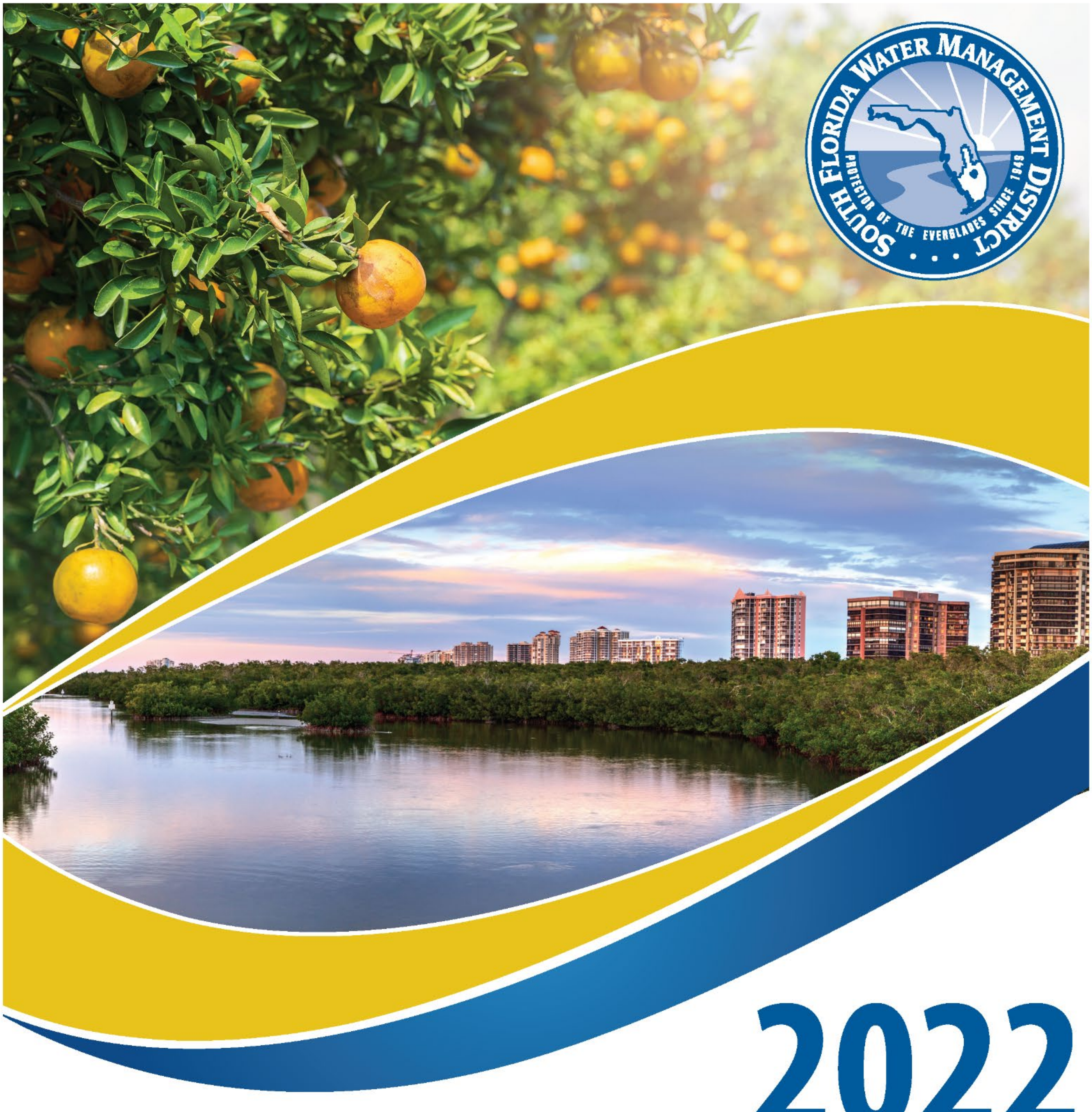

2022 LOWER WEST COAST

WATER SUPPLY PLAN UPDATE

PLANNING DOCUMENT/APPENDICES

Cover Photos

Front Top: Florida Oranges
Front Bottom: Clam Pass River, Naples, Florida
Back: Merritt Pump Station (S-488), Picayune Strand Restoration Project

Acknowledgments

The South Florida Water Management District (SFWMD) recognizes and thanks the regional water supply workshop participants for their contributions, comments, advice, information, and assistance throughout the development of this *2022 Lower West Coast Water Supply Plan Update.*

Furthermore, the SFWMD expresses appreciation to all staff who contributed to the development and production of this plan update.

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Executive Summary

The South Florida Water Management District's (SFWMD or District) strategic goal for its water supply plans is to identify sufficient water supply sources and projects to meet existing and future reasonable-beneficial uses during 1-in-10-year drought conditions while sustaining water resources and related natural systems. This *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update) is the fifth update to the 1994 Lower West Coast Water Supply Plan, which previously was updated in 2000, 2006, 2012, and 2017. This plan update is consistent with the water supply planning requirements of Chapter 373, Florida Statutes (F.S.), and presents population and water demand projections through 2045, a review of water supply issues and evaluations, and a list of water source options. It also examines local and regional water supply efforts and describes water resource and water supply development projects completed since the 2017 plan update.

This 2022 LWC Plan Update was developed in an open, public forum (**Chapter 1**). Meetings and workshops were held with water users, local and tribal governments, utilities, agricultural industry and environmental representatives, other stakeholders, and the general public to solicit input, provide information about planning results, and receive comments on draft sections. Due to the COVID-19 pandemic, the SFWMD held three virtual workshops for this water supply plan update.

The LWC Planning Area includes all of Lee County, most of Collier County, and portions of Charlotte, Glades, Hendry, and Monroe counties and the Seminole Tribe of Florida Immokalee Reservation. The LWC Planning Area covers more than 5,100 square miles and generally reflects the drainage patterns of the Caloosahatchee River Basin to the north and Big Cypress National Preserve to the south. The northern area of the Caloosahatchee River Basin also is the general jurisdictional boundary between the SFWMD and the Southwest Florida Water Management District 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. The southern end of the LWC Planning Area encompasses a coastal portion of Everglades National Park and ends just north of Shark River Slough.

Climate change and sea level rise are issues of concern, especially in coastal regions. South Florida is particularly vulnerable to potential changes in climate and sea level because of its location, regional variability in climate, hydrology, geology, low topography, natural resources, and dense population in coastal areas. To plan and prepare for regional climate change and sea level rise, the SFWMD is conducting research and computer modeling to better predict and reduce uncertainties, analyzing vulnerabilities in the current water management system, and developing effective adaptation strategies for the future. Coordination with other resource management entities, agencies, and local governments is vital to ensuring a common approach and shared information moving forward.

DEMAND ESTIMATES AND PROJECTIONS

As described in **Chapter 2** and **Appendix A**, the LWC Planning Area is home to nearly 1,200,000 people and supports a large agricultural industry. The permanent population is projected to exceed 1,600,000 people by 2045, an approximately 37% increase from the 2020 base year estimate for this plan update. Approximately two-thirds of the LWC Planning Area's permanent population resides in Lee County. Details about Public Supply (PS) utilities, including the populations within their service areas, are provided in **Appendix B**.

Agriculture is a substantial part of the regional economy. Agricultural irrigated acres are projected to increase modestly by 5%, from 291,765 acres in 2020 to 307,062 acres in 2045. Citrus is the dominant crop, covering more than 118,000 acres. Sugarcane also is a dominant crop in the region, accounting for more than 88,000 acres in 2020 and is expected to decrease by 2,000 acres in 2045. Average water demands for the Agriculture (AG) use category are projected to increase approximately 5%, from an average total water use of 592.02 million gallons per day (mgd) in 2020 to 621.40 mgd in 2045 (**Table ES-1**).

AG is projected to remain the largest water use category in the LWC Planning Area, accounting for approximately 53% of the total 2045 projected demand. Landscape/Recreational (L/R) is the second largest water use category, representing 25% of the total 2045 projected demand. PS is the third largest water use category, representing 16% of the total 2045 projected demand. Domestic Self-Supply (DSS), Commercial/Industrial/Institutional (CII), and Power Generation (PG) collectively account for approximately 7% of the total 2045 projected demand. In the LWC Planning Area, the overall demands are projected to increase by approximately 16% from 2020 to 2045. The total demand projection for 2045 in this 2022 LWC Plan Update is 3% less than the estimated 2040 demand projected in the 2017 LWC Plan Update.

Table ES-1. Estimated (2020) and projected (2045) gross water demands (in mgd) under average rainfall conditions in the LWC Planning Area by use category.

Water Use Category	2020	2045	Percent Change	Percent of Projected 2045 Total
Public Supply	138.70	186.82	35%	16%
Domestic Self-Supply	24.27	31.66	30%	3%
Agriculture	592.02	621.40	5%	53%
Commercial/Industrial/Institutional	37.73	48.23	28%	4%
Landscape/Recreational	219.17	289.23	32%	25%
Power Generation	1.54	2.03	32%	0.2%
LWC Planning Area Total	**1,013.43**	**1,179.37**	**16%**	**100%**

LWC = Lower West Coast; mgd = million gallons per day.

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation by all water use categories continues to be a priority to meet future water needs. Conservation programs often are among the lowest-cost solutions to meet future demands and can reduce costs over the long term if properly planned and implemented (**Chapter 3**). Conservation efforts in the LWC Planning Area have effectively lowered the net (finished) water per capita use rate for PS over the past two decades, from 178 gallons per capita per day in 2000 to approximately 123 gallons per capita per day in 2020. Analyses suggest that water users in the LWC Planning Area can collectively save an additional 43 mgd by 2045 if various urban and agricultural conservation options are implemented.

NATURAL SYSTEMS AND RESOURCE PROTECTION

Natural surface water systems in the LWC Planning Area include the Caloosahatchee River Estuary, Lake Trafford, Corkscrew Regional Ecosystem Watershed, Big Cypress Swamp, Picayune Strand State Forest, southern Charlotte Harbor, Estero Bay, Naples Bay, Ten Thousand Islands National Wildlife Refuge, Rookery Bay National Estuarine Research Reserve, and the Fakahatchee Estuary, among others. Natural systems are protected and addressed through regulatory mechanisms, restoration projects, and water resource development projects.

In the LWC Planning Area, minimum flows and minimum water levels (MFLs) with their associated recovery and prevention strategies have been adopted for the LWC aquifers, Lake Okeechobee, and the Caloosahatchee River (**Chapter 4**, **Appendix C**). The MFL recovery strategy for Lake Okeechobee affects portions of the LWC Planning Area but is described in the Lower East Coast water supply plan updates (last updated in 2018). A restricted allocation area has also been established for the Lake Okeechobee Service Area as part of the Lake Okeechobee MFL recovery strategy. Water reservations, another resource protection regulatory mechanism, have been adopted for the C-43 West Basin Storage Reservoir, the Fakahatchee Estuary, and the Picayune Strand.

Large ecosystem restoration projects are under way in the LWC Planning Area (**Chapter 7**) that are vital to improving and maintaining the viability of the region's water resources, including elements identified in the Caloosahatchee River MFL recovery strategy. The Comprehensive Everglades Restoration Plan (CERP), a partnership between the United States Army Corps of Engineers (USACE) and SFWMD, is a critical component of ecosystem restoration and water supply. CERP includes numerous capital projects needed to protect and restore natural systems and increase water availability, including the C-43 West Basin Storage Reservoir, Picayune Strand Restoration Project, and Lake Okeechobee Watershed Restoration Project. Although the Lake Okeechobee Watershed Restoration Project is not within the LWC Planning Area boundary, it does affect the region's water resources (i.e., the C-43 Canal and the Caloosahatchee River and Estuary). The project aims to increase storage capacity in the watershed, resulting in improved lake levels; improve the quantity and timing of discharges to estuaries; restore wetlands; and improve water supply for existing legal users.

WATER SOURCE OPTIONS

Water users in the LWC Planning Area rely on surface water, groundwater (fresh and brackish), and reclaimed water (**Chapter 5**) to meet urban and agricultural demands. Surface water from canals and lakes, and fresh groundwater from the surficial aquifer system (SAS) and intermediate aquifer system (IAS) are considered traditional water sources. Alternative water supply sources include brackish groundwater from the IAS and Floridan aquifer system (FAS), reclaimed water, seawater, and excess surface water and groundwater captured and stored in aquifer storage and recovery (ASR) wells, reservoirs, and other storage features. Use of alternative water supplies is an integral part of the current and future water supply strategy.

PS utilities within the LWC Planning Area rely on groundwater from the SAS and IAS and brackish groundwater from the IAS and FAS. Groundwater sources can meet 2045 PS demands; however, increases in fresh groundwater allocations must meet the SFWMD's water use permitting resource protection criteria. Of the 24 PS utilities in the LWC Planning Area, two utilities will need to construct new projects to meet their projected 2045 demands. However, 9 utilities have proposed 18 new projects through 2045. These new projects will increase water supply capacity, reliability, and distribution primarily through source diversification, changes in treatment technology, expanded use of the FAS, and extension of reclaimed water lines.

Fresh groundwater from the SAS and IAS supplies 100% of the estimated demand for DSS in the LWC Planning Area. Although DSS demand is expected to increase by 30% over the planning horizon, groundwater from the SAS can continue to meet the 2045 DSS demands in most areas. However, there are concentrated DSS withdrawals that have depressed IAS groundwater levels locally in northern Cape Coral (Mid-Hawthorn aquifer) and Lehigh Acres (Sandstone aquifer) towards established MFLs. The District is coordinating with Lee County, Cape Coral, and local utilities to identify potential solutions to protect the water resources for all stakeholders.

AG users rely primarily on surface water to meet their demands. Groundwater from the SAS and IAS is utilized to a much lesser extent and to a very small extent brackish groundwater. The FAS is used primarily for freeze protection or emergency backup supply due to the brackish water quality that typically requires blending with fresh water prior to its use for irrigation. A small increase in AG demands is expected over the planning horizon; therefore, existing surface and groundwater water sources can continue to meet 2045 AG demands.

L/R users, including golf courses, rely on surface water, fresh groundwater, and reclaimed water in nearly equal volumes and to a very small extent brackish groundwater. Increases in L/R irrigation demands are expected to be met primarily through the expansion of reclaimed water systems.

Increases in demands for the CII category through 2045 are expected to continue to be met primarily by fresh groundwater and surface water. PG demands will continue to be met primarily by surface water, fresh groundwater, and brackish groundwater, with use of reclaimed water when available. **Table ES-2** summarizes the variety of water source options that are typically used in the LWC Planning Area by water use category.

Table ES-2. Typical water source options for the water use categories in the LWC Planning Area.

Water Use Category	Fresh Surface Water	Fresh Groundwater	Brackish Groundwater	Reclaimed Water
Public Supply		✓	✓	
Domestic Self-Supply		✓		
Agriculture	✓	✓	✓	
Commercial/Industrial/Institutional	✓	✓		✓
Landscape/Recreational	✓	✓	✓	✓
Power Generation	✓	✓	✓	✓

Surface Water

Surface water supply sources in the LWC Planning Area include Lake Okeechobee and the C-43 Canal as well as county and water control district canals, lakes, reservoirs, and on-site ponds. Water availability from Lake Okeechobee and the C-43 Canal is limited due to the implementation of restricted allocation area rules. AG is the largest user of surface water in the LWC Planning Area. In 2020, approximately 52% of AG demands were met with surface water, and this percentage is expected to remain the same through 2045. Surface water is used primarily for AG and to a lesser extent L/R and CII uses. Based on demand projections, surface water sources appear sufficient to meet the projected 2045 demands.

Fresh Groundwater

The SAS and to a lesser extent the IAS are the primary sources of fresh groundwater in the LWC Planning Area and are used by all water use categories. Large-scale use of the SAS and IAS is limited by rate of groundwater recharge, potential impacts on wetlands, proximity to contamination sources, potential impacts to existing legal users, and the potential for saltwater intrusion. However, new small-scale uses of the SAS and IAS are viable in many locations. In general, saltwater interface mapping of the region indicates little to no appreciable movement of the saltwater interface in the SAS and IAS from 2009 to 2019 (**Chapter 6**, **Appendix D**). PS, DSS, and AG are the largest users of fresh groundwater from the SAS and IAS. Water availability from the SAS and IAS will be determined on an application-by-application basis, considering the quantities required, local resource conditions, existing legal users, and viability of other supply options. In 2020, fresh groundwater from the SAS and IAS accounted for approximately 45% of PS use and 100% of DSS use in the LWC Planning Area. SAS and IAS use for PS is projected to increase minimally by 2045, as utilities maximize their permitted allocations from these sources. Most PS utilities are expanding their use of the FAS to meet demand increases and have proposed projects to meet future growth (**Chapter 8**). DSS use of fresh groundwater from the IAS has created localized areas of low groundwater elevations in Cape Coral and Lehigh Acres, which will require local solutions to reduce aquifer stress in these areas.

Current and future SAS and IAS demands were simulated using the SFWMD's Lower West Coast Surficial and Intermediate Aquifer Systems Model to assess the potential impacts of withdrawals on water levels and the viability of the source through the planning horizon. The model results indicate no large-scale changes in water levels and harm to the water resources are expected for most of the model domain through 2045. Modeling results are provided in **Appendix D**.

Brackish Groundwater

Brackish groundwater from the IAS and FAS is used primarily by PS utilities and to a very small extent by AG and L/R. There are currently 11 PS utilities utilizing brackish groundwater treating it via reverse osmosis and have a combined treatment capacity of 138.17 mgd. In 2020, FAS water met 52% of PS demand. Current and future FAS demands were simulated using the SFWMD's West Coast Floridan Model to assess the potential impacts of withdrawals on water levels, water quality, and the viability of the source through the planning horizon. The model results indicate no large-scale changes in water levels or water quality in the FAS are expected for most of the model domain through 2045. Modeling results are provided in **Appendix D**. Review of historical chloride data and model results indicates properly managed FAS wellfields can meet projected demands through 2045.

Current water level and water quality data for the FAS are discussed in **Chapter 6**. Review and analyses of FAS data indicate there have been no substantial regional changes; however, some local changes in water quality have been observed, which may be the result of localized pumping stresses or hydrologic conditions. FAS users may need to spread out withdrawal facilities or reduce individual well pumping rates to mitigate water quality changes. These areas should continue to be monitored through a coordinated effort with utilities and other FAS stakeholders.

Reclaimed Water

Use of reclaimed water is an important component of managing water supplies in the LWC Planning Area. In 2020, 39 existing wastewater treatment facilities provided all or a portion of their treated wastewater for reuse (**Appendix E**). In total, these facilities generated 85 mgd of reclaimed water, primarily for irrigation of golf courses, parks, schools, and residences. However, 23 mgd of potentially reusable water was disposed, mainly through deep well injection. Wastewater flows are projected to increase to 170 mgd by 2045. Many utilities have constructed the required treatment facilities to produce reclaimed water for public access irrigation in anticipation of increased reclaimed water demand in the future. Reclaimed water pipelines are proposed to be extended as new development occurs, substantially increasing the volume of reuse by 2045.

Water Storage

Capturing surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. Water storage options include ASR wells and reservoirs, which are considered alternative water supplies. As of 2022, there are 18 operating ASR wells in the LWC Planning Area. Several test ASR wells have been constructed at other locations, but at this time are inactive or in various stages of planning. The SFWMD has previously constructed an ASR exploratory well at Moore Haven, and up to 55 ASR wells are planned as components of the Lake Okeechobee Watershed Restoration Project.

Regional reservoirs (e.g., C-43) associated with large ecosystem restoration projects (**Chapter 7**) will attenuate stormwater, provide water quality treatment, store excess surface water, and enhance surface water availability for the estuary during the dry season. On a smaller scale, local agricultural reservoirs can store recycled irrigation water and/or collect stormwater runoff.

FUTURE DIRECTION

Chapter 9 contains guidance to help focus future efforts in the region to meet projected water needs. Some of the key suggestions to regional stakeholders, including the SFWMD, utilities, local and tribal governments, agricultural interests, and environmental groups, are as follows:

- Continue implementation of water conservation programs throughout the LWC Planning Area to increase water use efficiency and reduce the amount of water needed to meet future demands.
- Continue implementation of the Caloosahatchee River and Lake Okeechobee MFL recovery strategies, and review and update the strategies, as appropriate, in conjunction with future water supply plan updates.
- Identify wells critical to long-term monitoring and modeling to ensure they are constructed, maintained, or replaced, as necessary.
- Continue mapping the saltwater interface and identify areas of concern that might require enhanced monitoring or changes in wellfield operations.
- Continue characterizing, monitoring, and designing adaptation solutions in response to climate change and sea level rise impacts to water supply.
- Design new FAS wellfields to maximize withdrawals while minimizing water level and water quality changes. This likely will require a combination of additional wells with greater spacing between wells, lower-capacity wells, and continued refinement of wellfield operational plans.
- Continue supporting ecosystem restoration efforts, including CERP.
- Continue development of alternative water supplies, including maximizing the use of reclaimed water.
- Develop regional and local reservoirs and other storage systems (e.g., ASR systems), where possible, to increase surface water availability for environmental, agricultural, and urban water supply needs.
- Coordinate with local governments and utilities in the Cape Coral and Lehigh Acres areas to develop solutions to reduce stress on the Mid-Hawthorn and Sandstone aquifers, respectively.

CONCLUSIONS

Building on the findings and conclusions of previous LWC water supply plan updates, this 2022 LWC Plan Update assesses water supply demand and available sources for the LWC Planning Area through 2045. This plan update concludes that future water needs of the region can be met through the planning horizon with appropriate management, conservation, and implementation of projects identified herein (**Chapter 9**). Meeting future water needs through 2045 depends on the following:

- Construction of potable water supply development projects by two PS utilities (Ave Maria and Florida Governmental Utility Authority – Lehigh Acres);

- Implementation of the CERP C-43 West Basin Storage Reservoir, Picayune Strand Restoration Project, and other ecosystem restoration projects;
- Coordination between the SFWMD and appropriate local governments to identify long-term sustainable water supply solutions in DSS demand areas that are currently or projected to experience aquifer stress; and
- Completion of repairs to the Herbert Hoover Dike by the USACE and implementation of the new Lake Okeechobee System Operating Manual.

Successful implementation of this 2022 LWC Plan Update requires coordination and collaboration with local and tribal governments, utilities, agricultural interests, and other stakeholders. This partnering should ensure that water resources can continue to be prudently managed and available to meet future demands while also protecting natural systems.

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Acronyms and Abbreviations

AFSIRS	Agricultural Field-Scale Irrigation Requirements Simulation
AG	Agriculture
APPZ	Avon Park permeable zone
ASR	aquifer storage and recovery
AWS	alternative water supply
BEBR	Bureau of Economic and Business Research
BMAP	basin management action plan
BMP	best management practice
CERP	Comprehensive Everglades Restoration Plan
CFP	Cooperative Funding Program
cfs	cubic feet per second
CII	Commercial/Industrial/Institutional
District	South Florida Water Management District
DSS	Domestic Self-Supply
ENP	Everglades National Park
EQIP	Environmental Quality Incentives Program
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
FDEP	Florida Department of Environmental Protection
FEB	flow equalization basin
FPL	Florida Power & Light
FSAID	Florida Statewide Agricultural Irrigation Demand
FY	Fiscal Year
gpcd	gallons per capita per day
HVAC	heating, ventilation, and air conditioning
IAS	intermediate aquifer system
L/R	Landscape/Recreational
LFA	Lower Floridan aquifer

LOSA	Lake Okeechobee Service Area
LOSOM	Lake Okeechobee System Operating Manual
LOWPP	Lake Okeechobee Watershed Protection Plan
LOWRP	Lake Okeechobee Watershed Restoration Project
LWC	Lower West Coast
LWCSIM	Lower West Coast Surficial and Intermediate Aquifer Systems Model
MDL	maximum developable limit
MFL	minimum flow and minimum water level
MIL	mobile irrigation lab
mg/L	milligrams per liter
mgd	million gallons per day
NEEPP	Northern Everglades and Estuaries Protection Program
NGVD29	National Geodetic Vertical Datum of 1929
PCUR	per capita use rate
PG	Power Generation
PS	Public Supply
RAA	restricted allocation area
RFGW	Regional Floridan Groundwater (monitoring program)
RO	reverse osmosis
SAS	surficial aquifer system
SFWMD	South Florida Water Management District
UF/IFAS	University of Florida Institute of Food and Agricultural Sciences
UFA	Upper Floridan aquifer
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WCFM	West Coast Floridan Model
WPP	watershed protection plan
WTP	water treatment plant
WWTF	wastewater treatment facility

1

Introduction

TOPICS
2022 LWC Plan Update
Goal and Objectives
Legal Authority and Requirements
Seminole Tribe of Florida
Regional and Local Planning Linkage
Plan Development Process
Progress Since the 2017 LWC Plan Update

The South Florida Water Management District (SFWMD or District) develops and updates regional water supply plans to address current and future water needs while protecting central and southern Florida's water resources. This *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update) assesses existing and projected water demands as well as water sources to meet those demands through 2045.

The LWC Planning Area includes all of Lee County, most of Collier County, and portions of Charlotte, Glades, Hendry, and Monroe counties and the Seminole Tribe of Florida Immokalee Reservation (**Figure 1-1**). The portions of the Big Cypress National Preserve and Monroe County within the LWC Planning Area have no permanent residents. The 2022 LWC Plan Update presents population estimates and associated water demands and projections (**Chapter 2**), water resource and water supply development projects (**Chapters 7** and **8**, respectively), and related water supply planning information for the 2020 to 2045 planning horizon. Designed to be a planning guide for local and tribal governments, utilities, agricultural operations, and other water users, the 2022 LWC Plan Update provides a framework for local and regional water supply planning and management decisions in the LWC Planning Area.

The LWC Planning Area covers more than 5,100 square miles and generally reflects the drainage patterns of the Caloosahatchee River Basin to the north and Big Cypress National Preserve to the south. The northern area of the Caloosahatchee River Basin is also the general jurisdictional boundary between the SFWMD and the Southwest Florida Water Management District in Charlotte County. The eastern boundary is along the western edge of the historic Everglades watershed, dividing the Big Cypress and Lake Okeechobee drainage basins. Lake Okeechobee borders four water supply planning areas and is formally included in the Lower East Coast Water Supply Plan. The southern end of the LWC Planning Area encompasses a coastal portion of Everglades National Park and ends just north of Shark River Slough. There are also extensive natural systems, including the Caloosahatchee River Estuary, Okaloacoochee Slough State Forest, Lake Trafford, Corkscrew Regional Ecosystem Watershed, Big Cypress Swamp, Picayune Strand State Forest, southern Charlotte Harbor, Estero Bay, Naples Bay, Ten Thousand Islands National Wildlife Refuge, J. N. "Ding" Darling National Wildlife Refuge, Rookery Bay National Estuarine Research Reserve, and Fakahatchee Strand Preserve State Park **(Figure 1-1)**.

Figure 1-1. LWC Water Supply Planning Area.

The primary sources of fresh water throughout the LWC Planning Area are surface water and groundwater from shallow aquifers. To a much lesser extent, reclaimed water also is used for nonpotable uses like irrigation. Major surface water resources include Lake Okeechobee, the Caloosahatchee River, and their hydraulically connected water bodies. The availability of surface water in the LWC Planning Area is limited, primarily due to water resource protection criteria (**Chapter 4**). Groundwater resources in the LWC Planning Area include the surficial, intermediate, and Floridan aquifer systems (SAS, IAS, and FAS). Further information about water source options is provided in **Chapter 5**.

2022 LWC PLAN UPDATE

The 2022 LWC Plan Update reflects the changes experienced in the LWC Planning Area since 2017, and their effect on water use and updates to projected water demands from 2040 to 2045. The 2022 LWC Plan Update consists of two documents: the planning document with appendices, and the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021). The planning document with appendices focuses on the LWC Planning Area. The 2021-2024 Support Document discusses aspects common to four of the SFWMD regional planning areas, including the legal authority and requirements for water supply planning. The Upper Kissimmee Basin is not included in the 2021-2024 Support Document because it is part of the Central Florida Water Initiative, which has its own support documents.

GOAL AND OBJECTIVES

The goal of the 2022 LWC Plan Update is to identify sufficient water supply sources and future projects to meet existing and future reasonable-beneficial uses during 1-in-10-year drought conditions through 2045 while sustaining water resources and natural systems. The objectives of the 2017 LWC Plan Update were reviewed and updated to develop the following objectives for this 2022 LWC Plan Update:

1. **Water Supply** – Quantify sufficient volumes of water and water supply projects to meet reasonable-beneficial consumptive uses projected through 2045 under 1-in-10-year drought conditions.

2. **Natural Systems** – Protect natural systems and water resources from harm due to water use, including declining water levels and the harmful movement of saline water.

3. **Water Conservation and Alternative Source Development** – Encourage water conservation measures to improve water use efficiency. Continue to encourage development of the FAS as an alternative water supply (AWS) and monitor the aquifers to enhance understanding of the relationships among water use, water levels, and water quality. Develop water storage options, including aquifer storage and recovery (ASR) systems and reservoirs, and promote projects that increase the supply and use of reclaimed water.

4. **Linkage with Local and Tribal Governments** – Provide information to support local government Comprehensive Plans. Promote compatibility of the 2022 LWC Plan Update with local and tribal government land use decisions.

5. **Compatibility and Linkage with Other Efforts** – Achieve compatibility and integration with the following planning-related activities:
    - Other state and federal water resource initiatives in the LWC Planning Area
    - Existing and proposed environmental projects
    - Development and modifications to operating schedules for regional projects (e.g., Caloosahatchee River [C-43] West Basin Storage Reservoir) and regional systems (e.g., Lake Okeechobee)
    - Water use permitting process, minimum flow and minimum water level (MFL) criteria, water reservations, and restricted allocation areas (RAAs)

LEGAL AUTHORITY AND REQUIREMENTS

The legal authority and requirements for water supply planning are included in Chapters 163, 187, 373, and 403, 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 to meet the demands of new development. The water supply planning region identified in this plan shall be considered a Water Resource Caution Area under Section 403.064, F.S., and affected parties may challenge the designation pursuant to Section 120.569, F.S.

In addition to water supply planning, the SFWMD is required by statute to provide updates for a variety of resource development, restoration, and monitoring programs implemented within the District's boundaries. Such updates are provided in the annual publication of the *South Florida Environmental Report*, which is referenced as needed in this plan update.

SEMINOLE TRIBE OF FLORIDA IMMOKALEE RESERVATION

The Seminole Tribe of Florida is a federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, F.S. The Seminole Tribe of Florida's Immokalee Reservation encompasses 600 acres within the central portion of the LWC Planning Area (**Figure 1-1**). The reservation has a population of fewer than 1,000 permanent residents.

REGIONAL AND LOCAL PLANNING LINKAGE

The SFWMD's regional water supply planning process is closely coordinated and linked to the local water supply planning of municipal/county governments and utilities. Coordination and collaboration among all water supply planning entities is needed throughout the regional water supply plan development and approval process. Included in the coordination process is the review of Sector Plans, which are long-term plans for a geographic area of at least 5,000 acres. Within the LWC Planning area, there are two adopted plans located within western Hendry County: the Rodina Sector Plan and the Southwest Hendry County Sector Plan.

While this 2022 LWC Plan Update addresses regional and Districtwide water supply issues, local governments are required to plan for their water and wastewater needs (as well as other infrastructure and public service elements) through their Comprehensive Plans. Local Comprehensive Plans also include Water Supply Facilities Work Plans (Work Plans), which are required by statute. In addition, local governments are required by statute to update their Work Plans and adopt revisions to their Comprehensive Plans within 18 months following approval of this 2022 LWC Plan Update. Revisions may include population projections, established planning periods, existing and future water supply development projects, intergovernmental coordination activities, conservation and reuse measures, and the capital improvements element. More information on Comprehensive Plan and Work Plan requirements is provided in the 2021-2024 Support Document (SFWMD 2021).

To assist local governments in updating their Comprehensive Plans and Work Plans, the SFWMD has developed technical assistance tools and informational documents, which are available on the SFWMD webpage (https://www.sfwmd.gov/doing-business-with-us/work-plans). Additional information about developing a Work Plan is available from the Florida Department of Economic Opportunity webpage (https://www.floridajobs.org/community-planning-and-development/programs/community-planning-table-of-contents/water-supply-planning).

PLAN DEVELOPMENT PROCESS

This 2022 LWC Plan Update describes how anticipated water supply needs will be met in the LWC Planning Area through 2045. The planning process used to develop this 2022 LWC Plan Update is outlined below.

PLAN DEVELOPMENT PROCESS			
1	**2**	**3**	**4**
Planning and Assessment	**Data Collection, Analyses, and Issue Identification**	**Evaluation of Water Resources and Water Source Options**	**Identification of Water Resource and Water Supply Development Projects**
The process incorporated public participation and coordination with local stakeholders, including water supply utilities, agricultural operations, nongovernmental environmental groups, local and tribal governments, the Florida Department of Environmental Protection, the 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 2017 LWC Plan Update were key starting points.	Using the 2017 LWC Plan Update as a foundation, developing this plan update involved collecting the latest information on current and projected population and water demands (**Chapter 2**), water conservation (**Chapter 3**), water resource protection (**Chapter 4**), water source options (**Chapter 5**), and water resource analyses (**Chapter 6**).	This phase of the planning process involved reviewing existing monitoring data and updated regional modeling used for evaluation of water resources to identify issues. Where projected demands exceed available supplies, water supply project options were identified, including alternative water supplies and water conservation.	Where resource conditions warranted, water resource development projects were identified (**Chapter 7**). Water supply development projects intended to meet water needs over the planning horizon were identified, compiled, and evaluated by the SFWMD with input from stakeholders, the public, and other agencies. The SFWMD also considers water supply projects in local government Work Plans, Tribal Work Plans, and adopted Sector Plans, which are required to identify needed water supplies and available water sources pursuant to Section 163.3245(3)(a)2., F.S. Additionally, the projects were screened for permitting feasibility (**Chapter 8**).

Public Participation

Public participation is a key component of the water supply plan development process to ensure the plan addresses the issues and concerns of stakeholders and that the direction and projects are appropriate for future water needs. The SFWMD held three virtual stakeholder workshops for this water supply plan update. Stakeholders representing a variety of interests in the region, such as agriculture, industry, environment, utilities, local government planning departments, tribal representatives, and state and federal agencies as well as the general public, were invited to attend the workshops. The workshops provided participants with an opportunity to review and comment on projected demands, water supply issues, the condition of regional water resources, water source options, groundwater modeling, and other key aspects of the water supply plan update.

Individual meetings were held throughout the planning process with public supply utilities, the Seminole Tribe of Florida, other planning agencies, local government planning departments, and agricultural representatives to discuss water demand projections and coordinate planning efforts. During meetings with the region's major utilities and local governments, population and demand estimates and projections were reviewed and verified, and the condition of regional water resources and AWS development efforts were discussed. Additionally, presentations were made to the District's Governing Board and the Big Cypress Basin Governing Board, providing overviews of the plan update and soliciting comments. Following the public comment period, the final version of the plan update was brought to the District's Governing Board for consideration of approval.

PROGRESS SINCE THE 2017 LWC PLAN UPDATE

Since the 2017 LWC Plan Update, the following activities and programs in the LWC Planning Area are supporting the sustainability of the region's water resources, water supply, and natural systems.

Modeling and Hydrologic Studies

- **FAS Monitoring Network** – The SFWMD maintains and updates a network of 106 FAS monitor wells, 18 of which are within the LWC Planning Area. Water level data from the monitor wells are evaluated to help manage use of the FAS as a water supply source. In addition, water quality sampling and analyses are conducted periodically to observe any trends that might signal overuse of the resource.
- **Lower West Coast Surficial and Intermediate Aquifer Systems Model** – The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) was completed and simulations to evaluate changes in water levels in the SAS and IAS for the 2014 and 2040 withdrawal scenarios were completed during 2020.
- **West Coast Floridan Model** – The West Coast Floridan Model (WCFM) was updated and simulations to identify potential changes in water quality, flows, and water levels in the FAS for the 2014 and 2040 withdrawal scenarios were conducted during 2020. **Chapter 6** provides information about both modeling efforts for this plan update.
- **Hydrogeologic Studies** – Between 2017 and 2020, the SFWMD and its partners completed the following hydrogeologic investigations in the LWC Planning Area:

- Aquifer performance testing of the Sandstone aquifer (Smith 2017)
- Geochemistry of the Upper Floridan aquifer and Avon Park permeable zone (Geddes et al. 2018)
- Groundwater chemistry of the Lower Floridan aquifer – upper permeable zone in Central and South Florida (Geddes et al. 2020)

- **Updated Delineation of the Saltwater Interface in Collier and Lee Counties** – The SFWMD reviewed water quality data from Collier and Lee counties and updated maps to compare the 2009, 2014, and 2019 extent of saltwater intrusion within the SAS and IAS (Shaw and Zamorano 2020). See **Chapter 6** for more details.

Water Supply Studies

- **Annual Estimated Water Use Reports** – The SFWMD prepared annual reports that summarize estimated use (based on reported withdrawals) for public supply, domestic self-supply, commercial/industrial, agriculture, landscape/recreational, and power generation. A copy of the annual reports can be found at https://www.sfwmd.gov/our-work/water-supply.

- **2022 Water Supply Cost Estimation Study** – The SFWMD funded an engineering evaluation of the capital and operational costs of various water supply facilities including groundwater wellfields, surface facilities, water treatment processes, storage, piping and distribution facilities, and other ancillary components. It is anticipated that the study report will be available in 2022.

Water Storage, Construction, and Restoration Projects

- **Herbert Hoover Dike/Lake Okeechobee** – In 2007, the United States Army Corps of Engineers (USACE) designated the Herbert Hoover Dike as a Class I risk, the highest risk for dam failure. Of the 32 culverts slated to be replaced, removed, or abandoned, 27 have been completed and the remaining 5 are under construction. The Dam Safety Modification Study identified 56.3 miles of the dam as needing improvement, of which 40 miles (71%) have been completed. Construction of all works are currently scheduled for completion by the end of 2022.

Herbert Hoover Dike

- **Lake Okeechobee Watershed Restoration Project** – Part of the Comprehensive Everglades Restoration Plan (CERP), the purpose of the Lake Okeechobee Watershed Restoration Project is to improve the ecology of Lake Okeechobee, decrease regulatory releases to the St. Lucie and Caloosahatchee estuaries, restore freshwater wetlands in the watershed, and improve water supply for existing legal users. The project team prepared a Final Integrated Project Implementation Report and Environmental Impact Statement that was released in August 2020 for public review. A Final Chief's Report by the USACE Chief of Engineers and congressional authorization are pending for the project. The recommended plan includes construction of up to 55 ASR wells located in clusters throughout the Lake Okeechobee watershed. To date, the Florida State Legislature appropriated $100 million ($50 million in Fiscal Year [FY] 2020 and $50 million in FY2021) to the SFWMD for the design, engineering, and construction of the specific project components designed to achieve the greatest reductions in harmful discharges to the St. Lucie and Caloosahatchee estuaries.
- **Picayune Strand Restoration Project** – Part of CERP, the purpose of the Picayune Strand Restoration Project is to restore and enhance wetlands in the Picayune Strand State Forest and adjacent public lands by reducing overdrainage, and to improve the water quality of coastal estuaries by moderating the large salinity fluctuations caused by point discharge of fresh water from the Faka Union Canal. Over 55,000 acres of wetland and upland habitat will be restored or enhanced for fish and wildlife resources, including threatened and endangered species. The Merritt Pump Station was completed in April 2016, Faka Union Pump Station in January 2017, and Miller Pump Station in May 2018. Plugging of the upper 3 miles of the Faka Union Canal was completed in May 2021. The Southwest Protection Feature levee will provide flood protection for existing agricultural and residential properties with an anticipated completion date of 2023.
- **Caloosahatchee River (C-43) West Basin Storage Reservoir** – Part of CERP, the purpose of the Caloosahatchee River (C-43) West Basin Storage Reservoir is to improve timing and quantity of water deliveries to the Caloosahatchee Estuary, capture stormwater runoff and Lake Okeechobee releases, and meet the MFL established for the Caloosahatchee Estuary. The project team completed the Package 1 Preload and Demolition in August 2017 to remove all existing agricultural facilities and consolidate the foundation beneath the surface to prevent settling. The Package 2 Irrigation Pump Station (S-476) was completed in April 2019. This pump station replaces the need for local drainage district pump stations. The Package 3 Inflow Pump Station (S-470) and the Package 4 Civil Works (dam embankment and associated structures) are currently under construction.
- **C-43 Water Quality Feasibility Study** – The Caloosahatchee Reservoir Water Quality Feasibility Study provides options for water quality improvement opportunities for water leaving the Caloosahatchee Reservoir. After extensive public and stakeholder engagement, Phase 1 of the study is complete and identifies four water quality treatment opportunities. Phase 2 is under way and includes siting of the possible alternatives to determine cost and compatibility with other infrastructure.

- **Caloosahatchee MFL Criteria and Recovery Strategy Revisions** – In December 2019, the MFL for the Caloosahatchee River was modified to be a 30-day moving average flow of 457 cubic feet per second (cfs) at control structure S-79 (Section 40E-8.221, Florida Administrative Code [F.A.C.]). The MFL recovery strategy includes several components and is fully described in **Appendix C**. Two components involve construction of the C-43 Reservoir and implementation of a research and monitoring plan. Construction of the C-43 Reservoir began in 2015 and is scheduled to be completed in 2024. Water to be stored in the reservoir has been protected with a water reservation. The research and monitoring plan is meant to document ecological responses of indicators before and after operation of the C-43 Reservoir to determine the benefits of additional future freshwater inflows from the reservoir.
- **Lake Hicpochee Storage and Hydrologic Enhancement Project** – The Lake Hicpochee Storage and Hydrologic Enhancement Project captures water from the C-19 Canal that discharges into the C-43 Canal. The project holds water in shallow storage and redistributes it into Lake Hicpochee to reduce harmful discharges to the Caloosahatchee Estuary.
- **Southern Corkscrew Regional Ecosystem Watershed (CREW)** – The State of Florida and SFWMD have partnered with other government agencies and conservation organizations to acquire 45,000 acres of the vast CREW. The Southern CREW hydrologic enhancement project consists of a 4,150-acre mosaic of wet prairies, native uplands, freshwater marsh, hydric pine flatwoods, and cypress strand wetlands. The project goal was to restore historical sheetflow and reduce excessive freshwater discharges which include nutrients and pollutants to Estero Bay during the rainy season. Construction of the Southern CREW project was completed in April 2018. The SFWMD has led this restoration effort. Based on the vegetation and hydrologic monitoring efforts to date, a trend of appropriate wetland vegetation recruitment has been observed, and it is anticipated that as a result of the hydrologic enhancements, further increases in native wetland vegetation will follow.

Alternative Water Supply and Water Conservation Cost-Share Funding

As part of the regional water supply plans' water resource development component (**Chapter 7**), and to assist local water users in implementation of the water supply development component (**Chapter 8**), the SFWMD periodically provides funding assistance to public water suppliers, local governments, special districts, homeowners' associations, water users, and other public and private organizations for AWS and water conservation projects that are consistent with the SFWMD's core mission. In 2019, the Florida Department of Environmental Protection and SFWMD initiated annual funding for the construction and implementation of AWS and water conservation projects to qualified applicants through the AWS Funding Program.

- **Alternative Water Supply** – From FY2017 through FY2021, the SFWMD provided AWS project funding for seven projects that were completed or are under construction in the LWC Planning Area, generating 9.87 million gallons per day (mgd) of additional water capacity.
- **Water Conservation** – From FY2017 through FY2021, the SFWMD provided funding for three water conservation projects that were completed or are being implemented in the LWC Planning Area. The projects are estimated to save 0.08 mgd.

Big Cypress Basin Initiatives

The Big Cypress Basin Board has oversight responsibilities for operation and maintenance of a network of 143 miles of primary canals and 36 water control structures. Big Cypress Basin facilities are operated in coordination with local governments. A 5-year strategic plan was prepared by the Big Cypress Basin in 2018, which included capital improvements to water management infrastructure, water supply, environmental, and flood control components. Within the past 5 years, numerous improvements to the system infrastructure, flood control components, and operational modifications have taken place.

REFERENCES

Geddes, E., S. Coonts, and R. Carroll. 2020. *Groundwater Chemistry of the Lower Floridan Aquifer – Upper Permeable Zone in Central and South Florida*. Technical Publication WS-57. South Florida Water Management District, West Palm Beach, FL. December 2020.

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SFWMD. 2021. *Support Document for the 2021-2024 Water Supply Plan Updates*. South Florida Water Management District, West Palm Beach, FL. November 2021.

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2

Demand Estimates and Projections

This chapter summarizes the water demand estimates and projections for the Lower West Coast (LWC) Planning Area of the South Florida Water Management District (SFWMD or District) through the planning horizon (2020 to 2045). Estimates and projections are presented by water use category and were developed in coordination with various stakeholder groups, including agriculture, utilities, industry, local and tribal governments, and other interested parties. A detailed discussion of the data collection and analysis methodology is provided in **Appendix A**.

TOPICS

- Water Demand
- Water Use Categories
- Population Estimates and Projections
- Public Supply
- Domestic Self-Supply
- Agriculture
- Commercial/Industrial/ Institutional
- Landscape/Recreational
- Power Generation
- Summary of Demand Estimates
- Demand Projections in Perspective

Water demands in the LWC Planning Area are driven by agricultural irrigation, followed by irrigation for landscape and recreation, and then potable water use provided by utilities. Irrigated agricultural acreage and production are projected to remain relatively stable with a slight increase. Citrus and sugarcane continue to be the two largest commodities. Acreages of all crops are projected to have small increases with the exception of sugarcane, sod, and potatoes. Starting in early 2020, the COVID-19 pandemic has had significant impacts on the economy, particularly on businesses and tourism. However, residential development has expanded at a robust rate in Collier and Lee counties.

WATER DEMAND

Water demands can be described and analyzed in two ways: gross demand and net demand. Gross demand is the volume of water withdrawn or diverted from a groundwater or surface water source. This definition serves as the basis for water allocations established through water use permits issued by the SFWMD. Further information on water use permitting is provided in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021). Net demand refers to the volume of water delivered to end users after accounting for treatment losses and delivery system inefficiencies. For Public Supply (PS) and Domestic Self-Supply (DSS), demands commonly are referred to as raw and finished demands rather than gross and net demands, respectively. In this *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update), gross demand is equal to net demand for all water use categories except PS.

This 2022 LWC Plan Update presents demands for average rainfall and 1-in-10-year drought conditions (**Appendix A**). Section 373.709, Florida Statutes (F.S.), states the level-of-certainty planning goal associated with identifying water demands contained in water supply plans shall be based on meeting demands during 1-in-10-year drought conditions for at least a 20-year period. Although not quantified in this plan, environmental demands are addressed through resource protection criteria (**Chapter 4**).

INFO ⓘ

Average Rainfall and 1-in-10-Year Drought

An **average rainfall year** is defined as a year with a rainfall amount that has a 50% probability of being exceeded in any other year.

A **1-in-10-year drought** is defined as a year in which below normal rainfall occurs, with a 90% probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

WATER USE CATEGORIES

Water demands for this 2022 LWC Plan Update are estimated in 5-year increments for the six water use categories listed below, which were established by the Florida Department of Environmental Protection (FDEP) in coordination with the state's water management districts. The water use category names and acronyms have been updated for this plan to align with other water supply planning efforts across the state.

- **Public Supply (PS)** – Potable water supplied by water treatment plants with a current allocation of 0.10 million gallons per day (mgd) or greater.
- **Domestic Self-Supply (DSS)** – Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.
- **Agriculture (AG)** – Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture irrigation, and aquaculture.
- **Commercial/Industrial/Institutional (CII)** – Self-supplied water associated with the production of goods or provision of services by commercial, industrial, or institutional establishments.

- **Landscape/Recreational (L/R)** – Self-supplied and reclaimed water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas such as land managed by homeowners' associations and commercial developments.
- **Power Generation (PG)** – Self-supplied and reclaimed water used for cooling, potable, and process water by power generation facilities.

Table 2-1 presents estimated (2020) and projected (2045) average gross water demands, by water use category, in the LWC Planning Area for this water supply plan update. AG accounts for the majority of current and projected demands, followed by PS, L/R, CII, DSS, and PG. An overall increase in total demand is projected through the planning horizon.

Table 2-1. Estimated (2020) and projected (2045) average gross water demands (in mgd) for the LWC Planning Area by use category.

Water Use Category	2020	2045
Public Supply	138.70	186.82
Domestic Self-Supply	24.27	31.66
Agriculture	592.02	621.40
Commercial/Industrial/Institutional	37.73	48.23
Landscape/Recreational	219.17	289.23
Power Generation	1.54	2.03
LWC Planning Area Total	**1,013.43**	**1,179.37**

LWC = Lower West Coast; mgd = million gallons per day.

POPULATION ESTIMATES AND PROJECTIONS

> NOTE
>
> All population estimates and projections are for permanent residents, as defined by the United States Census Bureau. However, the per capita use rate, which is used to calculate water demands, reflects use by seasonal residents as well.

Population estimates and projections were used to develop demands for all water use categories except AG and PG. Developing population estimates and projections required multiple sources of information, including county-level data from the University of Florida's Bureau of Economic and Business Research (BEBR; Rayer and Wang 2021), consistent with Section 373.709(2)(a), F.S., data from the 2020 Decennial Census (United States Census Bureau 2020), and data from local government Comprehensive Plans. Additionally, data were reviewed from two adopted Sector Plans within Hendry County. **Appendix A** provides further details on the development of population estimates and projections. Draft results were presented to the region's larger PS utilities to ensure accuracy and obtain agreement with final 2045 population projections in the plan update.

In 2020, the estimated population within the LWC Planning Area was 1,188,599 permanent residents (**Table 2-2**). BEBR projections indicate the LWC Planning Area population will grow to 1,628,546 permanent residents in 2045, an increase of approximately 37%. Nearly two-thirds of the LWC Planning Area population resides in Lee County, while Collier County accounts for approximately one-third, and this trend is expected to continue. As explained in

Appendix A, BEBR medium projections were used for all counties to develop detailed population projections for PS utilities and county DSS areas (Rayer and Wang 2021).

Table 2-2. Permanent resident population served by PS and DSS in the LWC Planning Area in 2020 and 2045.

County	2020 Population			2045 Population		
	PS	DSS	**Total**	PS	DSS	**Total**
Charlotte*	3,891	1,746	**5,637**	15,840	2,910	**18,750**
Collier[a]	314,633	72,817	**387,450**	431,984	87,016	**519,000**
Glades*	4,906	4,484	**9,390**	5,942	5,029	**10,971**
Hendry*	27,551	8,078	**35,629**	28,934	12,391	**41,325**
Lee	645,114	105,379	**750,493**	889,064	149,436	**1,038,500**
LWC Planning Area Total	**996,095**	**192,504**	**1,188,599**	**1,371,765**	**256,781**	**1,628,546**

DSS = Domestic Self-Supply; LWC = Lower West Coast; PS = Public Supply.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

PUBLIC SUPPLY

The PS category includes potable water supplied by water treatment plants with a current allocation of 0.10 mgd or greater and is the third largest water use category in the LWC Planning Area. Developing PS demand projections was a multistep process that included updating PS utility service areas and estimating DSS populations, calculating per capita use rates (PCURs), and projecting future water needs.

NOTE

Perceived discrepancies in table totals are due to rounding.

Per Capita Use Rates

For each PS utility, a net (finished) water PCUR was developed using past population estimates and finished water data reported to the FDEP. The PCUR for each utility is a 5-year (2016 through 2020) average, calculated by dividing annual net (finished) water volume by the corresponding service area population for each year. For PS demand projections, PCURs were assumed to remain constant through 2045. To calculate projected gross (raw) demands, the treatment efficiency for each utility, based on treatment process type(s) expected in 2045, was applied as a raw-to-finished ratio. Any demand reductions due to historical conservation practices were implicitly factored into the projections by using the 5-year average PCUR. Future water conservation savings (**Chapter 3**) were not factored into the demand projections used in this plan update due to water savings uncertainties. PS service area and water treatment plant maps are provided in **Appendix A**. Utility profiles containing population and finished water use data and projections as well as permitted allocations are provided in **Appendix B**.

PS Demand Estimates and Projections

Tables 2-3 and **2-4** present PS gross (raw) and net (finished) water demands, respectively, in 5-year increments by county. The results indicate PS gross (raw) water demands will increase approximately 35%, from 138.70 mgd in 2020 to 186.82 mgd in 2045 under average rainfall conditions. Calculation of 1-in-10-year demand increase is based only on the outdoor portion of PS use, and the methodology is explained in **Appendix A**.

Table 2-3. PS gross (raw) water demands in the LWC Planning Area by county.

County	Gross (Raw) Demand – Average Rainfall Conditions (mgd)						2045 1-in-10-Year Demand
	2020	2025	2030	2035	2040	2045	
Charlotte*	0.37	0.49	0.65	0.88	1.20	1.66	1.74
Collier[a]	58.58	62.97	67.32	71.41	75.17	78.73	84.66
Glades*	0.82	0.87	0.91	0.94	0.97	0.99	1.05
Hendry*	3.71	3.75	3.79	3.82	3.85	3.87	4.10
Lee	75.22	81.17	87.38	91.91	96.73	101.56	106.64
LWC Planning Area Total	**138.70**	**149.25**	**160.05**	**168.97**	**177.93**	**186.82**	**198.20**

LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply.
* Values listed are only for the area within the LWC Planning Area boundary.
[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table 2-4. PS net (finished) water demands in the LWC Planning Area by county.

County	Net (Finished) Demand – Average Rainfall Conditions (mgd)						2045 1-in-10-Year Demand
	2020	2025	2030	2035	2040	2045	
Charlotte*	0.31	0.40	0.53	0.71	0.96	1.32	1.39
Collier[a]	52.34	56.20	60.06	63.67	66.96	70.08	75.68
Glades*	0.69	0.72	0.76	0.78	0.81	0.83	0.88
Hendry*	2.65	2.68	2.71	2.73	2.75	2.77	2.94
Lee	65.08	70.40	75.88	79.86	84.04	88.25	92.66
LWC Planning Area Total	**121.06**	**130.39**	**139.93**	**147.75**	**155.54**	**163.25**	**173.55**

LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply.
* Values listed are only for the area within the LWC Planning Area boundary.
[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

DOMESTIC SELF-SUPPLY

The DSS category includes potable water used by households that are served by small utilities with current allocations less than 0.10 mgd or that are self-supplied by private wells. Permanent resident populations within DSS areas were developed simultaneously with the PS population estimates and projections. All permanent residents outside of PS utility service area boundaries were considered DSS population. Population projection methodology and results are further described in **Appendix A**.

Table 2-5 contains the LWC Planning Area's DSS demand estimates and projections under average rainfall conditions. The average PCUR of PS utilities in the county were used to calculate demands. For DSS demands, the raw to finished water ratio is assumed to be 1.00. Therefore, no distinction is made between gross (raw) and net (finished) water demands. Average DSS demands in 2020 were 24.27 mgd for 192,504 permanent residents (**Table 2-2**). DSS demands are expected to increase 30%, to 31.66 mgd for 256,781 residents in 2045. This increase can be attributed to high anticipated growth in DSS areas without expansion of PS utility service within those areas.

Table 2-5. DSS gross (raw) water demands in the LWC Planning Area by county.

County	Gross (Raw) Demand – Average Rainfall Conditions (mgd)						2045 1-in-10-Year Demand
	2020	2025	2030	2035	2040	2045	
Charlotte*	0.15	0.19	0.22	0.24	0.24	0.25	0.26
Collier[a]	12.09	13.73	14.42	14.69	14.69	14.44	15.60
Glades*	0.61	0.64	0.66	0.67	0.68	0.69	0.73
Hendry*	0.78	0.90	1.00	1.07	1.13	1.19	1.26
Lee	10.64	13.14	13.81	15.09	15.38	15.09	15.85
LWC Planning Area Total	**24.27**	**28.60**	**30.10**	**31.76**	**32.12**	**31.66**	**33.70**

DSS = Domestic Self-Supply; LWC = Lower West Coast; mgd = million gallons per day.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

AGRICULTURE

The AG category includes self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture irrigation, and aquaculture. AG is the largest water use category in the LWC Planning Area, accounting for over 60% of the region's total estimated water demand in 2020. Agricultural production in the LWC Planning Area is of regional significance, with 291,765 acres under irrigation (**Figure 2-1**).

Agricultural acreage data published by the Florida Department of Agriculture and Consumer Services (FDACS 2021) were used to determine water demands for this 2022 LWC Plan Update. Pursuant to Section 373.709(2)(a), F.S., water management districts are required to consider FDACS water demand projections. Any adjustments or deviations from the projections published by FDACS, "…must be fully described, and the original data must be presented along with the adjusted data." A detailed description of the analyses and adjustments is provided in **Appendix A**.

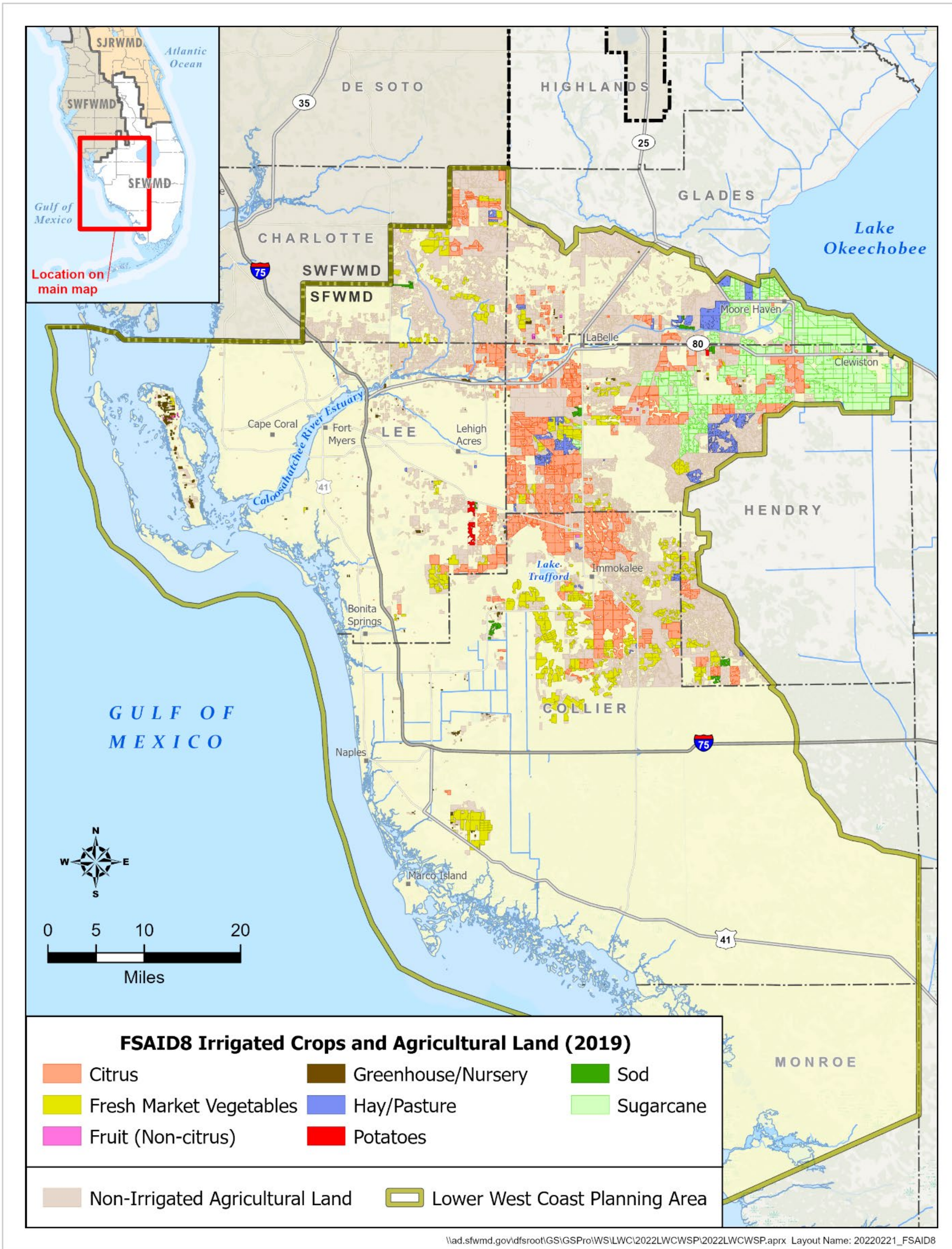

Figure 2-1. Agricultural irrigated land in the LWC Planning Area (Data from FDACS 2021).

Agricultural water demand was determined using the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model (Smajstrla 1990). No distinction was made between gross and net water demands. The FDACS irrigated crop acres, soil types, growing seasons, and irrigation methods were used as input data for the AFSIRS model. AG demand estimates and projections are based on the commercially grown crop categories in **Table 2-6**, as generally developed by the FDEP and water management districts for use in water supply plans. Citrus and sugarcane are the predominant irrigated crops in the LWC Planning Area, currently encompassing 206,687 acres. Together, these two crop types account for more than half of the irrigated acreage and demand under average rainfall conditions. Irrigated fresh market vegetables, hay/pasture, greenhouse/nurseries, and sod are the next largest AG crop categories, with a combined 83,042 acres.

Table 2-6. AG irrigated acres and gross water demands (in mgd) in the LWC Planning Area by crop type.

Crop	2020			2045		
	Acres	Average Demand	1-in-10-Year Demand	Acres	Average Demand	1-in-10-Year Demand
Citrus	118,047	189.07	236.69	124,820	198.45	244.72
Sugarcane	88,640	224.19	236.79	86,706	219.22	247.17
Fresh Market Vegetables	60,251	122.06	143.24	62,961	128.83	150.87
Hay/Pasture	16,223	34.03	40.53	16,806	35.34	41.84
Greenhouse/Nursery	3,239	7.86	8.54	5,239	12.76	16.37
Sod	3,328	9.20	11.29	3,287	8.99	11.08
Potatoes	1,279	2.73	3.18	1,199	2.43	2.88
Field Crops	188	0.50	0.89	4,244	10.96	11.03
Fruits (excluding citrus)	570	0.81	1.81	1,800	2.85	3.89
LWC Planning Area Total	**291,765**	**590.45**	**693.06**	**307,062**	**619.83**	**729.85**

LWC = Lower West Coast; mgd = million gallons per day.

Total irrigated acres in the LWC Planning Area are projected to increase 5% by 2045. The majority of crops are projected to increase in acreage over the planning horizon, except for sugarcane, sod, and potatoes. The largest change in irrigated acreage and demand is expected to occur in the citrus industry. By 2045, sugarcane is expected to decrease by 1,934 acres, and average demands are projected to decrease by 4.97 mgd.

Gross AG demands under average rainfall conditions in the LWC Planning Area are projected to increase from 592.02 mgd in 2020 to 621.40 mgd in 2045 (**Table 2-7**). These totals include demands from livestock and aquaculture in addition to the demands for crop irrigation shown in **Table 2-6**. Demands for livestock and aquaculture in the LWC Planning Area in 2020 are estimated to be 1.13 mgd and 0.44 mgd, respectively, with demands remaining constant over the planning horizon.

INFO ⓘ

Examples of crop categories used in this report include the following:

Fresh Market Vegetables:
- Tomatoes
- Green beans
- Peppers
- Melons

Fruits (excluding citrus):
- Mangoes
- Strawberries
- Blueberries
- Grapes

Field Crops:
- Corn
- Corn silage

Table 2-7. AG gross water demands for all agricultural acreage, livestock, and aquaculture in the LWC Planning Area by county.

County	Gross Demand– Average Rainfall Conditions (mgd)						2045 1-in-10-Year Demand
	2020	2025	2030	2035	2040	2045	
Charlotte*	31.88	31.88	32.06	32.48	32.75	33.07	39.68
Collier	133.13	131.33	130.57	128.66	127.95	126.39	150.46
Glades*	98.95	95.87	100.14	107.75	113.97	120.49	141.88
Hendry*	294.54	295.40	296.18	299.36	304.14	311.02	360.25
Lee	33.52	33.14	32.76	32.18	31.23	30.43	39.16
LWC Planning Area Total	**592.02**	**587.62**	**591.72**	**600.44**	**610.04**	**621.40**	**731.42**

AG = Agriculture; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL

The CII water use category includes water demands associated with commercial and industrial operations for processing, manufacturing, and technical needs such as concrete, citrus processing, and mining operations. CII demands only include self-supplied users and do not include commercial or industrial users that receive water from PS utilities; those users are included in the PS category. All CII demand estimates and projections are presumed to be the same for average rainfall and 1-in-10-year drought conditions, and withdrawal demand is assumed to be equal to user demand. Therefore, no distinction is made between gross and net water demands. Growth within the CII category is expected to be driven by regional population growth. Estimated CII demands for 2020 were 37.73 mgd, with projected growth resulting in demands of 48.23 mgd in 2045 (**Table 2-8**).

