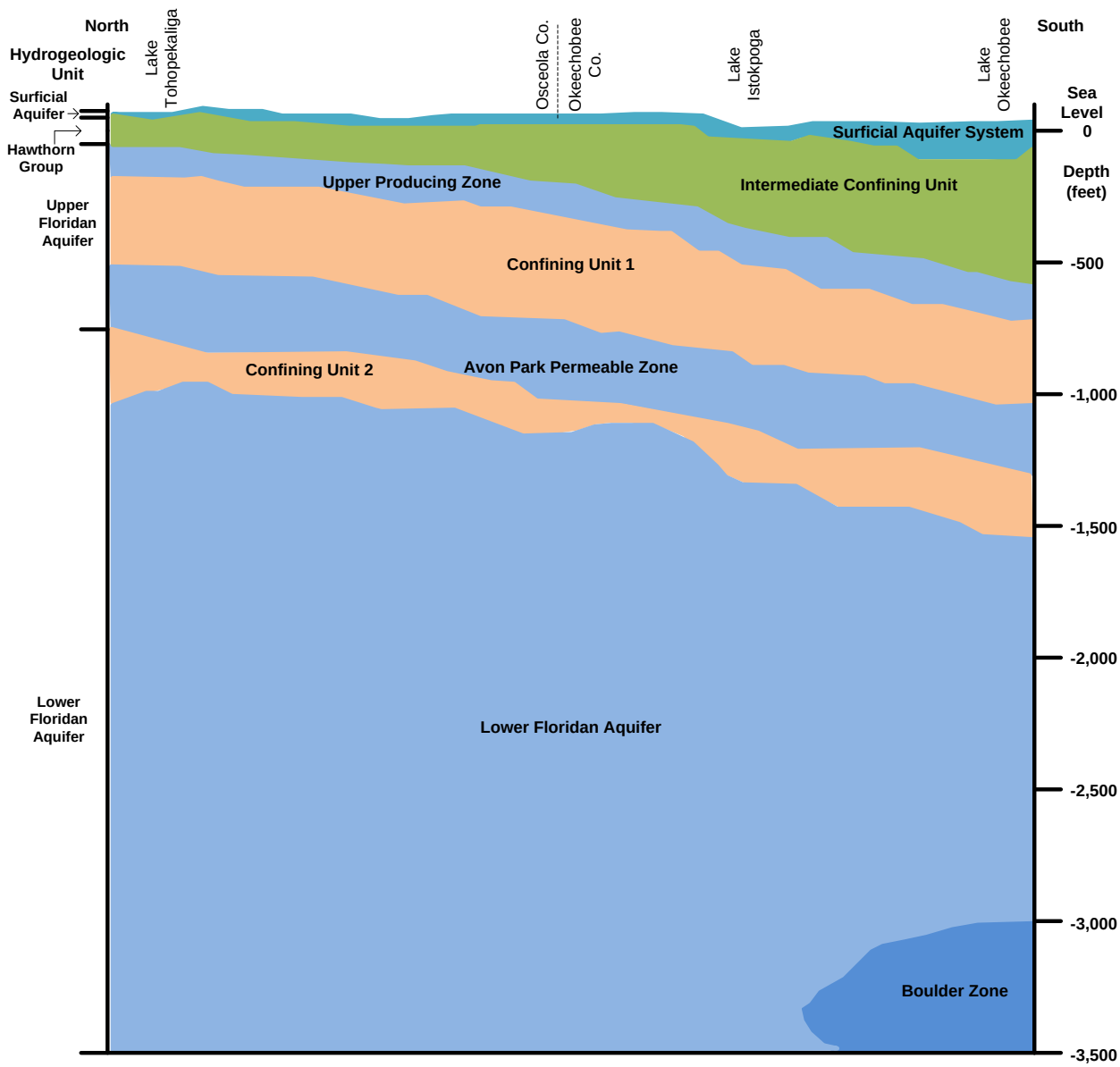

Figure 10. Generalized hydrogeologic cross-section (north to south) of the Kissimmee Basin Planning Area.

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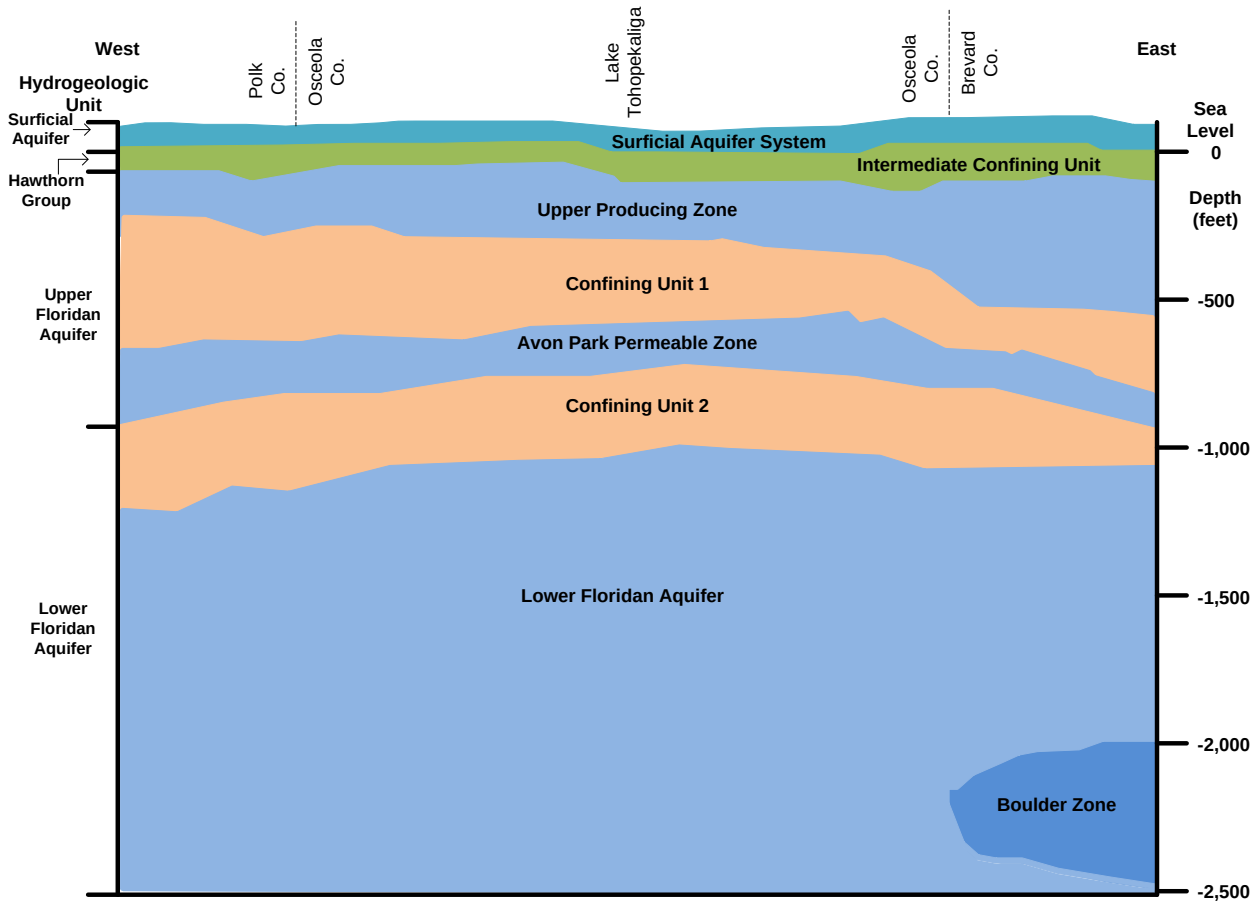

Figure 11. Generalized hydrogeologic cross-section (west to east) of the Kissimmee Basin Planning Area.

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Table 28. Groundwater systems in the Kissimmee Basin Planning Area.

Aquifer System	Hydrogeologic Unit	Aquifer Yield A=Absent L=Low M=Moderate H=High					
		Orange	Osceola	Polk	Highlands	Okeechobee	Glades
Surficial Aquifer System	Undifferentiated Clastic Deposits	L	L	L-M	L-M	L-M	L-M
Floridan Aquifer System	Upper Floridan Aquifer	H	H	H	H	H	H
	Lower Floridan Aquifer	H	M-H	M	M-H	M-H	M-H

Surficial Aquifer System

The surficial aquifer system (SAS), also known as the Water table aquifer in the Kissimmee Basin, is unconfined and consists of fine-to-medium grained quartz sand with varying amounts of silt, clay, and crushed shell that range from Pliocene to Holocene in age. The thickness of the surficial aquifer generally ranges from less than 10 to 150 feet within the planning area. The thickness of these sediments is generally less than 50 feet in the northern part of the planning area, thickening to the south and southwest. The thickness of surficial aquifer sediments reaches almost 300 feet in Polk County along the Lake Wales Ridge, but the depth to water may be several tens of feet below land-surface in this region.

The surficial aquifer produces small quantities of good-to-fair quality water. It is generally soft, low in mineral content, slightly corrosive, and often high in color and iron. This groundwater source contains relatively high chloride and dissolved solids concentrations toward the western part of Okeechobee County and near the Caloosahatchee River in Glades County.

Intermediate Confining Unit

Below the SAS lies a mixture of sands and clay collectively known as the intermediate aquifer system (IAS). The IAS acts as a confining unit for the underlying Upper Floridan aquifer in the KB Planning Area. This intermediate confining unit (ICU) consists of an interbedded sequence of sands, calcareous silts and clays, shell, and phosphatic limestone and dolomite of late-to-middle Miocene age (Hawthorn Group), although the top of the unit can also include the clayey sediments of early Pliocene age. It restricts vertical movement of water between the surficial aquifer and the Upper Floridan aquifer. West of the Lake Wales Ridge, multiple discrete producing zones can be found within the ICU, but these are absent within the KB Planning Area. The thickness of the ICU ranges from less than 50 feet in the Upper Kissimmee Basin to over 600 feet in parts of Okeechobee and Highlands counties.

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Floridan Aquifer System

Below the IAS is the Floridan aquifer system (FAS). The FAS acts as a confined or partially confined aquifer and the primary source for potable water in the Upper KB Planning Area. The FAS is traditionally divided into the Upper Floridan and Lower Floridan aquifers, which are separated by less permeable rocks (a middle confining unit) that restrict their interaction. The FAS is composed of a sequence of highly permeable carbonate rocks (limestone and dolomite) of Oligocene, Eocene, and late Paleocene age. The FAS has an average thickness of approximately 2,300 feet within the KB Planning Area, but because of variability in productivity and water quality, only a portion of this thickness is useful for water supply.

The elevation of the top of the Upper Floridan aquifer (UFA) ranges from less than 100 feet below MSL in northeastern Polk County, to more than 500 feet below MSL in the southwestern portion of the basin. The UFA is thicker in Glades and Okeechobee counties, averaging approximately 1,000 feet. Chloride, total dissolved solids, and sulfate concentrations increase with depth and distance to the south and west.

The UFA can be subdivided into three hydrogeologic units: 1) a moderately productive upper producing zone, 2) a semi-confining unit, and 3) a highly permeable fractured crystalline dolostone in the Avon Park Formation, referred to as the Avon Park permeable zone. The carbonate section of the Upper Avon Park Formation can be moderately productive as well (USGS 2010).

West of the Highlands Ridge, the upper producing zone is largely composed of rocks of the Suwannee Limestone. East of the ridge, this unit is absent, having undergone significant aerial exposure and erosion during past glacial periods. In the SJRWMD, the top of the deeper Ocala Limestone is often used as a surrogate for the top of the Upper Floridan, and the Ocala can be quite productive in this area. The permeability of the Ocala diminishes to the south and west. In most of Polk and Osceola counties, it comprises the semi-confining unit between the upper producing zone and Avon Park permeable zone. In these areas, where the Suwannee is also absent, the upper producing zone may be reduced to a thin region of enhanced dissolution around the contact between the Ocala and overlying units.

The Lower Floridan aquifer (LFA) is present throughout east-central Florida. The top of the LFA ranges from about 1,000 feet below MSL to more than 1,600 feet below MSL in the Lower Kissimmee Basin. The LFA consists of the lower part of the Avon Park and Oldsmar formations of middle Eocene age and the upper part of the Cedar Keys Formation of late Paleocene age. Like the UFA, the Lower Floridan aquifer is characterized by multiple productive zones with alternating lower permeability beds of varying degrees of confinement. In Orange County, the LFA is slightly brackish, but highly productive, characterized by abundant fractures and solution cavities.

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Surface Water and Groundwater Relationships

The relationship between a surface water feature and the underlying groundwater system is complex. This relationship is based on the hydraulic characteristics of each aquifer and the thickness and type of soils separating the two features. When a river, canal, or wetland has a higher water level than the water table, these surface water bodies provide seepage into the local shallow groundwater system. Conversely, when the water level of the surface water bodies is lower than the water table, groundwater discharge may occur. The rate at which this transfer occurs depends on the difference in these two levels and the permeability and thickness of the materials separating the surface water and groundwater.

The surficial aquifer is primarily recharged by rainfall and interacts with surface water features, such as rivers, canals, and lakes. The surficial aquifer provides temporary storage for infiltrating water that eventually recharges underlying aquifers or moves laterally to discharge areas.

The Upper Floridan aquifer in the Upper Kissimmee Basin is recharged primarily by downward leakance from the surficial aquifer and, where present, through the intermediate confining unit (ICU). Higher rates of recharge occur in areas with abundant sinkholes where the ICU is thin or breached by collapse into underlying dissolution cavities. These areas represent locations where the differences in surface and Upper Floridan water levels are greatest, and the thickness of the ICU is thinnest or breached by karst activity.

Karst / Sinkhole Features

The chemical processes by which rock is dissolved by interactions with water are commonly referred to as solution processes. The past and continuing solution of the limestone beneath the land surface by groundwater results in a landform called karst (USGS 1998).

The development of karst features is primarily expressed at the surface as “sinkhole lakes.” These occur within the Upper Kissimmee Basin and along the eastern side of Lake Wales Ridge. Surface water–groundwater exchange can occur through the bottom sediments of these lakes, depending on the thickness, composition, and the porousness of the lake bottom/sinkhole collapse sediments. As a result, water can seep from lakes into the Upper Floridan aquifer (FDEP 2006).

Drainage Wells

Hundreds of drainage wells in the metro-Orlando area receive water from stormwater runoff, lake and wetland overflow, and street runoff. These drainage wells discharge into the FAS, providing recharge to the system. Constructed up until the 1970s, these wells are generally limited to closed drainage basins in the Orlando area.

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ECOSYSTEM RESTORATION EFFORTS

Information about ecosystem restoration efforts for the Lower Kissimmee Basin Planning Area will be available in the upcoming LKB Plan (SFWMD in process).

More information and the status of these restoration projects can be found in the *South Florida Environmental Report* available from http://www.sfwmd.gov/sfer. Project descriptions, status, and further documentation about other projects are available from http://www.evergladesplan.org, http://www.sfwmd.gov/northerneverglades, and http://www.sfwmd.gov/everglades.

Horses in Restored Kissimmee River Area

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8

Upper East Coast Planning Area

This chapter describes characteristics of the Upper East Coast (UEC) Planning Area. An overview of the region's physical features and water resources, including surface water and groundwater, is presented in this Support Document, which supplements the *2011 UEC Water Supply Plan Update* (2011 UEC Plan Update) (SFWMD 2011b). For a comprehensive review of water supply status and issues in the UEC Planning Area, refer to the 2011 UEC Plan Update.

TOPICS

- Planning Area Boundaries
- Physical Features
- Water Resources and System Overview
- Ecosystem Restoration Efforts

PLANNING AREA BOUNDARIES

The UEC Planning Area includes Martin and St. Lucie counties and a small portion of Okeechobee County, as shown in **Figure 12**. The boundary of the UEC Planning Area generally reflects the drainage basins of the C-23, C-24, C-25, and C-44 (St. Lucie) canals. Its northern boundary corresponds to the St. Lucie–Indian River County line, which is also the jurisdictional boundary between the SFWMD and the St. Johns River Water Management District (SJRWMD). The planning area's southern boundary is the Martin–Palm Beach county line.

St. Lucie Estuary and Indian River Lagoon

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PHYSICAL FEATURES

Major water features in the UEC Planning Area include Lake Okeechobee, canal systems, St. Lucie River and Estuary, Five Mile Creek, Ten Mile Creek, and Southern Indian River Lagoon.

The Loxahatchee River is located in Martin and Palm Beach counties and has three major branches: the Northwest Fork, the North Fork, and the Southwest Fork. The 2011 UEC Plan Update (SFWMD 2011b) contains information about this system relative to water supply and projects within the UEC Planning Area. **Chapter 10** of this Support Document and the *2013 Lower East Coast Water Supply Plan Update* (SFWMD 2013a) contain information about the Loxahatchee River relative to water supply and projects within the Lower East Coast Planning Area.

NAVIGATE

For more information about the Loxahatchee River Watershed, see **Chapter 10** of this document.

Water Bodies and Landscapes

Lake Okeechobee is a key component of the south Florida hydrologic system. The lake has many functions, including flood protection, urban and agricultural water supply, navigation, and fisheries and wildlife habitat. Lake Okeechobee is critical for flood control during wet seasons and water supply during dry seasons. Releases from Lake Okeechobee flow into the St. Lucie (C-44) Canal, which discharges to the South Fork of the St. Lucie River.

Okeechobee Waterway (St. Lucie C-44 Canal)

The St. Lucie River flows through Martin and St. Lucie counties. The river is 35 miles long and has two major forks, the North Fork and the South Fork (**Figure 12**). Danforth and Mapp creeks are tributaries to the South Fork downstream of the St. Lucie Canal. Ten Mile Creek is the major freshwater tributary to the North Fork of the St. Lucie River, which is approximately 10 miles long. Several miles downstream, Five Mile Creek contributes relatively limited inflows to the North Fork. The North Fork is a freshwater system upstream and a brackish system near the St. Lucie Estuary.

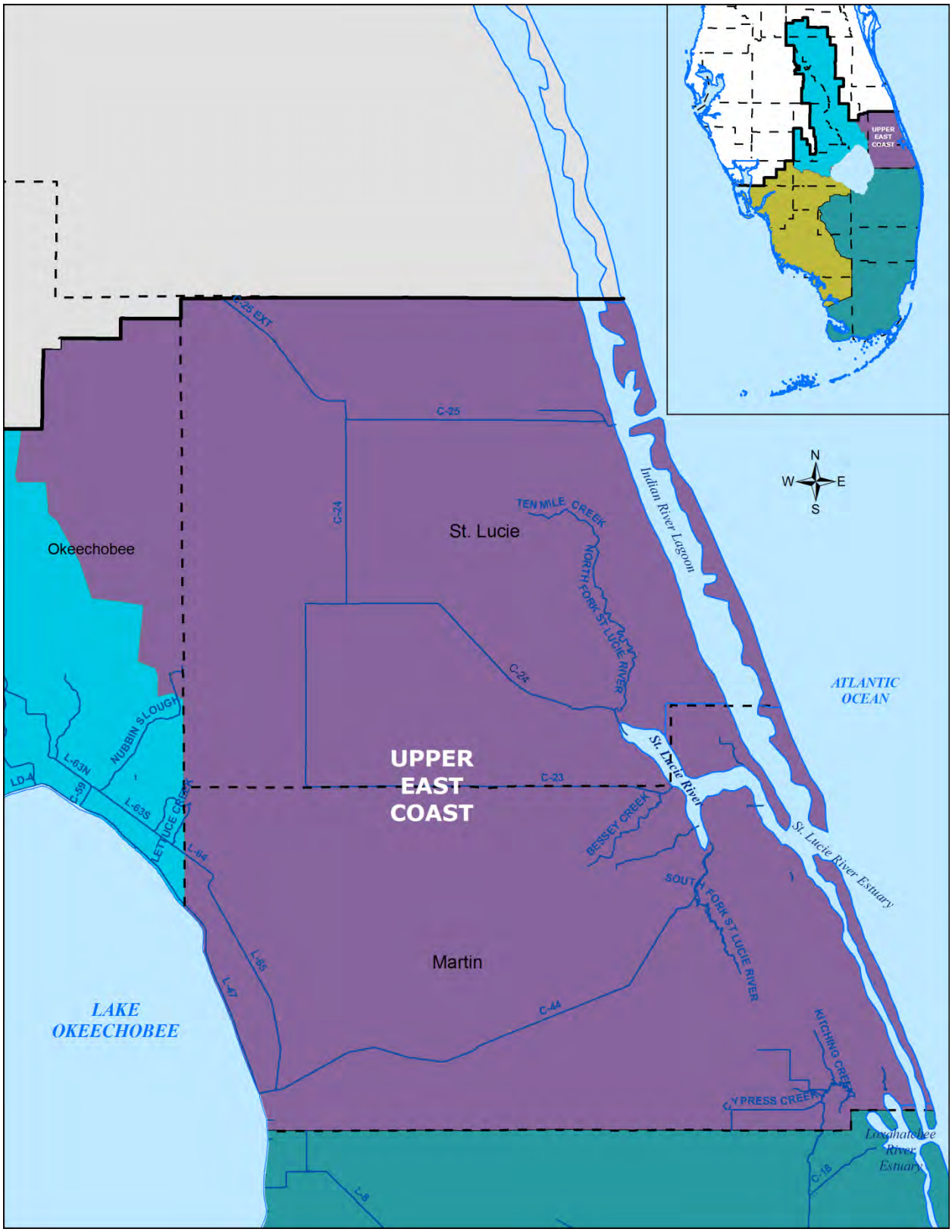

Figure 12. Upper East Coast Planning Area.

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The North Fork and the South Fork come together in the St. Lucie River (**Figure 12**), a primary tributary to the Southern Indian River Lagoon. The Indian River Lagoon extends about 155 miles through six coastal counties, from Ponce de Leon Inlet in Volusia County, southward to the Jupiter Inlet in Palm Beach County. Within the SFWMD boundaries, the Southern Indian River Lagoon (**Figure 12**) spans an area of approximately 48 square miles from Fort Pierce to Jupiter Sound.

Indian River Lagoon

Geography and Climate

The UEC Planning Area encompasses approximately 1,231 square miles in southeastern Florida, and its average elevation is 20 feet above mean sea level (MSL).

Average seasonal temperatures for the area range from approximately 64°F to 81°F. Estimated annual rainfall in the planning area averages 54 inches (see also the *Precipitation and Evapotranspiration* section).

Physiography

The UEC Planning Area is characterized by three principal physiographic zones with differing land characteristics (**Figure 13**), which generally trend from east to west. These zones are identified as: 1) the Atlantic Coastal Ridge, 2) the Eastern Valley, and 3) the Osceola Plain.

The Atlantic Coastal Ridge is composed of flatwoods, savanna-like wetlands, and relict beach ridges and sand bars. In the UEC Planning Area, the ridge varies in elevation from sea level to 86 feet above MSL at its highest point in Jonathan Dickinson State Park. The ridge's extensive upland/wetland systems provide a source of groundwater flow for the South Fork of the St. Lucie River and North Fork of the Loxahatchee River. This area is important for aquifer recharge and water supply to the coastal portion of Martin County, where the groundwater and ground elevations are higher than the surrounding lands.

West of the Atlantic Coastal Ridge is the Eastern Valley (also known as the Eastern Flatwoods), which encompasses most of the UEC Planning Area. The Eastern Valley is a generally low plain between 1 foot and 5 feet above MSL, averaging 30 miles in width. The Eastern Valley features long, low, narrow ridges ranging from 15 feet to 30 feet above MSL. The Green Ridge in south-central Martin County and the Ten Mile Ridge in north-central Martin County are two such ridges.

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The Eastern Valley consists of wetland communities, including tidal and floodplain swamp and forest. These areas are characteristically pocketed with shallow lakes and marshes and have limited natural drainage. Prior to development and the construction of canals, the valley drained by a slow drift of water through multiple sloughs to the St. Lucie River, the Loxahatchee River, and the Everglades. This area contains the Savannas; Pal-Mar; Loxahatchee Slough; the Allapattah, St. Lucie, and Osceola flats; and portions of St. Johns Marsh. The North Fork of the St. Lucie River is also located within the Eastern Valley.

The Osceola Plain lies west of the Eastern Valley in St. Lucie County and intrudes into the Eastern Valley in Martin County. The plain then extends into the eastern portion of Okeechobee County. The Osceola Plain is a relatively flat area that slopes from east to west. The elevation ranges from about 70 feet above MSL along the eastern boundary to 40 feet above MSL in the Martin County area. The landscape is a matrix of extensive open prairie, small ponds or depressions, swales, partially wooded sloughs, and hammocks.

St. Lucie River Estuary

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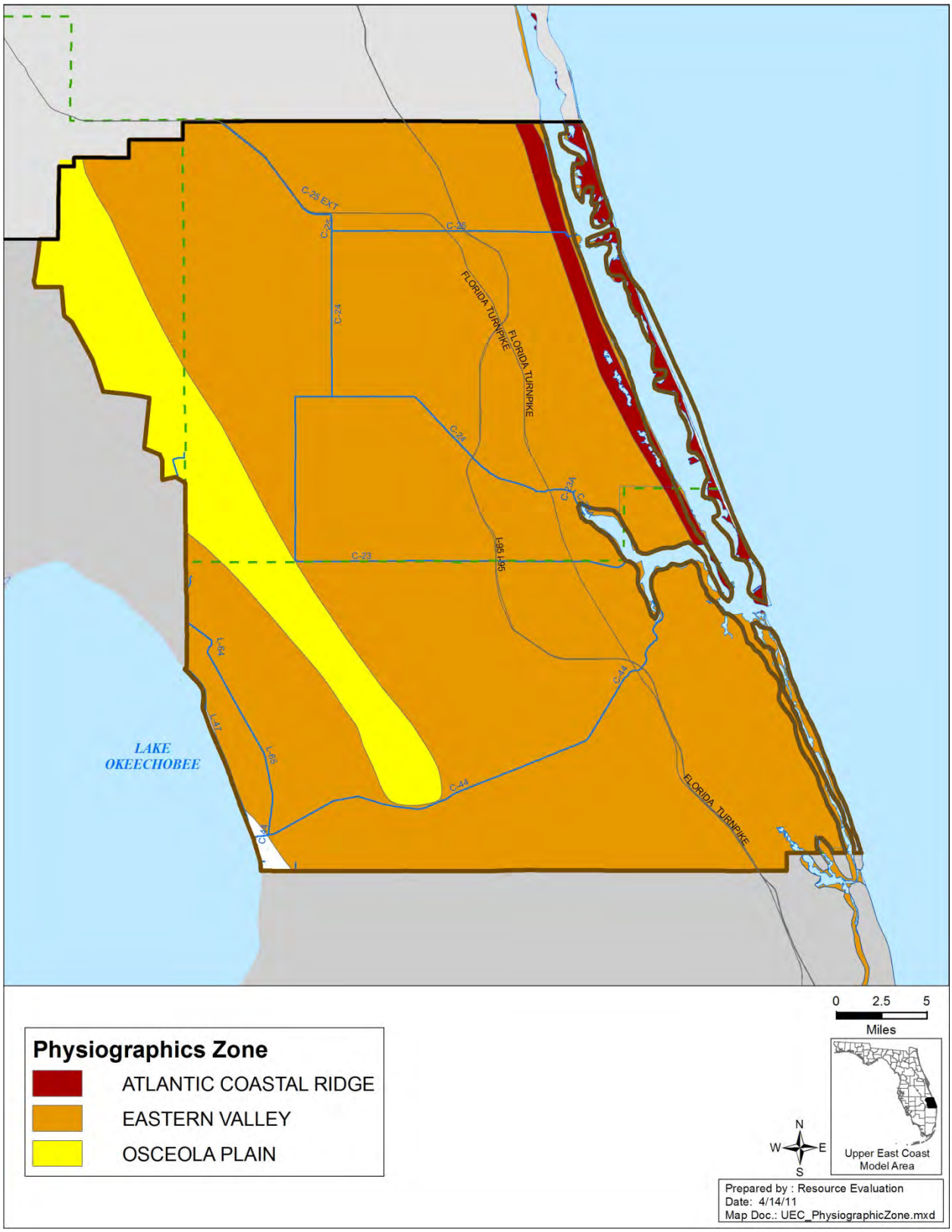

Figure 13. Physiography of the Upper East Coast Planning Area.

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WATER RESOURCES AND SYSTEM OVERVIEW

Allapattah Flats

Before development, most of the UEC Planning Area was characterized by nearly level, poorly drained lands subject to frequent flooding. Most of these surface water systems, especially those with poor drainage, were altered to make the land suitable for development and to provide flood protection. The natural surface drainage systems included large expanses of sloughs and marshes, such as St. Johns Marsh, Allapattah Slough (also known as Allapattah Flats), Cane Slough, and the Savannas. Drainage systems with higher conveyance included the North Fork and South Fork of the St. Lucie River, and a vast marsh system that included Ten Mile Creek, Five Mile Creek, the Loxahatchee River, and Bessey Creek.

In the following sections, surface water and groundwater resources are addressed as separate entities. Surface water resources in the UEC Planning Area include natural and artificial systems, such as canals. Groundwater resources include the surficial aquifer system and the Florida aquifer system.

Regional Hydrologic Cycle

The main components of the hydrologic cycle in the UEC Planning Area are precipitation, evapotranspiration, surface water inflow and outflow, and groundwater flow. The interaction between surface water and groundwater is expressed as either recharge to, or discharge from, the aquifer system.

Precipitation and Evapotranspiration

The region has a wet season from June through October, and a dry season from November through May. Annual rainfall in the UEC Planning Area averages 54 inches, but varies considerably from year to year. About 62 percent of the area's annual rainfall occurs during the June through October wet season.

Hydrologic and meteorological methods are available to measure and estimate the combined rate at which water is returned to the atmosphere by transpiration and evaporation. The combined processes are known as evapotranspiration (ET). Precipitation minus ET is equal to the combined amounts of surface water runoff and groundwater

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recharge. The estimate of potential evapotranspiration (ETp) from open water and wetlands in the UEC Planning Area is 50 inches (Abtew et al. 2003). Potential evapotranspiration represents the total estimated passive water use of an area under maximum conditions. While actual evapotranspiration varies due to temperature, soil moisture, and other factors, ETp estimates are important landscape-level factors in water balance calculations to determine if enough water will be available for all uses during different environmental conditions.

Surface Water Inflow and Outflow

Almost all surface water inflows and outflows in the planning area are derived from rainfall. The exception is the St. Lucie (C-44) Canal, which receives water from Lake Okeechobee as well.

Most of the flows and stages in the region's canals are regulated for water supply and flood protection. The amount of stored water is of critical importance to both the natural ecosystems and the developed areas in the UEC Planning Area. Surface water is mainly stored in the canals themselves. Management of surface water storage capacity involves balancing two conflicting extreme conditions: 1) providing flood protection during the wet season, and 2) meeting water supply needs during the dry season. Management of surface water systems and meteorological events are key factors affecting the movement of water through the regional hydrologic cycle.

Groundwater Flow

Two aquifer systems, the surficial aquifer system (SAS) and the Floridan aquifer system (FAS), lie beneath the UEC Planning Area. Groundwater inflows from outside the planning area contribute insignificant recharge to the SAS; the main source of recharge to the SAS is rainfall. The FAS receives most of its recharge from outside the UEC Planning Area in central and northern Florida.

Surface Water Resources

Surface water bodies in the UEC Planning Area include canals, natural water bodies, and wetlands. The St. Lucie Watershed is hydrologically divided into 15 sub-watersheds, each of which drains into a specific tributary or canal that connects to the St. Lucie Estuary. These sub-watersheds can be further divided into basins based on hydrologic and/or geographic divides. **Figure 14** shows the watersheds in the UEC Planning Area. The C-23, C-24, C-25, and C-44 (St. Lucie) canals are part of the Central and Southern Florida Flood Control Project (C&SF Project), and are important sources of irrigation water within their respective drainage basins. These canals also discharge directly to coastal waters.

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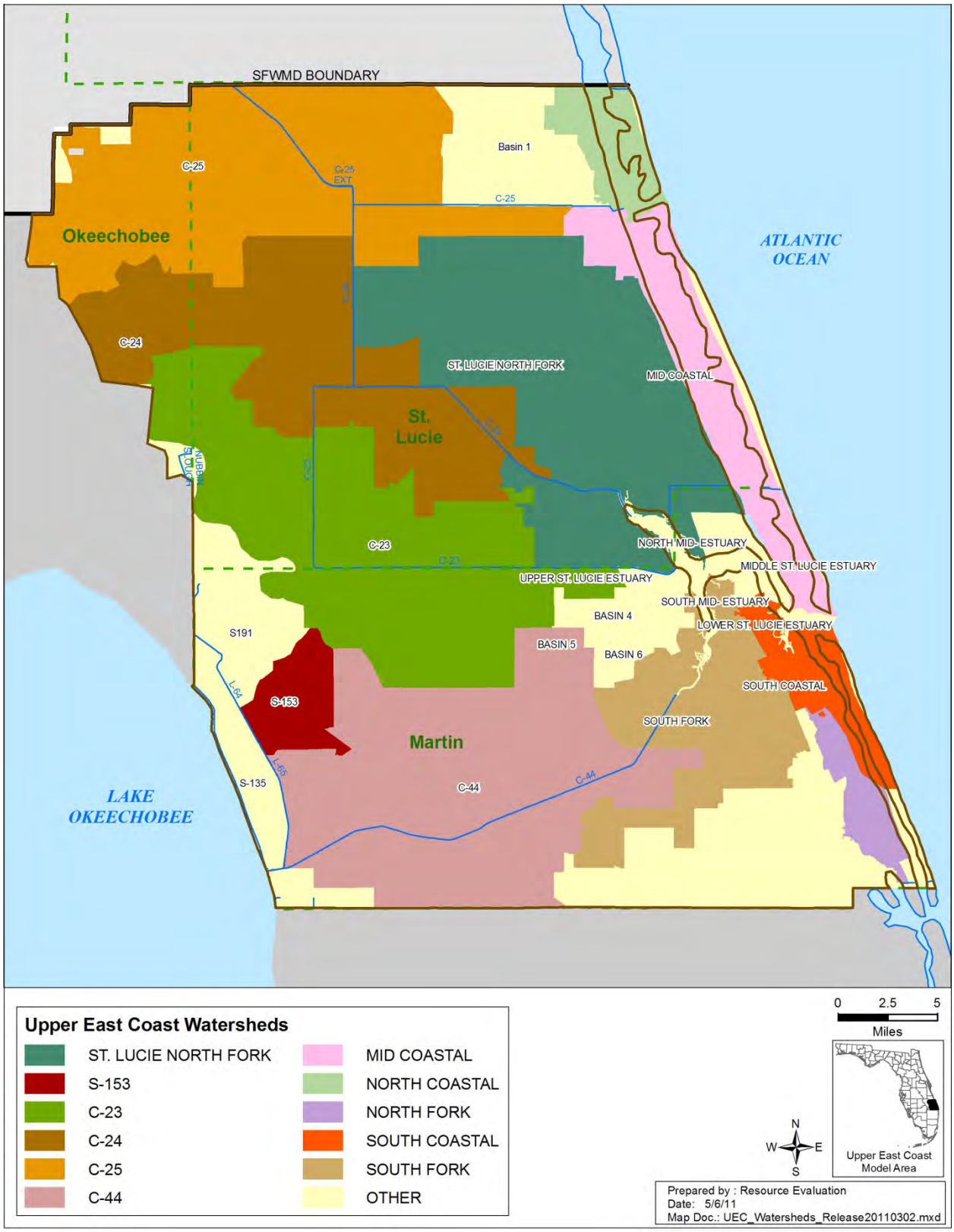

Figure 14. Upper East Coast Planning Area watersheds.

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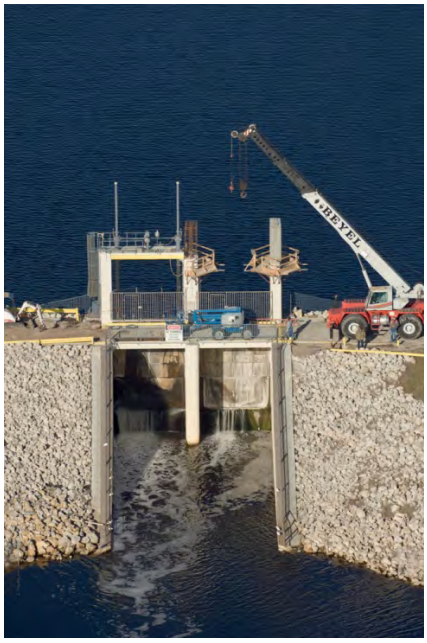
C-25 Sub-watershed

The C-25 Sub-watershed is located in northern St. Lucie County. A small portion of the C-25 Sub-watershed also falls within the St. Johns River Water Management District. The C-25 Basin may be divided into two subbasins based on where water may be discharged, western C-25 and eastern C-25. Together, these areas cover approximately 112,300 acres.

The major drainage canals in the C-25 Sub-watershed include the C-25, C-25 South Leg, and the C-25 Extension. The C-25 South Leg is connected to the C-24 Canal by water control structure G-81. The C-25 Extension Canal parallels the Florida Turnpike and then turns south to the confluence of the C-25 and C-25 South Leg canals. Excess water is discharged from the basin to tidewater in the Indian River Lagoon west of the Fort Pierce Inlet by way of the S-99 and S-50 structures, or to a much lesser extent, to the C-24 Canal by way of the G-81 Structure. The Turnpike Canal and Orange Avenue Borrow Canal provide flood protection and drainage in the western portion of the C-25 Sub-watershed. The Turnpike Canal is continuous with the C-25 Extension and extends west along the Turnpike. The Orange Avenue Borrow Canal makes an open channel connection with C-25 South Leg (SFWMD 2010b).

C-24 Sub-watershed

The C-24 Sub-watershed comprises the C-24 Canal system and basin, which has a total drainage area of approximately 87,706 acres. Most of the C-24 Sub-watershed is located in St. Lucie County, with a small portion in eastern Okeechobee County. This sub-watershed has two prominent canals: the Rim Ditch Canal and the Diversion Canal. The major water control structures are the G-79, G-81, and S-49 structures. The G-79 Structure serves as a basin divide and enables the discharge of water from the C-23 Sub-watershed into the C-24 Sub-watershed when conditions allow. The G-81 Structure is at the drainage divide between the C-24 and C-25 sub-watersheds.



S-49 Water Control Structure

The Rim Ditch Canal is connected to the C-25 South Leg Canal by way of the G-81 Structure. At its south end, the Rim Ditch Canal is connected to C-23 by way of the G-79 Structure and to the Diversion Canal by an open channel. Flow in the Rim Ditch Canal is usually to the south. If G-81 is opened to discharge water to the C-25 basin, flow in the Rim Ditch Canal may be to the north. The Diversion Canal extends from its intersection with the Rim Ditch Canal on the west to the North Fork of the St. Lucie River.

The S-49 Structure discharges from the C-24 Sub-watershed into the C-23A Canal, which is uncontrolled and discharges from the North Fork of the St. Lucie River to the St. Lucie Estuary.

C-23 Sub-watershed

The C-23 Sub-watershed comprises the C-23 Canal system and basin, which has a total drainage area of approximately 112,675 acres. Most of the C-23 Sub-watershed is located in southwestern St. Lucie County and northern Martin County, with a small portion in eastern Okeechobee County. The C-23 Canal is the main drainage canal. Water flows south from the C-24 Sub-watershed to the Martin–St. Lucie county line, then heads east, discharging into the North Fork of the St. Lucie River. Three structures control flow in the C-23 Sub-watershed: S-48, located at the outlet of the C-23 Canal to the North Fork of the St. Lucie River; S-97, located at the Florida Turnpike's crossing of the C-23 Canal; and G-78, located southwest of the convergence of C-23 and C-24. Water in the north–south leg of the C-23 Canal may occasionally be diverted to the C-24 Sub-watershed for water supply and flood protection purposes (SFWMD, FDEP, and FDACS 2009).

C-23 in St. Lucie Agricultural Area

North Fork Watershed

The North Fork Sub-watershed comprises the North Fork and North Mid-Estuary basins in eastern St. Lucie County and northeastern Martin County. The sub-watershed has a total drainage area of approximately 119,168 acres. The C-24 and C-23A canals, along with the S-49 Structure, regulate water levels in the North Fork Basin and the C-24 Basin (SFWMD, FDEP, and FDACS 2009).

C-44 Sub-Watershed

The C-44 Sub-watershed includes the C-44 and S-153 basins, and has a drainage area of approximately 129,719 acres. The St. Lucie (C-44) Canal connects Lake Okeechobee to the South Fork of the St. Lucie River. Two control structures are located in the C-44 Canal: the S-80 (St. Lucie Lock and Spillway) and the S-308 (Port Mayaca Lock and Spillway/Dam). The C-44 Canal is a primary outlet from Lake Okeechobee for flood control. Water levels in the C-44 Sub-watershed are regulated by the S-80 Structure, and regulatory releases from Lake Okeechobee are through the S-308 Structure (SFWMD, FDEP, and FDACS 2009).

The S-153 basin discharges into the western end of the C-44 Canal. Secondary drainage in the basin is provided by natural streams.

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South Fork Sub-watershed

The South Fork Sub-watershed (otherwise known as Tidal St. Lucie) includes the South Fork and South Mid-Estuary basins, and has a total drainage area of approximately 49,965 acres. Located east of the C-44 Basin, the South Fork Sub-watershed includes the South Fork of the St. Lucie from south of the Roosevelt Bridge, including the City of Stuart, to a portion of the area to the southwest and upstream of the S-80 Structure. The C-44 is the only major drainage canal in the Tidal St. Lucie/South Fork Sub-watershed.

Coastal Sub-watersheds

Three coastal sub-watersheds span St. Lucie and Martin counties: 1) North Coastal, 2) Middle Coastal, and 3) South Coastal. In general, these watersheds contain barrier islands, the Intracoastal Waterway, and mainland beaches. Most of the surface water in these watersheds is tidal and not used for water supply.

Groundwater Resources

The major hydrogeologic units underlying the UEC Planning Area are: 1) the SAS, 2) the intermediate confining unit (ICU) (low-permeability sediments of the Hawthorn Group), and 3) the FAS (**Figure 15**). The SAS extends to the top of the ICU, and the ICU extends to the top of the FAS. **Table 29** lists the groundwater systems, hydrogeologic units, and relative aquifer yields for each county in the UEC Planning Area.

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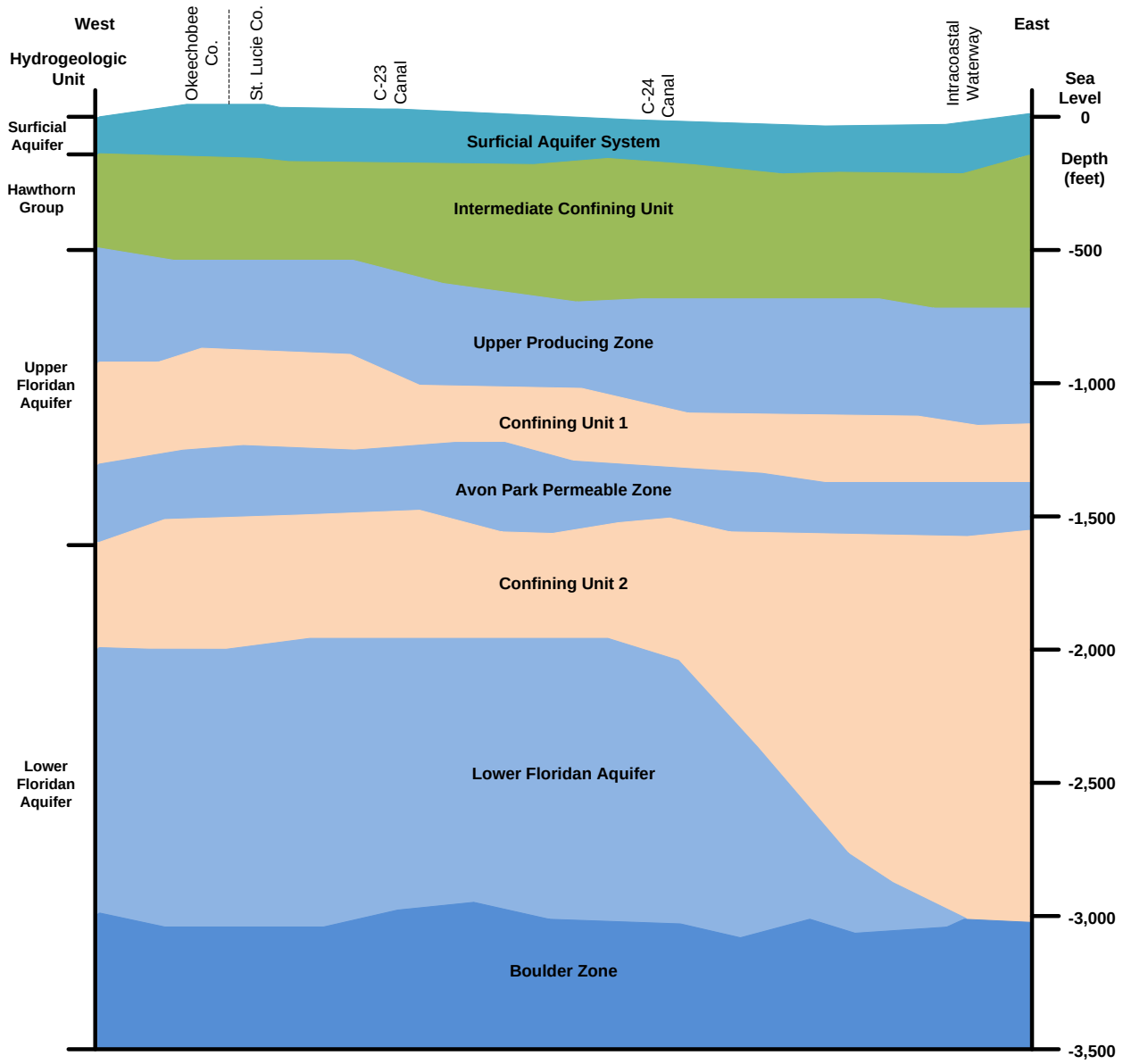

Figure 15. Generalized hydrogeologic cross-section of the Upper East Coast Planning Area.

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Table 29. Groundwater systems in the Upper East Coast Planning Area.

Aquifer System	Hydrogeologic Unit	Aquifer Yield L=Low M=Moderate H=High		
		Martin	St. Lucie	Okeechobee
Surficial Aquifer System	Surficial Aquifer	M	L–M	L
Intermediate Confining Unit	Hawthorn Group	L	L	L
Floridan Aquifer System	Upper Floridan Aquifer	H	H	M–H
	Lower Floridan Aquifer	H	H	H

Surficial Aquifer System

The SAS is one of the sources of water for urban uses, including potable water, within the UEC Planning Area. The system includes all saturated rock and sediment from the water table to the top of the underlying ICU, and ranges in thickness from 50 feet to 250 feet in this area (Brown and Reece 1979). Its lithology consists of quartz sand, silts, clay, shell beds, coquina, calcareous sandstone, and limestone with shells. The geologic units that make up the aquifers range from the youngest to the oldest: the Pamlico sand (Pleistocene), the Anastasia Formation (Pleistocene), the Fort Thompson Formation (Pliocene), and possibly part of the Tamiami Formation (Pliocene).

The SAS is generally unconfined to semi-confined (Adams 1992). The permeability of the aquifer typically increases to the south and east in the UEC Planning Area (Butler and Padgett 1995). Productivity and water quality in the aquifer also tend to improve from north to south and west to east. Throughout most of the UEC Planning Area, water in the SAS meets national drinking water standards with respect to chloride, total dissolved solids (TDS), and sulfate concentrations (Lukasiewicz and Switanek 1995).

Intermediate Confining Unit

Within the UEC Planning Area, the ICU comprises relatively impermeable phosphatic clays, silts, and limestones of the Hawthorn Group in the northwest corner of St. Lucie County. The top of this confining unit lies approximately 80 feet below MSL. It dips slightly to the southeast, reaching a maximum depth of more than 200 feet below MSL in southeastern Martin County. Thickness also varies, ranging from less than 300 feet in northern St. Lucie County, to more than 600 feet at the extreme southern end of the planning area. The ICU has low permeability, does not yield significant quantities of water to wells, and separates the overlying SAS from the underlying FAS.

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Floridan Aquifer System

The FAS ranges in thickness from 2,700 feet to 3,400 feet within the UEC Planning Area. The top of the FAS lies approximately 300 feet below MSL in the northwest corner of the planning area. It then dips to more than 900 feet below MSL in southeastern Martin County. The elevation of the top of the FAS corresponds to the top of the Hawthorn/Suwannee basal unit. The FAS includes rocks of middle Eocene (Oldsmar and Avon Park), Upper Eocene (Ocala Limestone), Oligocene (Suwannee Limestone), and Miocene (Hawthorn Group) age (Parker, Gorginsen, and Love 1955).

The FAS is divided into three aquifers based on the vertical occurrence of two regionally persistent zones: the Upper and Lower Floridan aquifers. The Upper and Lower Floridan aquifers are separated by a low-permeability interval, labeled the middle confining unit by Miller (1986) (confining unit 2 in **Figure 15**).

However, water from the FAS requires blending with surface water prior to irrigation because of the chloride levels in the water.

Upper Floridan Aquifer

The Upper Floridan Aquifer (UFA) is an artesian aquifer (meaning it flows at land surface without the aid of pumping) within the UEC Planning Area. The UFA is greater than 500 feet thick within the planning area. It is characterized by two distinct and regionally correlatable producing zones. Although these units occur together, they are not homogenous because both are composed of multiple smaller producing zones with intervening semi-confining units.

The upper producing zone is best developed along the lithologic contacts between the Suwannee Formation and the Ocala Group, and the Ocala Group and the Avon Park Formations. A lower-permeability semi-confining unit (**Figure 15**, confining unit 1) separates the upper producing zone from the Avon Park permeable zone. The Avon Park permeable zone is 800 feet or more below land surface (Rupert 1992). This zone is associated with fractured and solutioned dolomites within the Avon Park Formation.

Within the UFA, the deeper Avon Park permeable zone is generally more productive than the upper producing zone, but its productivity is also less predictable and varies widely across the planning area. The presence of the lower-permeability rock separating the upper producing zone from the Avon Park permeable zone allows for variations in water quality between these two units as well. In most cases, the deeper unit is more brackish than the upper. Many users of the UFA within the UEC Planning Area construct wells to use both the upper producing and Avon Park permeable zones, but must balance water quality with improved productivity.

The productivity of the UFA is considerably greater than that of the SAS throughout most of the planning area. Total dissolved solids concentrations in the upper producing zone average about 900 milligrams per liter (mg/L) and increase toward the southeast to 3,000 mg/L in southeastern Martin County. Total dissolved solids concentrations in the Avon Park

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permeable zone water average about 3,000 mg/L and increase toward the southwest as much as 5,000 mg/L in southwestern Martin County.

The UFA is an important source of agricultural irrigation water, particularly in the northern portion of the planning area and especially when surface water availability is limited. In parts of Martin and St. Lucie counties, the UFA is used for drinking water, and as the area continues to grow, use of the UFA to augment urban supply is expected to increase. The UFA's chloride concentrations are within a reasonable range for current desalination technology. Where chlorides are sufficiently low, UFA water can be blended with SAS water for use by Public Water Supply utilities as well. A number of utilities are using, or have immediate plans to use, desalinated UFA water to supply their service areas

Lower Floridan Aquifer

The deeper producing zones of the FAS are associated with the basal unit of the Floridan aquifer, a hard, porous, crystalline dolomitic limestone, with stringers of chalky fossiliferous limestone.

There are multiple flow zones within the upper part of the Lower Floridan aquifer (LFA), but these are generally not used as supply sources within the UEC Planning Area due to the high salinity (greater than 10,000 mg/L) and mineral content of the water.

An area of extremely high transmissivity, known as the Boulder Zone, occurs at the base of the LFA. A thick confining layer of dense limestones and dolomites impedes flow between the Boulder Zone and the transmissive zones at the top of the LFA. The base of the LFA generally coincides with the top of the evaporite beds in the Cedar Keys Formation (Miller 1986). The Boulder Zone is to dispose of wastewater effluent that is not reused and concentrate from desalination water treatment facilities.

Surface Water and Groundwater Relationships

In many ways, surface water and groundwater resources are interdependent. Although surface water management systems are a major source of water supply, in terms of interaction with groundwater, the systems within the UEC Planning Area function primarily as aquifer drains. Surface water management systems also affect aquifer recharge by diverting rainfall from an area before it has time to percolate down to the water table. Once diverted, this water may contribute to aquifer recharge elsewhere in the system, supply a downstream consumptive use, may be lost to evapotranspiration, or is discharged to tide.

Although the FAS is not hydraulically connected to surface water within the UEC Planning Area, FAS water has become a primary source of water for Public Water Supply. The FAS is usually diluted with surface water to achieve an acceptable quality for agricultural irrigation.

ECOSYSTEM RESTORATION EFFORTS

Information about ecosystem restoration efforts for the UEC Planning Area is available in the 2011 UEC Plan Update (SFWMD 2011b).

More information and the status of these restoration projects can be found in the *South Florida Environmental Report* available from http://www.sfwmd.gov/sfer. Project descriptions, status, and further documentation about other projects are available from http://www.evergladesplan.org, http://www.sfwmd.gov/northerneverglades, and http://www.sfwmd.gov/everglades.

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Roseate Spoonbills – Savannas Preserve State Park

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9

Lower West Coast Planning Area

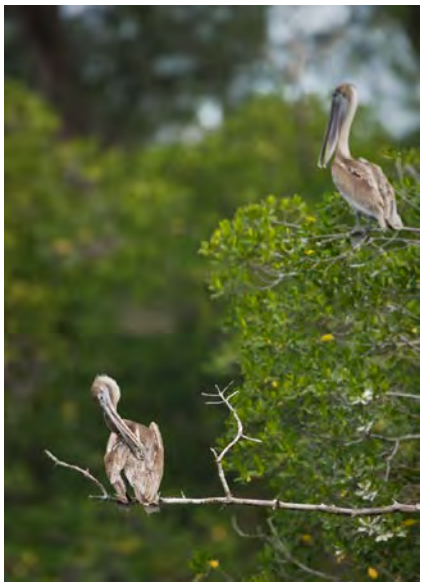
This chapter describes characteristics of the Lower West Coast (LWC) Planning Area. An overview of the region's physical features and water resources, including surface water and groundwater, is presented in this Support Document, which supplements the *2012 LWC Water Supply Plan Update* (2012 LWC Plan Update) (SFWMD 2012). For a comprehensive review of water supply status and issues in the LWC Planning Area, refer to the 2012 LWC Plan Update.

TOPICS

- Planning Area Boundaries
- Physical Features
- Water Resources and System Overview
- Ecosystem Restoration Efforts

PLANNING AREA BOUNDARIES

The Lower West Coast Planning Area includes all of Lee County, most of Collier County, and portions of Charlotte, Glades, Hendry, and Monroe counties (**Figure 16**). The boundaries of the LWC Planning Area generally reflect the drainage patterns of the Caloosahatchee River Basin to the north and the Big Cypress National Preserve to the south. The northern boundary corresponds roughly to the northerly watershed area of the Caloosahatchee River, which is generally the SFWMD and Southwest Florida Water Management District (SWFWMD) jurisdictional boundary in Charlotte County. The eastern boundary of the LWC Planning Area is along the western edge of the historic Everglades Watershed, dividing the Big Cypress and Lake Okeechobee drainage basins. At the southern end of the region, the LWC Planning Area encompasses a coastal portion of Everglades National Park and ends just north of Shark River Slough.



Brown Pelicans

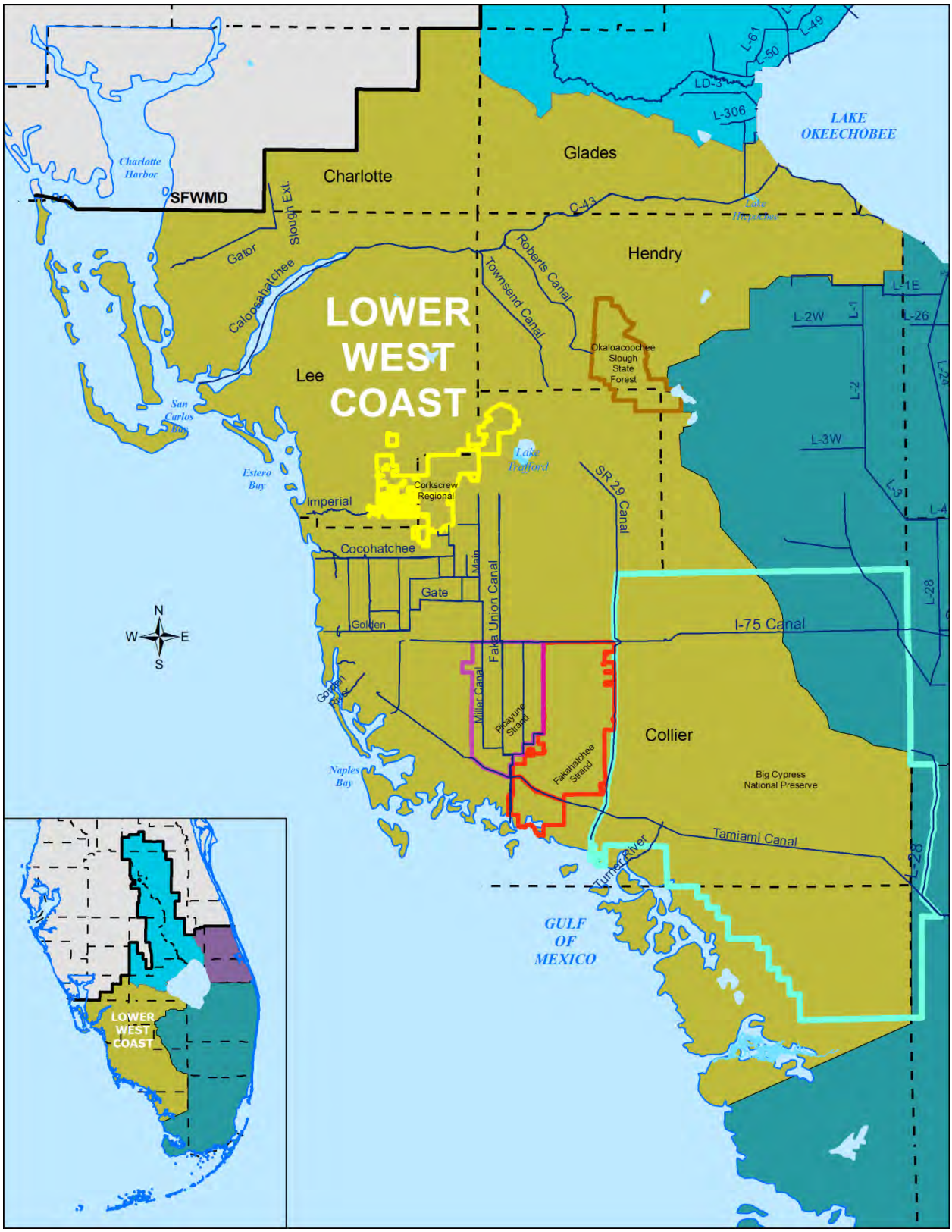


Figure 16. Lower West Coast Planning Area.

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PHYSICAL FEATURES

Major features of the LWC Planning Area include the Caloosahatchee River and Estuary; Lake Okeechobee; Lake Trafford; Corkscrew Regional Ecosystem Watershed (CREW); Big Cypress Swamp; and along the west coast, Southern Charlotte Harbor; Estero Bay; Naples Bay; Ten Thousand Islands and Rookery Bay; and the Fakahatchee Estuary. Elevation differences in Florida are generally minimal, with low coastal ridges and sloughs the most common topography, especially in the southern part of the state. Because of these low-relief elements, water generally flows from north to south within the SFWMD, with excess surface water runoff discharging to the coasts.

Big Cypress National Preserve

The Fisheating Creek Basin in the adjacent Kissimmee Basin Planning Area impacts the northeastern boundary of the LWC Planning Area. The basin is an extensive riverine swamp system that forms a watershed covering 440 square miles. It is the only free-flowing tributary to Lake Okeechobee and lessens the intensity of discharges to the lake that flow from north to south during heavy storm events. Flows from the Fisheating Creek Basin affect surface water flows in the LWC Planning Area through lake and river discharges and sheetflow events.

Water Bodies and Landscapes

Lake Okeechobee is one of the largest freshwater lakes in the nation, and provides the major storage for surface water in south Florida. It lies east of the LWC Planning Area, discharges through water control systems west to the coast through the Canal-43 Canal and Caloosahatchee River.

The Caloosahatchee River receives inflows from Lake Okeechobee and runoff from within its own watershed. West of the S-79 structure, the river mixes freely with estuarine water as it empties into the Gulf of Mexico, forming an important tidal estuary (see the *Coastal Ecosystems* section of this chapter). Lake Hicpochee connects to Lake Okeechobee via a canal for drainage, creating an avenue for lake water discharges to the west coast through the river. Later modifications to the Caloosahatchee River allowed development in the watershed, resulting in a network of local secondary and tertiary canals. This network provides conveyance for drainage, flood control, and irrigation to accommodate agricultural and urban needs.

Lake Trafford is the largest lake south of Lake Okeechobee. The lake is in the central portion of the LWC Planning Area and forms the inland headwaters of the Corkscrew Swamp and

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Imperial and Cocohatchee river watersheds that drain into the Ten Thousand Islands and Estero Bay estuary systems on the coast.

In the areas surrounding most of Lake Trafford's shores is the Corskcrew Regional Ecosystem Watershed (CREW), which extends west-southwest through Lee and Collier counties toward Naples. Pine flatwoods, marshes, and slough areas characterize CREW, with small bald cypress stands interspersed throughout. Of the approximately 94 square miles of watershed area, about 78 square miles have been designated as preserve. The *South Florida Environmental Report – Volume II* (available from http://www.sfwmd.gov/sfer) annually updates the status of this ecosystem restoration project.

Okaloacoochee Slough is an important surface water flow-way in Collier County. The headwaters of this 13,382-acre pristine slough originate in northern Hendry County. The slough runs north to south through the 32,039-acre Okaloacoochee Slough State Forest.

Composed largely of herbaceous plants with trees and shrubs scattered along its fringes and central portions, the Okaloacoochee Slough provides a large roaming area of contiguous habitat for a variety of wildlife species. The forest is home to listed, threatened, and endangered species, such as the Florida panther, Florida black bear, sandhill crane, wood stork, and gopher tortoise.

The natural systems of the Fakahatchee Strand Preserve and Big Cypress Preserve are dependent on the water supplied by the Okaloacoochee Slough.

South of Lake Trafford and CREW, roughly from west to east, are the Picayune Strand State Forest, Fakahatchee Strand Preserve State Park, Big Cypress Natural Preserve, and the Florida Panther National Wildlife Refuge, which sits on the north end of Fakahatchee Strand. Picayune Strand State Forest is located in the heart of the greater Big Cypress Basin. The forest encompasses two major tracts of land, Belle Meade and Southern Golden Gate Estates.

Picayune Strand State Forest

Fakahatchee Strand is a long, narrow forest with an unusual natural slough. The park covers about 100 square miles between the Picayune Strand State Forest and Big Cypress National Preserve. Within a dense bald cypress and royal palm canopy, Fakahatchee Strand shelters a slow-flowing river, several lakes, and a range of wet and dry landscapes. The trees and slough create a microclimate within the region that is more temperate than surrounding areas. Because of this, a large diversity of rare tropical plants, such as the ghost orchid, are often found. Prairie Canal currently defines the western border of Fakahatchee Strand, which has hastened the drainage of water from the natural areas.

Big Cypress National Preserve protects almost half of the Big Cypress Swamp. The preserve spans about 1,125 square miles (720,000 acres) of the 2,400-square-mile swamp basin. Dominated by cypress trees, Big Cypress Swamp is mainly in Collier County. The swamp's fresh waters are essential to the health of the Everglades, and support the estuaries along Florida's southwest coast. Fresh water from the preserve flows south and west into the Ten Thousand Islands region.

Coastal Ecosystems

Coastal areas are dominated by large estuarine systems where the waters of the Gulf of Mexico mix with the freshwater inflows from numerous river systems, sloughs, and overland sheetflow. These estuarine areas are characterized by shallow bays, extensive seagrass beds, and sand flats. Extensive mangrove forests dominate undeveloped areas of the shoreline. Coastal areas subject to tidal inundation support extensive mangrove forests and salt marsh areas. These brackish water communities were once commonly distributed along the entire coastline, but are now found in greatest abundance in southwestern Collier County and southern Lee County.

Mangroves in Estero Bay

Two large open water estuarine systems, Charlotte Harbor and the Caloosahatchee Estuary, dominate the northwest portion of the LWC Planning Area. Charlotte Harbor is Florida's second-largest open water estuary, characterized by a broad barrier island chain. Only the southern portion of this system lies within the District's boundaries, which includes the Caloosahatchee Estuary, San Carlos Bay, and most of Pine Island Sound and Matlacha Pass. Southern Charlotte Harbor is mostly preserve, and adjoins the J.N. "Ding" Darling National Wildlife Refuge on Sanibel Island. The harbor consists of mangroves, salt flats, oyster bars, and seagrasses. It is monitored regularly as part of a national aquatic preserve program. Economically important fisheries thrive in Southern Charlotte Harbor, and numerous endangered and threatened species can be found here.

At the tip of Southern Charlotte Harbor and north of Estero Bay is the Caloosahatchee River Estuary, a large estuarine ecosystem where the waters of the Gulf of Mexico mix with the freshwater inflows from the Caloosahatchee River and its watershed (C-43 Basin), as well as the largely urban tidal basin surrounding the estuary itself.

Estero Bay is a long, narrow, and very shallow body of water. Estero Bay's northwestern border begins at Bowditch Point on Estero Island and reaches as far south as Bonita Beach. Estero Island, Black Island, Long Key, Lover's Key, and Big Hickory Island are the barrier islands that separate the bay from the Gulf of Mexico. The major wetland and associated upland systems are located within the central and eastern parts of the basin.

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The Estero Bay Watershed includes central and southern Lee County, as well as parts of northern Collier and western Hendry counties. The watershed contains all of Estero Bay and adjacent barrier islands. The Estero Bay Aquatic Preserve protects the water, inlets, and islands along 10 miles of Estero Bay. Hendry Creek, Mullock Creek, the Estero River, areas of the CREW, Spring Creek, and the Imperial River are major surface water features and principal sources of freshwater inflows in the basin. The natural flow path between the Estero and Imperial river watersheds is through the Flint Pen Strand, part of the CREW. Flint Pen Strand has been disrupted by urban and agricultural development that hampers aquifer recharge and affects these natural systems. Restoring sheetflow through the region is part of the restoration effort for this watershed.

Naples Bay originates at the mouth of the Gordon River in downtown Naples. Several miles to the south, the bay connects to the Gulf of Mexico through Gordon Pass. South of Gordon Pass, at the southern lobe of the Naples Bay system, Dollar Bay connects to Rookery Bay and the Marco River through a shallow waterway with a dredged channel.

The 120-square-mile Naples Bay Basin lies within the greater Big Cypress Basin, and shares borders with the Corkscrew-Cocohatchee Basin to the north, the Faka-Union Canal Basin to the east, and the Henderson Creek Basin and Rock Creek, Winter Park Outlet, Haldeman Creek, Lely Canal, and Eagle Creek subbasins along the southeast. Fresh water flows into Naples Bay from the Golden Gate Canal, Gordon River, Rock Creek to the north, Haldeman Creek to the east, and runoff from the urban areas that surround the bay.

Rookery Bay, just south of Naples Bay, is in the northern edge of the Ten Thousand Islands estuary region in Collier County, between Naples and Marco Island. The bay is part of a national estuary preserve program, and is downstream of the Comprehensive Everglades Restoration Plan (CERP) Picayune Strand Restoration Project (previously referred to as the Southern Golden Gate Estates Restoration Project).

Rookery Bay

Golden Gate Weir No. 3 on the Golden Gate Canal was relocated and rebuilt in 2010. When coupled to a connecting canal, this weir will divert water to Henderson Creek, a tributary to Rookery Bay. The main goals of this weir are to restore more natural flows to both Naples and Rookery bays by restoring seasonal flows through Henderson Creek, and retain more water upstream during the dry season to assist in aquifer recharge. Golden Gate Weirs No. 6 and No. 7 were replaced in 2012 to improve flood protection and create additional groundwater storage capacity in the canal to during the dry season. These weirs will also help improve salinity by reducing freshwater flows to Naples Bay and the Ten Thousand Islands area.

Ten Thousand Islands

The Ten Thousand Islands estuarine ecosystem, located in the southern portion of Collier County contains bays, interconnected tidal embayments, lagoons, and tidal streams. Sources of freshwater drainage include sloughs, strands, a series of tidal creeks and channels, surface and sub-surface sheetflow, and canals.

Ten Thousand Islands is one of the world's largest remaining intact mangrove forests. The habitat extends from just south of Marco Island to Flamingo and Florida bays. Two-thirds of the area lie within the Everglades National Park's Whitewater Bay. Cape Romano/Ten Thousand Islands Aquatic Preserve and Ten Thousand Islands National Wildlife Refuge protect the areas outside the Everglades National Park boundaries.

For scientific study, the Fakahatchee Estuary may include Rookery Bay, the Ten Thousand Islands National Wildlife Refuge, and smaller embayments south through to Fakahatchee Bay. However, for the sake of water supply planning, Fakahatchee Estuary is narrowed to the north-to-south region beginning at Blackwater Bay and extending through Fakahatchee Bay into the northern coastal regions of Everglades National Park.

Geography and Climate

The LWC Planning Area extends approximately 5,129 square miles across southwestern Florida, and its average elevation is about 16 feet above mean sea level (MSL). The landscape slopes gently westward, in keeping with the overall topography of the state, which slopes away from the peninsular ridge that extends from the Georgia border and ends just above Lake Okeechobee. Within the LWC Planning Area, fresh water drained across the landscape from the historic Everglades and Lake Okeechobee and from the Immokalee Rise to the estuaries on the west coast.

Average seasonal temperatures for the area range from approximately 64°F to 82°F. Estimated annual rainfall in the LWC Planning Area averages 53 inches (see also the *Precipitation and Evapotranspiration* section). Nearly two-thirds of the area's rainfall occurs during the six-month wet season from May through October.

Physiography

South Florida is characterized by low topographic relief and a high water table. With this type of flat terrain, a few vertical feet may have a profound effect on surface water drainage, vegetation, and settlement patterns.

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Physiographically, the LWC Planning Area includes the Caloosahatchee River and Big Cypress watersheds. The Caloosahatchee Watershed encompasses the Caloosahatchee River Valley, Caloosahatchee Incline, DeSoto Plain, and Immokalee Rise (USDOI 1984). The Big Cypress Watershed contains all or parts of the Immokalee Rise, Big Cypress Spur, Southwestern Slope, and Coastal Swamps and Lagoons (USDOI 1984) (**Figure 17**).

In the Caloosahatchee River Watershed, the Caloosahatchee River Valley is the dominant physiographic feature. The valley follows the Caloosahatchee River from Lake Okeechobee to San Carlos Bay.

The valley "wall" is known as the Caloosahatchee Incline, which slopes gradually upward to the north of the river (USDOI 1984). At the peak of the valley wall lies the DeSoto Plain, a very flat terrace extending down from central Florida. The Immokalee Rise forms the valley wall south of the Caloosahatchee River.

The Immokalee Rise is an elevated flat area of predominantly sandy soils (USDOI 1984). This area is located primarily in Hendry County but extends into eastern Lee County and northeastern Collier County. The Immokalee Rise is bounded on the east by the Everglades, on the south-southeast by the Big Cypress Spur, and on the southwest by the Southwestern Slope. The Immokalee Rise ranges in elevation from 25 to 42 feet above MSL (FGS 1988).

The Big Cypress Spur is a sloping, transitional area between the Immokalee Rise, the Everglades to the east, and the Southwestern Slope to the west (USDOI 1984). This area receives runoff from the Immokalee Rise and drains to the Everglades and the Southwestern Slope. Elevations are only slightly higher than 25 feet MSL.

Big Cypress Swamp

The Southwestern Slope lies at elevations below approximately 25 feet MSL between the Gulf of Mexico and the western edges of the Immokalee Rise and Big Cypress Spur (FGS 1988). This area is a northwest-southeast trending area that tilts toward the Gulf of Mexico (USDOI 1984).

The Collier County coastline consists of quartz sand-dominated barrier islands and lagoons, with Cape Romano forming the southern end of these barrier islands. The Ten Thousand Islands are located south of Cape Romano, and are transitional between the barrier islands and shoreline to the south. The Reticulate Coastal Swamps border the Gulf Coast in the southern portion of Collier County. These swamps consist of channeled mangrove swamps and coastal marshes (FGS 1988).

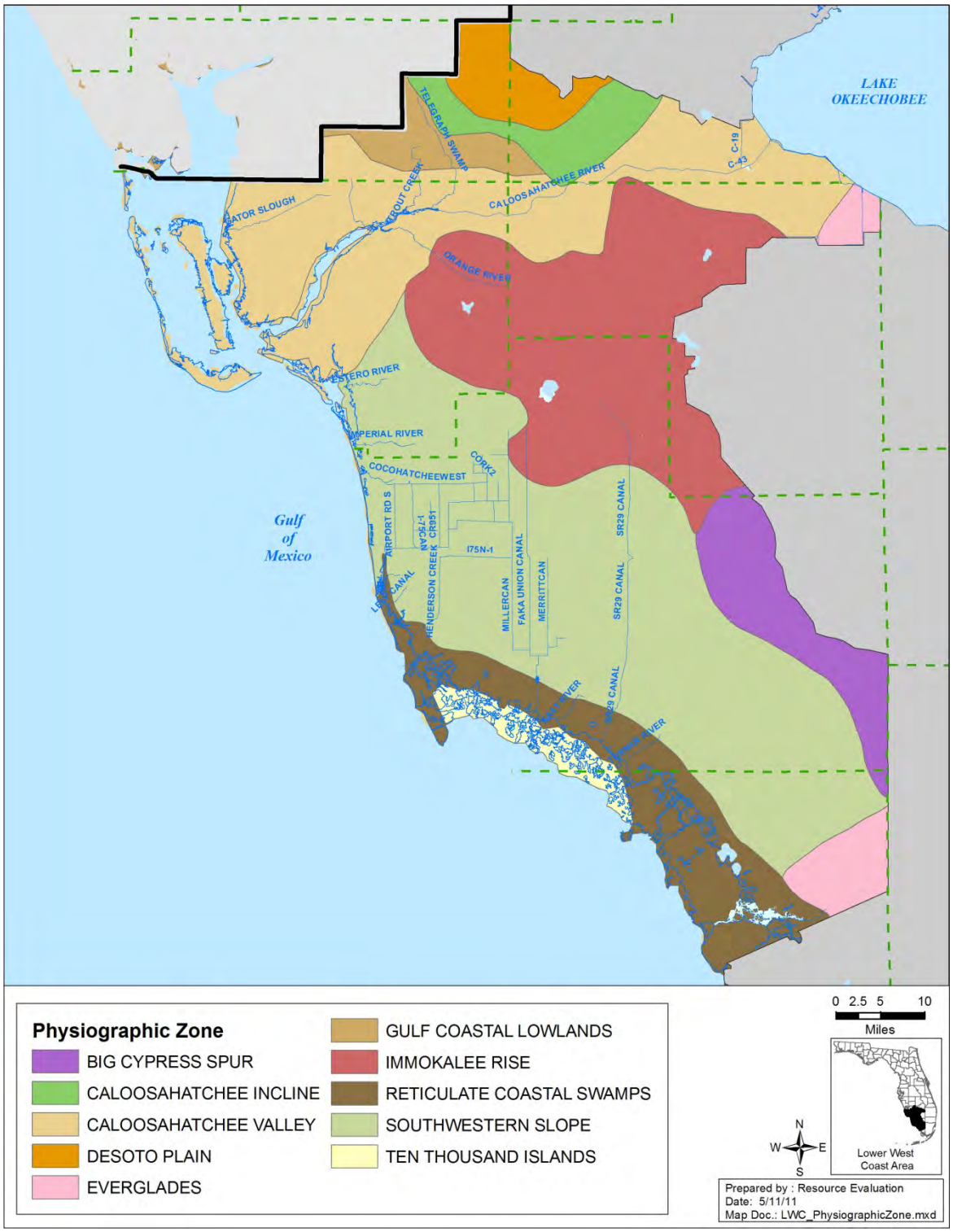

Figure 17. Physiography of the Lower West Coast Planning Area.

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WATER RESOURCES AND SYSTEM OVERVIEW

Before development, most of the LWC Planning Area was characterized by nearly level, poorly drained lands subject to frequent flooding. The natural surface drainage systems included large expanses of sloughs and marshes, such as Telegraph Cypress Swamp, Corkscrew Swamp, Flint Pen Strand, Camp Keais Strand, Six Mile Cypress Slough, Okaloacoochee Slough, and Twelve Mile Slough.

In the following sections, surface water and groundwater resources are addressed as separate entities. Surface water resources in the LWC Planning Area include natural systems and canals. Groundwater resources include the surficial aquifer system, intermediate aquifer system, and the Floridan aquifer system.

Regional Hydrologic Cycle

The main components of the hydrologic cycle in the LWC Planning Area are precipitation, evapotranspiration, surface water inflow and outflow, and groundwater inflow and outflow.

Precipitation and Evapotranspiration

Hydrologic and meteorological methods are available to measure and estimate the combined rate at which water is returned to the atmosphere by transpiration and evaporation. The combined processes are known as evapotranspiration (ET). Precipitation minus ET is equal to the combined amounts of surface water runoff and groundwater recharge. The estimate of potential evapotranspiration (ETp) from open water and wetlands in the LWC Planning Area is 52 inches (Abtew et al. 2003). Potential evapotranspiration represents the total estimated passive water use of an area under maximum conditions. While actual evapotranspiration varies due to temperature, soil moisture, and other factors, ETp estimates are important landscape-level factors in water balance calculations to determine if enough water will be available for all uses during different environmental conditions.

Mouth of Caloosahatchee River and San Carlos Bay

Surface Water Inflow and Outflow

With the exception of the Caloosahatchee River and C-43 Canal, most surface water in the LWC Planning Area originates from rainfall. The Caloosahatchee River also receives water

from Lake Okeechobee. Historic flow-ways in the region were natural drainage features, consisting of a series of flat wetlands or swamps, connected by shallow drainage ways or sloughs separated by low ridges. These features were dry for a portion of the year, and overtopped by water in periods of seasonal high rainfall.

Most of the canals in the LWC Planning Area were constructed as surface water drainage systems. The C-43 Canal and Caloosahatchee River are key sources of fresh water for consumptive use and the estuary. The amount of stored water is of critical importance to both the natural ecosystems and developed areas in the LWC Planning Area. Management of surface water storage capacity involves balancing two conflicting conditions: 1) drought conditions may occur during periods of deficient rainfall, and 2) flooding may occur due to excessive rainfall, especially during the wet season.

Groundwater Flow

Three major aquifer systems underlie the LWC Planning Area: the surficial aquifer system (SAS), the intermediate aquifer system (IAS), and the Floridan aquifer system (FAS). Rainfall is the main source of recharge to the SAS. The IAS is partially recharged from the SAS. The FAS receives its recharge from outside the LWC Planning Area.

Surface Water Resources

Surface water bodies in the LWC Planning Area include rivers and canals that provide storage and conveyance of surface water. However, the area's two largest lakes, Lake Trafford and Lake Hicpochee, are not considered suitable water supply sources. Lake Hicpochee changes dramatically in size on a seasonal basis as it receives overflows from Lake Okeechobee during times of high lake levels. The dynamic nature of Hicpochee makes it unsuitable as storage. The inflows are not of potable quality, and the water would require relatively expensive treatment for use. In addition, construction of the C-43 Canal through the center of Lake Hicpochee has resulted in lower lake water levels the lake does not provide enough storage to be considered a major water supply source.

The Caloosahatchee River, the region's most important surface water source, extends across seven of the 10 drainage basins in the LWC Planning Area. The river is provided by runoff from within its own basin and supplemented inflows from Lake Okeechobee. The freshwater portion of the river (C-43 Canal) extends eastward from the Franklin Lock and Dam (S-79 Structure) toward Lake Okeechobee and the cities of LaBelle and Moore Haven. West of the S-79 Structure, the river mixes with estuarine water as it empties into the Gulf of Mexico. The remaining rivers and canals in the LWC Planning Area drain into Estero Bay, the Caloosahatchee River, or the Gulf of Mexico.

Drainage Basins

The LWC Planning Area is divided into 10 major drainage basins according to their respective hydrologic characteristics (**Figure 18**). These basins are:

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1. North Coastal Basin
2. Tidal Caloosahatchee Basin
3. Telegraph Swamp Basin
4. West Caloosahatchee Basin
5. East Caloosahatchee Basin
6. S-4 Basin
7. S-236 Basin
8. Estero Bay Basin
9. West Collier Basin
10. East Collier Basin

North Coastal Basin

The North Coastal Basin, in southwestern Charlotte County and northwestern Lee County, contains numerous creeks. The basin drains via overland flow from the Fred C. Babcock/ Cecil M. Webb Wildlife Management Area in Charlotte County into the Gator Slough Watershed within northwestern Lee County. Most of this basin drains through the Gator Slough Canal into the Cape Coral Canal System.

The 400-mile canal system flows through Cape Coral, which is a 115-square-mile area and Florida's third-largest city (as measured by land mass). Approximately 295 miles of the canal system are considered fresh water and about 105 miles are brackish water. The system drains a large area, affecting the hydrology of the Matlacha Pass and Caloosahatchee estuaries.