Table 2-8. CII gross water demands in the LWC Planning Area by county.

County	Gross Demand (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte*	0.07	0.08	0.08	0.09	0.09	0.09
Collier	7.52	8.19	8.76	9.29	9.75	10.14
Glades*	13.76	14.45	15.03	15.48	15.94	16.26
Hendry*	4.59	4.82	5.02	5.17	5.27	5.38
Lee	11.79	13.09	14.14	14.98	15.73	16.36
LWC Planning Area Total	**37.73**	**40.63**	**43.03**	**45.01**	**46.78**	**48.23**

CII = Commercial/Industrial/Institutional; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

LANDSCAPE/RECREATIONAL

L/R is the second largest water use category in the LWC Planning Area, encompassing irrigation of golf courses and other landscaped areas such as parks, sports fields, and common areas of residential developments. L/R demands are met with the use of groundwater, surface water, and reclaimed water. L/R acreages reflect only the acres under water use permits and do not include acres irrigated solely with reclaimed water that do not have a water use permit for a supplemental or backup supply. Details regarding development of the L/R demands are provided in **Appendix A**.

Within the L/R category, 22,476 permitted acres were attributed to landscape irrigation. These landscaped areas are expected to grow 34% to 30,378 acres by 2045, which is approximately the same growth rate as the local population through 2045. In 2020, there were 128 golf courses irrigating 13,367 acres under water use permits in the LWC Planning Area (SFWMD 2022), and this is projected to increase by 130 acres by 2045.

Under average rainfall conditions, total estimated L/R gross water demands are projected to increase from 219.17 mgd in 2020 to 289.23 mgd in 2045 (**Table 2-9**). Groundwater and surface water supply sources met approximately 64% of the 2020 L/R water demands, with reclaimed water supplementing the remaining 36%. The ratio of reclaimed water to groundwater/surface water used to meet future landscape demands is assumed to remain constant. Golf course acreage is projected to remain relatively stable over the planning period and, as a result, water demand for golf is held relatively constant over the planning horizon, with a slight increase in Charlotte County. See **Chapter 5** for a discussion of reclaimed water as an alternative water supply source.

Table 2-9. L/R gross irrigation demands under average rainfall conditions in the LWC Planning Area (including reclaimed water).

Land Use	Demand – Average Rainfall Conditions (mgd)						2045 1-in-10-Year Demand
	2020	2025	2030	2035	2040	2045	
Charlotte County*							
Landscape	2.24	2.39	2.51	2.62	2.71	2.80	3.53
Golf	0.44	0.44	0.49	0.49	0.49	0.49	0.64
Charlotte County Total	**2.68**	**2.83**	**3.00**	**3.11**	**3.20**	**3.29**	**4.17**
Collier County							
Landscape	44.34	52.00	58.29	64.06	69.53	74.51	93.88
Golf	40.46	40.46	40.46	40.46	40.46	40.46	52.60
Collier County Total	**84.80**	**92.46**	**98.75**	**104.52**	**109.99**	**114.97**	**146.48**
Glades County*							
Landscape	0.13	0.14	0.15	0.15	0.15	0.15	0.19
Golf	0.05	0.05	0.05	0.05	0.05	0.05	0.07
Glades County Total	**0.18**	**0.19**	**0.20**	**0.20**	**0.20**	**0.20**	**0.25**
Hendry County*							
Landscape	0.64	0.67	0.70	0.72	0.73	0.74	0.93
Golf	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**0.64**	**0.67**	**0.70**	**0.72**	**0.73**	**0.74**	**0.93**
Lee County							
Landscape	100.75	112.55	120.87	128.13	134.53	139.91	176.29
Golf	30.12	30.12	30.12	30.12	30.12	30.12	39.16
Lee County Total	**130.87**	**142.67**	**150.99**	**158.25**	**164.65**	**170.03**	**215.44**
LWC Planning Area Total							
Landscape	148.10	167.75	182.52	195.68	207.65	218.11	274.82
Golf	71.07	71.07	71.12	71.12	71.12	71.12	92.47
LWC Planning Area Total	**219.17**	**238.82**	**253.64**	**266.80**	**278.77**	**289.23**	**367.29**

L/R = Landscape Recreational; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

POWER GENERATION

Demands under the PG category include use of groundwater, fresh surface water, or reclaimed water by thermoelectric power generation facilities. PG demands do not include the use of brackish surface water and cooling water returned to its withdrawal source, or seawater. Demands under average rainfall and 1-in-10-year drought conditions are assumed to be equal in the PG category; no distinction is made between gross and net water demands.

There are two power generation plants currently operating in the LWC Planning Area that are addressed in this plan update: Florida Power & Light (FPL) Fort Myers facility and the Lee County Solid Waste Energy Recovery Facility. In addition, FPL continues to expand its solar facilities throughout the LWC Planning Area; however, these facilities are photovoltaic systems and do not use water.

The FPL Fort Myers facility mainly uses brackish surface water from the Caloosahatchee River Estuary for its cooling tower technology as a one-time pass-through and is returned to the river. As a result, this is not considered as part of the demands, only the groundwater portion is considered. Groundwater is used for makeup water for steam generators, inlet spray coolers, and other industrial uses. For the planning period 2020 to 2045, the FPL Fort Myers facility is estimated to have a constant PG demand of 0.53 mgd. This demand is based on the average daily use in 2020 from groundwater sources.

The Lee County Solid Waste Energy Recovery Facility relies entirely on reclaimed water provided by the City of Fort Myers and is anticipated to continue relying on reclaimed water through the planning horizon. In 2020, 1.01 mgd of reclaimed water was supplied to this facility, and demands are anticipated to increase to 1.50 mgd by 2045. PG demands are expected to increase slightly from 2020 to 2045 (**Table 2-10**). More information on the development of PG estimates and projections is provided in **Appendix A**.

Table 2-10. Average gross water demands for PG in the LWC Planning Area between 2020 and 2045.

Facilities	Gross Demand (mgd)					
	2020	2025	2030	2035	2040	2045
FPL – Fort Myers	0.53	0.53	0.53	0.53	0.53	0.53
Lee County Solid Waste	1.01	1.08	1.16	1.50	1.50	1.50
LWC Planning Area Total	**1.54**	**1.61**	**1.69**	**2.03**	**2.03**	**2.03**

LWC = Lower West Coast; mgd = million gallons per day; PG = Power Generation.

SUMMARY OF DEMAND ESTIMATES

Total gross water demands under average rainfall conditions in the LWC Planning Area are projected to be 1,179.37 mgd by 2045, a 16% increase from 2020 demands (1,013.43 mgd). Demands under 1-in-10-year drought conditions are approximately 17% higher than those for average rainfall conditions in 2045.

Table 2-11 provides 5-year incremental summaries of gross demands for all water use categories in the LWC Planning Area under average rainfall and 1-in-10-year drought conditions. Gross demands under average rainfall conditions are used to demonstrate projected trends, including the following key highlights:

- PS and DSS gross demands combined are expected to increase 34%, from 162.97 mgd in 2020 to 218.48 mgd in 2045. PS will remain the third largest water use category in the LWC Planning Area.
- AG gross demands are projected to increase modestly from 592.02 mgd in 2020 to 621.40 mgd in 2045. AG will remain the largest water use category in the LWC Planning Area.
- CII gross demands are projected to increase 10.50 mgd over the planning period. The projected demand growth is related to regional population growth.
- L/R gross demands are projected to increase by 70.06 mgd by 2045. L/R will remain the second largest water use category in the LWC Planning Area.
- PG gross demands are projected to experience a slight increase over the planning period with 2.03 mgd expected in 2045.

Table 2-11. Summary of gross water demands under average rainfall and 1-in-10-year drought conditions in the LWC Planning Area by water use category.

Water Use Category	2020	2025	2030	2035	2040	2045
Demand – Average Rainfall Conditions (mgd)						
PS	138.70	149.25	160.05	168.97	177.93	186.82
DSS	24.27	28.60	30.10	31.76	32.12	31.66
AG	592.02	587.62	591.71	600.43	610.04	621.40
CII	37.73	40.63	43.03	45.01	46.78	48.23
L/R	219.17	238.82	253.64	266.80	278.77	289.23
PG	1.54	1.61	1.69	2.03	2.03	2.03
LWC Planning Area Total	**1,013.43**	**1,046.53**	**1,080.22**	**1,115.00**	**1,147.67**	**1,179.37**
Demand – 1-in-10-Year Drought Conditions (mgd)						
PS	147.22	158.38	169.83	179.29	188.79	198.20
DSS	25.86	30.46	32.06	33.80	34.19	33.70
AG	700.18	694.63	701.90	714.11	723.30	731.42
CII	37.73	40.63	43.03	45.01	46.78	48.23
L/R	279.01	303.76	322.45	339.03	354.11	367.29
PG	1.54	1.61	1.69	2.03	2.03	2.03
LWC Planning Area Total	**1,191.54**	**1,229.47**	**1,270.96**	**1,313.27**	**1,349.20**	**1,380.87**

AG = Agriculture; CII = Commercial/Industrial/Institutional; DSS = Domestic Self-Supply; L/R = Landscape Recreational; LWC = Lower West Coast; mgd = million gallons per day; PG = Power Generation; PS = Public Supply.

DEMAND PROJECTIONS IN PERSPECTIVE

Demand projections presented in this 2022 LWC Plan Update are based on the best available information. **Table 2-12** shows the 2040 average gross demands projected in the previous 2017 LWC Plan Update compared to the 2045 demands projected in this 2022 LWC Plan Update. The projections reflect trends, economic circumstances, and industry intentions that change over time, including a revised methodology of projection computations. Like any predictive tool based on past assumptions, there is uncertainty and a margin for error. The total demand projection for 2045 in this 2022 LWC Plan Update is 3% less than the estimated 2040 demand projected in the 2017 LWC Plan Update.

Table 2-12. Comparison of gross water demands under average rainfall conditions at the end of respective planning horizons in the 2017 LWC Plan Update and this 2022 LWC Plan Update.

Water Use Category	2017 LWC Plan Update	2022 LWC Plan Update	Percent Difference
	2040 Demand (mgd)	2045 Demand (mgd)	
Public Supply	199.88	186.82	-7%
Domestic Self-Supply	33.18	31.66	-5%
Agriculture	678.83	621.40	-8%
Commercial/Industrial/Institutional	29.07	48.23	66%
Landscape/Recreational	254.32	289.23	14%
Power Generation	15.40	2.03	-86%
LWC Planning Area Total	**1,210.68**	**1,179.37**	**-3%**

LWC = Lower West Coast; mgd = million gallons per day.

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3

Demand Management: Water Conservation

Demand management through water conservation is an important element of water supply planning and entails reducing the quantity of water required to meet demands through water use efficiency improvements and the prevention or reduction of unnecessary uses or losses of water. Water conservation contributes to the sustainability of water supply resources. Section 373.709(2), Florida Statutes (F.S.), requires that water conservation be considered when determining if the total capacity of the water supply development project options included in a water supply plan (**Chapter 8**) are greater than the increase in projected demands for the planning horizon (**Chapter 2**).

Conservation and efficiency measures should be maximized, regardless of the water source, before more costly water supply development options are implemented. Water conservation can reduce, defer, or eliminate the need to develop new water supply sources to meet current or future demands, which is comparable with expanding the existing water supply. Moreover, conservation and demand management have been shown to reduce costs to utilities and rate payers over the long term (Chesnutt et al. 2018, Feinglas et al. 2013). Improving water use efficiency can also reduce operational costs for most other users.

This chapter describes water conservation measures and programs and provides an estimate of potential water savings (demand reduction) achievable by 2045 in the Lower West Coast (LWC) Planning Area. Additional conservation information can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021), in the Comprehensive Water Conservation Program (SFWMD 2008), and on the SFWMD webpage (https://www.sfwmd.gov/conserve).

CONSERVATION MEASURES

The average per capita water use rate in the LWC Planning Area has decreased from about 177 gallons per capita per day (gpcd) in 2000 to about 123 gpcd in 2020 (**Figure 3-1**). However, more recently over the last 5 years, per capita water use has remained relatively stable, between approximately 123 gpcd and 127 gpcd. The leveling off of per capita water use is thought to be mostly due to a reliance on passive water savings, which result from the introduction of water-efficient fixtures and appliances into the marketplace, replacing older devices with more water-efficient models. Federal, state, and local codes and standards foster the development and use of more efficient devices, increasing passive savings. However, depending solely on passive savings will delay or exclude substantial conservation savings potential. Therefore, additional conservation measures and programs are necessary to encourage the use of high-efficiency equipment or improved water use behaviors that yield water savings, including increased outreach, education, and messaging to water users. Local governments, utilities, and large water users are encouraged to research which types of programs would be most appropriate and cost-effective for their residents and specific user groups and to develop goal-based water conservation plans that include development of public education and messaging. Cost-share funding and other collaborative opportunities may be available to help implement conservation strategies and programs. The following subsections include a brief description of conservation measures that can be implemented for outdoor and indoor water use applications.

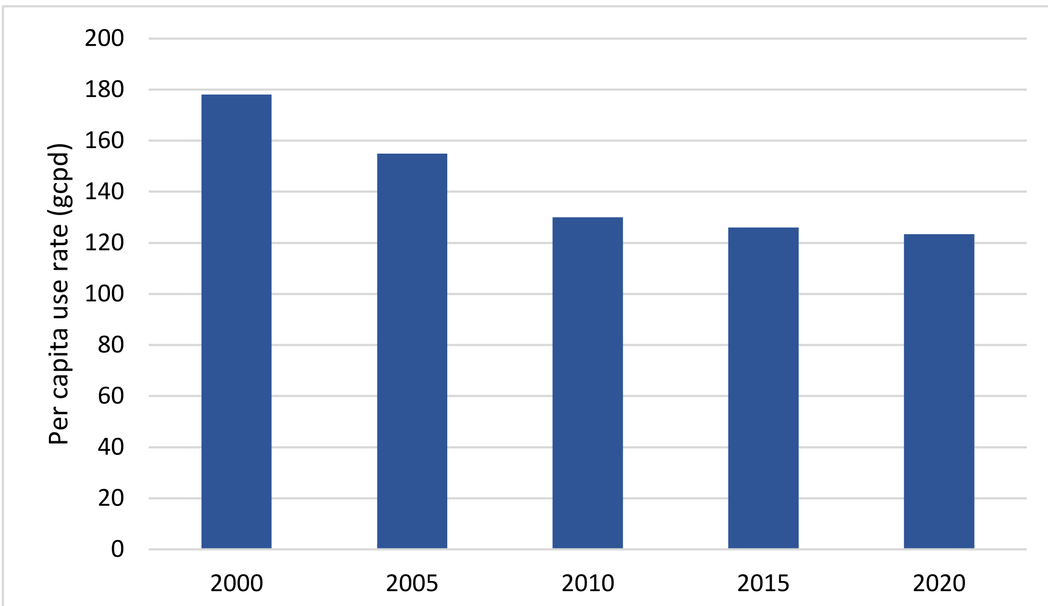

Figure 3-1. Net (finished) water per capita use rate (in gallons per capita per day) within the LWC Planning Area.

Outdoor Water Use (Irrigation)

A significant share of water used outdoors in the LWC Planning Area is for irrigation. Lawns and landscapes are irrigated by residential and commercial property owners, while irrigation of food and other commodity crops is practiced by agricultural water users. Many irrigation efficiency principles are common across these user groups; however, patterns and scales of use, system design, hardware and components, and operator knowledge can vary widely.

Agriculture

Many alternatives for improving irrigation delivery efficiency and conserving water in agricultural operations are available and should be considered for implementation when economically feasible. Typically, agricultural water conservation measures fall under three categories: 1) converting from one irrigation method (or system type) to a more efficient one; 2) improving the precision irrigation management capabilities of the system; and 3) implementing best management practices (BMPs). Real-time information on soil moisture and weather conditions, along with remote operation to allow quick irrigation changes in response to changing weather, can help adjust when water is delivered to precisely meet crop needs. Hardware and technology that can improve system management, reduce water quantities used to meet crop needs, and minimize water losses include the following:

- Flowmeters
- Weather stations
- Soil moisture sensors
- Variable-frequency pump drives
- Automated control systems
- Best management practices (e.g., laser leveling, irrigation system maintenance)

Urban

In South Florida, where irrigation occurs year-round, the largest portion of water used by urban water users served by utilities often is for irrigation. Moreover, the United States Environmental Protection Agency estimates approximately 50% of water used outdoors is wasted due to inefficient watering methods and systems. Therefore, improvements to irrigation efficiency are considered a primary target for conserving water used by urban water users.

Irrigation efficiency improvements can be achieved at single- and multi-family residences, commercial and institutional properties, recreational areas (e.g., parks, athletic fields, golf courses), and other landscaped areas (e.g., roadway medians) by replacing outdated irrigation systems and timers. Automatic controllers should be tested and shown to meet the United States Environmental Protection Agency's WaterSense program specifications for water efficiency and performance. More information on the WaterSense program and labeled irrigation controllers is available at https://www.epa.gov/watersense. All automatic lawn and landscape irrigation systems must be properly equipped with technology that inhibits or interrupts the system's operation during periods of sufficient rainfall (Section 373.62, F.S.).

Golf courses typically are irrigated with a high degree of efficiency. However, opportunities to improve efficiency may exist using many of the same types of hardware and technology as described above. Additional practices for efficient golf course water use can be found in *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses* published by the Golf Course Superintendents Association of America (2021) for golf course managers https://www.gcsaa.org/environment/bmp-planning-guide.

Indoor Water Use

Another area of potential conservation savings is indoor water use in single- and multi-family residences and commercial/institutional buildings (e.g., office buildings, restaurants, movie theaters, long-term care facilities, hospitals). Potential measures include detecting and repairing water leaks and replacing older, inefficient plumbing fixtures (e.g., toilets, urinals, faucets, showerheads) with models that have been tested and shown to meet the WaterSense program specifications for water efficiency and performance. Older, inefficient appliances can be replaced with water-efficient models that have received the ENERGY STAR label. For more information on the ENERGY STAR program and to find labeled products, visit https://www.energystar.gov.

Common water efficiency improvement measures for commercial and industrial users are outlined in the SFWMD's (2013) *Water Efficiency Audit Guide*, which is discussed in greater detail in the 2021-2024 Support Document (SFWMD 2021). Measures for improving water efficiency in nonresidential settings may be applicable to specific operations or facilities such as autoclaves in hospitals; pre-rinse spray valves, food steamers, and waste grinders in restaurants; heating, ventilation, and air conditioning (HVAC) system efficiency upgrades; converting water-based cooling devices to air-based; and water reuse/recycling in industrial operations. Other applicable measures may exist for specific industrial processes.

CONSERVATION PROGRAMS

Conservation programs help educate water users and facilitate adoption of effective water conservation measures (e.g., specific actions or hardware that improve water use efficiency). Utilities and local governments are the primary entities that develop and implement conservation programs. Other regional and state agencies may also assume a leadership role in promoting and providing cost-share funding for water conservation. Utilities and local governments are encouraged to analyze their service areas and jurisdictions to determine potential user groups and programs that may be most suitable for them. The following subsections contain brief descriptions of established conservation programs that may be applicable to different water use categories.

Education, Outreach, and Marketing

Although water savings attributed to education, outreach, and marketing campaigns are difficult to quantify, such campaigns are essential to reducing water use and instilling a lasting conservation ethic in businesses and communities. Developing a conservation ethic and educating water users enable people to know why conservation is important and necessary, what conservation measures are available, and how they can implement them. Campaigns usually are conducted by regional/local agencies or utilities and are designed to reach specific user groups (e.g., residents, schools, commercial properties), providing consistent and regular messaging.

The SFWMD maintains its commitment to water conservation education through distributing educational materials, conducting speaking engagements, and utilizing social media platforms to raise awareness about the necessity of saving water.

Cost-Share Funding Programs

SFWMD Cooperative Funding Program

The Water Conservation component of the SFWMD Cooperative Funding Program (CFP) seeks to support projects that improve water use efficiency and conservation. The CFP provides financial incentives to local governments and utilities, homeowners' associations, commercial entities, and agricultural operations to implement technology and hardware-based water conservation projects. Historically, funding for the CFP has come from both ad valorem taxes and the Florida Legislature through the Florida Department of Environmental Protection. CFP funding is considered annually during the SFWMD's budget development process. Since the 2017 LWC Plan Update, the SFWMD has provided approximately $3 million in water conservation funding for 60 projects Districtwide. Over the same period (Fiscal Year [FY] 2017 through FY2021), 3 water conservation projects were funded in the LWC Planning Area for a total of $40,000 and 0.08 million gallons per day (mgd) of water saved. Currently funded projects are listed in **Chapter 8**. The CFP is expected to continue although future funding levels are uncertain. The District's Governing Board has instituted that beginning in FY2023, local governments must have an adopted year-round irrigation ordinance that fully comports with the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, Florida Administrative Code [F.A.C.]) in order to be eligible for alternative water supply or water conservation funding through the CFP. Additional information regarding the CFP can be found on the SFWMD's webpage (https://www.sfwmd.gov/doing-business-with-us/coop-funding).

SUCCESS STORY

Bonita Springs Utilities received $10,000 (total project cost $25,000) to fund a high-efficiency toilet rebate program that issued 251 rebates targeting older homes in its service area saving over 1.5 million gallons per year of potable water. The cost per 1,000 gallons saved was less than $0.90.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP), implemented through the United States Department of Agriculture – Natural Resources Conservation Service, promotes agricultural production and environmental quality. Financial and technical assistance is offered to participants to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved groundwater and surface water, reduced soil erosion and sedimentation, and improved or created wildlife habitat. From FY2017 through FY2021, EQIP has provided $469,770 in funding for irrigation projects covering a total of 378 acres. EQIP is expected to continue although future funding levels are uncertain.

Certification and Recognition Programs

> **INFO ⓘ**
>
> Florida-Friendly Landscaping means using low-maintenance plants and environmentally sustainable landscaping practices to conserve water, reduce pollution and erosion, and create wildlife habitat.

There are several national and statewide certification and recognition programs that direct builders, property owners, and building managers toward meeting environmentally friendly standards. Such programs include the Florida Green Building Coalition's green certification programs, the Florida Department of Environmental Protection's Green Lodging Program, the United States Green Building Council's Leadership in Energy and Environmental Design (LEED), and the Green Building Initiative's Green Globes Certification. These holistic programs typically include criteria affecting water use, energy efficiency, climate-adaptive landscaping, sustainable building material, site selection, indoor environmental quality, and greenhouse gas emissions.

With respect to growing development and finite water resources, there are single-focus programs that target water use efficiency. These programs often are less expensive for builders and property managers than holistic ones. Two single-focus programs endorsed by all Florida water management districts are Florida Water Star and Florida-Friendly Landscaping Recognition. More information on these programs can be found on their individual program webpages and on the SFWMD's water conservation webpage (https://www.sfwmd.gov/conserve).

Other Programs

Agricultural Best Management Practices Program

The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts agricultural BMPs by rule for different types of agricultural operations. As of March 2022, there are 534,966 acres within the LWC Planning Area enrolled in the FDACS BMP program. All agricultural water users are encouraged to enroll in the FDACS BMP program and also to learn about the FDACS Agricultural-Environmental Leadership Award which recognizes environmentally innovative farming practices. Local governments and agencies should consider promoting these programs to agricultural operations.

Agricultural Mobile Irrigation Labs

The FDACS Mobile Irrigation Lab (MIL) program performs free evaluations of irrigation system efficiency on agricultural lands and makes recommendations for physical and operational improvements. Such recommendations may include modification of irrigation systems and equipment, alteration of irrigation scheduling, and other aspects of system management. Of the eight MILs operating in Florida, one (the Lower West Coast MIL) serves Charlotte, Collier, Glades, Hendry, and Lee counties.

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 throughout the state at 15-minute intervals. FAWN management tools provide decision support functions to growers using historical and real-time weather data and crop modeling technology to help with short- and long-term planning, thereby maximizing the efficiency of irrigation practices (UF/IFAS 2022). Currently, there are three FAWN stations (Palmdale, Clewiston, and Immokalee) supported by the SFWMD in the LWC Planning Area. Additional information for these stations is available at http://www.fawn.ifas.ufl.edu.

REGULATORY INITIATIVES

Regulations are useful tools to assist in the implementation of better practices and more efficient devices. The SFWMD requires that water conservation measures and programs be considered for users with water use permits. For a proposed use of water to be deemed reasonable-beneficial, water users requiring a permit must include a water conservation plan in the permit application. Section 2.3.2 of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022) includes specific water conservation requirements for various water use categories.

The SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.) was adopted to help protect South Florida's water resources by addressing landscape irrigation (the largest area of residential water use and greatest potential for viable water use reduction). In short, the rule limits landscape irrigation to 2 or 3 days per week, depending on location and local circumstances, and contains provisions for new landscaping and other situations that require a deviation from the rule requirements.

Adoption of local ordinances that comport with Chapter 40E-24, F.A.C. and associated outreach and education to residents, is crucial to reducing landscape irrigation water use. When local governments implement irrigation ordinances, it demonstrates a commitment to water resource protection through conservation.

To assist local governments in adopting such an ordinance, the SFWMD has created a model ordinance, a model code, and several customizable outreach materials designed to educate residents on their local irrigation ordinance. As of March 2022, 11 of 17 local governments within the LWC Planning Area had adopted a year-round irrigation ordinance. **Table 3-1** presents the list of governments in the LWC Planning Area and their ordinance adoption status. Additional information and example documents for local implementation are available on the SFWMD's webpage (https://www.sfwmd.gov/conserve).

Table 3-1. List of local governments in the LWC Planning Area and their irrigation ordinance adoption status.

Local Governments in the LWC Planning Area	Adopted Irrigation Ordinance	
	YES	NO
Bonita Springs, City of	×	
Cape Coral, City of	×	
Charlotte County*	×	
Clewiston, City of		×
Collier County	×	
Estero, Village of	×	
Everglades, City of	×	
Ft. Myers, City of	×	
Ft. Myers Beach, Town of		×
Glades County		×
Hendry County		×
LaBelle, City of		×
Lee County	×	
Marco Island, City of	×	
Moore Haven, City of		×
Naples, City of	×	
Sanibel, City of	×	

*Charlotte County follows the Southwest Florida Water Management District's irrigation restrictions.

POTENTIAL FOR WATER CONSERVATION SAVINGS

Potential conservation water savings for the LWC Planning Area were estimated for the following water use categories: Agriculture (AG), Public Supply (PS), Domestic Self-Supply (DSS), and Landscape/Recreational (L/R). For the Commercial/Industrial/Institutional (CII) and Power Generation (PG) water use categories, potential water savings were estimated only for potable indoor water use, which was assumed to be provided by a PS utility. Therefore, those potential savings are accounted for under PS. The methods used to estimate the savings for each category are discussed in each subsection.

Agriculture

AG is the largest water use category in the LWC Planning Area, accounting for 62% (592 mgd) of the total demand in 2020 and is expected to rise to 621 mgd in 2045. In addition, irrigated AG acreage is projected to increase approximately 5% (from 291,765 acres in 2020 to 307,062 acres in 2045), suggesting that AG will continue to be the largest water use sector.

As discussed in **Chapter 2** and **Appendix A**, the annual Florida Statewide Agricultural Irrigation Demand (FSAID) report published by FDACS includes 20-year estimates and projections of agricultural acreage and water demands. Estimated efficiency improvement (i.e., conservation estimate) is one of the parameters calculated by the FSAID model, and the spatially based data that contribute to the water demand estimates and projections are available by water management district planning area. The potential AG conservation savings within the LWC Planning Area were determined using the FSAID geodatabase (https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Water-Supply-Planning). The methodology for calculating the potential AG conservation savings is more fully described in Appendix E of the FSAID VIII report (FDACS 2021), but generally is based on estimated historical use determined from the United States Department of Agriculture's Farm and Ranch Irrigation Surveys and actual water savings data from MILs. The projected conservation savings are based primarily on irrigation system changes, changes in scheduling, and sensor-based automation.

The total savings calculated by the FSAID model for any given year depends on the crops produced, the acreage of each crop, and the irrigation systems employed, as projected to exist in that year. Because these variables change over the planning horizon (2020 to 2045), projected savings also change and may be nonlinear. The estimated conservation potential for the AG water use category in the LWC Planning Area in 2045 is 15.64 mgd.

Landscape/Recreational

The L/R use category is the second largest and includes irrigation of landscaped areas such as parks, athletic fields, roadway medians, commercial spaces, large private residential properties, and golf courses. Because their demands are estimated in different ways, golf course potential water savings are discussed separately from other permitted landscape irrigation.

There are approximately 3,717 active landscape irrigation water use permits in the LWC Planning Area. Landscape irrigation is projected to use a total of 289 mgd in 2045. To estimate the potential water conservation savings for landscaped areas, a variety of irrigation efficiency measures were applied to 30% of the permits over the planning horizon, yielding a 7% savings. Assuming an average per permit use for each county, the estimated conservation potential for landscape irrigation in 2045 is 8.31 mgd.

Golf Courses

There are 128 active water use permits in the LWC Planning Area (58 in Collier County, 69 in Lee County, and 1 in Glades County) for golf course irrigation. Indoor potable water use at golf courses is assumed to be provided by a PS utility. There are no active golf course permits in the portions of Charlotte and Hendry counties within the LWC Planning Area boundary.

Irrigation demands for golf courses in the LWC Planning Area are projected to decrease by 13% as acreage devoted to golf courses is projected to go from 13,367 acres in 2020 to 13,170 acres in 2045. Most golf courses are irrigated with a high degree of efficiency. According to a 2019 statewide survey of Florida Golf Course Superintendents Association members, 55% of golf courses use advanced irrigation controllers (Irwin and Wanvestraut 2020). A conservation program would therefore aim to affect the golf courses not yet using advanced irrigation controllers.

To estimate the potential water conservation savings for golf courses, a variety of irrigation efficiency measures were applied to 30% of the 128 permitted golf courses over the planning horizon, yielding a 10% savings. Assuming an average per permit use for each county, the estimated conservation potential for golf courses in 2045 is 4.40 mgd and combined with the potential savings for landscape irrigation (8.31 mgd) is a total savings of 12.71 mgd for the L/R use category.

Public Supply and Domestic Self-Supply

PS is the third largest water use category in the LWC Planning Area and is projected to increase through the planning horizon. PS accounted for an estimated 121 mgd of finished water demand in 2020 and 163 mgd in 2045 projected demands (**Chapter 2**). DSS is estimated to have demands of 24 mgd in 2020 and projected to have 32 mgd in 2045. Historical conservation efforts in PS are reflected in the per capita use rate, which has declined approximately 30% between 2000 and 2020. This decline likely is the result of new construction using higher-efficiency fixtures and/or designed for more efficient water use, the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.), conservation rate structures, public education, and other conservation factors. Local and tribal governments are encouraged to conduct educational outreach to promote and incentivize water conservation among DSS users.

Estimates of active and passive water conservation potential for each county in the LWC Planning Area were made for residential and nonresidential users (in both PS service areas and DSS areas) using the Alliance for Water Efficiency Conservation Tracking Tool (AWE Tool), Version 4.0 (AWE 2021). The AWE Tool calculates active water savings for user-selected conservation measures based on the number of measures implemented annually over the planning horizon, and the per unit savings and service lives of each measure. Passive savings are generated by the AWE Tool based on natural replacement of toilets, showerheads, and water-using appliances at the end of their service lives, whose current or future minimum efficiency is dictated by national, state, or local code requirements. Baseline data include Florida Department of Revenue parcel information, University of Florida Bureau of Economic and Business Research household data and population projections, and Florida Department of Environmental Protection finished water monthly operating reports (as used in this plan update for demand projections; **Appendix A**). Conservation potential for DSS was analyzed with PS users and extracted in proportion to its percentage of the total population in each county.

For this 2022 LWC Plan Update, seven frequently implemented measures were selected and quantified to generate the potential water savings for PS and DSS. Conservation measures included in the estimates for residential users supplied by PS utilities and DSS users were limited to the following measures: high-efficiency toilets, showerheads, clothes washers, irrigation audits, landscape evaluations, advanced irrigation controllers, and water use audits. For many types of permit holders, including CII and PG, indoor potable water use often is provided by a PS utility. Conservation measures for nonresidential users served by PS utilities included high-efficiency toilets and urinals.

For all measures, the conservation (demand reduction) estimate assumes a participation rate of 30% of the total annual potential implementations for each applicable measure. This assumption means 30% of all possible implementations would be accomplished over the planning horizon (2020 to 2045), which is thought to be an achievable participation rate for most conservation measures. The combined estimated conservation potential by PS and DSS (active and passive savings) in the LWC Planning Area in 2045 is 16.46 mgd.

Commercial/Industrial/Institutional

For CII permit holders, indoor potable water use is assumed to be provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis by the measures targeting nonresidential users (i.e., high-efficiency restroom fixtures and HVAC efficiency improvement measures). CII permitted water use was not analyzed for conservation potential as those uses were assumed to be process-specific and, therefore, difficult to estimate within the scope of a regional analysis.

Power Generation

PG facilities use large quantities of water for cooling, but most of the water is returned to the source from which it was obtained. As a result, there are minimal efficiency gains to be had from the cooling process. Potential savings for PG were not estimated as part of this analysis. As with the CII use category, indoor potable water use at PG facilities is assumed to be provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis in the AWE Tool by the measures specifically targeting nonresidential users (i.e., high-efficiency restroom fixtures and HVAC efficiency measures).

CONCLUSIONS

Table 3-2 summarizes potential water savings for the LWC Planning Area in all use categories using common water conservation measures. Greater conservation savings may be possible if additional measures are implemented or if increased participation rates are realized. Participation rates can be influenced by ineffective marketing and high implementation costs. The estimates presented in this report are conservative and not intended to represent the full conservation potential utilizing all measures available. Studies have found adoption of demand-side water conservation is highly variable (Rasoulkhani et al. 2018). A comprehensive list of conservation measures and applicable water use categories can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021).

Table 3-2. Potential water saved (in mgd) in the LWC Planning Area based on demand reduction estimates achievable by 2045.

Use Category	County					2045 Total by Sector
	Charlotte[a]	Collier	Glades	Hendry	Lee	
Agriculture	1.35	5.51	2.02	4.72	2.04	15.64
Landscape/Recreational[b]	0.17	5.25	0.02	0.06	7.21	12.71
Public Supply[c]	0.05	3.62	0.10	0.27	8.37	12.39
Domestic Self-Supply[c]	0.07	2.45	0.08	0.11	1.34	4.07
LWC Planning Area Total	**1.70**	**14.80**	**2.21**	**5.17**	**19.63**	**44.81**

mgd = million gallons per day; LWC = Lower West Coast.

a Values listed are only for the area within the LWC Planning Area boundary. There is only one public supply utility located in the portion of Charlotte County within the LWC Planning Area.

b Includes golf and landscape/recreational savings.

c Includes passive savings.

Regional and local agencies should conduct thorough analyses of their service areas, allocate adequate funding to assist individual users to make the necessary investments in conservation, and reduce the need for more costly projects in the future. Cities and utilities should consider the use of conservation planning tools. A robust public outreach and education component is critical to the success of all conservation programs. Finally, District staff are available to assist conservation program developers with technical support, collaborative program implementation, ordinance review, and long-term demand management planning.

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4

Water Resource Protection

This chapter provides an overview and update of protections afforded to water resources within the Lower West Coast (LWC) Planning Area through statutory and regulatory criteria. The ability to meet the water demands described in **Chapter 2** largely depends on the future availability of water resources. Understanding the relationship among projected water demands, water sources, and limitations imposed on withdrawals is critical to water supply planning.

TOPICS

- Water Resource Protection Standards
- Regulatory Protection of Water Resources
- Summary of Water Resource Protection

Past analyses indicated groundwater from the surficial and intermediate aquifers as well as surface water from Lake Okeechobee and canals were insufficient to meet the growing needs of the LWC Planning Area during 1-in-10-year drought conditions. Potential impacts on wetlands, the possibility of exacerbating saltwater intrusion, and other factors limit the use of these water bodies as water sources. In 2003, the South Florida Water Management District (SFWMD or District) adopted maximum developable limit criteria for surficial and intermediate aquifers within the LWC Planning Area. Additionally, restricted allocation area (RAA) rules were adopted for the Lower East Coast Everglades Waterbodies in 2007 and for the Lake Okeechobee Basin (Lake Okeechobee and Lake Okeechobee Service Area) in 2008 to address lower lake management levels and storage under the United States Army Corps of Engineers' (USACE's) Lake Okeechobee Regulation Schedule (LORS2008).

NOTE

MFLs and recovery strategies for Lake Okeechobee and the Everglades affect portions of the LWC Planning Area but are included in the Lower East Coast water supply plan updates.

To further protect water resources in the LWC Planning Area, minimum flows and minimum water levels (MFLs) were adopted in 2001 for the Caloosahatchee River, LWC Aquifers, Lake Okeechobee, and the Everglades (**Figure 4-1**). In addition, water reservations for the protection of fish and wildlife were adopted for Picayune Strand and Fakahatchee Estuary in 2009 and the Caloosahatchee River (C-43) West Basin Storage Reservoir in 2014.

This chapter discusses water use permitting criteria as well as MFLs, water reservations, and RAAs adopted in the LWC Planning Area. Further information about permitting and other resource protections, including those related to Comprehensive Everglades Restoration Plan (CERP) projects, is provided in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021). Water resource development projects that provide additional water, including projects supporting MFLs, water reservations, and RAAs, are discussed in **Chapter 7**.

Figure 4-1. Adopted minimum flows and minimum water levels, water reservations, and restricted allocation areas in the LWC Planning Area.

WATER RESOURCE PROTECTION STANDARDS

The intent of Chapter 373, Florida Statutes (F.S.), is to promote the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems pursuant to Section 373.016(3)(d), F.S. The SFWMD developed water resource protection standards, consistent with legislative direction, that are implemented to prevent various levels of harm (no harm, harm, significant harm, and serious harm). Each standard plays a role in achieving sustainable water resources. For instance, programs regulating surface water management and water use permitting must prevent harm to water resources, including related natural systems. **Figure 4-2** represents the conceptual relationship among water resource protection tools and standards, observed impacts, and water shortage severity. A more detailed discussion of resource protection tools, including water use permitting and water shortage rules, and definitions of the protection standards can be found in the 2021-2024 Support Document (SFWMD 2021).

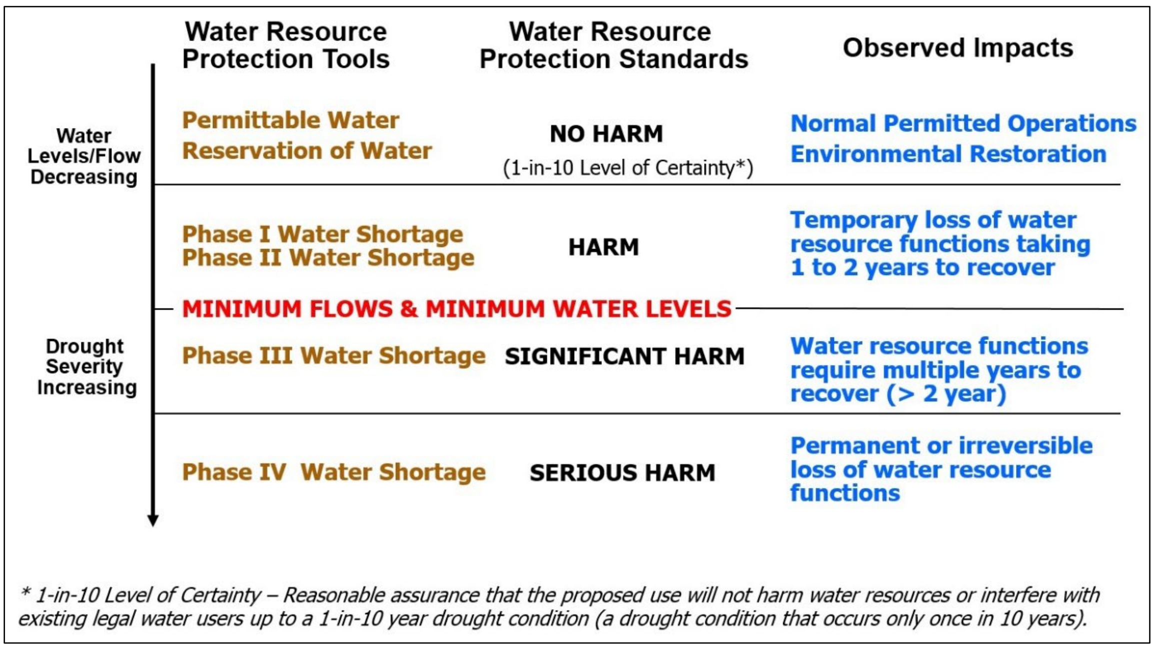

Figure 4-2. Conceptual relationship among water resource protection standards at various levels of water resource harm (Modified from Rule 40E-8.421, F.A.C.).

REGULATORY PROTECTION OF WATER RESOURCES

Water Use Permitting

INFO ⓘ

The Seminole Tribe of Florida has surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD (Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.).

Unless exempt by statute or identified in the Water Rights Compact of 1987, the right to use water is authorized by permit, which allows for the use of water for reasonable-beneficial uses while protecting natural systems from harm. Water use permit applicants must provide reasonable assurances that the proposed water use 1) is reasonable-beneficial, 2) will not interfere with any existing legal use of water, and 3) is consistent with the public interest as required by Section 373.223(1), F.S. The proposed water use must comply with the water resource protection criteria (see Rule 40E-2.301, Florida Administrative Code [F.A.C.], and the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* [Applicant's Handbook; SFWMD 2022]), including 1) implementation criteria for regulatory components of an adopted MFL recovery or prevention strategy, 2) implementation criteria for water reservations, and 3) RAA criteria. Additional information about water use permitting can be found in the 2021-2024 Support Document (SFWMD 2021).

Minimum Flows and Minimum Water Levels

MFL criteria are minimum flows or minimum water levels at which water resources, or the ecology of the area, would experience significant harm from further withdrawals. MFL criteria are applied individually to affected water bodies and define the minimum flow or minimum water level for surface water bodies, or minimum water level for groundwater in aquifers. Adopted MFLs in the SFWMD are contained in Chapter 40E-8, F.A.C. The SFWMD adopts a recovery or prevention strategy when an MFL is initially adopted (Rule 40E-8.421, F.A.C.) and, if needed, when an MFL is reevaluated or revised. The SFWMD fulfills its statutory obligation to identify key water bodies for which MFLs should be developed or reevaluated by providing a Priority Water Body List and Schedule in Chapter 3 of the annual updates to the *South Florida Environmental Report – Volume II* per Section 373.042(3), F.S. Detailed information about MFLs, including descriptions of recovery and prevention strategies, is provided in the 2021-2024 Support Document (SFWMD 2021). Additional information about MFLs can be found on the SFWMD webpage (http://www.sfwmd.gov/mfls) and in Chapter 40E-8, F.A.C.

Within the LWC Planning Area, MFLs have been adopted for the Caloosahatchee River and LWC Aquifers (**Figure 4-1**). Brief summaries of the MFLs are provided here; additional information, including recovery and prevention strategies, can be found in **Appendix C**. The Lake Okeechobee and Everglades MFLs and their associated recovery strategies affect portions of the LWC Planning Area but are included in the Lower East Coast water supply plan updates.

Caloosahatchee River

The SFWMD adopted an MFL for the Caloosahatchee River in 2001 in accordance with Subsection 40E-8.221(2), F.A.C. A recovery strategy was adopted simultaneously with MFL adoption. The original MFL criterion for the Caloosahatchee River was a minimum mean monthly flow of 300 cubic feet per second (cfs) at the S-79 structure, which, at the time of MFL adoption, was determined necessary to maintain a balanced and healthy salinity regime in order to prevent an MFL exceedance (when the MFL is not met) and sustain submerged aquatic vegetation in the Caloosahatchee River Estuary. The MFL was reevaluated between 2013 and 2019. The result of that reevaluation was a change in the criterion in 2019 to a 30-day moving average flow of 457 cfs at the S-79 structure. Additional details about the MFL, the reevaluation, and the revised recovery strategy are provided in **Appendix C**.

Caloosahatchee River

Lower West Coast Aquifers

The LWC Aquifers MFL includes the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers. In 2001, the SFWMD adopted an MFL specifying the minimum water levels for the LWC Aquifers must equal the elevation of the structural top of the aquifers (Rule 40E-8.331, F.A.C.). A prevention strategy was adopted simultaneously with MFL adoption. Additional information about the MFL and a description of the prevention strategy are provided in **Appendix C**.

Water Reservations

Water reservations in the SFWMD are adopted by rule in Chapter 40E-10, F.A.C. A water reservation sets aside a volume of water for the protection of fish and wildlife or public health and safety (Section 373.223, F.S.). Reserved volumes of water are unavailable for allocation to consumptive uses. However, any unreserved volumes of water may be certified by the District's Governing Board as available and allocated to consumptive uses. Water reservations do not 1) prevent the use of unreserved water or water allocated in consumptive use permits, 2) establish operating regimes, 3) drought-proof natural systems, 4) ensure wildlife proliferation, or 5) improve water quality.

Water reservations are developed based on existing water availability or in consideration of future water supplies made available by water resource development projects (**Chapter 7**). Regional water supply plans must list water resource development projects that support water supply development for existing and future uses and natural systems, including those in adopted water reservations (Section 373.709, F.S.). Additionally, water use permit applicants must provide reasonable assurance that their proposed use of water will not withdraw water that is reserved for the protection of fish and wildlife or public health and safety.

Water reservations may be used to protect water for CERP projects prior to their construction, as required by the Water Resources Development Act of 2000 and Section 373.470(3)(c), F.S. Additionally, a water reservation may be a component of an MFL recovery or prevention strategy. Further information about water reservations, including their role in CERP implementation, is provided in the 2021-2024 Support Document (SFWMD 2021).

Water reservations have been adopted in the LWC Planning Area for the Caloosahatchee River (C-43) West Basin Storage Reservoir (2014), Picayune Strand (2009), and Fakahatchee Estuary (2009) (**Figure 4-1**). Information about all water reservations adopted throughout the District can be found on the SFWMD webpage (http://www.sfwmd.gov/reservations) and in Chapter 40E-10, F.A.C.

Caloosahatchee River (C-43) West Basin Storage Reservoir

CERP identifies restoration of the Caloosahatchee River Estuary as an integral step in achieving systemwide benefits in the South Florida ecosystem. Promoting a balanced and healthy salinity regime in the Caloosahatchee River Estuary is essential for maintaining the ecological integrity and associated economic benefits of this unique habitat on Florida's southwest coast.

In 2014, the SFWMD adopted a water reservation rule pursuant to Subsection 40E-10.041(3), F.A.C., for the Caloosahatchee River (C-43) West Basin Storage Reservoir, a CERP project being constructed through an SFWMD/USACE cost-share agreement to support the USACE's efforts to restore the Caloosahatchee River Estuary. The reservoir and water reservation rule serve as key components of the recovery strategy for the Caloosahatchee River MFL. It is a prospective reservation, meaning the water will be protected when the reservoir is built and operational. The water reservation reserves from consumptive use all water contained within and released from the reservoir, which will cover 10,700 acres and provide 170,000 acre-feet of water storage when completed (for further details, including a site map, see **Chapter 7**). Capture, storage, and release of surface water runoff and a portion of Lake Okeechobee regulatory releases will reduce the freshwater flows to the Caloosahatchee River Estuary during wet periods and help maintain a desirable minimum flow of fresh water to the estuary during dry periods. Moderating flows in this manner is anticipated to achieve a more balanced salinity regime in the Caloosahatchee River Estuary. Site preparation for the reservoir and construction began in 2015. Construction is expected to be completed in 2024, followed by 2 years of operational testing and monitoring.

Picayune Strand

Picayune Strand is located in the southwestern corner of Florida between Alligator Alley (Interstate 75) and Tamiami Trail (U.S. 41), and north of Fakahatchee Estuary in the Ten Thousand Islands and the Everglades (**Figure 4-3**). Picayune Strand occupies a 55,000-acre area that was disturbed by partial development in the 1960s, including construction of canals, levees, and roads, that altered the natural hydrology of the site.

The CERP Picayune Strand Restoration Project was developed to restore and protect native wetlands and uplands in Picayune Strand (**Figure 4-4**). Substantial progress has been made towards restoring the site's hydrology, and project construction is anticipated to be completed in 2025 (**Chapter 7**). The project will also improve freshwater flows to the southern coastal wetlands of the Ten Thousand Islands region collectively known as

Fakahatchee Estuary. When complete, the project will support a more natural fire regime, increase aquifer recharge, provide manatee refugia, and maintain existing levels of flood protection.

The Picayune Strand water reservation was adopted in 2009 to support the Picayune Strand Restoration Project and to protect fish and wildlife per Subsection 40E-10.041(1), F.A.C. The water reservation includes all surface water contained within Picayune Strand; all surface water flowing into Picayune Strand simulated at weirs Miller2 (Miller Canal), FU3 (Faka Union Canal), and Lucky LA (Merritt Canal) (**Figure 4-5**); and all groundwater in the water table and unconfined portions of the Lower Tamiami aquifer underlying Picayune Strand.

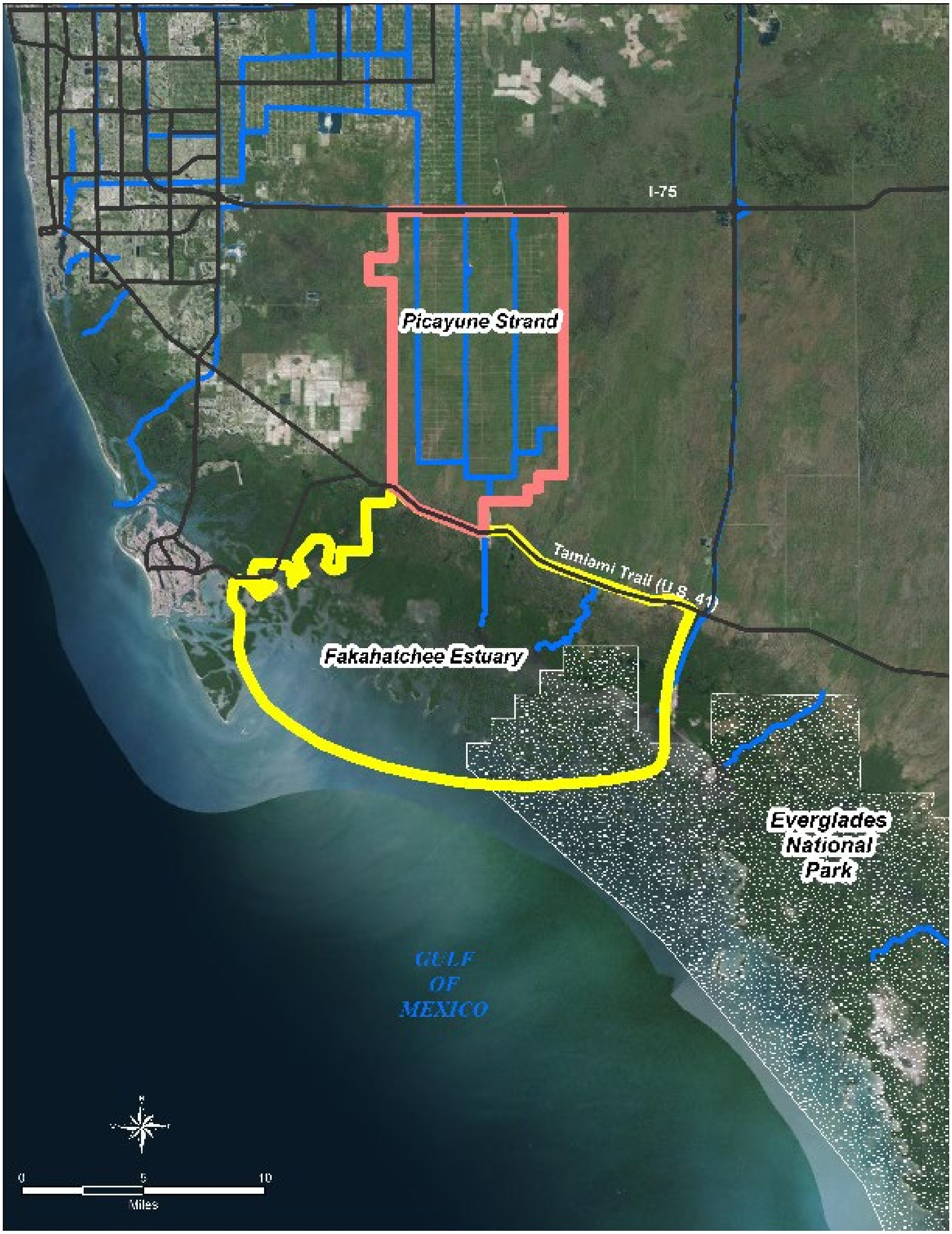

Figure 4-3. Location of Picayune Strand and Fakahatchee Estuary water reservations.

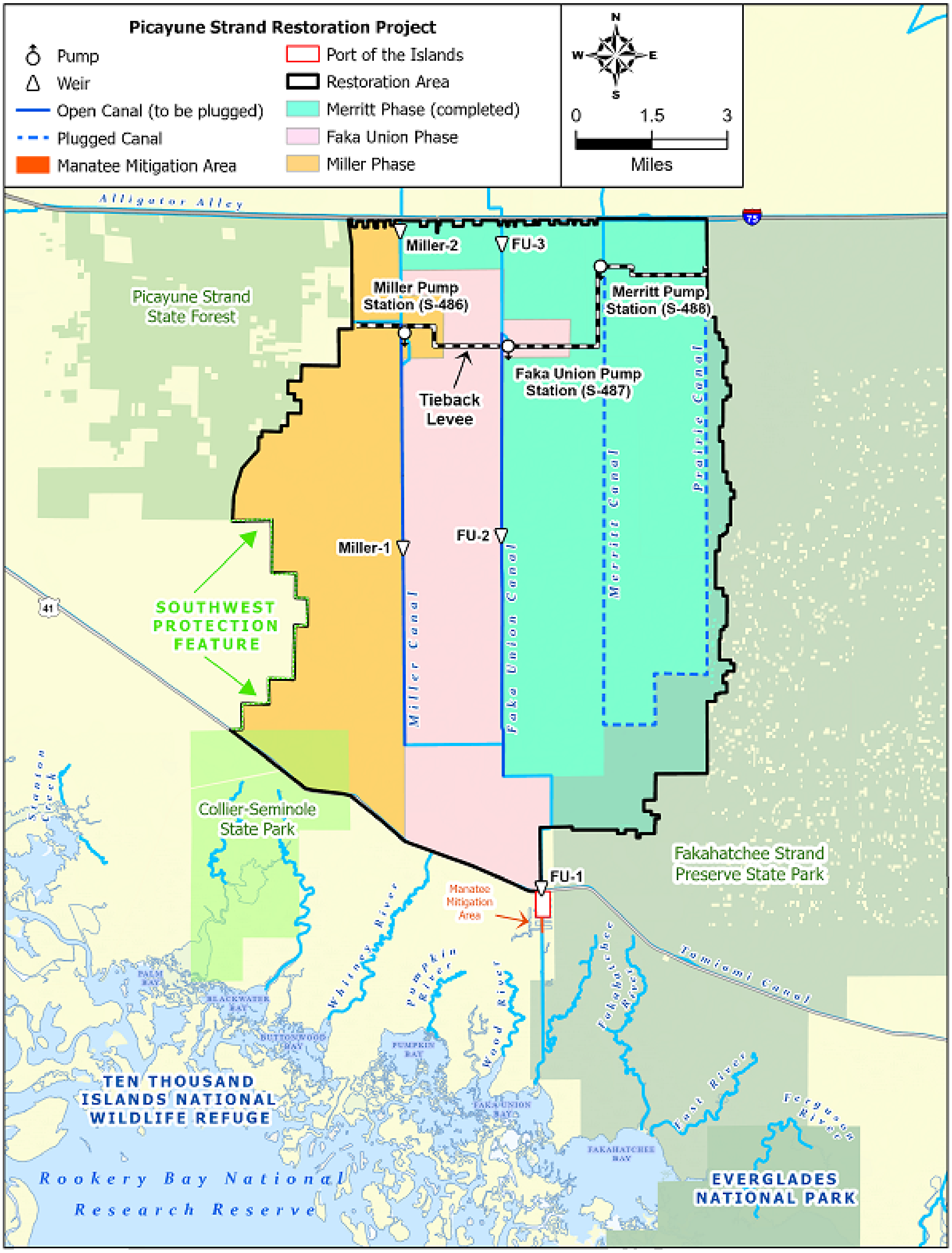

Figure 4-4. Comprehensive Everglades Restoration Plan (CERP) Picayune Strand Restoration Project site (From USACE 2021).

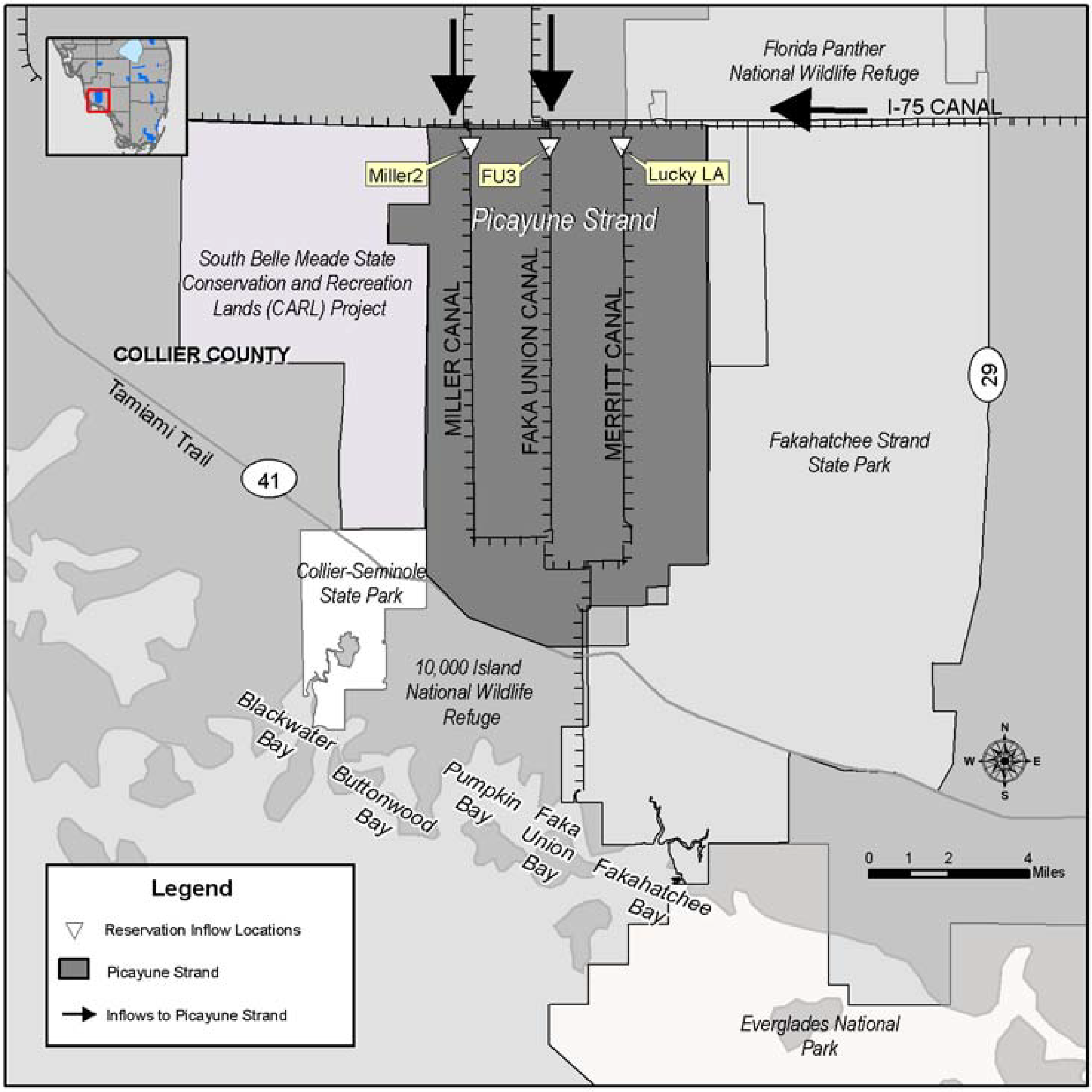

Figure 4-5. Historical water inflow locations into Picayune Strand from Miller, Faka Union, and Merritt canals.

Fakahatchee Estuary

Subsection 40E-10.021(1), F.A.C., defines Fakahatchee Estuary as the area within the Ten Thousand Islands region including the river/bay systems known as Blackwater River/Blackwater Bay, Whitney River/Buttonwood Bay, Pumpkin River/Pumpkin Bay, Wood River, Little Wood River, Faka Union Canal/Faka Union Bay, and Fakahatchee Bay (**Figure 4-5**). Covering almost 100,000 acres, Fakahatchee Estuary is part of the largest expanse of mangrove forest in North America and is home to a rich diversity of native wildlife, including several endangered species (United States Fish and Wildlife Service 2017).

In 2009, a water reservation for Fakahatchee Estuary was adopted pursuant to Subsection 40E-10.041(2), F.A.C., simultaneously with adoption of the Picayune Strand water reservation. The reservation protects water made available to the Fakahatchee Estuary through the Picayune Strand Restoration Project, which has a main objective to improve flows to the southern coastal estuaries. The Fakahatchee Estuary water reservation rule identifies and reserves from consumptive use the water needed to protect fish and wildlife in the estuary. The water reserved for Fakahatchee Estuary includes all surface water flowing into Fakahatchee Estuary simulated at weir FU1 (Faka Union Canal) and transects Miller@41, FU@41, Merrit@41, and Fakahatchee@41 (**Figure 4-6**) as well as all groundwater in the water table and unconfined portions of the Lower Tamiami aquifer underlying Fakahatchee Estuary.

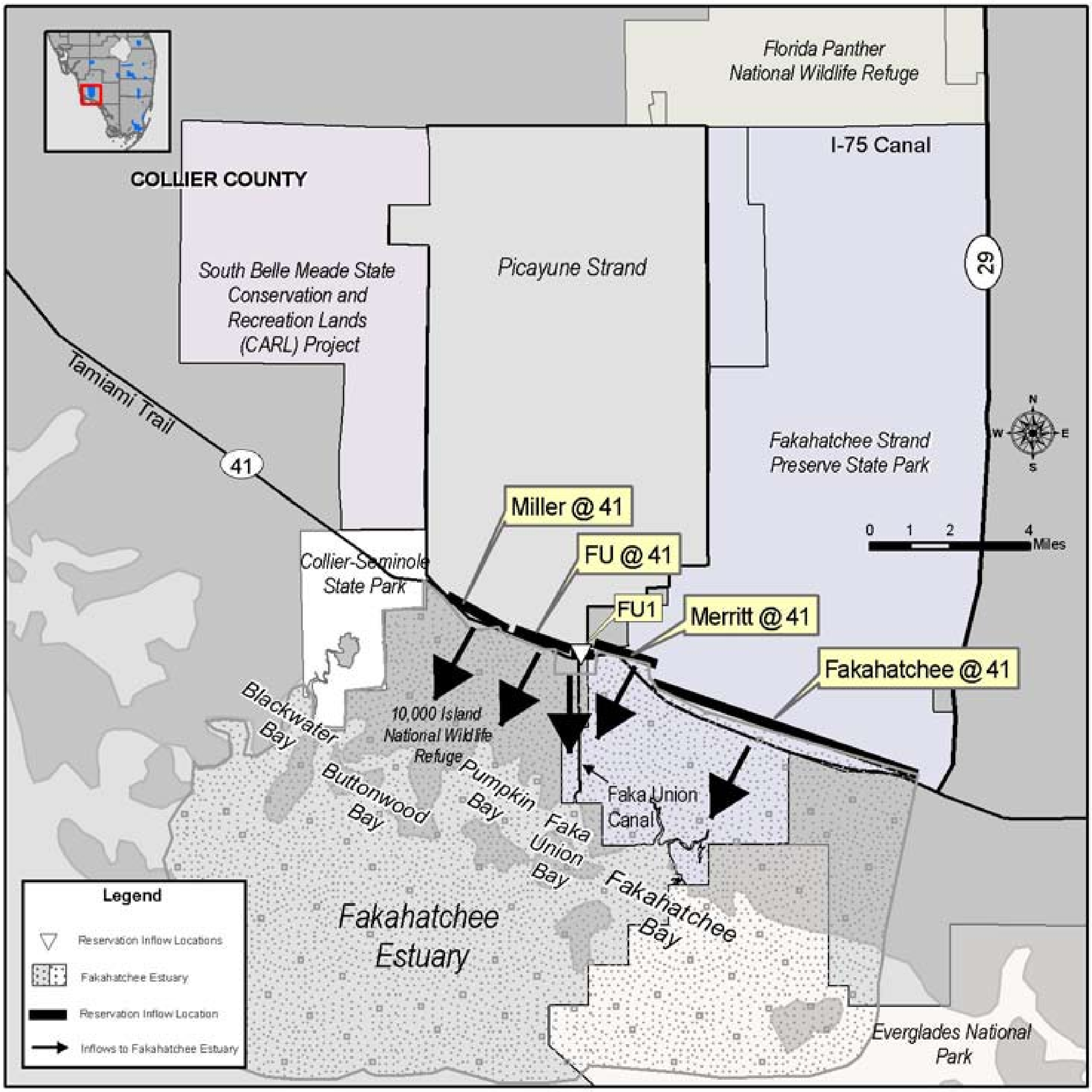

Figure 4-6. Historical inflow locations into Fakahatchee Estuary from Picayune Strand.