Tidal Caloosahatchee Basin

The Tidal Caloosahatchee Basin extends on both sides of the saltwater portion of the Caloosahatchee Basin and northerly into Charlotte County. Numerous creeks drain into the Caloosahatchee River in this basin.

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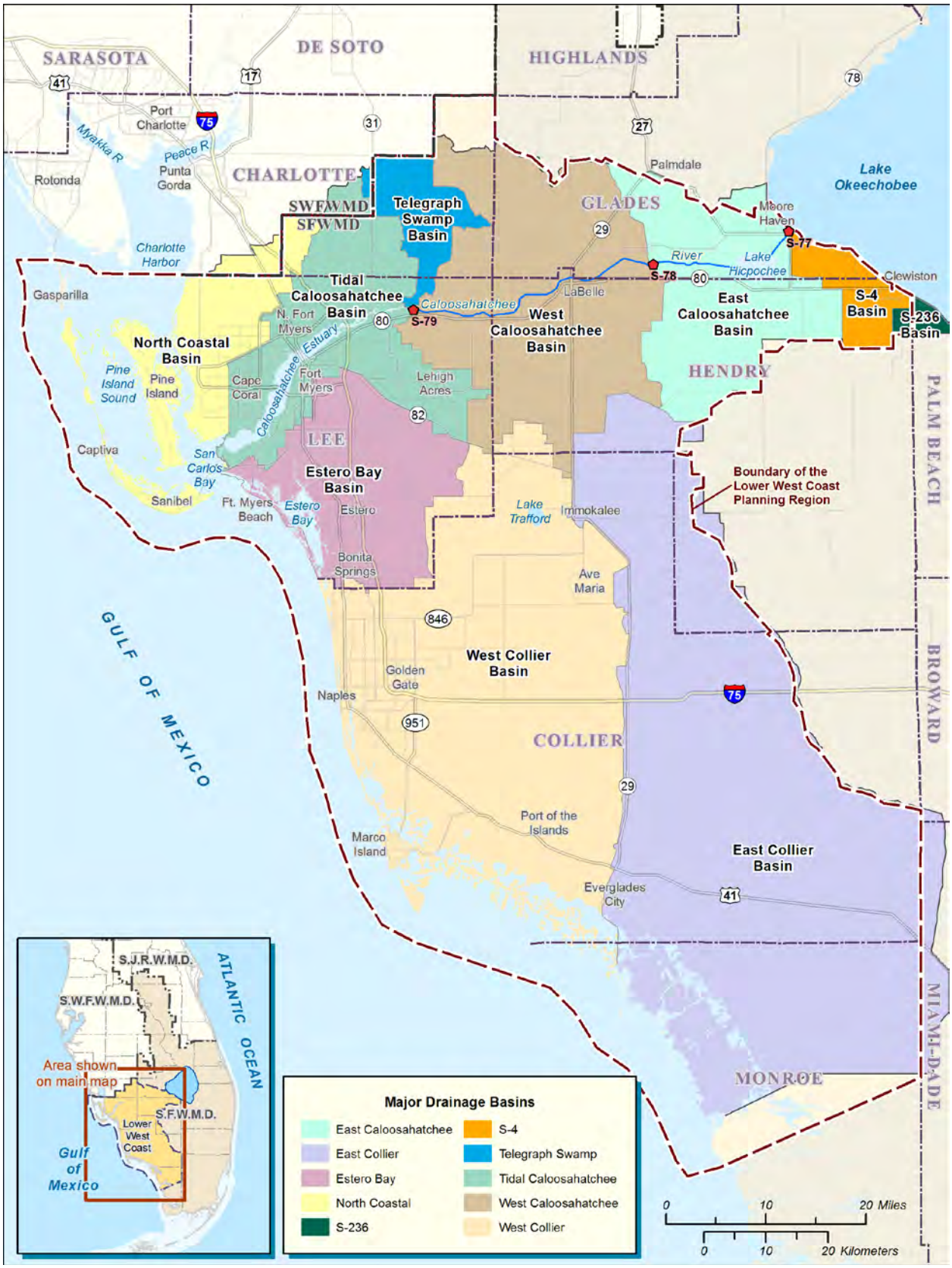

Figure 18. Lower West Coast Planning Area basins.

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Telegraph Swamp Basin

The Telegraph Swamp Basin extends from Charlotte County southward to the Caloosahatchee River. Telegraph Cypress Swamp, which drains via sheetflow into Telegraph Creek in Lee County, is the basin's major feature. The approximately 92-square-mile watershed with sheetflow discharge is potentially suitable as a water supply recharge area (Johnson Engineering et al. 1990).

West and East Caloosahatchee Basins

The West and East Caloosahatchee basins are located along the freshwater portion of the C-43 Canal. These basins include parts of Lee, Collier, Hendry, Glades, and Charlotte counties. The C-43 Canal is the major surface water resource within these basins. The canal has multiple purposes including navigation, water supply, drainage, and regulatory releases of excess water from Lake Okeechobee.

In the East Caloosahatchee Basin, Lake Hicpochee was severely impacted by the construction of the C-43 Canal through the lake's center, which resulted in lower lake water levels. The C-43 Canal provides drainage for numerous private drainage systems and local drainage districts within the combined drainage basins. The C-43 Canal also provides water for agricultural irrigation projects within the basins and water for Lee County's Olga Wastewater Treatment Facility.

C-43 Canal Operations

Three structures (S-77, S-78, and S-79) provide navigation and water control in the C-43 Canal. These structures are operated by the U.S. Army Corps of Engineers. They control the water stages in the C-43 Canal from Lake Okeechobee (S-77 Structure) to Franklin Lock (S-79 Structure). Water levels upstream of the S-78 Structure are maintained at approximately 11 feet above MSL and 3 feet above MSL downstream. The S-79 Structure also serves as a saltwater barrier. The operation schedule for these structures is dependent on rainfall conditions, agricultural practices, the need for regulatory releases from Lake Okeechobee, and the need to provide water quality control.

Estero Bay Basin

The Estero Bay Basin is located in southern Lee County. The basin includes Hendry Creek, Mullock Creek/Ten Mile Canal/Six Mile Cypress Slough, Kehl Canal/Imperial River, Estero River, and Spring Creek. These waterways are influenced in varying degrees by tides. Within the Estero Bay Basin, a twofold water management problem exists: 1) overdrainage in areas due to development, and 2) lack of conveyance in other areas resulting in flooding.

The Estero Bay Basin does not have a major source of surface water available for water supply. However, because the basin has good recharge areas, it was determined that saltwater barriers (weirs) could be used to increase water levels within the basin for recharge (Johnson Engineering et al. 1990). Several waterworks projects to increase water levels in the western part of the basin and to protect the water resources against saltwater

intrusion have been completed or are under way. Hendry Creek has a saltwater barrier, and weirs in Ten Mile Canal have been raised to increase the water levels within Six Mile Cypress Slough.

Estero Bay

The Estero River east of U.S. Highway 41 and the Imperial River east of Interstate-75 are both considered good recharge areas. The Kehl Canal is connected to this river and drains the water levels within this basin.

West Collier Basin

The West Collier Basin extends west from State Road 29 to the Gulf of Mexico, and north to the Lee County border. The basin also includes a portion of Hendry County. The West Collier Basin does not have an external source of surface water for year-round water supply. Lake Trafford, in the northern section of the basin, has a drainage area of approximately 30 square miles.

The West Collier Basin flows into the Gulf of Mexico near the Ten Thousand Islands. The Gordon and Cocohatchee rivers are the two remnant natural rivers in this basin. Both rivers are tidally influenced and connect to the canal system within this basin. This canal system, operated and managed by the Big Cypress Basin Board, serves primarily as a drainage network. The Big Cypress Basin Board retrofitted many old weirs and constructed new water control structures in the canals to prevent overdrainage of the basin. Because the primary source of water for this system is rainfall, the canals have little or no flow during the dry season, but produce considerable freshwater discharge during wet conditions.

The West Collier Basin has extensive wetland systems including the CREW, Picayune Strand State Forest, Fakahatchee Strand Preserve State Park, and Collier-Seminole State Park.

East Collier Basin

The East Collier Basin extends east from State Road 29 to the LWC Planning Area boundary, north approximately 3 miles into southern Hendry County, and south into Monroe County. Sheetflow from this basin flows south-southwest into Everglades National Park and the Gulf of Mexico. The Big Cypress National Preserve forms most of this basin. There are no major rivers or major sources of surface water for year-round water supply use in the East Collier Basin.

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Groundwater Resources

Three major aquifer systems—the surficial, intermediate, and Floridan—lie beneath southwestern Florida. As **Figure 19** illustrates**,** these systems are composed of multiple, discrete aquifers separated by confining units with low permeability.

Because hydraulic properties (i.e., ability to yield water to wells) and water quality may vary both vertically and horizontally within each individual aquifer, groundwater supply potential is uneven throughout the planning area.

Table 30 lists the aquifer systems, hydrogeologic units, and aquifer yields in the LWC Planning Area.

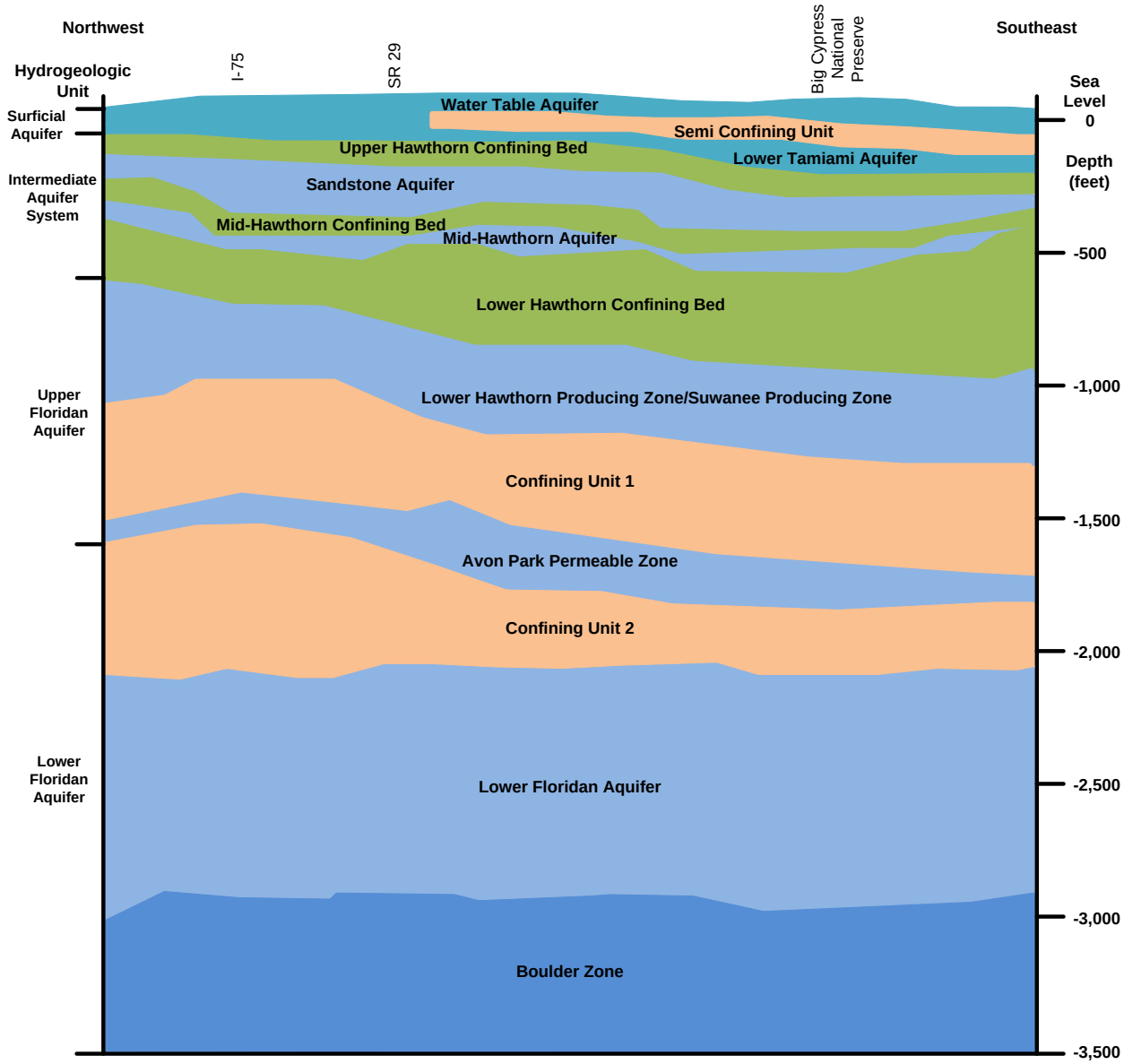

Figure 19. Generalized hydrogeologic cross-section of the Lower West Coast Planning Area.

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Table 30. Groundwater systems in the Lower West Coast Planning Area.

Aquifer System	Hydrogeologic Unit	Aquifer Yield A=Absent L=Low M=Moderate H=High				
		Charlotte	Glades	Lee	Hendry	Collier
Surficial	Water Table Aquifer	L	L-M	L-M	L-M	M-H
	Lower Tamiami Aquifer	A	A-L-M	A-M	A-M-H	H
Intermediate	Sandstone Aquifer	A-L	A-L-M	A-L-M	A-L-M	A-L
	Mid-Hawthorn Aquifer	L	A-L	L	L	M
Floridan	Upper Floridan Aquifer	H	H	H	M-H	M-H
	Avon Park Permeable Zone Middle Confining Unit (Confining Unit 2)	L	L	L	L	L
	Lower Floridan Aquifer	H	H	M	M	M

Surficial Aquifer System

In the LWC Planning Area, the surficial aquifer system (SAS) consists of the Water table aquifer, confining beds, and the Lower Tamiami aquifer with Holocene- to Pliocene-age materials. The thickness of the system ranges from about 200 feet in southwestern Collier County to less than 25 feet in northern Lee County (Reese 2000). The SAS is recharged by precipitation, seepage from canals and other surface water bodies, and upward leakance from the IAS.

Water Table Aquifer

The Water table aquifer is composed of sediments from the land surface to the top of the Tamiami confining beds. Within Lee County, several major Public Water Supply wellfields, all located in areas where the confining beds are absent, pump water from the Water table aquifer. The aquifer also furnishes water for agricultural and landscape irrigation. The Water table aquifer supports natural hydroperiods of wetland systems. Consequently, SFWMD water use permitting criteria limits water availability from this aquifer due to potential harm to wetlands.

Although the Water table aquifer in Hendry County may yield abundant quantities of water in isolated areas, it is generally used only where no suitable alternative is available. The aquifer produces potable quality water. However, in areas near LaBelle and the Caloosahatchee River, concentrations of chlorides and total dissolved solids may be

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elevated above drinking water standards. High iron concentrations exist in some isolated areas. In some locations, the Water table aquifer may not be appropriate for irrigation.

Lower Tamiami Aquifer

The Lower Tamiami aquifer is a major water producer in most of the LWC Planning Area. The aquifer supplies water to several Public Water Supply wellfields, agricultural uses, and Domestic Self-suppliers in the region. The potential for saltwater intrusion and water level drawdowns in wetland areas exists in the Lower Tamiami aquifer along the Collier County coast. Chapter 3 of the 2012 LWC Plan Update (SFWMD 2012) discusses the rules for Maximum Developable Limits (MDLs) in the LWC Planning Area, including the Lower Tamiami aquifer (see also SFWMD 2010a).

Intermediate Aquifer System

The intermediate aquifer system (IAS) consists of those units underlying the SAS and overlying and confining the Floridan aquifer system (FAS). It consists of three relatively impermeable confining units and the Sandstone and Mid-Hawthorn aquifers (Oligocene to Pliocene age). Recharge to the IAS occurs through upward leakance from the FAS and through downward leakance from the SAS (Bush and Johnston 1988). Leakance between the Sandstone and Mid-Hawthorn aquifers within the IAS is minimal. In Lee and Hendry counties, the IAS is a source of fresh water. In Collier County, the IAS is brackish and requires desalination to meet drinking water standards.

Sandstone Aquifer

The Sandstone aquifer has variable thickness and production. The aquifer's average thickness is approximately 100 feet near Immokalee and portions of central Lee County.

In Lee County, the Sandstone aquifer provides the water used by several Public Water Supply wellfields. In western Hendry County, where the Lower Tamiami aquifer is absent, the Sandstone aquifer is an important source of water for agricultural irrigation. Water from the Sandstone aquifer is only marginally acceptable for potable uses in Hendry and Collier counties due to salinity. In the LaBelle area, flowing Floridan aquifer wells in some areas have raised salinity levels in the Sandstone aquifer, making water unsuitable for irrigation in these locations. For more information about MDLs, see Chapter 3 of the 2012 LWC Plan Update (SFWMD 2012).

Mid-Hawthorn Aquifer

Although the Mid-Hawthorn aquifer is present throughout the LWC Planning Area, it is not always productive. The Mid-Hawthorn aquifer is used for Domestic-Self-Supply, landscape irrigation, and some agricultural irrigation, depending on location.

The aquifer's thickness is variable and relatively thin—and in some areas may include interbedded low-permeability layers, which results in the aquifer's low productivity.

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In addition to its low productivity, the Mid-Hawthorn aquifer experiences degradation in water quality as the aquifer dips to the south and east, yielding only brackish water in much of the planning area.

Floridan Aquifer System

In southwest Florida, the FAS is situated between 400 feet and 800 feet below MSL. The top of the FAS coincides with the top of a vertically continuous permeable carbonate sequence. The FAS contains several thin, highly permeable, water bearing zones, which define the Upper, Middle (Avon Park permeable zone), and Lower Floridan aquifers. The FAS produces brackish water throughout most of the LWC Planning Area. Salinity and hardness of water in the FAS increases from north to south and vertically with depth.

Upper Floridan Aquifer

The Upper Floridan aquifer (UFA) may include portions of the lower part of the Hawthorn Group, Suwannee Limestone, Ocala Limestone, and upper part of the Avon Park Formation. Production zones in the lower part of the Hawthorn Group and Avon Park permeable zone are not always present. The UFA consists of multiple thin water-bearing zones interlayered with thick zones of much lower permeability.

With reverse osmosis (RO) treatment, the UFA is a principal source of potable water in the LWC region. The UFA also supplies water for frost and freeze protection for some agricultural users, and irrigation water (blended with other water sources) for landscape and golf courses in the LWC.

Middle (Floridan) Confining Unit

The middle confining unit (**Figure 19**, confining unit 2) is relatively less permeable than both the UFA and the Lower Floridan aquifer (LFA). This portion of the Floridan aquifer separates the brackish water of the UFA from the more saline water of the LFA.

Lower Floridan Aquifer

Like the UFA, the LFA is characterized by multiple thin producing zones, (fractured or solutioned rock) sandwiched between lower permeability carbonate confining units. The lower portion of the LFA contains a highly transmissive fracture-riddled dolomite known as the Boulder Zone, typically about 2,800 feet below MSL, and is found in a section of rock approximately 400 feet thick (Reese 2000). This unit serves as a primary repository for residual brines from RO treatment and a back-up disposal of effluent from wastewater treatment facilities. The base of the LFA ranges between 3,500 feet and 4,000 feet below MSL (Miller 1986).

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Surface Water and Groundwater Relationships

The construction and operation of surface water management systems affect the quantity and distribution of recharge to the surficial aquifer system. Surface water management systems within the LWC Planning Area function primarily as SAS drains, because ambient groundwater levels generally exceed surface water elevations within the region. The Caloosahatchee River and the Gulf of Mexico act as regional groundwater discharge points. Groundwater seepage represents part of the inflow to the Caloosahatchee River. During the wet season after a rain event, some recharge to the SAS may occur from drainage canals, small lakes and stormwater ponds, Lake Trafford, and low-lying areas.

Surface water management systems also affect aquifer recharge by diverting rainfall from an area before it has time to percolate down to the Water table aquifer. Once diverted, this water may contribute to aquifer recharge elsewhere in the system, supply downstream consumptive uses, be lost to evapotranspiration, or discharged to tide.

ECOSYSTEM RESTORATION EFFORTS

Information about ecosystem restoration efforts for the LWC Planning Area is available in the 2012 LWC Plan Update (SFWMD 2012).

More information, as well as the status of these projects, can be found in the *South Florida Environmental Report* available from http://www.sfwmd.gov/sfer. Project descriptions, status, and further documentation about other projects are available from http://www.evergladesplan.org, http://www.sfwmd.gov/northerneverglades, and http://www.sfwmd.gov/everglades.

Cypress Trees – LWC Planning Area

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10

Lower East Coast Planning Area

This chapter describes characteristics of the Lower East Coast (LEC) Planning Area. An overview of the region's physical features and water resources, including surface water and groundwater, is presented in this Support Document, which supplements the *2013 LEC Water Supply Plan Update* (2013 LEC Plan Update) (SFWMD 2013a). For a comprehensive review of water supply status and issues in the LEC Planning Area, refer to the 2013 LEC Plan Update.

TOPICS

- Planning Area Boundaries
- Physical Features
- Water Resources and System Overview
- Ecosystem Restoration Efforts

PLANNING AREA BOUNDARIES

Within SFWMD, the LEC Planning Area includes Palm Beach, Broward, and Miami-Dade counties, most of Monroe County, and the eastern portions of Hendry and Collier counties (**Figure 20**). The LEC's boundaries follow the spreading north-to-south sheetflow pattern of the historical Everglades, draining eventually to Florida Bay at the southern tip of the peninsula, and encompassing the Florida Keys island chain south and west to the end of the state. Most of the Lake Okeechobee Service Area (LOSA) (see the Lake Okeechobee Basin/LOSA section later in this chapter) lies within the LEC Planning Area boundary. For consistency, all Lake Okeechobee and LOSA analyses are performed within the LEC planning process.

PHYSICAL FEATURES

Major features in the LEC Planning Area include Lake Okeechobee and hydraulically connected surface water bodies, the Loxahatchee River and Estuary, Lake Worth Lagoon, the Everglades Agricultural Area, Water Conservation Areas, portions of Everglades National Park, Biscayne Bay, and Florida Bay. Elevation differences in the LEC are slight,

with the highest elevations along the Atlantic Coastal Ridge that runs along the east coast, and lowest along the southern coastline.

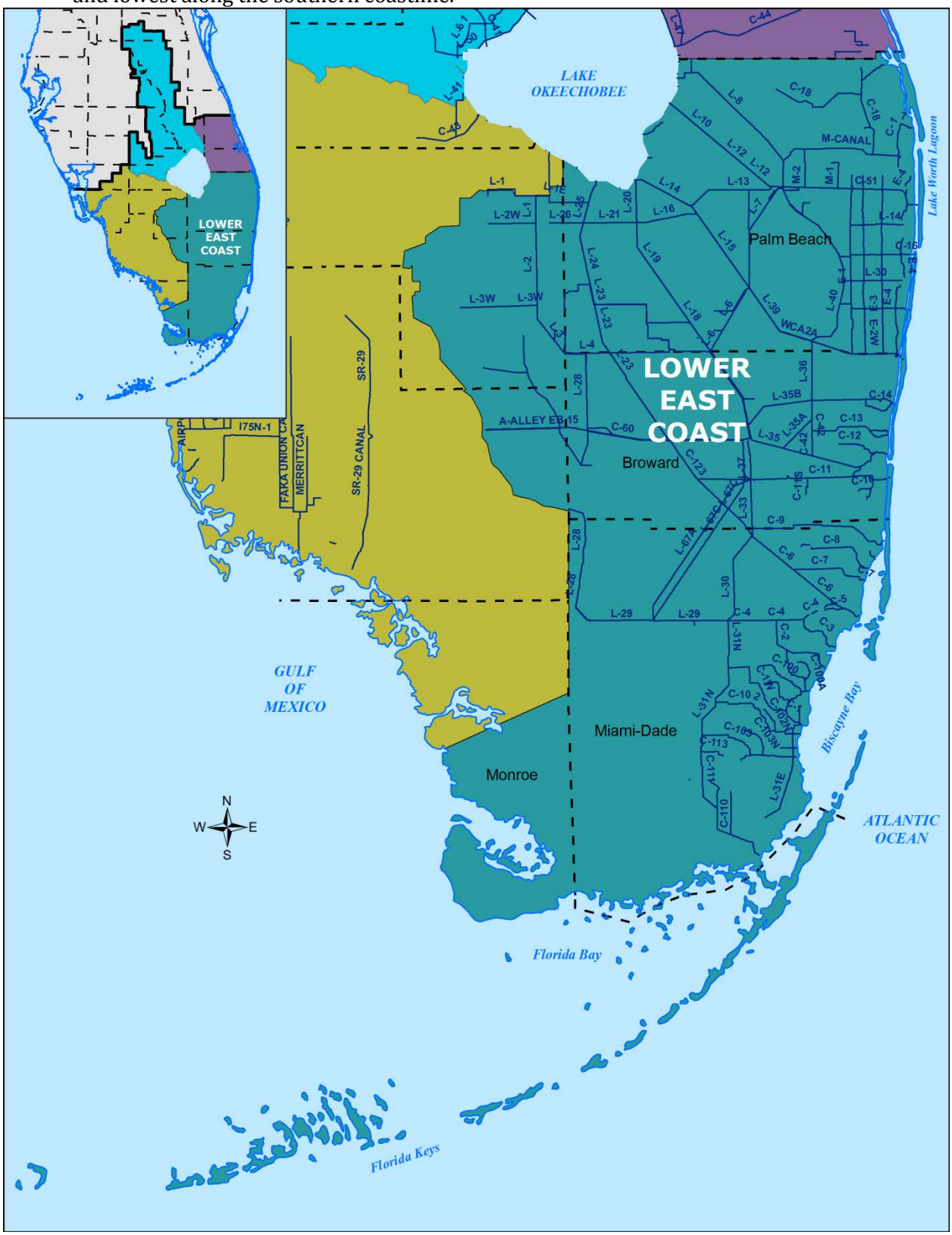

Figure 20. Lower East Coast Planning Area.

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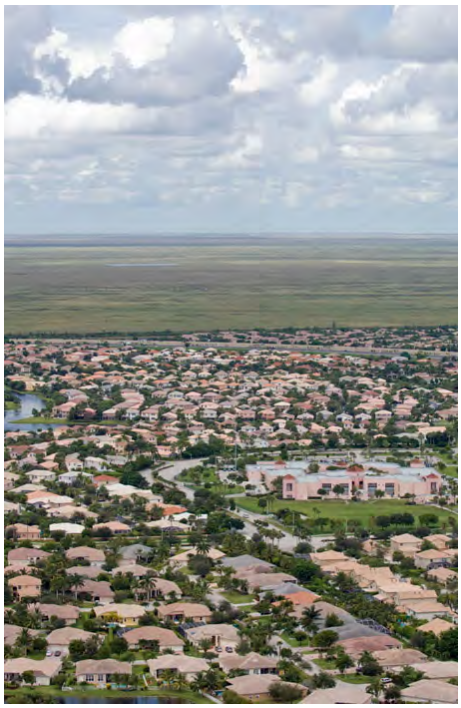
Water Bodies and Landscapes

The Central and Southern Florida Flood Control Project (C&SF Project) links Lake Okeechobee and the Everglades with the agricultural and urban areas, and other major ecosystems. The following significant freshwater systems and coastal ecosystems comprise the LEC Planning Area.



Western Broward County

Significant Freshwater Systems

Lake Okeechobee is the largest lake in the southeastern United States, and the major source of water storage and supply for the LEC Planning Area. Lake Okeechobee receives water from rainfall and its major tributaries – the Kissimmee River, Fisheating Creek, and Taylor Creek/Nubbin Slough. Downstream of the lake, outflows from Lake Okeechobee are received by the C-43 and C-44 canals, and ultimately the Caloosahatchee and St. Lucie estuaries, Everglades Agricultural Area (EAA), Everglades Stormwater Treatment Areas (STAs), C-139 and L-28 basins, and Water Conservation Areas (WCAs) in the LEC Planning Area.

The Everglades Protection Area lies south of the EAA, west of the Atlantic Coastal Ridge, and east of the Big Cypress Preserve. It comprises a number of management areas that have different operational needs and priorities, including the five Water Conservation Areas (WCAs), the Holey Land and Rotenberger wildlife management areas (WMAs), and most of the Everglades National Park, which includes Florida Bay.

The C&SF Project divided the remaining Everglades south of Lake Okeechobee and north of U.S. 41 in Palm Beach, Broward, and Miami-Dade counties into three hydrologic units known as the WCAs (WCA-1, WCA-2A/WCA-2B, and WCA-3A/WCA-3B). These diked areas are operated and maintained for flood control, environmental habitat, and water supply to the LEC Planning Area. The Arthur R. Marshall Loxahatchee National Wildlife Refuge west of Boynton Beach is contained within WCA-1. The WCAs serve as the first source of supplemental water to the coastal canals that recharge the Biscayne aquifer.

The Rotenberger Wildlife Management Area is a conservation area in the southern EAA. This area contains sawgrass marsh, tree islands, sloughs, wet prairies, and cattail marsh. The Holey Land Wildlife Management Area, to the east of Rotenberger, is composed of marsh and scattered tree island communities, including a red maple forest on the western edge, providing essential habitat for many plant and wildlife species.

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Regulatory discharges from Lake Okeechobee and runoff from the EAA are treated by stormwater treatment areas (STAs) before being delivered to the WCAs. Water from the WCAs then enters Everglades National Park and flows through Shark River Slough to Whitewater and Florida bays and the Ten Thousand Islands area. Some water enters the panhandle of Everglades National Park and Taylor Slough, which is an important tributary to northeastern Florida Bay.

C&SF Project canals in the LEC Planning Area move water from Lake Okeechobee and the Everglades to coastal counties to recharge the SAS during dry times. The canals are also a crucial component of the flood control system for the region, discharging water to tidal waters.

Wetlands extend across 3.2 million acres of the LEC Planning Area. Approximately 2 million acres are freshwater wetlands and 1.2 million are generally classified as estuarine or marine. The remnant Everglades represent the majority of the region's wetlands. In addition to Everglades National Park and the WCAs, key wetlands in the LEC Planning Area include Holey Land Wildlife Management Area, Rotenberger Wildlife Management Area, Grassy Waters Preserve, and other wetlands in the Loxahatchee River watershed. The region also has extensive constructed wetlands within the Everglades STAs. Finally, isolated wetlands can be found throughout the LEC Planning Area.

Significant Coastal Ecosystems

Significant coastal ecosystems in the LEC Planning Area include the Northwest Fork of the Loxahatchee River, Lake Worth Lagoon, the North Fork of the New River, Biscayne Bay, Florida Bay, and the Florida Keys, described as follows.

The Loxahatchee River and Estuary extend across an approximately 200-square-mile area in southern Martin and northern Palm Beach counties and overlap slightly into the Upper East Coast (UEC) Planning Area. A system of inland wetlands, known locally as Grassy Waters Preserve and the Loxahatchee and Hungryland sloughs, forms the headwaters of the watershed that drains into the Northwest Fork of the Loxahatchee River, federally designated as a Wild and Scenic River. The Loxahatchee River has two other branches—the North Fork and the Southwest Fork. All three branches discharge in the central embayment area, which flows through the Jupiter Inlet into the Atlantic Ocean. The downstream section of each fork is brackish water. Flows from all three forks drain into the Loxahatchee River Estuary—the southernmost tributary to the Indian River Lagoon. See **Chapter 8** of this Support Document and the *2011 UEC Water Supply Plan Update* (SFWMD 2011b) for more information about the Indian River Lagoon.

Lake Worth Lagoon drains into the Lake Worth and South Lake Worth inlets in Palm Beach County. The lagoon is a long, narrow body of brackish water, divided into three geographical segments (north, central, and south), and located along the heavily urbanized Intracoastal Waterway. The north segment includes waters north of Flagler Memorial Bridge to PGA Boulevard. The central segment includes waters south from the Flagler Memorial Bridge to Lake Worth Bridge, and the south segment includes waters south from

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Lake Worth Bridge to the Boynton Beach Bridge at Ocean Avenue. Sources of freshwater runoff include primary and secondary canal systems. The major sources of fresh water are the C-17 Canal (Earman River), C-51 Canal (West Palm Beach Canal), and the C-16 Canal (Boynton Canal).

The North Fork of the New River is a remnant tributary that drained the eastern Everglades and now flows through the City of Fort Lauderdale, where it eventually joins the river's main branch and empties into the Atlantic Ocean via the inlet at Port Everglades.

Biscayne Bay covers approximately 428 square miles located on the southeastern coast near Miami-Dade County. Everglades National Park shares some of the watershed along the southwestern boundary. The bay is an aquatic preserve and an Outstanding Florida Water. The southern half of the bay is within Biscayne National Park. This is the largest marine park in the National Park system and supports diverse flora and fauna, including many endangered species.

Florida Bay is a large, shallow, marine-estuarine lagoon between the southern edge of the Everglades and the Florida Keys. Most of the bay is within Everglades National Park.

The chain of islands known as the Florida Keys runs along the southeastern tip of the state south and west. Because of the unique marine ecosystems, the Florida Keys area is protected by the Florida Keys National Marine Sanctuary, three national parks – Everglades, Biscayne, and Dry Tortugas, and several state parks.

Geography and Climate

The LEC Planning Area encompasses approximately 6,500 square miles in southeast Florida. The bottom of Lake Okeechobee is approximately at sea level and the land immediately surrounding Lake Okeechobee ranges from 20 feet to 25 feet above mean sea level (MSL). Parts of the Atlantic Coastal Ridge are higher than 25 feet above MSL. Along the shoreline, the mangrove and coastal glades region is at or below sea level and often flooded by tides or freshwater runoff.

Land elevations in the WCAs generally range from about 16 feet above MSL at the northern end of WCA-1 to approximately 10 feet above MSL at the southern end of WCA-3. The topography of Everglades National Park is extremely low and flat, with most of the area lying 4 feet below MSL. The land surface generally slopes from 8 feet to 9 feet above MSL at the northern end, to below MSL as the freshwater wetlands of the Everglades merge with the saltwater wetlands of Florida Bay. Average seasonal temperatures for the area range from approximately 60°F to 80°F. Estimated annual rainfall in the planning area averages 57 inches (see also the *Precipitation and Evapotranspiration* section).

Physiography

Florida Bay

The LEC Planning Area is characterized by lakes, rivers, and canals, including Lake Okeechobee; coastal ridges, remnant Everglades and wetlands in the Everglades Protection Area; and coastal swamps and bays, including Biscayne Bay and Florida Bay. Except for the coastal and beach ridges, the region is flat in appearance, and slopes vary gradually from approximately 25 feet above MSL near Lake Okeechobee to sea level or below at the coastline. Physiographic regions include the Eastern Valley, Atlantic Coastal Ridge, Everglades, Immokalee Rise, Big Cypress Spur, Reticulate Coastal Swamps, and Florida Bay Mangrove Islands (**Figure 21**).

The Eastern Valley consists of wetland communities, including tidal and floodplain swamp and forest. These areas are characteristically pocketed with shallow lakes and marshes and have limited natural drainage. Prior to development and the construction of canals, the valley drained by a slow drift of water through multiple sloughs to the St. Lucie River, the Loxahatchee River, and the Everglades.

The Atlantic Coastal Ridge, composed of relict beach ridges and sand bars, is mostly underlain by thin sand and Miami Limestone that are highly permeable and moderately to well-drained. West of the coastal ridge, soils contain fine sand and loamy material and have poor natural drainage. Rockland areas on the coastal ridge in Miami-Dade County are characterized by weathered limestone surfaces and karst features such as solution holes and sinkholes. The Atlantic Coastal Ridge covers 12,300 acres of diverse community types, including scrub, pine flatwoods, and forested sloughs. The Southern Slope of the Atlantic Coastal Ridge contains small, pine-covered hammocks.

The Everglades is located west of the Atlantic Coastal Ridge, and extends southward from Lake Okeechobee and the Loxahatchee Slough to the mouth of the Shark River Slough at Florida Bay. The Everglades has an almost imperceptible slope to the south, which averages less than 2 inches per mile. Elevations range from 14 feet MSL near Lake Okeechobee to sea level at Florida Bay. Under predeveloped conditions, the Everglades was seasonally inundated, and water drained slowly to the south.

Much of the Everglades are underlain by peat and muck soils that developed in a shallow basin with poor natural drainage under prolonged conditions of flooding. Beneath these surface layers of organic material is the Fort Thompson Formation of interbedded sand, shell, and limestone. Bedrock in the Everglades is almost entirely limestone. Higher elevation marshes in the Southern Everglades on either side of Shark River Slough are

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characterized by calcitic marl soils deposited by algal mats, and exposed limerock surfaces with karst features.

The Immokalee Rise is bounded on the east by the Everglades, on the south-southeast by the Big Cypress Spur, and the on the southwest by the Southwestern Slope. This area, composed of predominantly sandy soils, ranges in elevation from 25 to 42 feet above MSL (FGS 1988).

The Big Cypress Spur is a sloping, transitional area between the Immokalee Rise, the Everglades to the east, and the Southwestern Slope to the west (USDOI 1984). This area receives runoff from the Immokalee Rise and drains to the Everglades and the Southwestern Slope. Elevations are only slightly higher than 25 feet MSL.

Mangrove swamps occupy a zone between the open waters of the coast and the uplands and freshwater wetlands of the interior of the Everglades. These mangroves form small, densely packed islands and shoreline jungles, which together form the Reticulate Coastal Swamps of northern Florida Bay. Along the southern shores of Everglades National Park, Florida Bay is underlain by Miami Limestone with variable sediment cover of sand, exposed bedrock, and mudbanks. The bay has an average depth of about 3 feet, and consists of shallow, interconnected basins. It is subject to rapid salinity changes due to mainland Everglades runoff and regional droughts, and is an important habitat for many species. Sand shoals and ancient corals underlie small mangrove keys throughout the bay.

The Florida Keys consist of highly permeable Key Largo Limestone in the Upper Keys and less permeable Miami Limestone on the Lower Keys.

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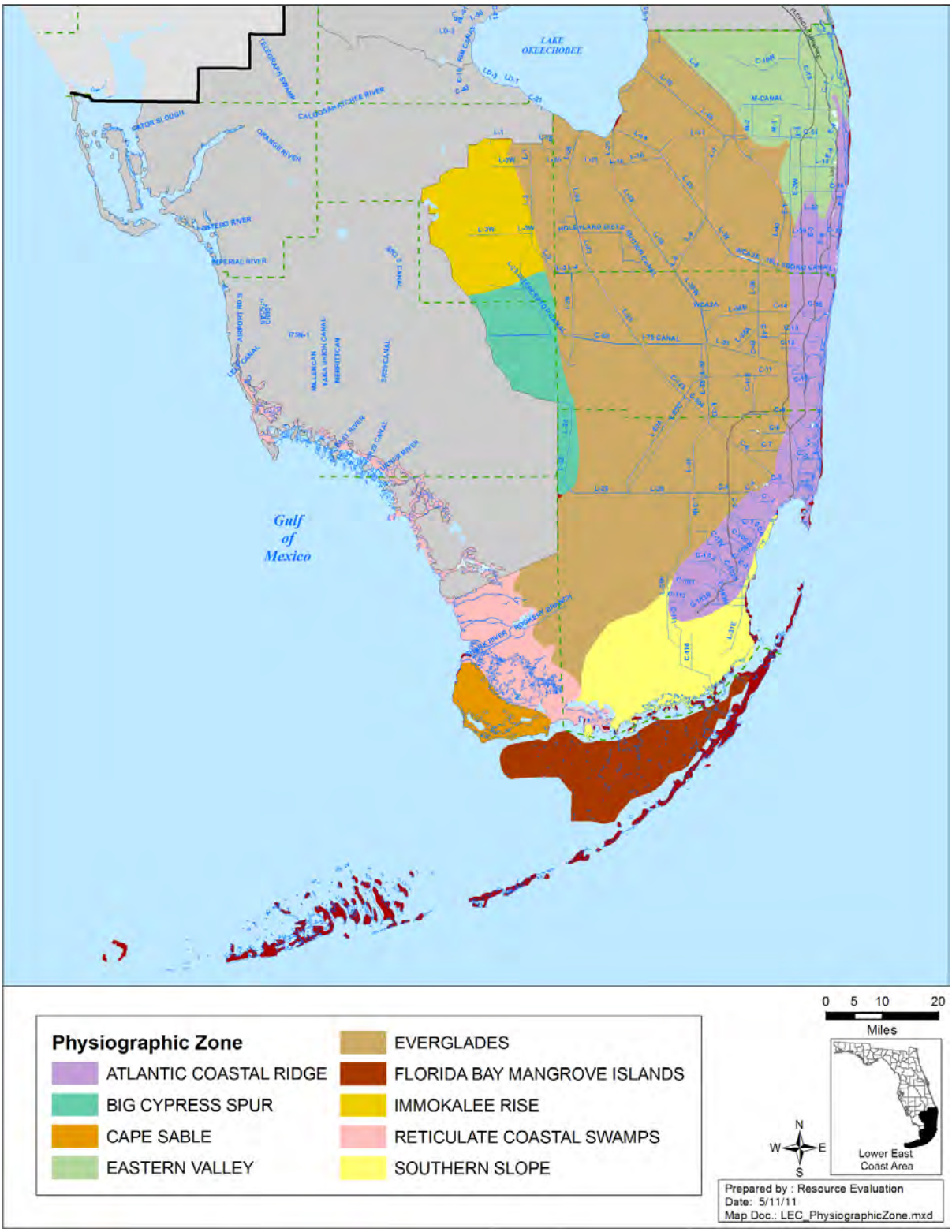

Figure 21. Physiography of the Lower East Coast Planning Area.