Restricted Allocation Areas

RAAs are defined geographic areas where use of specific water supply sources (e.g., lakes, wetlands, canals, aquifers) is restricted due to concerns regarding water availability. RAA criteria are listed in Section 3.2.1 of the Applicant's Handbook (SFWMD 2022), which is incorporated by reference in Rule 40E-2.091, F.A.C. Water allocations beyond the criteria listed in the Applicant's Handbook are restricted or prohibited. RAAs are adopted for a variety of reasons, including 1) where there is insufficient water to meet the projected needs of a region, 2) to protect water for natural systems and future restoration projects (e.g., CERP), or 3) as part of MFL recovery or prevention strategies.

Two RAAs extend into the LWC Planning Area (**Figure 4-1**): 1) Lower East Coast Everglades Waterbodies (Section 3.2.1.E of the Applicant's Handbook [SFWMD 2022]), adopted in 2007; and 2) Lake Okeechobee and Lake Okeechobee Service Area (Section 3.2.1.F of the Applicant's Handbook [SFWMD 2022]), adopted in 2008. The Lower East Coast Everglades Waterbodies RAA was adopted as part of the Everglades MFL recovery strategy, and the Lake Okeechobee and Lake Okeechobee Service Area RAA was adopted as part of the Lake Okeechobee MFL recovery strategy. These RAAs are discussed with their associated MFLs in the Lower East Coast water supply plan updates.

SUMMARY OF WATER RESOURCE PROTECTION

- The LWC Planning Area has the following resource protections in place:
  - Water use permitting criteria
  - MFLs for the Caloosahatchee River and LWC aquifers
  - Water reservations for the Caloosahatchee River (C-43) West Basin Storage Reservoir, Picayune Strand, and Fakahatchee Estuary
  - RAAs for the Lower East Coast Everglades Waterbodies and Lake Okeechobee and Lake Okeechobee Service Area
- MFL, water reservation, and RAA criteria continue to be implemented in the LWC Planning Area and have not been modified since the 2017 LWC Plan Update, except for the MFL and associated recovery strategy for the Caloosahatchee River, as discussed in **Appendix C**.
- Water shortage and water use permitting rules and criteria have not changed for the LWC Planning Area since the 2017 LWC Plan Update. Further information on water shortage management and water use permitting is available in the 2021-2024 Support Document (SFWMD 2021).

NAVIGATE

Detailed information about MFLs is available on the SFWMD webpage http://www.sfwmd.gov/mfls.

Detailed information about water reservations is available on the SFWMD webpage http://www.sfwmd.gov/reservations.

Detailed information about RAAs is available in the Applicant's Handbook (SFWMD 2022), which can be accessed through the SFWMD webpage http://www.sfwmd.gov/raas.

MFL, water reservation, and RAA status updates are provided annually in Chapter 3 of the *South Florida Environmental Report – Volume II*, available at http://www.sfwmd.gov/sfer.

Further information can be found in the 2021-2024 Support Document (SFWMD 2021) and **Appendix C**.

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5

Water Source Options

This chapter presents water source options that could be available through 2045 to accommodate urban and agricultural demands in the Lower West Coast (LWC) Planning Area while still meeting the needs of the natural system. Descriptions of the sources, current and projected uses, and factors that affect availability for water supply purposes are provided. **Chapter 6** presents the South Florida Water Management District's (SFWMD or District) analyses of the surface water and groundwater conditions in the region. Information about water treatment technologies and their related costs is provided in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021).

In the LWC Planning Area, fresh groundwater from the surficial aquifer system (SAS) and freshwater portions of the intermediate aquifer system (IAS) as well as surface water from canals and lakes are considered traditional water sources. Alternative water supply (AWS) or nontraditional water source options include brackish groundwater from the Floridan aquifer system (FAS) and brackish portions of the IAS, reclaimed water, water stored in aquifer storage and recovery (ASR) wells or in aboveground reservoirs, and seawater.

To meet water supply needs, water users primarily rely on fresh groundwater and surface water (**Figures 5-1** and **5-2**). However, withdrawals from these sources have approached sustainable limits because of aquifer productivity, environmental concerns, resource protection criteria, and regulatory limitations (**Chapter 4**). As a result, over the last two decades, brackish groundwater from the FAS and reclaimed water have become vital to urbanized areas to meet increased demands. Use of such AWS sources is an integral part of current and future water supply strategies in the LWC Planning Area. Most of the increased Public Supply (PS) demands will be met with proposed AWS projects using brackish groundwater. New surface water withdrawals are limited by restricted allocation area (RAA), minimum flow and minimum water level (MFL), and water reservation criteria. Groundwater withdrawals from the Water Table aquifer, Lower Tamiami aquifer, Sandstone aquifer, and Mid-Hawthorn aquifer are limited by resource constraints and MFL criteria (**Chapter 4**).

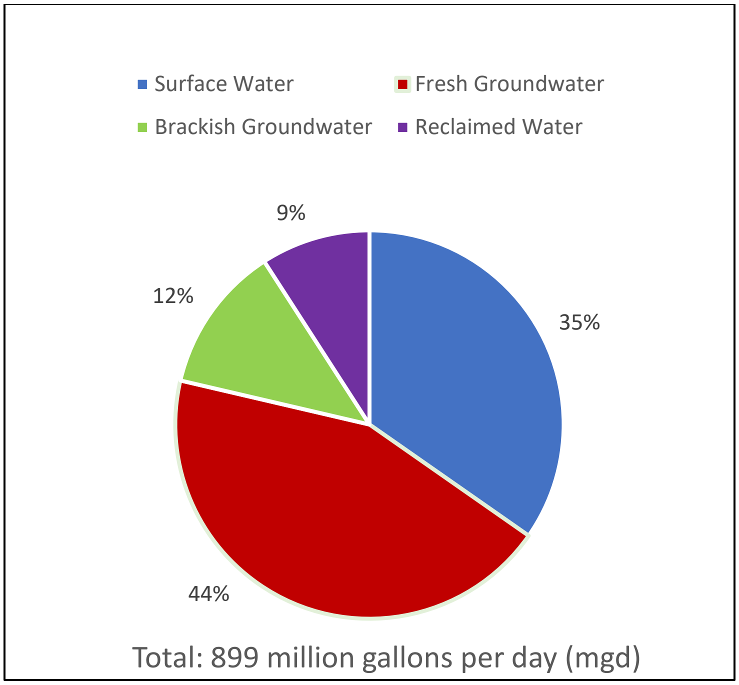

Figure 5-1. Water use percentage of the estimated total use of 899 mgd in the LWC Planning Area in 2020 by source (Data from SFWMD 2022).

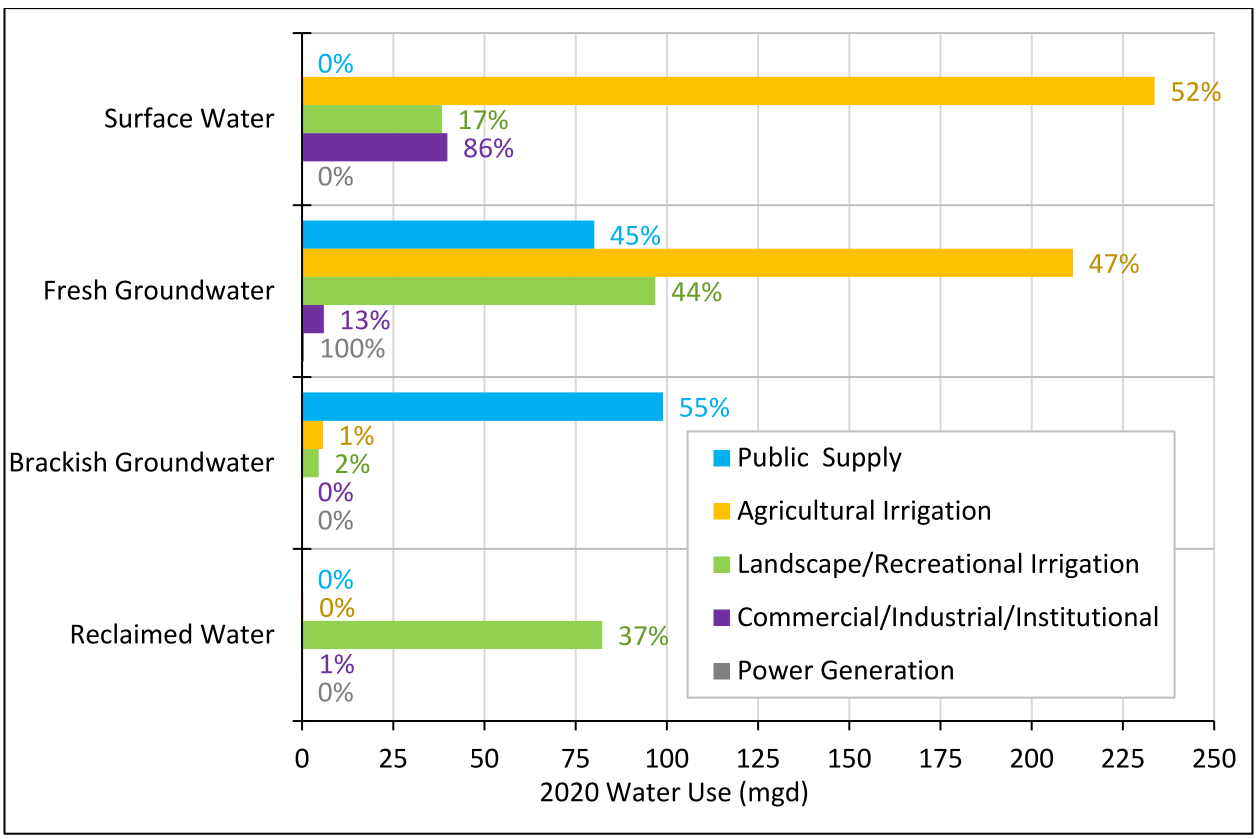

Figure 5-2. Estimated water use in the LWC Planning Area in 2020 by source and use type (Data from SFWMD 2022). (Notes: Fresh groundwater supplies 100% of Domestic Self-Supply demand. Percentages may not equal 100% due to rounding.)

SURFACE WATER

Surface water sources, primarily used for urban and agricultural irrigation, include rivers, canals, lakes, and reservoirs. Although the LWC Planning Area has multiple surface water sources, most are limited by regulatory protections (**Chapter 4**). A primary surface water source is Lake Okeechobee via the C-43 Canal and its connected canals as well as diversion and impoundment systems. The Cape Coral and Big Cypress Basin canal systems also provide surface water supply, and to a lesser extent, local irrigation needs are met using stormwater ponds.

Caloosahatchee River (C-43 Canal)/ Lake Okeechobee

The C-43 Canal was constructed as a navigable waterway and flood control outlet for Lake Okeechobee by straightening and deepening the freshwater portion of the Caloosahatchee River beginning in 1880. The C-43 Canal receives inflow from outside the basin via Lake Okeechobee, which is operated and maintained by the United States Army Corps of Engineers. Water is discharged from Lake Okeechobee to the C-43 Canal through the S-77 water control structure and then into the Caloosahatchee River Estuary downstream of the S-79 structure. The Caloosahatchee River Estuary covers approximately 26 miles west towards Shell Point. The C-43 Canal and Caloosahatchee River Estuary also receive surface water runoff from four subwatersheds (S-4, East Caloosahatchee, West Caloosahatchee, and Tidal Caloosahatchee) and a small amount of base groundwater flow from the SAS, in addition to the controlled discharges from Lake Okeechobee. The watershed includes creeks, wetland tributaries, canals, and drainage ditches that provide limited storage and allow conveyance of surface water. AG is the predominant user of surface water from the C-43 Canal and Lake Okeechobee, typically via connected canals and diversion and impoundment systems.

Water availability from Lake Okeechobee and its hydraulically connected water bodies is limited due to implementation of the 2008 Lake Okeechobee Regulation Schedule as well as SFWMD water use permit criteria. Concerns about the integrity of the Herbert Hoover Dike, which surrounds Lake Okeechobee, have resulted in a lowered lake regulation schedule that has reduced the level of certainty of permitted users within the Lake Okeechobee Service Area. Currently, all works associated with the Herbert Hoover Dike rehabilitation project are expected to be completed in 2022 along with a revised lake schedule and Lake Okeechobee System Operating Manual, expected to be completed by 2023.

Local Surface Water Sources

There are several water control districts, established under Chapter 298, Florida Statutes (F.S.), that are operated for flood control and water supply in the LWC Planning Area (**Figure 5-3**). Stormwater from the interconnected lakes and canals can be held within the water control district canal systems for irrigation. Some water control districts divert water from the C-43 Canal and Lake Okeechobee to maintain specific water levels within their boundaries. Water diversions into local canal networks are used primarily for AG irrigation purposes and, to a lesser extent, Landscape/Recreational (L/R) irrigation.

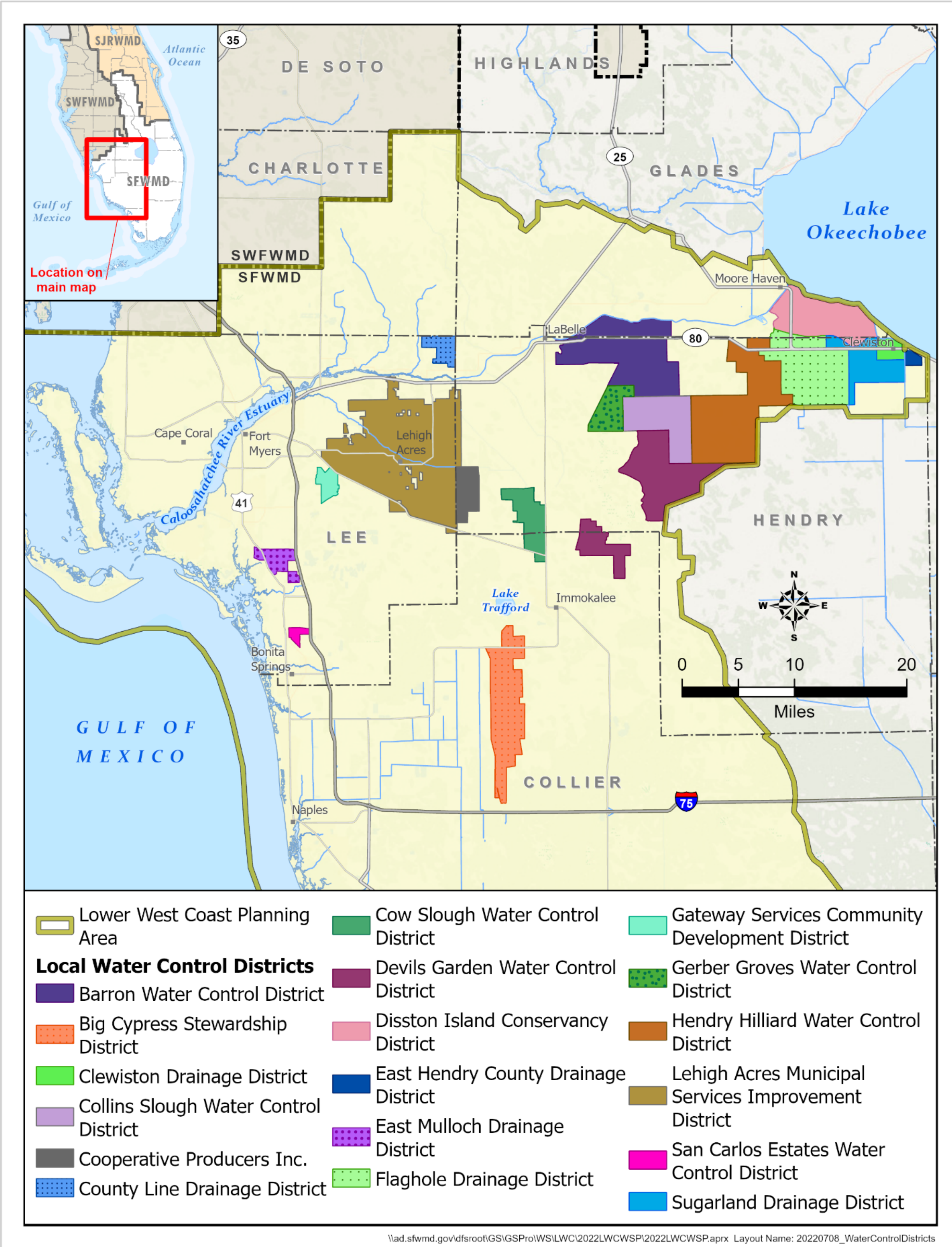

Figure 5-3. Water control districts in the LWC Planning Area.

Existing and Future Use of Surface Water

AG is the largest user of surface water in the LWC Planning Area. In 2020, approximately 52% of AG demands were met with surface water (**Figure 5-2**), and this percentage is expected to remain the same through 2045. However, irrigated agricultural acreage and associated demands are projected to increase approximately 5% from 2020 to 2045 (**Chapter 2**).

Approximately 17% of L/R demands in the LWC Planning Area, including golf courses, were met with surface water in 2020 (**Figure 5-2**). Withdrawals for L/R irrigation are primarily from on-site ponds or adjacent local canals. L/R use is expected to increase 34% by 2045; however, surface water withdrawals may decrease as new demands, and some existing demands, are met with reclaimed water. Permitted AG and L/R surface water irrigation withdrawal locations are shown in **Figure 5-4**, with L/R withdrawals typically from surface water management lakes in the western urban areas and AG withdrawals from surface water systems located primarily in the eastern rural portions of the LWC Planning Area.

In 2020, surface water was used to meet 86% of Commercial/Industrial/Institutional (CII) demands in the LWC Planning Area (**Figure 5-2**). CII demands will increase 28% by 2045, with most of the projected increase being supplied by fresh groundwater.

The Florida Power & Light (FPL) Fort Myers Power Plant withdraws water from the tidal portion of the Caloosahatchee Estuary, downstream of salinity control structure S-79. This is the only Power Generation (PG) facility using surface water for cooling water. No increase in surface water withdrawals for the PG use category is projected through 2045.

Surface water is used primarily for AG and to a lesser extent L/R, CII, and PG uses. Based on the revised demand projections for this plan update, which are 3% less than the previously projected 2040 demands, surface water sources appear sufficient to meet the projected 2045 demands.

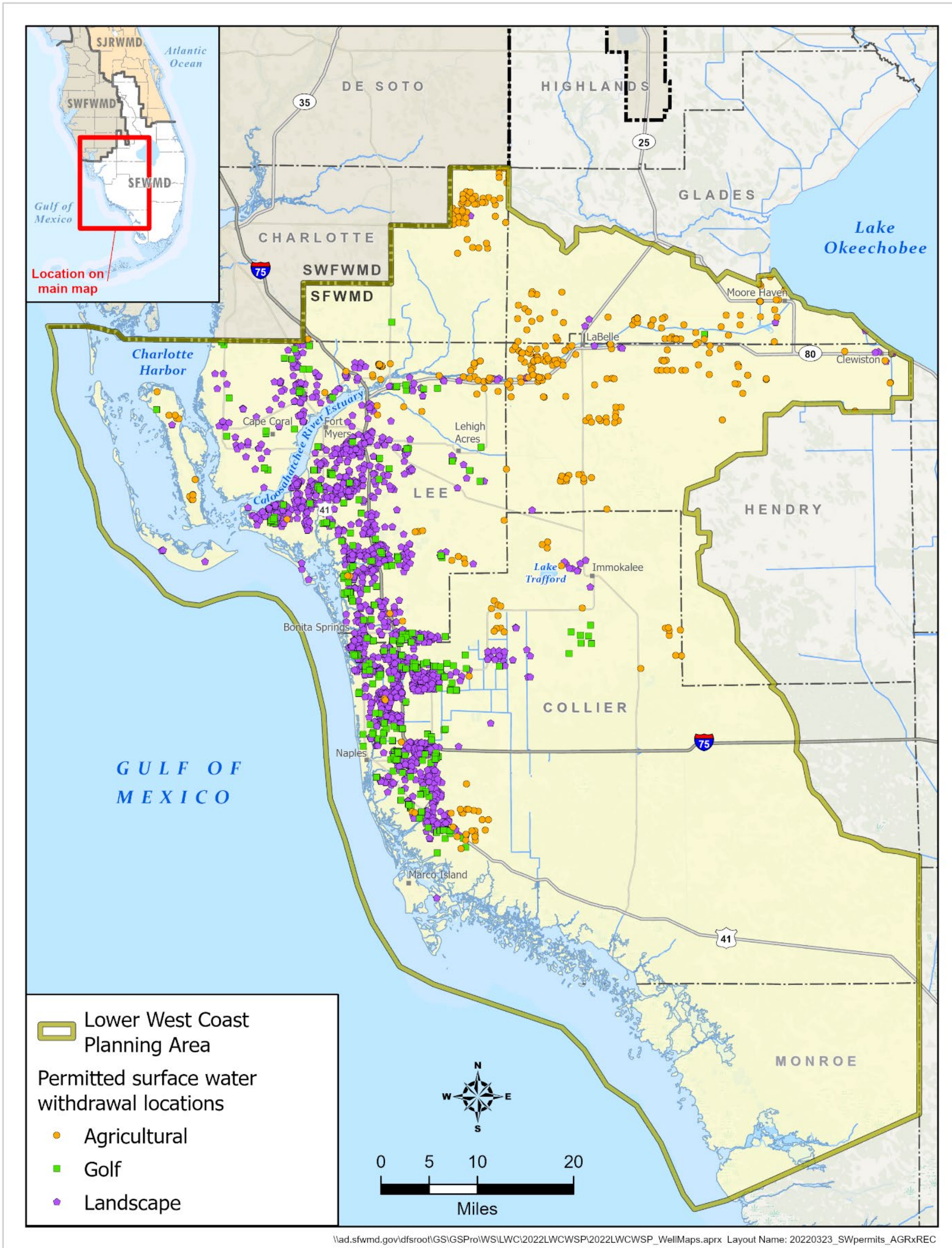

Figure 5-4. Permitted surface water withdrawal locations for irrigation within the LWC Planning Area.

GROUNDWATER

Groundwater is produced from three major aquifer systems in the LWC Planning Area: the SAS, IAS, and FAS (**Figure 5-5**). The SAS and portions of the IAS provide fresh groundwater, while other portions of the IAS and upper portion of the FAS provide brackish groundwater. For a detailed description of the geology within the LWC Planning Area, including mapping of the hydrostratigraphic unit, see Geddes et al. (2015).

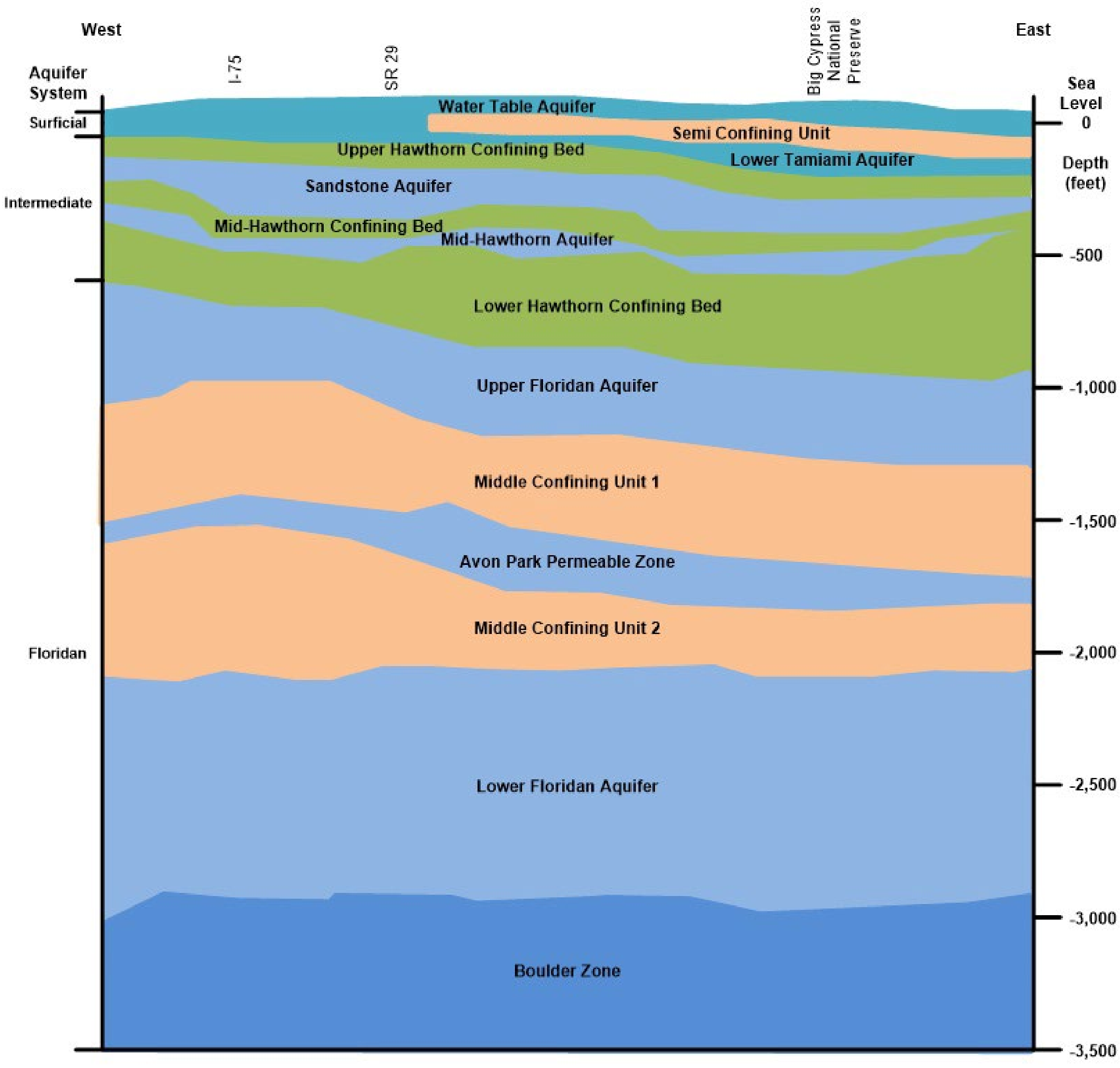

Figure 5-5. Generalized hydrogeologic cross section of the LWC Planning Area.

Fresh Groundwater

Surficial Aquifer System

In the LWC Planning Area, the SAS is composed of two water-bearing zones: the Water Table aquifer and the Lower Tamiami aquifer, which usually are separated by a semiconfining unit. The SAS is composed of solutioned limestone, sandstone, sand, shell, and clayey sand and is recharged by local rainfall and regional canals. Water availability from the SAS is limited by the rate of groundwater recharge, low aquifer productivity, potential wetland impacts, proximity to contamination sources, saltwater intrusion, and other existing legal users in the area. During droughts, low regional groundwater levels may cause inland movement of the saltwater interface in the SAS. In this case, water shortage restrictions may be declared by the District's Governing Board to conserve freshwater supplies and reduce the risk of saltwater intrusion.

The SAS produces fresh water from relatively shallow wells in most of the LWC Planning Area. Fresh groundwater has a chloride concentration less than 250 milligrams per liter (mg/L), which is a secondary drinking water standard (United States Environmental Protection Agency 2022). All water use categories rely on some fresh groundwater from the SAS, although AG predominantly uses surface water. Development of new SAS groundwater sources may be feasible in some areas; however, permitting new water supplies will depend on local resource conditions. **Figures 5-6** and **5-7** show the permitted withdrawal wells completed in the SAS.

Based on demand projections in this plan update, a combination of fresh and brackish groundwater (supplemented with surface water as described earlier) appears to be adequate to meet projected 2045 demands. Water availability from the SAS is further discussed in **Chapter 6** and in a groundwater modeling discussion within **Appendix D**.

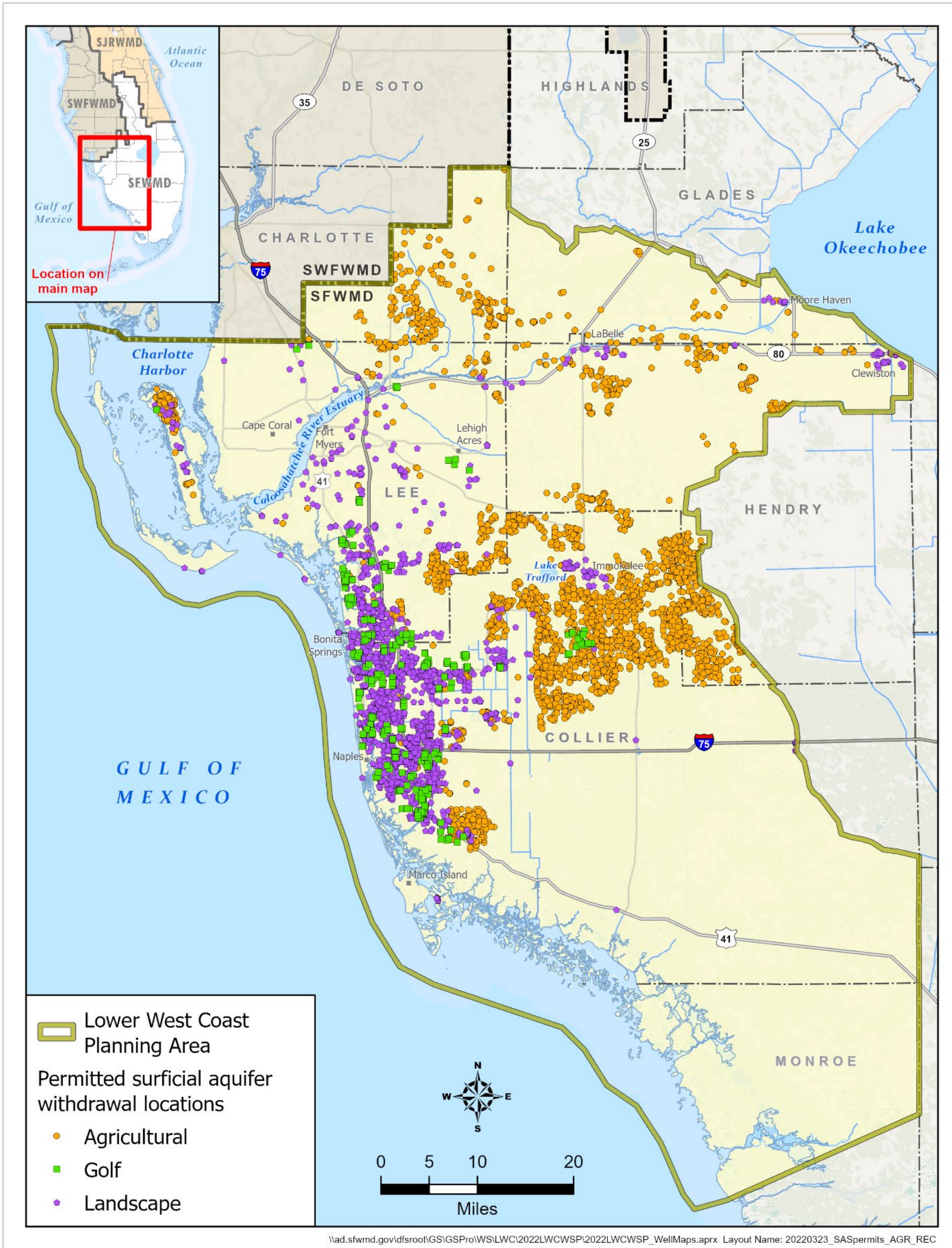

Figure 5-6. Permitted surficial aquifer system withdrawal locations for irrigation within the LWC Planning Area.

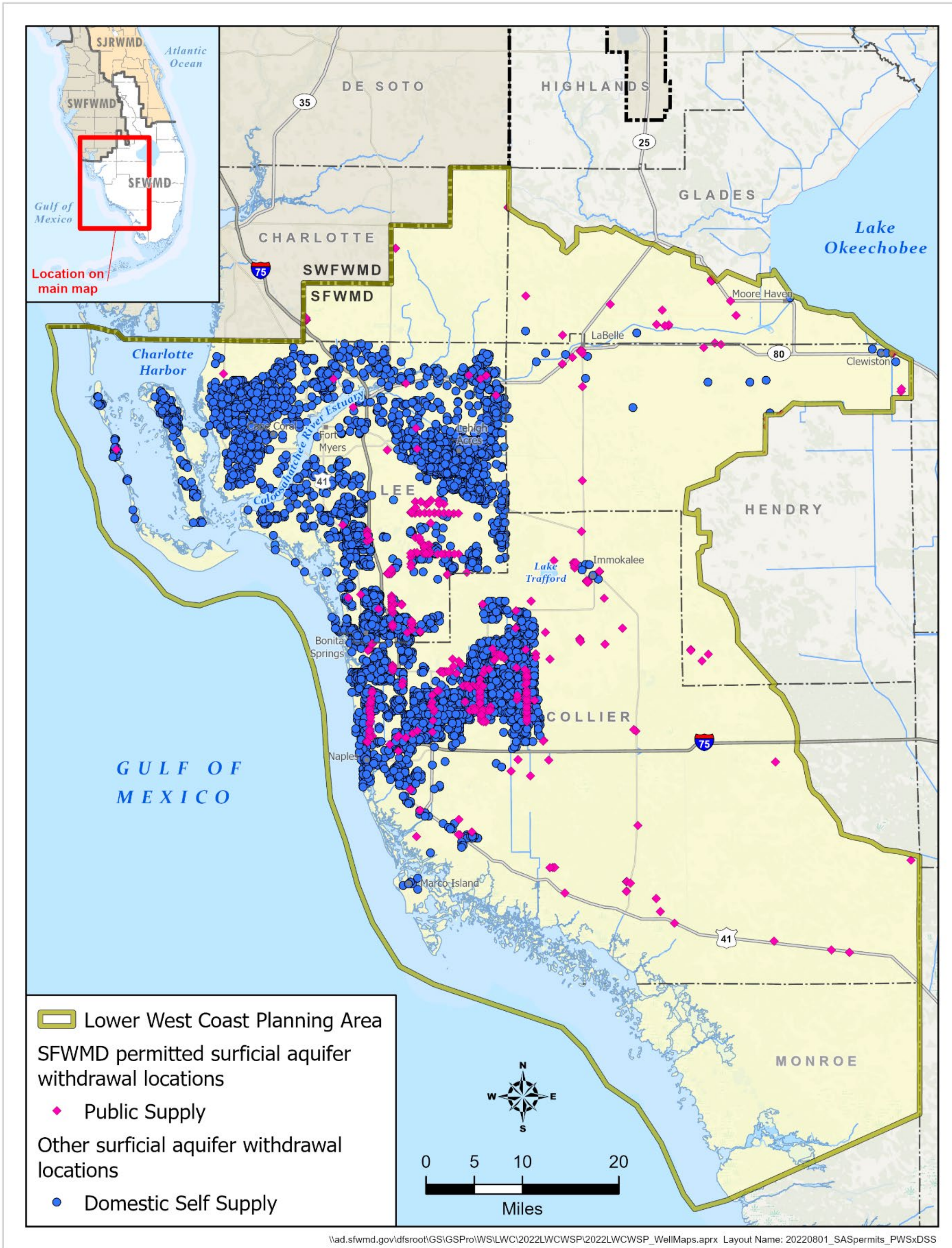

Figure 5-7. Permitted surficial aquifer system withdrawal locations for Public Supply and Domestic Self-Supply within the LWC Planning Area.

Intermediate Aquifer System

The IAS also is composed of two water-bearing zones: the Sandstone aquifer and the Mid-Hawthorn aquifer, which are separated by the Mid-Hawthorn confining unit. The Lower Hawthorn confining unit separates the IAS from the deeper FAS. The IAS is composed of relatively thin, discontinuous beds of sand, sandstone, and limestone that provide moderate quantities of water when present. Several confining sequences divide the water bearing units in this aquifer system. The IAS provides fresh groundwater throughout most of the region; however, there are locations that have been impacted by lateral saltwater intrusion from coastal seawater or by upward vertical intrusion from older or improperly constructed wells in the underlying brackish aquifers. In 2020, the IAS provided approximately 17% of water to the PS utilities in the LWC Planning Area. Permitted withdrawal locations from the IAS for AG, L/R, PS, and Domestic Self-Supply (DSS) are shown in **Figures 5-8** and **5-9**.

Sandstone Aquifer

The Sandstone aquifer typically occurs as two distinct permeable units, an upper clastic zone and a lower carbonate zone and is recharged by leakage downward through the upper confining unit and lateral recharge from the north. The Sandstone aquifer is composed of sandstone, sandy limestones, dolostones, and calcareous sands. These two units may be contiguous or separated by varying thicknesses of low-permeability silt and clay. The Sandstone aquifer is separated from the underlying Mid-Hawthorn aquifer by low-permeability clays and marls of the basal Peace River Formation, which is present throughout the LWC Planning Area. The Sandstone aquifer is used predominantly for AG and DSS. Intensive use of groundwater from the Sandstone aquifer in the Lehigh Acres area has resulted in a localized lowering of the groundwater level towards maximum developable limits (MDLs), as described in **Chapter 6** and **Appendix C**.

Mid-Hawthorn Aquifer

The Mid-Hawthorn aquifer, where present, is composed of limestone, phosphate, shell, and lime mud and is recharged by leakage downward from the overlying confining unit and laterally from areas north and outside the planning area. Where the Sandstone aquifer is absent or insignificant, the entire thickness of the Peace River Formation isolates the Mid-Hawthorn aquifer from the overlying SAS. The confinement from the underlying Lower Hawthorn producing zone consists of carbonate muds and terrigenous clays of the upper Arcadia Formation and is present throughout the LWC Planning Area. Use of the Mid-Hawthorn aquifer primarily occurs in the western part of the LWC Planning Area as a water supply source for DSS, L/R, and PS. Intensive DSS use of groundwater from the Mid-Hawthorn aquifer in northern Cape Coral has resulted in a localized lowering of the groundwater level towards MDLs, as described within **Chapter 6** and **Appendix C**.

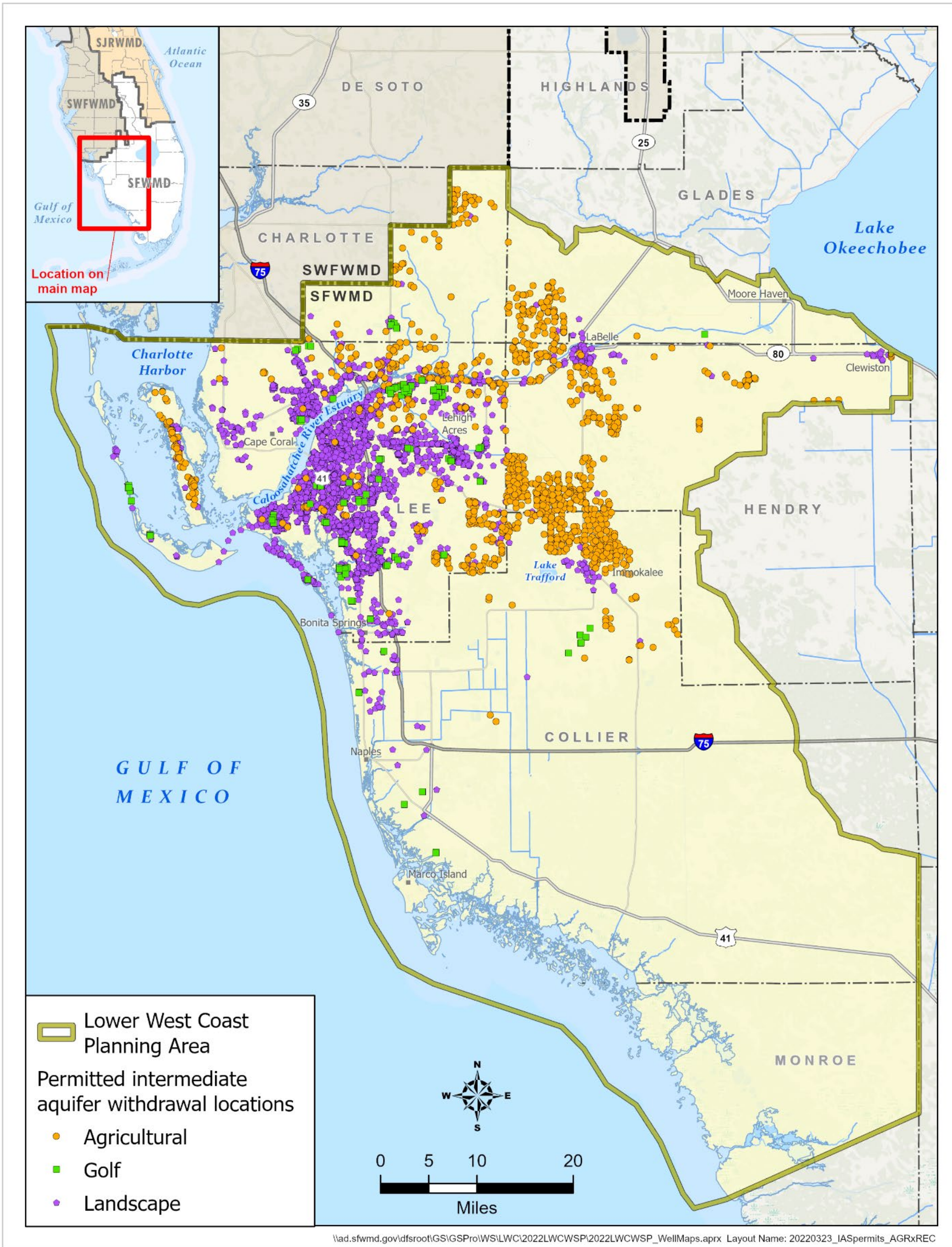

Figure 5-8. Permitted intermediate aquifer system withdrawal locations for irrigation within the LWC Planning Area.

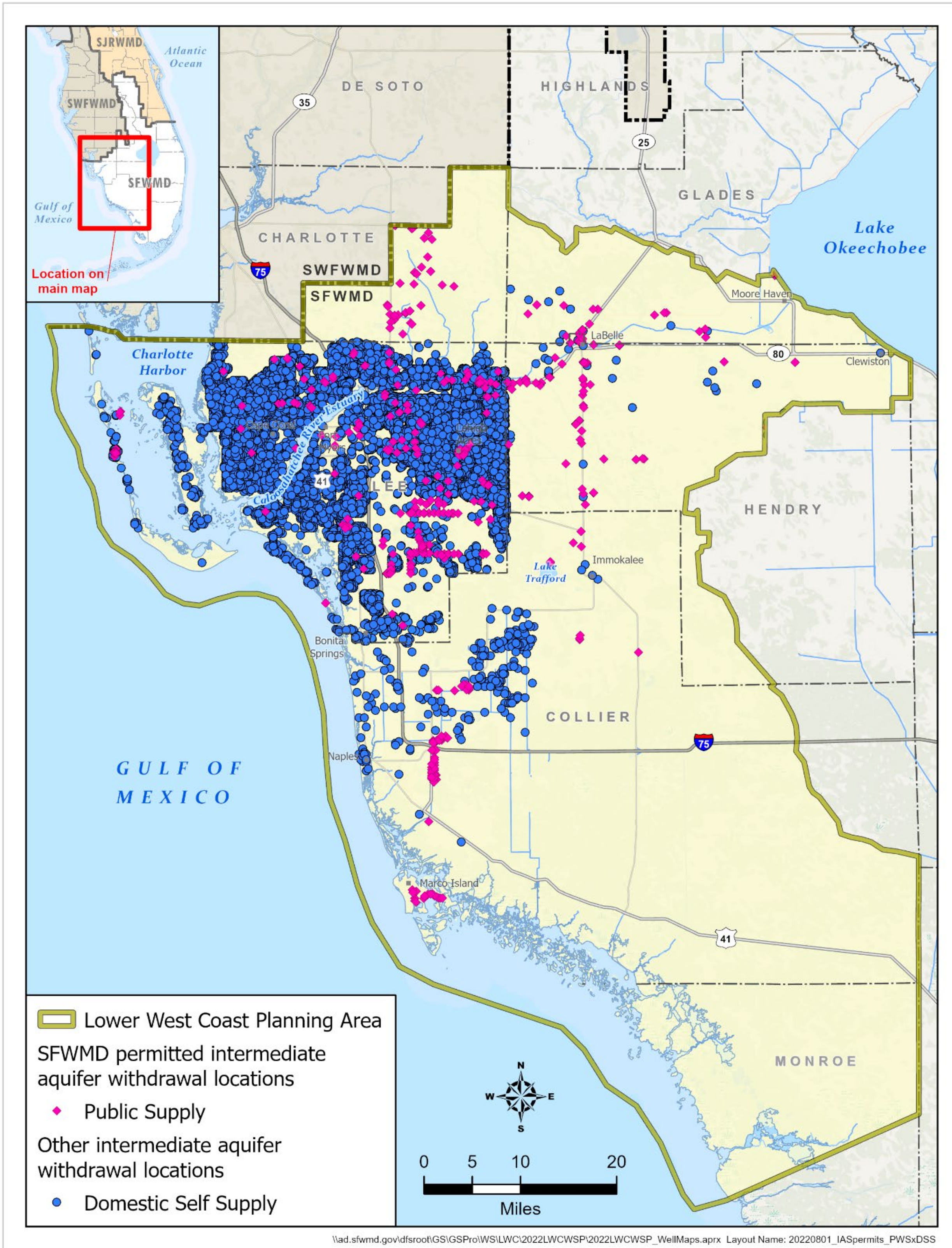

Figure 5-9. Permitted intermediate aquifer system withdrawal locations for Public Supply and Domestic Self-Supply within the LWC Planning Area.

Existing and Future Use of Groundwater

AG primarily depends on surface water but is also the largest user of fresh groundwater in the LWC Planning Area (**Figure 5-2**). In 2020, 278 million gallons per day (mgd) of the region's AG demand was met with fresh groundwater from the SAS and IAS. Use of fresh groundwater for AG irrigation is projected to increase slightly over the planning period.

The second largest user of fresh groundwater is L/R. In 2020, approximately 44% of L/R demand, including golf courses, was met with fresh groundwater (**Figure 5-2**). L/R demands are expected to increase 34% by 2045, based on population growth. Fresh groundwater is expected to meet approximately 37% of the increased demand, depending on availability at specific locations. For the L/R category, some fresh groundwater withdrawals may be replaced with reclaimed water if available.

Of the 24 PS utilities in the LWC Planning Area, 10 utilities use fresh groundwater to meet all their potable water demand, and the remaining 14 utilities use brackish groundwater for all or a portion of their current demands. Brackish groundwater supplies the majority of water for PS demands, while fresh groundwater supplies the remaining 45% (**Figure 5-2**). Total groundwater withdrawals for PS have slightly increased over the past 15 years (**Figure 5-10**). PS use of the FAS has increased in volume since 2005, while the volume of fresh groundwater withdrawn from the SAS has reduced. In 2005, the SAS provided approximately 55% of the water for PS, and the FAS provided approximately 34%. By 2020, only about 38% of PS demand was met with water from the SAS due to increased use of water from the FAS (45%). The percentage of SAS use for PS is projected to continue decreasing over time as the use of AWS sources (e.g., brackish water, reclaimed water) increases.

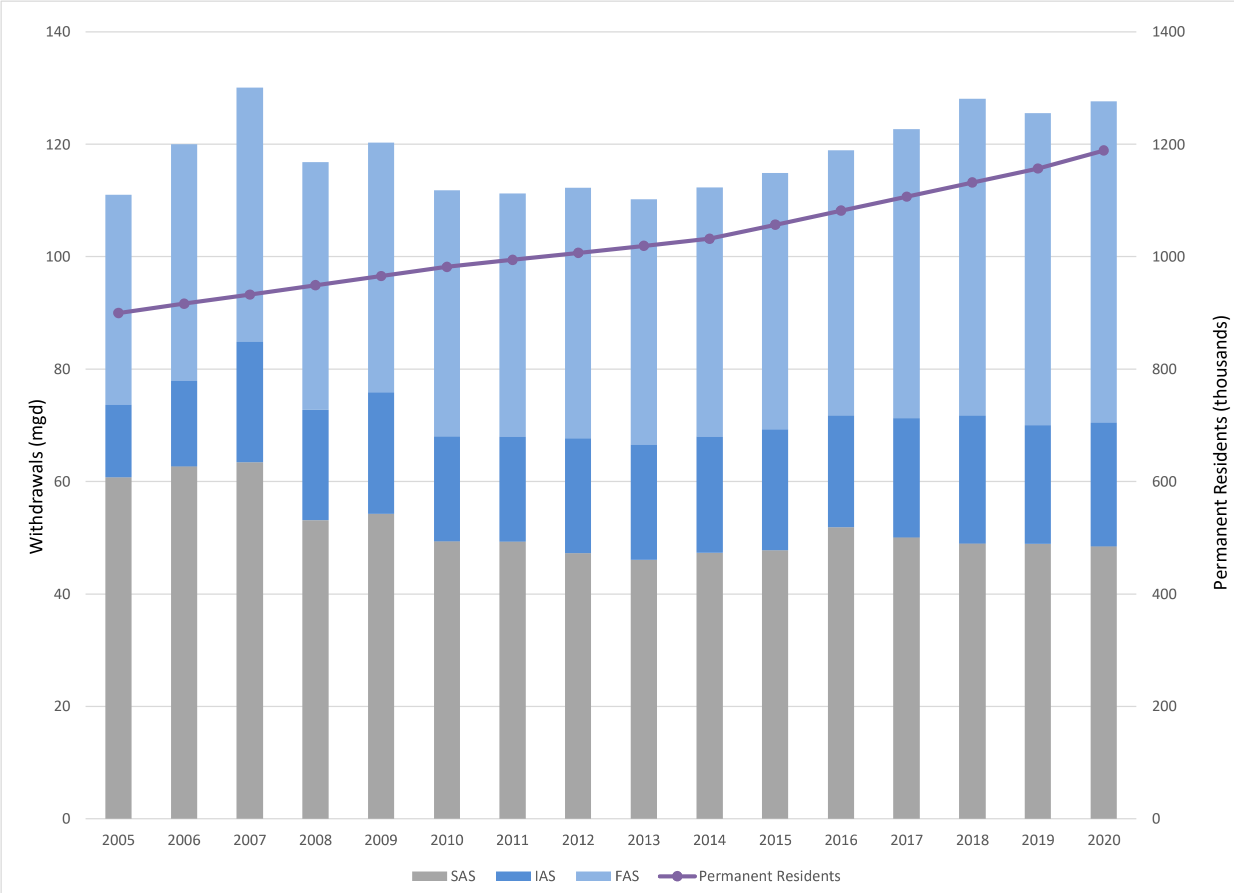

Figure 5-10. Public Supply withdrawals from the surficial, intermediate, and Floridan aquifer systems in the LWC Planning Area (2005 to 2020).

In 2020, fresh groundwater from the SAS and IAS supplied 100% of the estimated 24.27 mgd of demand for DSS. By 2045, DSS demand is expected to increase to 31.66 mgd, depending upon the rate of expansion of potable water distribution lines to self-supplied areas. Water levels within the Mid-Hawthorn aquifer have risen substantially in southern Cape Coral where DSS use has been replaced with expansion of PS distribution lines. However, areas not served by PS in northern Cape Coral and the southern portion of Fort Myers, continue to observe declining water levels in the Mid-Hawthorn aquifer due to DSS withdrawals. Monitoring wells in the Sandstone aquifer also indicate declining water levels in the area of Lehigh Acres, as discussed further in **Chapter 6**. In 2020, fresh groundwater was used to meet 13% of CII demands in the LWC Planning Area (**Figure 5-2**). CII demands will increase 26% by 2045, with most of the projected increase being supplied by fresh groundwater.

Increased withdrawals from the SAS and the freshwater portion of the IAS are generally limited due to potential impacts on wetlands and existing legal water uses, including DSS; the potential for saltwater intrusion; and the possibility of reaching aquifer MDLs. Therefore, traditional freshwater sources in the LWC Planning Area may not be sufficient to meet 2045 projected water use demands and alternative sources need to be developed to meet increased demands. The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) was developed and used to evaluate changes in water levels in the SAS and IAS for the 2014 and 2040 withdrawal scenarios. The model was completed and simulations were conducted during 2020. **Chapter 6** and **Appendix D** provide information about the modeling effort for this plan update.

Brackish Groundwater

Surficial Aquifer System/Intermediate Aquifer System

Brackish water has a chloride concentration between 250 and 19,000 mg/L (seawater). In the LWC Planning Area, portions of the SAS and IAS contain brackish groundwater in locations that have been impacted by lateral saltwater intrusion from coastal seawater or by upward vertical intrusion from older or improperly constructed wells that tap underlying brackish aquifers. Brackish groundwater from the SAS and IAS is used for PS after membrane treatment to meet drinking water standards and for AG and L/R irrigation, after blending with freshwater sources.

Floridan Aquifer System

In the LWC Planning Area, water from the FAS typically has chloride concentrations greater than 1,000 mg/L and is considered brackish. Desalination or blending with fresh water is required before this water supply source is suitable for most uses, including irrigation and human consumption. Water quality in the FAS decreases substantially from central to southern Florida, with increasing hardness, chlorides, and salinity. Salinity also increases with depth, making the deeper producing zones less desirable for development than shallower parts of the system. The FAS is productive in the LWC Planning Area; however, use of this brackish water source is limited by water quality concerns (**Chapter 6**).

The FAS is a confined, high-yield aquifer system that provides substantial volumes of water. Overall, the productivity of the FAS is considerably greater than that of the SAS and IAS in the region. The top of the FAS is separated from the IAS by the low-permeability sediments of the intermediate confining unit. The FAS has several discrete aquifers separated by low-permeability confining units, including a unit defined (when present) as the "Lower Hawthorn aquifer," the Upper Floridan aquifer, Avon Park permeable zone, and Lower Floridan aquifer (**Figure 5-5**). Though generally not considered useful as a water supply source in the LWC Planning Area due to high salinity, the Lower Floridan aquifer includes the Boulder Zone (approximately 2,100 to 3,500 feet below mean sea level), a cavernous and highly transmissive interval used for disposal of wastewater effluent and concentrate from reverse osmosis (RO) treatment facilities through the use of deep injection wells.

The SFWMD partners with other agencies (e.g., the United States Geological Survey) to monitor the FAS through regional monitor well networks and through permittees as part of reporting requirements for water use (SFWMD) and deep injection wells (Florida Department of Environmental Protection [FDEP]). Data from these wells indicate some seasonal variations in water levels, but overall, levels have remained stable over the period of record. Nearly all PS utilities in the LWC Planning Area that use the Upper Floridan aquifer have had one or more production wells experience degraded (increasing salinity) water quality. **Chapter 6** and **Appendix D** contain monitor well location information and data from the regional FAS network as well as water quality graphs from several PS utility wellfields.

Existing and Future Use of Brackish Groundwater

Brackish groundwater is used primary by PS utilities to supply a majority of the demand (55%), and in some limited cases by AG (1%) and L/R (2%), as an alternative water supply (**Figure 5-1**). Permitted withdrawal locations from the FAS for AG, L/R, and PS are shown in **Figure 5-11.** PS withdrawals from the FAS have increased from approximately 37.36 to 57.18 mgd between 2005 and 2020 (**Figure 5-10**) and are expected to increase to over 120mgd by 2045 (**Appendix D**). In the LWC Planning Area, 10 PS utilities have FAS permit allocations totaling 96.44 mgd. In addition, 5 PS utilities are using saline groundwater from the IAS or SAS with allocations totaling 16.11 mgd.

PS utilities use RO and membrane softening treatment technologies to remove or reduce excess salinity to acceptable drinking water quality. The approximate production efficiency, or recovery, for brackish water RO facilities Districtwide is between 75% and 85%, depending on the membrane technology employed and the salinity of the source water (Carollo Engineers, Inc. 2009). There currently are 14 PS utilities using RO or membrane softening water treatment plants with a combined treatment capacity of 138.17 mgd. To some extent, saline groundwater can be blended with fresh water from other sources and treated with lime softening or nanofiltration technology to meet chloride drinking water standards. The ability to use blending depends on the water quality of the saline source and other treated water produced by the utility.

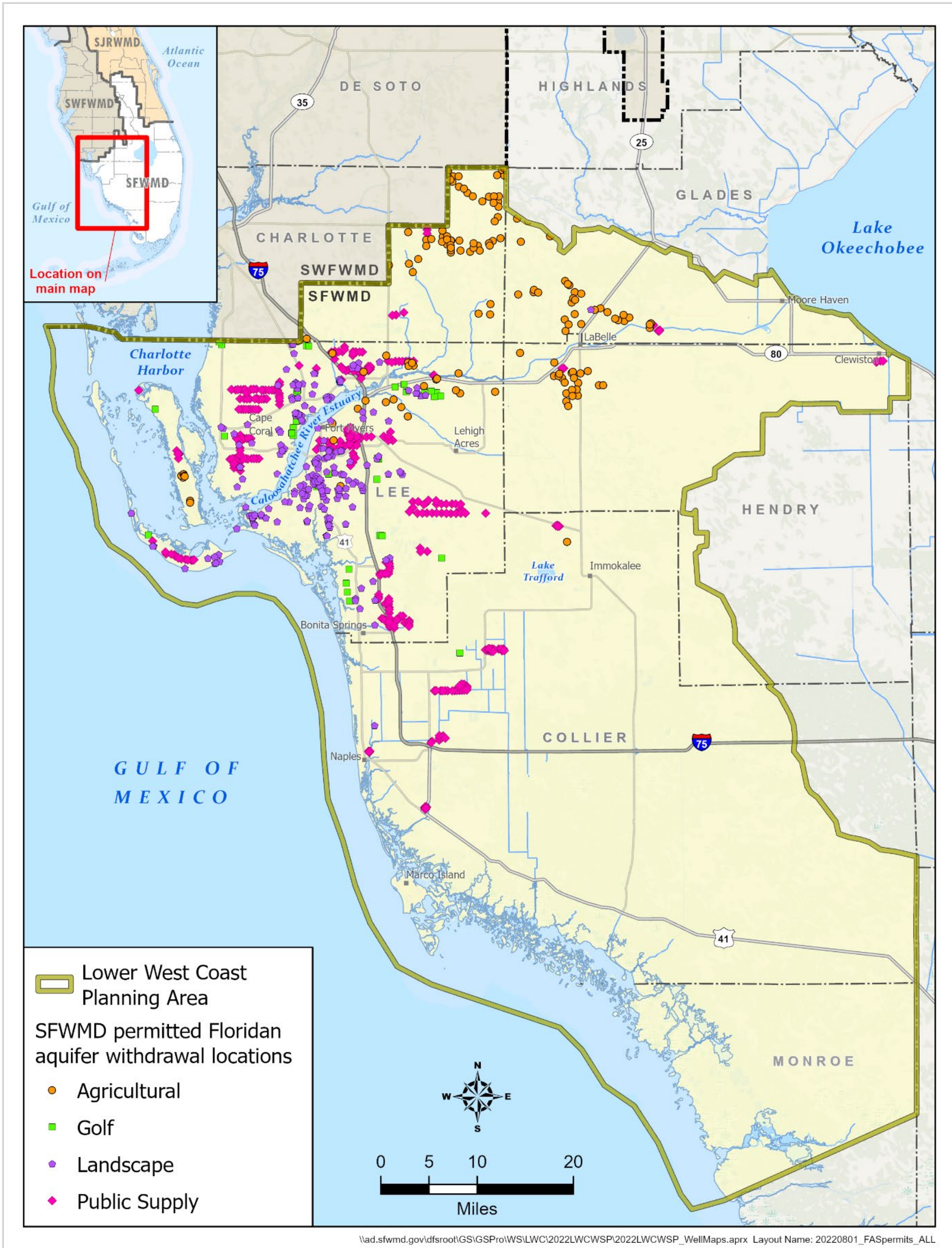

Figure 5-11. Permitted Floridan aquifer system wells in the LWC Planning Area.

RECLAIMED WATER

Reclaimed water is wastewater that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility (WWTF) in accordance with Rule 62-610.200, Florida Administrative Code (F.A.C.). Reuse is 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.

Florida Statute 373.250 identifies reclaimed water as an AWS, including declaring reclaimed water supply projects as eligible for AWS funding. The Water Resource Implementation Rule (Chapter 62-40, F.A.C.) requires the 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 water use permit applicants proposing to use more than 0.10 mgd of water and applicants within a mandatory reuse zone, as designated by local governments through ordinance, to use reclaimed water if feasible. In addition, substitution credits and impact offsets, resulting from use of reclaimed water, may be included in a water use permit. A substitution credit is the use of reclaimed water to replace a portion or all of an existing permitted use of a limited surface water or groundwater resource, allowing a different user to initiate or increase withdrawals from the resource. Impact offsets are derived from the use of reclaimed water to reduce or eliminate a harmful impact that has occurred or would occur as a result of a surface water or groundwater withdrawal.

Existing Reuse

Wastewater reuse conserves water resources by reducing reliance on traditional freshwater sources and is an environmentally sound alternative to deep well injection and other traditional disposal methods. Although disposal methods will be needed during 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, often at a lower cost. The volume of reclaimed water used in the LWC Planning Area for a beneficial purpose (e.g., landscape irrigation, golf course irrigation, cooling water, and other industrial uses) increased from 32.30 mgd in 1994 to 84.65 mgd in 2020 (**Figure 5-12**). Annual fluctuations in the volume of reclaimed water used are due to the addition of new users and variable amounts of rainfall. The individual reuse inventory reports for the year 2020 (unless otherwise noted for individual facilities) filed by each wastewater utility to the FDEP (FDEP 2021) were analyzed for the presentation in the following sections.