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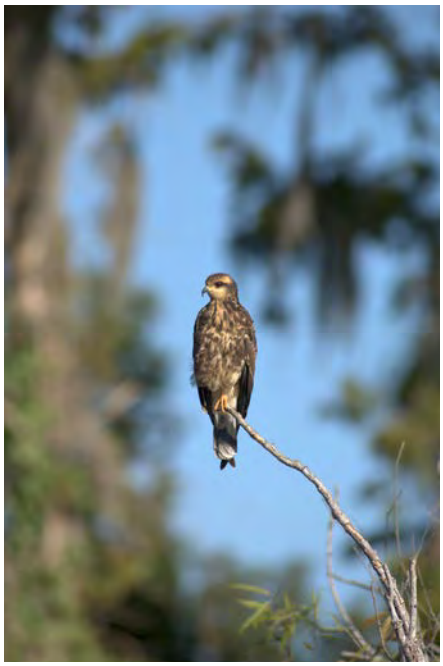
WATER RESOURCES AND SYSTEM OVERVIEW

In the following sections, surface water and groundwater resources are addressed as separate entities. Surface water resources in the LEC Planning Area include natural systems, canals, and constructed wetlands. Groundwater resources are the surficial aquifer system, which includes the Biscayne aquifer, and Floridan aquifer system.



Everglade Snail Kite

Regional Hydrologic Cycle

The main components of the LEC Planning Area's hydrologic cycle are precipitation, evapo-transpiration, surface water inflow and outflow, and groundwater flow.

Precipitation and Evapotranspiration

Annual precipitation in the LEC Planning Area averages 57 inches. Nearly 75 percent of the rainfall occurs during the six-month wet season from May through October.

Hydrologic and meteorological methods are available to measure and estimate the combined rate at which water is returned to the atmosphere by transpiration and evaporation. The combined processes are known as evapotranspiration (ET). Precipitation minus ET is equal to the combined amounts of surface water runoff and groundwater recharge. The estimate of potential evapotranspiration (ETp) from open water and wetlands in the LEC Planning Area is 53 inches (Abtew et al. 2003). Potential evapotranspiration represents the total estimated passive water use of an area under maximum conditions. While actual evapotranspiration varies due to temperature, soil moisture, and other factors, ETp estimates are important landscape-level factors in water balance calculations to determine if enough water will be available for all uses during different environmental conditions.

Surface Water Inflow and Outflow

Surface water inflows to the LEC Planning Area come through the C&SF Project canals. Outflows of surface water in the LEC Planning Area are largely directed through water control structures, many of which were constructed as part of the Central and Southern Florida Project Flood Control Project (C&SF Project). Flows and stages in Lake Okeechobee and most of the region's canals are operated consistent with regulation schedules for multiple purposes. The amount of stored water is of critical importance to both the natural ecosystems and the developed areas in the LEC Planning Area. Management of surface

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water storage capacity involves balancing two conflicting conditions: 1) drought conditions may occur during periods of deficient rainfall, and 2) flooding may occur due to excessive rainfall, especially during the wet season.

A regional system of canals provides a means to move water from one location to another (see the *Lower East Coast Canals and Service Areas* section of this chapter). Water is transported from north to south and west to east, from Lake Okeechobee through water control structures to the EAA canals and into the WCAs. Located south of Lake Okeechobee and north of the Everglades, Stormwater Treatment Areas (STAs) reduce excess phosphorus from stormwater runoff through the natural filtering of native vegetation before water enters protected wetlands. Water moves from the WCAs via structures and canals to Everglades National Park and the urbanized coastal basins. Water from WCA-1 also moves through the G-94 culverts, the Hillsboro Canal, and the C-51 Canal to the Lake Worth Drainage District. When canal elevations are greater than surrounding groundwater, water in coastal canals provides recharge to the Biscayne aquifer, enhancing groundwater supplies and helping replenish water in lakes, rivers, and wetlands.

Tree Island in Water Conservation Area 1

Groundwater Flow

Two principal aquifers underlie the LEC Planning Area: the surficial aquifer system (SAS), which includes the Biscayne aquifer and the Floridan aquifer system (FAS).

Rainfall is the main source of recharge to the SAS. Groundwater inflows from the Everglades to the coast form a significant portion of recharge to the SAS. The FAS receives most of its recharge from outside of the LEC Planning Area in central and northern Florida.

Surface Water Resources

The major surface water body storage in the LEC Planning Area is Lake Okeechobee. Lake Okeechobee is a central component of the C&SF Project and an interconnected regional aquatic ecosystem. It serves multiple functions including flood control, agricultural and urban water supply, fulfillment of Seminole Tribe of Florida water rights, navigation, recreation, and fish and wildlife preservation and enhancement. The operation of the lake affects a wide range of environmental and economic issues. Lake operations must carefully consider the entire and sometimes conflicting purposes of the C&SF Project.

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The Lake Okeechobee Watershed encompasses a drainage area of over 3.5 million acres (5,500 square miles), and is dominated by agricultural land uses that account for just over 50 percent of the total area. Based on hydrologic and geographic boundaries, the Lake Okeechobee Watershed includes the Upper and Lower Kissimmee basins, Lake Istokpoga/ Indian Prairie Basin, Taylor Creek/Nubbin Slough Basin, Fisheating Creek Basin, Everglades Agricultural Area (EAA), and Lake Okeechobee basins including the C-43 and C-44 basins.

Agricultural Land in Homestead

South of Lake Okeechobee, the Southern Everglades is divided into surface water management basins. In terms of water management, the SFWMD groups the LEC Planning Area into three hydrologically related areas: 1) Lake Okeechobee Basin/Lake Okeechobee Service Area (encompassing portions of Martin, Okeechobee, Palm Beach, Hendry, Glades, and Lee counties) including the EAA; 2) Water Conservation Areas (WCAs), and Everglades National Park; and 3) Lower East Coast Canals and Service Areas.

Figure 22 shows the Lake Okeechobee Service Area; areas outside the LEC Planning Area with a significant relationship to the region; Water Conservation Areas; Everglades National Park; and the LEC Service Areas.

Irrigation in the Everglades Agricultural Area

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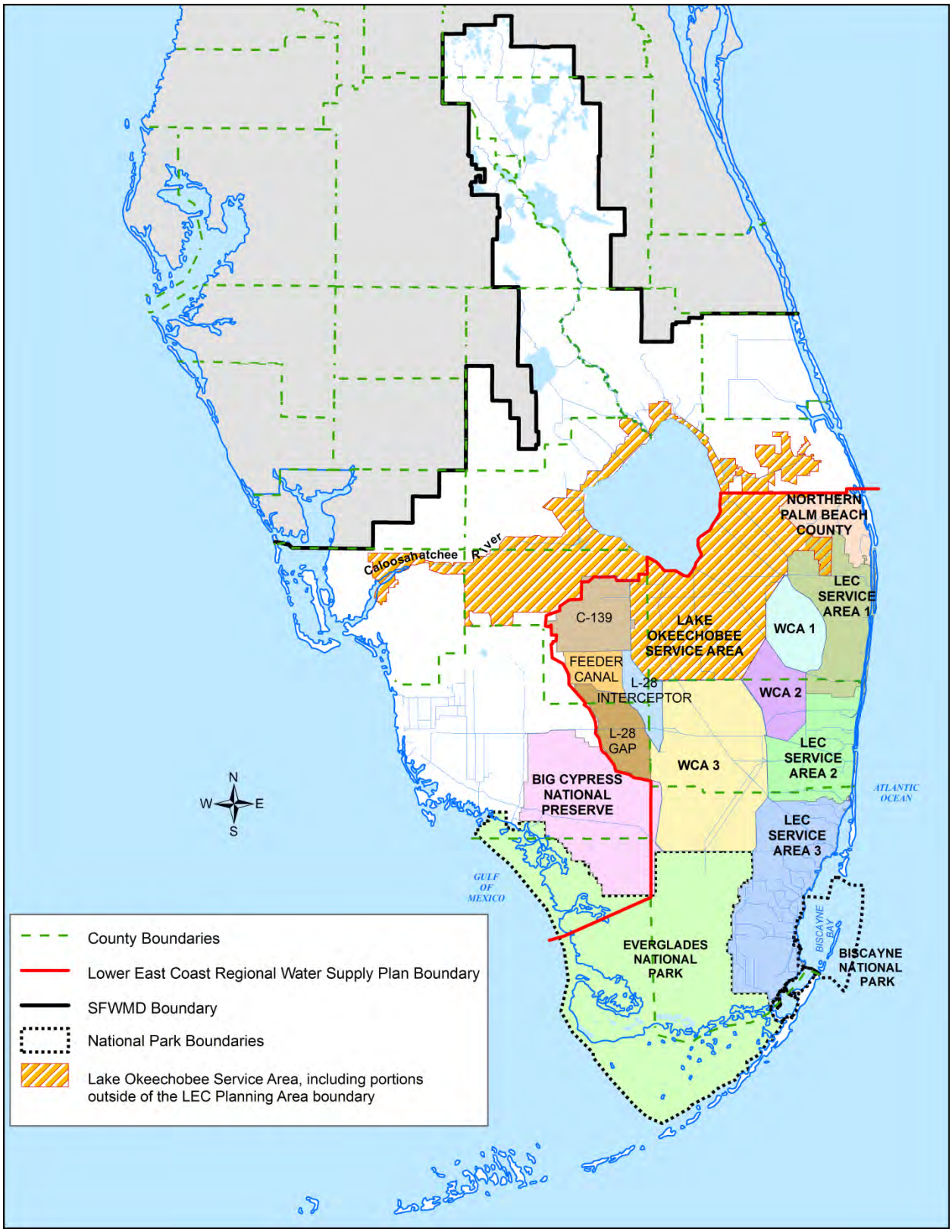

Figure 22. Major features of the Lower East Coast Planning Area.

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Lake Okeechobee Basin / Lake Okeechobee Service Area including the Everglades Agricultural Area

Lake Okeechobee is the primary source of supplemental irrigation for numerous adjacent agricultural basins in the SFWMD, including: Northeast Lake Shore; St. Lucie (C-44); West Palm Beach Canal and L-8; East Beach and East Shore water control districts; North New River and Hillsboro Canal; Miami Canal; C-21 and S-236; Caloosahatchee (C-43); Northwest Lakeshore and Southern Indian Prairie; and North Lake Shore. The Everglades Agricultural Area (EAA) is also part of the Lake Okeechobee Basin. Collectively, these basins are known as the Lake Okeechobee Service Area (LOSA). The entire Lake Okeechobee Service Area is considered during the LEC water supply planning process because of its reliance on Lake Okeechobee for water supply.

Stormwater Treatment Area 1E

Everglades Agricultural Area

The Everglades Agricultural Area is located south of Lake Okeechobee in eastern Hendry and western Palm Beach counties. The EAA is composed of rich, organic peat or muck soils. Agriculture within the EAA requires extensive drainage of this soil, which is accomplished by the canals and water control components of the C&SF Project. These canals are also used to provide the EAA with irrigation. In addition to C&SF canals, there is an extensive network of local canals and farm ditches.

Stormwater from the EAA is moved south through stormwater treatment areas (STAs) created by the SFWMD, and into the Everglades Protection Area. The stormwater treatment areas include STA-1 East, STA-1 West, STA-2, STA-3/4, STA-5, and STA-6. As of summer 2012, construction is complete on the expansion of STA-2 and STA-5/6 with pump station commissioning in progress. When operational, these two expansion projects will increase the total effective treatment area to 57,000 acres.

Water Conservation Areas

As a result of the C&SF Project, the remaining Everglades were divided into three hydrologic units known as the Water Conservation Areas (WCAs). The WCAs are shallow, diked marshes that provide water storage and detention for excess water; water supply for agricultural lands in the LEC Planning Area and Everglades National Park; and recharge for the Biscayne aquifer. The WCAs contain remnants of original Everglades sawgrass marsh, wet prairies, and hardwood swamps. These conservation areas are managed as surface water reservoirs using a set of water regulation schedules.

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WCA Regulation Schedules

Water levels in most of the WCAs are managed through inflow and outflow structures using a set of regulation schedules established by the U.S. Army Corps of Engineers (USACE) (1996). These schedules allow for different water levels under different conditions, balancing the needs of the natural system and other water users. These ranges can provide storage of runoff during the wet season for use during the dry season, and flood control during the wet season.

WCA-1

Water Conservation Area 1, located in south-central Palm Beach County, is contained within the Arthur R. Marshall National Wildlife Refuge and includes some of the original sawgrass marshes, wet prairies, and hardwood swamps of the remnant Everglades system. The 221-square-mile WCA-1 is enclosed by 58 miles of canals and levees. The WCA-1 regulation schedule varies from high stages in the late fall and winter to low stages at the beginning of the wet season (Abtew et al. 2007). Inflows to WCA-1 are primarily rainfall and discharges from STA-1W and STA-1E. Outflows from WCA-1 are received by WCA-2, the Hillsboro Canal, and a canal system monitored and controlled by the Lake Worth Drainage District.

WCA-2A and WCA-2B

Water Conservation Areas 2A and 2B comprise about 208 square miles located within southwestern Palm Beach and northwestern Broward counties. Water Conservation Area 2A is much larger than WCA-2B and provides a 167-square-mile shallow impoundment for storing excess water. These WCAs provide wellfield recharge and water supply for urban areas located within Broward County. Inflows to WCA-2 as a whole come from primarily from WCA-1 and STAs 2 and 3/4. Outflows from this WCA generally go to WCA-3A. The regulation schedule for WCA-2A is established by the USACE (1996). A regulation schedule is not used for WCA-2B because of high seepage rates into the underlying surficial aquifer to central Broward County.

WCA-3A and WCA-3B

Together, Water Conservation Areas 3A and 3B represent the largest of the three WCAs at 915 square miles. The Miami Canal traverses WCA-3A from northwest to southeast, and receives most of its water from direct rainfall, WCA-2, STAs 5 and 3/4, and regulatory releases from Lake Okeechobee on a case-by-case basis. This area also receives excess runoff from the Big Cypress Swamp to the west, and flood control discharges from Pump Station S-9 and S-9A in western Broward County. Water stored within WCA-3A/3B is used to meet the principal water supply needs of adjacent areas, including water supply and salinity control requirements for Miami-Dade County; irrigation requirements for LEC Agricultural Self-Supply; and environmental water supply for Everglades National Park. The regulation schedule for WCA-3A was established by the USACE (1996). A regulation schedule is not used for WCA-3B because of high seepage rates. Flows from WCA-3A and WCA-3B enter the northern boundaries of Everglades National Park through a series of water management structures and culverts located under Tamiami Trail (U.S. Highway 41).

Concern for the Cape Sable Seaside Sparrow, an endangered species, prompted the USACE to revise the regulation schedule for WCA-3A and the South Dade Conveyance System in 2002. The purpose of the new schedule, known as the Interim Operating Plan (IOP), was to reduce damaging high water levels within sparrow habitat west of Shark River Slough to the extent possible through water management operations. The IOP improves the opportunity for nesting during the sparrow breeding season. The IOP is accomplished through construction of water control structures associated with the C-111 and Modified Water Deliveries project, a regulation schedule that manages releases from WCA-3A into Shark River Slough, and releases to the South Dade Conveyance System.

In 2009, the USACE and the U. S. Fish and Wildlife Service (USFWS) began a review of the effects of the IOP on threatened and endangered species from 2002–2009. The review focused on operational flexibility within the IOP that would improve conditions for the Everglade snail kite and wood stork in WCA-3A, as well as Cape Sable Seaside Sparrow habitat in Everglades National Park. A series of water depth recommendations were developed for WCA-3A that address the needs of the snail kite, apple snail, and vegetation characteristics of their habitat. These recommendations, proposed as part of the USFWS Multi-Species Management Strategy, form the basis for the proposed revisions to the regulation schedule known as the Everglades Restoration Transition Plan (ERTP).

The ERTP also includes revisions to the WCA-3A regulation schedule to address stakeholder concerns about high water levels in WCA-3A and discharge limitations of the S-12 spillways. Based on a review and analyses conducted in 2010, the USACE identified the 1960 WCA-3A 9.5 to 10.5 feet NGVD Regulation Schedule as interim measure water management criteria for WCA-3A Zone A. These interim criteria and the application of the performance measures and ecological targets addressing endangered species conditions that comprise the ERTP have been documented in the final draft of the ERTP Environmental Impact Statement and Water Control Plan (USACE 2011), released for public and agency review in December 2011. A Record of Decision is pending and expected later in 2012.

Current regulation schedules and daily water levels are available at http://www.saj.usace.army.mil. More information about the WCAs can be found in Chapter 2 of the *South Florida Environmental Report– Volume I*, available from http://www.sfwmd.gov/sfer.

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Everglades National Park

Established in 1934 and expanded in 1989, Everglades National Park is the nation's second-largest national park covering over 2,300 square miles. The park is home to a wide variety of species, including some classified as threatened or endangered by the federal government, and has several international preserve-style designations.

Everglades National Park

Much of the water that enters the park from the WCAs flows in a southwest arc through Shark River Slough to Whitewater Bay and the Ten Thousand Islands area. Some water enters through S-12s, S-333, S-343A, S-343B, and S-344 structures. Some water enters the panhandle of Everglades National Park via the S-332D pump station and Taylor Slough or through intentional breaches in the lower C-111 Canal, which were created downstream of structure S-18C. Some water enters through S-12s, S-333, S-34A, S-343B, and S-344 structures. Water is encouraged to remain in Taylor Slough, an important tributary to northeastern Florida Bay, by a series of pumped seepage management features located east of the park's eastern boundary, collectively known as the C-111 South Dade Project.

In addition to the Whitewater Bay and the Ten Thousand Islands area, much of the water entering Everglades National Park ends up in Florida Bay. Florida Bay receives water that passes though the park's numerous tidal creeks and coastal wetlands, including mangrove and buttonwood forests, salt marshes, and coastal prairies, all of which are subject to the influence of salinity from tidal action.

Lower East Coast Canals and Service Areas

The Northwest Fork of the Loxahatchee River is hydrologically considered in the LEC Planning Area because the river's watershed includes a broad area of northern Palm Beach County. The Northwest Fork of the Loxahatchee River flows north into Martin County, continues north and bends east through Jonathan Dickinson State Park. It then flows southeast back into Palm Beach County, where it enters the central embayment area of the Loxahatchee Estuary. The Northwest Fork receives important inflows from three major tributaries, Cypress Creek, Hobe Grove Ditch, and Kitching Creek.

Grassy Waters Preserve (formerly known as the City of West Palm Beach's Water Catchment Area) provides the water resource for Public Water Supply in the City of West Palm Beach, Town of Palm Beach, Town of South Palm Beach, and surrounding unincorporated areas.

Flood control and water management structures extend from St. Lucie County southward through Martin, Palm Beach, and Broward counties to Miami-Dade County, a distance along the coast of about 170 miles. The coastal canals and water control structures are designed to permit rapid removal of storm water in adjacent drainage areas. The degree of flood protection provided by outlet capacity depends on whether the protected area is urban or agricultural.

The South Dade Conveyance System (SDCS) was added to the existing flood control system to deliver water to areas in south Miami-Dade County. The main design functions of these project canals and structures are to: 1) control flooding; 2) store water in the WCAs; 3) control water elevations; and 4) provide water for Everglades National Park and agriculture in south Miami-Dade County.

For purposes of water supply planning and operations, the SFWMD divides the LEC Planning into the following four service areas:

- **North Palm Beach** Includes all the coastal and inland portions of northern Palm Beach County east of the EAA and north of the West Palm Beach Canal (C-51) Basin. The Southern L-8 Basin and M-Canal/Water Catchment Area basins are in this service area. Natural areas within the North Palm Beach Service Area include DuPuis Reserve, J.W. Corbett Water Management Area, Grassy Waters Preserve, Loxahatchee Slough, Loxahatchee River, and Pal-Mar.

L-8 Reservoir

- **LEC Service Area 1** Includes the portion of Palm Beach County east of WCA-1 and a small portion of northern Broward County. The C-51 Canal and Hillsboro Canal basins are in this service area.
- **LEC Service Area 2** Includes the portion of Broward County east of the WCAs and south of the Hillsboro Canal Basin to the C-9 Basin in northern Miami-Dade County.
- **LEC Service Area 3** Includes the portion of Miami-Dade County south of the C-9 Basin, east of WCA-3B and east of Everglades National Park.

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Other Basins within the LEC Planning Area

The C-139 and the Feeder Canal basins in Hendry County are not within the Lake Okeechobee Basin, but are within the LEC Planning Area.

C-139 Basin

The 170,000-acre C-139 Basin is an agricultural area in Hendry County that drains into the Everglades Protection Area. Stormwater runoff enters the northwest corner of WCA-3A in Broward County via stormwater treatment areas.

Feeder Canal Basin

The Feeder Canal Basin is located in Hendry County and divided into three major areas: 1) the McDaniel Ranch area or North Feeder Subbasin (four private property owners), with a total area of 23,150 acres; 2) the West Feeder Subbasin (about 30 private owners) with a total area of 31,900 acres; and 3) a portion of the Big Cypress Seminole Indian Reservation (13,850 acres). The two major canals in this basin are the North Feeder Canal and the West Feeder Canal. These canals merge in the southeastern corner of the basin and discharge south to the L-28 Interceptor Canal and eventually to WCA-3. The Seminole Tribe relies on the Feeder Canal for their water supply.

Basins with Significant Relationship to the LEC Planning Process

St. Lucie Canal and Caloosahatchee River

The St. Lucie Canal (C-44 Canal) in the Upper East Coast (UEC) Planning Area and the Caloosahatchee River (C-43 Canal) in the Lower West Coast (LWC) Planning Area are outside the boundaries of the LEC Planning Area. Because of their hydraulic connection to Lake Okeechobee, these basins are included in the LEC planning process in addition to the UEC and LWC planning processes.

Groundwater Resources

Two aquifer systems, the surficial aquifer system (SAS) and the Floridan aquifer system (FAS), underlie the LEC Planning Area. The Biscayne aquifer is part of the SAS in the southern region. Virtually all of the Public Water Supply in the LEC Planning Area comes from groundwater. The only surface water users for Public Water Supply are Okeechobee County and the City of West Palm Beach, which also serves the Town of Palm Beach, Town of South Palm Beach, and surrounding unincorporated areas. Surface water is very important for recharging the Biscayne aquifer during the dry season.

Figure 23 illustrates a generalized cross-section of the hydrogeology of south Florida, depicting the aquifers. **Table 31** presents the groundwater systems, hydrogeologic units, and relative aquifer yields in the LEC Planning Area.

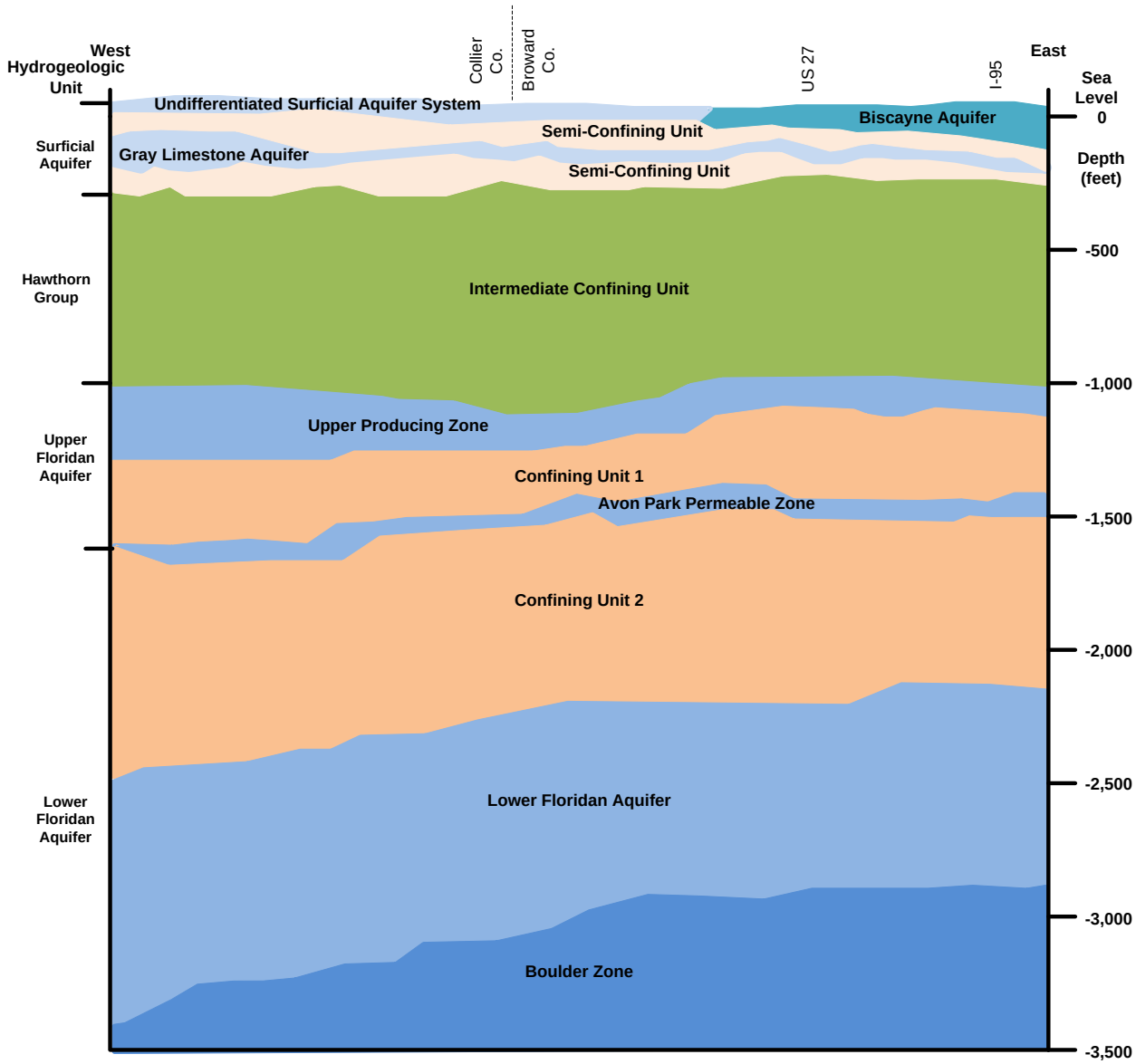

Figure 23. Generalized hydrogeologic cross-section of the Lower East Coast Planning Area.

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Table 31. Groundwater systems in the Lower East Coast Planning Area.

Aquifer System	Hydrogeologic Unit	Aquifer Yield L=Low M=Moderate H=High		
		Miami-Dade	Broward	Palm Beach
Surficial Aquifer System	Biscayne Aquifer	H	H	M
	Undifferentiated Surficial Aquifer System	M	M	L-M
Floridan Aquifer System	Upper Floridan Aquifer	M	M	M-H
	Lower Floridan Aquifer	M-H	M-H	M-H

Surficial Aquifer System

The SAS, which extends throughout southeast Florida, provides fresh water for Public Water Supply and supplemental irrigation uses within the LEC Planning Area. The SAS is an unconfined aquifer system composed of solutioned limestone, sandstone, sand shell, and clayey sand, and includes sediments from the water table down to the intermediate confining unit (Hawthorn Group). The SAS sediments have a wide range of permeability, and have been locally divided into aquifers separated by less permeable units. The best known of these is the Biscayne aquifer, which extends south from coastal Palm Beach County through most of Broward and Miami-Dade counties and into portions of southeastern Monroe County. Transmissivities of the surficial aquifer system vary locally, but have a recognizable areal trend. Estimated values generally are about 300,000 feet squared per day or greater in nearly all of central and eastern Miami-Dade County. Transmissivity is lower to the west, decreasing to less than 75,000 feet squared per day in western Miami-Dade County. High transmissivity usually is associated with thick sections of the Fort Thompson Formation within the Biscayne aquifer (Fish and Stewart 1991).

Biscayne Aquifer

The Biscayne aquifer (**Figure 24** and **Figure 25**) is composed of interbedded, unconsolidated sands and shell units with varying thickness of consolidated, highly solutioned limestone and sandstone. In general, the Biscayne aquifer contains less sand and more solutioned limestone than most of the SAS.

The major geologic deposits comprising the Biscayne aquifer include Miami Limestone, the Fort Thompson Formation, the Anastasia Formation, and the Key Largo Limestone. The base of the Biscayne aquifer is generally the contact between the Fort Thompson Formation and the underlying Tamiami Formation of Plio-Miocene Age. However, in places where the upper unit of the Tamiami Formation contains highly permeable limestones and sandstones, the zones are also considered part of the Biscayne aquifer if the thickness exceeds 10 feet.

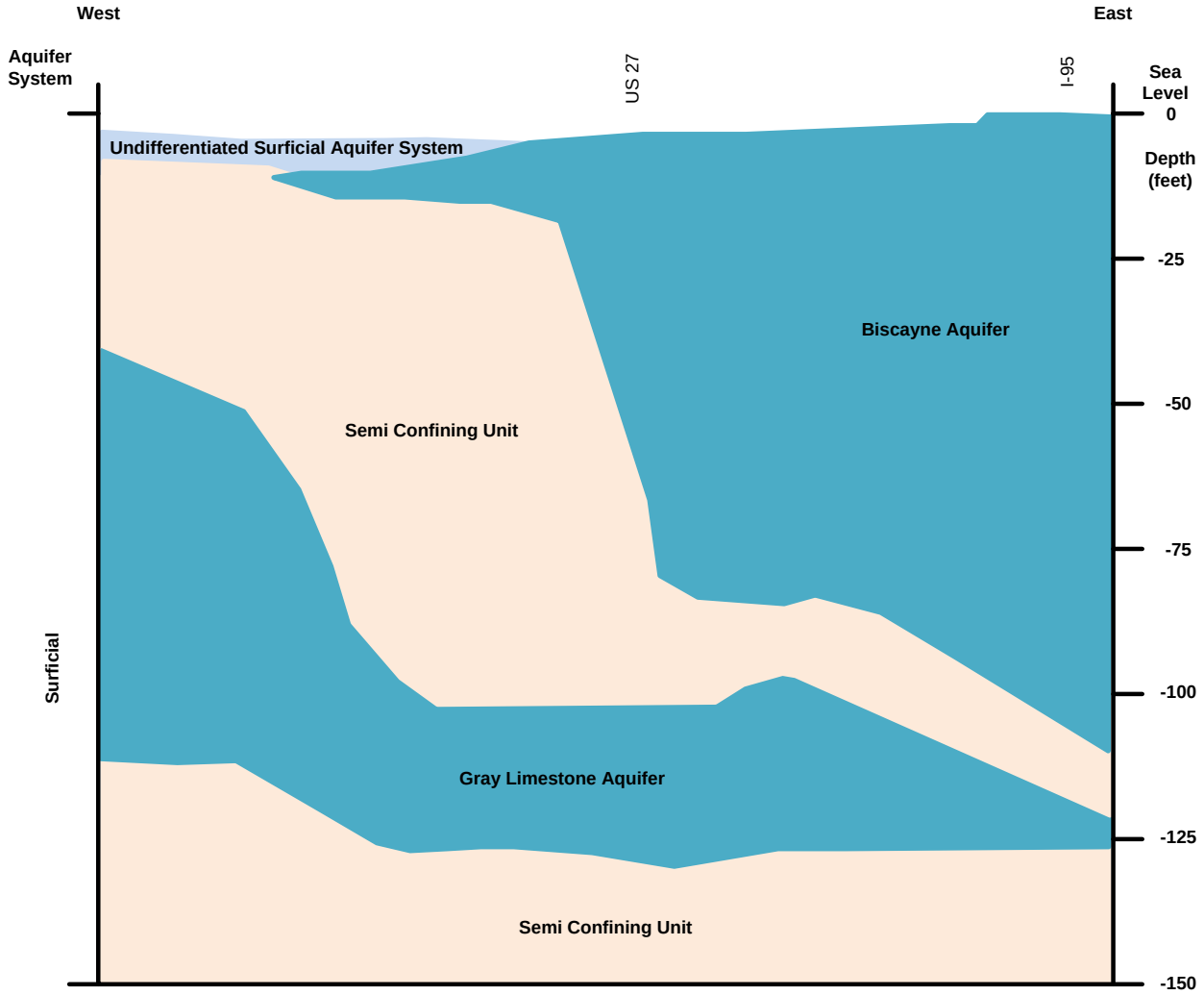

Figure 24. Generalized hydrogeologic cross-section of the surficial aquifer system.

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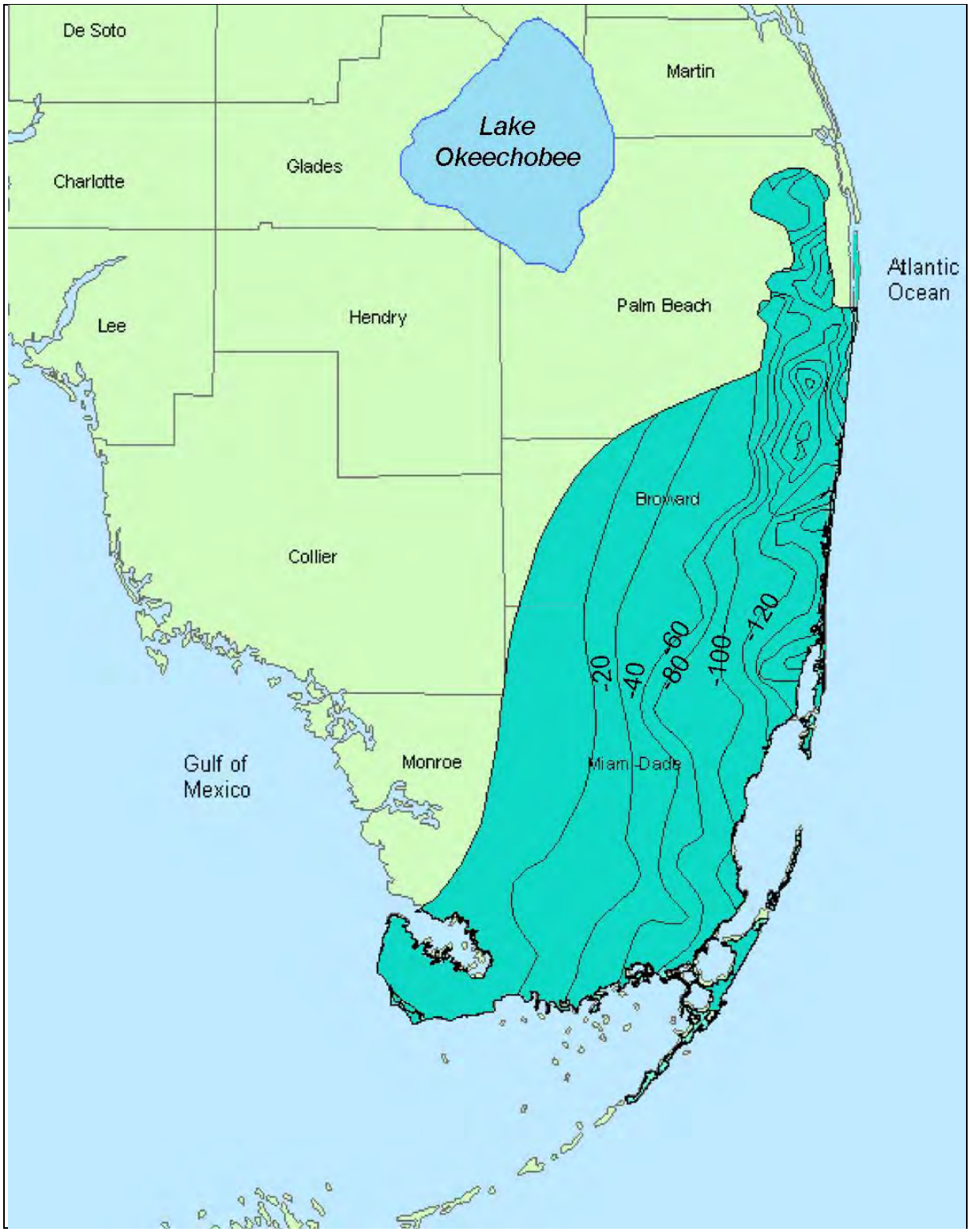

Figure 25. Location of the highly transmissive Biscayne aquifer (dark green) in eastern Miami-Dade, Broward, and Palm Beach counties with average aquifer depth in feet below mean sea level. Compiled from Restrepo et al. 1992, Fish and Stewart 1991, and Shine, Padgett, and Barfknecht 1989.

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Gray Limestone Aquifer

The gray limestone aquifer lies below and west of the Biscayne aquifer, extending into Hendry and Collier counties. For most of its extent, the gray limestone aquifer is confined by sand, clayey sand, mudstone, and clays of low hydraulic conductivity (Reese and Cunningham 2000). The thickness of the aquifer is comparatively uniform, generally ranging from 30 to 100 feet. Transmissivity values of the aquifer are commonly greater than 50,000 feet squared per day to the west of Miami-Dade and Broward counties. The hydraulic conductivity of the gray limestone aquifer generally increases from east to west, and ranges from approximately 200 feet to 12,000 feet per day.

INFO

Due to the regional importance of the Biscayne aquifer, it is designated as a Sole Source Aquifer by the U.S. Environmental Protection Agency, under the *Safe Drinking Water Act*. This stringent protection is necessary because the Biscayne aquifer is a principal source of drinking water and is highly susceptible to contamination and saltwater intrusion due to its high permeability and proximity to land surface in many locations.

Intermediate Confining Unit

The intermediate confining unit (ICU) consists of beds of clay, sand, sandy limestone, limestone, and dolostone that dip and thicken to the south and southwest. In much of south Florida, the ICU separates the SAS from the Upper Floridan aquifer. The ICU achieves its maximum development within the LEC, ranging from 600 feet to over 900 feet thick within the planning area.

Floridan Aquifer System

The Floridan aquifer system (FAS) is a confined aquifer system separated from the SAS by the low permeability sediments of the ICU. Within the LEC Planning area, the FAS is composed of a thick sequence (greater than 2,700 feet) of carbonate rocks (limestones and dolostones). However, not all of this thickness is useful for water supply. The FAS is more properly thought of as many discrete aquifers, or productive intervals, separated by lower permeability confining units. Traditionally, the FAS is subdivided into two major, regionally continuous producing zones, the brackish Upper Floridan aquifer (UFA) and more saline Lower Floridan aquifer (LFA), separated by a middle confining unit (**Figure 23**, confining unit 2).

The top of the FAS, which is coincident with the top of the UFA, can be found at depths from approximately 750 feet to 1,100 feet below MSL in the LEC Planning Area. It is shallowest in the northwestern corner of Palm Beach County, and deepens to the south and east. The UFA is under artesian pressure in the LEC Planning Area. The potentiometric heads range from 30 feet to 50 feet above MSL. Although the potentiometric surface of the aquifer is above land surface, the low-permeability units of the ICU prevent significant upward migration of saline waters into the shallower aquifers. This massive confining unit also serves as a

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protective barrier, isolating surface features from the drawdown effects of FAS withdrawals.

The UFA is composed of limestones from the Suwannee, Ocala, and Upper Avon Park formations. Permeability in these rocks is primarily due to the dissolution of rock material. Carbonate dissolution occurs most rapidly where waters of different chemistry meet. As a result, permeability in the UFA tends to increase from west to east, with the greatest productivity occurring in coastal areas. Salinity follows a similar trend, with the greatest salinity in coastal areas.

The UFA can be further divided into two regional sub-units, the upper producing zone at the top of the FAS and the Avon Park permeable zone in the upper portion of the Avon Park Formation. These two productive horizons are separated by an intervening confining unit (**Figure 23**, confining unit 1). Heads in these two units are very similar, but productivity and salinity may vary considerably. Generally, salinity within the FAS increases with depth, but in the LEC Planning Area, this relationship is inverted in several places, with greater salinity in the upper producing zone than in the Avon Park permeable zone. Throughout the LEC Planning Area, water from all portions of the UFA is non-potable due to salinity, requiring desalination or blending to meet potable standards.

The LFA comprises the limestones and dolostones of the Lower Avon Park, Oldsmar, and Upper Cedar Keys formations. Salinity within the LFA is greater than 10,000 milligrams per liter (mg/L) total dissolved solids, the designated cut-off for an underground source of drinking water. Though not generally considered useful as a water supply source, the LFA still provides some water supply benefit. Because of its salinity, the LFA has been eligible as a repository for underground injection of high-salinity by-product from reverse-osmosis treatment. The LFA is also suitable as a primary means for effluent disposal for several wastewater treatment facilities. At the base of the LFA, cavernous zones with extremely high transmissivities, collectively known as the Boulder Zone, are the target storage interval for these deep injection wells.