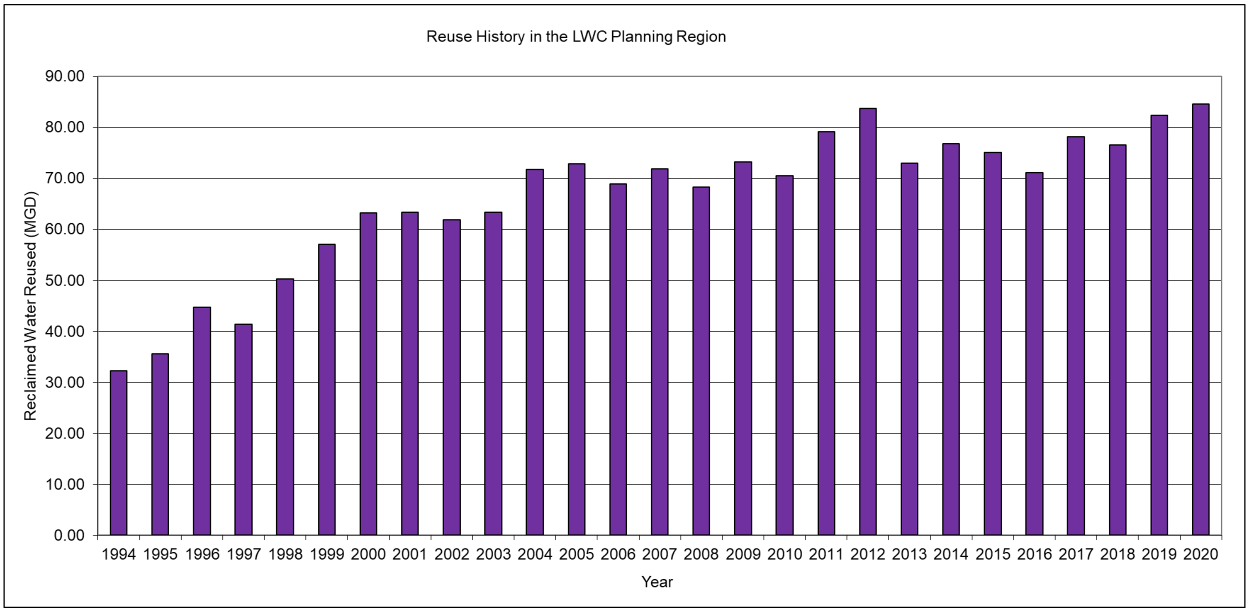

Figure 5-12. Annual average reclaimed water reuse in the LWC Planning Area from 1994 to 2020.

As of 2020, there are 40 domestic WWTFs in the LWC Planning Area with a capacity of 0.10 mgd or greater (**Appendix E**). In 2020, those facilities treated an average wastewater flow of 83.78 mgd. An additional 23.97 mgd of supplemental water was added by utilities. In total, 84.65 mgd was reused, which calculates to 78.6% total potential water reused including supplemental water. The county data indicated 98.0% of wastewater generated in Charlotte, 79.0% in Collier, 100% in Glades, 100% in Hendry, and 77.3% in Lee was reused (including supplemental flows). Reuse was primarily for irrigation of golf courses, parks, schools, and residential lots, accounting for 79.09 mgd (or 93.4%) of the total 84.65 mgd reused.

The remainder was reused for groundwater recharge through percolation ponds (2.29 mgd) irrigation of sprayfields (1.83 mgd), and other uses such as processes at the treatment facility, cooling water, and toilet flushing (1.44 mgd). However, 23.42 mgd of potentially reusable water was disposed of through deep well injection and surface water discharge in 2020, while 23.97 mgd of supplemental flows were required by reuse facilities to reliably meet their demands during dry conditions.

Supplemental Sources to Meet Reuse Demand

The use of supplemental water supplies to meet peak demands for reclaimed water may enable a wastewater utility to maximize its use of reclaimed water. However, during times of drought, water sources such as surface water, groundwater, and stormwater may not be available to supplement reclaimed water supplies in some areas. Use of supplemental water supplies is subject to consumptive use permitting and water shortage restrictions by the SFWMD.

During 2020, the following facilities cumulatively added 23.97 mgd of supplemental water to their reclaimed water supplies.

- Ave Maria
- Bonita Springs – East and West
- Collier County – North and South
- Cape Coral – Everest and Southwest
- Hunter's Ridge
- Lee County – Gateway
- Lee County – Three Oaks
- Marco Island
- Naples
- Port of the Islands – South
- Town and Country (Babcock Ranch)

Supplemental sources included surface water (16.33 mgd), followed by groundwater (7.43 mgd), with the remainder (0.21 mgd) being met with drinking water, demineralized concentrate, and ASR recovery. LWC utilities anticipate a cumulative demand of 58.90 mgd from supplemental sources to meet their 2045 reuse demands.

Reclaimed Water System Interconnects

Reclaimed water system interconnects may be owned or operated by different utilities or may be shared between two or more domestic WWTFs that provide reclaimed water for reuse activities. When two or more reclaimed water systems are interconnected, additional system flexibility is attained, which increases efficiency and reliability. In 2020, in the LWC Planning Area, interconnections existed between the following facilities: Collier County – North and Collier County – South; Bonita Springs – East and Bonita Springs – West; Cape Coral – Everest, Cape Coral – Southwest, and Del Prado; and Lee County – Fiesta Village and Lee County – Fort Myers Beach.

The Fort Myers – South facility does not currently provide reclaimed water service but will provide reclaimed water to Cape Coral's facilities by 2023. In addition, Fort Myers expects to interconnect its South facility to the Fort Myers – Central facility by 2040. Finally, Cape Coral plans to add a new North Phase I Water Reclamation Facility by 2035 which will connect to the Everest – South system.

Future Reuse

Based on information from wastewater utilities operating in the LWC, wastewater flows are projected to increase from 83.78 mgd in 2020 to 161.71 mgd by 2045. As stated previously, 23.42 mgd of potentially reusable wastewater effluent was disposed of in the LWC Planning Area in 2020. Combined, the projected 2045 wastewater and disposals flows represent 188.85 mgd of potential AWS.

Utilities currently distributing reclaimed water to customers intend to continue and expand their reuse systems as additional reclaimed water and users become available. Most major utilities in the region are planning to provide more reclaimed water and have begun or anticipate constructing the required treatment facilities to produce public access irrigation in anticipation of increasing reuse by 2045. In many cases, future reuse will occur in new residential developments, negating the use of potable water for irrigation, thereby reducing PS demands from the FAS compared to current projections.

Table 5-1 shows 2020 documented flows and 2045 projected flows, as estimated using utility-provided data, for average daily wastewater, total reuse, total discharges and supplemental flows, and the changes expected over the planning horizon by county.

Table 5-1. Documented 2020 and estimated 2045 reuse and related flows by county.

County	Wastewater Flows (mgd)		Total Disposal Flows (mgd)		Supplemental Flows (mgd)		Total Reuse (mgd)	
	2020	2045	2020	2045	2020	2045	2020	2045
Charlotte County	0.41	1.20	0.00	0.00	0.67	3.64	1.06	4.66
Collier County	30.71	51.52	7.06	9.93	3.95	8.53	27.39	50.18
Glades County	0.23	0.23	0.00	0.00	0.00	0.00	0.23	0.23
Hendry County	2.01	3.81	0.00	1.71	0.00	0.00	2.01	2.59
Lee County	50.42	104.95	16.36	15.50	19.35	46.73	53.97	135.94
LWC Planning Area Total	**83.78**	**161.71**	**23.42**	**27.14**	**23.97**	**58.90**	**84.65**	**193.59**

mgd = million gallons per day.

In many areas, local government development approval includes use of reclaimed water and extension of reclaimed water pipelines, substantially increasing the volume of reuse by 2045. Applying the current reuse rate of 78.6% to projected wastewater flows results in 43.24 mgd of additional reuse (for a total of 127.03 mgd) by 2045. However, utilities in the LWC Planning Area predict a cumulative increase in reuse of 108.94 mgd (for a total of 193.59 mgd) by 2045.

Currently, there are 17 proposed potable and nonpotable PS development projects in the LWC Planning Area that would potentially increase reclaimed water flows by 39.70 mgd, which, when combined to the cumulative current permitted wastewater capacity of all LWC reclaimed water facilities, total to 201.80 mgd. The full listing of these proposed projects can be seen in (**Chapter 8**).

WATER STORAGE

Storage is an essential component of any supply system that experiences fluctuation in supply and demand. Capturing excess surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. Approximately two-thirds of South Florida's annual rainfall occurs during the wet season. Without sufficient storage capacity, much of this water discharges to the ocean through surface water management systems and natural drainage. In the LWC Planning Area, potential water storage options include ASR systems and reservoirs, both of which are considered AWS options.

Aquifer Storage and Recovery

ASR involves storing stormwater, surface water, fresh groundwater, drinking water, or reclaimed water in an aquifer that has appropriate attributes (e.g., modest transmissivity, intergranular porosity, overlain by a competent confining unit, low ambient water salinity) and subsequently recovering the water. In this process, an aquifer acts as an underground reservoir for injected water. The injected water is treated to appropriate standards, which may vary depending on the water quality of the receiving aquifer, and then pumped into the aquifer through a well (i.e., stored). The water is pumped back out (i.e., recovered) at a later date for use. The amount of water recovered depends on subsurface conditions, storage time, and water quality. The level of treatment required during recovery, if any, depends on the intended use of the water (e.g., public consumption, irrigation, surface water augmentation, wetlands enhancement).

The volume of water made available through ASR depends on several factors, including well yield, water availability, aquifer characteristics, variability in water supply and demand, and use type. There are uncertainties that need to be addressed with the implementation of ASR systems, but this storage option has the potential to retain substantial quantities of water that otherwise would be lost to the ocean, deep well injection, or evaporation.

Most of the ASR systems in the District have been built by PS utilities to store potable water during periods of low seasonal demand for subsequent recovery during periods of high demand. The SFWMD, in cooperation with the United States Army Corps of Engineers, is pursuing regional ASR systems as part of the Comprehensive Everglades Restoration Plan (CERP). Further information about these projects is provided in **Chapter 7**.

Figure 5-13 shows the locations of ASR projects constructed in the LWC Planning Area and the water source type. To date, ASR systems have been built by Cape Coral, Collier County Utilities, Lee County Utilities, Marco Island, and Naples.

- Cape Coral ASR Program – The Everest water reclamation facility ASR system is a proposed project that will use up to four ASR wells to store excess reclaimed water flows from the City of Fort Myers within the Upper Floridan aquifer. Cape Coral also has constructed six exploratory ASR wells that may be used in the future for storing excess storm water. Once operational and permitted by the FDEP, water recovered from the proposed ASR systems could be used to supplement irrigation withdrawals from the Cape Coral freshwater canal system.
- Collier County Utilities ASR Program – Collier County Utilities has constructed and tested ASR systems at Livingston Road, Manatee Road, and Carica Road for the intention of integration into the reclaimed water system. However, the ASR wells are currently inactive and the utility is considering abandonment of all of them.
- Lee County Utilities ASR Program – The Corkscrew water treatment plant (WTP) ASR system consists of five ASR wells that store potable treated water. The Olga WTP ASR system, constructed to store treated surface water from the C-43 Canal for potable use, has been inactive since 2006. The Lee County North ASR system is also inactive.
- Marco Island ASR Program – The Marco Lakes ASR system consists of seven ASR wells that store surface water captured annually from Henderson Creek and Marco Lakes in the Upper Floridan aquifer. Recovered water is routed to a WTP on the island via pipeline to supplement PS demand.
- Naples ASR Program – The Golden Gate ASR system uses four ASR wells to store excess surface water from the Golden Gate Canal to supplement to the city’s on-site reclaimed water system during periods of high irrigation demand in the dry season.

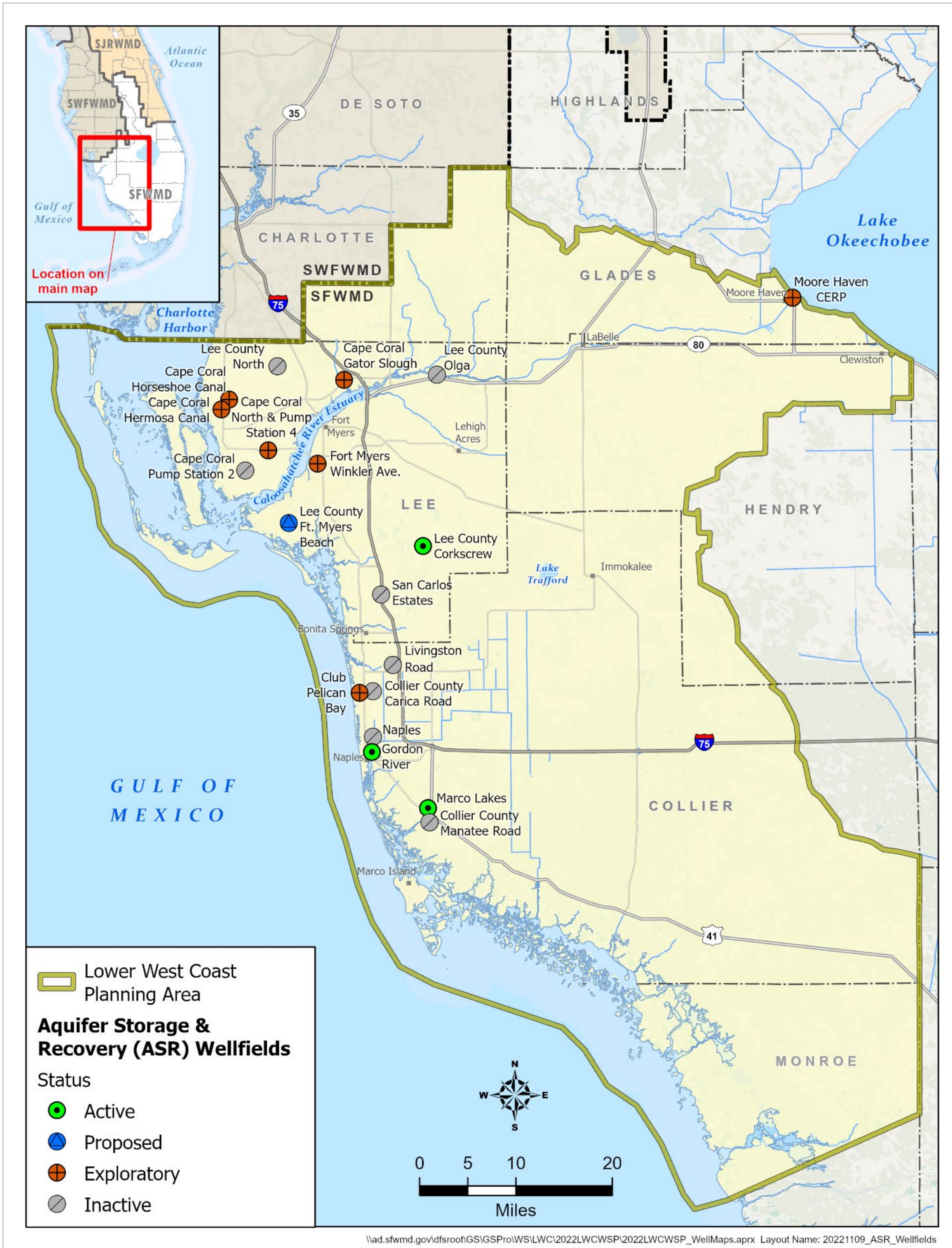

Figure 5-13. ASR wellfields in the LWC Planning Area.

Local and Regional Reservoirs

Surface water reservoirs store water primarily captured during wet weather conditions for use during the dry season and are considered an AWS source. Excess stormwater typically is captured from rivers or canals and stored in aboveground or in-ground reservoirs, which are referred to as off-stream reservoirs. Small-scale (local) reservoirs are used by agricultural operations to store recycled irrigation water and collect stormwater runoff. These reservoirs also may provide water quality treatment before off-site discharge. The C-43 West Basin Storage Reservoir is a CERP project currently under construction and one example of a large-scale, off-stream regional reservoir in the LWC Planning Area. Large-scale (regional) reservoirs are used for stormwater attenuation, water quality treatment in conjunction with stormwater treatment areas, and storage of seasonally available water. Regional storage projects, such as those related to CERP (**Chapter 7**), may enhance surface water availability.

SEAWATER

The use of desalinated seawater from the Gulf of Mexico is an AWS option. The SFWMD does not require water use permits for the use of seawater. The ocean is an abundant source of water; however, desalination is required before seawater can be used for most water supply purposes. There are no PS utilities currently using or proposing to use seawater by 2045.

Major advances in seawater desalination treatment and efficiencies have occurred over the past decade. As a result, desalination costs are declining; however, the cost of standalone seawater desalination facilities remains higher than brackish water desalination. Co-locating seawater desalination facilities with coastal power plants results in cost savings, decreasing the cost difference compared to other AWS options. Additional information regarding seawater desalination is provided in the 2021-2024 Support Document (SFWMD 2021).

SUMMARY OF WATER SOURCE OPTIONS

Water users in the LWC Planning Area rely on fresh groundwater and surface water as well as brackish water and reclaimed water for urban, agricultural, and industrial uses. Total gross water demands under average rainfall conditions are projected to increase 16% between 2020 and 2045. Additionally, the total demand projection for 2045 in this 2022 LWC Plan Update is 3% less than the estimated 2040 demand projected in the 2017 LWC Plan Update. As concluded in previous LWC water supply plan updates, traditional freshwater sources alone are not sufficient to meet projected 2045 water demands; therefore, continued development of AWS sources is needed.

Saline groundwater has recently become the primary source of water to meet increasing PS demands in the LWC Planning Area. Large-scale expansion of SAS and IAS withdrawals is limited by the rate of groundwater recharge, low aquifer productivity, potential impacts to existing legal users and wetlands, possible saltwater intrusion, and proximity to contamination sources. Therefore, the FAS will continue to provide an increasing portion of the water needed to meet 2045 PS demands. The West Coast Floridan Model results indicate the FAS will be able to meet demands, in terms of volume and water quality. Model results are discussed in **Appendix D**.

Traditional fresh surface water and groundwater sources will remain the primary sources for AG and L/R irrigation. As urban growth occurs, some agricultural land is expected to transition to urban uses. Many existing agricultural areas have water use permits to use fresh groundwater for crop irrigation. While water use permits cannot be directly transferred from one land use type to another, conversion of agricultural lands to another use may result in available fresh groundwater, consistent with regulatory criteria. In addition, several utilities are proposing to expand reclaimed water distribution systems for landscape and golf course irrigation.

The LWC Planning Area receives an average of 53 inches of rainfall annually; nearly two-thirds of this rainfall occurs during the wet season. Without sufficient storage capacity, much of this water discharges to tide. ASR systems and reservoirs under development as part of CERP will increase storage capacity and, in addition to meeting environmental water needs, will enhance water availability for other uses.

Water source options depend on location, use type, demand, regulatory requirements, and cost. As competition for limited water resources increases, development of AWS sources will also increase. The conclusions of previous plan updates continue to represent the issues considered to meet the 2045 projected water demands within the LWC Planning Area.

REFERENCES

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6

Water Resource Analyses

This chapter provides historical data and analyzes the current and future status of water resources in the Lower West Coast (LWC) Planning Area of the South Florida Water Management District (SFWMD or District) as well as their limitations and ability to meet the projected demands described in **Chapter 2**. The issues identified in this chapter may affect the use of existing water resources and the development of new supplies to meet projected water demands for 2045. **Appendix D** provides additional details about climate change, saltwater intrusion, and regional surficial aquifer system (SAS), intermediate aquifer system (IAS), and Floridan aquifer system (FAS) modeling. Understanding the effects of meeting water demands through withdrawals from water resources is critical to water supply planning.

TOPICS

- Summary of Issues Identified for 2045
- Evaluation and Analyses
- Surface Water Availability
- Groundwater Availability
- Climate Change and Sea Level Rise
- Summary of Water Resource Analyses

SUMMARY OF ISSUES IDENTIFIED FOR 2045

Traditional freshwater sources in the LWC Planning Area are not sufficient to meet 2020 and 2045 projected water use demands. Past analyses indicate that fresh groundwater from the SAS and IAS, and surface water from the Caloosahatchee River Basin are not adequate to meet the growing needs of the LWC Planning Area during 1-in-10-year drought conditions. As stated in **Chapter 5**, because development of the SAS and IAS has been maximized in many areas, most utilities have already tapped the deeper FAS to meet portions of current demands, and most of their increased needs in the future. The following water supply issues continue to influence water supply planning efforts in the LWC Planning Area:

- Increased withdrawals from the SAS and the freshwater portions of the IAS are generally limited due to potential impacts on wetlands and existing legal water uses, including Domestic Self-Supply (DSS); the potential for saltwater intrusion; and the possibility of reaching aquifer maximum developable limits (MDLs). New or increased allocations will be evaluated on an application-by-application basis to determine if a project meets water use permitting criteria.
  - In some areas, such as Cape Coral and Lehigh Acres, cumulative demands are negatively affecting aquifer water levels.

- Increases in surface water allocations from Lake Okeechobee and hydraulically connected surface waters are limited by the Lake Okeechobee Service Area (LOSA) restricted allocation area (RAA) criteria. Water availability from Lake Okeechobee is discussed comprehensively in the Lower East Coast Water Supply Plan.
- Peak freshwater discharges of surface water during the wet season are affecting the health of the Caloosahatchee River Estuary. Additional storage is required in the basin and in the regional system to attenuate damaging peak flow events.
- During dry conditions, surface water availability and current storage capacity sometimes are insufficient to meet water demands and environmental needs for the C-43 Canal and Caloosahatchee River Estuary.
- Withdrawals from the FAS are expected to increase to meet future demands. Monitoring water levels and water quality in the FAS will be needed to ensure long-term sustainability of the resource.
- Climate change and sea level rise could impact the availability of freshwater resources in the LWC Planning Area.

Previous LWC water supply plan updates identified a variety of alternative water supply (AWS) development projects to avoid water resource impacts as well as competition between water users, and to provide a sustainable supply of water. Projects include the use of reclaimed water, water storage using aquifer storage and recovery (ASR) wells, and development and use of brackish water sources.

While the development of fresh groundwater in many areas has been maximized, limited amounts of fresh groundwater may be locally available. As urban growth occurs, some agricultural land is expected to transition to urban community uses. Many existing agricultural areas have water use permits to use fresh groundwater for crop irrigation. While water use permits cannot be directly transferred from one land use type to another, conversion of agricultural lands to another use may result in available fresh groundwater.

EVALUATION AND ANALYSES

When developing this water supply plan update, data and information from many sources were considered. The following information sources were used to evaluate water resources in the LWC Planning Area, including their availability and ability to meet projected demands considering the issues listed above:

- Input from planning area stakeholders and the public
- Analyses and results from previous LWC water supply plan updates
- Water Supply Facilities Work Plans and capital improvements elements from local governments
- Activities and progress since the 2017 LWC Plan Update, including water supply diversification
- Groundwater modeling results from simulations conducted in 2020 using the Lower West Coast Surficial and Intermediate Aquifer Systems Model and the West Coast Floridan Model
- Water use permits and permit applications

- Water supply demand projections for 2045
- Hydrologic data for the SAS, IAS, and Upper Floridan aquifer (UFA) from monitor wells located in the LWC Planning Area
- Updated 2019 saltwater interface maps for Lee and Collier counties
- Data and information from the Comprehensive Everglades Restoration Plan (CERP), including status of CERP projects such as the Caloosahatchee River (C-43) West Basin Storage Reservoir

Based on information from these sources, issues identified in the 2017 LWC Plan Update were determined to be applicable for this 5-year plan update. The projected 2045 gross water demands for all water use categories in this plan update are 3% less than the projected 2040 demands in the 2017 LWC Plan Update (**Chapter 2**). The decrease in total projected demand is due primarily to decreases in projected Agriculture (AG) demands. As a result, the findings and conclusions of previous plan updates are considered conservative but still representative of current and projected scenarios.

SURFACE WATER AVAILABILITY

Traditionally, surface water from Lake Okeechobee, the C-43 Canal, and the Caloosahatchee River Estuary watershed has been the primary source of water supply for agriculture in the LWC Planning Area. As discussed in the 2017 LWC Plan Update, surface water availability from existing canal and storage networks within the hydraulically connected LOSA is insufficient to meet agricultural water use demands and environmental needs during 1-in-10-year drought conditions. Increases in surface water allocations from Lake Okeechobee and hydraulically connected surface waters are limited by the RAA criteria. Past analyses concluded that additional storage would be beneficial to providing adequate resources to meet existing legal user and natural system needs.

The lack of storage within the C-43 Canal and Caloosahatchee River Estuary watershed contributes to the following:

- The discharge of large volumes of water to tide during major storm events, which adversely impacts estuarine ecosystems due to sudden declines in salinity
- The discharge of water to tide during the wet season, making it unavailable to the ecosystem during the dry season
- The lack of sufficient dry season inflows to the estuary, which causes elevated salinity within the estuary

Construction of the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir (**Chapters 4, 7,** and **Appendix C**) will provide surface water storage as a component of the recovery strategy for the Caloosahatchee River minimum flow and minimum water level (MFL). The main objective of the project is to capture excess wet season flows that will be used to enhance dry season flows to the Caloosahatchee River Estuary. Construction of the reservoir is anticipated to be completed in 2024. Additional reservoirs or water storage solutions to increase water storage capacity have been proposed by agricultural entities.

Lake Okeechobee provides supplemental water to the Caloosahatchee River Estuary via the C-43 Canal during the dry season. However, concerns about the integrity of the Herbert Hoover Dike surrounding Lake Okeechobee resulted in the United States Army Corps of Engineers (USACE) revising the water level operational protocol (the 2008 Lake Okeechobee Regulation Schedule), which limits water availability to the C-43 Canal and its tributaries. The USACE currently is rehabilitating the Herbert Hoover Dike, with an expected completion date by 2022. Concurrently, the USACE initiated in 2019 a re-evaluation of Lake Okeechobee operations to coincide with the completion of Herbert Hoover Dike rehabilitation. The Lake Okeechobee System Operating Manual (LOSOM) planning effort is re-examining the opportunities to balance the congressionally authorized project purposes for flood control, water supply, navigation, recreation, and preservation of fish and wildlife resources. The USACE plans to have a new schedule completed in 2023.

Several factors were considered when evaluating surface water availability to meet current and future demands in the LWC Planning Area. Based on monitoring data and resource protection criteria (i.e., RAAs, MFLs), surface water use for water supply is limited and is expected to remain so through the planning horizon. Increased future demands in the region likely will be met using groundwater sources.

GROUNDWATER AVAILABILITY

The SAS, IAS, and FAS are the major groundwater sources in the LWC Planning Area (**Chapter 5**). The following sections provide data and analyses of water levels and water quality in the SAS, IAS, and FAS. The SAS and IAS historically served as the major sources of fresh groundwater for Public Supply (PS), Landscape/Recreational (L/R) irrigation, and AG irrigation. However, past and present analyses of the SAS and IAS indicate that they are limited sources of groundwater in many areas. The SAS and IAS could not be the primary sources for all projected water demands in the LWC Planning Area without harming the environment or the resource. Alternative sources would need to be developed to meet increased demands. The SFWMD has developed regional groundwater models for the SAS/IAS and the FAS to evaluate current and future conditions within the LWC Planning Area. A summary of the groundwater modeling results for simulations conducted in 2020 can be found in this chapter and in **Appendix D**.

Additional limited groundwater may be developed and permitted from the SAS and IAS depending on local resource conditions, changing land use, and the viability of other supply options. Increases in withdrawals from the SAS and IAS are constrained by saltwater intrusion, wetland impacts, impacts to existing legal users, and other regulatory considerations. Withdrawals from the freshwater portion of the SAS and IAS also are limited due to the regulatory protections provided by aquifer MFLs and MDLs, as discussed in **Chapter 4** and **Appendix C**. MDL elevations are shown below on water level time series plots. Applications for increased withdrawals from the SAS and IAS will be reviewed on a project-specific basis to determine if water use permitting criteria will be met.

Hydrographs for selected SAS, IAS, and FAS monitor wells are presented below using data from the District's DBHYDRO database, United States Geological Survey (USGS) wells database, and the District's regulatory database (for PS facilities and wellfields). In DBHYDRO, monitor wells are identified by a unique DBKey, as listed in each time-series hydrograph.

In addition to the hydrographs, time series plots of chloride concentrations are provided as indicators of water quality on the saltwater interface maps contained in **Appendix D**. Groundwater chloride concentration data for selected PS wellfields are presented herein. These time series plots are provided by PS utilities as part of their water use permit monitoring requirements. Additional information about PS utilities, including permitted allocations, treatment facilities, and proposed projects, is available in **Appendix B** and later sections of this chapter.

Surficial Aquifer System Evaluation

Within the SAS, the Water Table and Lower Tamiami aquifers are primary water sources for DSS, L/R, and AG as well as a major source for PS in Collier, Lee, and Hendry counties. As such, the shallow aquifers are critically important to the region. The hydrologic data used in this plan update show a wide range in water levels in the SAS. The SAS (and its associated wetlands) depend on local rainfall and lateral seepage for aquifer recharge. During dry conditions, recharge diminishes, drainage persists, and irrigation and other demands increase, compounding stress on the SAS and wetland systems.

Surficial Aquifer System Water Levels

Permitted withdrawal locations from these aquifers are presented in maps in **Chapter 5**. Throughout the LWC Planning Area, there are no consistent downward or upward trends in SAS water levels; however, individual wells may show temporal trends reflecting local climatic variations. Active SAS monitoring well locations are shown in **Figure 6-1**.

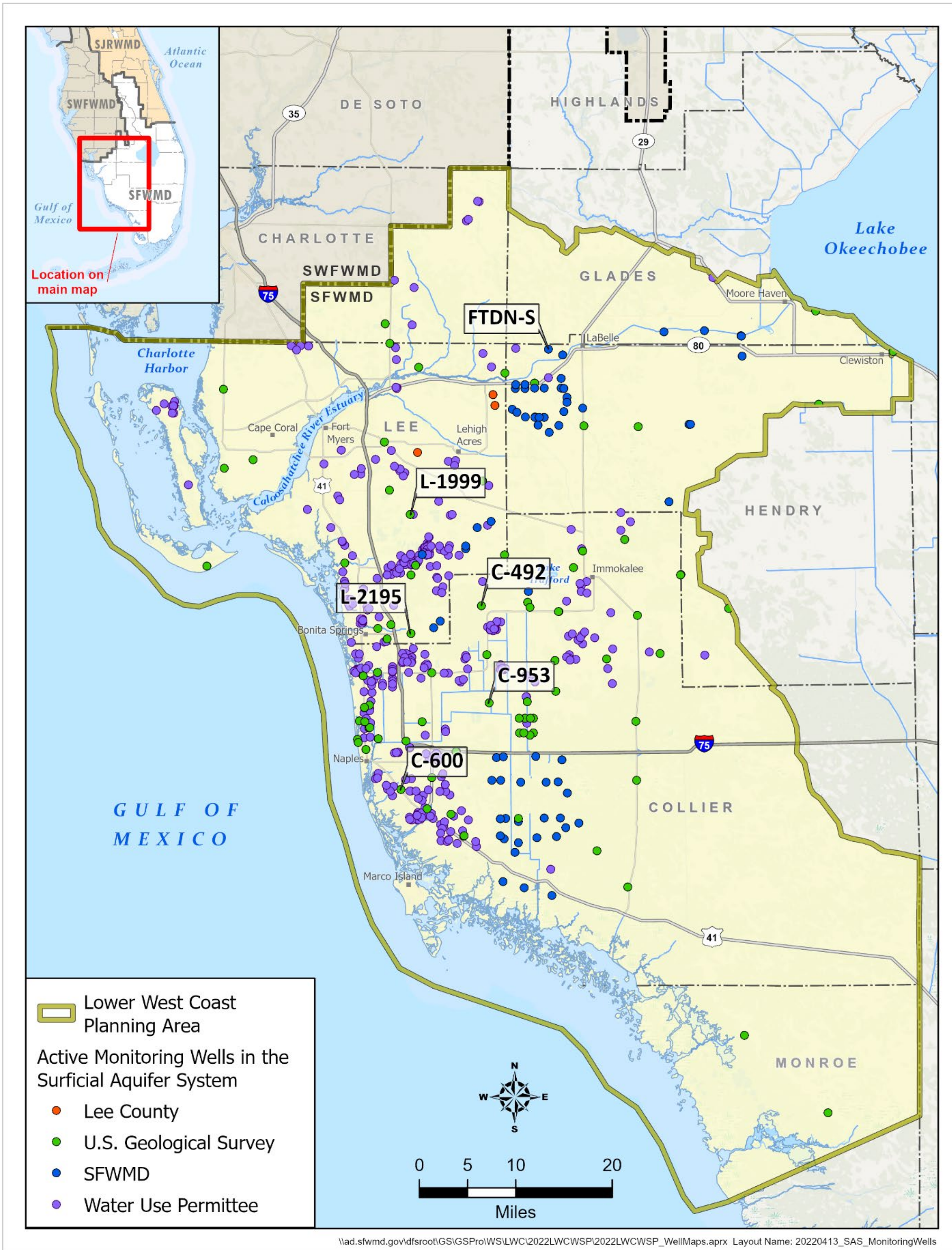

Figure 6-1. Active surficial aquifer system groundwater monitor wells in the LWC Planning Area.

Figures 6-2 through **6-6** are selected time-series plots showing groundwater elevation trends for Collier County SAS monitor wells C-492, C-600, Lee County SAS monitor well L-1999, Hendry County monitor well FTDN-S, and Lee County SAS monitor well L-2195. Wells C-492, L-1999, and L-2195 show approximately 5- to 6-foot variations in water levels between the wet and dry seasons, while the variations in water levels at C-600 are generally around 2 to 2.5 feet and 3.5 to 4 feet at FTDN-S. Seasonal variations in groundwater levels between the wet and dry seasons are typical in rainfall-driven shallow aquifers like the SAS. Well C-492 has shown an overall decreasing trend of about 0.8 feet over the lifetime of the water level records, while L-1999 shows a slight increasing water level trend over the entire period of record. The time-series plot for FTDN-S shows a stable water level trend throughout its 30-year record.

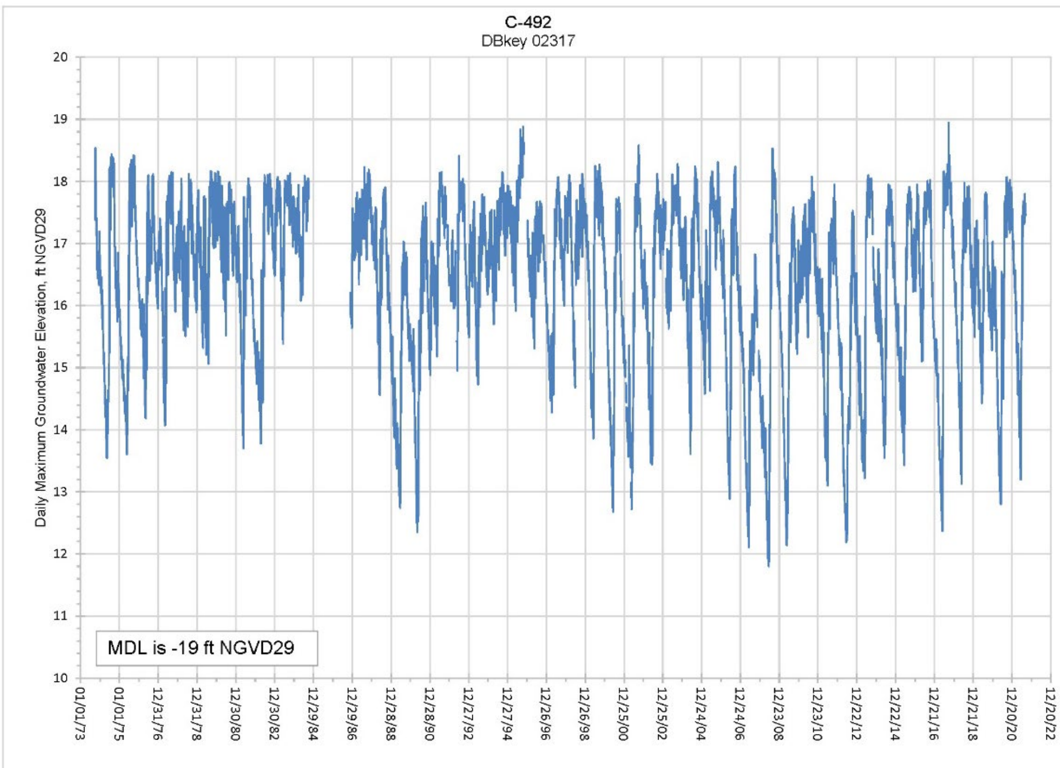

Figure 6-2. Water levels in Lower Tamiami aquifer monitor well C-492, northwestern Collier County.

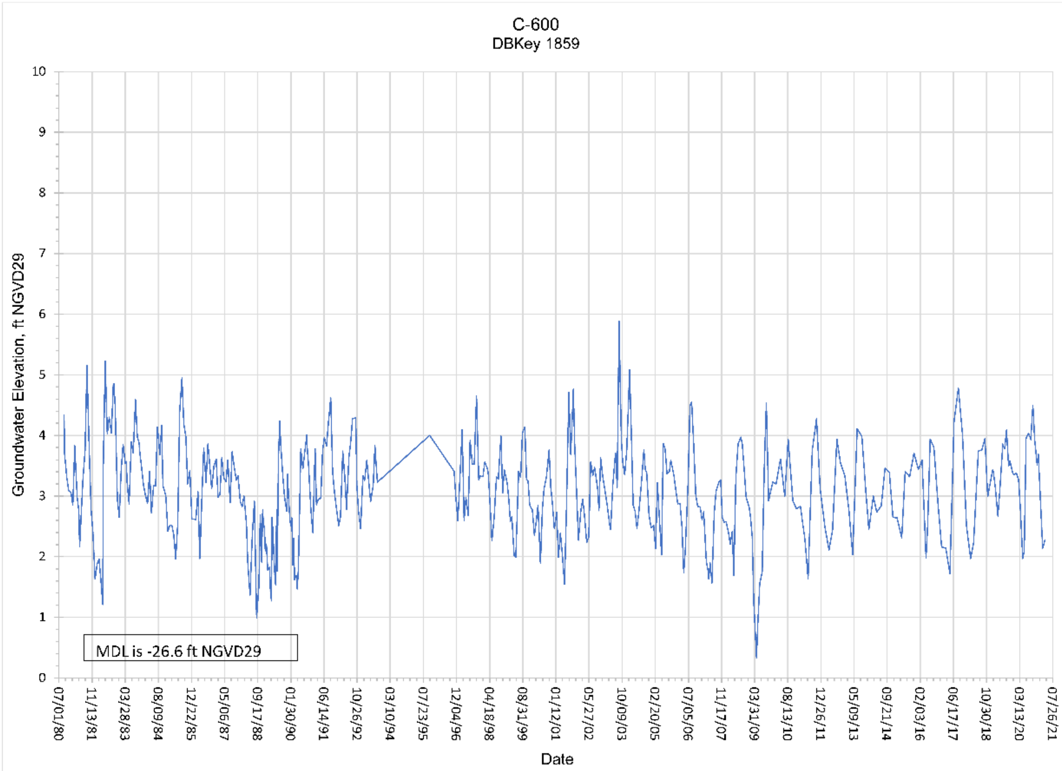

Figure 6-3. Water levels in USGS Lower Tamiami aquifer monitor well C-600, Collier County.

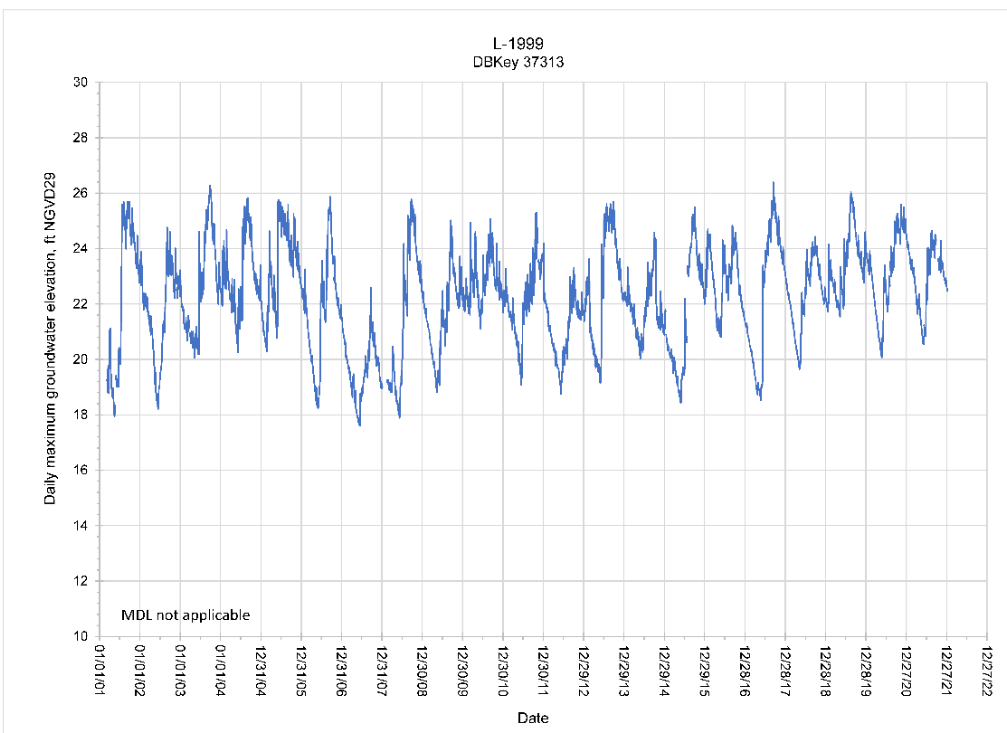

Figure 6-4. Water levels in surficial aquifer system monitor well L-1999, Lee County.

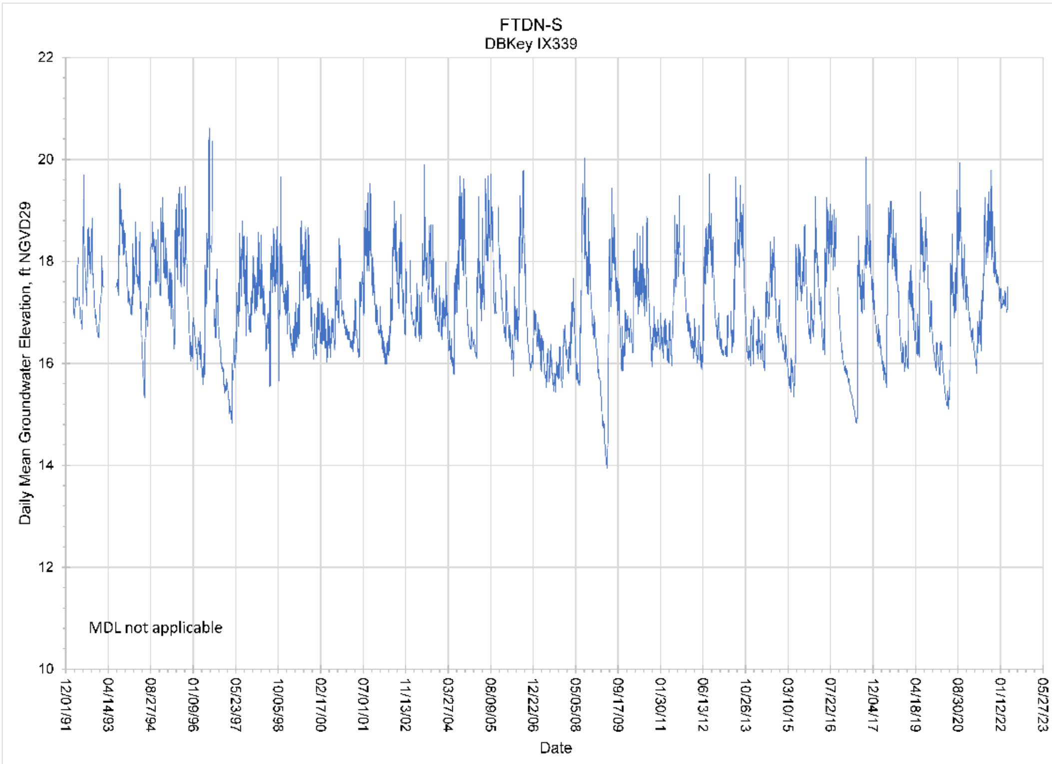

Figure 6-5. Water levels in surficial aquifer system monitor well FTDN-S, Hendry County.

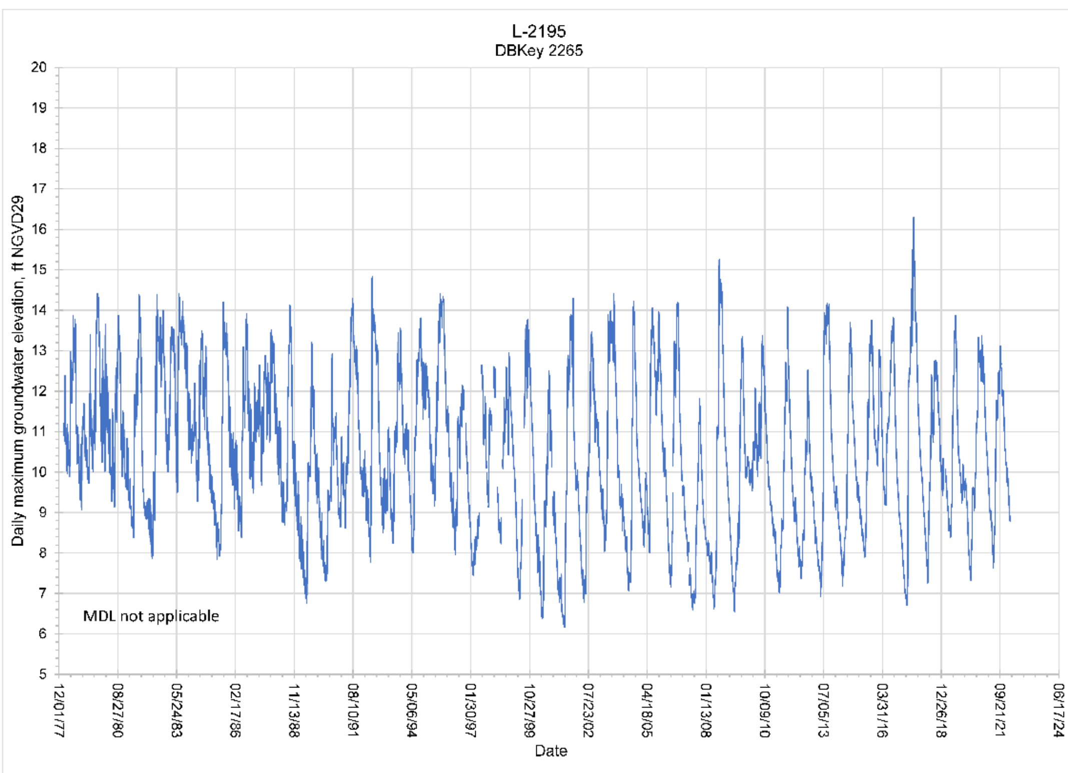

Figure 6-6. Water levels in surficial aquifer system monitor well L-2195, Lee County.

Intermediate Aquifer System Evaluation

In the LWC Planning Area, the IAS includes the Sandstone and Mid-Hawthorn aquifers. The Sandstone aquifer is used predominantly for AG and DSS. The Mid-Hawthorn aquifer is used by DSS and as a supplemental source for L/R and PS. The hydrologic data used in this plan update show a wide range in water levels in the IAS. The IAS is confined/semiconfined in the LWC Planning Area. The Mid-Hawthorn aquifer is recharged outside and north of the planning area, while the Sandstone aquifer receives some recharge locally (dampened because of the semiconfining rock unit above it) and from the north. Active IAS monitoring well locations are shown in **Figure 6-7**.

Intermediate Aquifer System Water Levels

Sandstone Aquifer

The time-series plots shown in **Figures 6-8** through **6-12** show steadily declining IAS groundwater elevations and relatively large variations in minimum and maximum groundwater elevations in Lehigh Acres. Prior to the 2000s, water level fluctuations between the wet and dry seasons in these wells varied by up to approximately 10 feet. Since about 2000, this variation has increased to approximately 20 feet. The overall declining groundwater elevation trend has caused some DSS wells to become inoperable. During the 2007 drought, 64% of the 526 replacement wells permitted by Lee County were in Lehigh Acres. Sandstone aquifer water levels have recovered near wellfields where withdrawals from this aquifer have been reduced. However, overall groundwater withdrawals from the IAS have increased in the LWC Planning Area.

In 2010, the SFWMD installed two Sandstone aquifer monitor wells (L-729 and L-2186) to help refine the top of the Sandstone aquifer and the MDLs for these two wells in Lehigh Acres (McMillon and Anderson 2015). This project and the results from other drilling in the area demonstrate the variability in the elevations of the top of the Sandstone aquifer.

From March 2017 to present, dry season water levels in well L-2186 have declined to less than 10 feet above (and sometimes less than 5 feet above) the MDL (9.1 feet National Geodetic Vertical Datum of 1929 [NGVD29]). Population in the Lehigh Acres area is expected to increase over the next few decades, and groundwater levels are expected to continue declining toward the MDL, particularly during the dry seasons and times of greater water use.

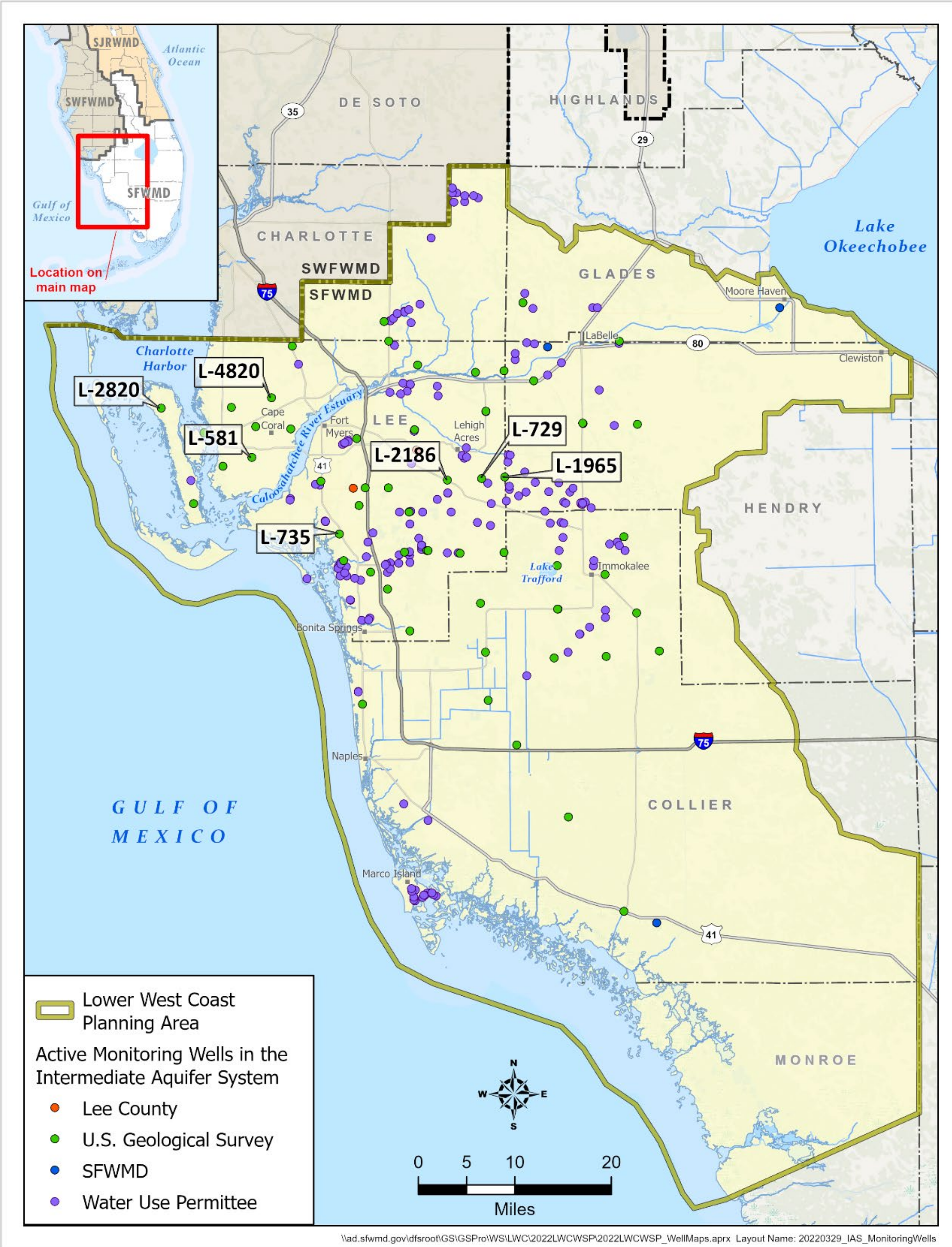

Figure 6-7. Active intermediate aquifer system water level monitor wells in the LWC Planning Area.

As shown in the time series plots for Sandstone aquifer wells L-729, L-2186, and L-1965 (**Figures 6-8** to **6-10**), water levels show declining trends with the usual seasonal variations. Water levels at well L-729 began to show a greater seasonal variation starting around 2001 and continuing into the present, with a slight overall decreasing trend. For approximately the last 15 years, the lowest groundwater elevations at L-729 have come within approximately 12 feet of the MDL elevation of -15 feet NGVD29. Water levels at Sandstone aquifer well L-2186 also show similar trends to well L-729, with increasing seasonal variations and declining water levels starting around 2000. During the dry season at L-2186, the water levels have dropped to within about 3 to 8 feet of the MDL elevation of -9.1 feet NGVD29. At Sandstone aquifer well L-1965, the same declining water level trend is visible. Slightly greater seasonal fluctuations in water levels are seen at L-1965 than those seen in L-729 and L-2186, with numerous MDL violations recorded at L-1965 since late 1999. The time-series plots indicate a long-term decline in available groundwater with increasingly greater seasonal variations and lower groundwater elevations during dry seasons.

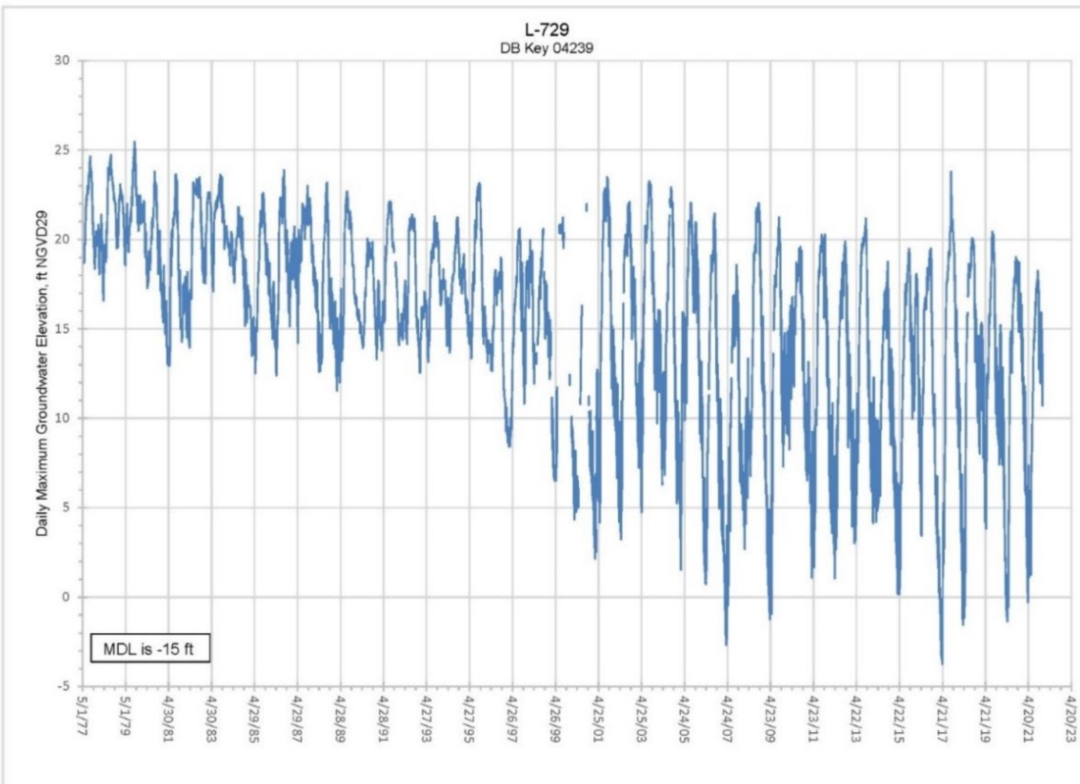

Figure 6-8. Water levels in Sandstone aquifer well L-729 in Lehigh Acres.

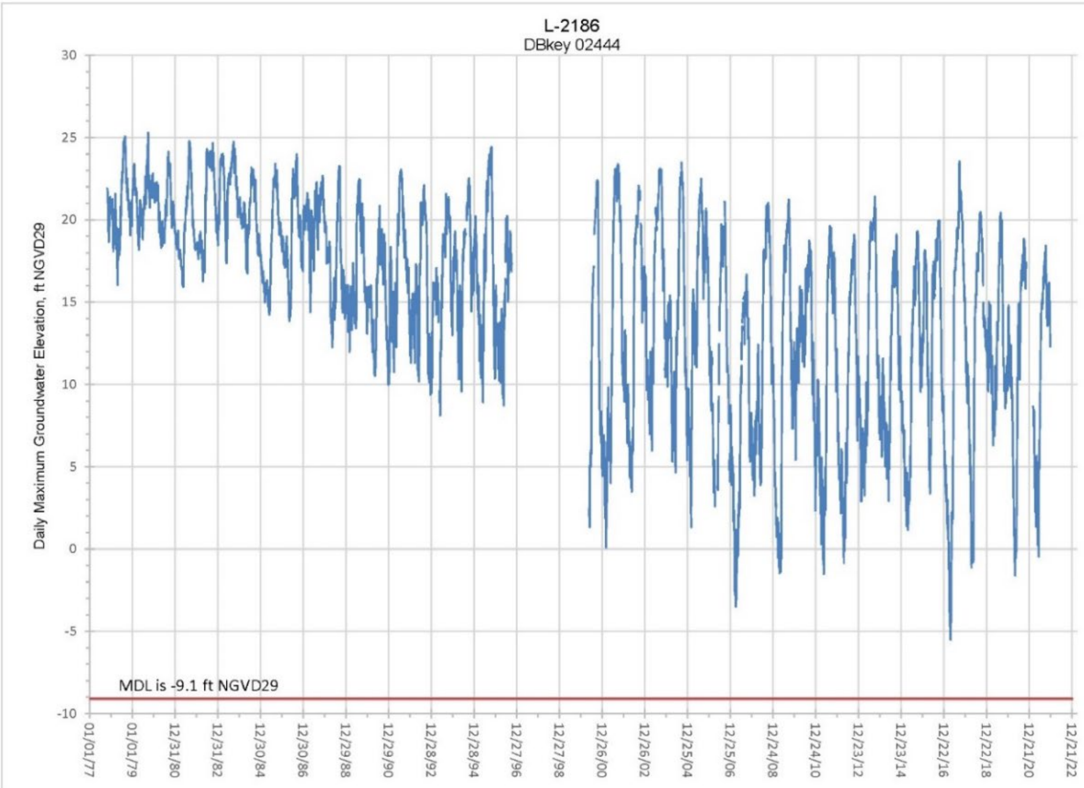

Figure 6-9. Water levels in Sandstone aquifer well L-2186 in Lehigh Acres.

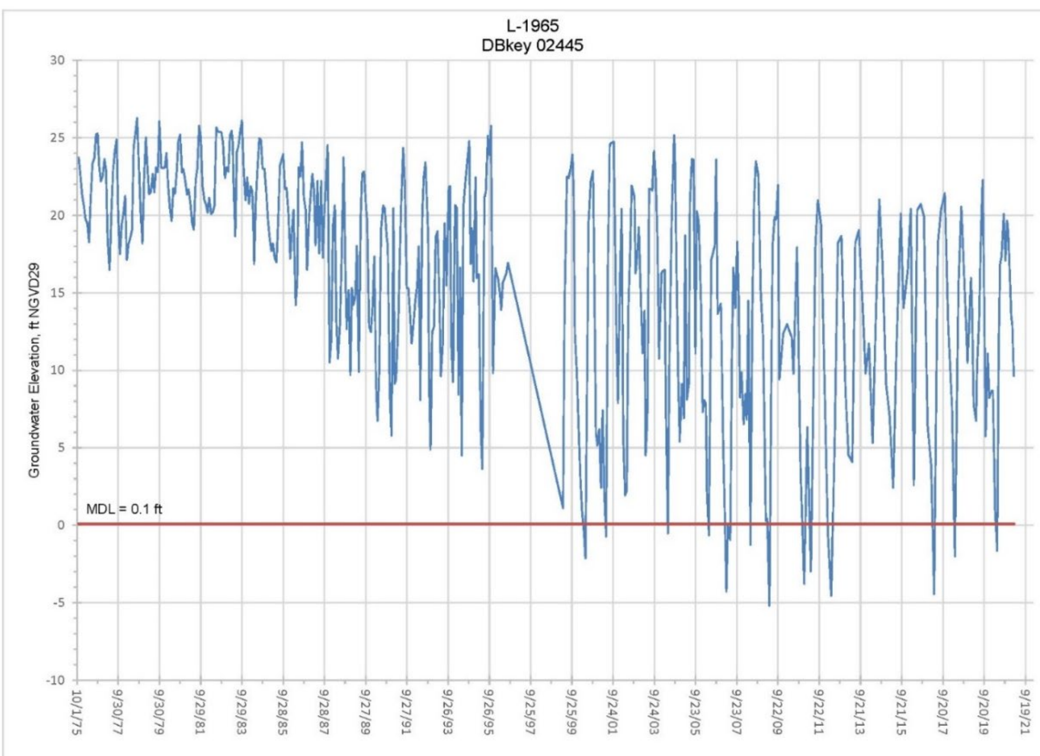

Figure 6-10. Water levels in Sandstone aquifer well L-1965 in Lehigh Acres.

Mid-Hawthorn Aquifer

In contrast to the declining trends observed for the IAS/Sandstone aquifer in Lehigh Acres, water levels within the Mid-Hawthorn aquifer have risen substantially in southern Cape Coral due to PS and reclaimed water service area expansion by the City of Cape Coral, which decreased DSS withdrawals from the Mid-Hawthorn (as shown by the increasing groundwater elevations at L-581; **Figure 6-11**). PS for this portion of Cape Coral is derived primarily from the FAS, which is hydraulically isolated from the IAS and SAS. Expansion of the southern Cape Coral service area as well as increased use of the FAS and reclaimed water were identified in the 2012 LWC Plan Update as partial solutions to diminishing IAS water availability in the area.

However, in northern Cape Coral not yet served by PS, water levels in the Mid-Hawthorn aquifer have continued to decline as shown in the hydrograph for well L-4820, where groundwater elevations are now approximately 65 feet lower than they were in 2003 (**Figure 6-12**). In addition, the MDL of -81 feet NGVD29 was exceeded twice (from March 27, 2020 to June 1, 2020 and from March 25, 2021 to July 5, 2021). Continued reliance on this IAS aquifer will cause further water level declines, which reinforces the need for AWS development to ensure adequate future water supply.

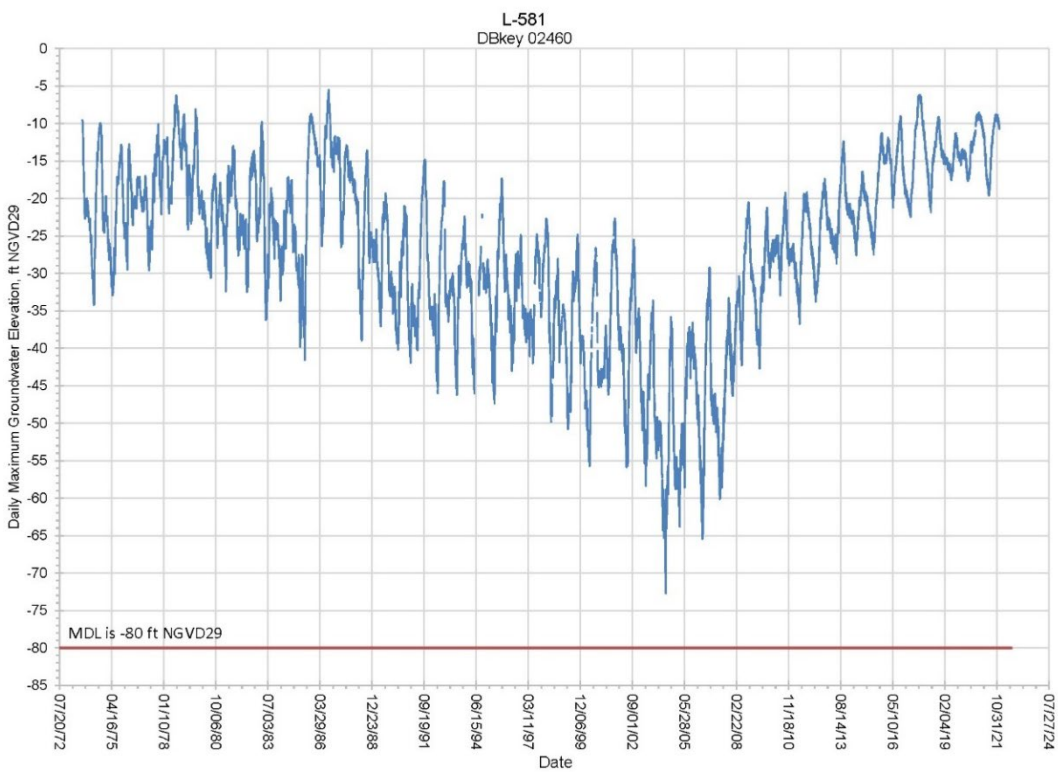

Figure 6-11. Water levels in Mid-Hawthorn aquifer well L-581 in southern Cape Coral.