Surface Water and Groundwater Relationships

In many ways, surface water and groundwater resources are interdependent. Although surface water management systems are a major source of water supply, in terms of interaction with groundwater, the systems within the LEC Planning Area function primarily as aquifer drains during certain times of the year. Surface water management systems also affect aquifer recharge by diverting rainfall from an area before it has time to percolate down to the water table. Once diverted, this water may contribute to aquifer recharge elsewhere in the system, supply a downstream consumptive use, may be lost to evapotranspiration, or is discharged to tide.

The groundwater hydrology of the LEC Planning Area has been permanently altered by construction of the C&SF Project, as well as urban and agricultural development. These

canals have drained both the upper portion of the Biscayne aquifer and the freshwater mound behind the coastal ridge. This has resulted in a significant decline in groundwater flow toward the ocean and, consequently, has allowed the inland migration of the saline interface in some areas. The inland movement of salt water is a major concern in the coastal areas of the LEC Planning Area. Coastal canal water control structures constructed in the 1950s has helped stabilize or slow the advance of saltwater intrusion, although isolated areas still show evidence of continued inland migration of salt water.

ECOSYSTEM RESTORATION EFFORTS

Information about ecosystem restoration efforts for the LEC Planning Area is available in the 2013 LEC Plan Update (SFWMD 2013a).

More information and the status of these restoration projects can be found in the *South Florida Environmental Report* available from http://www.sfwmd.gov/sfer. Project descriptions, status, and further documentation about other projects are available from http://www.evergladesplan.org, http://www.sfwmd.gov/northerneverglades, and http://www.sfwmd.gov/everglades.

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Storm over the Everglades

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Glossary

1-in-10 year drought A drought of such intensity that it is expected to have a return frequency of once in 10 years. A drought in which below normal rainfall occurs, and has a 90 percent probability of being exceeded over a 12-month period. A drought event that results in an increase in water demand to a magnitude that would have a 10 percent probability of being exceeded during any given year. (See also *Level of certainty.*)

2008 Lake Okeechobee Regulation Schedule (2008 LORS) An interim schedule of required water levels by season and meteorological condition for Lake Okeechobee during evaluation and repairs to the Herbert Hoover Dike.

A

Acre-foot The volume of water that covers 1 acre to a depth of 1 foot; 43,560 cubic feet; 1,233.5 cubic meters; or 325,872 gallons, which is approximately the amount of water it takes to serve two typical families for one year.

Alternative water supply Salt water; brackish surface water and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater, water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; conservation programs; and any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan (Section 373.019, F.S.).

Applicant's Handbook From the District's publication, *Applicant's Handbook for Water Use Permit Applications* (SFWMD 2014). Read in conjunction with Chapter 40E-2, F.A.C., the Applicant's Handbook further specifies the general procedures and information used by District staff for review of water use permit applications with the primary goal of meeting District water resource objectives.

Aquatic Preserve Water body set aside by the state to be maintained in essentially natural or existing condition for the protection of fish, wildlife, and public recreation so that their aesthetic, biological, and scientific values may endure for the enjoyment of future generations.

Aquifer A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Aquifer storage and recovery (ASR) The underground storage of storm water, surface water, fresh groundwater, or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells during wet periods. The aquifer (typically the Floridan aquifer system in south Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is stored with the intent to later recover it for use in the future during dry periods.

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Aquifer system A heterogeneous body of (interbedded or intercalated) permeable and less permeable material that functions regionally as a water yielding hydraulic unit and may be composed of more than one aquifer separated at least locally by confining units that impede ground-water movement, but do not greatly affect the hydraulic continuity of the system.

Artesian A commonly used expression in aquifer discussions, generally synonymous with "confined" and referring to subsurface (ground) bodies of water which, due to underground drainage from higher elevations and confining layers of soil material above and below the water body (referred to as an artesian aquifer), result in underground water at pressures greater than atmospheric.

B

Base flow Sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced streamflows. Natural base flow is sustained largely by groundwater discharges.

Baseline A specified period of time during which collected data are used for comparison with subsequent data.

Basin (groundwater) A hydrologic unit containing one large aquifer or several connecting and interconnecting aquifers.

Basin (surface water) A tract of land drained by a surface water body or its tributaries.

Below land surface (bls) Depth below land surface regardless of land surface elevation.

Best management practice (BMP) A practice or combination of practices, based on research, field testing, and expert review, determined to be the most effective and practicable on-farm means of improving water quality in agricultural discharges to a level that balances water quality improvements and agricultural productivity. BMPs may also include measures that reduce on-farm water use, such as tailwater recovery and the use of drought-resistant crops.

Biscayne aquifer A portion of the surficial aquifer system, which provides most of the fresh water for Public Water Supply and agriculture within Miami-Dade, Broward, and southeastern Palm Beach County. It is highly susceptible to contamination due to its high permeability and proximity to land surface in many locations.

Boulder Zone A highly transmissive, cavernous zone of limestone within the Lower Floridan aquifer used to dispose of secondary-treated effluent from wastewater treatment facilities and concentrate from membrane water treatment facilities via deep injection wells.

C

Central and Southern Florida Flood Control Project (C&SF Project) A complete system of canals, storage areas, and water control structures spanning the area from Lake Okeechobee to both the east and west coasts and from Orlando south to the Everglades. It was designed and

constructed during the 1950s by the U.S. Army Corps of Engineers (USACE) to provide flood control and improve navigation and recreation.

Central Florida Coordination Area (CFCA) The area of central Florida where the boundaries of the South Florida, Southwest Florida, and St. Johns River water management districts meet. Mechanisms for formal coordination and communication were established between the districts in 2006.

Central Florida Water Initiative (CFWI) A collaborative approach to resolve water supply technical and policy issues within the CFCA and address the limitations of the 2006 CFCA Action Plan, while still fulfilling the plan's original water resource objectives.

Coastal Utilities at Risk Utilities with wellfields near the saltwater interface that do not have an inland wellfield, have not developed adequate alternative sources of water, and have limited ability to meet user needs through interconnects with other utilities.

Coastal Utilities of Concern Utilities having wellfields near the saltwater interface, the ability to shift pumpages to an inland wellfield, or an alternative source that is not threatened by saltwater intrusion.

Comprehensive Everglades Restoration Plan (CERP) The federal-state framework and guide for the restoration, protection, and preservation of the south Florida ecosystem. The CERP also provides for water-related needs of the region, such as water supply and flood protection.

Confined aquifer Water-bearing stratum of permeable rock, sand, or gravel overlaid by a thick, impermeable stratum. An aquifer that contains groundwater, which is confined under pressure and bounded between significantly less permeable materials, such that water will rise in a fully penetrating well above the top of the aquifer. In cases where the hydraulic head is greater than the elevation of the overlying land surface, a fully penetrating well will naturally flow at the land surface without means of pumping or lifting.

Confining unit A body of significantly less permeable material than the aquifer, or aquifers, that it stratigraphically separates. The hydraulic conductivity may range from nearly zero to some value significantly lower than that of the adjoining aquifers, and impedes the vertical movement of water.

Conservation rate structure A water rate structure that is designed to conserve water. Examples of conservation rate structures include, but are not limited to, increasing block rates, seasonal rates, and quantity-based surcharges.

Consumptive use Any use of water that reduces the supply from which it is withdrawn or diverted.

Consumptive use permitting (CUP) The issuance of permits by the SFWMD, under authority of Chapter 40E-2, F.A.C., allowing withdrawal of water for consumptive use.

Cost Study *Water Supply Cost Estimation Stud*y, a *c*omprehensive study of the costs associated with various alternative water supply options conducted by Camp, Dresser & McKee, Inc., under contract to the South Florida Water Management District.

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Cryptosporidium A protozoan parasite that infects the intestinal tracts of humans and other vertebrates.

Culvert Conveyance structure that provides a means for water to pass under a road or railroad.

D

Demand management Reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, reduce waste of water, alter land management practices, and/or alter land uses.

Desalination A process that treats saline water to remove or reduce chlorides and dissolved solids, resulting in the production of fresh water.

Detention The delay of stormwater runoff prior to discharge into receiving waters.

Dike An embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee.

Discharge The rate of water movement past a reference point, measured as volume per unit time (usually expressed as cubic feet or cubic meters per second).

Disinfection The process of inactivating microorganisms that causes disease. All potable water requires disinfection as part of the treatment process prior to distribution. Disinfection methods include chlorination, ultraviolet (UV) radiation, and ozonation.

Disposal Effluent disposal involves the wasteful practice of releasing treated effluent back to the environment using ocean outfalls, surface water discharges, and deep injection wells.

Dissolved oxygen The concentration of oxygen dissolved in water, sometimes expressed as percent saturation, where saturation is the maximum amount of oxygen that theoretically can be dissolved in water at a given altitude and temperature.

District Water Management Plan (DWMP) Regional water resource plan developed by the District under Section 373.036, F.S.

Domestic Self-Supply (DSS) The water demand use category that includes water used by households whose primary sources of water are private wells or water treatment facilities with pumpages of less than 0.1 million gallons per day.

Domestic use Use of water for household purposes, such as drinking, bathing, cooking, or sanitation.

Domestic wastewater Wastewater derived principally from residential dwellings, business or commercial buildings, institutions, and the like; sanitary wastewater; sewage.

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Downstream augmentation Use of reclaimed water downstream of the point of treatment and discharge for indirect potable and nonpotable projects, such as wellfield recharge, wetland rehydration, applicable irrigation, and maintaining Minimum Flows and Levels.

Drainage basin Describes the land area where precipitation ultimately drains to a particular watercourse (river, stream) or body of water (lake, reservoir). Drainage basins in south Florida are defined by Rule and are periodically redefined to reflect changes in the regional drainage network.

Drainage District A locally constituted drainage, water management, or water control district created by a special act of the legislature and authorized under Chapter 298 F.S., to constrict, complete, operate, maintain, repair, and replace all works needed to implement an adopted water control plan.

Drawdown (1) The vertical distance between the static water level and the surface of the cone of depression. (2) A lowering of the ground-water surface caused by pumping.

Drought A period of below average rainfall, typically longer than a few months, that adversely affects growing or living conditions.

E

Ecosystem restoration The process of reestablishing to as near its recent natural condition as possible, the structure, function, and composition of an ecosystem.

Effluent Water that is not reused after flowing out of any facility or other works used for the purpose of treating, stabilizing, or holding wastes. Effluent is “disposed” of.

Electrodialysis Dialysis that is conducted with the aid of an electromotive force applied to electrodes adjacent to both sides of a water treatment membrane.

Elevation The height in feet above mean sea level according to National Geodetic Vertical Datum (NGVD) or North American Vertical Datum (NAVD). May also be expressed in feet above mean sea level.

Endangered species A species that is in danger of extinction throughout all or a significant portion of its range.

Estuary A partially enclosed part of the wide lower course of a river where its current is met by open ocean tides or an arm of the sea; where riverine fresh and oceanic salt water meet.

Evapotranspiration (ET) The total loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Everglades America’s Everglades is a vast subtropical marsh and mangrove area noted for its wildlife and a critical part of southern Florida’s water supply. The Northern Everglades and Estuaries Protection Program (373.4595, F.S.) subdivided the Greater Everglades ecosystem into

northern and southern Everglades along the Caloosahatchee and St. Lucie rivers and Lake Okeechobee.

Everglades Agricultural Area (EAA) Highly productive agricultural land, the EAA is an area of histosols (muck) extending south from Lake Okeechobee to the northern levee of Water Conservation Area 3A, from the EAA's eastern boundary at the L-8 Canal to the western boundary along the L-1, L-2, and L-3 levees.

Everglades Construction Project (ECP) Twelve interrelated construction projects located between Lake Okeechobee and the Everglades. The cornerstone of the ECP is the Everglades Stormwater Treatment Areas (Everglades STAs). The STAs are constructed wetlands intended to reduce phosphorus in waters that discharge to the Everglades Protection Area. The ECP also contains four hydropattern restoration projects designed to improve the volume, timing, and distribution of water entering the Everglades.

Everglades Protection Area This area comprises the Arthur R. Marshall Loxahatchee National Wildlife Refuge, Water Conservation Areas, and Everglades National Park.

Exceedance The violation of the pollutant levels permitted by environmental protection standards.

Existing legal use of water A water use that is authorized under a District water use permit or is existing and exempt from permit requirements.

F

Feasibility study The phase of a project where the purpose is to describe and evaluate alternative plans and fully describe a recommended project.

Filtration The method by which water treatment facilities physically remove constituents to improve water quality for Public Water Supply, irrigation, or other uses.

Finished water Water that has completed a purification or treatment process; water that has passed through all the processes in a water treatment facility and is ready to be delivered to consumers. Contrast with *raw water*.

Fiscal Year (FY) The South Florida Water Management District's fiscal year begins on October 1 and ends on September 30 the following year.

Floodplain Land next to a stream or river that is flooded during high-water flow.

Florida Administrative Code (F.A.C.) The Florida Administrative Code is the official compilation of the administrative rules and regulations of state agencies.

Florida Department of Agriculture and Consumer Services (FDACS) The FDACS is the state agency that communicates the needs of the agricultural industry to the Florida legislature, the FDEP, and the water management districts. The FDACS is also charged with handling general consumer problems, such as complaints against businesses. The FDACS oversees Florida's Soil and

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Water Conservation districts, which coordinate closely with the U.S. Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS).

Florida Department of Environmental Protection (FDEP) The FDEP is the state agency charged with protecting, conserving, and managing Florida's natural resources and enforcing the state's environmental laws. The SFWMD operates under the general supervisory authority of the FDEP, which includes budgetary oversight.

Florida-Friendly Landscaping Quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection. Additional components include practices such as landscape planning and design, soil analysis, the appropriate use of solid waste compost, minimizing the use of irrigation, and proper maintenance.

Florida Statutes (F.S.) The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

Florida Water Plan State-level water resource plan developed by the FDEP under Section 373.036, F.S.

Floridan aquifer system (FAS) A highly used aquifer system composed of the Upper Floridan and Lower Floridan aquifers. It is the principal source of water supply north of Lake Okeechobee, and the Upper Floridan aquifer is used for drinking water supply in parts of Martin and St. Lucie counties. From Jupiter to south Miami, water from the FAS is mineralized (total dissolved solids are greater than 1,000 mg/L) along coastal areas and in southern Florida.

G

Geologic unit A geologic unit is a volume of rock or ice of identifiable origin and age range that is defined by the distinctive and dominant, easily mapped and recognizable petrographic, lithologic, or paleontologic features that characterize it.

Geophysical log A record of the structure and composition of the earth with depth encountered when drilling a well or similar type of test or boring hole.

Governing Board Governing Board of the South Florida Water Management District.

Groundwater Water beneath the surface of the ground, whether or not flowing through known and definite channels. Specifically, that part of the subsurface water in the saturated zone, where the water is under pressure greater than the atmosphere.

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H

Harm As defined in Rule 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface or groundwater hydrology and takes a period of one to two years of average rainfall conditions to recover.

Headwaters 1) Water that is typically of higher elevation (with respect to tailwater) or on the controlled side of a structure, 2) The waters at the highest upstream point of a natural system that are considered the major source waters of the system.

Hydraulic conductivity A coefficient of proportionality describing the rate at which water can move through an aquifer or other permeable medium.

Hydrogeologic unit Any rock unit or zone that, because of its hydraulic properties, has a distinct influence on the storage or movement of groundwater.

Hydropattern Water depth, duration, timing, and distribution of fresh water in a specified area. A consistent hydropattern is critical for maintaining various ecological communities in wetlands.

Hydroperiod The frequency and duration of inundation or saturation of an ecosystem. In the context of characterizing wetlands, the term hydroperiod describes that length of time during the year that the substrate is either saturated or covered with water.

Hypersaline Salinity conditions that are above what is typical of open marine conditions. Salinity conditions in excess of typical marine conditions.

I-J-K

Impoundment Any lake, reservoir, or other containment of surface water occupying a depression or bed in the earth's surface and having a discernible shoreline.

Indian River Lagoon (IRL) Extending for 156 miles from north of Cape Canaveral to Stuart along the east coast of Florida, this lagoon is one of America's most diverse estuaries, home to thousands of plant and animal species.

Industrial/Commercial/Institutional (ICI) Self-Supply The water demand use category that includes water used by industrial, commercial, or institutional operations withdrawing a minimum water quantity of 0.1 million gallons per day from individual, on-site wells.

Infiltration The movement of water through the soil surface into the soil under the forces of gravity and capillarity.

Injection well Refers to a well constructed to inject treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage in a designated aquifer. Injection wells are generally drilled below freshwater levels, or into unused aquifers or aquifers that do not deliver drinking water.

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Inorganic Involving neither organic life nor the products of organic life; relating to or composed of chemical compounds not containing hydrocarbon groups.

Institute of Food and Agricultural Sciences (IFAS) Agricultural branch of the University of Florida that performs research, education, and extension.

Interbedded Said of beds lying between or alternating with others of different character; esp. said of rock material laid down in sequence between other beds, such as a contemporaneous lava flow "interbedded" with sediments.

Intermediate aquifer system (IAS) This aquifer system consists of five zones of alternating confining and producing units. The producing zones include the Sandstone and Mid-Hawthorn aquifers.

Invasive species Species of plants or animals that are not naturally found in a region (see also *Nonindigenous*). They can sometimes aggressively invade habitats and cause multiple ecological changes, including the displacement of native species.

Irrigation audit A procedure in which an irrigation systems application rate and uniformity are measured.

Irrigation efficiency The average percent of total water pumped or delivered for use that is delivered to the root zone of a plant.

Irrigation system efficiency A measure of the effectiveness of an irrigation system in delivering water to a crop for irrigation and freeze protection purposes. It is expressed as the ratio of the volume of water used for supplemental crop evapotranspiration to the volume pumped or delivered for use.

Karst A topography formed over limestone, dolomite, or gypsum and characterized by sinkholes, caves, and underground drainage.

Kissimmee Chain of Lakes (KCOL) The Upper Kissimmee Basin is composed of a diverse group of wetland and lake ecosystems known as the Kissimmee Chain of Lakes. The Upper Basin contains hundreds of lakes and wetlands with the largest lakes occurring along the eastern boundary. These larger lakes include Lake Kissimmee, the third largest lake in the State of Florida. Collectively, these larger lakes are referred to as the Kissimmee Chain of Lakes.

L

Lagoon A body of water separated from the ocean by barrier islands, with limited exchange with the ocean through inlets.

Lake Management Area (LMA) The SFWMD conceptualizes the Kissimmee Basin as (1) a set of Water Control Units that conveys water, and (2) Water Control Catchments that drain into the Water Control Units. Lakes in the Kissimmee Chain of Lakes (KCOL) are organized into seven lake management areas comprising one or many Water Control Units.

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Landscape irrigation The outside watering of shrubbery, trees, lawns, grass, ground covers, vines, gardens, and other such flora, not intended for resale, which are planted and are situated in such diverse locations as residential and recreation areas, cemeteries, public, commercial and industrial establishments, and public medians and rights of way.

Leachate Liquid containing soluble substances that percolates through the ground, such as water seeping through a landfill.

Leaching The process by which soluble materials in the soil, such as salts, nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

Leakance The vertical movement of water from one aquifer to another across a confining zone or zones due to differences in hydraulic head. Movement may be upward or downward depending on hydraulic head potential in source aquifer and receiving aquifer. This variable is typically expressed in units of gallons per day per cubic foot.

Leak detection Systematic method to survey the distribution system and pinpoint the exact locations of hidden underground leaks.

Levee An embankment to prevent flooding or a continuous dike or ridge for confining the irrigation areas of land to be flooded.

Level of certainty A water supply planning goal to assure at least a 90 percent probability during any given year that all the needs of reasonable-beneficial water uses will be met, while also sustaining water resources and related natural systems during a 1-in-10 year drought event.

Littoral zone (1) The zone within a lake that is inundated at least part of the year by changes in lake stage and characterized by littoral wetland vegetation. (2) The area between the perimeter of lake or in shallow areas within a lake that is inundated year-round and contains emergent, floating-leaved, and submerged, rooted plants.

Lower pressure reverse osmosis A reverse osmosis technology where nanofiltration or other alternative membranes are used that result in the ability of a facility use lower pressure when pushing the water to be treated through the system (see also *Reverse osmosis*).

M

Marl A mixture of clays, carbonates of calcium and magnesium, and remnants of shells, forming a loam that is useful as a fertilizer.

Mean sea level (MSL) 1) The level of the surface of the sea between mean high and mean low tide; used as a reference point for measuring elevations. 2) The average height of the sea for all stages of the tide over a 19-year period, usually determined from hourly height observations on an open coast or in adjacent waters having free access to the sea. 3) (FEMA) For purposes of the National Flood Insurance Program (NFIP), the National Geodetic Vertical Datum (NGVD) of 1929 or other

datum, to which base flood elevations shown on a community's Flood Insurance Rate Map (FIRM) are referenced.

MFL Exceedance To fall below a minimum flow or level, which is established in Chpater 40E-8, F.A.C., for a duration greater than specified for the MFL water body.

Microconstituents Sometimes known as "emerging pollutants of concern," these are chemicals found in a wide array of consumer goods, including pharmaceuticals and personal care products (FDEP) that may end up in Public Water Supplies. Presence or absence of these may eventually have water quality criteria set for them.

Microfiltration A membrane separation process in which particles greater than about 20 nanometers in diameter are screened out of a liquid in which they are suspended.

Microirrigation The application of small quantities of water on or below the soil surface as drops or tiny streams of spray through emitters or applicators placed along a water delivery line. Microirrigation includes a number of methods or concepts, such as bubbler, drip, trickle, mist or microspray, and subsurface irrigation.

Minimum flow and level (MFL) The point at which further withdrawals will result in significant harm to water resources or ecology of the area. An MFL is established by a water management district pursuant to Sections 373.042 and 373.0421, F.S., for a given water body and set forth in Parts II and III of Chapter 373.

Model A computer model is a representation of a system and its operations, and provides a cost-effective way to evaluate future system changes, summarize data, and help understand interactions in complex systems. Hydrologic models are used for evaluating, planning, and simulating the implementation of operations within the SFWMD's water management system under different climatic and hydrologic conditions. Water quality and ecological models are also used to evaluate other processes vital to the health of ecosystems.

Monitor well Any excavation by any method to monitor fluctuations in groundwater levels, quality of underground waters, or the concentration of contaminants in underground waters.

N-O-P

National Geodetic Vertical Datum (NGVD) 1929 A geodetic datum derived from a network of information collected in the United States and Canada. It was formerly called the "Sea Level Datum of 1929" or "mean sea level." Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

Net water demand (or user/customer water demand) is the water demand of the end user after accounting for treatment and process losses, and inefficiencies. When discussing Public Water Supply, the term "finished water demand" is commonly used to denote net demand.

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Nonindigenous A nonnative species, especially one that tends to out-compete native species and become quickly established, especially in areas of disturbance or where the normal hydroperiod has been altered (see also *Invasive species*).

North American Vertical Datum (NAVD) of 1988 The official civilian vertical control datum (reference for elevation data) for surveying and mapping activities in the United States.

Nutrient loading Discharging of nutrients from the watershed (basin) into a receiving water body (lake, stream, wetland); expressed usually as mass per unit area per unit time (e.g., pounds/ acre/year).

Outlet An opening through which water can be freely discharged from a reservoir.

Overhead sprinkler irrigation A pressurized system, where water is applied through a variety of outlet sprinkler heads or nozzles. Pressure is used to spread water droplets above the crop canopy to simulate rainfall.

Overland flow The flow of rainfall or snowmelt over the land surface toward stream channels. After overland flow enters a watercourse, it becomes runoff.

Parameter Whatever it is you measure; a particular physical, chemical, or biological property that is being measured.

Parts per million (ppm) The number of "parts" by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations. Equivalent to a milligram per liter (mg/L).

Peak flow The maximum instantaneous discharge of a stream or river at a given location. Peak flow usually occurs at or near the time of maximum stage.

Peat Any mass of semi-carbonized vegetable tissue formed by partial decomposition in water of various plants, especially mosses of the genus *Sphagnum*. Peat varies in consistency from turf to slime. As it decomposes its color deepens, old peat being dark brown or black, and keeping little of the plant texture. According to its formation, it is known as Bog Peat (mosses), Heath Peat, or Meadow Peat (grasses and sedges), Forest Peat, or Wood Peat (trees), and Sea Peat (seaweeds).

Per capita use The average amount of water used per person during a standard time period, generally per day.

Percolation (1) The movement of water through the openings in rock or soil. (2) The entrance of a portion of the streamflow into channel materials to contribute to groundwater replenishment.

Performance measure Scientifically measurable indicator or condition that can be used as a target for meeting water resource management goals. Performance measures quantify how well or how poorly an alternative meets a specific objective. Good performance measures are quantifiable, have a specific target, indicate when a target has been reached, and measure the degree to which the goal has been met.

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Permeability The capacity of a porous rock, sediment, or soil for transmitting a fluid.

pH A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14.

Planning Area The SFWMD is divided into five areas within which planning activities are focused: Upper Kissimmee Basin (UKB), Lower Kissimmee Basin (LKB), Upper East Coast (UEC), Lower West Coast (LWC), and Lower East Coast (LEC).

Plume A body of contaminated groundwater originating from a specific source and influenced by such factors as the local groundwater flow pattern, density of contaminant, and character of the aquifer.

Pollutant loading Influx of a chemical or nutrient that contaminates air, soil, or water.

Porosity The percentage of the soil or rock volume that is occupied by pore space, void of material; defined by the ratio of voids to the total volume of a specimen.

Potable water Water that is safe for human consumption.

Potentiometric surface A surface that represents the hydraulic head in an aquifer and is defined by the level to which water will rise above a datum plane in wells that penetrate the aquifer.

Power Generation Self-Supply The water demand use category that describes the difference in the amount of water withdrawn by electric power generating facilities for cooling purposes and the water returned to the hydrologic system near the point of withdrawal.

Public Water Supply The water demand use category that includes finished water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages greater than 0.1 MGD.

Q-R

Raw water (1) Water that is direct from the source — groundwater or surface water — without any treatment. (2) Untreated water, usually that entering the first unit of a water treatment facility. Contrast with *finished water*.

Reasonable-beneficial use Use of water in such quantity as is needed for economic and efficient utilization for a purpose, which is both reasonable and consistent with the public interest.

Recharge (canal) The discharge of highly treated wastewater or reclaimed water into canals or surface water bodies for beneficial recharge of groundwater or downstream augmentation.

Recharge (groundwater) The natural or intentional infiltration of surface water into the ground to raise groundwater levels.

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Recharge (hydrologic) The downward movement of water through soil to groundwater; the process by which water is added to the zone of saturation; or the introduction of surface water or groundwater to groundwater storage, such as an aquifer. Recharge or replenishment of groundwater supplies consists of three types:

1) Natural recharge, which consists of precipitation or other natural surface flows making their way into groundwater supplies.

2) Artificial or induced recharge, which includes actions by man specifically designed to increase supplies in groundwater reservoirs through various methods, such as water spreading (flooding), ditches, and pumping techniques.

3) Incidental recharge, which consists of actions, such as irrigation and water diversion, which add to groundwater supplies, but are intended for other purposes. Recharge may also refer to the amount of water so added.

Recharge area (groundwater) The land area over which precipitation infiltrates into soil and percolates downward to replenish an aquifer; the area in which water reaches the zone of saturation by surface infiltration. Infiltration moves downward into the deeper parts of an aquifer in a recharge area. Also referred to as a recharge zone.

Reclaimed water Water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (Rule 62-610.200, F.A.C.).

Recovery The rate and extent of return of a population or community to some aspect(s) of its previous condition. Because of the dynamic nature of ecological systems, the attributes of a "recovered" system should be carefully defined.

Recreational/Landscape Self-Supply The water demand use category that includes water used for landscape and golf course irrigation. The landscape subcategory includes water used for parks, cemeteries, and other irrigation applications greater than 0.1 million gallons per day (MGD). The golf course subcategory includes those operations not supplied by a Public Water Supply or regional reuse facility.

Regional Water Supply Plan Update Detailed water supply plan developed by the District under Section 373.709, F.S., providing an evaluation of available water supply and projected demands, at the regional scale. The planning process projects future demand for 20 years and recommends projects to meet identified needs.

Restricted Allocation Area Area designated within the District for which allocation restrictions are applied regarding the use of specific sources of water. The water resources in these areas are managed in response to specific sources of water in the area for which there is a lack of water availability to meet the projected needs of the region from that specific source of water.

Retention The prevention of stormwater runoff from direct discharge into receiving waters; included as examples are systems that discharge through percolation, exfiltration, filtered bleed-down, and evaporation processes.

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Retrofit The replacement of existing water fixtures, appliances, and devices with more efficient fixtures, appliances, and devices for the purpose of water conservation.

Reuse The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as "reuse" or "effluent disposal" are contained in Rule 62-610.810, F.A.C. The term "reuse" is synonymous with "water reuse."

Reverse osmosis (RO) A membrane process for desalting water using applied pressure to drive the feedwater (source water) through a semipermeable membrane.

Rule Of or pertaining to regulatory programs of the District and other agencies, which are set forth as various prescribed guides for conduct, action, or criteria.

Runoff That component of rainfall, which is not absorbed by soil; intercepted and stored by surface water bodies; evaporated to the atmosphere; transpired and stored by plants; or infiltrated to groundwater, but which flows to a watercourse as surface water flow.

S

Saline water or saltwater interface The hypothetical surface of chloride concentration between fresh water and seawater where the chloride concentration is 250 mg/L at each point on the surface.

Saltwater intrusion The invasion of a body of fresh water by a body of salt water, due to its greater density. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by seawater, the upward migration of seawater into rivers and navigation channels, and the movement of seawater into freshwater aquifers along coastal regions.

Saturated zone The part of the subsurface that is saturated with water. The upper surface of this zone, open to atmospheric pressure, is known as the water table (phreatic surface).

SEAWAT A program developed to simulate three-dimensional, variable-density, transient groundwater flow in porous media. The source code for SEAWAT was developed by combining MODFLOW and MT3DMS into a single program that solves the coupled flow and solute-transport equations.

Seawater or **salt water** Water with a chloride concentration at or above 19,000 mg/L (Applicant's Handbook, SFWMD 2014).

Secondary wastewater treatment Treatment that follows primary wastewater treatment. It involves the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems, which generally removes 80 to 95 percent of the oxygen-demanding substances and suspended matter. Secondary wastewater treatment may be accomplished by biological or chemical-physical methods. Activated sludge and trickling filters are two of the most common means of secondary treatment. Disinfection is the final stage of secondary treatment.

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Seepage The passage of water or other fluid through a porous medium, such as the passage of water through an earth embankment or masonry wall. Groundwater emerging on the face of a stream bank; the slow movement of water through small cracks, pores, interstices, etc., of a material into or out of a body of surface or subsurface water. The interstitial movement of water that may take place through a dam, its foundation or its abutments. The loss of water by infiltration into the soil from a canal, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field. Seepage is generally expressed as flow volume per unit of time. During the process of priming (a field during initial irrigation), the loss is called absorption loss.

Seepage irrigation Irrigation that conveys water through open ditches. Water is either applied to the soil surface (possibly in furrows) and held for a period of time to allow infiltration, or is applied to the soil subsurface by raising the water table to wet the root zone.

Seepage irrigation system Irrigation which relies primarily on gravity to move the water over and through the soil, and does not rely on emitters, sprinklers or any other type of device to deliver water to the vicinity of expected plant use.

Self-Supply The water used to satisfy a water need, not supplied by a Public Water Supply utility.

Semi-confined aquifer A completely saturated aquifer that is bounded above by a semi-pervious layer, which has a low, though measurable permeability, and below by a layer that is either impervious or semi-pervious.

Serious harm As defined in Rule 40E-8.021, F.A.C., the long-term, irreversible, or permanent loss of water resource functions resulting from a change in surface water or groundwater hydrology.

Service area The geographical region in which a water supplier has the ability and the legal right to distribute water for use.

Significant harm As defined in Rule 40E-8.021, F.A.C., the temporary loss of water resource functions that result from a change in surface water or groundwater hydrology and takes more than two years to recover, but which is considered less severe than serious harm.

Smart irrigation Advanced sensors and other equipment added to irrigation systems that automatically adjust water used to meteorological or site conditions.

Soil moisture Water diffused in the upper part of the soil mantle that is lost by the transpiration of plants or by soil evaporation.

Storm water Water that does not infiltrate, but accumulates on land as a result of storm runoff, snowmelt runoff, irrigation runoff, or drainage from such areas as roads and roofs.

Stormwater treatment area (STA) Constructed water quality treatment wetland that uses natural biological processes (such as plant uptake) to reduce levels of phosphorus from surface water runoff.

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Surface water Water above the soil or substrate surface, whether contained in bounds created naturally or artificially or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Surface Water Utilities of Concern Cities that are dependent on their present water intakes directly from Lake Okeechobee for potable water supply, as well as cities that rely on surface water lakes and impoundments for water supply.

Surficial aquifer system (SAS) Often the principal source of water for urban uses within certain areas of south Florida. This aquifer is unconfined, consisting of varying amounts of limestone and sediments that extend from the land surface to the top of an intermediate confining unit.

T

Tailwater that is typically of lower elevation or on the discharge side of the structure.

Total trihalomethanes (TTHMs) A sum of chloroform, bromodichloromethane, dibromochloromethane, and bromoform. Trihalomethanes are any of several synthetic organic compounds formed when chlorine combines with organic materials in water during the disinfection process.

Transmissivity A term used to indicate the rate at which water can be transmitted through a unit width of aquifer under a unit hydraulic gradient. It is a function of the permeability and thickness of the aquifer, and is used to judge its production potential.

Treatment facility Any facility or other works used for the purpose of treating, stabilizing, or holding water or wastewater.

Turbidity The measure of water clarity caused by suspended material in a liquid.

U

Ultralow-volume (ULV) fixtures Water-conserving plumbing fixtures that meet industry standards at a test pressure of 80 pounds per square inch (psi) listed below.

Unconfined aquifer A permeable geologic unit or units only partly filled with water and overlying a relatively impervious layer. Its upper boundary is formed by a free water table or phreatic surface under atmospheric pressure. Also referred to as Water table aquifer.

Upconing Process by which saline water underlying fresh water in an aquifer rises upward into the freshwater zone as a result of pumping water from the freshwater zone.

Uplands An area with a hydrologic regime that is not sufficiently wet to support vegetation typically adapted to life in saturated soil conditions; nonwetland; upland soils are non-hydric soils.

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U.S. Army Corps of Engineers (USACE) As part of the U.S. Department of the Army, the Corps has responsibilities in civil and military areas. In civil works, the USACE has authority for approval of dredge and fill permits in navigable waters and tributaries thereof; the USACE enforces wetlands regulations, and constructs and operates a variety of water resources projects, mostly notably levees, dams, and locks.

U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) This agency provides technical assistance for soil and water conservation, natural resource surveys and community resource protection. Formerly the U.S. Soil Conservation Service (SCS).

U.S. Environmental Protection Agency (USEPA) Consolidated federal agency that is responsible for a variety of research, monitoring, standard-setting and enforcement activities to ensure environmental protection in the U.S., including water quality.

U.S. Fish and Wildlife Service (USFWS) The USFWS is a bureau within the U.S. Department of the Interior. Its mission is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

U.S. Geological Survey (USGS) The federal agency that classifies public lands and examines the geologic structure, mineral resources, and products of the national domain. As part of its mission, the USGS provides information and data on the nation's rivers and streams that are useful for mitigation of hazards associated with floods and droughts.

Utility Any legal entity responsible for supplying potable water for a defined service area.

Utility interconnections Physical connections between utilities in different service areas. These interconnections are also formal methods by which utilities can move water around during times of high demand, such as during water shortages.

Utilities of Concern Utilities that have wellfields near the saltwater interface, have a non-coastal wellfield, and/or an alternative water source that is not threatened by saltwater intrusion.

Utilities at Risk Utilities with wellfields near the saltwater interface that do not have a non-coastal wellfield, have not developed alternative sources of water, and have limited ability to meet user needs through interconnects with other utilities.

W-X-Y-Z

Wastewater The combination of liquid and water-carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any groundwater, surface runoff or leachate that may be present.

Water Conservation Areas (WCAs) Part of the original Everglades ecosystem that is now diked and hydrologically controlled for flood control and water supply purposes. These are located in the western portions of Miami-Dade, Broward, and Palm Beach counties, and preserve over 1,350 square miles, or about 50 percent of the original Everglades.

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Water control structure An artificial structure designed to regulate the level/flow of water in a canal or water body (e.g., weirs, dams).

Water quality standards The physical, chemical, and biological condition of water as applied to a specific use. Federal and state guidelines set these criteria based on the water's intended use, whether for recreation, fishing, drinking, navigation, shellfish harvesting, or agriculture.

Water reservation A water reservation is a legal mechanism to set aside water for the protection of fish and wildlife or the public health and safety from consumptive water use. The reservation is composed of a quantification of the water to be protected, which includes seasonal and location components.

Water resource development The formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and groundwater storage, and groundwater recharge augmentation; and related technical assistance to local governments and Public Water Supply utilities (Section 373.019, F.S.).

Water Resources Advisory Commission (WRAC) The SFWMD Water Resources Advisory Commission (WRAC) serves as an advisory body to the Governing Board. The WRAC is the primary forum for conducting workshops, presenting information, and receiving public input on water resource issues affecting central and south Florida.

Water shortage declaration If there is a possibility that insufficient water will be available within a source class to meet the estimated present and anticipated user demands from that source, or to protect the water resource from serious harm, the governing board may declare a water shortage for the affected source class (Rule 40E-21.231, F.A.C.). Estimates of the percent reduction in demand required to match available supply is required and identifies which phase of water restriction is implemented. A gradual progression in severity of restriction is implemented through increasing phases. Once declared, the District is required to notify permitted users by mail of the restrictions and to publish restrictions in area newspapers.

Water Shortage Plan This effort includes provisions in Rule 40E-8.441(4), F.A.C., and Chapter 40E-21, F.A.C., and identifies how water supplies are allocated to users during declared water shortages. The plan allows for supply allotments and cutbacks to be identified on a weekly basis based on the water level within Lake Okeechobee, demands, time of year, and rainfall forecasts.

Water shortage trigger Water shortage triggers are water levels at which phased restrictions will be declared under the SFWMD's Water Shortage Plan.

Water supply development The planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use [Subsection 373.019(24), F.S.].

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Water table The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere; defined by the level where water within an unconfined aquifer stands in a well.

Water table aquifer An unconfined aquifer within which is found the water table. Synonymous with the surficial aquifer system in certain planning areas.

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water. Watersheds conform to federal hydrologic unit code standards and can be divided into subwatersheds and further divided into catchments, the smallest water management unit recognized by SFWMD operations. Unlike drainage basins, which are defined by rule, watersheds are continuously evolving as the drainage network evolves.

Watershed management goals Goals that encompass any one or all of the major water management district responsibilities: flood protection, water supply, water quality, and environmental system protection and enhancement. The goals provide the general direction for developing cohesive strategies to manage water resources within a drainage basin, subbasin, or segment of a drainage basin or subbasin.

Weir A barrier placed in a stream to control the flow and cause it to fall over a crest. Weirs with known hydraulic characteristics are used to measure flow in open channels.

Wellfield One or more wells producing water from a subsurface source. A tract of land that contains a number of wells for supplying a large municipality or irrigation district.

Wetland An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (e.g., swamps, bogs, and marshes).

Wild and Scenic River A river as designated by the U.S. Fish and Wildlife Service under the authority of the of Public Law 90-542, the *Wild and Scenic Rivers Act*, as amended, is a means to preserve selected free-flowing rivers in their natural condition and protect the water quality of such rivers. A portion of the Northwest Fork of the Loxahatchee River was federally designated as the first Wild and Scenic River in Florida on May 17, 1985.

Xeric Of or pertaining to a habitat having a low or inadequate supply of moisture, or of or pertaining to an organism living in such an environment.

Yield The quantity of water (expressed as rate of flow or total quantity per year) that can be collected for a given use from surface or groundwater sources.

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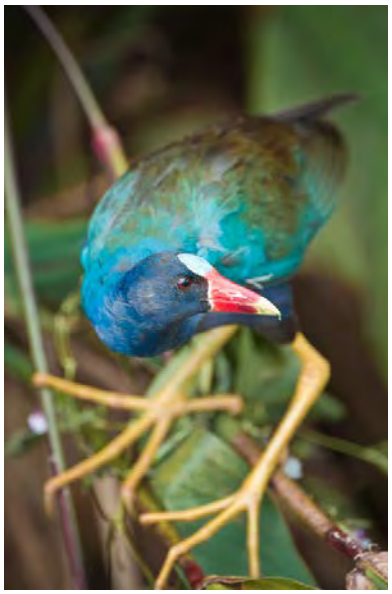
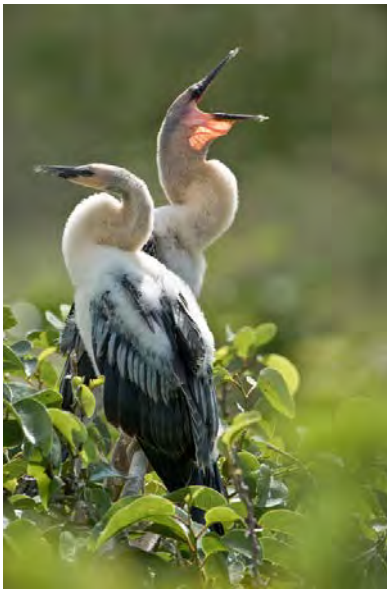


Purple Gallinule

Pineland Clustervine (Endangered)

Phasey Bean Wildflower



Juvenile Anhinga

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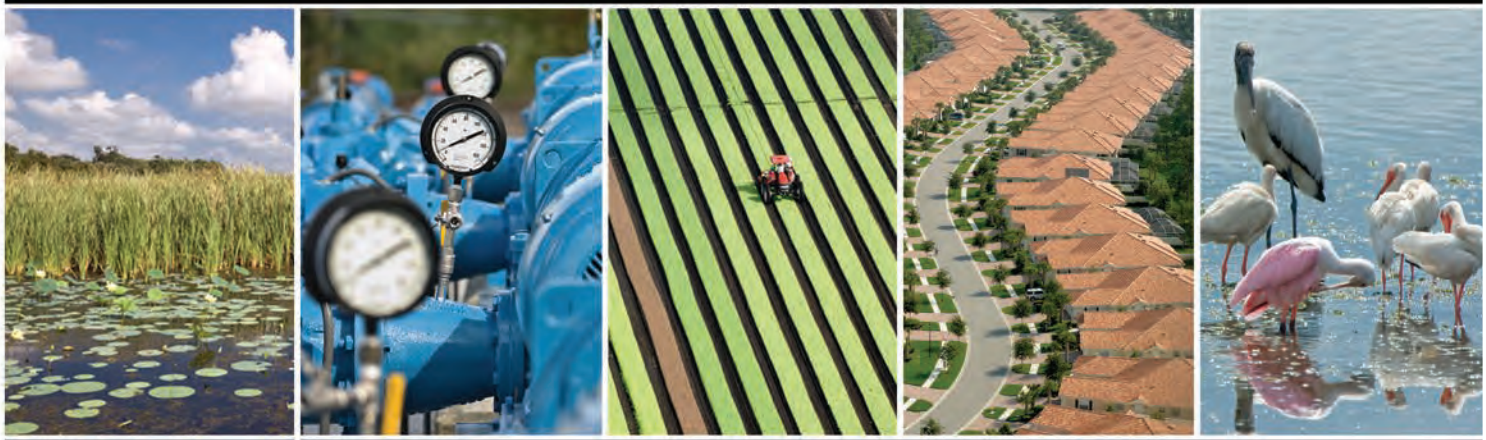

Meeting South Florida's water supply needs while safeguarding its natural systems requires innovative solutions, cohesive planning, and a shared vision.

South Florida Water Management District

Committed to managing and protecting our region's water resources

South Florida Water Management District
3301 Gun Club Road • West Palm Beach, Florida 33406
561-686-8800 • FL WATS 1-800-432-2045 • www.sfwmd.gov
MAILING ADDRESS: P.O. Box 24680 • West Palm Beach, FL 33416-4680

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Attachment: 2011-2014_water_supply_plan_support_doc (2054 : Enter a Final Order Approving the 2014 Lower Kissimmee Basin Water Supply

M E M O R A N D U M

TO: Governing Board Members

FROM: Jeff Kivett, Division Director

DATE: September 11, 2014

SUBJECT: Cooperative Agreement with USGS Florida Integrated Science Center, Orlando - Contract 4600002335

Summary

Over the past 60 years, the District and the U.S. Geological Survey (USGS) have partnered on collecting groundwater and surface water data for incorporation into the District's Data Management system, DBHydro. This Agreement continues that partnership for an additional one year period. It will allow the District to count on continued groundwater and surface water monitoring support from the USGS. These data support various District programs related to ecosystems restoration, water supply, regulatory requirements and baseline monitoring. The monitoring support provided by USGS assists the Districts efforts at assessing water resources available, changes in flow trends due to structural changes in the system and their impact on water quality issues. The data is particularly useful in the assessment of environmental compliance of waters being discharged into Lake Okeechobee and the Everglades Protection Area with state water quality standards.

Continuing this agreement will insure continuity of the monitoring work that the USGS has partially funded for the sites listed in the statement of work of the agreement. The monitoring work includes the collection of monthly, quarterly, semi-annual, continuous recorder and satellite telemetry data from ten (10) surface water stations, one (1) evapo-transpiration station, and ground-water level data from twenty five (25) groundwater stations. Data are archived in the USGS's national database, and then transferred to the District via direct computer link on a monthly or as-needed basis.

Staff Recommendation

Staff recommends approval to enter into a 365 day cooperative agreement in the amount of $228,219.00 with the United States Geological Survey (USGS) for the collection of ground-water, surface-water, and Evapotranspiration (ET) data.

Core Mission and Strategic Priorities

Priorities outlined in the District's Strategic Plan include preserving and protecting South Florida's ecosystem while providing for other water-related needs of the region, including water quality, water supply and flood protection. The monitoring support provided by USGS assists the Districts efforts at assessing water resources available, changes in flow trends due to structural changes in the system and their impact on water quality issues. The data is particularly useful in the assessment of environmental compliance of waters being discharged into Lake Okeechobee and the Everglades Protection Area with state quality standards.

Funding Source:

This is a one-year cooperative agreement with the USGS for which $243,330.00 in ad valorem funding has been budgeted for FY15, subject to Governing Board approval of the FY15 budget.

Furthermore, the District cost share will be reduced due to the elimination of one site in the Orlando region. This will represent a final cost of $228,219.00 to the District for FY15.

Staff Contact
Jeff Kivett, Division Director, Operations, Engineering & Construction
561-682-2680 / jkivett@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0905

A Resolution of the Governing Board of the South Florida Water Management District authorizing an amendment to cooperative agreement (4600002335) with the United States Geological Survey Florida Integrated Science Center (Orlando), for ground water, surface water, and evapotranspiration data in the amount of $228,219.00 in ad valorem funds subject to Governing Board approval of the FY15 budget; providing an effective date. (Contract Number 4600002335-A4).

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to authorize entering into a one-year cooperative agreement with the U.S. Geological Survey Florida Integrated Science Center (Orlando) for groundwater, surface water, and evapotranspiration monitoring**.**

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the one-year cooperative agreement with the U. S. Geological Survey Florida Integrated Science Center, in the amount of $228,219.00.

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Tim Beirnes,

DATE: September 11, 2014

SUBJECT: Contract 4600003120 - Okeechobee Flat Mowing

Agenda Item Description
A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a three-year contract with two (2) one-year renewal options with James L. King and Associates, Inc., the lowest responsive and responsible bidder for Flat Mowing Services in the Okeechobee Field Station area, in the amount of $860,618.25 in ad valorem funds subject to Governing Board approval of FY15, FY16 and FY17 budgets.

Background
Maintenance of the Right of Ways is required to ensure that vegetation is controlled at a manageable height and will uphold the operational integrity of the District's flood control system. This project for the Okeechobee Field Station area, will contract approximately 19,449 acres to be mowed on an annual basis. The lowest responsive and responsible bidder is James L. King & Associates, Inc., at $14.75 per acre. Since this is a work order contract, the amount of acres to be mowed will fluctuate, based on the weather, budget, and construction projects in these areas.

Core Mission and Strategic Priorities
Mowing the District's Right of Ways will reduce and control vegetative growth along canal banks which can impede operations, inspections and access to the District's water control facility.

Funding Source:
This is a three-year contract with two (2) one-year renewal options, in the amount of $860,618.25 in ad valorem funds subject to Governing Board approval of FY15, FY16 and FY17 budgets.

Staff Recommendation
Staff recommends authorizing the approval of Contract Number 4600003120, as this item supports continual operations and maintenance of the District canal system. If not mowed and maintained, these areas would become a potential hazard to the public as well as District employees.

Staff Contact
Karen Estock, ext. 6282, kestock@sfwmd.gov
Joel Arrietta, ext. 2867, jarrieta@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0906

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a three-year contract with two (2) one-year renewal options with James L. King and Associates, Inc., the lowest responsive and responsible bidder, for Flat Mowing Services in the Okeechobee Field Station area, in the amount of $860,618.25 in ad valorem funds subject to Governing Board approval of FY15, FY16 and FY17 budgets, providing an effective date. (Contract Number 4600003120)

WHEREAS, it is in the public interest to authorize entering into a three-year contract with two (2) one-year renewal options with James L. King, and Associates, Inc., the lowest responsive and responsible bidder, for Flat Mowing Services in the Okeechobee Field Station area, in the amount of $860,618.25 in ad valorem funds subject to Governing Board approval of FY15, FY16 and FY17 budgets.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby authorizes the execution of Contract Number 4600003120 with James L. King and Associates, Inc.

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Temperince Morgan, Division Director

DATE: September 11, 2014

SUBJECT: Amended and Restated Agreement for the West Waterhole Pasture FRESP Project

Summary

On April 12, 2006 the parties entered into agreement number OT061107 to design and implement a water management alternative ("WMA") Pilot Project to provide water storage and water quality treatment in a 2,500 acre detention area of Lykes property known as the West Waterhole Pasture Pilot Project. The agreement was later renumbered as OT061107/3600001161. Since that time the Parties have executed amendments to the agreement to modify payment amounts and extend the term of the agreement. The West Waterhole Pasture Pilot Project has been operating since 2008 and has successfully stored and treated stormwater consistent with the project goals. In 2013, the project removed from the regional system (C-40 Canal) 6.4 metric tons of TP (87% removal efficiency), 16.12 metric tons of TN (30% removal efficiency), and 2.6 billion gallons (7,955 acre-feet) of excess stormwater. The Parties wish to extend the agreement and continue the WMA water storage and treatment project. Highlands County Soil and Water Conservation District ("HSWCD") was a party to the original agreement and amendments and acted as an administrator for the Pilot Project. HSWCD is not a party to this amended and restated agreement. This amended and restated agreement supersedes and replaces the original agreement and all its amendments.

Staff Recommendation

Staff recommends authorization to enter into an amended and restated agreement with Lykes Brothers, Inc. for the West Waterhole Pasture Florida Ranchlands Environmental Services Pilot Project to extend the term of the agreement by two years and increase the funding in the amount of $940,476.20, subject to Governing Board approval of the FY15 and FY16 budgets.

Core Mission and Strategic Priorities

Additional storage and nutrient reduction is a primary goal of the Northern Everglades and Estuaries Plan initiatives. The West Waterhole Pasture project is a unique method of providing additional storage and nutrient reduction in the Northern Everglades watersheds and has been included in the Lake Okeechobee Protection Plans.

Funding Source

Funding for the amended and restated agreement will be provided by Ad Valorem funds subject to Governing Board approval of the FY15-FY16 budgets.

Staff Contact

Beth Lewis, Chief, Office of State Policy & Coordination
561-682-6343 / belewis@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0907

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into an amended and restated agreement with Lykes Brothers, Inc. for the West Waterhole Pasture Florida Ranchlands Environmental Services Pilot Project to extend the term of the agreement by two years and increase the funding in the amount of $940,476.20, subject to Governing Board approval of the FY15 and FY16 budgets; providing an effective date. (Contract No. OT061107/3600001161)

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to authorize entering into an amended and restated agreement with Lykes Brothers, Inc. for the West Waterhole Pasture Florida Ranchlands Environmental Services Pilot Project to extend the term of the agreement by two years and increase the funding in the amount of $940,476.20, subject to Governing Board approval of the FY15 and FY16 budgets.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby authorizes the execution of the amended and restated Agreement No. OT061107/3600001161.

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

OT061107/
3600001161

AMENDED AND RESTATED AGREEMENT NO. OT061107/3600001161

BETWEEN THE

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

AND

LYKES BROS. INC.

This Amended and Restated Agreement ("Agreement") is entered into on _____ between the South Florida Water Management District, a government entity created under Chapter 373, Florida Statutes ("District" or "SFWMD") and Lykes Bros. Inc., a Florida Corporation ("Lykes"). The District and Lykes may be referred to individually as a "Party" and collectively as "Parties."

Background

A. On July 22, 2005, the Parties entered agreement number OT050889 for a pilot phase of implementing water management alternatives to store and treat runoff on private lands. On April 12, 2006 the parties entered into agreement number OT061107 to design and implement a water management alternative ("WMA") Pilot Project to provide water storage and water quality treatment in a 2,500 acre detention area of Lykes property known as the West Waterhole Pasture Pilot Project (the "Original Agreement"). The Original Agreement was later renumbered as OT061107/3600001161.

B. Since that time the Parties executed 6 amendments to the Original Agreement to modify payment amounts and extend the effective time of the Agreement. The last amendment was executed on September 21, 2012.

C. Highlands County Soil and Water Conservation District ("HSWCD") was a party to the Original Agreement and the 6 amendments and acted as an administrator for the Pilot Project. HSWCD is not a party to this Agreement.

D. The West Waterhole Pasture Pilot Project ("Pilot Project") has been operating since 2008 and has successfully stored and treated stormwater consistent with the project goals. In the second half of 2008 (data for the first half of the year was unavailable), it removed 4.0 metric tons of Total Phosphorus (TP, 60% removal efficiency), 20 metric tons of Total Nitrogen (TN, 41% removal efficiency), and 4.2 billion gallons (12,900 acre-feet) of excess stormwater. Dry conditions and project adjustments in 2009 limited the use of the pilot project during that

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

year. In 2010, the project removed 8.4 metric tons of TP (94% removal efficiency), 35 metric tons of TN (56% removal efficiency), and 4.1 billion gallons (12,602 acre-feet) of excess stormwater. In 2011, the project removed 1.3 metric tons of TP (92% removal efficiency), 10.5 metric tons of TN (66% removal efficiency), and 3.8 billion gallons (11,636 acre-feet) of excess stormwater. In 2012, the project removed 7.8 metric tons of TP (88% removal efficiency), 43.5 metric tons of TN (59% removal efficiency), and 3.4 billion gallons (10,369 acre-feet) of excess stormwater. In 2013, the project removed 6.4 metric tons of TP (87% removal efficiency), 16.12 metric tons of TN (30% removal efficiency), and 2.6 billion gallons (7,955 acre-feet) of excess stormwater. Additional operation and performance monitoring of the 2,500 acre treatment area is critical for verifying the water quality improvement tool for the Northern Everglades Payment for Environmental Services Program and for achieving additional water quality improvements in the watershed.

E. The Parties wish to extend the agreement and continue the WMA water storage and treatment project.

F. This Agreement supersedes and replaces the Original Agreement and all its amendments.

Terms and Conditions

1. Cover Page. The Cover Page is part of this Agreement.

2. Exhibits. The following Exhibits are attached to and made a part of this Agreement:

A7 Map showing Pilot Project Area
B7 Payment and Deliverable Schedule
C7 West Waterhole Pasture Pilot Project Approved Final Design and Operations and Maintenance Plan
D7 Insurance Requirements

3. Term. The term of this Agreement shall commence on the last date of execution by the parties ("Effective Date"). This Agreement shall remain in effect for a period of two (2) years following the Effective Date. Lykes shall participate in the Operations and Maintenance phase of the Pilot Project according to the herein agreed terms of this Agreement for a period of no less than two (2) years, unless terminated early as hereinbelow provided.

4. Pilot Project Objectives. The mission of the Pilot Project is to design, field test and evaluate components of a market based approach for securing environmental services of water storage, phosphorus retention, on Lykes' ranchlands described in Exhibit "A7," ("Pilot Project Area"). The Pilot Project will be feasible, profitable for ranchers, cost-effective for tax-payers and produce measurable benefits to the environment.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

5. Consideration. SFWMD shall pay Lykes for the Pilot Project Objectives specified above as more particularly described in Exhibit "B7" Payment and Deliverable Schedule. SFWMD shall pay Lykes within thirty (30) days following receipt of an invoice and successful completion of each deliverable described in Exhibit "B7." All invoices shall be substantiated by adequate documentation to justify actual costs incurred by Lykes.

6. Deliverables.

A. Exhibit "B7," attached hereto and made an integral part of this Agreement, establishes deliverables that shall be provided to SFWMD by Lykes on the schedule set forth therein. For each deliverable set forth in Exhibit "B7," there is an associated payment from SFWMD to Lykes for the operation and maintenance of the water management alternative

B. During the Agreement Term, SFWMD (its officers, board members and employees, and contractors) shall have the right to enter onto the Pilot Project Area as depicted in the map provided as Exhibit "A7," after giving advance notification and receiving Lykes approval, which shall not be unreasonably withheld, for the purposes of inspection and documentation of the installation, operation, maintenance and monitoring of the Pilot Project. All reasonable Lykes entry requirements shall be met. SFWMD may enter the Project Area only along the Indian Prairie Canal Levee as shown in Exhibit "A7" and for purposes reasonably related to this Agreement. However, access is granted only to the areas so noted on Exhibit "A7."

C. Lykes will continue to provide its excess surface water treatment storage capacity and will notify SFWMD when the Project Area is able to accept additional flows. Lykes shall comply with Surface Water Management Permit Number 22-00019-S regarding the use of the Project Area for excess surface water treatment and storage. This Project shall not diminish the discharges and other activities allowed by existing Permit Number 22-00019-S except with consent of Lykes.

D. Lykes' Superior Interest. Lykes specifically retains the right to drain the surrounding lands in Permit Number 22-00019-S, to the Project Area. Lykes shall manage the actual water flow in accordance with the Operations and Maintenance Plan attached as Exhibit "C7." Only the excess water storage capacity (as determined solely by Lykes) remaining on the Project Area after Lykes uses the Project Area according to Water Use Permit Number 22-00019-W shall be available to the Project. Lykes's rights shall be and are superior to the rights granted by this Agreement to SFWMD.

7. Ownership. SFWMD and Lykes shall have joint ownership rights to all work items, including, but not limited to, all documents, technical reports, research notes, scientific data, computer programs, including the source and object code, which are developed, created or otherwise originated hereunder by Lykes, its subcontractor(s), assign(s), agent(s) and/or successor(s). SFWMD rights to deliverables under this Agreement shall include the unrestricted and perpetual right to use, reproduce, modify and distribute such deliverables at no additional

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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cost to either party. Notwithstanding the foregoing, ownership of all equipment and hardware purchased by Lykes under this Agreement shall be deemed to be the property of Lykes upon completion of this Agreement. Exhibit "B7" specifies existing equipment that shall remain the sole property of the SFWMD

8. Termination. Either party may terminate this Agreement at any time for convenience upon thirty (30) calendar day's prior written notice to the other party. In the event of termination, Lykes shall be compensated for authorized Pilot Project work performed through the effective date of termination. If any party fails to fulfill its obligations under this Agreement in a timely and proper manner, the other party shall have the right to terminate this Agreement by giving written notice of any deficiency. The party in default shall then have thirty (30) calendar days from receipt of notice to correct the deficiency. If the defaulting party fails to correct the deficiency within this time, the non-defaulting parties shall have the option to terminate this Agreement at the expiration of the thirty (30) day time period.

9. Duties Regarding Public Records.

A. Compliance with Florida Laws. Lykes must provide public access to all records concerning this Agreement according to applicable Florida laws including Chapter 119, Florida Statutes. If Lykes asserts any exemptions to Florida's public records laws, Lykes has the burden of establishing and defending the exemption.

B. Recordkeeping and Public Access. If Lykes receives a request from any member of the public for records associated with this Agreement, Lykes must promptly provide the requested records to the person requesting them and provide written notice to the District of what was requested and what it provided to the requestor. In addition, Lykes must: (1) keep and maintain public records that ordinarily and necessarily would be required by the District in order to perform the service; (2) provide the public with access to public records on the same terms and conditions that the District would provide the records and at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law; (3) ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law; and (4) meet all requirements for retaining public records and transfer, at no cost, to the District all public records in possession of Lykes upon termination of the Agreement and destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. All records stored electronically must be provided to the District in a format that is compatible with the information technology systems of the public agency. At the conclusion of this Agreement, Lykes shall provide all applicable records associated with this Agreement on electronic media (CD-ROM or USB flash drive).

10. Liability.

A. Nothing under the terms of this Agreement or any usage of Lykes' land and water in the WMA contemplated by this Agreement shall render Lykes or its officers,

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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employees, agents and representatives, liable for damage to any property or equipment belonging to SFWMD as a result of natural catastrophe or of Act of God, etc., or for personal injury of SFWMD officers, employees, agents and representatives resulting in any way from the negligent acts of SFWMD in the performance of authorized activities described herein. SFWMD represents that it is self-funded for Worker's Compensation and liability insurance, covering bodily injury, personal injury and property damage, with such protection being applicable to SFWMD and its respective officers and employees while acting within the scope of their employment during performance under this Agreement.

B. Lykes assumes any and all risks of personal injury, bodily injury and property damage attributable to the negligent acts or omissions of Lykes and the officers, employees, servants and agents thereof. For value received, which is hereby acknowledged, Lykes shall indemnify and hold SFWMD, its agents, assigns and employees, harmless from claims or causes of action, including without limitation, all damages, losses, liabilities, expenses, costs and attorney's fees that arise from any negligent or intentional act of omission, or the violation of any federal, state or local law of regulation, by Lykes, its subcontractors, agents, assigns, invitees, or employees. Lykes further acknowledges that it is solely responsible for ensuring its compliance and the compliance of its subcontractors, agents, assigns, invitees and employees with the terms of this Agreement. Despite any other provision in this section 10, Lykes releases all claims and causes arising from the retention or storage of phosphorus or other nutrients on the subject property as a result of this Agreement and the resulting project. This paragraph shall survive the expiration or termination of the Agreement.

11. Insurance. Lykes shall procure and maintain, through the term of this Agreement, insurance coverage reflecting, at a minimum, the limits and coverage conditions identified on the District's Certificate of Insurance, attached and made a part of this Agreement as Exhibit "D7." The coverage required shall extend to all employees and subcontractors of Lykes. The attached District's Certificate of Insurance shall be completed in full, indicating the producer, insured, carrier's name and Best rating, policy numbers and effective and expiration dates of each type of coverage required. The Certificate shall be signed by the insurance carrier's authorized representative and shall include the District as Additional Insured for General Liability.

12. Contact Persons.

The contact person for SFWMD will be:

Brian Tilles
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
(561) 682-2552
btilles@sfwmd.gov

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

The contact person for Lykes will be:

Linda McCarthy
Lykes Bros. Inc.
106 Southwest County Road 721
Okeechobee, Florida 34974
(863) 763-3041
linda.mccarthy@lykesranch.com

13. Notices. All notices, requests, consents and other communications required or permitted under this Agreement shall be in and shall be (as elected by the person giving such notice) hand delivered by messenger or courier service, or mailed (airmail if international) by registered or certified mail (postage prepaid), return receipt requested, or sent by any form of overnight mail, addressed to:

TO SFWMD:
South Florida Water Management District
Procurement Bureau
Linda Greer, Sr. Contract Specialist, MS 6612
3301 Gun Club Road
West Palm Beach, FL 33406

TO Lykes:
Charles P. Lykes, Jr.
106 SW CR 721
Okeechobee, Florida 34974

14. Applicable Law. This Agreement shall be governed by, and construed in accordance with, the laws of the State of Florida, without giving effect to any choice of law or conflict or law rules or provisions, whether of the State of Florida or any other jurisdiction, that would cause the application of the laws of any jurisdiction other than the State of Florida. Any dispute relating hereto shall be heard in the state or federal courts of Florida, and the parties agree to jurisdiction and venue therein.

15. Binding Effect. This Agreement shall be binding upon and inure to the benefit of the SFWMD and Lykes and their respective successors.

16. No Public Entry. This Agreement does not grant to the general public any rights whatsoever. Public access is strictly prohibited. SFWMD will cooperate with Lykes and law enforcement in the arrest and prosecution of all persons entering upon the property without proper authorization.

17. Assignment. SFWMD shall not assign this Agreement.

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

18. Condemnation. If, during the Term or any extension or renewal of the Agreement, all of the Pilot Project Area is taken for any public or quasi-public use under any governmental law, ordinance, or regulation, or by right of eminent domain, or are sold to the condemning authority under threat of condemnation, this Agreement will terminate effective as of the date of condemning authority takes the Pilot Project Area Premises. If less than all of the premises is taken for any public or quasi-public use under any governmental law, ordinance, or regulation or by right of eminent domain, or is sold to the condemning authority under threat of condemnation, SFWMD may terminate the Agreement by giving written notice to Lykes within thirty (30) days after the entity exercising the power of condemnation takes possession of the condemned portion. Lykes will receive the entire award from any condemnation, and SFWMD will have no claim to that award or for the value of any unexpired terms of this Agreement.

19. Construction Liens. SFWMD will not directly or through its contractors undertake any construction on the Pilot Project Area under this Agreement; therefore no liens will be placed on the Pilot Project Area as a consequence of actions taken by SFWMD.

20. Exculpation of Lykes. If Lykes shall convey title to the Pilot Project Area pursuant to a sale or exchange of property, Lykes shall not be liable to SFWMD or any immediate or remote assignee or successor of SFWMD as to any act or omission from and after such conveyance. This provision shall have no effect unless Lykes's purchaser assumes all obligations of Lykes under the terms of this Agreement.

21. Brokers. Lykes and SFWMD represent that they have not entered into any agreement, written or oral, with any person or real estate broker as a result of which they will become obligated to pay a finder's fee or broker's commission as a result of this Agreement or consummation of the transactions provided for herein.

21. Entire Agreement. This Agreement supersedes all agreements previously made between the parties relating to its subject matter.

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
BY ITS GOVERNING BOARD

By: _____
Dorothy A. Bradshaw, Procurement Bureau Chief

SFWMD PROCUREMENT APPROVED

BY: _____

PRINT NAME:: _____

DATE: _____

SFWMD OFFICE OF COUNSEL APPROVED

BY: _____

PRINT NAME:: _____

DATE: _____

LYKES BROS. INC., a Florida Corporation

By: _____

Title: _____

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

Exhibit "A7"
Map of Project Area

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

EXHIBIT "B7"
Payment & Deliverable Schedule

- Upon completion of each Deliverable described below, Lykes shall submit invoices and any attachments to the District at **APInvoice@sfwmd.gov** and the District will pay Lykes for its actual costs incurred to operate the WMA Pilot Project, and the quarterly fixed payment, below listed.

- Upon receipt of each Deliverable and invoice the District will review it and within 21 days of receipt notify Lykes of any changes Lykes must make for the District to accept it.

- Once the District determines that the Deliverable is acceptable and in compliance with the provisions of this Agreement, the District will promptly pay Lykes the invoiced amount as set forth in the table below.

Task	Deliverable	Invoice Due Date	District Payment
1	WMA Project Operation for water storage and phosphorus retention	Each Quarter ending in December March June, and September	Fixed payment of $93,750 per quarter
2	Operation and maintenance costs for labor, management, fuel, monitoring, compliance, and general and administrative costs	Each Quarter ending in December March June, and September	Not to Exceed $95,238.10 each fiscal year
	2 YEAR TOTAL		Not to Exceed $940,476.20 over the 2 year Term of the Agreement

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
AMENDED AND RESTATED AGREEMENT

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

Task 1 Requirements

WMA Project Operation & Maintenance – Lykes shall operate and maintain the WMA project as described in the District approved Final Design and Operations and Maintenance Plan for the environmental services of water storage and phosphorus retention attached to the Agreement as Exhibit "C7".

Task 2

A. **Operation and Maintenance –** Lykes shall undertake all activities necessary to operate and maintain the WMA Pilot Project including labor, management, fuel, monitoring, compliance, and general and administrative functions. Project pump station and associated components (e.g. fuel tanks, hoses, pipes) are the sole property of the SFWMD but will be operated and maintained in good working condition by Lykes for the terms of this agreement. The pump station shall have only one (1) pump. Maintenance does not include repair. Repairs shall be made by SFWMD. If the Operation & Maintenance budget is consumed prior to termination of the Agreement, then Lykes duty to pump ends.

B. **General and Administrative (G&A) Costs –** Lykes may apply a 17% G&A rate to the reimbursable costs in this Task 2. The G&A rate is comprised of the following costs: General Manager, Senior Ecologist, Accounting Personnel, Purchasing Personnel, Human Resources Personnel, Administrative Assistants, Secretarial Staff, copying/duplication costs (other than costs associated with responding to Public Records' requests), postage and telephone/communications costs.

Exhibit "C7"

7-11-08

West Waterhole Pasture 3 Year Pilot Project Operation Plan

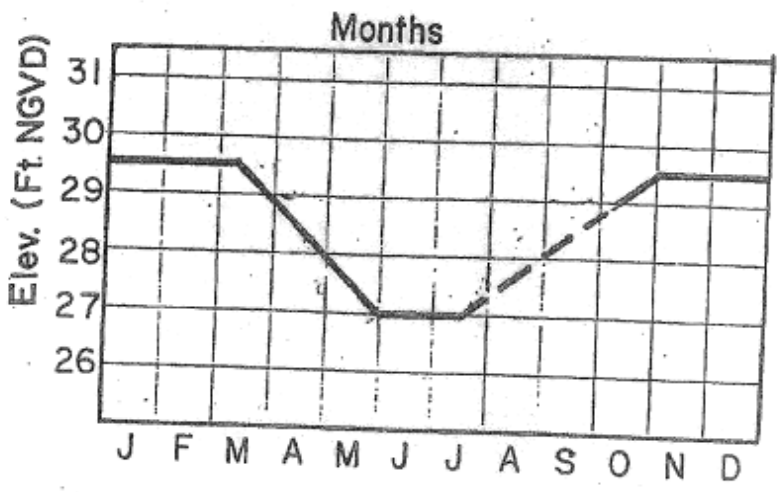
- Existing structures permitted under 22-00019-R/S/W will continue to follow established/permitted schedules (see attached schedule).

- New 50,000 gpm (~110 cfs) SFWMD inflow pilot pump station (refer to project map) will be operated by Lykes Bros. when excess stormwater is present within the regional system/C-40 to treat surface water. Excess stormwater is defined by any of the following conditions:

  1) When Lake Istokopoga is in Zone A, or
  2) When S-75 and S-72 are both releasing water, or
  3) Other conditions are identified and mutually agreed to by the SFWMD, Lykes Bros., and the Seminole Tribe of Florida.

- Monitoring (flow and TP concentrations) will occur at all inflow and outflow detention area structures and flow at the SFWMD's project culverts directly downstream of the West Waterhole Pasture Detention Area where detention area discharges re-enter C-40. All data will be promptly and regularly supplied to Lykes Bros. and the Seminole Tribe of Florida.

- At any time the Seminole Tribe may request that Lykes Bros. cease pilot project pump inflows. Operation of the pilot pump will immediately cease and will not resume until the Tribe agrees and the SFWMD gives authorization to re-initiate inflows.



ANNUAL SCHEDULE
RESERVOIR 8

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Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

Exhibit "D7"

INSURANCE REQUIREMENTS

In accordance with Article 11 of this Agreement, the information listed in this Exhibit "D7" defines the various types and limits of insurance the Contracting Party is required to maintain during performance of work for the term of this Agreement.

Unless otherwise specified, the District shall be named and included as an additional insured under all required insurance policies, excluding workers' compensation. The DISTRICT shall also be identified as the certificate holder on all certificates of insurance. The general liability, automobile liability and all other coverages, as appropriate, shall be no more restrictive than the latest editions of the Insurance Services Office (ISO).

Each line of coverage and specific endorsements are the types of insurance required. The minimum limit of insurance required is also identified. The limit is "per occurrence", combined single limit for personal injury, bodily injury and property damage. The District may require a separate project aggregate depending on the type of work being performed. The applicable Agreement Number and designated Contract Specialist identified on the cover page of this Agreement shall also be specified on the Certificate.

South Florida Water Management District is to be named as Additional Insured for General Liability Coverage. When the Agreement requires aircraft and/or environmental Impairment Liability, the South Florida Water Management District is to be named as an Additional Insured for those items also.

GENERAL LIABILITY	$2,000,000
SFWMD Additional Insured	
COMPREHENSIVE FORM	
OCCURRENCE FORM	
PREMISES / OPERATIONS	
DELETE XCU EXCLUSION	
PRODUCTS / COMPLETED	
CONTRACTUAL	
INDEPENDENT CONTRACTORS	
BROAD FORM PROPERTY	
PERSONAL INJURY	

WORKERS COMPENSATION AND EMPLOYER'S LIABILITY

Coverage:	Statutory
Limit:	$100,000 each accident
	$100,000 disease-each employee
	$500,000 disease policy limit

The attached Certificate of Insurance Form is preferable to the District, however the Acord Form is acceptable.

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

Exhibit "D7"

CERTIFICATION OF INSURANCE			Agent/Broker Name: Address: Telephone: EMAIL: FAX:	Insured Name: Address: Telephone: EMAIL: FAX:
Carrier Letter I.D.	Type of Coverage			
A		**General Liability** (Place check to the left of the coverage provided)	**Agent/Broker Certification:** Should any of the coverage listed herein be terminated or otherwise modified, the Agent/Broker shall notify the certificate holder identified below by certified mail at least 30 days prior to the effective date of termination or modification, or as soon as possible thereafter. I herein certify that I am duly licensed agent authorized to broker insurance in the State of Florida. _____ Agent/Broker Signature _____ Date	
		Comprehensive Form		
		Occurrence form		
		Premises Operations		
		Delete XCU Exclusion		
		Products Completed		
		Contractual		
		Independent Contractors	**Policy Limits**	**Carrier information**
		Broad Form Property		**Company A**
		Personal Injury	**Bodily Injury & Property Damage**	**Name** _____
		Blasting		**Policy No** _____
		Demolition	$_____	**Effective Date** ___/___/___ **Termination date** ___/___/___
		Watercraft	**Combined Limit**	
		Pollution		
B		**Automobile Liability**		**Company B**
		Any Auto	**Bodily Injury & Property Damage**	**Name** _____
		Owned		**Policy No** _____
		Non - Owned	$_____	**Effective Date** ___/___/___ **Termination date** ___/___/___
			Combined Limit	
C		**Workers' Compensation and Employer's Liability**	***Statutory Limits*** **$100,000/Accident** **$100,000/$500,000 Disease**	**Company C** **Name** _____ **Policy No.** _____ **Effective Date** ___/___/___ **Termination date** ___/___/___
D		**Professional liability**	$_____	**Company D** **Name** _____ **Policy No** _____ **Effective Date** ___/___/___ **Termination date** ___/___/__
E		**Builder's Risk/Installation Floater**	**@100% of Value**	**Company E** **Name** _____ **Policy No** _____ **Effective Date** ___/___/___ **Termination date** ___/___/___
F		**Aircraft Liability**	**Bodily injures & Property Damage** $_____ **Combined Limit**	**Company F** **Name** _____ **Policy No** _____ **Effective Date** ___/___/___ **Termination date** ___/___/___
G		**Environmental Impairment Liability**	**Bodily injures & Property Damage** $ _____ **Combined Limit**	**Company G** **Name** _____ **Policy No** _____ **Effective Date** ___/___/___ **Termination date** ___/___/___

Certificate Holder:	Additional Insured:	For District Use Only:
South Florida Water Management District 3301 Gun Club Road West Palm Beach, FL 33406	The South Florida Water Management District is named additional insured under the General and Auto liability policies identified herein.	Compliance with Contractual Insurance Requirements reviewed by: _____ _____ Initials Date

2005 SFWMD Insurance Certification.doc

Attachment: West Watershole OT061107-A07 final (Resolution No. 2014 - 0907 : Amended and Restated Agreement for the West Waterhole

M E M O R A N D U M

TO: Governing Board Members

FROM: Edward L. Artau, Interim General Counsel

DATE: September 11, 2014

SUBJECT: Authorize Publication of Notice of Proposed Rule - Lobbyist Registration

Summary:
The State of Florida Water Management Districts (WMDs), in conjunction with the Florida Department of Environmental Protection (DEP), have worked together to implement consistency in the registration of lobbyists before the WMDs. The rule will establish procedures for registering to lobby the South Florida Water Management District (District). The rule will also adopt two forms for use in registration, changing information, renewing registration, and cancelling registration; along with incorporation of a business classification system for the principals of the registering lobbyists.

Staff Recommendation:
Staff is recommending the following actions by the Governing Board:
Authorize publication of Notice of Proposed Rule in the Florida Administrative Register, request review by the Office of Fiscal Accountability and Regulatory Reform, and adopt new Rule 40E-1.800, Florida Administrative Code (provided no changes are made and no request for hearing is timely received), to implement the newly passed legislation regarding the lobbyist registration process for WMDs, in an effort to provide a uniform system for lobbyist registration.

Core Mission and Strategic Priorities
This item is required to implement rulemaking for the District's continued compliance with Florida Statute section 112.3261, effective July 1, 2014, requiring lobbyists to register with the WMDs.

Funding Source
The publication of the Notice of Proposed Rule will be funded from the Office of Counsel's budget.

Staff Contact
Derek C. Brown, Senior Attorney, debrown@sfwmd.gov <mailto:debrown@sfwmd.gov>,
(561) 682-6278

40E-1.800 Lobbyist Registration.

1) A person who is a "lobbyist" as defined in Section 112.3215, F.S., may not lobby the South Florida Water Management District (the "District") until he or she has registered as a lobbyist with the District. Registration shall be made by completing, under oath, the "Lobbyist Registration Form," which is incorporated by reference in subsection (7) below, and submitting that form to the District Clerk at the mail or email address provided in the form.

2) A separate completed Lobbyist Registration Form must be submitted for each principal represented by the lobbyist before the District.

3) For identifying and designating a principal's main business on the Authorization to Represent the Principal part of the Lobbyist Registration Form, the District adopts and incorporates by reference the 6-digit NAICS code published in the *North American Industry Classification System – United States, 2012*. Classification system information can be obtained by contacting the NAICS Association, 129 Lakeshore Drive, Rockaway, NJ 07866, or by visiting its website: www.naics.com.

4) Changes to the information provided on a Lobbyist Registration Form must be reported to the District within 15 days by submitting a completed Lobbyist Registration Form and checking the box indicating the submitted form is for the purpose of changing previously filed information.

5) A lobbyist may renew his or her registration to lobby by filing a completed Lobbyist Registration Form with the District and checking the box indicating the submitted form is for renewal purposes. Renewals must be filed before January 1 of each year.

6) The principal of a lobbyist may cancel the lobbyist's registration by submitting a completed "Lobbyist Registration Cancellation Form," which is incorporated by reference in subsection (7) below, informing the District that a particular lobbyist is no longer authorized to represent that principal. A lobbyist must cancel his or her registration with the District upon termination of his or her contract or other such employment relationship with the principal by promptly submitting a completed Lobbyist Registration Cancellation Form.

7) The Lobbyist Registration Form, form number 1400, (*effective date*) (*hyperlink*), and the Lobbyist Registration Cancellation Form, form number 1402, *(effective date) (hyperlink)*, are hereby incorporated by reference and may be obtained without cost from the District Clerk either at South Florida Water Management District, 3301 Gun Club Road, West Palm Beach, FL 33406, or at clerk@sfwmd.gov. These forms may also be downloaded from the District's website at: *www.sfwmd.gov/opengov*.

Rulemaking Authority 112.3261(8) FS. Law Implemented 112.3261 FS. History—New _____.

Attachment: LOBBYIST REG RULE 40E1.800 (2084 : Authorize Publication of Notice of Proposed Rule - Lobbyist Registration)

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lobbyist Registration

For what purpose are you using this form? ☐ New registration ☐ Changes to filed information ☐ Renewal

To what year does this form apply? 20

Full Name of Lobbyist	Name of Principal Represented (only one Principal per form)
Business Address	Principal's Mailing Address
Telephone Number	Principal's Telephone Number
Area of Interest	

Do you have any direct or indirect business associations, partnership, or financial relationship with any officer employee of the South Florida Water Management District (SFWMD)?

☐ Yes ☐ No State with whom and explain: _____

I do solemnly swear or affirm that all the foregoing facts are true and correct

_____
Signature of Lobbyist

STATE OF FLORIDA
COUNTY OF _____

Sworn to (or affirmed) and subscribed before me this _____ day of _____ 20 _____ , by _____

Personally known ☐ or produced identification ☐ type of identification produced _____

_____
Notary Signature

(Seal or Stamp)

_____
Print, Type or Stamp Name of Notary

Attachment: LOBBYIST REG RULE 40E1.800 (2084 : Authorize Publication of Notice of Proposed Rule - Lobbyist Registration)

Authorization to Represent the Principal

Type or print the principal represented and name of lobbyist as they are shown on the registration form. Also, describe the main business and provide the NAICS numerical code for the principal. This authorization to represent the principal before the South Florida Water Management District for this lobbyist will be carried forward each calendar year if the renewal form submitted by this lobbyist indicates "yes" to renew for the next year. Cancellation of a lobbyist's registration by the principal must be provided by written notice. Cancellation forms can be found at *www.sfwmd.gov*

_____ hereby authorizes _____

Name of Principal — Lobbyist's Name

to represent the principal before the South Florida Water Management District.