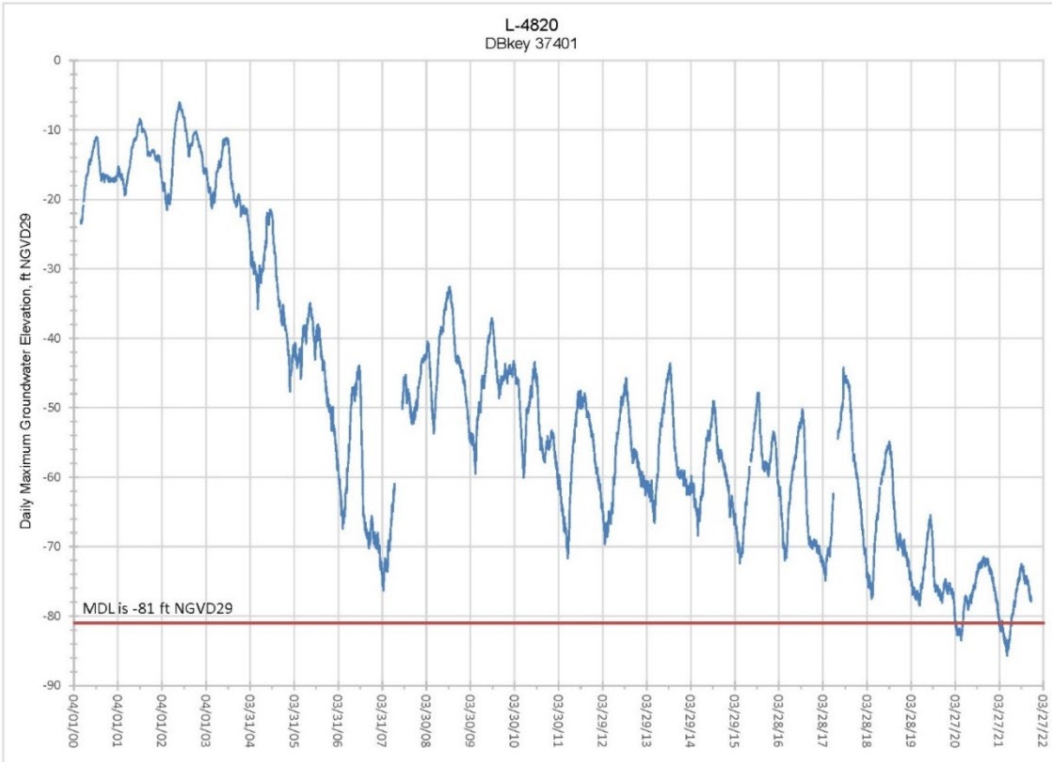

Figure 6-12. Water levels in Mid-Hawthorn aquifer well L-4820 in northern Cape Coral.

Surficial and Intermediate Aquifer System Water Quality

Water quality monitoring is crucial to managing and protecting fresh groundwater sources such as the SAS and IAS. The concentrations of chloride detected in groundwater samples are used as indicators of saltwater intrusion, which can occur due to the inland movement of the saltwater interface, or due to upward movement of saline groundwater (upconing) from underlying geologic units. Upconing and leakage from deeper brackish aquifers can occur through a variety of mechanisms including sustained overpumping, or flow through improperly abandoned or designed wells that are open to multiple aquifers. Chloride concentrations must be below the United States Environmental Protection Agency secondary drinking water standard of 250 milligrams per liter (mg/L) to meet the drinking water standard (United States Environmental Protection Agency 2021).

Saltwater Interface Mapping

The SFWMD periodically develops saltwater interface maps to help visualize and understand the potential degradation of the coastal aquifers and water supply wellfields tapping the SAS and IAS (**Appendix D**). Salinity data from monitor wells were compiled from multiple sources (e.g., USGS, SFWMD, water use permittees) and contoured to estimate the position of the saltwater interface, defined as the isochlor line with a 250 mg/L chloride concentration. To date, three series of maps have been developed (2009, 2014, and 2019), with plans to update the maps every 5 years. This approach tracks the position of the saltwater interface over time, can be used to identify areas of concern that may need additional monitoring, and may suggest the need for changes in wellfield operations. The SFWMD's saltwater interface monitoring and mapping program is described by Shaw and Zamorano (2020). The 2019 saltwater interface maps are available on the SFWMD's webpage https://www.sfwmd.gov/documents-by-tag/saltwaterinterface.

In general, the 2019 maps are similar to the 2014 maps; however, relatively small differences indicate that the interface is regionally dynamic, with inland movement in some areas and seaward movement in other areas. Local-scale investigation of the saltwater interface could be warranted in some areas, depending on the network of monitor wells available, the proximity of the saltwater interface to specific wellfields, and groundwater withdrawal rates at these wellfields. The 2019 saltwater interface maps for the Water Table, Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers are presented in **Appendix D**.

Water Quality Data from Selected PS Wellfields in the SAS

For water supply, the primary concern of rising sea levels is the inland migration of salt water. In coastal South Florida, saltwater intrusion has been an issue since humans began draining lands for development and withdrawing groundwater for drinking and irrigation supplies. Sea level rise is anticipated to exacerbate the situation. Several PS utilities in the LWC Planning Area use the SAS for all or part of their water needs, and several utilities have limited ability to desalinate water. Therefore, many utilities are required by their water use permit to maintain chloride monitoring to identify possible inland movement of the saltwater interface. This section includes the historical plots of chloride concentrations from a few PS wellfields that withdraw water from the SAS. An additional discussion of the PS utilities that are particularly vulnerable to dry conditions within the LWC Planning Area is included in **Appendix D**.

Naples Coastal Ridge Wellfield

Naples has been utilizing the groundwater from the Lower Tamiami aquifer at the Coastal Ridge wellfield since the 1960s. The city has maintained a vigilant water quality monitoring and wellfield operating regime (in tandem with operation of the East Golden Gate wellfield) that has successfully provided continued withdrawals from the aquifer without causing a significant deterioration of water quality from the production wells (**Figure 6-13**).

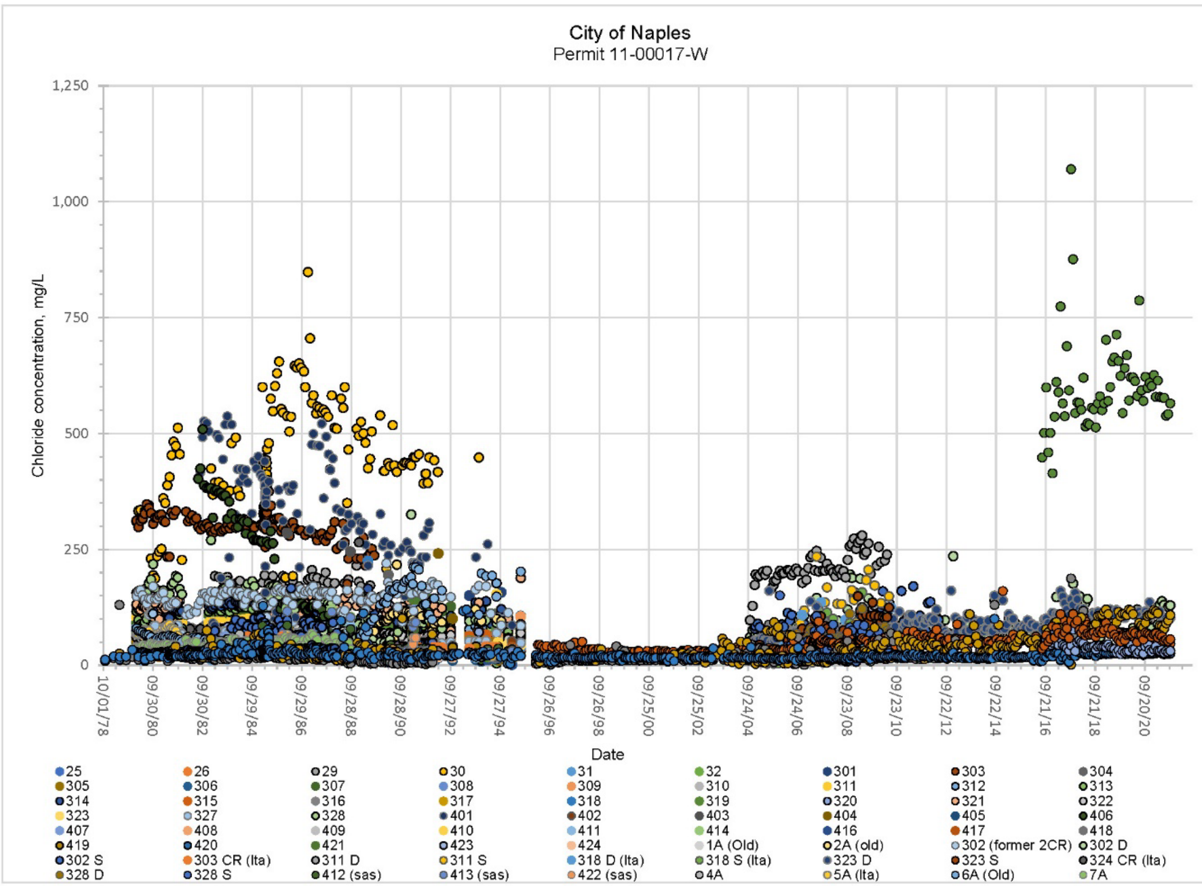

Figure 6-13. Chloride concentrations in the Naples Coastal Ridge wellfield.

Bonita Springs West Wellfield

The Bonita Springs West wellfield has been utilizing the Lower Tamiami aquifer for PS since the early 1980s. Over the last 14 years, all the chloride concentrations are stable with most of the wells containing chloride concentrations below about 150 mg/L, with well MW-1 reporting values around 300 mg/L. Well 1 contained elevated chloride concentrations between 1,200 mg/L and 350 mg/L; however, use of this well was discontinued in 2007 (**Figure 6-14**).

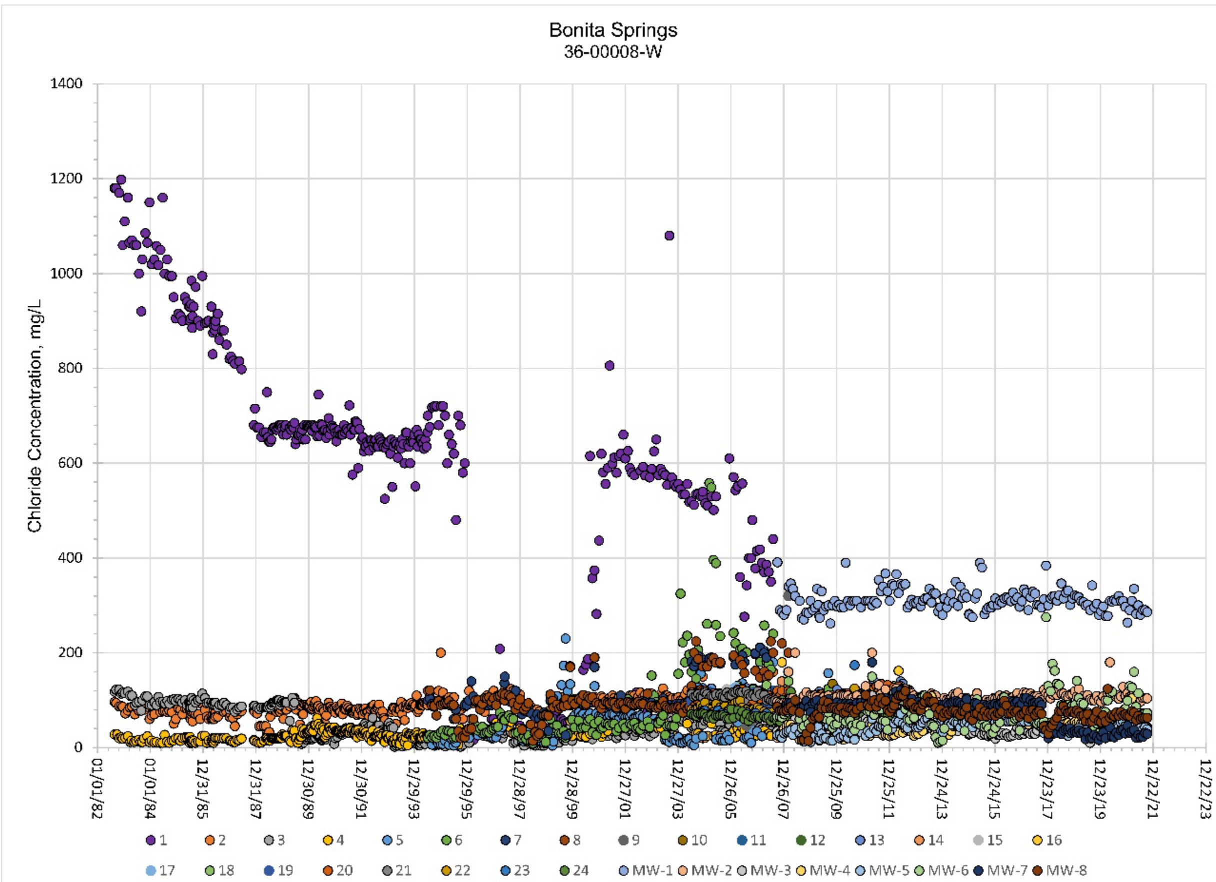

Figure 6-14. Chloride concentrations in the Bonita Springs West wellfield.

Lee County Green Meadows

Lee County Utilities has been utilizing the SAS at the Green Meadows wellfield for PS since 1985. Over the last 10 years, the chloride concentrations have been fairly stable with the majority of the wells containing chloride concentrations below about 80 mg/L, with a number of the wells showing a slight decreasing trend in chloride concentrations (**Figure 6-15**).

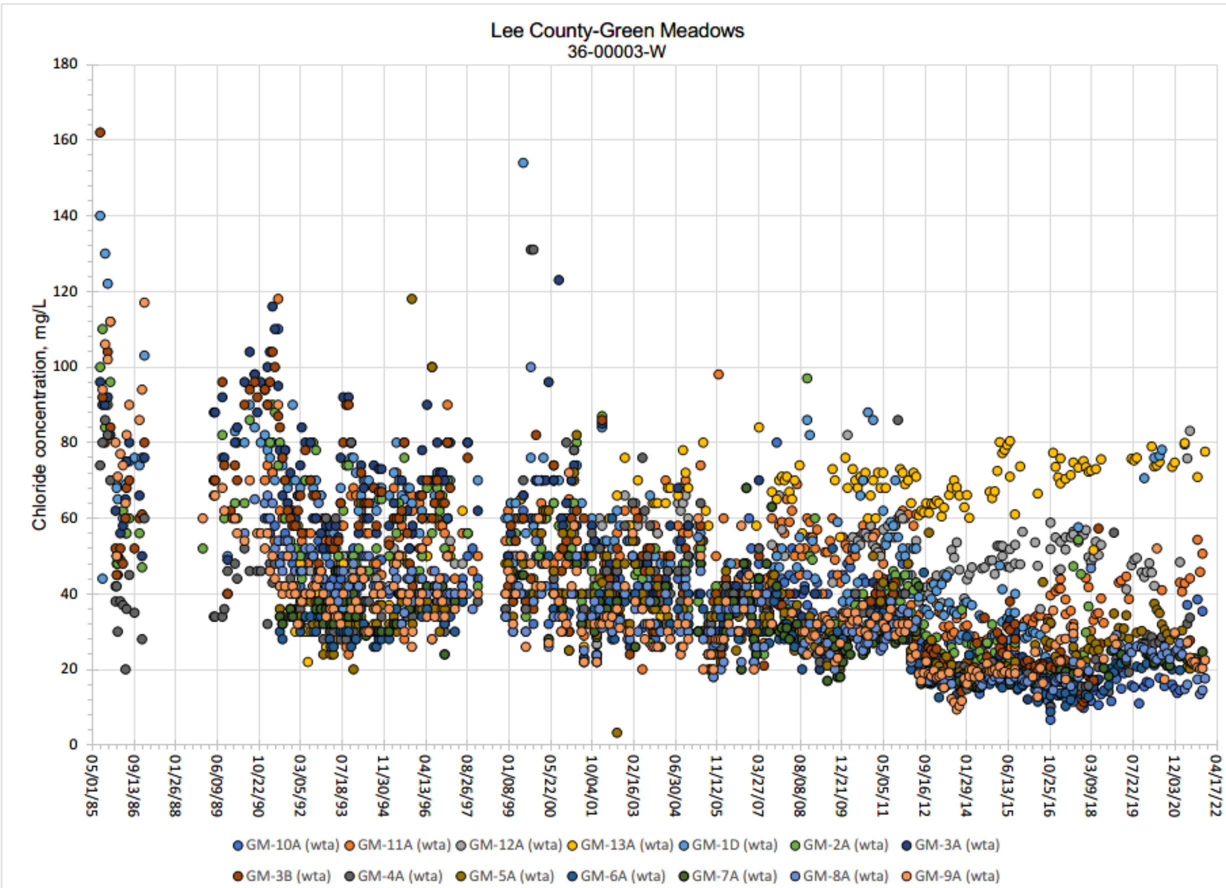

Figure 6-15. Chloride concentrations in the Lee County Green Meadows surficial aquifer system wellfield.

Surficial and Intermediate Aquifer Groundwater Modeling

The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) was designed to evaluate the sustainability of existing and projected future LWC Planning Area demands from the SAS and IAS. The LWCSIM was used to identify areas where cumulative water use withdrawals may harm existing groundwater resources and natural systems (e.g., wetlands). The modeling effort also investigated the potential for increased risk of saltwater intrusion in the SAS and IAS. The results from the model simulations indicated that no widespread impacts are anticipated from groundwater withdrawals through 2040. The total demand projection for 2045 in this 2022 LWC Plan Update is 3% less than the estimated 2040 demand projected in the 2017 LWC Plan Update. Therefore, the modeled results are considered to be representative of the future demands. The LWCSIM indicated a few localized areas that require continued monitoring, additional planning, and adaptive management strategies to prevent harmful impacts to groundwater resources and wetlands in the future. The LWCSIM also indicated that groundwater withdrawals at the projected 2040 demand levels do not pose an increased risk of saltwater intrusion near major public supply wellfields in the coastal portions of the SAS and IAS. **Figures 6-16** and **6-17** present the difference between 2020 and 2040 water levels in the Water Table aquifer (SAS) and the Sandstone aquifer (IAS). Additional graphics and a summary discussion of the LWCSIM results are provided in **Appendix D** and within the complete model application report (Bandara et al. 2020).

Surficial and Intermediate Aquifer System Conclusions

Analyses of the SAS and IAS indicate that water availability for increased water allocations is limited in many areas and cannot be the primary source for all projected water demands in the LWC Planning Area without harming the water resource including related natural systems. Water levels and water quality in the SAS appear to be stable at current withdrawal rates as available from saltwater intrusion monitoring mapping data and PS wellfield information. IAS water levels are declining towards established MDL/MFL elevations in localized areas of Cape Coral and Lehigh Acres. Northern expansion of Cape Coral's water services should address this resource concern; however, a sustainable water strategy needs to be developed for Lehigh Acres. AWS sources such as the FAS and reclaimed water will need to be expanded to meet increasing water demands in many urbanized areas.

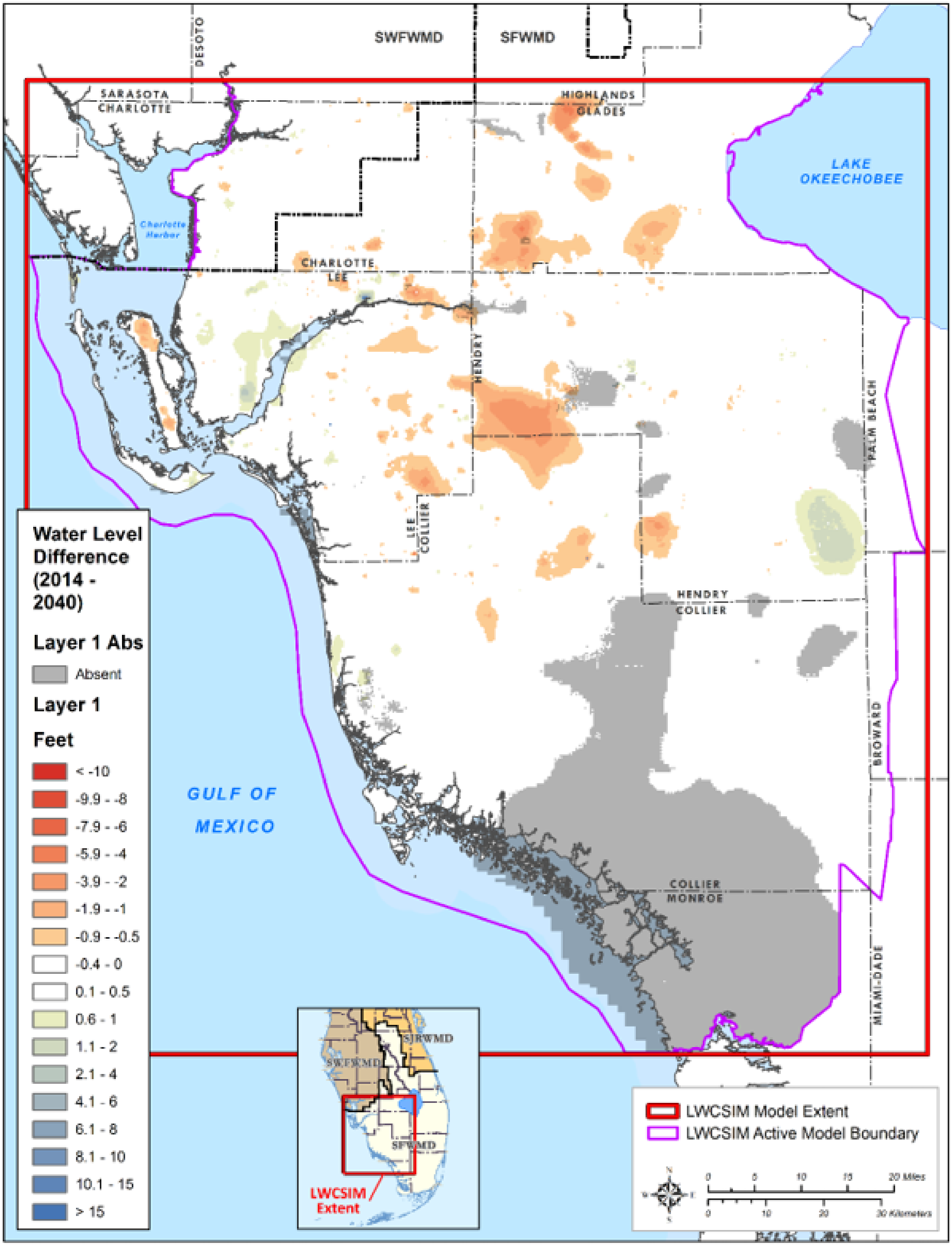

Figure 6-16. 2014 to 2040 water level difference in the Water Table aquifer (SAS).

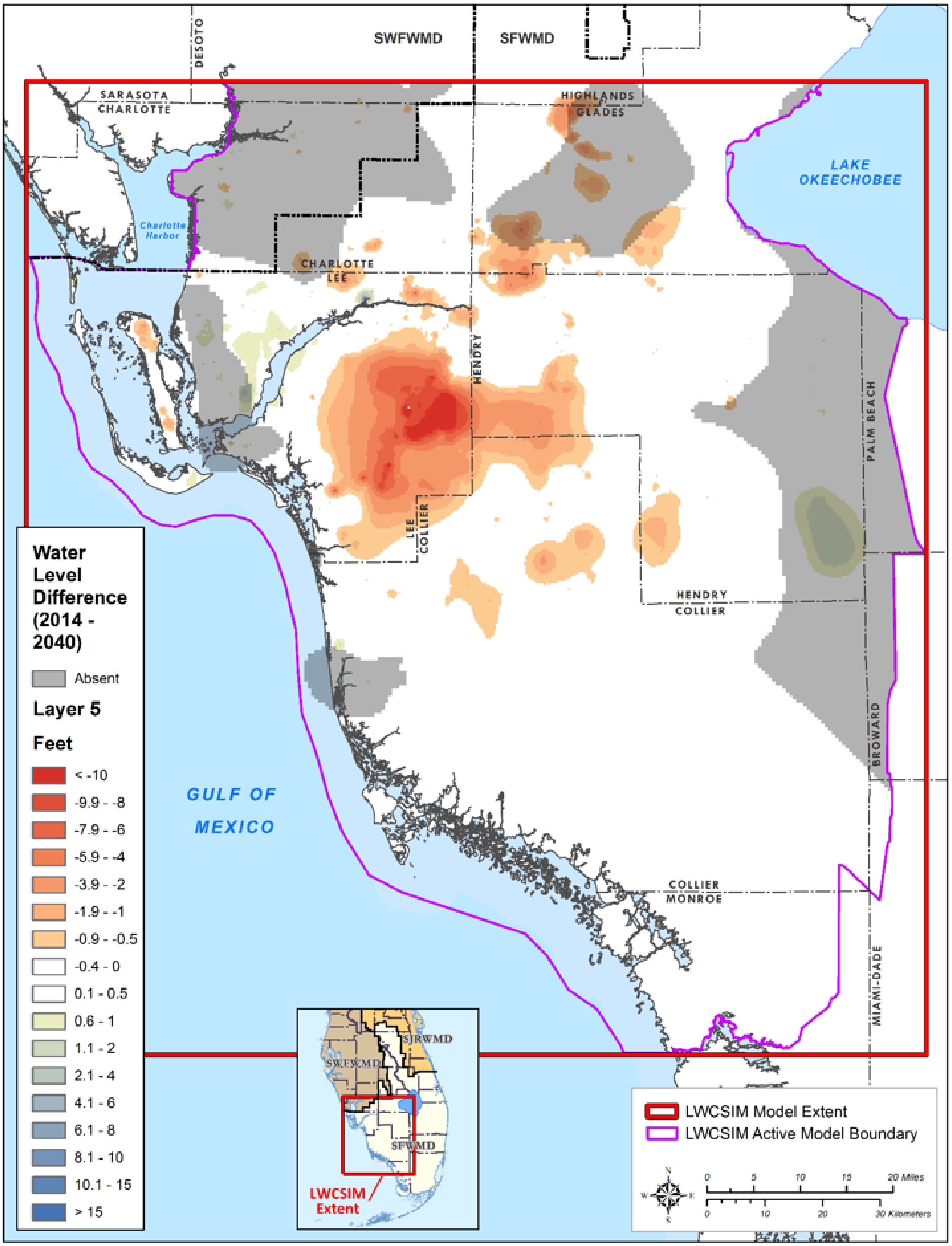

Figure 6-17. 2014 to 2040 water level difference in the Sandstone aquifer (IAS).

Floridan Aquifer System Analysis

The FAS is a productive and important aquifer used primarily by PS utilities as an AWS. As development of the SAS and IAS became maximized without causing harm to the water resources, most utilities have used the FAS to meet a portion of their current demands, and these utilities are anticipating expansion of FAS wellfields to meet future demands (**Chapter 8**). The FAS is brackish in the LWC Planning Area and requires desalination treatment prior to use. FAS wells primarily pump from the brackish UFA. Currently, the Avon Park permeable zone (APPZ), and the Lower Floridan aquifer are not used as water sources in the LWC Planning Area.

Water availability from the FAS is affected primarily by water quality degradation, which can be managed through appropriate wellfield design and operating protocols. One of the key objectives is to minimize upconing of saline water from deeper portions of the aquifer. PS utilities can increase well spacing between newly installed wells to minimize interference effects and excessive drawdowns, rotate the operation of individual wells to reduce pumping stress and excessive drawdowns, reduce pumping rates, and plug and abandon wells that have shown an increase in chloride concentrations or that were designed with open intervals intersecting multiple aquifer zones of varying water quality. Most PS utilities are required to monitor water quality at their wellfields as part of their water use permits. Future strategies to address managing withdrawals to minimize water quality degradation are provided in **Chapter 9**.

Groundwater monitoring provides water users with an understanding of the hydrogeologic system through long-term systematic data collection, which is needed to evaluate current and expected future groundwater conditions, detect temporal trends in water levels and water quality, and develop and calibrate groundwater models. The SFWMD's Regional Floridan Groundwater (RFGW) monitoring program consists of a network of monitor wells completed in the various producing zones of the FAS (i.e., UFA, APPZ). Data collected from the RFGW program includes lithologic data, groundwater level data, and groundwater quality data, all of which are crucial to evaluating the water supply potential of the FAS.

Floridan Aquifer System Water Levels

PS utilities are expanding their use of the FAS to meet increased water demands. Due to this increased use, it is important to monitor water levels to identify any impacts to the resource. Regional FAS monitor well locations in the LWC Planning Area are shown in **Figure 6-18**. For water supply planning purposes, four FAS monitor wells were chosen as representative of trends in regional water levels. Water level time series plots for these wells are presented in this section.

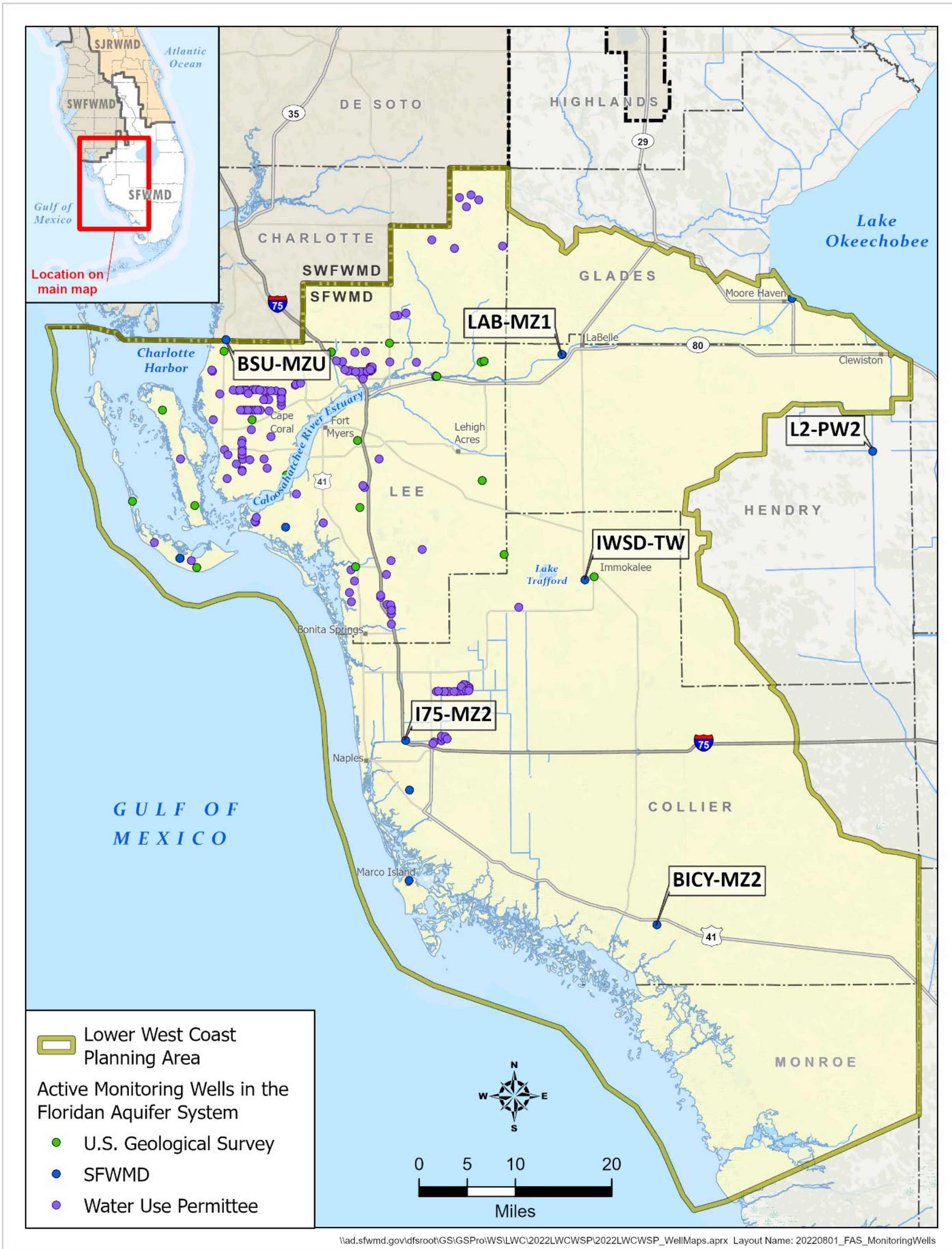

Figure 6-18. Regional Floridan Aquifer Groundwater monitoring wells in the LWC Planning Area.

As shown in **Figure 6-19**, groundwater levels at well BICY-MZ2 (BICY-TW), located in Big Cypress Swamp, show seasonal fluctuations of approximately 1 foot, with variability in the overall water level trend over the entire record. Groundwater elevations reached their highest elevations in 2020.

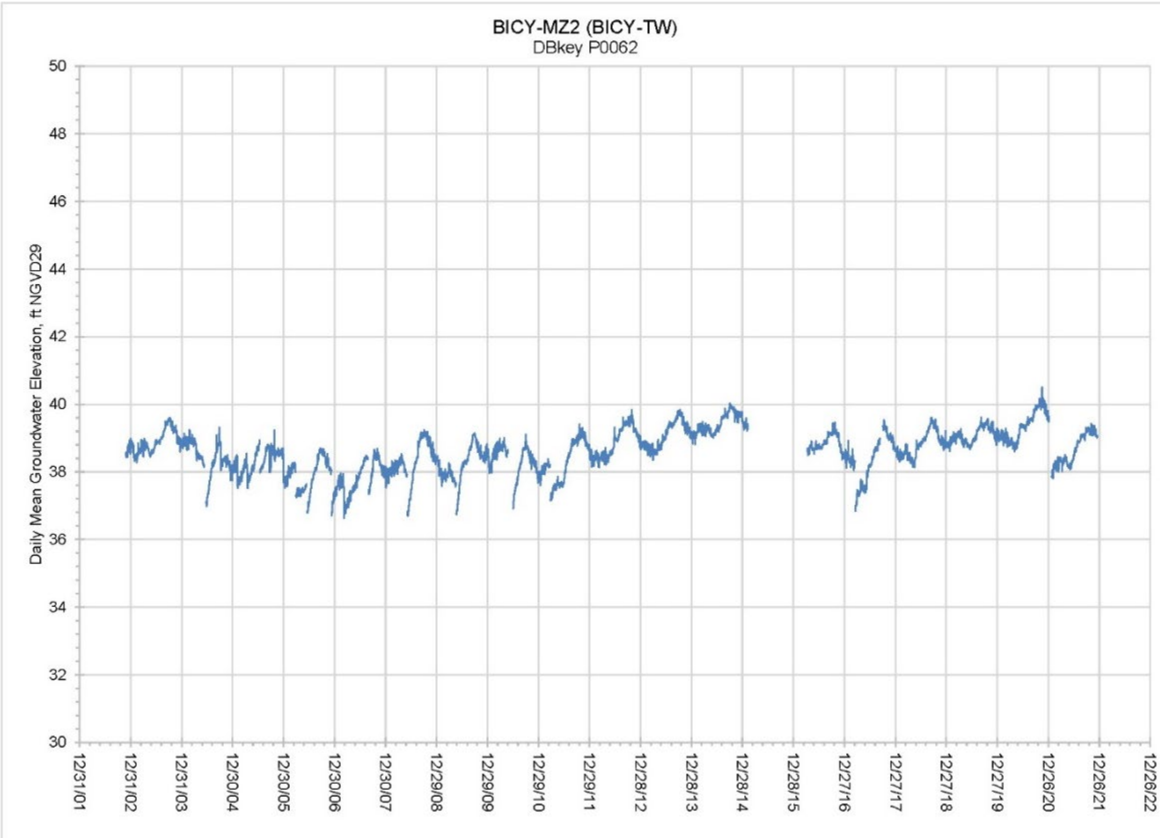

Figure 6-19. Water levels in Floridan aquifer system monitor well BICY-MZ2 (BICY-TW), Big Cypress Swamp, Collier County.

As shown in **Figure 6-20**, water levels at well I75-MZ2 (I75-TW), located near Naples, seasonally fluctuate between 2 to 3 feet. Longer-term trends also can be seen. For example, from a high in 2003 of 36.32 feet NGVD29, a downward trend continued through 2007, when the record low of 30.88 feet NGVD29 was recorded. During the subsequent 10 years, there was a gradual recovery in groundwater elevations throughout each wet-dry season cycle, with a high of +35.75 feet NGVD29 following the 2016 wet season. Since 2016, the water levels appear to be fairly stable.

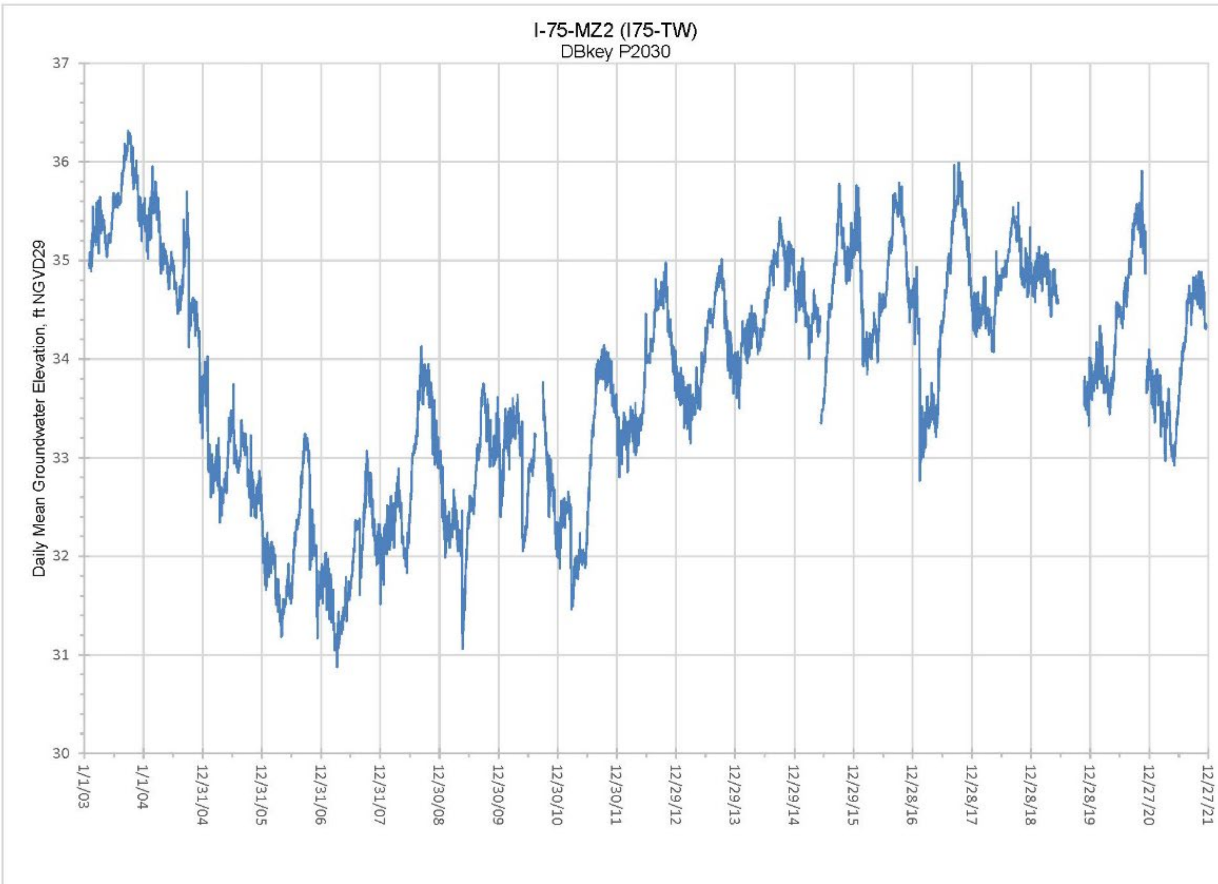

Figure 6-20. Water levels in Floridan aquifer system monitor well I75-MZ2 (I75-TW), Collier County.

As shown in **Figure 6-21**, water levels at well LAB-MZ1 (LAB-PW2), located in LaBelle, seasonally fluctuate approximately 2 to 3 feet. The overall long-term water level trend is stable.

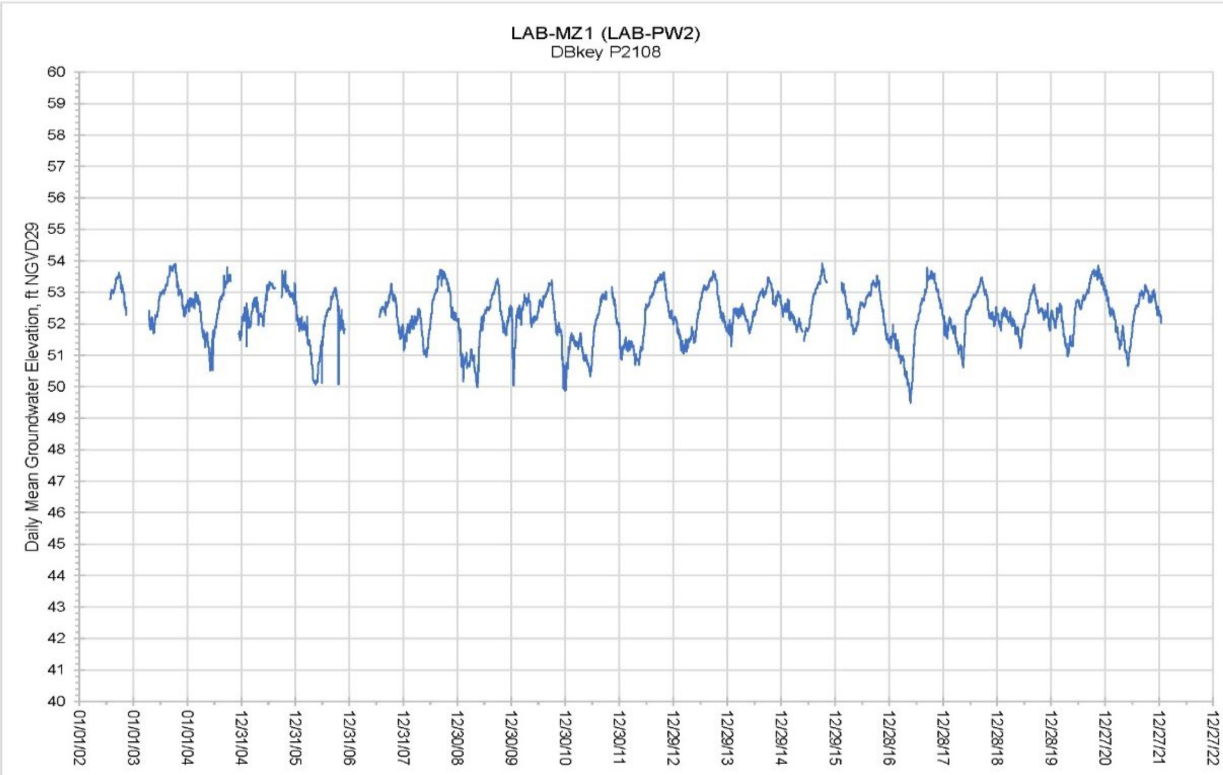

Figure 6-21. Water levels in Upper Floridan aquifer monitor well LAB-MZ1 (LAB-PW2), Glades County.

As shown in **Figure 6-22**, groundwater elevations in well L2-PW2, located in western Hendry County, seasonally fluctuate up to approximately 2 feet. The overall long-term water level trend is stable.

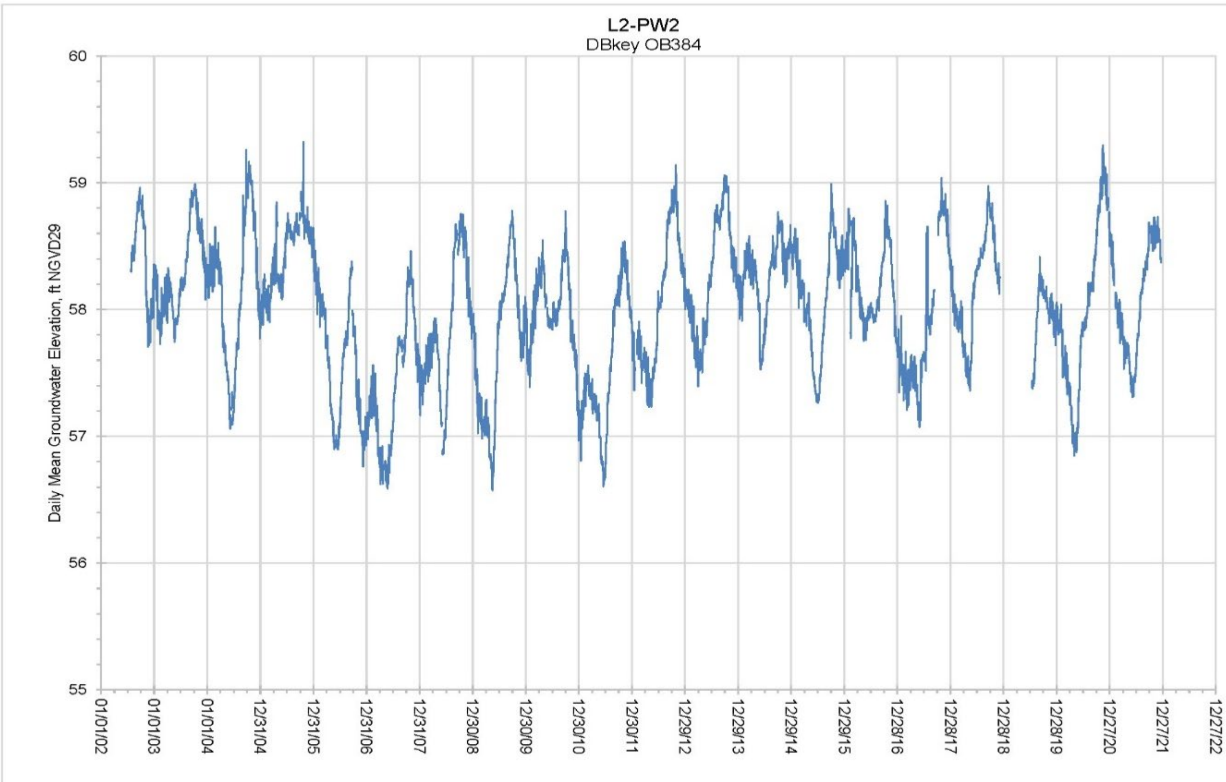

Figure 6-22. Water levels in Upper Floridan aquifer monitor well L2-PW2, western Hendry County.

In summary, data from these monitoring wells indicate that regional UFA groundwater levels are stable, with expected seasonal fluctuations. While the magnitude of these fluctuations may vary from year to year, no UFA monitor wells show declining trends.

Upper Floridan Aquifer Water Quality

This section discusses chloride concentrations in the UFA at six monitor wells shown in **Figure 6-18**. The chloride concentration results are varied, with maximum historical concentrations ranging from 851 mg/L at L2-PW2 to 4,300 mg/L at I75-MZ2.

As shown in **Figure 6-23**, groundwater samples from well BSU-MZU (BSU-MW), have chloride concentrations that fluctuate by approximately 250 mg/L over the period of record. The minimum chloride concentration (650 mg/L) was in December 2006, and the maximum chloride concentration (900 mg/L) was in October 2020. Since 2008, the sampling frequency has decreased, but the chloride concentrations have increased from 772 mg/L in May 2009 to 807 mg/L in February 2016 and, finally, to the maximum recorded concentration of 900 mg/L in October 2020.

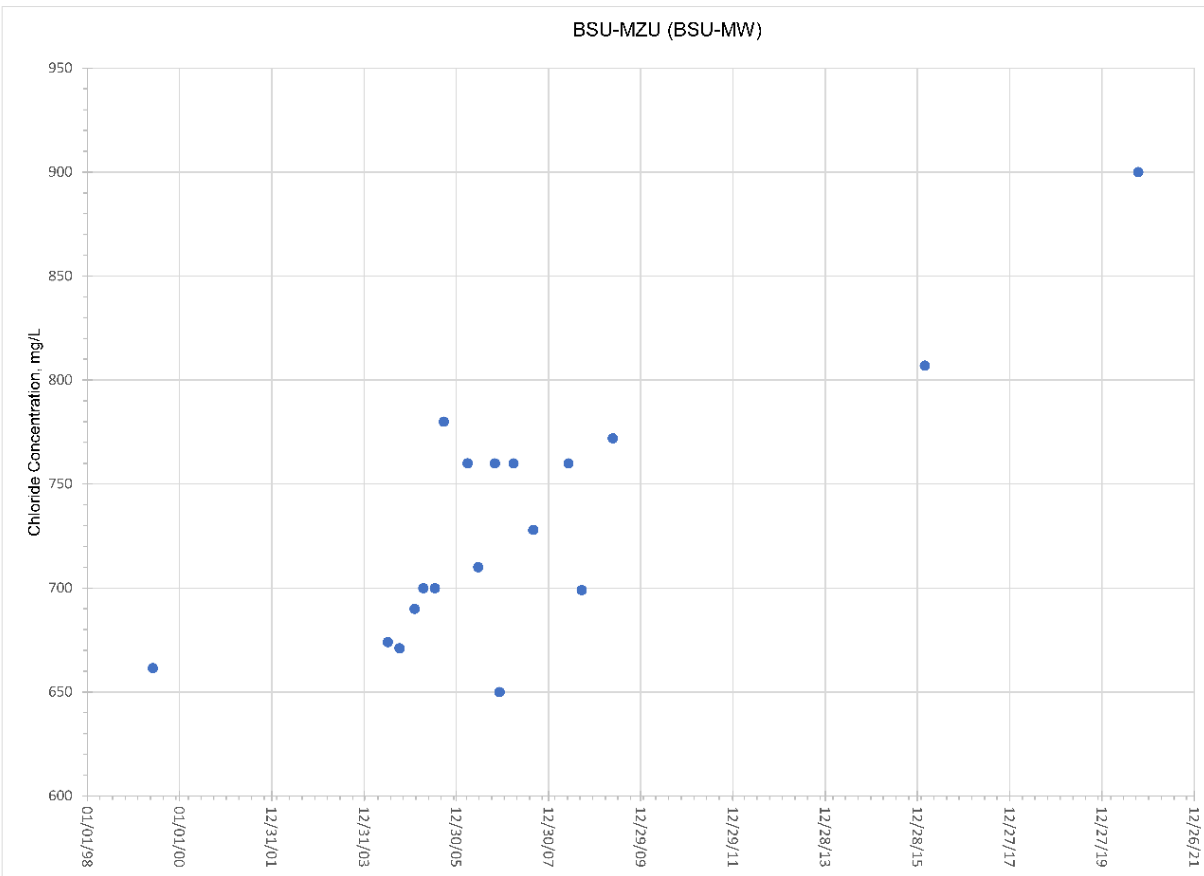

Figure 6-23. Chloride concentrations in Upper Floridan aquifer monitor well BSU-MZU (BSU-MW), southwestern Charlotte County.

As shown in **Figure 6-24**, well BICY-MZ2 (BICY-TW), located in Big Cypress Swamp, has chloride concentrations that generally fluctuate by 500 mg/L over the period of record, except for the approximately 1,300 mg/L variation observed in 2006 and 2008. Overall, and since 2008, chloride concentrations have been consistent and predominantly fall around the average for the period of record (2,628 mg/L). The two most recent samples showed similar chloride concentrations close to 2,750 mg/L.

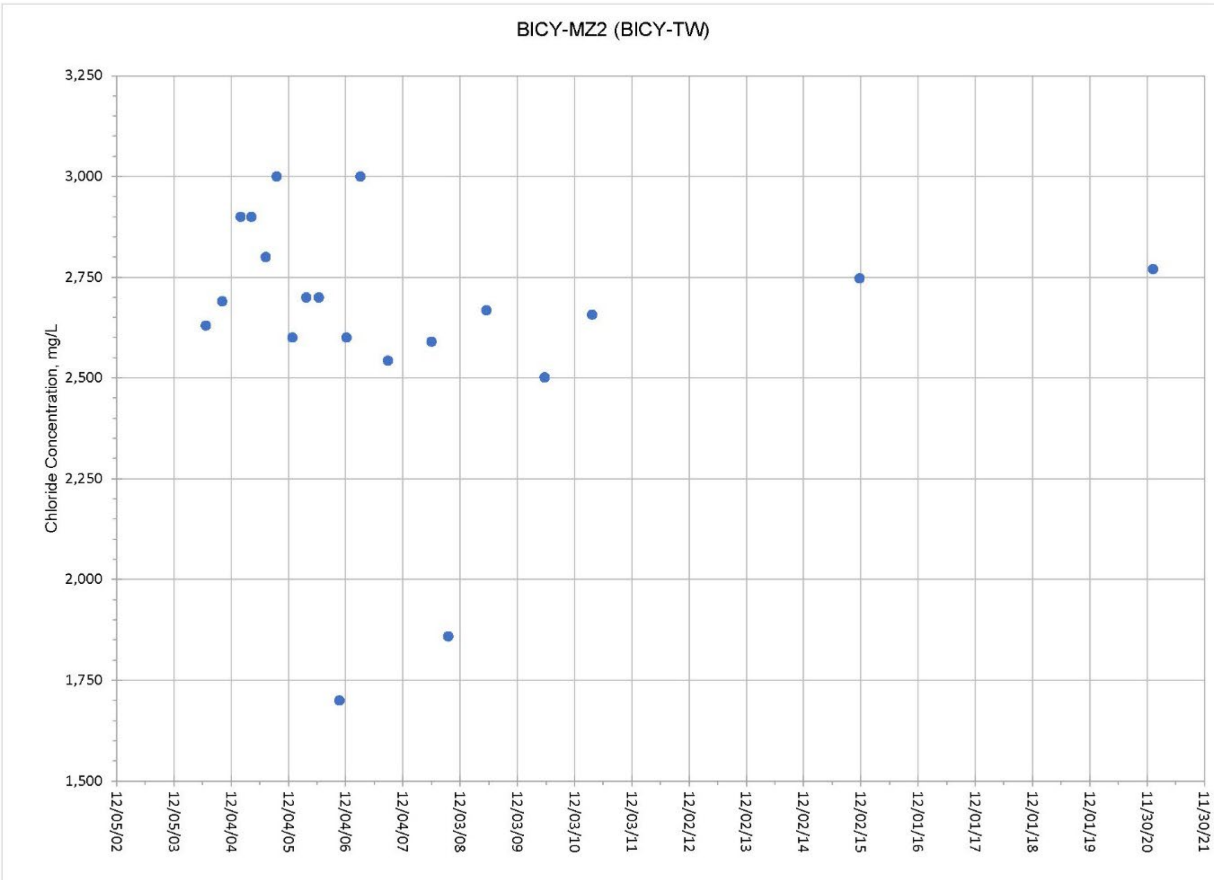

Figure 6-24. Chloride concentrations in Upper Floridan aquifer monitor well BICY-MZ2 (BICY-TW), Big Cypress Swamp.

As shown in **Figure 6-25**, well I75-MZ2 (I75-TW), located near Naples, has chloride concentrations fluctuating approximately 1,300 mg/L over the period of record, with the most recent sample (December 2020) having a chloride concentration of 3,659 mg/L, close to the long-term average chloride concentration of 3,753 mg/L for this well, but 357 mg/L higher than the last sample collected on February 23, 2016.

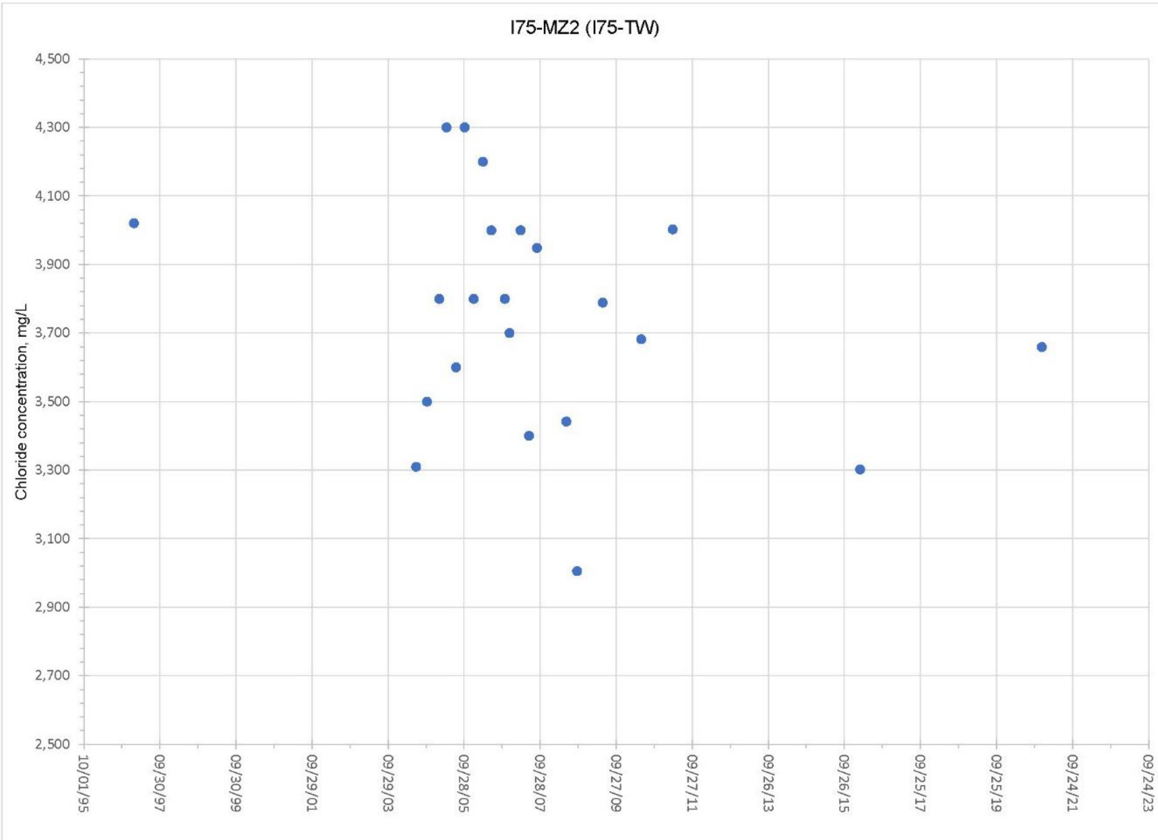

Figure 6-25. Chloride concentrations in Upper Floridan aquifer monitor well I75-MZ2 (I75-TW), Naples.

As shown in **Figure 6-26**, well ISWD-TW (IWSD-MZ2), located in Immokalee, has chloride concentrations that generally fluctuate by approximately 200 mg/L over the period of record. Both the minimum and maximum chloride concentrations occurred in 2005 (September and February, respectively). The two most recent samples (January 2016 and October 2020) had chloride concentrations close to the average value for the entire period of record. Chloride concentrations appear to be stable at this well although gaps of 4 to 6 years exist between the last three samples.

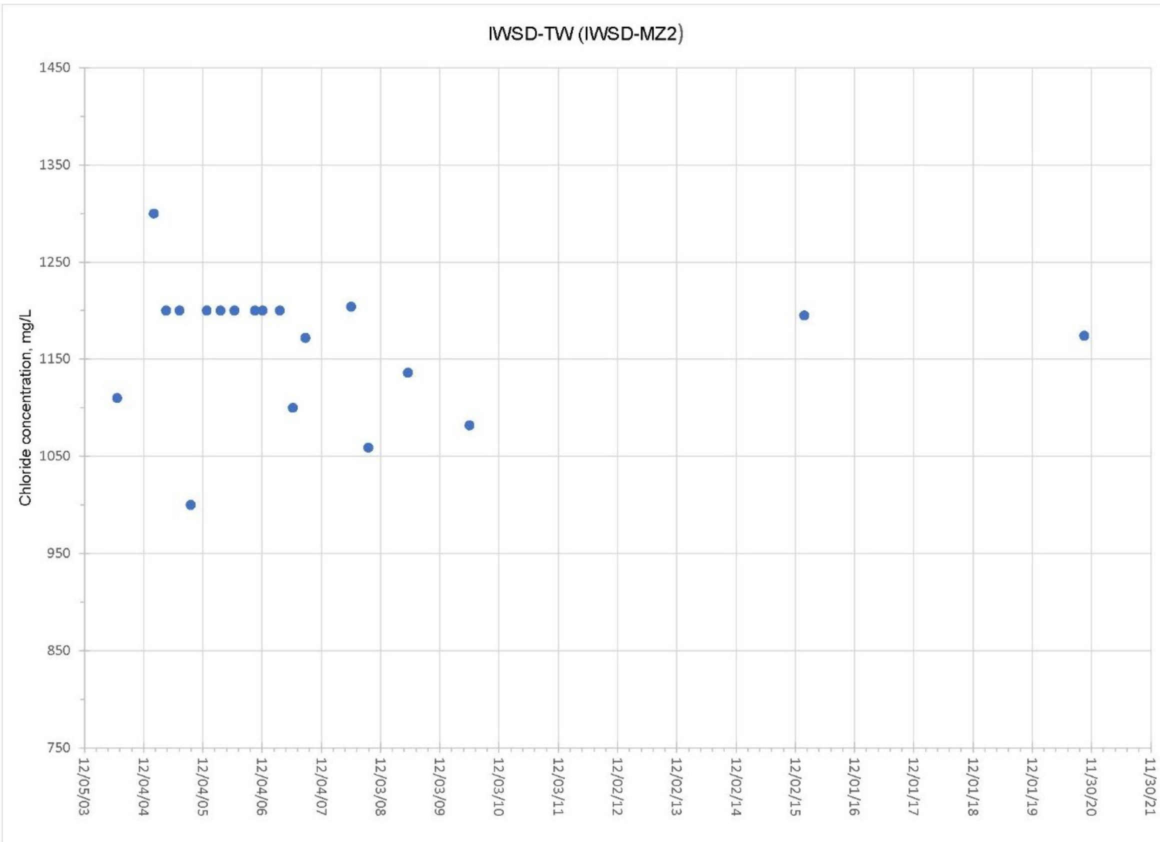

Figure 6-26. Chloride concentrations in Upper Floridan aquifer monitor well IWSD-TW (IWSD-MZ2), Immokalee.

As shown in **Figure 6-27,** well LAB-MZ1 (LAB-PW2), located in LaBelle, has chloride concentrations fluctuating approximately 350 mg/L over the period of record. The maximum chloride concentration (1,000 mg/L) was reported in January 2007. Recent chloride concentrations are more in line with the long-term average at this well. The two most recent samples show a decline in chloride concentrations from 708 mg/L in January 2016 to 673 mg/L in February 2021.

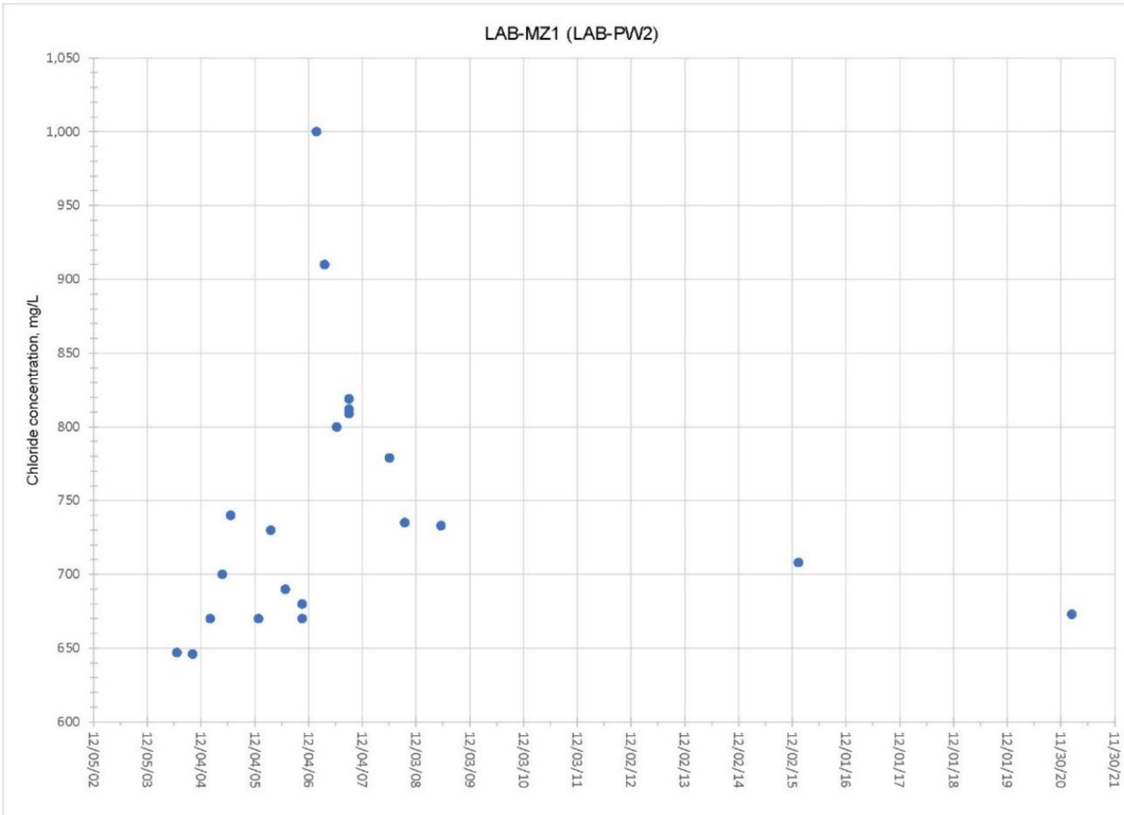

Figure 6-27. Chloride concentrations in Upper Floridan aquifer monitor well LAB-MZ1 (LAB-PW2), LaBelle.

As shown in **Figure 6-28**, well L2-PW2, located in western Hendry County, has chloride concentrations fluctuating approximately 290 mg/L over the period of record. The maximum chloride concentration (851 mg/L) was reported for the most recent sample collected on March 16, 2021, an increase of 200 mg/L over the second most recent sample collected on February 9, 2016. There appears to be an increasing chloride concentration trend since 2010; however, only three samples have been collected and analyzed.

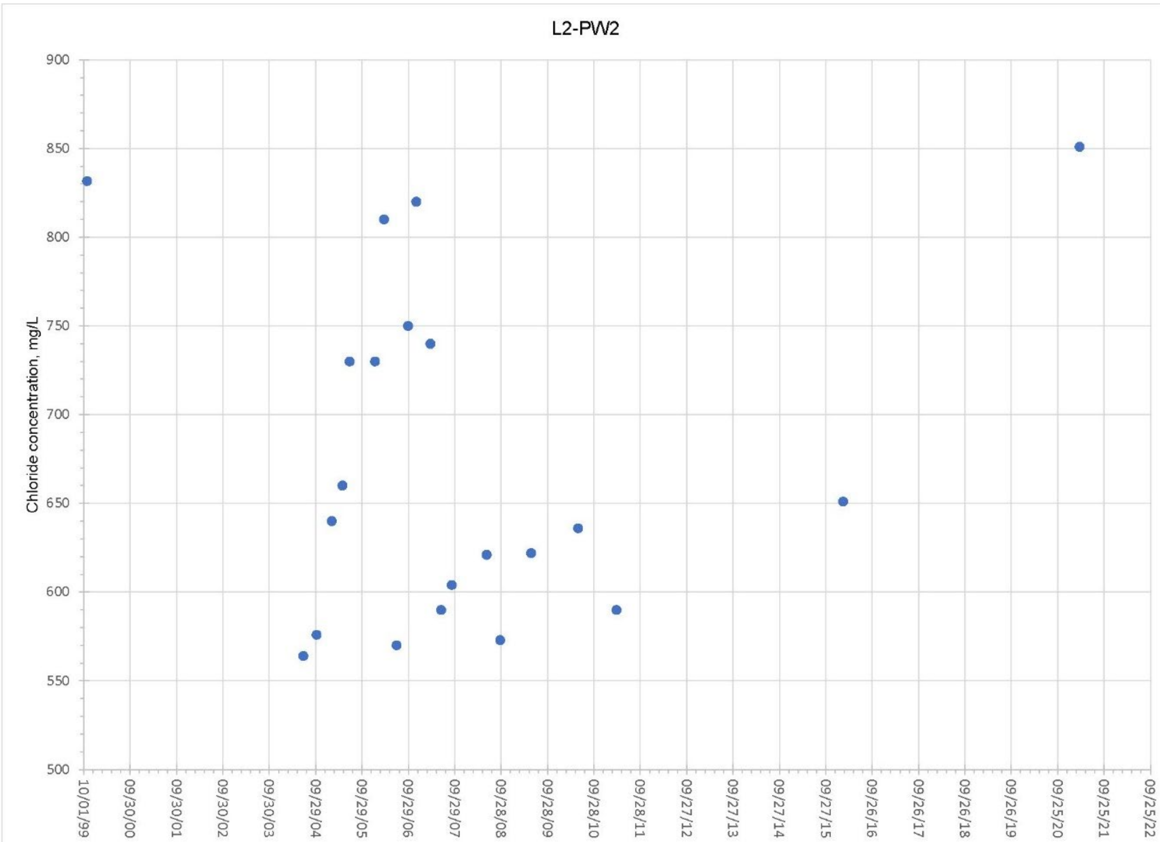

Figure 6-28. Chloride concentrations in Upper Floridan aquifer monitor well L2-PW2, western Hendry County.

FAS Chloride Data from a Recent SFWMD Sampling Event

On a biannual basis, the SFWMD conducts water quality sampling of FAS monitoring wells within the LWC Planning Area. Maps are prepared that are color-coded to indicate the regional range of ambient chloride concentrations within the UFA. **Figure 6-29** presents the concentration of chlorides within the UFA from monitoring wells during the 2020-2021 sampling event.

Figure 6-29. Upper Floridan aquifer chloride concentrations during the 2020-2021 sampling event.

Public Water Supply Utilities Using the Upper Floridan Aquifer

In the LWC Planning Area, the UFA is brackish and requires desalination via reverse osmosis (RO) treatment prior to potable use. The UFA supplies water primarily for PS utilities, and some AG users have permits to withdraw from the UFA for freeze protection or backup supply.

Although UFA chloride concentrations are expected to be high (>250 mg/L), it is still important to monitor water quality trends to ensure that treatment processes are suitable to deliver fresh drinking water, and consumptive uses are not impacting the resource. Increased chloride concentrations suggest that deeper FAS water is being drawn upward into a wellfield. If this should occur, FAS wellfield operations may need to be adjusted to shift pumpage within the wellfield or temporarily cease FAS pumping and instead use SAS wells until water quality stabilizes in the FAS.

Nearly all PS utilities utilizing the UFA in the LWC Planning Area have had one or more production wells experience a degradation in water quality, causing the utility to discontinue pumping at one or more wells. This section discusses changes in chloride concentrations over time in six LWC PS wellfields (**Table 6-1**).

Table 6-1. Major Public Supply Upper Floridan aquifer wellfields discussed in this section.

Utility	Permit Number	Number of Existing Permitted FAS Wells	Permitted FAS Allocation (mgd)
Clewiston	26-00769-W	4	2.58
Collier County Utilities (North)	11-00249-W	19*	Combined 19.52 mgd
Collier County Utilities (South)	11-00249-W	9*	
LaBelle	26-00105-W	2	0.92
Fort Myers	36-00035-W	19	15.25
Lee County Utilities (North)	36-00152-W	18	16.68
Cape Coral (South)	36-00046-W	22	Combined 39.25 mgd
Cape Coral (North)	36-00046-W	34	

mgd = million gallons per day.
* Excludes wells completed in the Mid-Hawthorn aquifer.

Fort Myers Wellfield

The Fort Myers RO treatment plant began operation in 2002, with an initial capacity of 6 million gallons per day (mgd) of net (finished) water using seven UFA production wells. By 2007, the system had been expanded to 13 mgd using 16 production wells. Plans are in place to build out the current RO plant with a capacity of 20 mgd of net (finished) water using a total of 41 UFA production wells. **Figure 6-30** shows chloride concentrations over time for 16 UFA production wells in the Fort Myers RO wellfield. Several wells have chloride concentrations around 1,000 to 1,500 mg/L. However, many wells show notable increases in chloride concentrations 4 to 5 years after installation. These wells generally started with a chloride concentration below 1,500 mg/L but exhibited two-to three-fold increases by 2017. One of the wells (P-10) started with a chloride concentration of approximately 1,750 mg/L, but by 2014, the concentration had increased to approximately 9,000 mg/L.

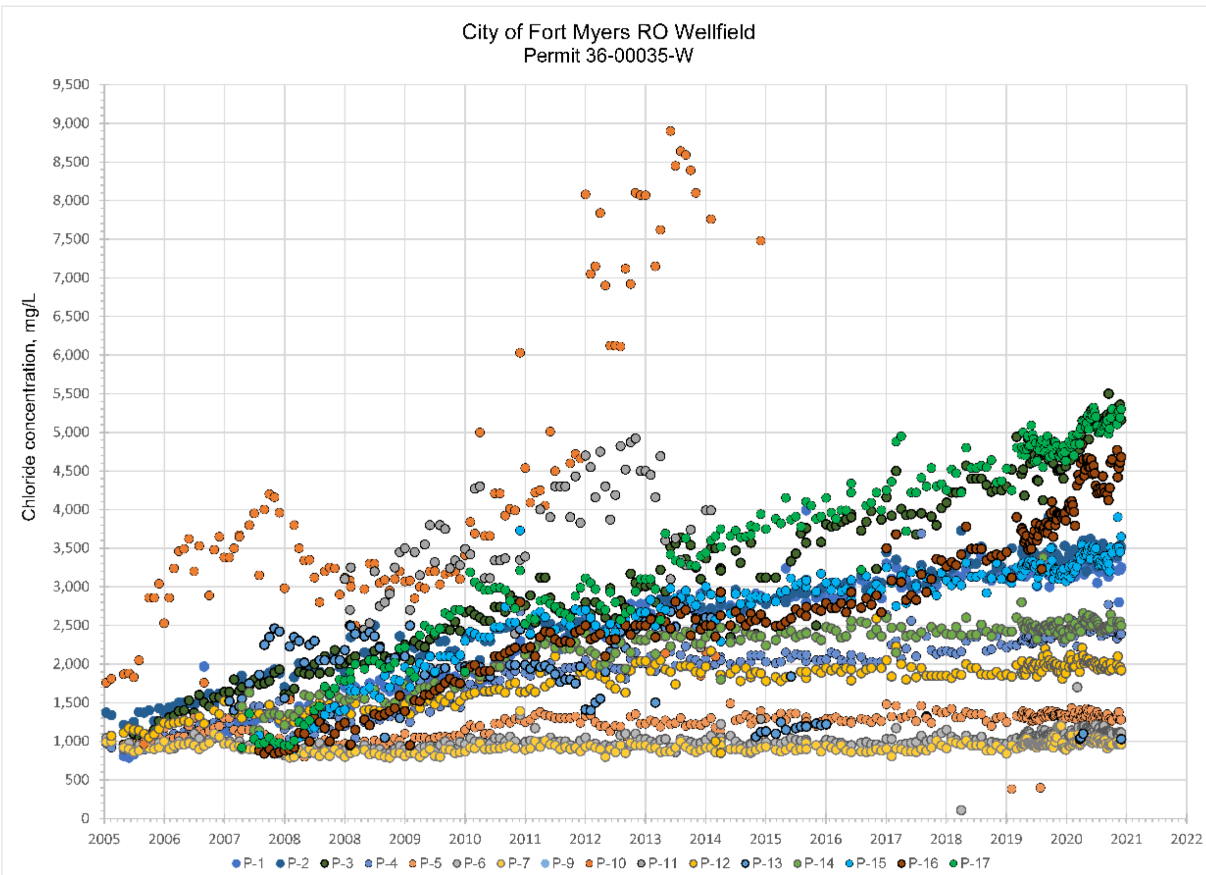

Figure 6-30. Chloride concentration trends at production wells in the Fort Myers wellfield.

Lee County Utilities North Wellfield

Chloride data have been collected at this wellfield since 1985. **Figure 6-31** presents the change in chloride concentrations since December 2004 for 38 production wells in the Lee County Utilities North wellfield. Most of the wells that are still in operation have chloride concentrations greater than about 600 mg/L and a period of record extending back to 2006. Chloride concentrations at well PW-6 increased to 4,800 mg/L within 1 year, and the well was taken offline. Chloride concentrations at most of the wells that came online in 2010 and 2013 remain under 1,500 mg/L and appear to be stable.

Wells PW-9, PW-13A, and PW-16A have reported the highest concentrations of chloride, generally within the 1,800 to 3,000 mg/L range. Starting in 2009, chloride concentrations at well PW-9 increased and remained in the 2,800 to 3,500 mg/L range, until 2018 when chloride concentrations began to decrease to approximately 2,200 mg/L in 2021. During 2021, chloride concentrations once again have increased at PW-9 to approximately 2,800 mg/L. PW-13 chloride concentrations have been declining over approximately the last 3 years and are now around 2,800 mg/L. Chloride concentrations at PW-16A show a slight increasing trend, with the November 2021 chloride sample having a concentration of 2,090 mg/L.

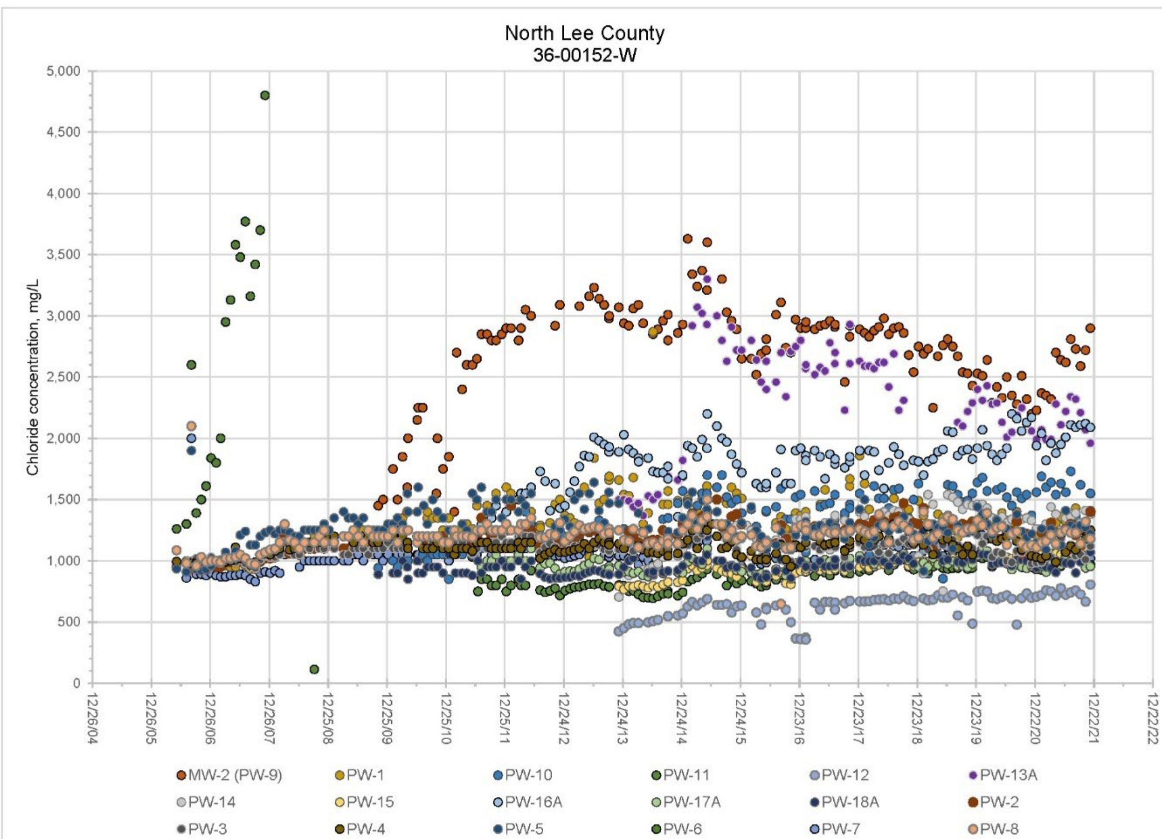

Figure 6-31. Changes in chloride concentrations in operational and nonoperational wells in the Lee County Utilities North wellfield.

Collier County Utilities North Wellfield

All operational and nonoperational UFA and Mid-Hawthorn production wells in the Collier County Utilities North wellfield are shown in **Figure 6-32**. Most of the production wells have stable chloride concentration trends over time. However, the wells that have higher chloride concentrations show slightly more variation in chloride concentrations. Well RO-2N contained elevated chloride concentrations from 2013 to 2016 (approximately 9,000 mg/L) and was apparently shut down after 2016.

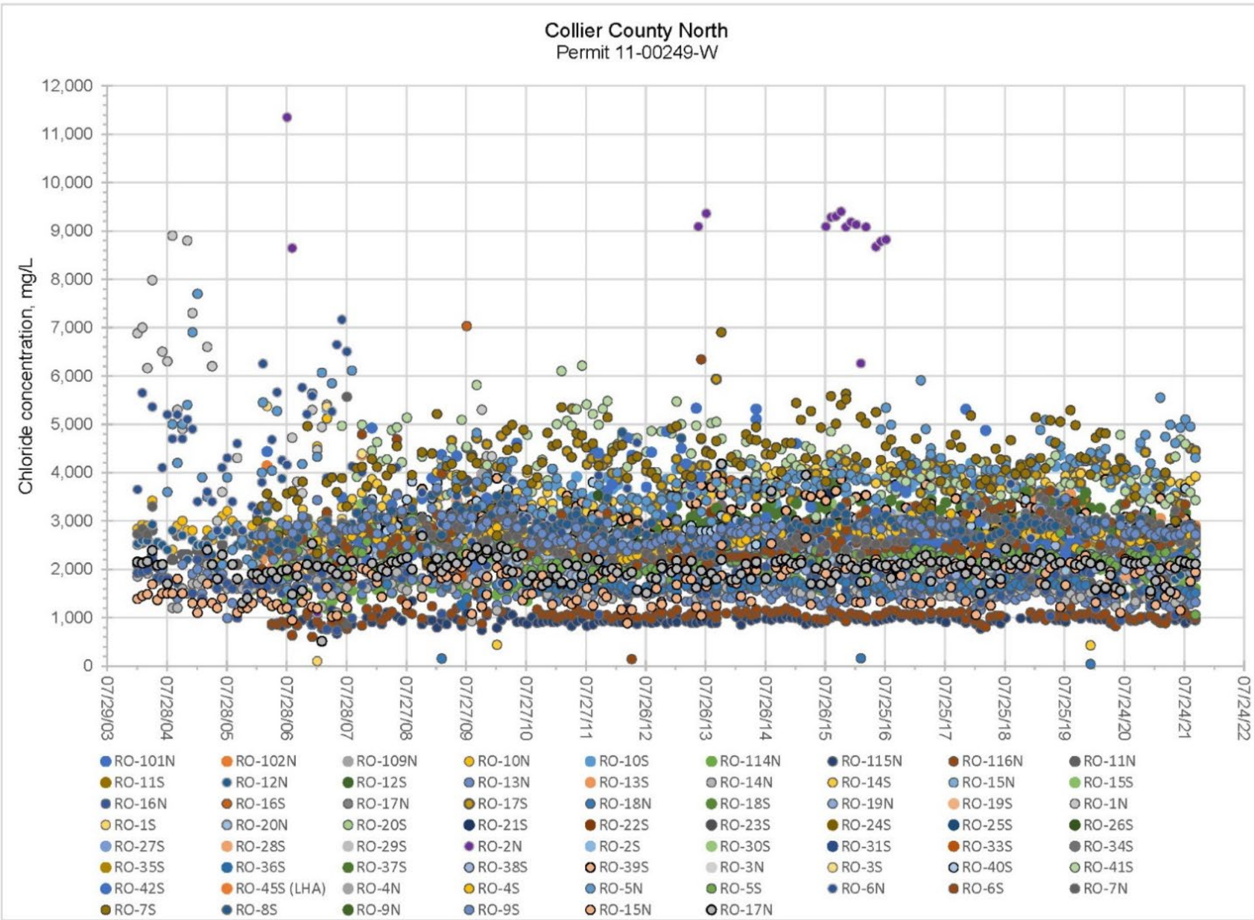

Figure 6-32. Changes in chloride concentrations in production wells at the Collier County Utilities North wellfield.

Cape Coral South Wellfield

Cape Coral was one of the first PS utilities in the LWC to convert to RO treatment for potable water supply and has two UFA wellfields (named Cape Coral North and Cape Coral South). As shown in **Figure 6-33**, most Cape Coral South UFA production wells had initial chloride concentrations between 250 and 1,000 mg/L. All the production wells show increasing chloride concentrations over time. Well RO-14 had an initial chloride concentration of 720 mg/L in July 1985, but the chloride concentrations increased over time to a maximum of 5,280 mg/L in April 2014. The chloride concentrations at RO-14 dropped to about 1,500 mg/L in 2015 but have increased to 2,480 mg/L during the last three sampling events in June, July, and August of 2021. In general, most of the wells with chloride concentrations greater than about 1,000 mg/L have shown steeper increasing chloride concentration trends over time than wells with concentrations less than 1,000 mg/L.

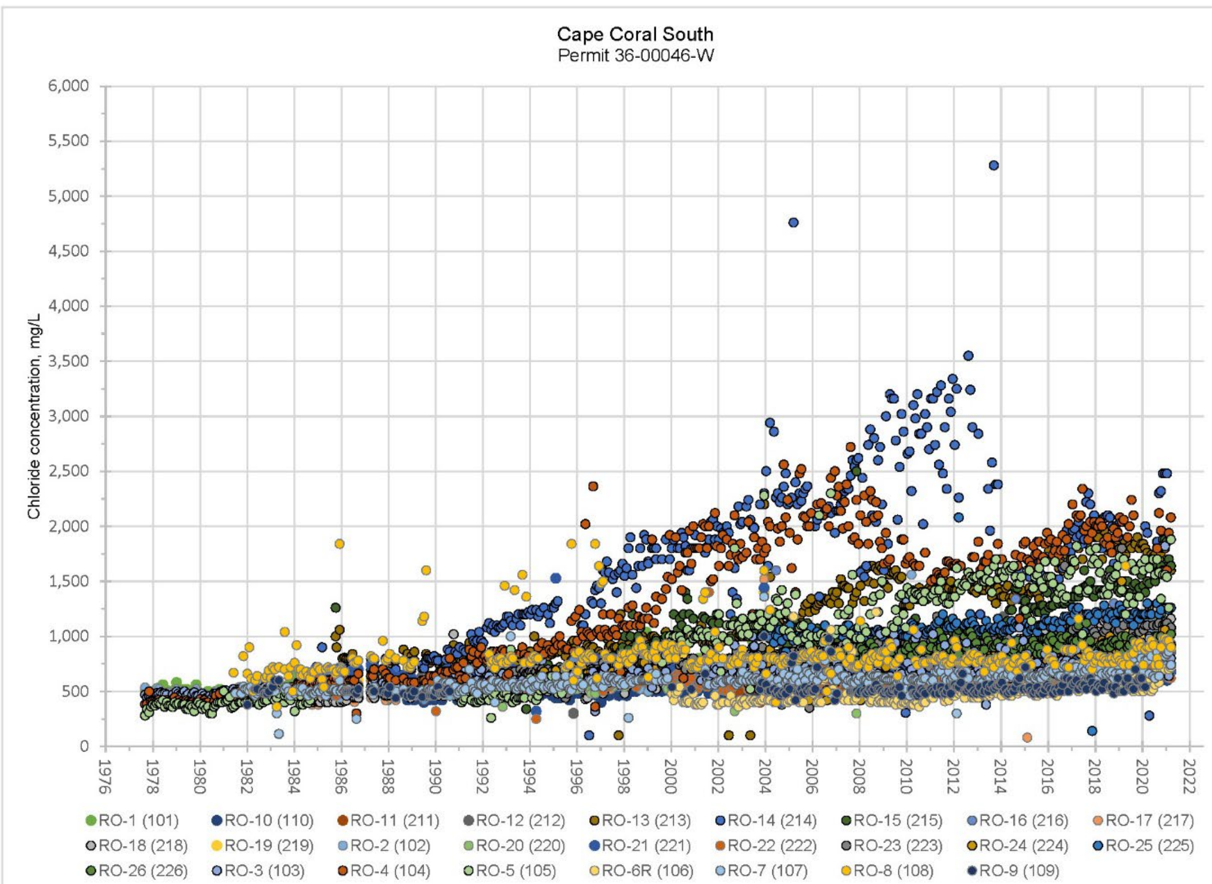

Figure 6-33. Changes in chloride concentrations in production wells at the Cape Coral South wellfield.

Cape Coral North Wellfield

The production wells in the Cape Coral North UFA wellfield are orientated along an east-west transect in northwestern Cape Coral. Although there is a general upward trend in most of the chloride concentrations, most wells remain in the 500 to 1,800 mg/L range (**Figure 6-34**). Three production wells (18N, 17N, and 7N) have shown elevated chloride concentrations and steeply increasing concentration trends compared to most of the wells at this wellfield. Well 18N has reported the highest chloride concentrations of any of the wells with a maximum of 7,640 mg/L but has shown a marked decline in chloride concentrations since February 2020, with the three most recent concentrations in this well reported to be 1,520 mg/L. Concentrations in well 7N have continued to increase, and the October 2021 sample contained 4,000 mg/L chloride. Similarly, well 17N has continued to show increasing concentrations, with the most recent sample in October 2021 having a chloride concentration of 3,621 mg/L.

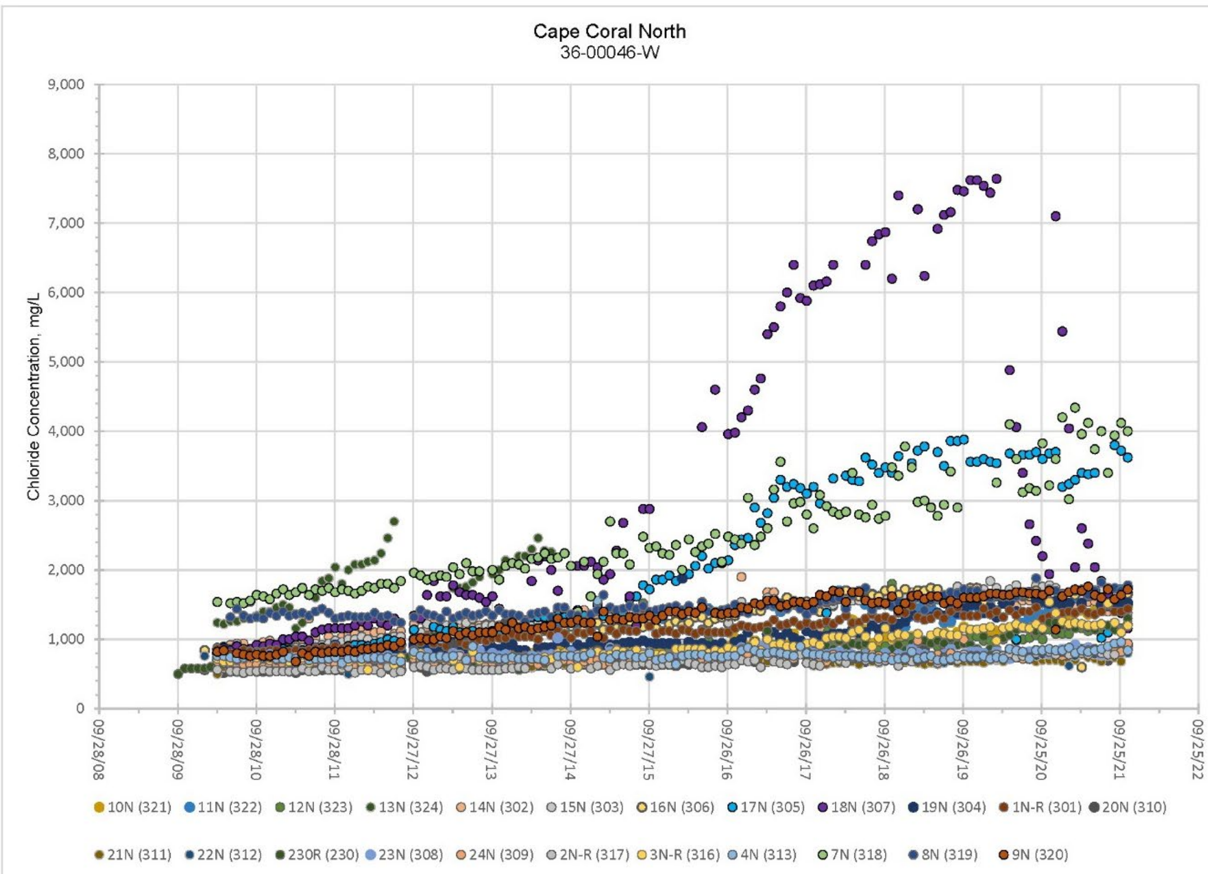

Figure 6-34. Changes in chloride concentrations in production wells in the Cape Coral North wellfield.

Clewiston Wellfield

Chloride concentration trends for all four UFA production wells in the Clewiston UFA wellfield are shown in **Figure 6-35**. Most of the UFA production wells appear to have stable chloride concentration trends except for Well 4, where chloride concentrations increased slightly starting in 2016 but appear to have remained stable since January 2020.

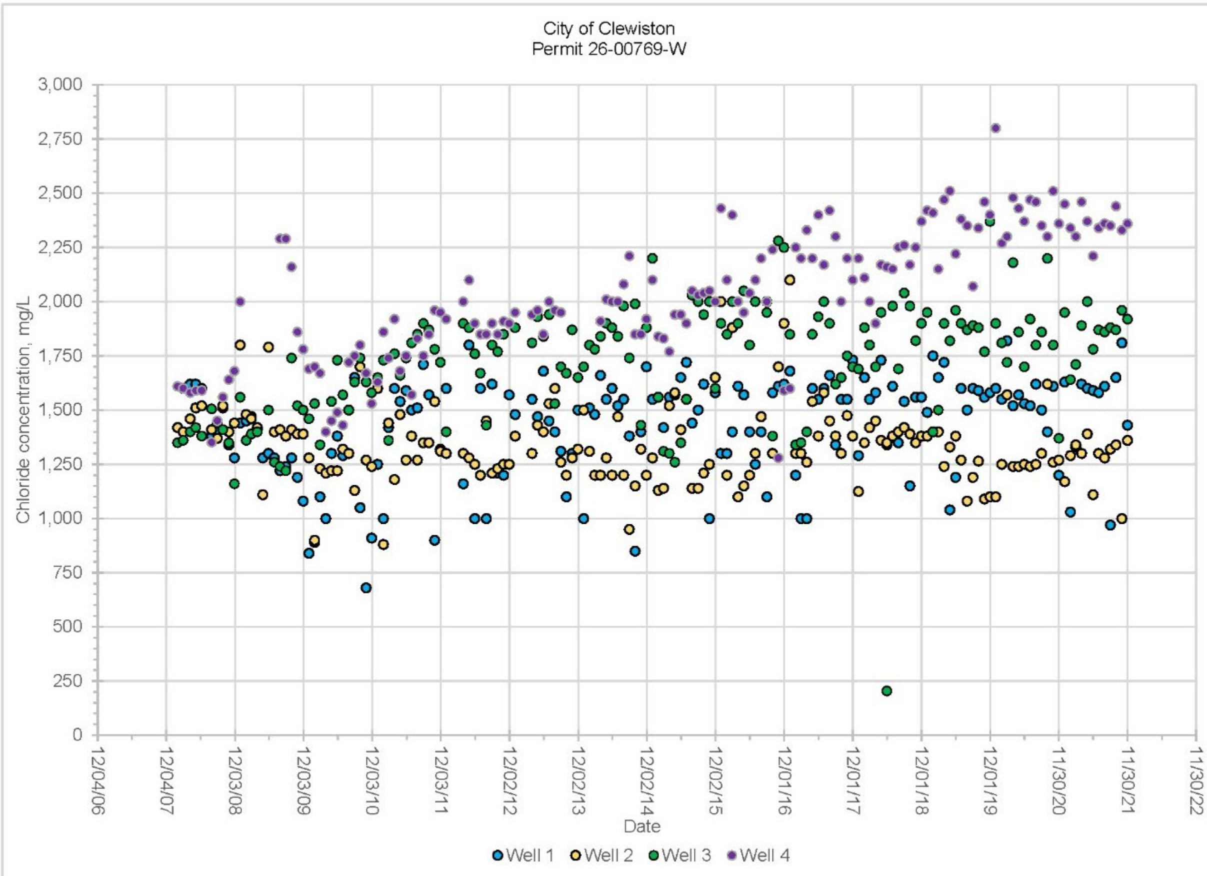

Figure 6-35. Changes in chloride concentrations in production wells in the Clewiston wellfield.

Floridan Aquifer System Groundwater Modeling

The SFWMD's West Coast Floridan Model (WCFM) was used to evaluate potential changes within the FAS as a result of projected groundwater withdrawals in the LWC Planning Area. The WCFM is a three-dimensional groundwater flow and transport model used to simulate water levels and total dissolved solids concentrations within the FAS for the southwestern coast of Florida. The model was developed using the USGS SEAWAT model code. The WCFM simulates the three primary zones in the FAS: the UFA, the APPZ, and the first permeable zone of the Lower Floridan aquifer. In the LWC Planning Area, the APPZ and the first permeable zone of the Lower Floridan aquifer contain groundwater with undesirably high salinity and in Collier County, the APPZ is not productive enough for water supply. There currently are no users withdrawing water from these aquifers within the planning area.

The WCFM results were analyzed for water level and water quality (total dissolved solids) changes by comparing the 2014 withdrawal quantities to the projected 2040 withdrawal quantities. Although there are some localized areas around wellfields with noticeable drawdowns and water quality degradation, the 2040 model results indicate no significant adverse impact to groundwater levels or water quality. **Figure 6-36** presents the difference in water levels within the UFA between 2020 and 2040 as predicted by the model. Overall, the model results conclude use of the FAS is sustainable through 2040. Additional graphics and a concise discussion of the WCFM results, conclusions, and recommendations are provided in **Appendix D**. The complete model design, calibration, and simulation results are contained within Billah et al. (2021).

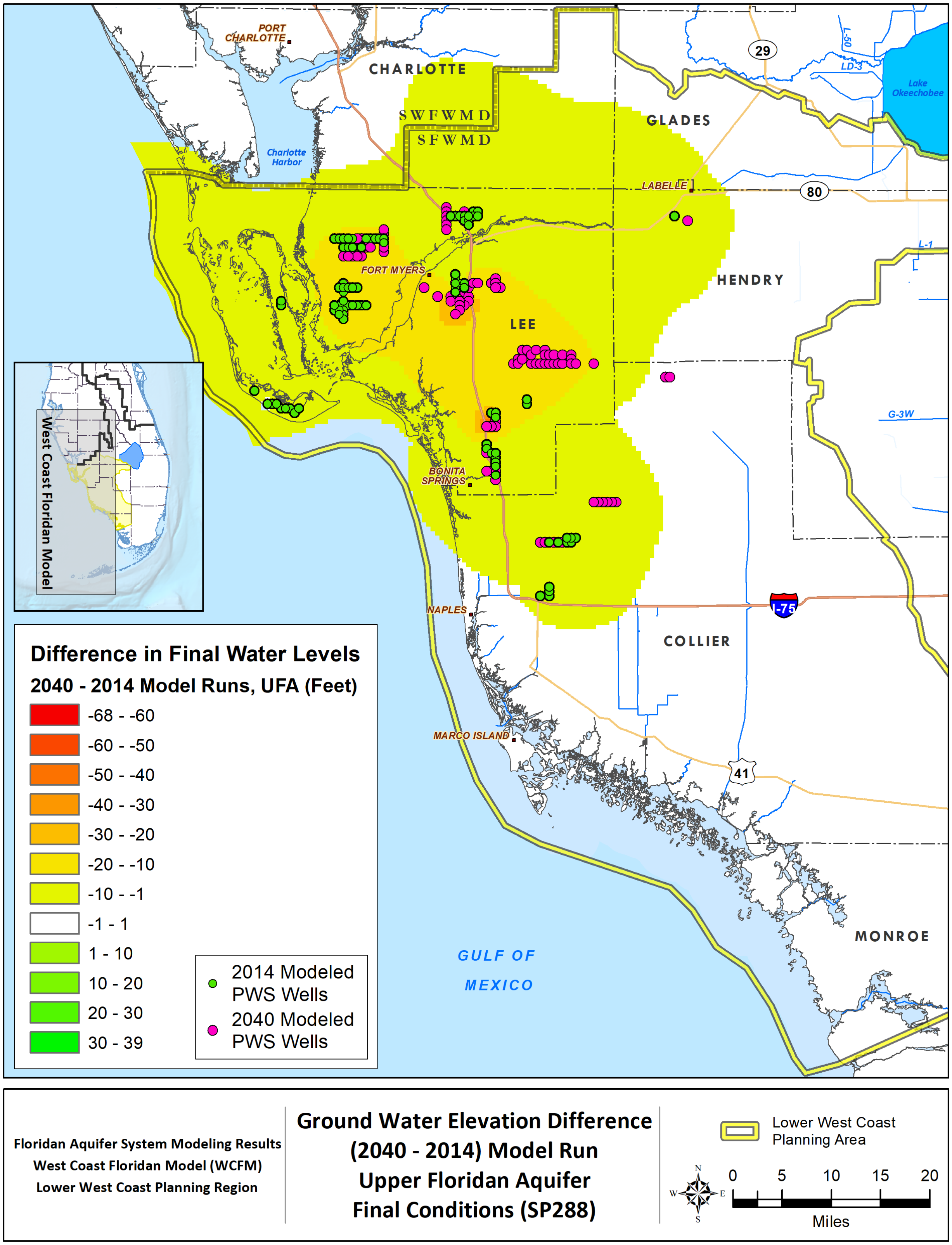

Figure 6-36. Upper Floridan aquifer water level differences between 2014 and 2040.

Floridan Aquifer System Conclusions

The total demand projection for 2045 in this 2022 LWC Plan Update is 3% less than the estimated 2040 demand projected in the 2017 LWC Plan Update. Therefore, the modeled results are considered to be representative of the future demands. Recent data and modeling results indicate the FAS can meet current and projected demands through 2045 with proper wellfield management. FAS water levels appear stable at current withdrawal rates. Where possible, more frequent sampling and analysis of FAS monitoring wells would aid in better defining the trends. However, model results indicate local decreases in water levels may occur based on assumed wellfield configurations and 2045 pumping rates. Chloride concentration trends show FAS wellfields have experienced some water quality degradation after several years of operation, which is likely to continue. Water level reductions and water quality degradation can be minimized by PS utilities through the following activities:

- Maximizing well spacing to reduce interference effects and stress on the FAS
- Plugging and abandoning individual wells experiencing chloride concentration increases and replacing them with new wells elsewhere in the wellfield area
- Partially back-plugging individual wells to isolate deeper poor-quality layers from overlying higher-quality layers, thereby keeping the wells in operation
- Reducing pumping rates at individual wells to minimize the potential for poor-quality water to be pulled into the well's production zone from below
- Rotating the operation of individual wells to reduce pumping stress and the potential influx of poor-quality water from below
- Installing additional monitor wells to provide early warning of upconing or lateral movement of poor-quality water

As PS utilities expand use of the FAS, implementation of these wellfield management activities is important to minimize the effects of water level reductions and water quality degradation. If interference to existing legal users results from another user's withdrawals, the interference shall be mitigated as described in the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022).

CLIMATE CHANGE AND SEA LEVEL RISE

Climate change is an issue of concern globally and especially in coastal regions such as South Florida. Because of its location, climate, hydrology, geology, topography, natural resources, and dense coastal populations, South Florida is particularly vulnerable to the effects of future changes in climate, including sea level rise. The nature and rate of change are highly uncertain, particularly at regional scales, but effects of sea level rise are already being experienced in South Florida.

Sea level rise affects flood control operations at coastal structures and contributes to inland movement of salt water into aquifers. In addition, increased air temperatures and changes in precipitation regimes and storm frequency associated with climate change could result in greater evaporation, longer drought periods, and higher risk of flooding throughout South Florida. These changes could affect regional water resources and planning and thus need to be considered when evaluating the ability of water supplies to meet future demands.

The SFWMD is responsible for managing and protecting water resources in South Florida by balancing and improving flood control, water supply, water quality, and natural systems. Over the last decade, the SFWMD has implemented strategies to adapt its operations and infrastructure to ensure this mission continues to be met under changing climate conditions. The SFWMD's approach focuses on assessing how sea level rise and extreme events, including flood and drought events, are likely to happen under current and future climate conditions. In addition, the SFWMD is working to ensure its resiliency planning is based on the best available science. These efforts require collaboration and cooperation with local and tribal governments; other regional, state, and federal agencies; universities; nongovernmental entities; a wide array of stakeholders; and concerned citizens throughout South Florida. Coordination is essential because effective solutions and adaptations require action across multiple agencies and administrative boundaries. Additional information regarding climate change and sea level rise within the LWC Planning Area is provided in **Appendix D**.

SUMMARY OF WATER RESOURCE ANALYSES

The evaluations and analyses associated with this 2022 LWC Plan Update support the findings and conclusions of the 2017 LWC Plan Update. The following are findings regarding the availability of water resources to meet projected 2045 water demands:

- New or increased allocations of surface water from Lake Okeechobee and LOSA, including the C-43 Canal, are limited in accordance with RAA criteria.
- Surface water will remain the primary source for agricultural irrigation, with fresh groundwater from the SAS and IAS as supplemental sources.
- The SAS and IAS historically have served as the primary sources of fresh water for urban demands. However, expansion of SAS and IAS withdrawals is limited due to low aquifer productivity, rate of recharge, potential impacts to wetlands and the increased potential for saltwater intrusion, and proximity to contamination sources. New or increased allocations of water from the SAS in coastal areas beyond those currently permitted will require evaluation on an application-by-application basis.

- The results of the LWCSIM simulations indicated no widespread water level or water quality impacts are projected to occur in the SAS and IAS. However, localized areas of intensive withdrawals from the Mid-Hawthorn aquifer in Cape Coral and the Sandstone aquifer in Lehigh Acres are depressing groundwater elevations towards established MFLs.
- Monitoring well networks have been established for the SAS, IAS, and FAS and provide valuable data for evaluation of saltwater intrusion, aquifer assessment, and groundwater modeling.
- Most large PS utilities in the LWC Planning Area use the FAS to meet some or all of their demands and plan to increase their use of the FAS to meet increased future demands.
- The results of the WCFM simulations indicated no widespread water level or water quality impacts are projected to occur in the FAS. However, increased withdrawals at projected future rates (2045) will have a greater effect on water levels and water quality in the UFA, primarily in northwestern Lee County.
- Saltwater intrusion monitoring and mapping indicate little movement of the saltwater interface in the SAS and IAS from 2009 to 2019. Local-scale investigation of the interface position could be warranted in some areas.

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7

Water Resource Development Projects

TOPICS

- Regional Groundwater Modeling
- Districtwide Water Resource Development Projects
- Comprehensive Everglades Restoration Plan
- Northern Everglades and Estuaries Protection Program
- Big Cypress Basin Programs

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 West Coast (LWC) Planning Area. The water resource development efforts presented in this chapter reflect the current budget categories the SFWMD uses for funding new and ongoing water resource development projects. The project summaries serve as an overview of water resource-related activities in the region. This chapter was created using the Fiscal Year (FY) 2021 Districtwide water resource budget and includes schedules and costs for FY2021 to FY2025. Additional details on the status of these projects can be found in Chapter 5A (Kraft and Medellin 2021) of the *2021 South Florida Environmental Report – Volume II* (https://www.sfwmd.gov/sfer).

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 (**Chapter 8**). Water resource development is defined in Section 373.019(24), Florida Statutes (F.S.), as follows:

> *…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 related technical assistance to local governments, and to government-owned and privately owned water utilities.*

Most water resource development activities in the SFWMD support and enhance water supply development but do not directly yield specific quantities of water. Instead, these projects are intended to assess the availability of an adequate water supply for existing and future uses, including maintaining the functions of natural systems. For example, project-related hydrologic investigations as well as groundwater monitoring and modeling provide important information about aquifer characteristics (e.g., hydraulic properties, water quality), which are useful for designing appropriate facilities, identifying safe aquifer yields, and evaluating the economic viability of projects, but do not increase water availability.

Water supply development projects (**Chapter 8**) generally are the responsibility of water users (e.g., utilities) and involve the water source options described in **Chapter 5** to meet specific needs. These projects often include construction of wellfields, water treatment plants, distribution lines, reclaimed water facilities, and storage systems.

Water resource planning in the LWC Planning Area is influenced by the Comprehensive Everglades Restoration Plan (CERP). Authorized by the United States Congress in 2000, CERP builds on and complements other state and federal initiatives to revitalize South Florida's ecosystems. These efforts have multiple implementation phases, which are supported by water resource development activities such as planning; land acquisition; design, including modeling; construction; and long-term operations and maintenance. CERP efforts are described in this chapter and in the annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer).

Since 2005, the SFWMD has been working with a coalition of government agencies, nongovernmental organizations, farmers, ranchers, and researchers to enhance opportunities for storing excess surface water on private and public lands. The effort, known as dispersed water management, includes the former pilot project Florida Ranchlands Environmental Services Project (FRESP), Northern Everglades Payment for Environmental Services (NE-PES), water farming, storage on public lands, and Northern Everglades public-private partnerships. Dispersed water management projects are constructed and managed primarily to attenuate wet season water releases and improve water quality entering Lake Okeechobee and the coastal estuaries, with ancillary benefits including increased opportunities for groundwater recharge, hydrological enhancement, and habitat improvement. In some cases, dispersed water management projects with storage features are constructed and operated to offset irrigation demands and other water-related needs of the system. Additional information can be found at https://www.sfwmd.gov/storage.

REGIONAL GROUNDWATER MODELING

The SFWMD funds development and application of numerical models for evaluation of groundwater and surface water resources in the District's planning areas. The models support development of regional water supply plans, minimum flows and minimum water levels (MFLs), water reservations, restricted allocation areas (RAAs), and other projects benefitting water resources. Regional groundwater flow models simulate the rate and direction of water movement through the subsurface. Such models include the major components of the hydrologic cycle and are used in water supply planning to understand the effects of current and future water use. These models also can be designed to simulate salinity changes in the form of total dissolved solids, which are referred to as density-dependent and solute transport models.

West Coast Floridan Model

Groundwater withdrawals, particularly from the Floridan aquifer system (FAS), are anticipated to increase with the growing demand for water and limitations on fresh groundwater and surface water sources throughout South Florida. The West Coast Floridan Model (WCFM) is a density-dependent groundwater flow and transport model of the FAS. The model area covers the entire west coast of the District, extending from the Southwest Florida Water Management District boundary in Charlotte County to the Florida Keys. The model was completed, calibrated, and in 2020, used to evaluate potential changes to regional conditions of the FAS in the LWC Planning Area through 2040. **Appendix D** provides further information about the WCFM update and the simulation results.

Lower West Coast Surficial and Intermediate Aquifer Systems Model

The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) was originally completed in 2006. The District updated this model to incorporate new hydrostratigraphic, water level, water use, and saltwater interface data that cover both the surficial and intermediate aquifer systems (SAS and IAS). A hydrostratigraphic reinterpretation report was completed in 2016, and the calibrated model underwent peer review. In 2020, the model was used to evaluate regional water resources from 2014 to 2040. **Appendix D** provides further information about the LWCSIM construction and simulation results.

DISTRICTWIDE WATER RESOURCE DEVELOPMENT PROJECTS

Water resource development projects encompassing more than one planning area generally are considered Districtwide projects. **Table 7-1** summarizes the estimated costs through 2025 of Districtwide water resource development projects and regional projects that benefit water supply. The following categories are types of ongoing Districtwide water resource development projects:

- MFL, water reservation, and RAA rule activities
- Comprehensive Water Conservation Program
- Cooperative Funding Program for alternative water supply (AWS) development and water conservation
- Drilling and testing groundwater resources
- Groundwater assessment through data collection and modeling
- Groundwater, surface water, and wetland monitoring

MFL, Water Reservation, and RAA Rule Activities

MFLs, water reservations, and RAA rules as well as other water resource protection measures have been developed to ensure the sustainability of water resources within the SFWMD. **Chapter 4** provides information on MFLs, water reservations, and RAAs in the LWC Planning Area. Additional information about water resource protection can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021).

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; use of alternative sources, including reclaimed water; public education and outreach; 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. The program is discussed further in **Chapter 3**. Additional information can be found in the 2021-2024 Support Document (SFWMD 2021).

Cooperative Funding Program

AWS projects and source diversification are important supplements and replacements to traditional water sources in order to meet current and future water needs Districtwide. The SFWMD has provided cost-share funding for AWS development for more than two decades. In 2016, the SFWMD combined funding programs for stormwater, AWS, and water conservation projects into one streamlined program, the Cooperative Funding Program (**Chapter 8**). AWS funding helps water users develop reclaimed water projects, water reclamation facilities, brackish water wellfields, reverse osmosis (RO) treatment facilities, stormwater capture systems, and aquifer storage and recovery (ASR) well systems. A full description of AWS-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 annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer). Further information about AWS options (e.g., reservoirs, ASR systems) is provided in **Chapter 5**.

Table 7-1. Fiscal Year 2021-2025 implementation schedule and projected expenditures (including salaries, benefits, and operating expenses) for water resource development activities within the SFWMD. All activities are ongoing unless noted otherwise (Modified from Kraft and Medellin 2021).

Regional Water Activities	Plan Implementation Costs ($ thousands)					Total
	2021	2022	2023	2024	2025	
Water Supply Planning	1,280	1,280	1,280	1,280	1,280	**6,400**
CFWI Water Supply Planning Project	1,838	1,838	1,838	1,838	1,838	**9,190**
Comprehensive Plan, Documents Review, and Technical Assistance to Local Governments	224	224	224	224	224	**1,120**
Water Supply Implementation	243	243	243	243	243	**1,215**
MFL, Water Reservation, and RAA Rule Activities	354	354	354	354	354	**1,770**
Comprehensive Water Conservation Program	1,462[a]	358[b]	358[b]	358[b]	358[b]	**3,290**
Cooperative Funding Program	15,057	0[b]	0[b]	0[b]	0[b]	**14,661**
Groundwater Monitoring	2,249	2,249	2,249	2,249	2,249	**11,245**
Groundwater Modeling	1,033	1,033	1,033	1,033	1,033	**5,165**
Estimated portion of C&SF Project Operation & Maintenance budget allocated to Water Supply[c]	120,139	120,139	120,139	120,139	120,139	**600,695**
Subtotal	**143,879**	**127,718**	**127,718**	**127,718**	**127,718**	**654,751**
Regional Projects Benefitting Water Supply						
Lake Okeechobee Watershed Restoration[d]	98,000	50,000[e]	50,000[e]	50,000[e]	50,000[e]	**298,000**
EAA Storage Conveyance Improvements and Stormwater Treatment Area[d,f]	77,532	70,468	61,229	29,811	46,095	**285,135**
Other Projects Associated with MFL Recovery/Prevention Strategies[g]	160,270	151,602	151,647	153,554	121,300	**738,373**
Subtotal	**335,802**	**272,070**	**262,876**	**233,365**	**217,395**	**1,321,508**
Total	**479,681**	**399,788**	**390,594**	**361,083**	**345,113**	**1,976,259**

C&SF Project = Central and Southern Florida Project; CFP = Cooperative Funding Program; CFWI = Central Florida Water Initiative; EAA = Everglades Agricultural Area; FY = Fiscal Year; MFL = minimum flow and minimum water level; RAA = restricted allocation area; SFWMD = South Florida Water Management District; STA = stormwater treatment area.

a FY2021 includes $1.5 million of tentative, one-time funding for CFP water conservation projects.

b A determination of what funds, if any, will be allocated for CFP projects will be made by the District's Governing Board during the fiscal year budget development process.

c Approximated based on 50% of the FY2021 operation and maintenance budget.

d Project cost based on information contained in the draft FY2021–FY2025 SFWMD Five-Year Capital Improvement Plan.

e Funding contingent upon future state appropriations.

f Includes the C-44/C-23 Interconnect, Site Preparation, Inflow Canal Reservoir/STA, A-2 STA, North New River and Miami Canal Improvements, and bridges.

g Totals from Table 5A-8 of the *2021 South Florida Environmental Report* (Kraft and Medellin 2021), less the funding for the Lake Okeechobee Watershed Restoration and EAA Storage Reservoir Conveyance Improvements and STA.

Drilling and Testing Groundwater Resources

Evaluation of groundwater resources involves the installation of wells for short- and long-term monitoring of aquifer water levels and water quality. This work includes drilling and well construction, geophysical logging, aquifer tests, sediment analysis, lithologic descriptions, and water quality sampling to determine if the water is fresh or brackish. Knowledge of South Florida hydrogeology is enhanced through construction of exploratory and test wells and has improved the accuracy of the SFWMD's groundwater modeling and decision-making regarding water use permits.

Groundwater Assessment

Groundwater assessment includes results of drilling and testing programs as well as development of hydrostratigraphic maps and saltwater interface maps. A variety of technical publications related to hydrogeology, groundwater quality, project investigations, and saltwater interface mapping have been completed since the 2017 LWC Plan Update, as summarized below:

- **Geochemistry of the Upper Floridan Aquifer and Avon Park Permeable Zone** – The Regional Floridan Groundwater (RFGW) monitoring network was developed to evaluate current and future water quality and water level trends in the FAS within the SFWMD. The RFGW network includes 113 monitor wells completed in aquifers and confining units within the FAS. This investigation (Geddes et al. 2018) acquired and analyzed data from the Upper Floridan aquifer and Avon Park permeable zone.
- **Saltwater Interface Monitoring and Mapping Program** – The saltwater interface monitoring program was established to evaluate the extent of saltwater encroachment into aquifers along the South Florida coastline. Water quality data are collected and analyzed every 5 years to estimate and map the saltwater interface location in the SAS (Shaw and Zamorano 2020).
- **Groundwater Modeling** – As described above, the WCFM and LWCSIM models were recalibrated with additional hydrogeologic and hydrostratigraphic data collected since the previous calibration and updated with 2014 to 2040 demands to provide a planning-level evaluation of regional conditions in the SAS, IAS, and FAS.

Groundwater, Surface Water, and Wetland Monitoring

Water level and water quality monitoring provides critical information for developing groundwater models, assessing groundwater conditions, and managing groundwater resources. The SFWMD maintains extensive groundwater monitoring networks and partners with the United States Geological Survey (USGS) to provide additional support for ongoing monitoring. Data are archived in DBHYDRO (the SFWMD's corporate environmental database), which stores hydrologic, meteorologic, hydrogeologic, and water quality data. The USGS also monitors, archives, and publishes data annually. Districtwide groundwater monitoring activities include the following:

- **USGS contract for groundwater level monitoring** – In an ongoing effort by the USGS, with funding support from the SFWMD, groundwater level monitoring data are collected at 280 stations. The project includes well and recorder maintenance as well as archiving data in a USGS database for sites throughout the SFWMD.
- **Groundwater level monitoring** – In an ongoing effort by the SFWMD, groundwater levels are monitored throughout the District. As of 2020, Districtwide monitoring includes 443 active SFWMD groundwater stations for the SAS, IAS (where present), and FAS. Data are collected, analyzed, validated, and archived in DBHYDRO.
- **Regional Floridan Groundwater (RFGW) well network** – Water level and water quality monitoring is ongoing at 113 FAS monitor well sites in the SFWMD as of 2020. Well maintenance is conducted as needed.
- **Hydrogeologic database improvements** – Backlogged data are uploaded, and miscellaneous database corrections are made.
- **Monthly groundwater level measurements** – Continued water level monitoring is conducted at select sites, including data collection, analysis, and validation, to supplement the existing groundwater level network.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

CERP provides a framework to restore, protect, and preserve the greater Everglades system. The United States Congress approved the restoration plan in the Water Resources Development Act of 2000. CERP efforts are reported in annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer). CERP projects in the LWC Planning Area include, but are not limited to, the following:

- Caloosahatchee River (C-43) West Basin Storage Reservoir
- Picayune Strand Restoration Project
- Southwest Florida Comprehensive Watershed Plan (formerly known as Southwest Florida Feasibility Study)
- Lake Okeechobee Watershed Restoration Project

Caloosahatchee River (C-43) West Basin Storage Reservoir

The Caloosahatchee River (C-43) West Basin Storage Reservoir (C-43 Reservoir) is a critical CERP project that will moderate flows to the Caloosahatchee River Estuary and help achieve a more balanced salinity regime. Early in the 20th century, the Caloosahatchee River was channelized (i.e., deepened and straightened), water control structures (e.g., S-78, S-79) were built, and canals were dug in the river basin to drain agricultural lands and urban areas. As a result of the modifications, during periods of prolonged low rainfall, freshwater flow to the estuary is greatly reduced, increasing salinity above tolerance levels for various ecosystem components. During periods of heavy rainfall, large volumes of nutrient- and sediment-rich fresh water are transported into the estuary, affecting habitat quality for seagrasses, oysters, and other aquatic organisms. The C-43 Reservoir location is shown in **Figure 7-1** and is designed to capture and store up to 170,000 acre-feet of water from the Caloosahatchee River Basin or from Lake Okeechobee when releases are necessary due to high lake levels. During dry periods, the stored water can be released to supplement low river flows and maintain optimal salinity levels in the estuary. The area of ecosystem benefits encompasses almost 80,000 acres of riverine and coastal waters.

Construction of the C-43 Reservoir began in late 2015 and is anticipated to be completed in 2024. In 2017, all existing agricultural facilities on the site were removed and the embankment foundation was completed. The Irrigation Pump Station (S-476) was completed in 2019. This pump station replaces the need for local drainage district pump stations. The Inflow Pump Station (S-470), reservoir embankment, and associated structures are currently under construction. The full project involves construction of two pumping stations and the reservoir, which has two cells (**Figure 7-2**). In addition, the reservoir has a perimeter canal that provides seepage management and ensures water can be provided to adjacent landowners. Plans are in place to increase the capacity of the Townsend Canal to accommodate filling the C-43 Reservoir.

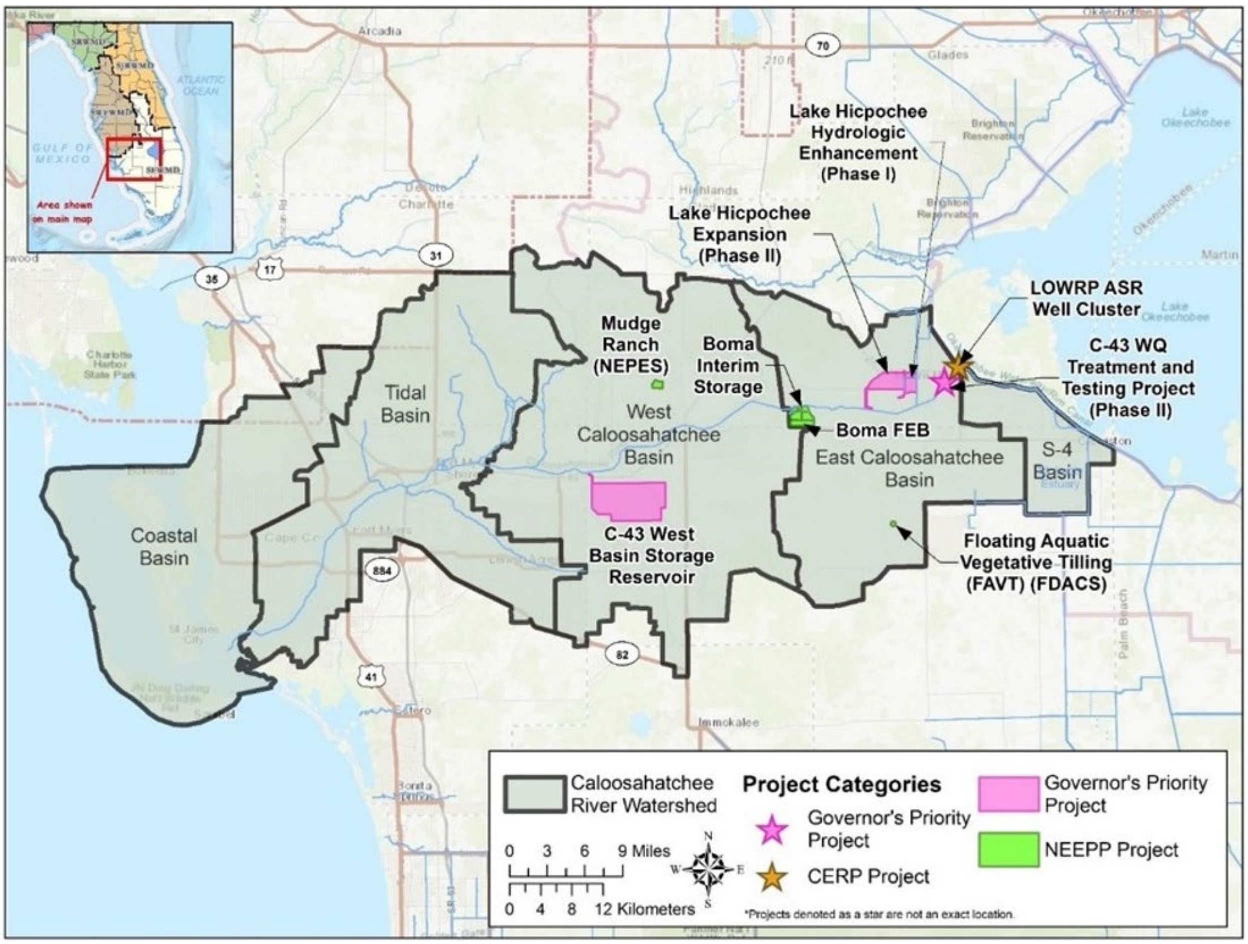

Figure 7-1. Caloosahatchee River Watershed projects.

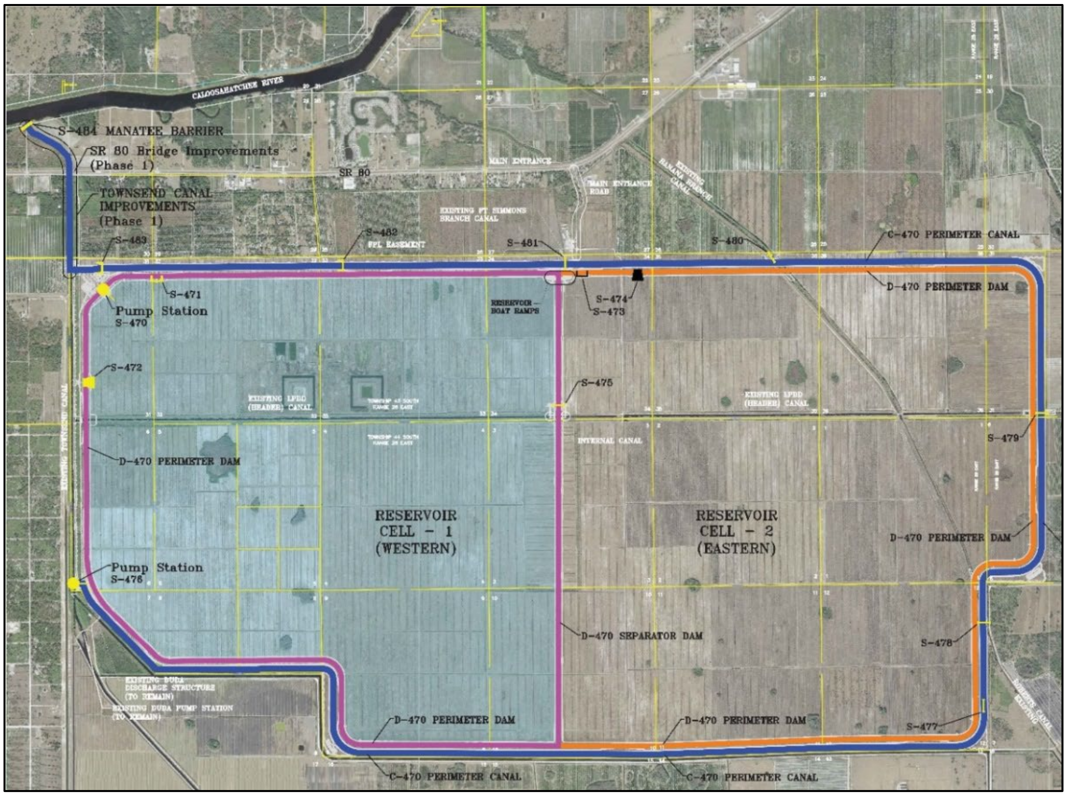

Figure 7-2. The Caloosahatchee River (C-43) West Basin Storage Reservoir site plan.