Description of Principal's Main Business

NAICS 6-digit code for Principal's Main Business

Signature of Principal or Principal's Representative

Print Name of Principal / Principal's Representative

Print Title of Principal / Principal's Representative

Date

Attach this authorization to your registration form.

Attachment: LOBBYIST REG RULE 40E1.800 (2084 : Authorize Publication of Notice of Proposed Rule - Lobbyist Registration)

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lobbyist Registration Cancellation

Type of print clearly the name of the lobbyist and the principal represented as they are shown on the lobbyist registration form for the South Florida Water Management District. This form may be used by either a lobbyist or a principal and only one signature is necessary. **Cancellation is effective upon receipt by the District Clerk.**

Name of Lobbyist _____
Last Name First Name MI

Lobbyist's Mailing Address _____

_____

Name of Principal to be canceled _____

_____ or _____
Signature of Lobbyist Signature of Principal

_____
Date

VERY IMPORTANT - If you have changed your address, you must notify the District Clerk in writing within 15 days of any changes. Changes may be made with the Lobbyist Registration Form submitted to the District Clerk in the same manner as below.

Return completed form:
Via email to clerk@sfwmd.gov,
or via mail to
District Clerk
South Florida Water Management District
ATTN: Lobbyist Registration
P.O. Box 24680
West Palm Beach, FL 33416-4680

Attachment: LOBBYIST REG RULE 40E1.800 (2084 : Authorize Publication of Notice of Proposed Rule - Lobbyist Registration)

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Amendment to FY2013-14 Adopted Budget

Summary

As noted in the August amendment request for $1M, the health insurance claims continue to trend higher than projected, therefore an additional amendment has become necessary before the end of this fiscal year. This amendment request is to recognize additional revenues in the amount of $1.5 million from FY2013-2014 ad valorem revenue collection in excess of the FY2013-2014 budget. Expenditure trends for the first three quarters of FY2013-2014 indicate that there is insufficient budget for the remainder of the fiscal year. Internal Service Funds are used to account for District activities that provide services to other funds and organizational units on a cost reimbursement basis. The Health Benefits Fund accounts for the operations related to providing health and medical insurance coverage to District employees and retirees who choose to remain in the plan. Revenue is provided through interfund charges and employee and retiree contributions.

This amendment will increase the FY2013-14 budget by $3 million.

Staff Recommendation

Staff recommends Governing Board approval of this budget amendment.

Additional Background

In 2010 the District established a self-insurance program for health benefits - including medical, dental and vision coverage - for its employees and retirees who choose to remain within the plan. The claims are administered by a third party and accounted for in the Health Benefits Fund. The participating funds make payments to the Health Benefits Fund by means of premiums charged and employee payroll deductions. The payments are based on management's estimates, using historical trends, of the amounts needed to pay prior and current year claims. The District maintains a stop loss insurance policy that pays the cost of individual health care claims above $375,000; the District pays claims up to that amount.

Core Mission and Strategic Priorities

This item supports the District Management and Administration Program within the Administrative Services Division.

Funding Source

Ad valorem revenue collection in excess of the FY2013-2014 budget.

Staff Contact and/or Presenter

Candida J. Heater - cheater@sfwmd.gov <mailto:cheater@sfwmd.gov> (561) 682-6486
Doug Bergstrom - dbergstr@sfwmd.gov <mailto:dbergstr@sfwmd.gov> (561) 682-6214

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0908

See attachment

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

South Florida Water Management District

Resolution No. 2014 -

A Resolution of the Governing Board of the South Florida Water Management District amending the Fiscal Year 2013 - 14 Budget; providing an effective date

WHEREAS, the Governing Board of the South Florida Water Management District on September 24, 2013 adopted Resolution No. 2013-931 "Adoption of Budget for Fiscal Year 2013-14", and

WHEREAS, the Governing Board of the South Florida Water Management District on April 10, 2014 adopted Resolution No. 2014-0404 "Amendment of Budget for Fiscal Year 2013-14", and

WHEREAS, the Governing Board of the South Florida Water Management District on May 15, 2014 adopted Resolution No. 2014-0502 "Amendment of Budget for Fiscal Year 2013-14", and

WHEREAS, the Governing Board of the South Florida Water Management District on July 10, 2014 adopted Resolution No. 2014-0709 "Amendment of Budget for Fiscal Year 2013-14", and

WHEREAS, the Governing Board of the South Florida Water Management District on August 14, 2014 adopted Resolution No. 2014-0806 "Amendment of Budget for Fiscal Year 2013-14", and

WHEREAS, pursuant to Section 373.536(4) F.S., If the district receives unanticipated funds after the adoption of the final budget, the final budget may be amended, following review and approval by the Executive Office of the Governor, and

WHEREAS, pursuant to Section 373.536(4) F.S., the notice of intention to amend was published in the notice of the Governing Board meeting at which the Budget Amendment will be considered, and

WHEREAS, implementation of this budget amendment is contingent upon approval by the Executive Office of the Governor, and

NOW, THEREFORE, be it resolved by the Governing Board of the South Florida Water Management District that the Fiscal Year 2013-14 Budget be amended as follows:

	GENERAL FUND	TOTAL SPECIAL REVENUE FUNDS	TOTAL CAPITAL PROJECTS FUNDS	INTERNAL SERVICE FUNDS	TRUST & AGENCY FUND	TOTAL FINAL BUDGET
FY14 AMENDED REVENUES, TRANSFERS AND BALANCES						
Estimated Fund Balance and Net Assets						
Fund Balance, beginning of year (Net of Encumbrances)	$59,857,750	$141,534,498	$206,960,111	$0	$14,037,630	$422,389,989
Net Assets, beginning of year				17,284,889		17,284,889
Sub-Total Estimated Fund Balance and Net Assets	**59,857,750**	**141,534,498**	**206,960,111**	**17,284,889**	**14,037,630**	**439,674,878**
Encumbrances Funded By Fund Balance/Future Revenue	6,178,734	21,626,534	67,567,014	9,069	0	95,381,351
Total Estimated Fund Balance and Net Assets, beginning of year	**66,036,484**	**163,161,032**	**274,527,125**	**17,293,958**	**14,037,630**	**535,056,229**
FY14 Amended Revenue	**115,493,967**	**207,927,780**	**67,132,581**	**29,799,913**	**0**	**420,354,241**
Ad Valorem - District / Okeechobee / Everglades Restoration	825,000	675,000				1,500,000
Health Insurance Charges				1,500,000		1,500,000
Total Amended Revenues	**116,318,967**	**208,602,780**	**67,132,581**	**31,299,913**	**0**	**423,354,241**
FY14 Amended Operating Transfers (Net)	-14,893,226	-55,619,399	69,692,276	0	820,349	**0**
Total Amended Operating Transfers (Net)	**-14,893,226**	**-55,619,399**	**69,692,276**	**0**	**820,349**	**0**
TOTAL AMENDED ESTIMATED REVENUES, TRANSFERS AND FUTURE DESIG. BALANCES	**$167,462,225**	**$316,144,413**	**$411,351,982**	**$48,593,871**	**$14,857,979**	**$958,410,470**
FY14 AMENDED EXPENDITURES AND ENCUMBRANCES						
FY14 Amended Expenditures	**127,339,688**	**237,105,855**	**227,379,559**	**31,869,722**	**820,349**	**624,515,173**
Administrative Services & Executive Offices						
District Everglades Program		225,000				225,000
Operations and Maintenance Program	338,250	450,000				788,250
Water Supply Program	272,250					272,250
Regulation Program	99,000					99,000
Mission Support Program	115,500					115,500
Internal Service Funds (Additional Health Claims)				1,500,000		1,500,000
Total Amended Expenditures	**128,164,688**	**237,780,855**	**227,379,559**	**33,369,722**	**820,349**	**627,515,173**
Encumbrances (Estimate)	6,178,734	21,626,534	67,567,014	9,069	0	95,381,351
TOTAL AMENDED EXPENDITURES AND ENCUMBRANCES	**134,343,422**	**259,407,389**	**294,946,573**	**33,378,791**	**820,349**	**722,896,524**
NET ASSETS, RESTRICTIONS, COMMITMENTS AND UNASSIGNED						
Net Assets	0	0	0	15,215,080	0	15,215,080
						-
Amended Net Assets	0	0	0	15,215,080	0	15,215,080
Nonspendable	201,145	6,080,612	0	0	14,037,630	20,319,387
Restricted	0	50,656,412	116,347,799	0	0	167,004,211
Committed	27,514,703		57,610	0	0	27,572,313
Amended Net Assets, Restrictions and Commitments	**27,715,848**	**56,737,024**	**116,405,409**	**15,215,080**	**14,037,630**	**230,110,991**
Unassigned	5,402,955	0	0	0	0	5,402,955
TOTAL AMENDED EXPENDITURES, ENCUMBRANCES, NET ASSETS, RESTRICTIONS, COMMITMENTS AND UNASSIGNED	**$167,462,225**	**$316,144,413**	**$411,351,982**	**$48,593,871**	**$14,857,979**	**$958,410,470**

This resolution shall take effect immediately upon adoption.

PASSED AND ADOPTED this 11th day of September, 2014

Approved as to form:
By:
Office of Counsel

Print Name:

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:
Chairman

ATTEST:

District Clerk/Secretary

Attachment: FY14 BA #5 Resolution FINAL (Resolution No. 2014 - 0908 : Amendment to FY2013-14 Adopted Budget)

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Enterprise Resource Planning (ERP) Contractors Supporting SAP

Summary

This is a request to continue the services of two ERP Programmer Analysts and one ERP Team Lead supporting SAP for the time period October 1, 2014 - September 30, 2015 in the amount of $677,881. These services will be procured from A.L. Jackson and Company, PA using the State of Florida Contract #973-561-10-1.

Staff Recommendation

Staff recommends approving the issuance of a purchase order to A.L. Jackson and Company, PA for two ERP Programmer Analysts and one ERP Team Lead, for the time period October 1, 2014 - September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $677,881 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

Staff augmentation contractors providing SAP expertise were previously procured through the SAP Work Order contracts. These contracts are expiring in October and November 2014. By procuring these services through the State of Florida Contract, Information Technology was able to obtain lower hourly rates while retaining existing contractors with extensive District SAP knowledge. These contractors are providing ABAP programming, Funds Management expertise, and Business Warehouse development skills needed to support business requirements.

Core Mission and Strategic Priorities

SAP is an integrated Enterprise Resource Planning System used for the District's core business functions (Accounting, Finance, Procurement, Human Resources, Payroll, Plant Maintenance, and Project Management). All of these functions support the District's core mission and strategic priorities.

Funding Source

The total amount for three contractors is $677,881, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0909

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with A.L. Jackson and Company, PA for three Enterprise Resource Planning (ERP) contractors, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $677,881 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with A.L. Jackson and Company, PA for three Enterprise Resource Planning (ERP) contractors, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $677,881 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to A.L. Jackson & Company, PA.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of Symantec Corporation (Veritas) Software Maintenance

Summary

This is the annual renewal of the Symantec Corporation (Veritas) software maintenance in the amount of $192,512. The time period for support is December 1, 2014 through November 30, 2015. This maintenance will be procured from Dyntek Services, Inc. using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y.

Staff Recommendation

Staff recommends approving a purchase order with Dyntek Services, Inc. for the annual renewal of Symantec storage software maintenance and upgrades, for the time period December 1, 2014 - November 30, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y, in the amount of $192,512 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

This maintenance includes technical support and upgrade service, on Symantec Corporation (Veritas) software licenses (Storage Foundation and Netbackup). With Veritas Storage Foundation, physical disks can be grouped into logical volumes to improve disk utilization and eliminate storage-related downtime. In addition, Veritas Storage Foundation gives systems administrators the flexibility to move data between different operating systems and storage arrays, and to balance input/output (I/O) across multiple paths to improve performance. Veritas Netbackup enables the District to backup, restore, and provide data integrity. Ensuring critical data retention is a high priority and, in case of an emergency and data loss, Netbackup provides data protection for the District.

Core Mission and Strategic Priorities

Information is one of the most important and valuable assets of the District. As the amount of information that is stored electronically grows, the management of the storage systems is of critical importance. This software assists staff in the administration and protection of the information supporting the District's mission and strategic goals.

Funding Source

The total amount for the annual renewal is $192,512, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0910

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with Dyntek Services, Inc. for the annual renewal of Symantec storage software maintenance and upgrades, for the time period December 1, 2014 through November 30, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y, in the amount of $192,512 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with Dyntek Services, Inc. for the annual renewal of Symantec storage software maintenance and upgrades, for the time period December 1, 2014 through November 30, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0119Y, in the amount of $192,512 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to Dyntek Services, Inc.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of EMC Corporation Hardware and Software Maintenance

Summary

This is the annual renewal of the EMC Corporation infrastructure hardware and software maintenance in the amount of $258,571. The time period for support is November 1, 2014 through October 31, 2015 and will be procured through an EMC Corporation authorized reseller using governmental contract pricing.

Staff Recommendation

Staff recommends approving a purchase order for the annual renewal of EMC Corporation infrastructure hardware and software maintenance, for the time period November 1, 2014 - October 31, 2015, through an EMC Corporation authorized reseller, in the amount of $258,571 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

The Information Technology Bureau Systems Engineering Section uses EMC equipment and software to maintain, store, and backup the District's critical data across three tiers of storage. The storage infrastructure provides high availability and redundancy for numerous services. The third tier of storage is utilized by Documentum, file system & email archiving. The second tier provides file system storage for all employees at the District (projserv & dataserv). The final tier provides the high speed storage to critical services such as SAP, email and Operations databases. Also to protect this data from any unforeseen disaster, select information across the storage platforms is replicated remotely to the District's disaster recovery site. The environment is scalable and strategically lends itself to the overall long term solution for data management at the District.

Core Mission and Strategic Priorities

Information is one of the most important and valuable assets of the District. As the amount of information that is stored electronically grows, the management of the storage systems is of critical importance. This hardware and software assist District staff in the administration and protection of the District's core mission and strategic priorities and enables the high availability of the information to the end users.

Funding Source

The total amount for the annual renewal is $258,571, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0911

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with an EMC Corporation authorized reseller for the annual renewal of the EMC Corporation hardware and software, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $258,571 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with an EMC Corporation authorized reseller for the annual renewal of the EMC Corporation hardware and software, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $258,571 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to an EMC Corporation authorized reseller.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Data Warehouse Analyst Contractor Supporting SAP

Summary

This is a request to continue the services of a Data Warehouse Analyst supporting SAP for the time period October 1, 2014 - September 30, 2015 in the amount of $200,431. These services will be procured from GDKN Corporation using the State of Florida Contract #973-561-10-1.

Staff Recommendation

Staff recommends approving a purchase order to GDKN Corporation for a Data Warehouse Analyst, for the time period October 1, 2014 - September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $200,431 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

Staff augmentation contractors providing SAP expertise were previously procured through the SAP Work Order contracts. These contracts are expiring in October and November 2014. By procuring these services through the State of Florida Contract, Information Technology was able to obtain a lower hourly rate while retaining an existing contractor with extensive District SAP knowledge. This contractor is providing Business Warehouse and Workflow development skills needed to support business requirements.

Core Mission and Strategic Priorities

SAP is an integrated Enterprise Resource Planning System used for the District's core business functions (Accounting, Finance, Procurement, Human Resources, Payroll, Plant Maintenance, and Project Management). All of these functions support the District's core mission and strategic priorities.

Funding Source

The total amount for one contractor is $200,431, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0912

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with GDKN Corporation for a Data Warehouse Analyst, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $200,431 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with GDKN Corporation for a Data Warehouse Analyst, for the time period October 1, 2014 through September 30, 2015, using the State of Florida Contract #973-561-10-1, in the amount of $200,431 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to GDKN Corporation.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of Oracle Software Maintenance

Summary

This is the annual renewal of the Oracle software maintenance in the amount of $942,578. The time period for support is October 25, 2014 through October 24, 2015. This support will be procured from Mythics, Inc. using the United States General Services Administration (GSA) Schedule #GS-35F-0153M.

Staff Recommendation

Staff recommends approving a purchase order with Mythics, Inc. for the annual renewal of Oracle software maintenance and upgrades, for the time period October 25, 2014 - October 24, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0153M, in the amount of $942,578 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

This maintenance includes technical support and upgrade service on all Oracle software supporting numerous (104) District and CERPZone databases and websites. The District's Oracle infrastructure is utilized by Operations, SAP and all Portal Web Applications (Portal, Employee Emergency Notification Site, Weather/Real-Time Readings, Agenda Builder, GB/WRAC Public Reporting, Key Permit Application, ePermitting, eSubmittal, Graphical Verification Analysis, and Regulation). The Operations Oracle database is part of the decision support system that is critical for water managers making real-time decisions. The Portal infrastructure is built on Oracle Application and Cluster Server ensuring reliable web applications and service availability. This level of support for the Oracle maintenance also ensures access to Oracle's engineering team for issues and rapid escalation to problem resolution.

Core Mission and Strategic Priorities

Some of the vital District functions managed by Oracle software are budget preparation, hydrologic and meteorological data processing and storage, regulatory administration, research, planning, land management, risk management, operations and maintenance, and water quality monitoring.

Funding Source

The total amount for the annual renewal is $942,578, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0913

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with Mythics, Inc. for the annual renewal of the Oracle software maintenance and upgrades, for the time period October 25, 2014 through October 24, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0153M, in the amount of $942,578 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with Mythics, Inc. for the annual renewal of the Oracle software maintenance and upgrades, for the time period October 25, 2014 through October 24, 2015, using the United States General Services Administration (GSA) Schedule #GS-35F-0153M, in the amount of $942,578 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to Mythics, Inc.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of Sun Microsystems (Oracle Corporation) Hardware Maintenance

Summary

This is the annual renewal of the Sun Microsystems (Oracle Corporation) hardware maintenance in the amount of $280,384. The time period for support is November 1, 2014 through October 31, 2015. This support will be procured directly from the manufacturer Oracle Corporation. Oracle Corporation purchased Sun Microsystems.

Staff Recommendation

Staff recommends approving a purchase order with Oracle Corporation for the annual renewal of Sun Microsystems server, storage, and peripheral hardware maintenance, for the time period November 1, 2014 - October 31, 2015, in the amount of $280,384 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

The Sun Microsystems maintenance includes servers, storage, peripherals and the Sun Solaris operating system. Currently the District has 100+ Sun Solaris servers. Critical District applications such as SAP, DBHYDRO, Operations, Oracle, and other core infrastructure applications reside on the Sun Microsystems hardware. Utilizing this support provides a high availability of services and reduced systems administration cost.

Core Mission and Strategic Priorities

The Sun Microsystems hardware houses critical data supporting the District's mission and strategic goals.

Funding Source

The total amount for the annual renewal is $280,384, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0914

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with Oracle Corporation for the annual renewal of the Sun Microsystems server, storage, and peripheral hardware maintenance, for the time period November 1, 2014 through October 31, 2015, in the amount of $280,384 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with Oracle Corporation for the annual renewal of the Sun Microsystems server, storage, and peripheral hardware maintenance, for the time period November 1, 2014 through October 31, 2015, in the amount of $280,384 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to Oracle Corporation.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of Cisco Systems Hardware and Software Maintenance

Summary

This is the annual renewal of the Cisco Systems network hardware and software maintenance in the amount of $352,405. The time period for support is November 1, 2014 through October 31, 2015 and will be procured through a Cisco Systems authorized reseller using governmental contract pricing.

Staff Recommendation

Staff recommends approving a purchase order for the annual renewal of Cisco Systems network hardware and software maintenance, for the time period November 1, 2014 - October 31, 2015, through a Cisco Systems authorized reseller, in the amount of $352,405 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background

The Cisco Systems hardware and software supports all District networks including the SCADA and internal networks, our ability to monitor and control water levels, internet connectivity, telephone system, and connection between all District offices and microwave network sites. The hardware maintenance includes phone support to trouble shoot network problems and replacement of malfunctioning equipment. The software support includes upgrades for the Cisco router operating system and technical support. This maintenance renewal also includes support for the video conferencing equipment.

Core Mission and Strategic Priorities

The hardware and software maintenance provide improved network reliability and network support for the entire District.

Funding Source

The total amount for the annual renewal is $352,405, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0915

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with a Cisco Systems authorized reseller for the annual renewal of the Cisco Systems hardware and software maintenance, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $352,405 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with a Cisco Systems authorized reseller for the annual renewal of the Cisco Systems hardware and software maintenance, for the time period November 1, 2014 through October 31, 2015, using governmental contract pricing, in the amount of $352,405 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to a Cisco Systems authorized reseller.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

_____

M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Annual Renewal of SAP Software Maintenance

Summary
This is the annual renewal of the SAP software maintenance in the amount of $592,000. The time period for support is October 1, 2014 through September 30, 2015. This support will be procured directly from the manufacturer SAP.

Staff Recommendation
Staff recommends approving a purchase order with SAP for the annual renewal of SAP software maintenance and upgrades, for the time period October 1, 2014 - September 30, 2015, in the amount of $592,000 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Additional Background
SAP is the integrated Enterprise Resource Planning System used for the District's core business functions (Accounting, Finance, Procurement, Human Resources, Payroll, Plant Maintenance, and Project Management). In addition to technical support and upgrades, the annual maintenance also provides 7x24 access to the Support and Advisory Center, webinars, remote sessions, continuous quality checks, and monitoring by the SAP Early Watch Alert Service

Core Mission and Strategic Priorities
SAP is an integrated Enterprise Resource Planning System used for the District's core business functions (Accounting, Finance, Procurement, Human Resources, Payroll, Plant Maintenance, and Project Management). All of these functions support the District's core mission and strategic priorities.

Funding Source
The total amount for the annual renewal is $592,000, for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

Staff Contact and/or Presenter
Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0916

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a Purchase Order with SAP Public Services, Inc. for software maintenance and upgrades, for the time period October 1, 2014 through September 30, 2015, in the amount of $592,000 for which ad valorem funds are subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize entering into a Purchase Order with SAP Public Services, Inc. for software maintenance and upgrades, for the time period October 1, 2014 through September 30, 2015, in the amount of $592,000 for which ad valorem funds are subject to Governing Board approval of the FY15 budget.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves issuing a purchase order to SAP Public Services, Inc.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Increase Funding for the Toshiba Business Solutions Multi-Function Devices Contract #4600002336

Summary

This request is to increase the Toshiba Business Solutions Multi-Function Devices Contract in the amount of $366,708. This additional funding will provide services for the time period October 1, 2014 through November 8, 2015.

Staff Recommendation

Staff recommends approving an increase to the Toshiba Business Solutions Multi-Function Devices Contract in the amount of $366,708 for the time period October 1, 2014 - November 8, 2015 for which ad valorem funds are budgeted and subject to Governing Board approval of the FY15 and FY16 budgets.

Additional Background

In FY13 the Toshiba Business Solutions Multi-Function Devices Contract was extended for two additional years (November 9, 2013 - November 8, 2015). Sufficient funds were available on the contract threshold to cover the first year extension. To fund the second year (through November 8, 2015), the contract must be increased by $366,708. The contract includes the multi-function devices lease, Hewlett Packard printer/plotter maintenance, full time on-site technician, and all supplies for the equipment.

Core Mission and Strategic Priorities

The Toshiba Business Solutions Multi-Function Devices Contract provides the technology for District staff to produce documents supporting the core mission and strategic priorities.

Funding Source

The total increase amount for the Toshiba Business Solutions contract is $366,708, for which ad valorem funds are subject to Governing Board approval of the FY15 and FY16 budgets.

Staff Contact and/or Presenter

Doug Bergstrom ext. 6214 or Duane Piper ext. 2638

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0917

A Resolution of the Governing Board of the South Florida Water Management District to authorize an amendment to increase the funding for Toshiba Business Solutions Multi-Function Devices Contract #4600002336, for the time period October 1, 2014 through November 8, 2015, in the amount of $366,708 for which ad valorem funds are subject to Governing Board approval of the FY15 and FY16 budgets; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate, and in the public interest to authorize increasing the funding for Toshiba Business Solutions Multi-Function Devices Contract #4600002336, for the time period October 1, 2014 through November 8, 2015, in the amount of $366,708 for which ad valorem funds are subject to Governing Board approval of the FY15 and FY16 budgets.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves increasing the funding for Toshiba Business Solutions Multi-Function Devices Contract #4600002336.

Section 2. This resolution shall take effect immediately upon adoption

PASSED and **ADOPTED** this 11TH day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Blake C. Guillory, Executive Director

DATE: September 11, 2014

SUBJECT: Cooperative Funding for Stormwater and Water Supply Projects

Summary
The Cooperative Funding Program provides a mechanism for District cost-share funding of priority stormwater and alternative water supply (AWS) construction projects. The Governing Board will establish priority considerations that are aligned with the District's core mission. A single, annual solicitation is proposed for both project types. Program funds would be budgeted each year and allocated between stormwater and AWS pursuant to Governing Board direction.

Staff Recommendation
Staff recommends approval to modify the existing program to issue an RFP by October and to follow the proposed program structure and schedule.

Core Mission and Strategic Priorities
The Cooperative Funding Program provides financial incentive to promote local projects that complement ongoing regional restoration, flood control, water quality and water supply efforts. Components of the proposed program include the Governing Board setting priorities and determining funding amount, a single solicitation issued for program consideration, preliminary list compiled by January followed by detailed evaluations and priority ranking, and approved projects included in final budget.

Funding Source
District staff will coordinate evaluation and ranking of projects for funding based on criteria and priorities established by the Governing Board. Program funding will be subject to approval by the Governor and Legislature each year.

Staff contact
Dan DeLisi, Chief of Staff, 561-682-6232

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0918

A Resolution of the Governing Board of the South Florida Water Management District approving a Cooperative Funding Program that provides cost-share funding to local governments and other organizations for priority stormwater management and alternative water supply projects aligned with the District's core mission; providing an effective date.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to approve a Cooperative Funding Program that provides cost-share funding to local governments and other organizations for priority stormwater management and alternative water supply aligned with the District's core mission;

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves a Cooperative Funding Program that provides cost-share funding to local governments and other organizations for priority stormwater management and alternative water supply projects.

Section 2. The program supports and is aligned with the District's core mission of flood control, water supply and water quality responsibilities.

Section 3. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Dan DeLisi, Chief of Staff

DATE: September 11, 2014

SUBJECT: Indian River Lagoon National Estuary Program Inter-Local Agreement and Funding 4600003137

Summary
The Indian River Lagoon National Estuary Program (IRL NEP) was established in 1990 through the Environmental Protection Agency's (EPA) designation of the IRL as an "estuary of national significance." The IRL NEP provides a non-regulatory, stakeholder-driven, collaborative approach to coastal watershed restoration and protection. In 1991, a Management Conference was established to guide development of the IRL NEP Comprehensive Conservation Management Plan (CCMP) and its future implementation. Last month the Governing Board was briefed on proposed organizational changes that will increase community participation and expand project opportunities. This month staff is requesting authorization to enter into an Interagency Agreement and approval of initial investment funds.

Staff Recommendation
Staff recommends approval of this item as the project leverages state dollars with federal and local cost-share funds to implement water resource projects/programs that directly benefit the Indian River Lagoon. Further, this project is supported by the Indian River Lagoon County Collaborative and the Florida Legislature.

Background
The CCMP's development was closely coordinated with the goals and objectives of the South Florida Water Management District's (SFWMD) and St. Johns River Water Management District's (SJRWMD) Indian River Lagoon Surface Water Improvement and Management (IRL SWIM) Plan. Due to the similarities between the SWIM and the NEP programs, and the foundation of support offered by SJRWMD to the IRL NEP, the SJRWMD was selected as IRL NEP's local sponsoring agency and has provided administrative, personnel and facility support to the IRL NEP since its inception in 1991.

During the past several months, SJRWMD, SFWMD, the Florida Department of Environmental Protection (FDEP), local governments and other key stakeholders have been exploring alternative organizational structures for the IRL NEP that would allow for program expansion and enhanced impact to benefit the IRL.

In June 2014, the IRL NEP Advisory Board - an advisory body to the SJRWMD Governing Board - voted unanimously to move forward with preparing an inter-local agreement modeled after the Tampa Bay National Estuary Program (TB NEP). The TB NEP was created as a special district of the state of Florida and is recognized as having one of the most effective organizational structures for supporting an NEP.

To achieve this, a Design Sub-Committee made up of representatives from the IRL NEP Advisory Board, SFWMD and SJRWMD staff, and local governments developed a draft inter-local agreement for consideration. To expedite the process toward finalizing the agreement, SFWMD staff is requesting Governing Board authorization for the Executive Director, or his designee, to enter into a new inter-local agreement whereby SFWMD would be one of several agency/governmental partners of the expanded IRL NEP.

Staff is also requesting approval to allocate $500,000 in Fiscal Year 2014-2015 funding as an initial investment in the restructured IRL NEP. This funding is proposed to be combined with funding from EPA, SFWMD, FDEP and Volusia, Brevard, Indian River, St. Lucie and Martin counties.

How this helps meet the District's 10-year Strategic Plan: The project is consistent with the goals of the Comprehensive Everglades Restoration Plan: Indian River Lagoon-South Plan and the Northern Everglades & Estuaries Protection Program and supports the District's 10-Year Strategic Plan's Coastal Watersheds Program goal to restore coastal watersheds and estuaries through local initiatives and partnerships.

Funding Source: The initial investment of $500,000 in FY15 is from ad valorem funds.

This Board item impacts what areas of the District, both resource areas and geography: The IRL is 156 miles long and spans five counties along the East Coast of Florida, including St. Lucie and Martin counties within the SFWMD.

What concerns could this Board item raise? The IRL NEP will likely request annual funding to support its implementation of the CCMP.

If you have any questions, please contact Dan DeLisi at ext. 6232.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0919

A Resolution of the Governing Board of the South Florida Water Management District authorizing the Executive Director, or his designee, to enter into an Interagency Agreement with other agency/governmental partners for the expanded Indian River Lagoon National Estuary Program; approving the allocation of $500,000 in ad valorem funds for FY15 as an initial investment subject to Governing Board approval of the FY15 budget; providing an effective date.

WHEREAS, the Indian River Lagoon National Estuary Program (IRL NEP) was established in 1990 through the Environmental Protection Agency's (EPA) designation of the IRL as an "estuary of national significance;" and

WHEREAS, during the past several months, St. Johns River Water Management District (SJRWMD), SFWMD, the Florida Department of Environmental Protection (FDEP), local governments and other key stakeholders have been exploring alternative organizational structures for the IRL NEP that would allow for program expansion and enhanced impact to benefit the IRL; and

WHEREAS, in June 2014, the IRL NEP Advisory Board - an advisory body to the SJRWMD Governing Board - voted unanimously to move forward with preparing an inter-local agreement modeled after the Tampa Bay National Estuary Program (TB NEP). The TB NEP was created as a special district of the state of Florida and is recognized as having one of the most effective organizational structures for supporting an NEP; **now therefore**

BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District authorizes the Executive Director, or his designee, to enter into an Interagency Agreement whereby SFWMD would be one of several agency/governmental partners of the expanded IRL NEP.

Section 2. The Governing Board approves allocating $500,000 in ad valorem funds for FY15 as an initial investment subject to Governing Board approval of the FY15 budget.

Section 3. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

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Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Jeff Kivett, Division Director

DATE: September 11, 2014

SUBJECT: L-8 Divide Structure Construction - Contract Number 4600003133

Summary

As part of the District's Restoration Strategies initiative the L8 Divide Structure, G541, was identified as a component of the Eastern Flow Path in the Restoration Strategies Regional Water Quality Plan. It is to be located in the L8 Canal approximately 2.67 miles north of State Road 80 in Palm Beach County. The structure has two basic functions:

1. When closed, it allows stages in the L8 Canal, south of G541, to be raised and held without affecting water elevations in the remainder of the L8 Canal north of the structure. Raising stages south of G541 allows filling of the L8 FEB by gravity and also allows pumping of water out of the L8 FEB to nearby STA 1E and 1W.

2. When open, it is essentially hydraulically "invisible" based on flows in the L8 Canal and has no impact on the way the system is currently operated.

This G541, L8 Divide Structure, project is to construct a fully automated, reinforced concrete vertical lift roller gate structure, utilizing a three gate arrangement. The structure also includes back-up power generation and considerations for passive public access across the facility.

Staff Recommendation

Staff recommends approval to enter into a 540 day contract in the amount of $4,444,443.00 with Douglas N. Higgins, Inc., the lowest responsive and responsible bidder, for the construction of the G541 L8 Divide Structure.

Core Mission and Strategic Priorities

This project will support the Restoration Strategies Regional Water Quality Plan, which was developed and approved in 2012. The District has access to the project lands/sites, completed the design, and received the permits for the G541 L8 Divide Structure Project.

Funding Source

The lowest responsive and responsible bidder is Douglas N. Higgins, Inc. for which $1,500,218.00 in ad valorem funds are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15 and FY16 budgets.

Staff Contact

Jeff Kivett, Division Director, Operations, Engineering and Construction
561-682-2680 / jkivett@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0920

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a 540 day contract with Douglas N. Higgins, Inc., the lowest responsive and responsible bidder, for the G541 L8 Divide Structure project, for a total amount of $4,444,443.00, for which $1,500,218.00 in ad valorem funds are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15 and FY16 budgets; providing an effective date.

WHEREAS, the G541 L8 Divide Structure is a component of the Eastern Flow Path identified in the Restoration Strategies Regional Water Quality Plan in Palm Beach County, Florida. This facility will work in conjunction with the existing Everglades Stormwater Treatment Area (STAs) to meet the Water Quality Base Effluent Limit (WQBEL);

WHEREAS, construction of the G541 L8 Divide Structure is required to meet the WQBEL to achieve compliance with the State of Florida's numeric phosphorous criterion in the EPA;

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to authorize entering into a 540 day contract with Douglas N. Higgins, Inc., the lowest responsive and responsible bidder, for the G541 L8 Divide Structure project, for a total amount of $4,444,443.00;

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the 540 day contract with Douglas N. Higgins, Inc. for the construction of the G541 L8 Divide Structure, in the amount of $4,444,443.00

Section 2. This project supports the District's Strategic Priority to the Restoration Strategies Regional Water Quality Plan.

Section 3. This Resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

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Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Jeff Kivett, Division Director

DATE: September 11, 2014

SUBJECT: C-44 STA's Construction - Contract Number 4600003135

Summary

The C-44 Reservoir/Stormwater Treatment Area Project (C-44 Project) is intended to be constructed by the U.S. Army Corps of Engineers (USACE) and the District over the next five (5) years. In December 2013 the District completed construction of the C-44 Communication Tower and in July 2014 the USACE completed construction of Contract 1 (C-400 Intake Canal and Access Road, C-133A Canal, C-133 Canal, S-418 Spillway, and Citrus Boulevard improvements). As stated in the Project Partnership Agreement (PPA) Amendment executed in August 2014, the District intends to construct the System Discharge (approved by the Governing Board in August 2014, construction to start early September 2014), the Stormwater Treatment Areas (construction start October 2014), and the S-401 Pump Station (construction start April 2015). The District started construction in July 2014 on the System Discharge Interim Spillway. That contract will achieve early benefits of retaining additional water within the C-44 Project site. That contract is not cost shareable since it was executed prior to the USACE executing the PPA Amendment. The USACE intends to start construction of the C-44 Reservoir (Contract 2) in July 2015.

This C-44 Stormwater Treatment Area (C-44 STA) construction contract is to construct six STA cells which include 32 miles of berms, 30 miles of canals, 56 concrete water control structures, and all associated ancillary features. These features in conjunction with the System Discharge features will provide water quality treatment on 6,300 wetted acres of STAs.

Staff Recommendation

Staff recommends approval to enter into a 1,034 day contract in the amount of $100,792,387.00 with Blue Goose Growers, LLC dba Blue Goose Construction, the lowest responsive and responsible bidder, for the construction of the C-44 STA.

Core Mission and Strategic Priorities

This contract will support the completion of the C-44 Project which is linked to the 10-Year Strategic Plan. The District has access to the project lands/sites, completed the design, and received the permits for the C-44 Project. The USACE requires these construction efforts to be initiated prior to the USACE Contract 2 award.

Funding Source

The lowest responsive and responsible bidder is Blue Goose Growers, LLC dba Blue Goose Construction, for which $200,000.00 in dedicated funds (Save Our Everglades Trust Fund) are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15, FY16 and FY17 budgets. In order for this effort to be deemed cost shareable with the USACE, this contract cannot be executed prior to the USACE District Commander approval of the plans and specifications.

Staff Contact

Jeff Kivett, Div. Dir. Operations, Engineering & Construction, 561-682-2680 / jkivett@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0921

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a 1,034 day contract with Blue Goose Growers, LLC dba Blue Goose Construction, the lowest responsive and responsible bidder, for the C-44 Stormwater Treatment Area, in the amount of $100,792,387.00, for which $200,000.00 in dedicated funds (Save Our Everglades Trust Fund) are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY15, FY16 and FY17 budgets; providing an effective date.

WHEREAS, the C-44 Stormwater Treatment Area is a component of the Comprehensive Everglades Restoration Plan C-44 Reservoir/Stormwater Treatment Area Project in Martin County, Florida, and

WHEREAS, construction of the C-44 Stormwater Treatment Area is required to be constructed for the South Florida Water Management District to meet its commitments to the U.S. Army Corps of Engineers, and

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to authorize entering into a 1,034 day contract with Blue Goose Growers, LLC dba Blue Goose Construction, the lowest responsive and responsible bidder, for the C-44 Stormwater Treatment Area;

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the 1,034 day contract with Blue Goose Growers, LLC dba Blue Goose Construction, for the construction of the C-44 Stormwater Treatment Area, in the amount of $100,792,387.00

Section 2. This project supports the District's Strategic Priority to the Comprehensive Everglades Restoration Plan

Section 3. This Resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

_____
Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Jeff Kivett, Division Director

DATE: September 11, 2014

SUBJECT: S5AS Structure Rehabilitation Construction Contract 4600003132

Summary
The S-5AS Divide Structure Rehabilitation Project is intended to be constructed by the District over the next nineteen (19) months.

As part of the Restoration Strategies Project the S-5A Basin and C-51 West Basin runoff will be directed north through S-5AS to the L-8 FEB. With implementation of this project, the use of the S-5AS structure will increase and therefore will require the structure to be upgraded to ensure more efficient operations and increased use at higher stages and flow rates.

Staff Recommendation
Staff recommends approval to enter into a 570 day contract in the amount of $2,284,000.00 with Murray Logan Construction, Inc., the lowest responsive and responsible bidder, for the construction of the S-5AS Divide Structure Rehabilitation Project.

Core Mission and Strategic Priorities
This contract will support the overall Restoration Strategies Regional Water Quality Plan. The District has access to the project lands/sites, completed the design, and received the permits for the S-5AS Divide Structure Rehabilitation Project.

Funding Source
The lowest responsive and responsible bidder is Murray Logan Construction, Inc. for which $475,250.00 in ad valorem funds are budgeted for FY14, and the remainder is subject to Governing Board approval of the FY15 budget.

Staff Contact
Jeff Kivett, Division Director, Operations, Engineering and Construction
561-682-2680 / jkivett@sfwmd.gov

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Resolution No. 2014 - 0922

A Resolution of the Governing Board of the South Florida Water Management District to authorize entering into a 570 day contract with Murray Logan Construction, Inc., the lowest responsive and responsible bidder, for the S-5AS Divide Structure Rehabilitation Project, in the amount of $2,284,000.00, for which $475,250.00 in ad valorem funds are budgeted in FY14, and the remainder is subject to Governing Board approval of the FY 15 budget; providing an effective date.

WHEREAS, the S-5AS Divide Structure Rehabilitation Project is a component of the Restoration Strategies Regional Water Quality Plan, Eastern Flow Path in Palm Beach County, Florida.

WHEREAS, construction of the S-5AS Divide Structure Rehabilitation Project is required to meet the Water Quality Based Effluent Limits (WQBEL) to achieve compliance with the State of Florida's numeric phosphorous criterion in the EPA.

WHEREAS, the Governing Board of the South Florida Water Management District deems it necessary, appropriate and in the public interest to authorize entering into a 570 day contract with Murray Logan Construction, Inc., the lowest responsive and responsible bidder for the construction of the S-5AS Divide Structure Rehabilitation Project, in the amount of $2,284,000.00;

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BOARD OF THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT:

Section 1. The Governing Board of the South Florida Water Management District hereby approves the 570 day contract with Murray Logan Construction, Inc. For the construction of the S-5AS Divide Structure Rehabilitation Project, in the amount of $2,284,000.00

Section 2. This resolution shall take effect immediately upon adoption.

PASSED and **ADOPTED** this 11th day of September, 2014.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, BY ITS GOVERNING BOARD
By:

_____
Chairman

Attest:

_____
District Clerk/Secretary

Legal form approved:
By:

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Office of Counsel

Print name:

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M E M O R A N D U M

TO: Governing Board Members

FROM: Doug Bergstrom, Director, Administrative Services Division

DATE: September 11, 2014

SUBJECT: Monthly Financial Statement – July 2014

The attached financial status report is provided for your review. This report provides an overview of District financial activity and includes revenue collections by source and expenditures by program. Also attached is a summary in the State Program format in compliance with Chapter 373.536(4)(e) F.S., requiring each District to provide a monthly financial statement in the form and manner prescribed by the Department of Financial Services to the District's Governing Board and make such monthly financial statement available for public access on its website. This unaudited financial statement is provided as of July 31, 2014, with 83.3% of the fiscal year completed.