Picayune Strand Restoration Project

The Picayune Strand Restoration Project is designed to restore more than 55,000 acres of public lands by reducing overdrainage and returning natural and beneficial sheetflow to the project site and adjacent areas, including the Fakahatchee Strand Preserve State Park, Florida Panther National Wildlife Refuge, Ten Thousand Islands National Wildlife Refuge, Collier-Seminole State Park, and related estuaries. Since the filling of the Prairie Canal and removal of the roads east of the Merritt Canal in 2007, three pump stations have been constructed, the Merritt and Miller Canals and the upper 2 miles of the Faka Union Canal. Additionally, the east-west stairstep canals have been plugged. As a result, the Prairie and Merritt canal phases of the project are fully operational, resulting in the hydrologic restoration of about 11,000 acres in the northeastern corner of Picayune Strand and 9,000 acres in the northwestern area of Fakahatchee Strand Preserve State Park. Approximately 75% of roads and 93% of old logging trams have been degraded in the Picayune Strand Restoration Project. The Manatee

Merritt Pump Station

Mitigation Feature, a 2-acre warm water manatee refugium area, was completed in April 2016. Construction on the Southwestern Protection Feature levee began in 2021 and will provide flood protection for existing agricultural and residential properties with an anticipated completion date of 2023. The project cannot be operated for restoration purposes until the Southwest Protection Feature is installed and the Faka Union and Miller canals are plugged, which is anticipated by 2024.

Southwest Florida Comprehensive Watershed Plan

As part of CERP, the United States Congress authorized the Southwest Florida Feasibility Study (now known as the Southwest Florida Comprehensive Watershed Plan) in the Water Resources Development Act of 2000. The purpose of the study was to 1) perform a comprehensive assessment of all watersheds in southwest Florida, and 2) develop a regional restoration plan that addressed all water resource issues within the watersheds. Issues addressed by the study included loss of natural ecosystems, fragmentation of natural areas, degradation of wildlife habitat, alteration of natural freshwater flows to wetlands and estuaries, and water quality degradation in surface waters. The Southwest Florida Comprehensive Watershed Plan (United States Army Corps of Engineers [USACE] and SFWMD 2015) was completed in 2015.

Lake Okeechobee Watershed Restoration Project

In 2016, the USACE and SFWMD began planning efforts for the Lake Okeechobee Watershed Restoration Project (LOWRP), which aims to

- Increase water storage capacity in the watershed, resulting in improved Lake Okeechobee water levels;
- Improve the quantity and timing of discharges to the Caloosahatchee and St. Lucie estuaries;
- Restore wetlands; and
- Improve existing and future water supply.

The LOWRP preliminary project area covers a large portion of the Lake Okeechobee watershed north of the lake. Project features under consideration to meet the project goals include up to 55 ASR wells and re-establishment of former wetland areas. The planning process is anticipated to proceed through 2023.

NORTHERN EVERGLADES AND ESTUARIES PROTECTION PROGRAM

In 2007, the Florida Legislature authorized the Northern Everglades and Estuaries Protection Program (NEEPP; Section 373.4595, F.S.), which expanded the existing Lake Okeechobee Protection Act. In 2016, the Florida Legislature amended NEEPP to further clarify the roles and responsibilities, coordination, implementation, and reporting efforts among the three coordinating agencies: the SFWMD, Florida Department of Environmental Protection (FDEP), and the Florida Department of Agriculture and Consumer Services (FDACS). NEEPP was also amended to indicate that basin management action plans (BMAPs) shall be the component of the watershed protection plans (WPPs) that addresses pollutant loading or total maximum daily loads established in accordance with Section 403.067, F.S. The legislation also requires that the WPPs for the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds are routinely updated as part of NEEPP. The WPPs build on existing approaches and consolidate restoration efforts throughout the Northern Everglades system. The two plans relevant to the LWC Planning Area are described below. More details about specific projects and activities under the WPPs are included in annual updates of the *South Florida Environmental Report* (https://www.sfwmd.gov/sfer). Further information about NEEPP can be found on the SFWMD webpage (http://www.sfwmd.gov/wpps).

Lake Okeechobee Watershed Protection Plan

NEEPP mandated that the SFWMD, FDEP, and FDACS develop a Lake Okeechobee Watershed Protection Plan (LOWPP). The plan initially was developed in 2004 (SFWMD et al. 2004) and was updated in 2007, 2008, 2011, 2015, and 2020 (Betts et al. 2020; SFWMD et al. 2007, 2008, 2011; Sharfstein et al. 2015). Future updates to the LOWPPs will be done in accordance with the 2016-amended NEEPP to ensure they are consistent with the state's adopted BMAP for Lake Okeechobee.

The plan includes source controls (e.g., best management practices) and several subregional and regional technologies, such as stormwater treatment areas and alternative treatment technologies, to improve the quality of water within the watershed and delivered to Lake Okeechobee. Several measures are included in the plan to improve water levels within the lake as well as the quantity and timing of discharges from Lake Okeechobee to the northern estuaries to achieve more desirable salinity ranges. These measures include reservoirs, dispersed water management projects, ASR, and deep well injection.

Caloosahatchee River Watershed Protection Plan

The Caloosahatchee River Watershed Protection Plan (CRWPP), developed by the SFWMD, FDEP, and FDACS, was submitted to the Florida Legislature on January 1, 2009 (SFWMD et al. 2009). It identified major influences that negatively affect the Caloosahatchee River Estuary's ecological health (primarily water quality, quantity, timing, and distribution) and proposed strategies to minimize those stressors. The plan was updated in 2012 (Balci and Bertolotti 2012) and 2015 (Buzzelli et al. 2015). Future updates to the CRWPPs will be done in accordance with the 2016-amended NEEPP to ensure they are consistent with the state's adopted BMAP for the Caloosahatchee River and Estuary.

The CRWPP contains the following three main components:

- **Pollutant Control Program** – This program is a multifaceted approach to reducing pollutant loads by improving the management of pollutant sources within the watershed. This component comprises source control programs implemented by the coordinating agencies, including best management practices, on-site treatment technologies, stormwater and wastewater infrastructure upgrades and master planning, and regulatory programs focused on water quality and quantity.

- **Construction Project** – This component identifies water quality and storage projects to improve hydrology, water quality, and aquatic habitats within the watershed. It includes regional, subregional, and local water quality and quantity projects (e.g., reservoirs, stormwater treatment areas, chemical treatment, local stormwater projects).
- **Research and Water Quality Monitoring Program** – This program builds on the SFWMD's existing research program and is intended to carry out, comply with, or assess the plans, programs, and other responsibilities created by the CRWPP. The program also will assess the water volumes and timing from the Lake Okeechobee and Caloosahatchee River watersheds and their relative contributions to the estuary. The primary purpose of this component is to track progress toward achieving water quality and storage targets.

Lake Hicpochee Storage and Hydrologic Enhancement Project

Lake Hicpochee was one of three lakes historically considered the headwaters of the Caloosahatchee River (**Figure 7-1**). The channelization of the C-43 Canal in the 1800s resulted in detrimental impacts to the lake. Phase 1 of the Lake Hicpochee Storage and Hydrologic Enhancement Project (completed in 2019) captures surface water from the C-19 Canal, then stores the water before distributing it via a spreader canal to the northwestern area of Lake Hicpochee. Phase 2 of the project (**Figure 7-3**) will include the construction of a flow equalization basin (FEB), a new pump station to draw water from the C-43 Canal, and associated flow features connecting to the existing project. Phase 2 of the project will increase the storage capacity of Phase 1 features and capture runoff from both the C-19 and C-43 basins. Phase 2 is currently under design, and construction is expected to be completed by September 2025.

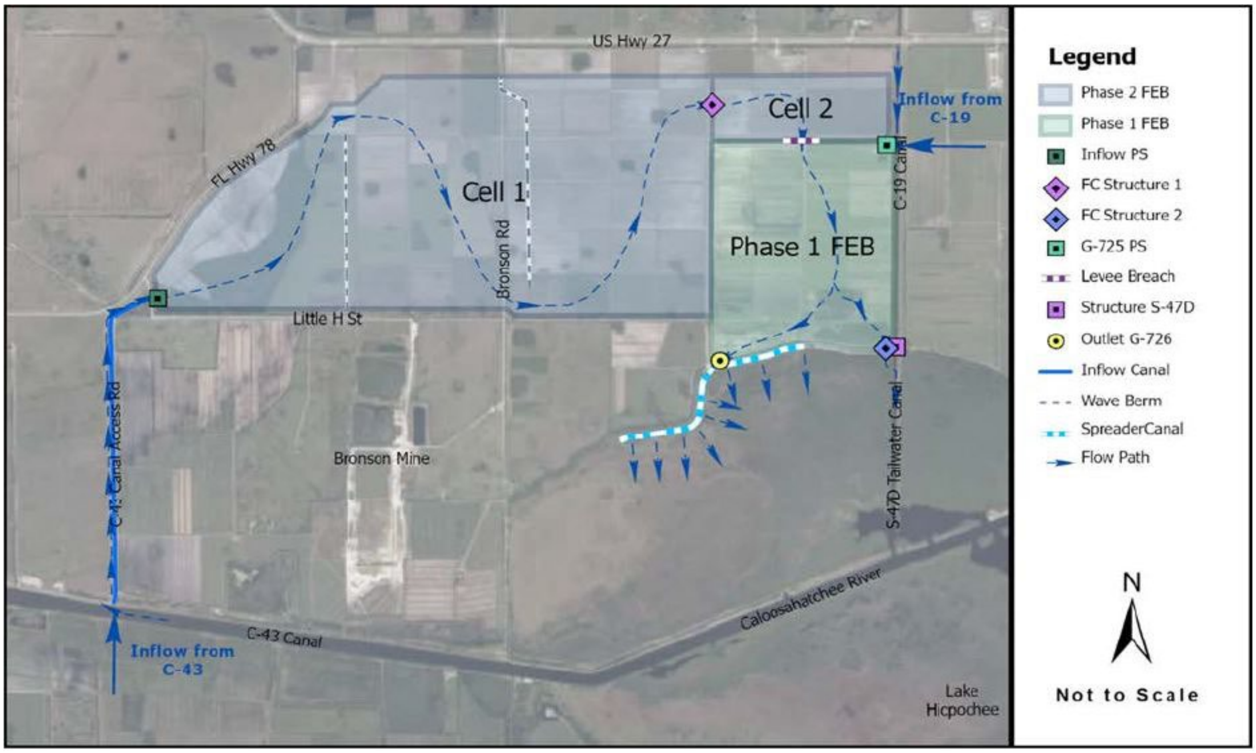

Figure 7-3. Lake Hicpochee Storage and Hydrologic Enhancement Project.

C-43 Water Quality Treatment Feature

The C-43 Water Quality Treatment Feature often referred to as the “Boma” project (**Figure 7-1**) is approximately 1,765 acres of active and fallow citrus land adjacent to the C-43 Canal that was purchased by the SFWMD and Lee County in 2008 for development of a shallow water storage and treatment system (**Figure 7-4**). The Boma property currently includes two interim storage impoundments (total 370 acres) and the C-43 Water Quality Treatment and Testing Phase I mesocosm research facility. Two permanent projects are currently in the design phase for the property and include the C-43 Water Quality Treatment and Testing Phase II test cells and the Boma FEB. Construction of the Phase II test cells project is anticipated to begin in late 2022, and the Boma FEB project is anticipated to begin in 2023.

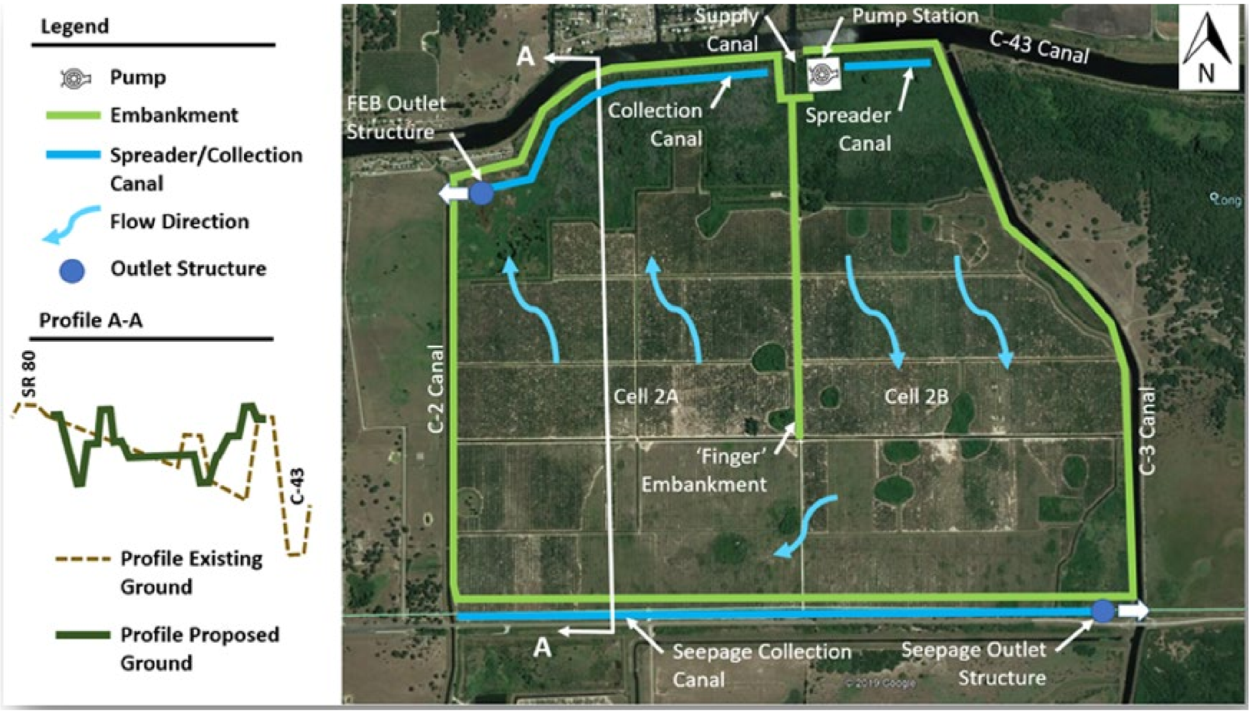

Figure 7-4. C-43 Water Quality Treatment Feature.

BIG CYPRESS BASIN PROGRAMS

The Big Cypress Basin Board is responsible for the operation, maintenance, planning, and capital improvements of approximately 140 miles of canals and 38 water control structures within Collier County and part of Monroe County. The southwest Florida representative on the District Governing Board serves as the chair of the Big Cypress Basin Board.

Big Cypress Swamp

The Big Cypress Basin Board provided cooperative funding focusing on water quality and AWS projects within the basin from 2017-2022 in an amount of \$5 million. Below are some of the highlights:

- **Naples Bay Restoration and Water Quality Improvements at the Cove** – Stormwater and ecosystem restoration through the removal of nutrient-rich sediment, constructing a pollution control device, and installing a living shoreline to improve water quality.

- **City of Naples and Collier County West Goodlette-Frank Road Area Joint Stormwater and Septic Tank Replacement Project** – Conversion of residential septic tanks to a central sanitary sewer collection system and stormwater improvements. The project will increase the volume of reclaimed water available for water supply use as well as improve water quality in Naples Bay.
- **Collier County Lely Branch Water Control Structure Project** – Construction of a new weir on the Lely Branch Canal, which will limit the need for releases of floodwater during the wet season. This will result in increasing shallow groundwater levels and reducing overdrainage of wetlands and native habitats.
- **Collier County Freedom Park Water Quality Improvements** – Construction of this project included widening the bypass canal along the north side of Freedom Park to allow for enhanced flood protection and increased nutrient reduction of upstream flows before discharging to the Gordon River and into Naples Bay.
- **City of Naples Reclaimed Water System Expansion Phase 5** – Installation of 11,600 linear feet of reclaimed water mains to increase the amount of reclaimed water within the city and offset the demand of traditional water sources by approximately 0.26 million gallons per day.

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8

Water Supply Development Projects

TOPICS
Projects Identified for This Plan Update
Cooperative Funding Program
Summary of Water Supply Development Projects

This chapter summarizes the proposed water supply development projects anticipated to meet water needs in the Lower West Coast (LWC) Planning Area of the South Florida Water Management District (SFWMD or District) for the 2020 to 2045 planning period. Water supply development projects include 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 and are proposed by water users to meet existing and future demands. Water users such as Public Supply (PS) utilities, local and tribal governments, and self-suppliers including Commercial/Industrial/Institutional (CII) and Agriculture (AG) users are primarily responsible for water supply development projects. For this *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update), alternative water supply (AWS) development projects have been proposed by PS utilities that rely on nontraditional water sources.

Water use permits typically are required for most water supply development projects. 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.). Further information is provided in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021). Regarding water supply development projects, local economic conditions and population growth may affect when water is needed, which projects are required, and how water use permits need to be obtained or modified to accommodate demand.

PROJECTS IDENTIFIED FOR THIS PLAN UPDATE

Projects proposed for inclusion in this plan update were evaluated based on the level of detail provided (e.g., project scope, cost, and schedule) and whether the project is expected to increase conservation or contribute new water supply, possibly increasing a utility's permit allocation(s) or a treatment system's rated capacity. Projects listed in this 2022 LWC Plan Update were discussed with the SFWMD's Water Use Bureau to determine if a proposed project is likely to be permitted.

Users are not required to select a project included in this 2022 LWC Plan Update. In accordance with Section 373.709(6), F.S., nothing contained in the water supply component of a regional water supply plan should be construed to require local governments, public or privately owned utilities, special districts, self-suppliers, multijurisdictional entities, or other water suppliers to select the identified projects. In addition, a proposed project may not be implemented or may be deferred if there is insufficient need.

Public Supply

PS demand includes all potable uses served by public and private utilities with an allocation of 0.10 million gallons per day (mgd) or greater. In 2020, PS demand in the LWC Planning Area was met by fresh groundwater (45%) and brackish groundwater (55%). The PS average net demand (finished water) is projected to grow from 121.06 mgd in 2020 to 163.25 mgd by 2045, a 35% increase. A combination of existing and additional capacity developed by water supply development projects will be used to meet the projected demand.

Water Treatment Facility

In addition to meeting demands, utilities may propose water supply development projects to address specific situations such as accommodating a change in treatment processes or sources or optimizing distribution systems to match future demand locations. Although water conservation of potable water does not produce potable water, it is a demand management option for utilities that can extend existing potable supplies to meet future demand. In addition, utilities can implement reuse projects for irrigation and aquifer recharge purposes that reduce or replace use of current or projected potable water sources. Proposed projects are listed in the utility profiles contained in **Appendix B** and summarized at the end of this chapter. In addition to proposed water supply development projects, each profile includes population and demand projections (**Chapter 2**, **Appendix A**), permitted water allocations, and permitted treatment capacities for potable water and wastewater. Based on planning-level screening, water supply projects are identified in this plan update to meet 2045 projected demands and generally have a likelihood of being permittable. However, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, F.S., and the implementing criteria found in Chapter 40E-2, F.A.C., and will be reviewed on an application-by-application basis.

In the LWC Planning Area, 9 PS utilities have proposed 18 projects relating to source diversification, changes in treatment technology, expansion of existing plants, and construction of new production wells. In total, the proposed PS development projects could create 26.27 mgd of additional potable water treatment capacity. Combined with existing capacity (237.76 mgd), this will exceed the projected 2045 PS total net (finished) demand of 163.25 mgd.

Two PS utilities need to construct future projects to meet their projected 2045 demands. Florida Governmental Utility Authority (FGUA) – Lehigh Acres would need to construct 0.22 mgd of water supply to meet its projected 2045 demands. The existing potable water treatment capacity for FGUA – Lehigh Acres is 3.10 mgd, and the projected net demand for 2045 is 3.32 mgd (**Appendix B**). The utility has not proposed any projects but maintains an interlocal agreement with the City of Fort Myers for purchase of up to 2.00 mgd of treated bulk water. Ave Maria, in Collier County, would need to construct approximately 1.0 mgd of water supply capacity to meet its 2045 demands. The utility has proposed a combination of wellfield expansion and construction of additional potable water treatment capacity.

PS utilities also have proposed nonpotable water supply projects that could create 39.70 mgd of additional reclaimed water supply for landscape and golf course irrigation as well as groundwater recharge (**Table 8-1**). The proposed nonpotable water projects include construction and expansion of reclaimed water production facilities and construction of aquifer storage and recovery (ASR) and surface water/stormwater storage projects.

Table 8-1. Number and capacity of potable and nonpotable water supply development projects proposed by utilities for construction/implementation between 2020 and 2045.

Water Source	Number of Projects[a,b]	Capacity (mgd)	Cost ($ million)
Potable Projects			
Surficial Aquifer System	1	3.00	$24.20
Floridan Aquifer System	8	**23.27**	$180.81
Potable Total	**9**	**26.27**	**$205.01**
Nonpotable Projects			
Reclaimed Water	17	39.70	$588.40
Aquifer Storage and Recovery	1	1.00[c]	$4.00
Nonpotable Total	**18**	**40.70**	**$592.40**
LWC Planning Area Total	**27**	**66.41**	**$797.41**

mgd = million gallons per day.

[a] Projects designed to expand distribution of treated water or repair or replace existing facilities are not included because they do not generate new water. Wellfield expansion projects are not included if they do not increase treatment capacity.

[b] Many of the projects are multi-phased (e.g., more than one project at the same water treatment plant).

[c] Estimated recoverable storage capacity, not new water supply capacity.

The individual reuse inventory reports for the year 2020 (unless otherwise noted for individual facilities) filed by each wastewater utility to the Florida Department of Environmental Protection (FDEP 2021) indicated approximately 75% of wastewater generated in Charlotte County, 78% in Collier County, 0% in Glades County, 0% in Hendry County, and 74% in Lee County was reused for irrigation, and 9%, 1%, 100%, 100%, and 1% of wastewater in those counties, respectively, was reused for aquifer recharge. These percentages include supplemental flows to reclaimed water, which is discussed in some detail in **Chapter 5**. In 2020, 23.97 mgd of supplemental flows were added to reclaimed water to meet reuse demands, while 23.42 mgd of potentially reusable wastewater effluent was disposed in the LWC Planning Area. Wastewater flows are projected to increase by 87.02 mgd from 2020 to 2045. When considering wastewater and disposal flows (excluding supplemental flows), there would be 197.86 mgd of potential alternative water supply.

Domestic Self-Supply

Domestic Self-Supply (DSS) includes potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells. DSS average net (finished) demands in the LWC Planning Area are projected to increase from 24.27 mgd in 2020 to 31.66 mgd in 2045. DSS needs currently are met and are expected to continue being met with fresh groundwater from the surficial aquifer system (SAS) and the intermediate aquifer system (IAS). As stated in previous chapters, stress is occurring in IAS groundwater levels in limited areas of Cape Coral and Lehigh Acres, wholly or partially due to DSS withdrawals. The City of Cape Coral plans to extend potable water service using alternative water supplies to areas where fresh groundwater IAS withdrawals for DSS are contributing to declining water levels in aquifers approaching the maximum developable limit. The District will continue to engage Lee County to encourage development of long-range plans for a sustainable water supply in DSS areas, such as extending potable water service to other areas where DSS withdrawals are contributing to declining water levels.

Agriculture

AG water use includes self-supplied water used for crop irrigation, greenhouses, nurseries, livestock watering, pasture irrigation, and aquaculture. AG is the largest water use category in the LWC Planning Area and is projected to remain so over the planning horizon. Irrigated crop acreage is expected to increase from 291,765 acres in 2020 to 307,062 acres in 2045. Gross AG water demand is projected to increase 5%, from 592.02 mgd in 2020 to 621.40 mgd in 2045, under average rainfall conditions. **Chapter 2** and **Appendix A** provide more information about AG water use and projected demands.

The majority of AG water demand in the LWC Planning Area is supplied by fresh groundwater from the SAS and IAS and surface water primarily from the C-43 Canal and its connected canals and diversion and impoundment systems. Water availability from most surface water sources is limited by regulatory protections (**Chapter 4**).

Water supply opportunities for AG may be available in the future by capture and use of on-site water normally lost to a farm's water management system (tailwater recovery), capture and use of stormwater, and blending of brackish groundwater with fresh water. The storage and use of reclaimed water may be possible for a limited number of crops when meeting food safety and market standards, but there are no reclaimed water sources near AG areas in the region. More efficient irrigation systems could substantially reduce the amount of water needed to meet future crop demands; however, implementation of such systems can be economically and technically challenging. No specific water supply development projects for this category were provided or identified for this 2022 LWC Plan Update.

Continued use of best management practices (BMPs), including water conservation, could reduce the amount of water needed to meet crop demands (**Chapter 3**). The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts (by rule) agricultural BMPs addressing water quality. Some BMPs 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 towards meeting water resource protection goals.

Commercial/Industrial/Institutional

The CII water use category includes self-supplied water associated with the production of goods or provision of services by commercial, industrial, and institutional establishments. Water demands for CII in the LWC Planning Area are met primarily using traditional supplies such as fresh surface water and groundwater, and to a limited extent, reclaimed water. The projected average gross demand for this category is estimated to be 48.23 mgd by 2045, which is a slight increase from 2020 demands (37.73 mgd).

Although traditional water supplies generally are considered adequate to meet the relatively small demands projected for CII, AWS options should be considered based on local conditions. If reclaimed water is available to meet existing and/or new CII demands, the feasibility of such opportunities will be evaluated through the water use permitting process. No specific water supply development projects for this category were provided or identified for this 2022 LWC Plan Update.

Landscape/Recreational

The Landscape/Recreational (L/R) category includes self-supplied water used for irrigation of golf courses, sports fields, parks, cemeteries, and large common areas (e.g., land managed by homeowners' associations and commercial developments). Historically, irrigation supplies for this category included local fresh groundwater and surface water from canals or stormwater management system ponds. Several golf courses use brackish groundwater blended with fresh surface water in on-site lakes. Reclaimed water is used to meet approximately 37% of the irrigation demand for L/R. In the LWC Planning Area, L/R average gross demand is projected to increase from 219.17 mgd in 2020 to 268.04 mgd in 2045.

Golf Course

The projected increase in growth for this category is expected to be met, for the most part, by currently proposed reclaimed water projects, and to a lesser extent, groundwater or surface water from on-site stormwater management ponds. In the LWC Planning Area, reclaimed water is used to irrigate large, landscaped areas such as golf courses, parks, and residential and commercial parcels. Proposed projects submitted by utilities for wastewater treatment facilities are expected to add 39.70 mgd of reclaimed water treatment capacity by 2045. Additional reclaimed water supply may provide an opportunity to convert existing irrigation from traditional freshwater to reclaimed water. No specific water supply development projects for this category were provided or identified for this 2022 LWC Plan Update;

however, reclaimed water main extension projects have been proposed and will provide additional reclaimed water for L/R irrigation purposes.

Power Generation

Currently, the Power Generation (PG) water use category includes two PG facilities in the LWC Planning Area: Florida Power & Light (FPL) Fort Myers and the Lee County Solid Waste Energy Recovery Facility.

The FPL Fort Myers facility uses brackish surface water for a one-time pass-through cooling tower system which is returned to the Caloosahatchee River Estuary. Groundwater is used for makeup water for steam generators, inlet spray coolers, and other industrial uses. For the planning period 2020 to 2045, the FPL Fort Myers facility is estimated to have a constant PG demand of 0.53 mgd. This demand is based on the Fort Myers Power Plant's average daily use in 2020 from groundwater sources.

The Lee County Solid Waste Energy Recovery Facility relies entirely on reclaimed water provided by the City of Fort Myers and is anticipated to continue relying on reclaimed water through the planning horizon. In 2020, 1.01 mgd of reclaimed water was supplied to this facility, and demands are anticipated to increase to 1.50 mgd by 2045.

PG water demands are expected to increase slightly, from 2020 to 2045. Because the availability of fresh water is limited in the LWC Planning Area, AWS sources may be the most feasible options to meet future PG use if a new use is proposed. No specific water supply development projects for this category were provided or identified for this 2022 LWC Plan Update.

COOPERATIVE FUNDING PROGRAM

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 AWS and measurable water conservation programs. One guideline for funding consideration is that the project must be included in, or consistent with, the appropriate regional water supply plan update. Some projects not included in this 2022 LWC Plan Update but consistent with the plan's goals may be funded. When the SFWMD deems appropriate, a plan may identify the need for multijurisdictional approaches to project options based on the ability to permit and finance the project and its technical feasibility.

For nearly two decades, the Cooperative Funding Program (CFP) has provided funding to local governments, special districts, utilities, homeowners associations, water users, and other public and private organizations for AWS, water conservation, and stormwater projects that are consistent with the District's core mission. In 2016, these cooperative funding efforts were combined under the CFP, which provides financial incentives to promote local projects that complement ongoing regional restoration, flood control, water quality, and water supply efforts within the SFWMD's 16-county jurisdiction.

Each fiscal year, the District's Governing Board determines the amount of funding to allocate to the CFP, the project priorities for that year, and the cost share to be allocated. SFWMD staff review the proposed projects based on guidelines and priorities established by the District's Governing Board. Program funding is subject to approval by the District's Governing Board.

Alternative Water Supply

The AWS component of the CFP provides cost-share funding for projects that increase water supply. These projects include development of saltwater or brackish water, reclaimed or recycled water, surface water captured during heavy rainfalls, sources made available through addition of new storage capacity, and stormwater (for use by a water use permittee), among others. From Fiscal Year (FY) 2017 through FY2021, the SFWMD provided more than $25.7 million in AWS funding for 32 projects located throughout the District. Seven of these projects are in the LWC Planning Area, generating 9.78 mgd of AWS capacity and 40.26 mgd of additional reclaimed water distribution capacity (**Table 8-2**).

Table 8-2. AWS projects in the LWC Planning Area funded through the FDEP AWS Program and the Water Protection and Sustainability Program (FY2017 to FY2021).

Project Name	County	Fiscal Year	Total Capacity (mgd)
Ave Maria Utility Company, LLC - Phase III Reclaimed Water System Expansion – Lined Storage Pond and Reclaimed Water Main Extension along Anthem Parkway	Collier	2017-2018	0.60
Naples, City of – Reclaimed Water System Expansion, Phase 5	Collier	2017-2018	0.26
Lee County Utilities – Reclaimed Water ASR (Fort Myers Beach/ Fiesta Village)	Lee	2017-2018	0.18
Cape Coral, City of – Water North 2 Utility Extension Program – Irrigation Canal Pump Station East #10	Lee	2017-2018	7.00
Cape Coral, City of – Water North 2 Utility Extension Program – Irrigation Transmission	Lee	2017-2018	24.00
Cape Coral, City of – Reclaimed Water Expansion: Cape Coral and Fort Myers Interconnect under the Caloosahatchee River	Lee	2020	2.00
Lee County Utilities – Fiesta Village Reclaimed Water Main Extension	Lee	2021	16.00
		LWC Planning Area Total	**50.04**

AWS = alternative water supply; FDEP = Florida Department of Environmental Protection; FY = Fiscal Year; mgd = million gallons per day; LWC = Lower West Coast.

Water Conservation

The water conservation component of the CFP, formerly known as the WaterSIP, provides cost-share funding for projects that reduce urban and agricultural water use. The SFWMD has provided matching funds up to 50% to water providers and users (e.g., local governments, utilities, agricultural operations, industrial groups, schools, hospitals, homeowners' associations) for water-saving technologies such as low-flow plumbing fixtures, rain sensors, fire hydrant flushing devices, and other hardware. From FY2017 to FY2021, the SFWMD approved more than $2.8 million in funding towards 60 water conservation projects Districtwide through the CFP, with an estimated water savings of 1.45 billion gallons per year, or 3.96 mgd. In the LWC Planning Area, three projects received over $40,000 in funding with an estimated water savings of 28 million gallons per year, or 0.08 mgd (**Table 8-3**). **Chapter 3** contains additional information on water conservation efforts in the LWC Planning Area.

Table 8-3. Water conservation projects in LWC Planning Area supported by the FDEP AWS Program and Water Protection and Sustainability Program (FY2017 to FY2021).

Project Name	Entity Name	Project Type	Fiscal Year	Proposed Water Savings (mgy)
Collier County				
Bayrock Grove Irrigation Monitoring	AgReserves Inc. DBA – Deseret Farms of Ruskin	Irrigation	2017-2018	20.00
Hendry County				
BWEN Irrigation Water Conservation Project	Bishopwood East of Forest Glen Neighborhood Association Inc. (BWEN)	Irrigation	2017-2018	7.50
Lee County				
High-Efficiency Toilet Rebate Program	Bonita Springs Utilities, Inc.	Indoor Plumbing	2020	0.93
			Estimated Yearly Total Water Savings	**28.43**

AWS = alternative water supply; FDEP = Florida Department of Environmental Protection; FY = Fiscal Year; mgy = million gallons per year; LWC = Lower West Coast.

SUMMARY OF WATER SUPPLY DEVELOPMENT PROJECTS

Total average gross water demands within the LWC Planning Area, from all sources, are projected to increase 165.94 mgd (16%) by 2045. During the planning horizon, the PS category has a projected 35% increase in average finished water demand. While utilities proposed a total of nine potable water multiphased projects, only one utility appears to need an increase in treatment capacity before 2045, based on demand projections and treatment system requirements. The evaluation for this 2022 LWC Plan Update indicates groundwater and surface water supplies are adequate to meet the total projected demands through the planning horizon of 2045.

Twenty-four PS utilities are located within the LWC Planning Area. Lee County Utilities is the region’s largest utility and is projected to serve approximately 371,422 residents by 2045. FGUA – Lehigh Acres will need to construct 0.22 mgd of additional treatment capacity to meet 2045 projected demands if the interlocal agreement to purchase water from the City of Fort Myers is not renewed. All other PS growth within the LWC Planning Area can be served with existing facilities, although nine utilities have proposed projects. The proposed water supply development projects could generate 26.27 mgd of new potable water treatment capacity to meet the 2045 net PS demand of 163.25 mgd. The new capacity consists of 23.27 mgd produced by projects using groundwater from the Floridan aquifer system (FAS) and 3.00 mgd from the SAS. Summaries of existing and proposed project capacities are provided in **Tables 8-4** and **8-5**.

Several projects are for construction of additional FAS wells without a corresponding increase in treatment capacity. These wells will increase raw water production capacity to the treatment facility and/or address water quality degradation and sustainability of the FAS as a water supply source. Current operations have shown water quality degradation caused by pumping can be managed by PS utilities through appropriate wellfield design and operating protocols, including the following activities:

- Increasing well spacing (more than 1,000 feet) to minimize interference effects and reduce stress on the FAS.
- Installing monitor wells to provide early warning of the need for changes to wellfield operations to minimize upconing or lateral movement of poor-quality water.
- Rotating the operation of individual wells, thereby reducing overall pumping stress on the well's production zone.
- Plugging and abandoning individual wells that have increased chloride concentrations and replacing them with new wells elsewhere within the wellfield.
- Reducing pumping rates at individual wells to minimize water level declines, which increase the potential for poor-quality water to enter the well's production zone from below.

Table 8-4. Existing and proposed increase in water supply capacities (in mgd) for Public Supply utilities in the LWC Planning Area.

County	Public Supply Utility	Surface Water/ Stormwater		SAS		IAS		FAS		ASR[a]		Reclaimed Water[b]	
		Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]	Existing	Proposed[c]
Charlotte	Charlotte Correctional			0.30									
	Town and Country			0.49		0.50			7.01			0.75	3.25
Collier	Ave Maria			0.49		0.50			2.76			0.90	1.25
	Collier County Utilities			20.80	3.00	15.60		15.60	2.00			42.35	5.25
	Everglades City			0.47								0.16	0.20
	Immokalee (IWSD)			5.60					2.50			4.00	3.00
	Marco Island	6.67				6.00				6.67		4.92	
	Naples			30.00								10.00	
	Port of the Islands			0.44								0.20	
	STOF - Immokalee[d]			0.43									
Glades	Moore Haven			0.96									
	Silver Lake - Muse Village					0.33							
Hendry	Clewiston							3.00				1.50	0.75
	LaBelle							1.50				0.75	
	Port LaBelle					0.90						0.50	
Lee	Bonita Springs			10.50				8.56	4.00			11.00	2.00
	Cape Coral							30.00			1.00	32.65	9.00
	Citrus Park – Bonita Terra			0.54								0.20	
	FGUA – Lake Fairways					0.20						0.30	
	FGUA – Lehigh Acres					3.10						2.76	
	Fort Myers							13.00				23.00	15.00
	Lee County Utilities	5.00		8.51		9.41		29.08	5.00	5.00		20.38	
	Pine Island (GPIWA)							3.29					
	Sanibel Island (IWA)							5.99				2.38	
	LWC Planning Area Total	**11.67**		**79.53**	**3.00**	**36.54**		**110.02**	**23.27**	**11.67**	**1.00**	**158.7**	**39.70**

ASR = aquifer storage and recovery; FAS = Floridan aquifer system; FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IAS = intermediate aquifer system; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; mgd = million gallons per day; SAS = surficial aquifer system; LWC = Lower West Coast; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

[a] Estimated recoverable storage capacity, not water supply capacity.

[b] Reclaimed water is not a potable water source in the LWC Planning Area; however, it is an alternative water supply used to reduce reliance on traditional water sources.

[c] Distribution lines, wells, and other infrastructure projects that do not generate additional water supplies are not counted as adding increased capacity.

[d] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table 8-5. Proposed potable and nonpotable Public Supply development projects in the LWC Planning Area (2020 to 2045).

County	Implementing Agency	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Potable – Surface Water						
Collier	Marco Island	Northwest WTP Biological Activated Filter	Construct pre-treatment system	0.00[a]	$5.70	2023
	Marco Island	Northwest WTP Nanofiltration Filtration Improvements	Improvements to WTP	0.00[a]	$10.00	2025
Potable – SAS						
Collier	Collier County Utilities	Northeast Interim WTP (three phases) and NE Lower Tamiami Aquifer Wellfield	Construct interim WTP and wellfield	2.88	$28.80	2032
	Collier County Utilities	New Northeast 3.0 mgd WTP Using Ion Exchange Phase I	Construct 3 mgd ion exchange WTP	3.00	$24.20	2037
Potable – IAS						
Collier	Ave Maria	Sandstone Aquifer Wellfield Expansion (2 wells) Ave Maria	Construct two supply wells	0.00[a]	$3.70	2023
Potable – FAS						
Charlotte	Town and Country	Phase 3 – 2.51 mgd WTP Expansion and Supply Wells (4 wells, 2 IAS, 2 FAS)	Expand WTP to include RO and construct four supply wells	2.51	$27.21	2023
	Town and Country	Phase 4 – 2.50 RO WTP Expansion, Deep Injection Well, and Supply Wells (4 FAS wells)	Expand RO WTP, construct injection well, and construct four supply wells	2.50	$14.14	2027
	Town and Country	Phase 5 – 2.0 mgd RO Expansion and Supply Wells (2 FAS wells)	Expand RO WTP and construct two supply wells	2.00	$14.38	2031
Collier	Ave Maria	2.76 mgd RO WTP Expansion	Expand RO treatment capacity	2.76	$5.00	2031
	Immokalee (IWSD)	New 2.5 mgd RO WTP	Construct new RO WTP	2.50	$12.00	2032
	Collier County Utilities	New 2.0 mgd Northeast WTP – Phase I	Construct new RO WTP	2.00	$24.20	2037

Table 8-5. Continued.

County	Implementing Agency	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Lee	Bonita Springs	4.00 mgd Expansion RO WTP – Phase 3 and 12 FAS Wells	Expand RO WTP and construct 12 FAS wells	4.00	$45.00	2024
	Cape Coral	South RO WTP Replacement	Replace RO WTP	0.00[a]	$20.00	2028
	Cape Coral	North RO WTP Backup Deep Injection Well	Construct backup deep injection well	0.00[a]	$9.00	2023
	Cape Coral	North RO WTP New and Replacement FAS Wells	Construct new and replacement FAS supply wells	0.00[a]	$7.20	2025
	Fort Myers	FAS Wellfield Expansion (7 wells)	Construct seven FAS supply wells	0.00[a]	$14.06	2023
	Lee County Utilities	North Lee County WTP and Wellfield Expansion	Expand WTP and FAS wellfield	5.00	$38.88	2025
	Lee County Utilities	Green Meadows RO Wellfield Expansion (4 wells)	Construct four FAS wells	0.00[a]	$4.00	2025
Nonpotable – Reclaimed Water						
Charlotte	Town and Country	Phase 3 – 0.75 mgd WWTF Expansion	Expand WWTF	0.75	$40.00	2026
	Town and Country	Phase 4 – 1.16 mgd WWTF Expansion	Expand WWTF	1.16	$30.00	2029
	Town and Country	Phase 5 – 1.34 mgd WWTF Expansion	Expand WWTF	1.34	$17.00	2033
Collier	Ave Maria	Phase 2 – 1.25 mgd WWTF Expansion	Expand WWTF	1.25	$6.50	2030
	Collier County Utilities	Northeast New 1.50 mgd WWTF	Replace 0.75 with 1.50 mgd WWTF	0.75[b]	$65.00	2030
	Collier County Utilities	Foxfire Reclaimed Water Supplemental Wells	Construct supplemental reclaimed water wells in the Lower Tamiami aquifer	1.00	$1.00	2023
	Collier County Utilities	South County WWTF Supplemental Wells	Construct supplemental reclaimed water wells in the Lower Tamiami aquifer	1.00	$3.00	2030
	Collier County Utilities	Golden Gate 2.5 mgd WWTF Expansion	Expand WWTF	2.50	$86.00	2030
	Everglades City	New Rapid Infiltration Basins	Construct rapid infiltration basins	0.10	TBD	2026
	Everglades City	0.1 mgd Reclaimed Water Production Facility	Pumps and piping for public access reuse system	0.10	$3.00	2029
	Immokalee	3.0 mgd Reclaimed Water Production Facility and Water Main Extension	Reclaimed water production facility (filters and high-level disinfection) extension to Williams Ranch	3.00	$3.40	2027

Table 8-5. Continued.

County	Implementing Agency	Project Name	Project Description	Project Capacity (mgd)	Total Capital ($M)	Estimated Completion Date
Hendry	Clewiston	0.75 mgd Reclaimed Water Production Facility and Water Main Extension	Reclaimed water production facility (filters and high-level disinfection) and main extension	0.75	$0.50	2035
	LaBelle	Reclaimed Water Main Extension to Proposed Golf Course	Construct reclaimed water main extension	0.50	$3.00	2027
Lee	Bonita Springs	East 2.0 mgd WWTF Expansion	Expand WWTF	2.00	$38.00	2028
	Cape Coral	Reclaimed Water Interconnect with Fort Myers	Construct reclaimed water main interconnect with City of Fort Myers	0.00[a]	$11.80	2023
	Cape Coral	Southwest WWTF 5.0 mgd Expansion, 15 to 20 mgd	Expand WWTF	5.00	$60.00	2025
	Cape Coral	New 4.0 mgd North WWTF Phase I	Construct WWTF	4.00	$120.00	2035
	Fort Myers	South WWTF Upgrade to Reuse and Interconnect with Cape Coral	Upgrade WWTF to reuse and interconnect with Cape Coral	9.00	$55.00	2023
	Fort Myers	Central 6.0 mgd WWTF Expansion	Expand WWTF	6.00	$60.00	2026
Nonpotable – ASR						
Lee	Cape Coral	ASR Wells for Irrigation Supply	Excess surface water stored in proposed ASR wells	1.00	$4.00	2027

ASR = aquifer storage and recovery; FAS = Floridan aquifer system; IAS = intermediate aquifer system; IWSD = Immokalee Water Sewer District; mgd = million gallons per day; PS = Public Supply; RO = reverse osmosis; SAS = surficial aquifer system; LWC= Lower West Coast; WTP = water treatment plant; WWTF = wastewater treatment facility.

[a] Distribution lines, wells, and other infrastructure projects that do not generate additional water supplies are not counted as adding increased capacity.

[b] Replacing the existing 0.75 mgd WWTF, increases total capacity by 0.75 mgd.

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FDEP. 2021. *OCULUS Electronic Document Management System*. Florida Department of Environmental Protection, Tallahassee, FL. Available online at https://depedms.dep.state.fl.us/Oculus/servlet/login.

SFWMD. 2021. *Support Document for the 2021-2024 Water Supply Plan Updates*. South Florida Water Management District, West Palm Beach, FL. November 2021.

9

Conclusions and Future Direction

TOPICS

- Demand Summary
- Demand Management: Water Conservation
- Natural Systems and Resource Protection
- Water Source Options
- Coordination
- Climate Change and Sea Level Rise
- Conclusions

This chapter of the *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update) provides conclusions and summarizes future direction for water supply in the LWC Planning Area of the South Florida Water Management District (SFWMD or District). This plan update assesses the water demands and available sources through 2045. Water demand is expected to increase by 167.43 million gallons per day (mgd) by 2045, primarily due to increases in the Public Supply (PS) and Landscape/Recreational (L/R), followed to a lesser extent by the Agriculture (AG) water use categories (**Chapter 2**). Water conservation is an important component of integrated water resource management and may reduce, defer, or eliminate the need to expand water supply infrastructure. Water conservation by all users reduces demands and is a component of meeting future water needs (**Chapter 3**).

There are several activities planned or under way to meet natural systems water needs, including Comprehensive Everglades Restoration Plan (CERP) projects and changes to lake regulation schedules, that can affect (enhance or limit) future water supplies within the LWC Planning Area (**Chapter 7**). In addition, regulatory criteria designed to protect water resources, including elements identified in minimum flow and minimum water level (MFL) recovery and prevention strategies, place limitations on water available for allocation (**Chapter 4**, **Appendix C**).

Guidance in this 2022 LWC Plan Update should be considered when developing water supply options to meet future needs. Statutory requirements, existing conditions, resource constraints (including protection tools and criteria), and the needs of water users are addressed. All water users are encouraged to continue being prudent with water use decisions and use water efficiently. The SFWMD's recommendations for water supply planning in the LWC Planning Area include continued coordination with AG stakeholders, PS utilities, and other water users; protection of natural resources; diversification of water sources; and continued monitoring of water levels and water quality in surface water and groundwater.

DEMAND SUMMARY

Total average annual demand for all water use categories for 2045 is projected to be 1,179.37 mgd (**Table 9-1**). This is a 16.37% increase from the estimated 2020 demands (1,013,43 mgd) and 3% less than the projected 2040 demands in the 2017 LWC Plan Update.

Table 9-1. Summary of estimated 2020 and projected 2045 gross water demands under average rainfall conditions in the LWC Planning Area by water use category.

Water Use Category	2020 Estimated Use (mgd)	2045 Projected Demand (mgd)	Percent Change	Percent of Projected 2045 Total Demand
PS	138.70	186.82	34.69%	15.84%
DSS	24.27	31.66	30.47%	2.68%
AG	592.02	621.40	4.90%	52.69%
CII	37.73	48.23	27.80%	4.09%
L/R	219.17	289.23	31.96%	24.52%
PG	1.54	2.03	31.80%	0.17%
LWC Planning Area Total	**1,013.43**	**1,179.37**	**16.37%**	**100.0%**

AG = Agriculture; CII = Commercial/Industrial/Institutional; DSS = Domestic Self-Supply; L/R = Landscape/Recreational; mgd = million gallons per day; PG = Power Generation; PS = Public Supply

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation programs for all water use categories offer the potential to reduce the amount of water needed to meet future demands (**Chapter 3**). All water users are urged to implement water conservation measures to reduce demands and defer construction of capital-intensive projects. The following conservation-related actions are recommended:

- The SFWMD will continue to implement its Comprehensive Water Conservation Program.
- All water users are encouraged to implement water conservation measures and practices that increase water use efficiency to help reduce future demands.
- AG water users are encouraged to install or upgrade to high-efficiency irrigation systems and advanced irrigation technology. More efficient irrigation systems could substantially reduce the amount of water needed to meet future crop demands; however, implementation of such systems can be economically and technically challenging.
- When applicable, AG water users are encouraged to use Florida Automated Weather Network irrigation tools.
- PS utilities are encouraged to develop goal-based water conservation plans and proactively implement water-saving measures and programs, such as incentives to promote replacement of older water fixtures with new high-efficiency ones.
- Local governments should evaluate whether mandated water conservation measures, such as requirements for construction of water-efficient homes and commercial properties, are appropriate for their jurisdiction.

- Local governments should adopt a year-round irrigation ordinance that fully comports with the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, Florida Administrative Code). Local governments that have not yet adopted irrigation ordinances include Clewiston, Ft. Myers Beach, Glades County, Hendry County, LaBelle, and Moore Haven.
- Local governments should develop and adopt ordinances to be consistent with Florida-Friendly Landscaping provisions (Section 373.185, Florida Statutes).
- Public education programs can help instill a year-round conservation ethic. Local and tribal governments and PS utilities are encouraged to provide conservation-related educational programs in cooperation with the SFWMD.
- Water users are encouraged to seek cost-share funding opportunities that may be available for water conservation projects.
- Landscape/Recreational (L/R) water users are encouraged to implement advanced irrigation technology, improve landscape design and management practices, and participate in recognition programs (e.g., Florida-Friendly Landscaping program) to further increase landscape water use efficiency.
- Commercial/Industrial/Institutional (CII) entities are encouraged to use the *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities, A Guide for Facility Managers* (SFWMD 2013) to improve water use efficiency and reduce operating costs.

NATURAL SYSTEMS AND RESOURCE PROTECTION


Caloosahatchee River Estuary

In addition to the protection of water resources, a wide range of activities related to natural systems can affect future water supplies within the LWC Planning Area. Such activities include construction of CERP projects; changes by the United States Army Corps of Engineers (USACE) to regulation schedules for the Everglades, Lake Okeechobee, and other water bodies; and monitoring and research projects. In addition, regulatory criteria designed to protect water resources and related natural systems, including elements identified in MFL recovery and prevention strategies, can place limitations on water available for allocation (**Chapter 4**, **Appendix C**).

CERP includes water resource development projects to improve the quality, timing, volume, distribution, and delivery of water to the natural system and can enhance water availability for other uses (**Chapter 7**). Future environmental restoration and water resource protection efforts include the following:

- The SFWMD and USACE will continue to make progress towards completion of the C-43 West Basin Storage Reservoir, C-43 Water Quality Treatment Feature (Boma), Picayune Strand Restoration, Lake Okeechobee Watershed Restoration, Lake Hicpochee Storage and Hydrologic Enhancement, and other ecosystem restoration projects.

- The USACE is anticipated to complete and implement the Lake Okeechobee System Operating Manual by 2023. The operating manual considers water needs for the environment among other benefits.
- The SFWMD will continue to partner with the USACE on planning for future CERP projects in the Lake Okeechobee and Caloosahatchee River watersheds as well as the Big Cypress Basin.
- The SFWMD will continue to monitor natural areas, including the Caloosahatchee Estuary, Corkscrew Swamp Sanctuary, the Big Cypress National Preserve, and the Picayune Strand State Forest, and provide annual updates on the ecological health of these areas in the *South Florida Environmental Report* to meet regulatory requirements.
- The SFWMD will continue to implement MFL prevention strategy components for the Caloosahatchee River and LWC aquifers and update them, if needed, in conjunction with future plan updates.

WATER SOURCE OPTIONS

The LWC Planning Area AG users rely primarily on surface water from the C-43 Canal as well as Lake Okeechobee and its connected canals and groundwater where surface water is not available. Fresh groundwater from the surficial aquifer system (SAS) and the intermediate aquifer system (IAS) and brackish water from the Floridan aquifer system (FAS) are the primary sources for PS and other urban and industrial uses (**Chapter 5**).

Withdrawals from the SAS have been maximized in many areas, especially along the coast, due to potential impacts on wetlands, potential for saltwater intrusion into freshwater sources, proximity to contamination sources, rate of recharge, and low aquifer productivity. Therefore, PS utilities are projected to continue increasing use of the IAS and FAS to meet future water demands. Additionally, blending brackish water with fresh water from the SAS or surface water is a practical solution to meet some of the region's AG needs when surface water availability is limited or during freezes. However, the suitability of supplementing water from the FAS may depend on the salt tolerance of the intended crops.

Alternative water supply (AWS) sources, such as reclaimed water, can be used to meet new uses or replace freshwater sources and potable water currently used for irrigation or industrial purposes. Additionally, water storage features such as reservoirs, aquifer storage and recovery (ASR) wells, and impoundments can capture excess stormwater, groundwater, and surface water during wet-weather periods and provide supplemental water supply for AG, PS, natural systems, and other needs during dry periods. Seawater is a potential AWS source as membrane technology costs continue to decline; however, no seawater projects are proposed in this plan update.

In addition, climate change and sea level rise can affect water resources and water demands in the LWC Planning Area. The District, local governments, and water users need to be diligent in proactively understanding potential impacts and developing resiliency strategies, including development of tools to predict potential impacts, in coordinated effort.

The following sections offer guidance for consideration by local governments, water users, and the SFWMD as a basis for the future direction of water supply planning in the LWC Planning Area.

Surface Water

Caloosahatchee River (C-43 Canal)

Surface water is the primary source for the AG water use category in the LWC Planning Area. Surface water supply sources within the LWC Planning Area primarily include the C-43 Canal and Lake Okeechobee with its connected secondary system in the Lake Okeechobee Service Area. Lake Okeechobee borders four water supply planning areas and is formally included in the Lower East Coast Water Supply Plan. Water availability in most of these systems is limited due to restricted allocation area criteria or other protective measures. Additional water storage features could enhance water availability. The following actions should be implemented:

- The SFWMD and USACE will complete the construction of the C-43 West Basin Storage Reservoir and associated project components.
- The SFWMD and USACE will complete and implement the components identified in the Lake Okeechobee Watershed Restoration Project. Part of CERP, this project will increase the watershed's storage capacity and improve the quantity and timing of water deliveries to Lake Okeechobee.
- The USACE will complete rehabilitation of the Herbert Hoover Dike and the Lake Okeechobee System Operating Manual by 2023.
- Local governments, PS utilities, and agricultural operations are encouraged to create additional storage capacity for surface water, where appropriate and feasible.
- AG users are encouraged to consider reducing or augmenting surface water use with options such as stormwater and tailwater recovery, the blending of brackish groundwater with fresh water where available, and more efficient water conservation practices.

Groundwater

Groundwater is the primary source of water for urban needs in the LWC Planning Area, with approximately 35% of the 2020 PS demand met with fresh groundwater from the SAS, 15% from the IAS, and 50% with brackish groundwater from the FAS. This 2022 LWC Plan Update supports the use of reclaimed water for urban irrigation, thereby reducing demands on the potable water system and freshwater resources.

Surficial and Intermediate Aquifer Systems

Development of the SAS and IAS has been maximized in many areas due to the potential harm to water resources and related natural systems, saltwater intrusion, and impacts to existing legal users. At current use rates and locations, water levels in the SAS and IAS appear stable — although there are localized areas within Lee County where the Sandstone and Mid-Hawthorn aquifers are under stress. Potential use of the SAS for new or increased allocations will be evaluated on an application-by-application basis to determine if the project meets the SFWMD's water use permitting criteria. The following actions are suggested:

- Water users are encouraged to reduce reliance on the SAS and IAS by diversifying water sources and developing AWS sources to meet future water demands.
- PS utilities should design wellfield locations, configurations, and pumping regimes to minimize the potential for saltwater intrusion, pollution, harm to natural systems, or increased dependence on the regional system (as demonstrated through modeling).
- PS utilities should continue to expand interconnections with other utilities for supply reliability and assess existing interconnections to confirm they operate as intended.
- The SFWMD, United States Geological Survey (USGS), and local governments should continue coordinating saltwater intrusion monitoring efforts to delineate the location and movement of the saltwater interface and identify areas of concern. The SFWMD will continue to update saltwater interface maps every 5 years.
- The SFWMD will periodically review, maintain, and enhance existing groundwater monitoring networks that collect water level and water quality data.
- The SFWMD will work with appropriate local governments to identify long-term sustainable water supply solutions in Domestic Self-Supply (DSS) areas that are currently or projected to experience aquifer stress.

Floridan Aquifer System

The FAS is expected to be the primary water source to meet increased PS demands. Brackish groundwater from the FAS is considered an AWS source in the LWC Planning Area. The following future actions are suggested:

- Local water users installing FAS wells are encouraged to collaborate with the SFWMD to gather and share hydrogeologic data. Additional data will increase knowledge of aquifer properties and could support updates to future groundwater modeling efforts of the FAS.
- The monitoring networks used to assess the SAS, IAS, and FAS are a hybrid of regional monitoring by agencies, such as the SFWMD and USGS, and monitoring performed by water use permittees as part of their permit requirements. Efforts should be made to identify wells considered critical to long-term monitoring and modeling to ensure they are maintained or replaced, as necessary.
- Local water users, other agencies, local governments, and PS utilities are encouraged to coordinate with the SFWMD to improve ongoing water level and water quality monitoring of the FAS.

- PS utilities should use an incremental approach when installing and testing production wells due to geologic variability within the FAS. Wellfields should be designed and monitored to prevent overstressing production zones and to minimize harmful changes in water quality.
- The SFWMD will continue to work with FAS stakeholders and the Southwest Florida Water Management District to further refine assumptions and data used in groundwater model simulations.
- AG water users are encouraged to consider blending brackish water from the FAS with fresh groundwater or surface water to produce acceptable irrigation-quality water. Blended water supplies depend on crop requirements, water sources, treatment type, volume of stored water, and natural system requirements. These blended supplies require monitoring to ensure acceptable water quality.

Floridan Aquifer System Monitor Well

- Landowners are encouraged to plug and abandon free-flowing inactive or nonfunctional FAS wells in accordance with existing rules and regulations. This will prevent loss of water via free-flowing wells and contamination of the overlying SAS and IAS with more saline water from the FAS.

Reclaimed Water

Reclaimed Water Piping

In the LWC Planning Area, reclaimed water has been an integral part of water supply for over three decades and is used primarily for L/R irrigation, with some used for groundwater recharge, cooling water, and environmental enhancement. Reclaimed water can be used to meet new uses or replace freshwater sources currently used for irrigation and industrial purposes, thereby decreasing the use of traditional freshwater sources. Opportunities to expand reclaimed water use include the following:

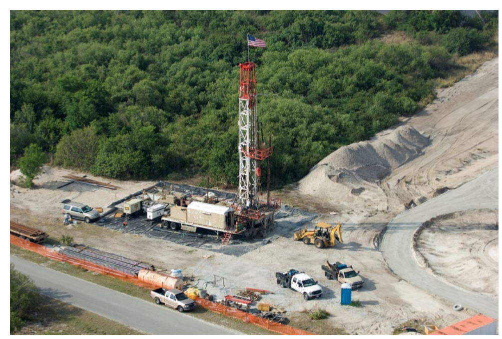
- Local governments should consider requiring construction of reclaimed water infrastructure in new development projects. Building codes, ordinances, and land development regulations are options to promote reclaimed water use.
- Local governments and PS utilities should support the installation of additional reclaimed water lines for irrigation of residential lots, road medians, common areas, and golf courses to decrease reliance on traditional freshwater sources and potable water distribution systems. When funds are available, entities are encouraged to apply for AWS grants for "shovel-ready" reclaimed water construction projects.

- Local governments should consider establishing mandatory reuse zones, where reclaimed water use is required by ordinance. The SFWMD can provide technical assistance to local governments who wish to establish mandatory reuse zones.
- PS utilities should consider using substitution credits and impact offsets (Section 373.250, Florida Statutes) during the water use permitting process to promote increased use of reclaimed water.
- Utilities should extend their reclaimed water supply by implementing feasible options such as reclaimed water augmentation, increased storage, residential customer metering, tiered rate structures, limiting landscape irrigation frequency, and interconnects with other reclaimed water utilities.

New Storage Capacity for Surface Water or Groundwater

In the LWC Planning Area, water storage options include reservoirs, ASR wells, and surface water impoundments that capture excess groundwater or surface water for later use. In addition, ASR can be used to store excess potable water and reclaimed water for seasonal or longer-term drought resilience. Proposed projects that develop new storage and create additional water supply may be considered AWS sources. Opportunities for new storage capacity include the following:

- Surface water storage systems (e.g., reservoirs) can help meet environmental, agricultural, and urban water supply needs.
- New or retrofitted surface water storage systems for agricultural operations could provide additional water supply for irrigation but may have limited availability during a 1-in-10-year drought.
- ASR systems can store water during periods of low demand and high-water levels (i.e., during the wet season) for subsequent recovery during dry periods, which could reduce withdrawals from the SAS and IAS wells.



Well Drilling Operation

Seawater

The ocean is an important source of water, but desalination is required before seawater can be used for water supply purposes. Where appropriate, utilities should consider the feasibility of desalinated seawater from the Gulf of Mexico as an additional water source option for the LWC Planning Area.

COORDINATION

Coordination and collaboration among regional and local government agencies and utility planning entities is essential to ensure the supply of water is sufficient and sustainable to meet urban, agricultural, and environmental needs. Examples of coordination activities include the following:

- Water Supply Facilities Work Plans are due within 18 months of approval of this 2022 LWC Plan Update. Local governments must provide linkages and coordination between the SFWMD's plan update and the water supply-related components of their Comprehensive Plans.
- The SFWMD will continue to work with the Florida Department of Agriculture and Consumer Services and AG stakeholders to provide data for annual updates to the Florida Statewide Agricultural Irrigation Demand simulation for future crop acreage and water demand projections.
- The SFWMD will continue to coordinate with utilities, counties, and the USGS to review, recommend improvements, and provide data and analysis for saltwater intrusion monitoring networks.
- Where wellfields are at risk of saltwater intrusion, the SFWMD will work with utilities and counties to identify additional monitoring needs and potential solutions.
- The SFWMD will coordinate with stakeholders on the development and use of regional groundwater and surface water models to evaluate water resource availability.
- The SFWMD will coordinate ongoing activities with the Southwest Florida Water Management District's planning efforts along the SFWMD boundaries.

CLIMATE CHANGE AND SEA LEVEL RISE

Climate change and sea level rise could affect hydrologic conditions, and thus water supply sources, as well as patterns of water demand. Recommendations related to climate change and sea level rise include the following:

- The SFWMD will continue to investigate climate change and sea level rise projection models for use in water supply planning and system operations.
- The SFWMD will continue to support AWS development and promote water conservation to increase the security and diversity of water sources, as withdrawing less water from aquifers helps prevent saltwater intrusion.
- The SFWMD, USACE, and coastal utilities and municipalities should identify methods to evaluate the consequences of climate change and sea level rise and use them to assess the cumulative impacts to existing structures, water resources, and legal users.
- The SFWMD will continue to provide technical assistance to local governments as they develop climate change and sea level rise adaptation strategies.
- Water users should periodically review irrigation schedules and consider installing weather-based controllers.

- PS utilities should plan for climate change and sea level rise by reducing withdrawals from the SAS and by using the IAS and FAS, employing water conservation measures to reduce overall water demands, and expanding reuse programs to reduce potable and self-supplied SAS withdrawals for irrigation.
- Local governments, utilities, and private entities should coordinate on resiliency efforts and development of adaptive strategies to address climate change and sea level rise (e.g., constructing defensive barriers, improving infrastructure, rezoning property threatened by inundation or transferring it to public ownership).