Schedule of Sources and Uses – This financial statement compares revenues received and encumbrances/expenditures made against the District's FY14 $718.6 million consumable budget. Encumbrances represent orders for goods and services which have not yet been received.

- With the fiscal year 83.3% complete, 96.3% of the District's budgeted operating revenue (excludes fund balance) has been collected. The primary source of operating revenue received to date is taxes. Ad Valorem taxes comprise 64.0% of the budgeted operating revenues and drive collections based on the annual cycle of the property tax bill. The remaining revenue source is fund balance which represents the amount of prior year residual revenue that is budgeted in the current year and has already been received. Total FY14 sources collected were 97.8% of budget or $703 million.

- 100.7% of budgeted Ad Valorem tax revenue and 101.2% of Agricultural Privilege tax revenue have been collected to date. Ad Valorem and Agricultural Privilege tax collections peak November through January driven by the mailing of property tax bills in October and the 4.0% maximum discount available when paid in full by November 30. These taxes are budgeted at a discounted rate of 95.0% to allow for the discounts property owners may take advantage of through early payment options. Historical ad valorem trends for the past five years through July average a collection rate of 98.4%.

- There is $9.1 million in budgeted intergovernmental revenue in ad valorem funds, which includes $4.4 million in Alligator Alley toll revenue, $2.8 million in WMLTF for moving water south, $1.6 million in USACE reimbursements, and $304K in DEP reimbursements for aquatic plant control activities. Actual revenues earned as of the end of July amount to $9.6 million.

- There is $93.0 million in budgeted intergovernmental revenue in dedicated funds, comprised of $74.8 million in SOETF reimbursements, $5.0 million in reimbursements from the Florida Fish and Wildlife Conservation Commission (FWC) for aquatic/invasive

Attachment: Monthly Financial Statement Memo July FY14 (2057 : Monthly Financial Statement - July 2014)

plant control and $15K for Model Lands, $6.9 million in WMLTF reimbursements for debt service expenses related to bonds and $4.0 million for the Corbett Levee, reimbursement of federal revenues of $538K for St. Lucie Watershed Water Farming and $375K for Tropical Storm Isaac repairs, $240K from Indian River Lagoon and Everglades License Tag proceeds, and $175K reimbursement from FDEP for water quality studies. FY14 actual revenue to date amounts to $57.4 million. Reimbursement requests are submitted to the state based on actual expenses incurred and are typically received later in the fiscal year.

- The District budgeted $2.9 million in investment earnings in ad valorem funds for FY14. Total revenue to date is $5.1 million or 177.1% of budgeted Investment Earnings; $3.8 million or 133% of investment earnings in ad valorem funds and $1.3 million in dedicated funds.

- Lease revenue represents amounts collected from leases of real property owned by the District. The timing of revenue received is based on the fee schedules within the agreements – monthly, semi-annual, or annual payments – and these varying timing issues impact the collection rate. The District has received $4 million which represents 132.8% of the current year budgeted lease revenue. The use of lease revenue collected for lands purchased with State or Federal funds is restricted based on the guidelines in the acquisition or grant.

- There is $3.9 million in budgeted permit fee revenue, which includes water use permits ($549K), right of way permits ($68K), Environmental Resource Permit (ERP) application fees ($1.5 million), and wetland mitigation fees for C-139 Annex Restoration ($1.8 million). FY14 revenue of $21.7 million received include $800K from water use permits, $2.3 million from ERP Application Fees, $16.2 million in unbudgeted revenues from Lake Belt Mitigation fees, $2.3 million from Loxahatchee Wetland Mitigation and $100K from other applications and fees.

- Budgeted revenue in the Other category includes $210K in civil penalties and enforcement fees and $251K in miscellaneous revenues such as cash discounts, insurance reimbursements, refunds for prior year expenditures, and sale of recycled oil and scrap metal. Fiscal year collections amount to $1.8 million at the end of July, representing 383.3% of the budgeted $461K. $1.1 million of the amount received was a refund of prior year expenditures from Florida League of Cities.

- Sale of District Property represents the sale of real property and land. This is budgeted conservatively at $250K due to the uncertainty involved. FY14 revenues received total $412K.

- Self-insurance premiums represent the District's contribution and the contribution from active and retired District employees to the self-funded health benefits program. Also included is the District's contribution to the workers compensation, auto and general liability self-insurance program. Contributions of $23.8 million received through July equate to 82.8% of the $28.8 million budget.

Attachment: Monthly Financial Statement Memo July FY14 (2057 : Monthly Financial Statement - July 2014)

Expenditure and Encumbrance Status:

As of July 31, 2014, with 83.3% of the year complete, the District has expended **$377 million or 66.6%** and has encumbered **$133 million or 23.4%** of its non-reserve budget. The District has obligated (encumbrances plus expenditures) **$510 million** or **90%** of its non-reserve budget.

Summary of Expenditures and Encumbrances by Program – This financial statement illustrates the effort to date for each of the District's program areas. Provided below is a discussion of the primary uses of funds by program.

- The **Comprehensive Everglades Restoration Plan Program** has obligated 90.0% and expended 54.6% of their $105.7 million budget. Principal expenditures include personnel services ($4.4 million), contractual services ($10.4 million), operating ($495K), and capital outlay ($42.4 million). Capital outlay encumbrances ($32.8 million) and contractual services encumbrances ($4.5 million) include the following projects: Southern CREW, Biscayne Bay Coastal Wetlands, C-111 Spreader Canal, L-8 Flow Equalization Basin, C-44 Reservoir/STA Project, Loxahatchee Impoundment Landscape Assessment, Picayune Strand, WCA3 Decompartmentalization and Sheetflow Equalization, Lake Okeechobee Water Retention – Nubbin Slough, CERP Monitoring and Assessment, Modified Water Deliveries & South Dade C-111 Project, CERP Water Quality Study, and CERP Data Management.

- The **Coastal Watersheds Program** has obligated 92.0% and expended 62.2% of their total $16.0 million budget. Principal expenditures include personnel services ($2.7 million), contractual services ($4.8 million), and capital outlay ($2.4 million). Contractual services encumbrances primarily consist of regional projects ($3.4 million) including: St. Lucie River and Indian River Lagoon Initiatives, Loxahatchee River Preservation Initiative, Lakes Park Restoration, Spanish Creek/Four Corners Initiative, Mirror Lakes/Halfway Pond Rehydration, Village of El Portal Stormwater project, and Big Cypress Basin Stormwater Projects; remaining contractual encumbrances ($1.0 million) include: St. Lucie River Watershed WaSh Model Upgrade; St. Lucie and Caloosahatchee River Watersheds nutrient study; water quality monitoring in St. Lucie River, Indian River Lagoon, Loxahatchee River, and Caloosahatchee River; water quality monitoring, modeling, nutrient, ecological, and hydrological studies for the Florida Bay and Coastal Wetlands Project; Biscayne Bay water quality and submerged aquatic monitoring; Lake Trafford monitoring; public process to develop a restoration vision of the Caloosahatchee River and Estuary; hydro model for Naples and Rookery Bay, Naples Bay salinity data collection, and Collier County water quality monitoring. Capital outlay encumbrances ($337K) are for the Lake Hicpochee Hydrologic Enhancement project.

- The **District Everglades Program** has obligated 89.4% and expended 55.7% of their total $96.1 million budget. Principal expenditures include personnel services ($14.9 million), contractual services ($4.0 million), operating ($5.6 million), and capital outlay ($29.0 million). Contractual services encumbrances ($2.6 million) primarily include the operations monitoring, maintenance, and repair of Stormwater Treatment Areas (STA), Lainhart & Masten Dam project, NAVD88/Vertical Datum work for the STA's, Restoration Strategies Science Plan projects, STA 1W Expansion and the Everglades Regulation Source Control. Operating encumbrances ($629K) are in support of the overall operations and the maintenance of the STA's. Capital outlay encumbrances ($29.1 million) include

Attachment: Monthly Financial Statement Memo July FY14 (2057 : Monthly Financial Statement - July 2014)

work on Everglades Agricultural Area A1 Flow Equalization Basin, STA 1W Expansion, and Restoration Strategies Science Plan projects.

- The **Kissimmee Watershed Program** has obligated 95.4% and expended 14.4% of their total $17.3 million budget. Principal expenditures include personnel services ($1.5 million), contractual services ($560K), and operating ($450K). Contractual services and operating encumbrances ($574K) primarily consist of Kissimmee River Restoration Evaluation ($71K), Kissimmee Basin Modeling and Operating System ($86K), the Oak Creek project ($45K), the Rolling Meadows project ($15K), hydrologic monitoring ($52K), Orange County Area Stormwater Improvements ($281K), land acquisition related costs, environmental risk assessments, and electrical services ($24K). Capital outlay encumbrances ($13.4 million) are primarily for the Kissimmee River Restoration land acquisition and associated costs.

- The **Lake Okeechobee Program** has obligated 85.9% and expended 58.4% of their total $19.5 million budget. Principal expenditures include personnel services ($3.1 million), contractual services ($7.4 million), operating ($207K), and capital outlay ($673K). Contractual services and operating encumbrances ($4.9 million) primarily consist of Dispersed Water Management (DWM) and Florida Ranchland Environmental Services Projects ($3.6 million), Northshore Navigation Canal project ($1.1 million), Lake Okeechobee Watershed Pre-Drainage Characterization study ($76K), Lake Istokpoga Marsh project ($30K), water quality assessments, improvements, and reporting ($47K), utilities ($27K), and computer hardware/software maintenance and support ($16K). Capital outlay encumbrances for DWM projects ($480K) are for electric powered pump stations for DWM temporary storage opportunities.

- The **Land Stewardship Program** has obligated 84.6% and expended 63.6% of their total $18.1 million budget. Principal expenditures include personnel services ($3.5 million), contractual services ($5.8 million), operating ($1.5 million), and capital outlay ($619K). Contractual services and operating encumbrances ($3.3 million) include the maintenance of vegetation and exotic plant control, work on the C-139 Annex Mitigation project, provision of law enforcement services, and management of District owned lands and facilities. Capital outlay encumbrances ($523K) include work on the C-139 Annex Mitigation project.

- The **Mission Support Program** has obligated 92.3% and expended 85.6% of their total $45.4 million budget. Principal expenditures include personnel services ($17.8 million), contractual services ($5.3 million), operating ($14.3 million), and capital ($1.3 million). Contractual services encumbrances ($1.9 million) include legal and technical support services, IT consulting services, hardware/software systems maintenance, and facilities maintenance and repair services. Operating encumbrances ($777K) include utilities and space rental. Capital outlay encumbrances ($350K) include design, construction, and inspection work to upgrade the chiller system to provide redundant cooling capacity for the IT data center located within the Emergency Operations Center, and computer hardware components.

- The **Modeling and Science Support Program** has obligated 89.1% and expended 83.8% of their total $12.9 million budget. Principal expenditures include personnel services ($8.4 million), contractual services ($1.7 million), operating ($535K), and capital

outlay ($139K). Contractual services and operating encumbrances ($673K) include water quality sampling, field equipment maintenance, technical assistance and peer reviews, computer hardware/software maintenance and consulting, and utilities.

- The **Operations and Maintenance Program** has obligated 88.8% and expended 70.6% of their total $150.0 million budget. Principal expenditures include personnel services ($43.3 million), contractual services ($20.0 million), operating ($24.0 million), and capital outlay ($18.4 million). Encumbrances for contractual services and capital outlay ($26.2 million) primarily relate to the O&M capital program for maintenance and repair of existing water management system canals and water control structures including, Miami B-47 Building Replacement, Diesel Oxidation Catalyst Installation, C-4 Canal Bank Improvements, S-5A Hardening and Service Bridge Refurbishment, C-100A Canal Bank Repairs, BCB Field Station Design/Build, Miller Weir #3, Hillsboro Canal Bank Repairs, S-9 Access Bridge Replacement, S-6 Tower Replacement, C-41A NRCS project, North Shore Trash Rake Project, S-13 Repower and Automation, G-94 A-D Refurbishment and Repairs, S-150 Replacement and Automation, G-151 Structure Replacement and NAVD88 Vertical Datum Upgrades. Operating encumbrances ($1.0 million) are primarily associated with field station daily operations and maintenance including vegetation and exotic plant control for the Central and Southern Flood Control system.

- The **Regulation Program** has obligated 81.9% and expended 80.5% of their total $23.0 million budget. Principal expenditures include personnel services ($14.0 million), contractual services ($1.3 million), operating ($3.2 million), and capital outlay ($329K). Contractual services and operating encumbrances ($261K) include application development, permit scanning contractors/support, computer hardware/software, and advertising services. Capital outlay encumbrances ($50K) consist primarily of the ePermitting enhancement project which saves time and expenses with online filing/searching of permits.

- The **Water Supply Program** has obligated 88.5% and expended 70.2% of their total $21.0 million budget. Principal expenditures include personnel services ($4.7 million), contractual services ($1.9 million), operating ($7.8 million), and capital outlay ($38K). Contractual services and operating encumbrances ($3.7 million) include the MFL Water Reservation Rules Status ($45K), Central Florida Water Initiative ($99K), WaterSIP grants ($235K), Lower Floridan Aquifer ($10K), interagency agreements for Alternative Water Supply projects ($281K), Big Cypress Basin ($2.8 million), Mobile Irrigation Lab ($14K), hydrologic data gathering and analysis ($196K), Water Supply Plan implementation ($25K), and Outreach and Education ($13K).

- **Debt Service** expenses amount to the total $42.1 million budget. Debt service principal and interest payments include Land Acquisition Bonds issued through the Water Management Lands Trust Fund and Certificates of Participation. Scheduled debt service payments are structured into a single principal payment and partial payment of interest in October and the balance of interest in April.

- **Reserves** of $152.2 million are held for future transfer to program areas as project needs and requirements are identified by staff and presented to the Governing Board for review. Sixty million dollars ($60.0 million) of these reserves are designated as economic stabilization reserves, including $10.0 million for O&M capital projects. Remaining

managerial reserves include $1.8 million in cost savings and $90.4 million in FY14 funds intended for FY15 re-budget.

We hope these reports and the associated narrative will aid in understanding the District's financial condition as well as expenditure performance against the approved budget. If you have any questions, please feel free to contact Candida Heater at (561) 682-6486.

DB/CJH
Attachment

Attachment: Monthly Financial Statement Memo July FY14 (2057 : Monthly Financial Statement - July 2014)

South Florida Water Management District

Statement of Sources and Uses of Funds (Unaudited)

For the month ended: July 31, 2014. Percent of fiscal year completed: 83.3%

SOURCES	ANNUAL BUDGET	ACTUALS THROUGH 07/31/2014	VARIANCE (UNDER) / OVER BUDGET	ACTUALS AS A % OF BUDGET
Ad Valorem Property Taxes	$ 266,557,178	$ 268,442,205	$ 1,885,027	100.7%
Agricultural Privilege Taxes	11,300,000	11,439,641	139,641	101.2%
Intergovernmental - Ad Valorem Funds	9,136,087	9,625,293	489,206	105.4%
Intergovernmental - Non Ad Valorem Funds	93,026,091	57,352,823	(35,673,268)	61.7%
Intergovernmental Total	***102,162,178***	***66,978,116***	***(35,184,062)***	***65.6%***
Investment Earnings - Ad Valorem Funds	2,870,000	3,816,884	946,884	133.0%
Investment Earnings - Non Ad Valorem Funds	-	1,266,641	1,266,641	-
Investment Earnings Total	***2,870,000***	***5,083,526***	***2,213,526***	***177.1%***
Leases	3,041,656	4,037,944	996,288	132.8%
Permit Fees/Miscellaneous Fees	2,110,999	5,484,637	3,373,638	259.8%
Mitigation Fees - Lake Belt & Wetlands	1,801,117	16,255,626	14,454,509	902.5%
Licenses, Permits and Fees Total	***3,912,116***	***21,740,264***	***17,828,148***	***555.7%***
Other	461,200	1,767,785	1,306,585	383.3%
Sale of District Property	250,000	411,608	161,608	164.6%
Self Insurance Premiums	28,799,913	23,844,616	(4,955,297)	82.8%
SUB-TOTAL OPERATING REVENUES	***419,354,241***	***403,745,705***	***(15,608,536)***	***96.3%***
Fund Balance	299,242,283	299,242,283	-	100.0%
TOTAL SOURCES	**$ 718,596,524**	**$ 702,987,987**	**$ (15,608,536)**	**97.8%**

USES	ANNUAL BUDGET	EXPENDITURES	ENCUMBRANCES[1]	REPORTED AVAILABLE BUDGET	% EXPENDED	% ENCUMBERED	% OBLIGATED[2]
CERP	$ 105,692,255	$ 57,746,446	$ 37,349,964	$ 10,595,845	54.6%	35.3%	90.0%
Coastal Watersheds	16,090,900	10,015,394	4,786,424	1,289,081	62.2%	29.7%	92.0%
District Everglades	96,132,260	53,576,163	32,335,777	10,220,320	55.7%	33.6%	89.4%
Kissimmee Watershed	17,296,651	2,484,066	14,012,784	799,801	14.4%	81.0%	95.4%
Lake Okeechobee	19,549,521	11,414,448	5,377,323	2,757,750	58.4%	27.5%	85.9%
Land Stewardship	18,070,106	11,497,057	3,798,646	2,774,403	63.6%	21.0%	84.6%
Mission Support	45,385,560	38,833,415	3,079,270	3,472,875	85.6%	6.8%	92.3%
Modeling & Sci Supp	12,875,707	10,795,659	676,561	1,403,487	83.8%	5.3%	89.1%
Ops & Maintenance	149,727,589	105,700,969	27,206,655	16,819,964	70.6%	18.2%	88.8%
Regulation	22,973,723	18,497,151	313,964	4,162,608	80.5%	1.4%	81.9%
Water Supply	20,505,678	14,395,634	3,760,579	2,349,465	70.2%	18.3%	88.5%
Debt Service	42,074,439	42,074,438	-	1	100.0%	0.0%	100.0%
SUB-TOTAL NON-RESERVES USES	*566,374,389*	*377,030,841*	*132,697,947*	*56,645,601*	*66.6%*	*23.4%*	*90.0%*
Reserves	$ 152,222,135	$ -	$ -	152,222,135	0.0%	0.0%	0.0%
TOTAL USES	**$ 718,596,524**	**$ 377,030,841**	**$ 132,697,947**	**$ 208,867,736**	**52.5%**	**18.5%**	**70.9%**

[1] Represents unexpended balances of open purchase orders

[2] Represents the sum of expenditures and encumbrances as a percentage of the annual budget

South Florida Water Management District

Statement of Sources and Uses of Funds (Unaudited)

For the month ended: July 31, 2014. Percent of fiscal year completed: 83.3%

	CURRENT BUDGET	ACTUALS THROUGH 07/31/2014	VARIANCE (UNDER) / OVER BUDGET	ACTUALS AS A % OF BUDGET
Sources				
Taxes[1]	$ 277,857,178	$ 279,881,846	$ 2,024,668	100.73%
Intergovernmental Revenues	102,162,178	66,978,116	(35,184,062)	65.56%
Interest on Invested Funds	2,870,000	5,083,526	2,213,526	177.1%
License and Permit Fees	3,912,116	21,740,264	17,828,148	555.7%
Other[2]	32,552,769	30,061,953	(2,490,816)	92.3%
Fund Balance	299,242,283	299,242,283	-	100.0%
Total Sources	**$ 718,596,524**	**$ 702,987,987**	**$ (15,608,536)**	**97.8%**

[1] Includes Ad Valorem and Agricultural Privilege Taxes

[2] Includes Leases, Sale of District Property, and Self Insurance Premiums

	CURRENT BUDGET	EXPENDITURES	ENCUMBRANCES [3]	AVAILABLE BUDGET	% EXPENDED	% OBLIGATED [4]
Uses						
Water Resources Planning and Monitoring	$ 53,199,397	$ 40,439,659	$ 6,570,978	$ 6,188,760	76.0%	88.4%
Acquisition, Restoration and Public Works	332,054,269	141,616,527	89,586,347	100,851,396	42.6%	69.6%
Operation and Maintenance of Lands and Works	268,454,208	140,320,941	34,469,040	93,664,227	52.3%	65.1%
Regulation	26,456,121	21,029,999	491,864	4,934,258	79.5%	81.3%
Outreach	2,385,541	2,034,869	16,989	333,683	85.3%	86.0%
Management and Administration	36,046,988	31,588,846	1,562,729	2,895,412	87.6%	92.0%
Total Uses	**$ 718,596,524**	**$ 377,030,841**	**$ 132,697,947**	**$ 208,867,736**	**52.5%**	**70.9%**

[3] Encumbrances represent unexpended balances of open purchase orders and contracts.

[4] Represents the sum of expenditures and encumbrances as a percentage of the current budget.

This unaudited financial statement is prepared as of July 31, 2014, and covers the interim period since the most recent audited financial statements.

Attachment: Statement of Sources and Uses of Funds_July14_state (2057 : Monthly Financial Statement -

South Florida Water Management District

Statement of Sources and Uses of Funds (Unaudited)

For the month ended: July 31, 2014. Percent of fiscal year completed: 83.3%

	Annual Budget	Expenditures	Encumbrances	Reported Available Budget	% Expended	% Encumbered	% Obligated
CERP							
Personnel Services	$ 6,652,127	$ 4,390,595	$ -	$ 2,261,532	66.0%	0.0%	66.0%
Contractual Services	15,555,087	10,445,978	4,507,682	601,427	67.2%	29.0%	96.1%
Operating	1,091,356	495,339	9,107	586,909	45.4%	0.8%	46.2%
Travel	26,030	11,167	1,213	13,651	42.9%	4.7%	47.6%
Capital Outlay	79,034,687	42,403,368	32,831,961	3,799,358	53.7%	41.5%	95.2%
CERP Indirect	3,332,968	-	-	3,332,968	0.0%	0.0%	0.0%
Total CERP	**105,692,255**	**57,746,446**	**37,349,964**	**10,595,845**	**54.6%**	**35.3%**	**90.0%**
Coastal Watersheds							
Personnel Services	3,547,921	2,732,954	-	814,967	77.0%	0.0%	77.0%
Contractual Services	9,365,288	4,798,943	4,413,034	153,311	51.2%	47.1%	98.4%
Operating	135,008	59,279	36,033	39,695	43.9%	26.7%	70.6%
Travel	27,629	13,954	250	13,425	50.5%	0.9%	51.4%
Capital Outlay	3,015,055	2,410,264	337,107	267,683	79.9%	11.2%	91.1%
Total Coastal Watersheds	**16,090,900**	**10,015,394**	**4,786,424**	**1,289,081**	**62.2%**	**29.7%**	**92.0%**
District Everglades							
Personnel Services	18,337,254	14,906,073	-	3,431,181	81.3%	0.0%	81.3%
Contractual Services	8,369,080	4,028,427	2,595,251	1,745,402	48.1%	31.0%	79.1%
Operating	9,303,893	5,624,155	629,140	3,050,598	60.4%	6.8%	67.2%
Travel	31,313	13,265	212	17,836	42.4%	0.7%	43.0%
Capital Outlay	60,090,719	29,004,242	29,111,174	1,975,303	48.3%	48.4%	96.7%
Total District Everglades	**96,132,260**	**53,576,163**	**32,335,777**	**10,220,320**	**55.7%**	**33.6%**	**89.4%**
Kissimmee Watershed							
Personnel Services	2,139,657	1,462,051	-	677,606	68.3%	0.0%	68.3%
Contractual Services	1,224,671	559,956	565,532	99,184	45.7%	46.2%	91.9%
Operating	447,031	449,991	8,384	(11,344)	100.7%	1.9%	102.5%
Travel	20,803	11,211	240	9,352	53.9%	1.2%	55.0%
Capital Outlay	13,464,489	857	13,438,628	25,004	0.0%	99.8%	99.8%
Total Kissimmee Watershed	**$ 17,296,651**	**$ 2,484,066**	**$ 14,012,784**	**$ 799,801**	**14.4%**	**81.0%**	**95.4%**

Attachment: Summary of Uses of Funds_July14 (2057 : Monthly Financial Statement - July 2014)

South Florida Water Management District

Statement of Sources and Uses of Funds (Unaudited)

For the month ended: July 31, 2014. Percent of fiscal year completed: 83.3%

	Annual Budget	Expenditures	Encumbrances	Reported Available Budget	% Expended	% Encumbered	% Obligated
Lake Okeechobee							
Personnel Services	$ 3,969,002	$ 3,108,640	$ -	$ 860,362	78.3%	0.0%	78.3%
Contractual Services	14,109,203	7,424,692	4,862,064	1,822,447	52.6%	34.5%	87.1%
Operating	277,574	207,476	34,576	35,522	74.7%	12.5%	87.2%
Travel	7,458	437	388	6,633	5.9%	5.2%	11.1%
Capital Outlay	1,186,284	673,203	480,295	32,786	56.7%	40.5%	97.2%
Total Lake Okeechobee	**19,549,521**	**11,414,448**	**5,377,323**	**2,757,750**	**58.4%**	**27.5%**	**85.9%**
Land Stewardship							
Personnel Services	4,078,658	3,536,032	-	542,625	86.7%	0.0%	86.7%
Contractual Services	9,901,323	5,832,403	3,064,165	1,004,756	58.9%	30.9%	89.9%
Operating	2,588,987	1,503,519	211,677	873,791	58.1%	8.2%	66.2%
Travel	15,610	5,802	97	9,712	37.2%	0.6%	37.8%
Capital Outlay	1,485,528	619,302	522,707	343,519	41.7%	35.2%	76.9%
Total Land Stewardship	**18,070,106**	**11,497,057**	**3,798,646**	**2,774,403**	**63.6%**	**21.0%**	**84.6%**
Mission Support							
Personnel Services	21,808,844	17,769,413	-	4,039,431	81.5%	0.0%	81.5%
Contractual Services	7,977,582	5,271,811	1,947,012	758,759	66.1%	24.4%	90.5%
Operating	16,889,635	14,281,908	777,389	1,830,337	84.6%	4.6%	89.2%
Travel	311,271	241,895	4,672	64,704	77.7%	1.5%	79.2%
Capital Outlay	1,731,196	1,268,389	350,196	112,611	73.3%	20.2%	93.5%
CERP Indirect	(3,332,968)	-	-	(3,332,968)	0.0%	0.0%	0.0%
Total Mission Support	**45,385,560**	**38,833,415**	**3,079,270**	**3,472,875**	**85.6%**	**6.8%**	**92.3%**
Modeling & Science Support							
Personnel Services	9,627,745	8,380,374	-	1,247,370	87.0%	0.0%	87.0%
Contractual Services	2,423,682	1,723,128	582,002	118,552	71.1%	24.0%	95.1%
Operating	640,207	535,384	90,636	14,186	83.6%	14.2%	97.8%
Travel	42,818	17,280	2,159	23,378	40.4%	5.0%	45.4%
Capital Outlay	141,255	139,492	1,763	(0)	98.8%	1.2%	100.0%
Total Modeling & Science Support	**$ 12,875,707**	**$ 10,795,659**	**$ 676,561**	**$ 1,403,487**	**83.8%**	**5.3%**	**89.1%**

Attachment: Summary of Uses of Funds_July14 (2057 : Monthly Financial Statement - July 2014)

South Florida Water Management District

Statement of Sources and Uses of Funds (Unaudited)

For the month ended: July 31, 2014. Percent of fiscal year completed: 83.3%

	Annual Budget	Expenditures	Encumbrances	Reported Available Budget	% Expended	% Encumbered	% Obligated
Operations & Maintenance							
Personnel Services	$ 52,220,663	$ 43,349,006	$ -	$ 8,871,657	83.0%	0.0%	83.0%
Contractual Services	32,973,218	19,928,598	11,335,240	1,709,379	60.4%	34.4%	94.8%
Operating	30,993,398	23,919,311	1,012,764	6,061,323	77.2%	3.3%	80.4%
Travel	166,284	106,639	16,788	42,857	64.1%	10.1%	74.2%
Capital Outlay	33,374,025	18,397,415	14,841,863	134,747	55.1%	44.5%	99.6%
Total Operations & Maintenance	**149,727,589**	**105,700,969**	**27,206,655**	**16,819,964**	**70.6%**	**18.2%**	**88.8%**
Regulation							
Personnel Services	17,122,340	13,739,070	-	3,383,270	80.2%	0.0%	80.2%
Contractual Services	1,634,034	1,260,511	198,824	174,699	77.1%	12.2%	89.3%
Operating	3,809,071	3,153,591	62,188	593,292	82.8%	1.6%	84.4%
Travel	29,279	14,980	2,952	11,347	51.2%	10.1%	61.2%
Capital Outlay	378,999	328,999	50,000	-	86.8%	13.2%	100.0%
Total Regulation	**22,973,723**	**18,497,151**	**313,964**	**4,162,608**	**80.5%**	**1.4%**	**81.9%**
Water Supply							
Personnel Services	5,644,468	4,692,088	-	952,380	83.1%	0.0%	83.1%
Contractual Services	5,698,339	1,865,546	3,737,320	95,474	32.7%	65.6%	98.3%
Operating	9,112,777	7,797,616	22,967	1,292,194	85.6%	0.3%	85.8%
Travel	12,239	2,529	292	9,418	20.7%	2.4%	23.1%
Capital Outlay	37,855	37,855	-	-	100.0%	0.0%	100.0%
Total Water Supply	**20,505,678**	**14,395,634**	**3,760,579**	**2,349,465**	**70.2%**	**18.3%**	**88.5%**
Reserves							
Reserves	152,222,135	-	-	152,222,135	0.0%	0.0%	0.0%
Total Reserves	**152,222,135**	**-**	**-**	**152,222,135**	**0.0%**	**0.0%**	**0.0%**
Debt Service							
Debt Service	42,074,439	42,074,438	-	1	100.0%	0.0%	100.0%
Total Debt Service	**42,074,439**	**42,074,438**	**-**	**1**	**100.0%**	**0.0%**	**100.0%**
Grand Total	**$ 718,596,524**	**$ 377,030,841**	**$ 132,697,947**	**$ 208,867,736**	**52.5%**	**18.5%**	**70.9%**

Attachment: Summary of Uses of Funds_July14 (2057 : Monthly Financial Statement - July 2014)

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INDIVIDUAL PERMITS ISSUED BY
AUTHORITY DELEGATED TO EXECUTIVE DIRECTOR
FROM August 1, 2014 TO August 31, 2014

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Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

COLLIER COUNTY

1. EAGLE LAKES GOLF CLUB
NAPLES GOLF CLUB SOUTH, LLC
SEC 20 TWP 51S RGE 27E

APPL. NO. 101008-35
PERMIT NO. 11-01281-W
ACREAGE: 120.00
LAND USE: GOLF COURSE

PERMIT TYPE: WATER USE EXPIRED/PREVIOUSLY PERMITTED
WATER SOURCE: ON-SITE LAKES
ALLOCATION: 20.71 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 13, 2014

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2. NAPLES ZOO
NAPLES ZOO INC
SEC 27 TWP 49S RGE 25E

APPL. NO. 110714-8
PERMIT NO. 11-03570-W
ACREAGE: 14.00
LAND USE: INDUSTRIAL

PERMIT TYPE: WATER USE EXISTING/UNPERMITTED
WATER SOURCE: OFF-SITE CANALS,MID-HAWTHORN AQUIFER,ON-SITE LAKES,LOWER TAMIAMI AQUIFER
ALLOCATION: 16.81 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 10, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

HIGHLANDS COUNTY

1. BLUE HEAD RANCH
   SPP LAND, L.L.C.
   SEC 17,20,21,27-29,32-34,2-5,8-11,14-17,19-22,27-34, TWP 36,37S RGE 28E

   APPL. NO. 140611-11
   PERMIT NO. 28-00102-W
   ACREAGE: 14683.00
   LAND USE: AGRICULTURAL

   PERMIT TYPE: WATER USE MODIFICATION/RENEWAL
   WATER SOURCE: UPPER FLORIDAN AQUIFER
   ALLOCATION: 1561.98 MILLION GALLONS PER MONTH
   LAST DATE FOR AGENCY ACTION: SEPTEMBER 9, 2014

2. PH CITRUS
   P H CITRUS, L.L.C.
   SEC 6,7,18,19,30-32 TWP 36,37S RGE 28E

   APPL. NO. 140611-15
   PERMIT NO. 28-00714-W
   ACREAGE: 2288.00
   LAND USE: AGRICULTURAL

   PERMIT TYPE: WATER USE EXISTING/PREVIOUSLY PERMITTED
   WATER SOURCE: UPPER FLORIDAN AQUIFER
   ALLOCATION: 308.88 MILLION GALLONS PER MONTH
   LAST DATE FOR AGENCY ACTION: SEPTEMBER 9, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

MARTIN COUNTY

1. H S L C D UNIT 5 (GREENRIDGE GROVE)
PERO GREENRIDGE FARMS, LLC
SEC 4-9,15,16,21,22,30,31,32 TWP 38,39S RGE 40E

APPL. NO. 140307-28
PERMIT NO. 43-00718-W
ACREAGE: 600.00
LAND USE: DIVERSION AND IMPOUNDMENT AGRICULTURAL

PERMIT TYPE: WATER USE MODIFICATION
WATER SOURCE: SFWMD CANAL (C-44)
ALLOCATION: 447.98 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 28, 2014

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2. LAKE POINT INDUSTRIAL ROCK WASHING
LAKE POINT RESTORATION L L C
SEC 13,14,23-26 TWP 40S RGE 37E

APPL. NO. 140530-19
PERMIT NO. 43-02172-W
ACREAGE: 1006.00
LAND USE: INDUSTRIAL

PERMIT TYPE: WATER USE MODIFICATION
WATER SOURCE: ON-SITE LAKES
ALLOCATION: 38.2 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 28, 2014

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3. MARTIN COUNTY CONSOLIDATED SOUTH PWS
MARTIN COUNTY UTILITIES
SEC 1,2,3,4,5,7-9,10-15,18,19,20,22-24,25,29,32,35,36 TWP 38,39S RGE 40,41,42E

APPL. NO. 070814-6
PERMIT NO. 43-00169-W
ACREAGE: N/A
LAND USE: PUBLIC WATER SUPPLY

PERMIT TYPE: WATER USE MODIFICATION/RENEWAL
WATER SOURCE: SURFICIAL AQUIFER SYSTEM,FLORIDAN AQUIFER SYSTEM
ALLOCATION: 393 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 27, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

MIAMI-DADE COUNTY

1. ACOSTA COMSTOCK
   ACOSTA FARMS INC
   SEC 35 TWP 55S RGE 38E

APPL. NO. 140606-14
PERMIT NO. 13-05635-W

ACREAGE: 194.00
LAND USE: NURSERY

PERMIT TYPE: WATER USE EXISTING/UNPERMITTED

WATER SOURCE: BISCAYNE AQUIFER

ALLOCATION: 64.72 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: SEPTEMBER 4, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

OKEECHOBEE COUNTY

1. CAL MAINE FOODS OKEECHOBEE
   CAL MAINE FOODS INC

APPL. NO. 140108-23
PERMIT NO. 47-00118-Q

ACREAGE: 561.43
LAND USE: Improved Pasture

PERMIT TYPE: LOK SWIM WORKS OF THE DISTRICT MODIFICATION
RECEIVING BODY:
LAST DATE FOR AGENCY ACTION: AUGUST 5, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

ORANGE COUNTY

1. STOREY PARK PHASES 1 2 AND 4
LENNAR HOMES L L C
SEC 4,5,8,9 TWP 24S RGE 31E

APPL. NO. 140414-1
PERMIT NO. 48-02343-W
ACREAGE: 206.00
LAND USE: DEWATERING

PERMIT TYPE:
WATER SOURCE: WATER TABLE AQUIFER
ALLOCATION: NOT REQUIRED
LAST DATE FOR AGENCY ACTION: SEPTEMBER 17, 2014

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2. THE GOLDEN BEAR CLUB
THE GOLDEN BEAR CLUB L L C
SEC 20,29-31 TWP 23S RGE 28E

APPL. NO. 140107-5
PERMIT NO. 48-00983-W
ACREAGE: 263.10
LAND USE: GOLF COURSE
LANDSCAPE

PERMIT TYPE: WATER USE RENEWAL
WATER SOURCE: UPPER FLORIDAN AQUIFER,ON-SITE LAKES/PONDS
ALLOCATION: 46.93 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: AUGUST 20, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

OSCEOLA COUNTY

1. BATTAGLIA FRUIT COMPANY
NEPTUNE ROAD L L C
SEC 4 TWP 26S RGE 30E

APPL. NO. 140210-6
PERMIT NO. 49-00034-W
ACREAGE: 120.00
LAND USE: AGRICULTURAL

PERMIT TYPE: WATER USE RENEWAL
WATER SOURCE: UPPER FLORIDAN AQUIFER
ALLOCATION: 19.76 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: SEPTEMBER 7, 2014

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2. SPLENDID CHINA - ROLLING OAKS
ROLLING OAKS SPLENDID L L C
SEC 3, 4 TWP 25S RGE 27E

APPL. NO. 140115-10
PERMIT NO. 49-01801-P-02
ACREAGE: 304.38
LAND USE: RESIDENTIAL
COMMERCIAL

PERMIT TYPE: ENVIRONMENTAL RESOURCE (CONSTRUCTION/OPERATION MODIFICATION), INCLUDES CONSERVATION EASEMENT TO THE DISTRICT)
RECEIVING BODY: ON-SITE WETLANDS
LAST DATE FOR AGENCY ACTION: SEPTEMBER 9, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

PALM BEACH COUNTY

1. ALL ABOARD FLORIDA MP 298.94-299.83 AND MP 340.19-
FLORIDA EAST COAST RAIL WAY L L C
SEC 3,10,21 TWP 43,50S RGE 42,43E

APPL. NO. 140708-16
PERMIT NO. 13-05321-P
ACREAGE: 18.65
LAND USE: INDUSTRIAL/UTILITIES

PERMIT TYPE: ENVIRONMENTAL RESOURCE (CONSTRUCTION/OPERATION MODIFICATION)
RECEIVING BODY: INTRACOASTAL WATERWAY
LAST DATE FOR AGENCY ACTION: SEPTEMBER 6, 2014

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2. N P B C I D UNIT 2 C NEIGHBORHOOD 1
K H ALTON L L C
SEC 26 TWP 41S RGE 42E

APPL. NO. 131216-7
PERMIT NO. 50-00610-S-24
ACREAGE: 58.11
LAND USE: RESIDENTIAL

PERMIT TYPE: ENVIRONMENTAL RESOURCE (CONSTRUCTION/OPERATION MODIFICATION)
RECEIVING BODY: MASTER SYSTEM
LAST DATE FOR AGENCY ACTION: MAY 23, 2014

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3. N P B C I D UNIT 2 C PHASE 1
NORTHERN PALM BEACH COUNTY IMPROVEMENT DISTRICT
SEC 26, 35 TWP 41S RGE 42E

APPL. NO. 131119-5
PERMIT NO. 50-00610-S-24
ACREAGE: 681.54
LAND USE: ROADWAY

PERMIT TYPE: ENVIRONMENTAL RESOURCE (CONCEPTUAL APPROVAL MODIFICATION AND CONSTRUCTION/OPERATION MODIFICATION), INCLUDES CONSERVATION EASEMENT TO THE DISTRICT)
RECEIVING BODY: UNIT 2 MASTER SYSTEM
LAST DATE FOR AGENCY ACTION: MAY 19, 2014

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4. S R 710 MARTIN/P B COUNTY LINE TO PRATT WHITNEY EN
FLORIDA DEPARTMENT OF TRANSPORTATION
SEC 3-5,10-11,13-14,31-33 TWP 40,41S RGE 40E

APPL. NO. 131203-1
PERMIT NO. 50-04716-P
ACREAGE: 75.28
LAND USE: HIGHWAY

PERMIT TYPE: ENVIRONMENTAL RESOURCE (CONSTRUCTION/OPERATION MODIFICATION)
RECEIVING BODY:
LAST DATE FOR AGENCY ACTION: AUGUST 29, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)

ST LUCIE COUNTY

1. FLORIDA MAID DRAINAGE & IRRIGATION ASSOC.
EVANS PROPERTIES, INC.
SEC 6,7,18,19,30 TWP 34S RGE 38E

APPL. NO. 140509-2
PERMIT NO. 56-01935-W

ACREAGE: 2999.43
LAND USE: DIVERSION AND IMPOUNDMENT AGRICULTURAL

PERMIT TYPE: WATER USE RENEWAL
WATER SOURCE: SFWMD CANAL (C-25)
ALLOCATION: 424.5 MILLION GALLONS PER MONTH
LAST DATE FOR AGENCY ACTION: SEPTEMBER 8, 2014

Attachment: IP Issued by ED August 2014 (2074 : Executive Director's Report)