CONCLUSIONS

This 2022 LWC Plan Update concludes that future water needs of the region can continue to be met through 2045 with appropriate management, conservation, and implementation of projects identified herein. Meeting future water needs through 2045 depends on the following:

- Construction of future potable water supply development projects by two PS utilities (Ave Maria and Florida Governmental Utility Authority – Lehigh Acres).
- Implementation of the CERP C-43 West Basin Storage Reservoir and other ecosystem restoration projects.
- Completion of repairs to the Herbert Hoover Dike by the USACE and implementation of the new Lake Okeechobee System Operating Manual.

Successful implementation of this 2022 LWC Plan Update requires close coordination and collaboration with local and tribal governments, utilities, agricultural interests, and other stakeholders. This partnering should ensure water resources in the LWC Planning Area are prudently managed and available to meet future demands while also protecting the environment.

REFERENCES

SFWMD. 2013. *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities, A Guide for Facility Managers*. Second Edition. South Florida Water Management District, West Palm Beach, FL.

Glossary

1-in-10-year drought A year in which below normal rainfall occurs with a 90% probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

1-in-10-year level of certainty (see *Level of Certainty*)

Acre-foot, acre-feet The volume of water that covers 1 acre (43,560 square feet) to a depth of 1 foot. The equivalent of 43,560 cubic feet, 1,233.5 cubic meters, or 325,872 gallons.

Agricultural best management practice (Agricultural 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 water budget model for calculating 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.

Agriculture (AG) Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture, and aquaculture.

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; stormwater; 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 [F.S.]).

Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District **(Applicant's Handbook)** Read in conjunction with Chapter 40E-2, Florida Administrative Code (F.A.C.), the Applicant's Handbook further specifies the general procedures and criteria used by SFWMD staff for review of water use permit applications to ensure water uses permitted by the SFWMD are reasonable-beneficial, do not interfere with existing legal users, and are in the public interest.

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 potable water, stormwater, surface water, fresh groundwater, or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells. The aquifer (typically the Floridan aquifer system in South Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation.

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.

Average rainfall year A year having rainfall with a 50% probability of being exceeded over a 12-month period.

Base condition A specified period of time during which collected data are used for comparison with subsequent data.

Basin There are two types of basins: 1) a groundwater basin is a hydrologic unit consisting of one large aquifer, or several connecting and interconnecting aquifers; and 2) a surface water basin is 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.

Boulder Zone A highly transmissive, cavernous zone of dolomite within the Lower Floridan aquifer used to dispose of secondary-treated effluent from wastewater treatment facilities and concentrate from membrane water treatment plants via deep injection wells.

Brackish water Water with a chloride concentration greater than 250 milligrams per liter (mg/L) and less than 19,000 mg/L.

Canal A manmade waterway used for draining or irrigating land or for navigation by boat.

Capacity The ability to treat, move, or reuse water. Typically, capacity is expressed in millions of gallons per day (mgd).

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 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 (USACE) to provide flood control and improve navigation and recreation.

Commercial/Industrial/Institutional (CII) Self-supplied water associated with the production of goods or provision of services by industrial, commercial, or institutional establishments.

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 An aquifer containing groundwater that is confined under pressure and bounded between substantially 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 (see *Water conservation*)

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).

Cubic feet per second (cfs) A rate of flow (e.g., in streams and rivers) equal to a volume of water 1 foot high and 1 foot wide flowing a distance of 1 foot in 1 second. One cfs is equal to 7.48 gallons of water flowing each second.

DBHYDRO The SFWMD's corporate environmental database, storing hydrologic, meteorologic, hydrogeologic, and water quality data.

Demand The quantity of water needed to fulfill a requirement.

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.

Dike An embankment to confine or control water, especially one built along the banks of a river or lake to prevent overflow of lowlands; a levee.

Discharge The rate of water movement past a reference point, measured as volume per unit of time (usually expressed as gallons per minute, cubic feet per second, or cubic meters per second).

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.

Disposal Effluent disposal involves the practice of releasing treated effluent back to the environment using ocean outfalls, surface water discharges, or deep injection wells.

Domestic Self-Supply (DSS) Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.

Domestic wastewater Wastewater derived principally from residential dwellings, commercial buildings, and institutions; sanitary wastewater; sewage.

Drainage basin The land area where precipitation ultimately drains to a particular watercourse (e.g., river, stream) or body of water (e.g., lake, reservoir). Drainage basins in South Florida are defined by rule and periodically are redefined to reflect changes in the regional drainage network.

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 long period of abnormally low rainfall, especially one that reduces water supply availability.

Ecology The study of the inter-relationships of plants and animals to one another and to their physical and biological environment.

Ecosystem Biological communities together with their environment, functioning as a unit.

Ecosystem restoration The process of reestablishing to as near its natural condition as possible, the structure, function, and composition of an ecosystem.

Elevation The height in feet above mean sea level according to National Geodetic Vertical Datum of 1929 (NGVD29) or North American Vertical Datum of 1988 (NAVD88). May also be expressed in feet above mean sea level as reference datum.

Environmental impact statement An evaluation of the positive and negative environmental effects of a proposed agency action 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."

Estuary A body of water found where a river meets the ocean that is characterized by fresh water mixing with salt water.

Evapotranspiration (ET) The total loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Exceedance The violation of the pollutant levels permitted by environmental protection standards.

Exceedance (MFL) As defined in Rule 40E-8.021(17), F.A.C., to fall below a minimum flow or level, which is established in Parts II and III of Chapter 40E-8, F.A.C, for a duration greater than specified for the MFL water body.

Finished water Water that has undergone a purification or treatment process; water that has passed through all the processes in a water treatment plant and is ready to be delivered to consumers. Contrast with *Raw water*.

Finished water demand (see *Net water demand*)

Fiscal Year (FY) The South Florida Water Management District'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 Department of Agriculture and Consumer Services (FDACS) An executive department of the Government of Florida. FDACS supports and promotes Florida agriculture, protects the environment, safeguards consumers, and ensures the safety and wholesomeness of food.

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.

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.

Floridan aquifer system (FAS) A highly used, deep aquifer system composed of the Upper and Lower Floridan aquifers. It is the principal source of water supply north of Lake Okeechobee and is highly mineralized south of the lake, requiring membrane treatment prior to use.

Flow The actual amount of water flowing by a particular point over some specified time. In the context of water supply, flow represents the amount of water being treated, moved, or reused. Flow is frequently expressed in millions of gallons per day (mgd).

Fresh water An aqueous solution with a chloride concentration less than or equal to 250 mg/L.

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.

Gross (raw) water demand The amount of water withdrawn from a 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 to account for treatment and distribution losses.

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.

Groundwater recharge (see *Recharge*)

Harm As defined in Chapter 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.

Headwater(s) 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.

Hydrogeologic unit Any rock unit or zone that because of its hydraulic properties has a distinct influence on the storage or movement of groundwater.

Hydrogeology The geology of groundwater, with emphasis on the chemistry and movement of water.

Hydrologic condition(s) The state of an area pertaining to the amount and timing of water present.

Hydrologic model A conceptual or physically based procedure for numerically simulating a process or processes that occur in a watershed.

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.

Infiltration The movement of water through the soil surface into the soil under the forces of gravity and capillarity.

Inflow 1) The act or process of flowing in or into. 2) The measured quantity of water that has moved into a specific location.

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 contain drinking water.

Irrigation The application of water to crops and other plants by artificial means to supplement rainfall.

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.

Landscape/Recreational (L/R) Self-supplied and reclaimed water used to irrigate golf, courses, sports fields, parks, cemeteries, and large common areas such as land managed by homeowners' associations and commercial developments.

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% 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.

Marsh A frequently or continually inundated unforested wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Million gallons per day (mgd) A rate of flow of water equal to 133,680.56 cubic feet per day, 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).

Minimum flow and minimum water level (MFL) A flow or level established by the SFWMD pursuant to Sections 373.042 and 373.0421, F.S., for a given water body, at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

Mobile irrigation lab (MIL) 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 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. Groundwater flow models are a numerical representation of water flow and water quality within an aquifer or aquifer system.

Monitor well Any human-made excavation by any method to monitor fluctuations in groundwater levels, quality of underground waters, or the concentration of contaminants in underground waters.

National Geodetic Vertical Datum of 1929 (NGVD29) 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." As technology has improved and the demand for greater accuracy increased, inherent inaccuracies were uncovered in NGVD29. As a result, NGVD29 has been superseded by the North American Vertical Datum (NAVD) of 1988.

Natural system(s) A self-sustaining living system that supports an interdependent network of aquatic, wetland-dependent, and upland living resources.

Outflow The measured quantity of water that has left an area or water body (through pumping or gravity) during a certain period of time.

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.

Permeability The capacity of a porous rock, sediment, or soil for transmitting a fluid.

Planning Area The SFWMD is divided into five areas within which planning activities are focused: Upper Kissimmee Basin (part of the Central Florida Water Initiative), Lower Kissimmee Basin, Upper East Coast, Lower West Coast, and Lower East Coast.

Potable water Water that is suitable for drinking, culinary, or domestic purposes.

Potentiometric head The level to which water will rise when a well is placed in a confined aquifer.

Power Generation (PG) 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.

Priority Water Bodies List and Schedule Required in Section 373.042(2), F.S. of the state's five water management districts to provide the Florida Department of Environmental Protection with an annual list and schedule of specific surface waters and groundwaters with minimum flows and levels and water reservation rules that will be adopted to protect them from the effects of consumptive use allocations.

Process water Water used for nonpotable industrial use, e.g., mixing cement.

Public Supply (PS) Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages greater than 0.10 million gallons per day.

Public Supply (PS) demand All potable (drinking quality) water supplied by water treatment plants with projected average pumpages of 0.10 million gallons per day or greater to all types of customers, not just residential.

Rapid infiltration basin A disposal method by which treated wastewater is applied in deep and permeable deposits of highly porous soils for percolation.

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. Contrast with *Finished Water*.

Raw water demand The amount of water that must be withdrawn from the groundwater or surface water system to meet a particular need. Withdrawal demands are almost always higher than user/customer demands because of treatment and process losses, and inefficiencies associated with delivering water from the source to the end user.

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 or reclaimed water into the ground to raise groundwater levels.

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 natural 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.

Reservoir An artificial or natural water body used for water storage. Reservoirs can be above or below ground.

Restoration The recovery of a natural system's vitality and biological and hydrological integrity to the extent that the health and ecological functions are self-sustaining over time.

Restricted allocation area An area designated within the South Florida Water Management District boundaries 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.

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: The replacement or changing out of an existing irrigation system with a more efficient irrigation system, such as a conversion from an overhead sprinkler system to a micro-irrigation system. May also include rain or soil moisture sensors to increase efficiency.

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 A treatment process for desalting water using applied pressure to drive the feed water (source water) through a semipermeable membrane.

Rule(s) Of or pertaining to the SFWMD's regulatory programs, which are set forth in various statutes, codes, and 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.

Salinity Of or relating to chemical salts, usually measured in milligrams per liter (mg/L), or practical salinity units.

Salt water (see *Seawater or Salt water*)

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.

Seawater or **Salt water** Water with a chloride concentration at or above 19,000 mg/L.

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.

Seminole Tribe of Florida A federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, Florida Statutes.

Serious harm As defined in Chapter 40E-8, 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 Chapter 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface water or groundwater hydrology and takes more than 2 years to recover, but which is considered less severe than serious harm.

Stormwater Water that does not infiltrate but accumulates on land as a result of storm runoff, snowmelt, irrigation, or drainage from impervious surfaces.

Stormwater discharge Precipitation runoff from roadways, parking lots, and roof drains that is collected in gutters and drains. A major source of nonpoint source pollution to water bodies and sewage treatment facilities in municipalities where stormwater is combined with the flow of domestic wastewater (sewage) before entering the wastewater treatment facility.

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. 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.

Treatment facility Any facility or other works used for the purpose of treating, stabilizing, or holding water or wastewater.

Tributary A stream that flows into a larger stream or other body of water.

United States Army Corps of Engineers (USACE) As part of the Department of the Army, the USACE 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 levee, dams, and locks.

United States Geological Survey (USGS) The federal agency chartered in 1879 by Congress to classify public lands, and to examine 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.

Violation (MFL) As defined in Rule 40E-8.021(18), F.A.C., 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 conservation The permanent, long-term reduction of daily water use. Permanent water use reduction requires the implementation of water saving technologies and measures that reduce water use while satisfying consumer needs. Water conservation is considered a demand management measure because it reduces the need for future expansion of water supply infrastructure (see *Demand management*).

Water conservation rate structure A water rate structure designed to conserve water. Examples of conservation rate structures include increasing block rates, seasonal rates, and quantity-based surcharges.

Water management The general application of practices to obtain added benefits from precipitation, water or water flow in any of a number of areas, such as irrigation, drainage, wildlife and recreation, navigation, water supply, watershed management, and water storage in soil for crop production. Watershed management is the analysis, protection, development, operation, or maintenance of the land, vegetation, and water resources of a drainage basin for the conservation of all its resources for the benefit of its residents. Watershed management for water production is concerned with the quality, quantity and timing of the water which is produced.

Water quality 1) A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose. 2) The physical, chemical, and biological condition of water as applied to a specific use. Federal and state guidelines set water quality standards based on the water's intended use, whether it is for recreation, fishing, drinking, navigation, shellfish harvesting, or agriculture.

Water reservation 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 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, F.S.).

Water reuse (see *Reuse*)

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.

Water Shortage Plan(s) This effort includes provisions in Chapters 40E-21 and 40E-22, 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 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, F.S.).

Water Supply Plan Detailed water supply plan developed by the water management districts 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 at least 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.

Water use Any use of water that reduces the supply from which it is withdrawn or diverted.

Water use permitting The issuance of permits by the South Florida Water Management District, under the authority of Chapter 40E-2, F.A.C., allowing a specified quantity of water withdrawal for consumptive use over a specified time period.

Wellfield One or more wells producing water from a groundwater 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, marshes).

Withdrawal Water removed from a groundwater or surface water source for use.

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.

Appendices

A

Water Demand Projections

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POPULATION ESTIMATES AND PROJECTIONS

The South Florida Water Management District (SFWMD or District) develops water demand estimates and projections in coordination with stakeholder groups, other agencies, utilities, and local governments. **Chapter 2** of the *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update) provides summary information, and this appendix describes the methods used to develop water demand estimates for 2020 and projections through 2045 for the LWC Planning Area. Demands are developed for six water use categories: Public Supply (PS), Domestic Self-Supply (DSS), Agriculture (AG), Commercial/Industrial/Institutional (CII), Landscape/Recreational (L/R), and Power Generation (PG). Water demand estimates and projections are provided in 5-year increments through 2045 for average rainfall and 1-in-10-year drought conditions. In addition, demands are described and analyzed in two ways: gross (or raw) demand and net (or finished) demand.

This section presents the methodology used to develop the 2020 population estimates and 2045 population projections for the LWC Planning Area, which are essential to determining water demands. The University of Florida's Bureau of Economic and Business Research (BEBR) provides population estimates and projections at the county level; however, water supply planning requires population projections at the sub-county level to delineate PS utility service areas and DSS populations. Section 373.709(2)(a)1., Florida Statutes (F.S.), prescribes the use of population projections from BEBR in determining water supply needs in regional water supply plans.

In accordance with Section 373.709(2)(a)1., F.S., permanent resident estimates and projections for each county, published by BEBR (Rayer and Wang 2021), were used as the basis for population projections in this 2022 LWC Plan Update. BEBR county population estimates, and projections are also used by local governments in their Comprehensive Plans. The 2020 permanent resident populations within the LWC Planning Area were as follows:

- Lee County: 750,493 permanent residents
- Collier County: 387,450 permanent residents
- Hendry County: 35,629 permanent residents
- Glades County: 9,390 permanent residents
- Charlotte County: 5,637 permanent residents

Utility Service Areas

To establish current and future PS and DSS populations, each PS utility's 2020 and 2045 potable water service area was delineated. A utility service area refers to the area with water distribution infrastructure and water customers served by a particular PS utility. The SFWMD developed 2020 and 2045 utility service area maps based on information from utilities and the SFWMD's water use permit database. Accuracy of the service area maps was verified through correspondence with all PS utilities.

Population Projection Methodology

Census block populations from the 2020 Decennial Census (United States Census Bureau 2020) and 2020 PS service area maps were used to estimate the 2020 permanent resident populations for PS utilities and DSS areas. Each census block within the LWC Planning Area was assigned to a PS service area or DSS area. The distribution of population in census blocks not entirely within a single PS service area or DSS area was based on visual comparison of residential land use coverage. PS service area and DSS population estimates for 2017 through 2020 were calculated by applying annual county growth rates published by BEBR 2021 population estimates (Rayer and Wang 2021) and the United States Census Bureau (2020).

Detailed sub-county population projections from county planning departments were assigned to PS utility service areas and DSS areas. In some cases, modifications were made to service area populations based on information from local land use planning maps and local government Comprehensive Plans. Population projections to 2045 were calculated using Future Utility Service Area distributions of population served with the 2020 Decennial Census data (United States Census Bureau 2020). Population growth rate was provided by the population county projections (BEBR medium) from BEBR 2021 (Rayer and Wang 2021) in accordance with Section 373.709, F.S. BEBR publishes low, medium, and high population projections to account for uncertainty in future population growth.

Population Projection Results

Table A-1 presents the results of the population distributions by county and PS utility (or DSS area) from 2020 to 2045. The results were shared with and reviewed by utility, municipal, local government, and tribal staff. The populations shown in **Table A-1** indicate the LWC Planning Area will have an additional 439,947 permanent residents by 2045, an increase of approximately 37%. Overall, the utilities in Lee County have the largest current and future populations, accounting for more than half of the region's projected 2045 PS population.

Table A-1. Service area population projections in the LWC Planning Area.

PS Utility or DSS	Service Area Population Projections					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Charlotte Correctional	1,278	1,278	1,278	1,278	1,278	1,278
Town and Country[a]	2,613	3,684	5,195	7,325	10,328	14,562
PS Total	**3,891**	**4,962**	**6,473**	**8,603**	**11,606**	**15,840**
DSS Total	**1,746**	**2,197**	**2,569**	**2,790**	**2,817**	**2,910**
Charlotte County Total	**5,637**	**7,159**	**9,042**	**11,393**	**14,423**	**18,750**
Collier County						
Ave Maria[b]	6,242	8,177	10,712	14,033	18,383	24,081
Collier County Utilities	209,504	228,359	244,344	259,005	271,955	282,833
Everglades City	1,069	1,165	1,247	1,322	1,388	1,444
Immokalee (IWSD)	24,618	26,834	28,610	29,469	30,058	30,359
Marco Island	18,077	19,162	20,120	21,126	21,971	22,850
Naples	53,812	55,800	59,414	62,692	65,646	68,510
Port of the Islands	907	924	937	947	956	963
STOF – Immokalee[c]	404	474	575	694	819	944
PS Total	**314,633**	**340,895**	**365,959**	**389,288**	**411,176**	**431,984**
DSS Total	**72,817**	**82,705**	**86,841**	**88,512**	**88,524**	**87,016**
Collier County Total	**387,450**	**423,600**	**452,800**	**477,800**	**499,700**	**519,000**

Table A-1. Continued.

PS Utility or DSS	Service Area Population Projections					
	2020	2025	2030	2035	2040	2045
Glades County*						
Clewiston (Glades Portion)	638	670	697	718	740	755
Moore Haven	3,335	3,502	3,642	3,751	3,863	3,940
Port LaBelle (Glades Portion)	733	770	800	824	849	866
Silver Lake – Muse Village	200	234	273	320	374	381
PS Total	**4,906**	**5,176**	**5,412**	**5,613**	**5,826**	**5,942**
DSS Total	**4,484**	**4,691**	**4,800**	**4,875**	**4,938**	**5,029**
Glades County Total	**9,390**	**9,867**	**10,212**	**10,488**	**10,764**	**10,971**
Hendry County*						
Clewiston (Hendry Portion)	14,154	14,288	14,387	14,463	14,528	14,584
LaBelle	7,923	7,998	8,054	8,096	8,132	8,164
Port LaBelle (Hendry Portion)	5,474	5,627	5,785	5,947	6,065	6,186
PS Total	**27,551**	**27,913**	**28,226**	**28,506**	**28,725**	**28,934**
DSS Total	**8,078**	**9,410**	**10,402**	**11,166**	**11,817**	**12,391**
Hendry County Total	**35,629**	**37,323**	**38,628**	**39,672**	**40,542**	**41,325**
Lee County						
Bonita Springs	66,897	74,256	80,197	85,009	89,259	92,829
Cape Coral	160,295	177,928	207,535	224,138	242,069	261,435
Citrus Park – Bonita Terra	1,368	1,560	1,589	1,645	1,686	1,754
FGUA – Lake Fairways	1,187	1,463	1,580	1,675	1,759	1,829
FGUA – Lehigh Acres	27,467	30,488	32,927	34,903	36,648	38,114
Fort Myers	94,421	96,905	102,719	107,855	115,535	122,170
Lee County Utilities	273,284	295,691	309,828	322,221	334,614	347,999
Pine Island (GPIWA)	12,841	13,419	13,848	14,254	14,492	15,072
Sanibel Island (IWA)	7,354	7,508	7,627	7,719	7,796	7,862
PS Total	**645,114**	**699,218**	**757,850**	**799,419**	**843,858**	**889,064**
DSS Total	**105,379**	**130,082**	**136,750**	**149,381**	**152,242**	**149,436**
Lee County Total	**750,493**	**829,300**	**894,600**	**948,800**	**996,100**	**1,038,500**
LWC Planning Area Total						
PS Total	**996,095**	**1,078,164**	**1,163,920**	**1,231,428**	**1,301,191**	**1,371,765**
DSS Total	**192,504**	**229,085**	**241,362**	**256,724**	**260,338**	**256,781**
LWC Planning Area Total	**1,188,599**	**1,307,249**	**1,405,282**	**1,488,153**	**1,561,529**	**1,628,546**

DSS = Domestic Self-Supply; FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The 2020 population is based on data provided in support of the most recent water use permit application. Projected populations are based on the University of Florida Bureau of Economic and Business Research (BEBR) "high" growth rate.

[b] The 2020 population is based on the 2021 United States Census Bureau population estimate. Projected populations are based on the University of Florida BEBR "high" growth rate.

[c] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Comparing this 2022 LWC Plan Update population projection to those published in the 2006, 2012, and 2017 LWC plan updates can provide insight into the importance of population growth rates based on BEBR projections. Prior to the national economic downturn in 2008, high rates of development in the region pointed to higher population growth rates (**Figure A-1**). The population projections in the 2006 LWC Plan Update were a result of higher population growth rates prior to the recession. The BEBR projections used in this 2022 LWC Plan Update indicate slower growth rates from previous plan updates. However, they are closely aligned with the projections published in the 2017 LWC Plan Update.

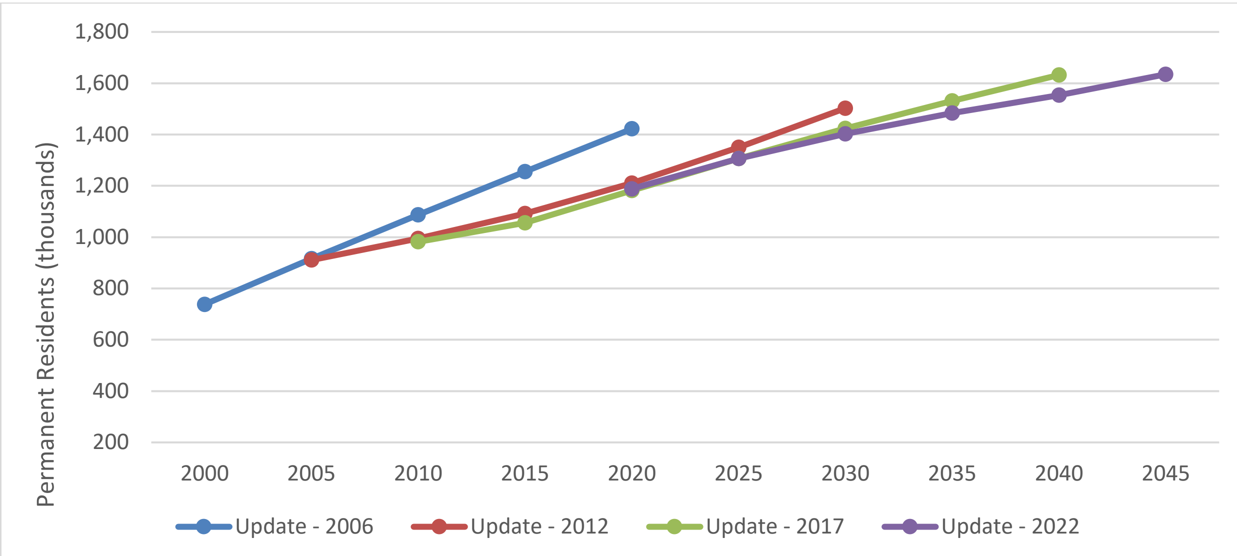

Figure A-1. Comparison of population projections from the 2006, 2012, 2017, and 2022 LWC plan updates.

PUBLIC SUPPLY

The PS category includes potable water supplied by water treatment plants with a current allocation of 0.10 million gallons per day (mgd) or greater. Developing PS demand projections in the LWC Planning Area was a multistep process that included determining PS utility service area and DSS populations, calculating per capita use rates (PCURs), and projecting future water needs.

NOTE

Perceived discrepancies in table totals are due to rounding.

PS Projection Methodology

Per Capita Use Rates

For each PS utility, a net (finished) water PCUR was developed by dividing the annual net (finished) water volume for 2016 through 2020 by the corresponding service area estimated population (permanent residents) for each year; then, the five annual PCURs were averaged (**Table A-2**). Net (finished) water volumes for 2016 through 2020 were obtained from the PS utility monthly operating reports submitted to the Florida Department of Environmental Protection (FDEP). The net (finished) water volume reported to the FDEP includes all water produced for permanent and seasonal residents; industrial, landscaping, and irrigation water supplied by PS utilities; and any water distribution losses. The resulting PCURs conform to guidance provided by the FDEP for consistent statewide water supply planning. Future water conservation savings (**Chapter 3**) were not factored into demand projections and PCURs due to water savings uncertainty. The LWC Planning Area county average PCURs were calculated by averaging PS and DSS PCURs, weighted by their respective permanent resident populations.

Table A-2. Average net (finished) water per capita use rates (in gallons per capita per day) in the LWC Planning Area.

PS Utility or DSS	2016-2020 Average PCUR
Charlotte County	
Charlotte Correctional	68
Town and Country	85
Charlotte County DSS	85
Charlotte County Average	**81**
Collier County	
Ave Maria	89
Collier County Utilities	130
Everglades City	223
Immokalee (IWSD)	89
Marco Island	425
Naples	264
Port of the Islands	85
STOF – Immokalee[a]	297
Collier County DSS	166
Collier County Average	**166**
Glades County	
Clewiston (Glades Portion)	108
Moore Haven	159
Port LaBelle (Glades Portion)	81
Silver Lake – Muse Village	136
Glades County DSS	134
Glades County Average	**137**
Hendry County	
Clewiston (Hendry Portion)	108
LaBelle	85
Port LaBelle (Hendry Portion)	81
Hendry County DSS	96
Hendry County Average	**93**

Table A-2. Continued.

PS Utility or DSS	2016-2020 Average PCUR
Lee County	
Bonita Springs	153
Cape Coral	81
Citrus Park – Bonita Terra	124
FGUA – Lake Fairways	64
FGUA – Lehigh Acres	87
Fort Myers	91
Lee County Utilities	115
Pine Island (GPIWA)	509
Sanibel Island (IWA)	93
Lee County DSS	101
Lee County Average	**101**
LWC Planning Area Average	**123**

DSS = Domestic Self-Supply; FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; PCUR = per capita use rate; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Finished to Raw Water Conversion

Net (finished) demands (**Table A-3**) were calculated by multiplying the PS utility service area or DSS area population and the 5-year average PCUR. Gross (raw) water withdrawals are the volumes needed from the water source(s) to produce the required net (finished) water volumes, considering water treatment process losses. Water use permit allocations for PS utilities are based on the gross (raw) water volume to meet service area demands. To determine gross (raw) water demand for each PS utility, net (finished) water projections were multiplied by raw-to-finished ratios (**Table A-4**), which are based on the treatment efficiency of each PS water treatment plant. For example, if a typical reverse osmosis treatment facility withdraws a gross (raw) volume of 10.00 mgd and produces 8.00 mgd of net (finished) water, its treatment losses are 20%. Therefore, its raw-to-finished ratio would be 1.25 (10 mgd divided by 8 mgd).

Treatment efficiencies were determined from information supplied in the water use permit and from actual pumpage reports. The assumed losses are 0% for aeration/disinfection only, 3% for lime softening/flocculation, 15% for nanofiltration, and 25% for reverse osmosis. If a utility has more than one treatment method, the ratio reflects combined treatment efficiencies. Potable water treatment plants in the LWC Planning Area and their treatment processes are shown in **Figures A-2, A-3,** and **A-4**.

Table A-3. PS net (finished) water demands under average rainfall conditions in the LWC Planning Area.

PS Utility	Net (Finished) Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Charlotte Correctional	0.09	0.09	0.09	0.09	0.09	0.09
Town and Country	0.22	0.31	0.44	0.62	0.88	1.24
Charlotte County Total	**0.31**	**0.40**	**0.53**	**0.71**	**0.96**	**1.32**
Collier County						
Ave Maria	0.56	0.73	0.95	1.25	1.64	2.14
Collier County Utilities	27.24	29.69	31.76	33.67	35.35	36.77
Everglades City	0.24	0.26	0.28	0.29	0.31	0.32
Immokalee (IWSD)	2.19	2.39	2.55	2.62	2.68	2.70
Marco Island	7.68	8.14	8.55	8.98	9.34	9.71
Naples	14.21	14.73	15.69	16.55	17.33	18.09
Port of the Islands	0.08	0.08	0.08	0.08	0.08	0.08
STOF – Immokalee[a]	0.15	0.18	0.20	0.22	0.24	0.26
Collier County Total	**52.34**	**56.20**	**60.06**	**63.67**	**66.96**	**70.08**
Glades County*						
Clewiston (Glades Portion)	0.07	0.07	0.08	0.08	0.08	0.08
Moore Haven	0.53	0.56	0.58	0.60	0.61	0.63
Port LaBelle (Glades Portion)	0.06	0.06	0.06	0.07	0.07	0.07
Silver Lake – Muse Village	0.03	0.03	0.04	0.04	0.05	0.05
Glades County Total	**0.69**	**0.72**	**0.76**	**0.78**	**0.81**	**0.83**
Hendry County*						
Clewiston (Hendry Portion)	1.53	1.54	1.55	1.56	1.57	1.58
LaBelle	0.67	0.68	0.68	0.69	0.69	0.69
Port LaBelle (Hendry Portion)	0.44	0.46	0.47	0.48	0.49	0.50
Hendry County Total	**2.65**	**2.68**	**2.71**	**2.73**	**2.75**	**2.77**
Lee County						
Bonita Springs	10.24	11.36	12.27	13.01	13.66	14.20
Cape Coral	12.98	14.41	16.81	18.16	19.61	21.18
Citrus Park – Bonita Terra	0.17	0.19	0.20	0.20	0.21	0.22
FGUA – Lake Fairways	0.08	0.09	0.10	0.11	0.11	0.12
FGUA – Lehigh Acres	2.39	2.65	2.86	3.04	3.19	3.32
Fort Myers	8.59	8.82	9.35	9.81	10.51	11.12
Lee County Utilities	25.42	27.50	28.81	29.97	31.12	32.36
Pine Island (GPIWA)	1.48	1.54	1.59	1.64	1.67	1.73
Sanibel Island (IWA)	3.74	3.82	3.88	3.93	3.97	4.00
Lee County Total	**65.08**	**70.40**	**75.88**	**79.86**	**84.04**	**88.25**
LWC Planning Area Total	**121.06**	**130.39**	**139.93**	**147.75**	**155.54**	**163.25**

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table A-4. Raw-to-finished water adjustment ratios for PS utilities in the LWC Planning Area.

PS Utility	Raw-to-Finished Ratio
Charlotte County	
Charlotte Correctional	1.03
Town and Country	1.27
Collier County	
Ave Maria	1.27
Collier County Utilities	1.15
Everglades City	1.11
Immokalee (IWSD)	1.01
Marco Island	1.19
Naples	1.03
Port of the Islands	1.33
STOF – Immokalee[a]	1.33
Glades County	
Moore Haven	1.18
Silver Lake – Muse Village	1.01
Hendry County	
Clewiston (Hendry Portion)	1.47
LaBelle	1.39
Port LaBelle (Hendry Portion)	1.18
Lee County	
Bonita Springs	1.10
Cape Coral	1.10
Citrus Park – Bonita Terra	1.05
FGUA – Lake Fairways	1.02
FGUA – Lehigh Acres	1.03
Fort Myers	1.39
Lee County Utilities	1.12
Pine Island (GPIWA)	1.14
Sanibel Island (IWA)	1.30

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

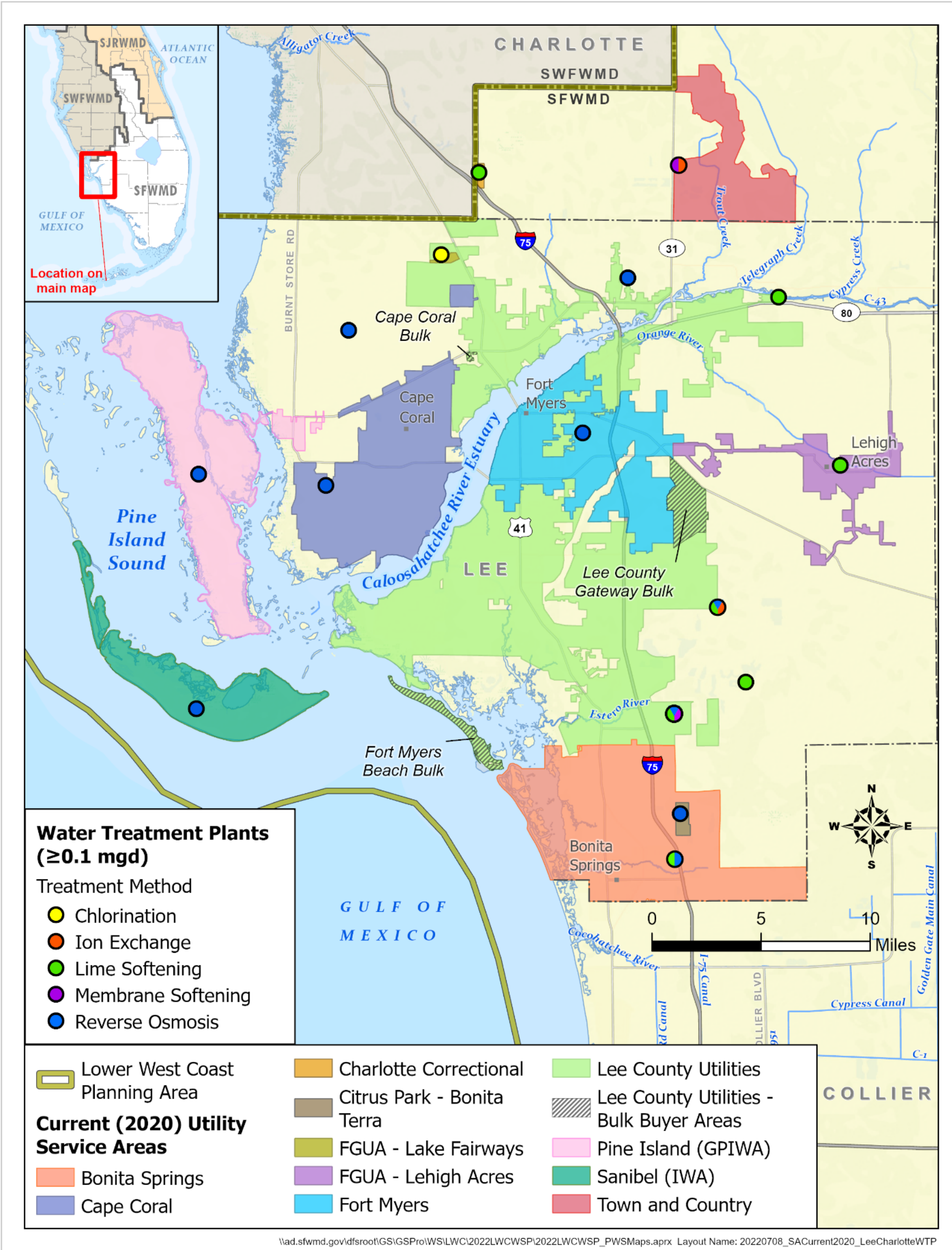

Figure A-2. Potable water treatment plants and Public Supply utility service areas in Lee and Charlotte counties.

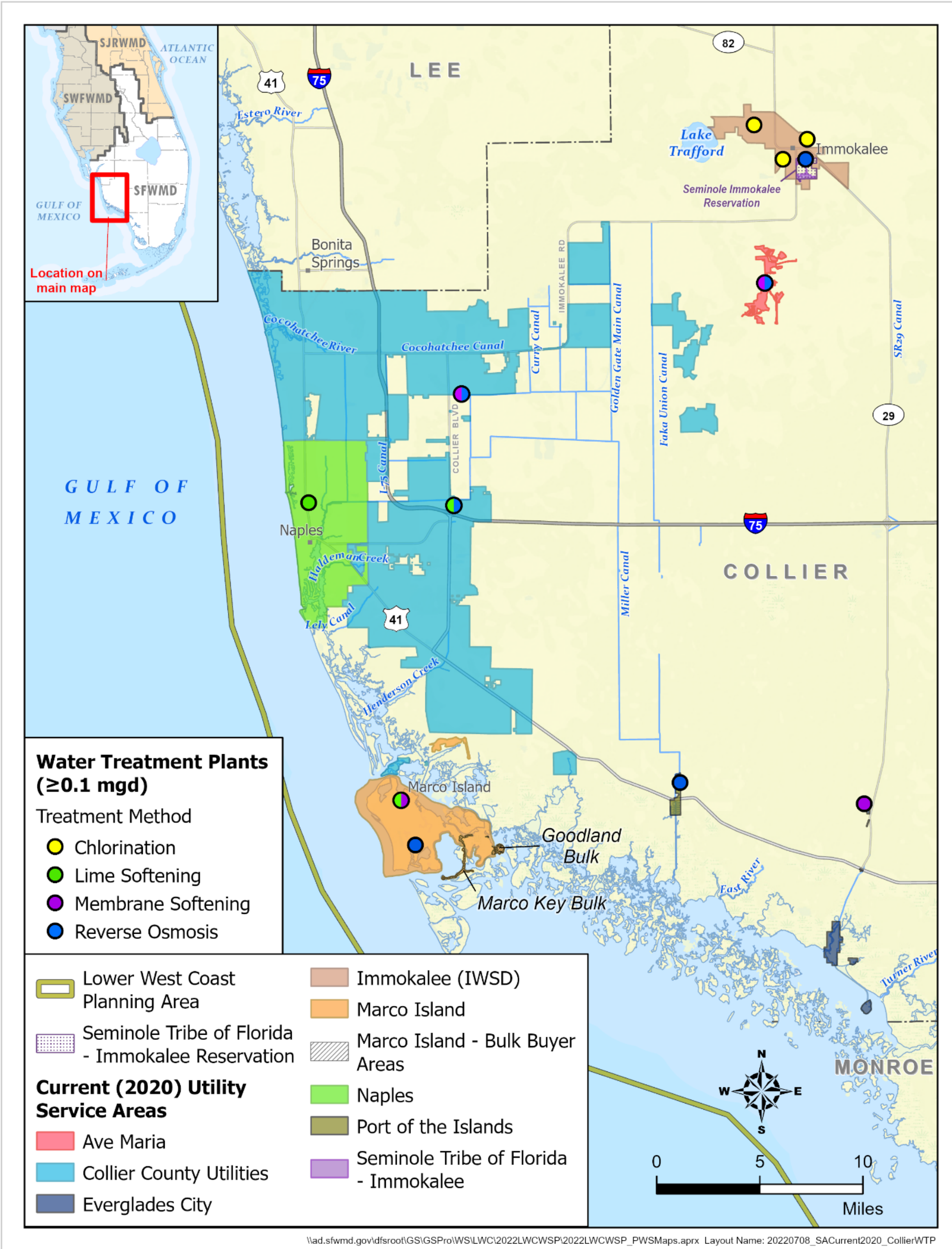

Figure A-3. Potable water treatment plants and Public Supply utility service areas in Collier County.

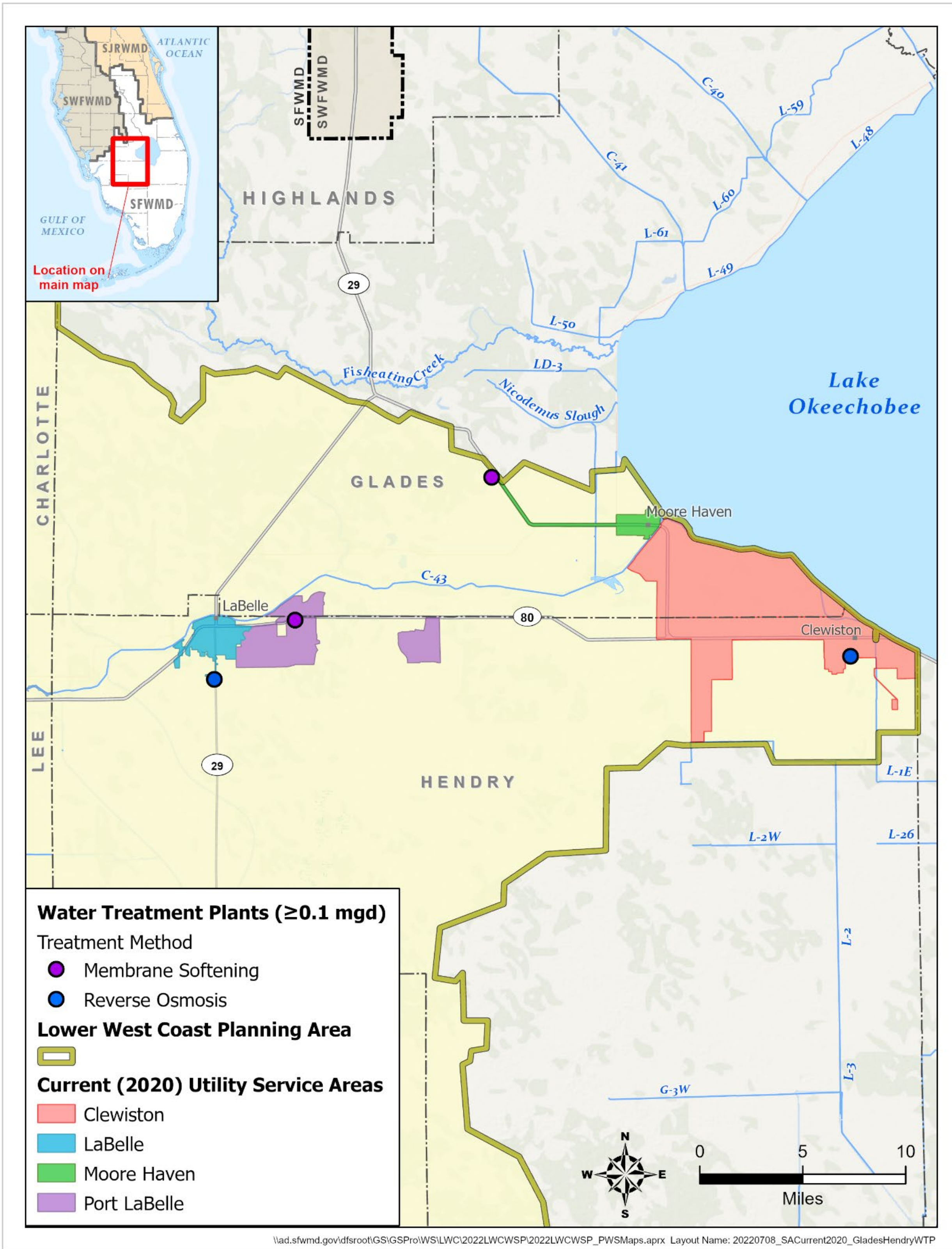

Figure A-4. Potable water treatment plants and Public Supply utility service areas in Glades and Hendry counties.

PS Projection Results

Average Rainfall Conditions

Gross (raw) demands for PS under average rainfall conditions for 2020 through 2045 are provided in **Table A-5**.

Table A-5. PS gross (raw) water demands under average rainfall conditions in the LWC Planning Area.

PS Utility	Gross (Raw) Water Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Charlotte Correctional	0.09	0.09	0.09	0.09	0.09	0.09
Town and Country	0.28	0.40	0.56	0.79	1.11	1.57
Charlotte County Total	**0.37**	**0.49**	**0.65**	**0.88**	**1.20**	**1.66**
Collier County						
Ave Maria	0.71	0.92	1.21	1.59	2.08	2.72
Collier County Utilities	31.32	34.14	36.53	38.72	40.66	42.28
Everglades City	0.26	0.29	0.31	0.33	0.34	0.36
Immokalee (IWSD)	2.21	2.41	2.57	2.65	2.70	2.73
Marco Island	9.14	9.69	10.18	10.68	11.11	11.56
Naples	14.63	15.17	16.16	17.05	17.85	18.63
Port of the Islands	0.10	0.10	0.11	0.11	0.11	0.11
STOF – Immokalee[a]	0.20	0.24	0.27	0.29	0.32	0.35
Collier County Total	**58.58**	**62.97**	**67.32**	**71.41**	**75.17**	**78.73**
Glades County*						
Clewiston (Glades Portion)	0.10	0.11	0.11	0.11	0.12	0.12
Moore Haven	0.63	0.66	0.68	0.70	0.72	0.74
Port LaBelle (Glades Portion)	0.07	0.07	0.08	0.08	0.08	0.08
Silver Lake – Muse Village	0.03	0.03	0.04	0.04	0.05	0.05
Glades County Total	**0.82**	**0.87**	**0.91**	**0.94**	**0.97**	**0.99**
Hendry County*						
Clewiston (Hendry Portion)	2.25	2.27	2.28	2.30	2.31	2.32
LaBelle	0.94	0.94	0.95	0.96	0.96	0.96
Port LaBelle (Hendry Portion)	0.52	0.54	0.55	0.57	0.58	0.59
Hendry County Total	**3.71**	**3.75**	**3.79**	**3.82**	**3.85**	**3.87**

Table A-5. Continued.

PS Utility	Gross (Raw) Water Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Lee County						
Bonita Springs	11.26	12.50	13.50	14.31	15.02	15.62
Cape Coral	14.28	15.85	18.49	19.97	21.57	23.29
Citrus Park – Bonita Terra	0.18	0.20	0.21	0.21	0.22	0.23
FGUA – Lake Fairways	0.08	0.10	0.10	0.11	0.11	0.12
FGUA – Lehigh Acres	2.46	2.73	2.95	3.13	3.28	3.42
Fort Myers	11.94	12.26	12.99	13.64	14.61	15.45
Lee County Utilities	28.47	30.80	32.27	33.56	34.85	36.25
Pine Island (GPIWA)	1.68	1.76	1.82	1.87	1.90	1.98
Sanibel Island (IWA)	4.87	4.97	5.05	5.11	5.16	5.20
Lee County Total	**75.22**	**81.17**	**87.38**	**91.91**	**96.73**	**101.56**
LWC Planning Area Total	**138.70**	**149.25**	**160.05**	**168.97**	**177.93**	**186.82**

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

1-in-10-Year Drought Conditions

Section 373.709, F.S. states that the level-of-certainty planning goal associated with identifying water demands shall be based on meeting demands during 1-in-10-year drought conditions. A 1-in-10-year drought is characterized by diminished rain and increased evapotranspiration relative to the historical record for a specific location. The increased PS demands during 1-in-10-year drought conditions were calculated using the method described in the *Districtwide Water Supply Assessment* (SFWMD 1998), which considers the increased demands on the irrigation portion of PS during droughts. The drought demand factors are as follows:

> NOTE
>
> **Average Rainfall and 1-in-10-Year Drought**
>
> An **average rainfall** year is defined as a year with a rainfall amount that has a 50% probability of being exceeded in any other year.
>
> A **1-in-10-year drought** is defined as a year in which below normal rainfall occurs, with a 90% probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

- Charlotte County: 1.05
- Collier County: 1.08
- Glades County: 1.06
- Hendry County: 1.06
- Lee County: 1.05

Average water demands were multiplied by the drought demand factor to calculate demands during 1-in-10-year drought conditions (**Tables A-6** and **A-7**).

Table A-6. PS net (finished) water demands under 1-in-10-year drought conditions in the LWC Planning Area.

PS Utility	Net (Finished) Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Charlotte Correctional	0.09	0.09	0.09	0.09	0.09	0.09
Town and Country	0.23	0.33	0.46	0.65	0.92	1.30
Charlotte County Total	**0.32**	**0.42**	**0.55**	**0.75**	**1.01**	**1.39**
Collier County						
Ave Maria	0.60	0.79	1.03	1.35	1.77	2.31
Collier County Utilities	29.41	32.06	34.31	36.36	38.18	39.71
Everglades City	0.26	0.28	0.30	0.32	0.33	0.35
Immokalee (IWSD)	2.37	2.58	2.75	2.83	2.89	2.92
Marco Island	8.30	8.80	9.24	9.70	10.08	10.49
Naples	15.34	15.91	16.94	17.87	18.72	19.53
Port of the Islands	0.08	0.08	0.09	0.09	0.09	0.09
STOF – Immokalee[a]	0.16	0.19	0.22	0.24	0.26	0.28
Collier County Total	**56.52**	**60.69**	**64.86**	**68.76**	**72.32**	**75.68**
Glades County*						
Clewiston (Glades Portion)	0.07	0.08	0.08	0.08	0.08	0.09
Moore Haven	0.56	0.59	0.61	0.63	0.65	0.66
Port LaBelle (Glades Portion)	0.06	0.07	0.07	0.07	0.07	0.07
Silver Lake – Muse Village	0.03	0.03	0.04	0.05	0.05	0.05
Glades County Total	**0.73**	**0.77**	**0.80**	**0.83**	**0.86**	**0.88**
Hendry County*						
Clewiston (Hendry Portion)	1.62	1.64	1.65	1.66	1.66	1.67
LaBelle	0.71	0.72	0.73	0.73	0.73	0.74
Port LaBelle (Hendry Portion)	0.47	0.48	0.50	0.51	0.52	0.53
Hendry County Total	**2.80**	**2.84**	**2.87**	**2.90**	**2.92**	**2.94**
Lee County						
Bonita Springs	10.75	11.93	12.88	13.66	14.34	14.91
Cape Coral	13.63	15.13	17.65	19.06	20.59	22.24
Citrus Park – Bonita Terra	0.18	0.20	0.21	0.21	0.22	0.23
FGUA – Lake Fairways	0.08	0.10	0.11	0.11	0.12	0.12
FGUA – Lehigh Acres	2.51	2.79	3.01	3.19	3.35	3.48
Fort Myers	9.02	9.26	9.81	10.31	11.04	11.67
Lee County Utilities	26.69	28.87	30.25	31.46	32.68	33.98
Pine Island	1.55	1.62	1.67	1.72	1.75	1.82
Sanibel Island	3.93	4.01	4.08	4.13	4.17	4.20
Lee County Total	**68.34**	**73.92**	**79.67**	**83.85**	**88.24**	**92.66**
LWC Planning Area Total	**128.72**	**138.63**	**148.76**	**157.08**	**165.36**	**173.55**

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table A-7. PS gross (raw) water demands under 1-in-10-year drought conditions in the LWC Planning Area.

PS Utility	Gross (Raw) Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Charlotte Correctional	0.09	0.09	0.09	0.09	0.09	0.09
Town and Country	0.30	0.42	0.59	0.83	1.17	1.65
Charlotte County Total	**0.39**	**0.51**	**0.68**	**0.92**	**1.26**	**1.74**
Collier County						
Ave Maria	0.76	1.00	1.31	1.71	2.24	2.94
Collier County Utilities	33.83	36.87	39.45	41.82	43.91	45.67
Everglades City	0.29	0.31	0.33	0.35	0.37	0.39
Immokalee (IWSD)	2.39	2.61	2.78	2.86	2.92	2.95
Marco Island	9.87	10.47	10.99	11.54	12.00	12.48
Naples	15.80	16.39	17.45	18.41	19.28	20.12
Port of the Islands	0.11	0.11	0.11	0.12	0.12	0.12
STOF – Immokalee[a]	0.22	0.26	0.29	0.32	0.34	0.37
Collier County Total	**63.05**	**67.75**	**72.42**	**76.81**	**80.84**	**84.66**
Glades County*						
Clewiston (Glades Portion)	0.11	0.11	0.12	0.12	0.12	0.13
Moore Haven	0.66	0.70	0.72	0.75	0.77	0.78
Port LaBelle (Glades Portion)	0.07	0.08	0.08	0.08	0.09	0.09
Silver Lake – Muse Village	0.03	0.03	0.04	0.05	0.05	0.06
Glades County Total	**0.87**	**0.92**	**0.96**	**1.00**	**1.03**	**1.05**
Hendry County*						
Clewiston (Hendry Portion)	2.38	2.40	2.42	2.43	2.44	2.45
LaBelle	0.99	1.00	1.01	1.01	1.02	1.02
Port LaBelle (Hendry Portion)	0.55	0.57	0.59	0.60	0.61	0.63
Hendry County Total	**3.93**	**3.98**	**4.02**	**4.05**	**4.08**	**4.10**
Lee County						
Bonita Springs	11.82	13.12	14.17	15.02	15.77	16.40
Cape Coral	15.00	16.65	19.42	20.97	22.65	24.46
Citrus Park – Bonita Terra	0.19	0.21	0.22	0.22	0.23	0.24
FGUA – Lake Fairways	0.08	0.10	0.11	0.11	0.12	0.13
FGUA – Lehigh Acres	2.58	2.87	3.10	3.28	3.45	3.59
Fort Myers	12.54	12.87	13.64	14.32	15.34	16.23
Lee County Utilities	29.89	32.34	33.89	35.24	36.60	38.06
Pine Island (GPIWA)	1.77	1.85	1.91	1.96	1.99	2.07
Sanibel Island (IWA)	5.11	5.22	5.30	5.36	5.42	5.46
Lee County Total	**78.98**	**85.22**	**91.74**	**96.51**	**101.57**	**106.64**
LWC Planning Area Total	**147.22**	**158.38**	**169.83**	**179.29**	**188.79**	**198.20**

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; mgd = million gallons per day; PS = Public Supply; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

DOMESTIC SELF-SUPPLY

The DSS category includes potable water used by households that are served by small utilities with current allocations less than 0.10 mgd or that are self-supplied by private wells. Permanent resident populations within DSS areas were developed simultaneously with the PS population estimates and projections, as described earlier. All permanent residents outside of PS utility service area boundaries were considered DSS population. To determine the current and future DSS demands, the average PCUR of PS utilities in each county, weighted by the population (**Table A-2**), was multiplied by the DSS permanent resident population in each county. DSS county PCURs remain constant through 2045. For DSS demands, the raw-to-finished water ratio is assumed to be 1.00. Therefore, no distinction is made between gross (raw) and net (finished) water demands.

Tables A-8 and **A-9** contain the LWC Planning Area's DSS demand estimates and projections under average rainfall and 1-in-10-year drought conditions, respectively. The drought demand factor used for PS was used to calculate 1-in-10-year drought demands for DSS. The average DSS demand in 2020 was 24.27 mgd for 192,504 permanent residents (**Table A-1**) and is expected to increase to 31.66 mgd in 2045.

Table A-8. DSS gross (raw) water demands under average rainfall conditions in the LWC Planning Area.

County DSS	Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte DSS	0.15	0.19	0.22	0.24	0.24	0.25
Collier DSS	12.09	13.73	14.42	14.69	14.69	14.44
Glades DSS	0.61	0.64	0.66	0.67	0.68	0.69
Hendry DSS	0.78	0.90	1.00	1.07	1.13	1.19
Lee DSS	10.64	13.14	13.81	15.09	15.38	15.09
LWC Planning Area DSS Total	**24.27**	**28.60**	**30.10**	**31.76**	**32.12**	**31.66**

DSS = Domestic Self-Supply; LWC = Lower West Coast; mgd = million gallons per day.

Table A-9. DSS gross (raw) water demands under 1-in-10-year drought conditions in the LWC Planning Area.

County DSS	Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte DSS	0.16	0.20	0.23	0.25	0.25	0.26
Collier DSS	13.05	14.83	15.57	15.87	15.87	15.60
Glades DSS	0.65	0.68	0.70	0.71	0.72	0.73
Hendry DSS	0.82	0.96	1.06	1.14	1.20	1.26
Lee DSS	11.18	13.80	14.50	15.84	16.15	15.85
LWC Planning Area DSS Total	**25.86**	**30.46**	**32.06**	**33.80**	**34.19**	**33.70**

DSS = Domestic Self-Supply; LWC = Lower West Coast; mgd = million gallons per day.

HENDRY COUNTY SECTOR PLANS

A Sector Plan is a long-term development plan (20 to 50 years) for a geographic area of at least 5,000 acres. Hendry County has adopted two Sector Plans: the Rodina Sector Plan and the Southwest Hendry County Sector Plan. Although both Sector Plans do not specify the quantity and timing of population growth that might occur as a result of the anticipated development, both plans represent areas of future growth within Hendry County.

Rodina Sector Plan – The Rodina Sector Plan was approved in 2012 and includes a long-term plan for mixed-use development on approximately 25,826 acres in western Hendry County. As proposed, development would include up to 21,000 residential units, 2.45 million square feet of retail space, 1.9 million square feet of office/civic/industrial space, and 400 hotel/motel rooms. The planned potable water supply sources are the Upper Floridan and Sandstone aquifers. Irrigation water supply is proposed to be a combination of reclaimed water and surface water. Potable water demand at buildout is projected to be between 38.21 and 42.80 mgd.

Southwest Hendry County Sector Plan – The Southwest Hendry County Sector Plan was approved in 2014 and covers approximately 23,500 acres in two planning areas (West and East) in southern Hendry County. The proposed maximum development program would allow up to 22,949 residential dwelling units, 400 hotel rooms, 1.73 million square feet of commercial space, and 3.31 million square feet of industrial space over 50 years. The planned potable water supply source for the Sector Plan area is the Sandstone aquifer. Potable water demand at buildout is projected to be 6.06 mgd.

AGRICULTURE

Water demands reported under AG include water used for agricultural production, such as farm irrigation, operation of greenhouses and nurseries, and raising livestock. Water used in the processing of agricultural commodities is accounted for under the CII category.

The 2017 LWC Plan Update relied on various sources to develop agricultural acreage estimates and projections, including agricultural water use permits, parcel-level land use maps, and results from the United States Census of Agriculture. Irrigated acres were translated to water volume estimates (in mgd) using the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model (Smajstrla 1990).

Florida State legislation passed in 2013 prescribed a new approach for water management districts to consider when developing agricultural water demands for regional water supply plans. Section 570.93, F.S. directs the Florida Department of Agriculture and Consumer Services (FDACS) to develop annual statewide agricultural acreage and water demand projections based on the same 20-year planning horizon used in water supply planning. Under Section 373.709(2)(a), F.S., water management districts are required to consider FDACS projections, and any adjustments or deviations from the projections published by FDACS, "…must be fully described, and the original data must be presented along with the adjusted data."

AG Projection Methodology

FSAID VIII Acreage and Demands Data

FDACS publishes 20-year agricultural acreage and associated water demand projections in annual Florida Statewide Agricultural Irrigation Demand (FSAID) reports. The eighth annual report (referred to as FSAID VIII) was published in 2021 (FDACS 2021). The FSAID VIII acres (**Table A-10**) were used for this 2022 LWC Plan Update to calculate AG demands. For the purposes of this 2022 LWC Plan Update, the 2019 acres in FSAID VIII were considered representative of 2020 conditions. The FSAID VIII demands, as calculated by FDACS (**Table A-11**), were not used in this plan update, and the deviation from using these projections is described below.

Table A-10. Irrigated agricultural acres in the LWC Planning Area (From FDACS 2021).

Crop	2020*	2025	2030	2035	2040	2045
Citrus	118,047	121,391	125,269	125,194	124,675	124,820
Sugarcane	88,640	85,844	85,864	86,104	86,382	86,706
Fresh Market Vegetables	60,251	60,146	59,744	60,851	62,156	62,961
Hay/Pasture	16,223	16,161	16,454	16,816	16,806	16,806
Greenhouse/Nursery	3,239	3,026	2,955	3,740	4,372	5,239
Sod	3,328	3,294	3,294	3,294	3,250	3,287
Potatoes	1,279	1,279	1,279	1,409	1,471	1,199
Field Crops	188	188	281	1,292	2,875	4,244
Fruits (excluding citrus)	570	570	570	1169	1,397	1,800
LWC Planning Area Total	**291,765**	**291,899**	**295,709**	**299,870**	**303,383**	**307,062**

FDACS = Florida Department of Agriculture and Consumer Services; LWC = Lower West Coast.
* 2019 acres are considered representative of 2020 conditions for the purposes of this plan update.

Table A-11. Irrigated agricultural demands (in mgd) in the LWC Planning Area (From FDACS 2021).

Crop	2020*	2025	2030	2035	2040	2045
Citrus	104.62	108.42	112.45	112.22	111.50	111.27
Sugarcane	109.19	105.79	105.83	106.17	106.56	107.01
Fresh Market Vegetables	84.16	83.95	83.57	85.25	87.19	88.42
Hay/Pasture	9.89	9.76	9.91	10.21	10.20	10.20
Greenhouse/Nursery	8.39	7.86	7.66	9.37	10.78	12.69
Sod	3.33	3.30	3.30	3.30	3.25	3.32
Potatoes	1.45	1.46	1.46	1.60	1.67	1.37
Field Crops	0.15	0.15	0.23	1.04	2.31	3.42
Fruits (excluding citrus)	1.22	1.21	1.22	2.31	2.72	3.43
LWC Planning Area Total	**322.40**	**321.90**	**325.63**	**331.47**	**336.18**	**341.13**

FDACS = Florida Department of Agriculture and Consumer Services; LWC = Lower West Coast; mgd = million gallons per day.
* 2019 acres are considered representative of 2020 conditions for the purposes of this plan update.

Prior to the publication of the FSAID VIII report, SFWMD staff identified FSAID VII parcels for removal from irrigated acreage based on visual inspection of historical aerial imagery, recent regulatory water use data, and the location of recently implemented surface water management or environmental restoration projects. All edits were made in coordination with FDACS and integrated into the FSAID VIII report. The FSAID VIII acreage estimates, and projections are used in this 2022 LWC Plan Update; however, water demands were calculated separately by SFWMD staff using the AFSIRS model. AG demands published in the 2017 LWC Plan Update and in other regional water supply plans were developed using the AFSIRS model. Alternative demands developed using FSAID VIII acreages and the AFSIRS model were evaluated with the demands published in the FSAID VIII report, as described below.

Comparison of FSAID VIII and AFSIRS Demands

The estimated 2020 and projected 2045 demands from the AFSIRS model were compared to the demands in the FSAID VIII report. Both sets of demands are based on the same irrigated acreages, established in the FSAID VIII report. Despite being based on the same unadjusted irrigated footprint, the demand projections differed by 268.14 mgd in 2020 and 278.79 mgd in 2045 (**Figure A-5**).

The SFWMD uses AFSIRS to estimate demands simulated in regional groundwater models, and the demands using AFSIRS resemble those obtained through the SFWMD's permitting methods. After reviewing water demands from FSAID VIII and AFSIRS, the SFWMD chose to use water demand estimates and projections from AFSIRS based on irrigated acres published in the FSAID VIII report. The decision to deviate from water demands published in the FSAID VIII report was made to maintain a consistent approach with previous planning and regional modeling efforts.

Data for soil type, rainfall, reference evapotranspiration, and irrigation method are among the key inputs for AFSIRS to calculate current and future demands. Soil input data were obtained from the Natural Resources Conservation Service's SSURGO database. Daily rainfall data were obtained from the SFWMD's Next Generation Radar (NEXRAD) rainfall data set. Reference evapotranspiration data were obtained from the United States Geological Survey's statewide evapotranspiration information and data. The irrigation method for each irrigated parcel used with AFSIRS is part of the FSAID VIII data set. Most citrus groves are irrigated via micro-spray. Flood irrigation is the most common method for all other crop categories.

Water demands associated with livestock and aquaculture production complete the demands for the AG category. Demands for these activities were taken directly from the FSAID VIII report (FDACS 2021) without adjustment.

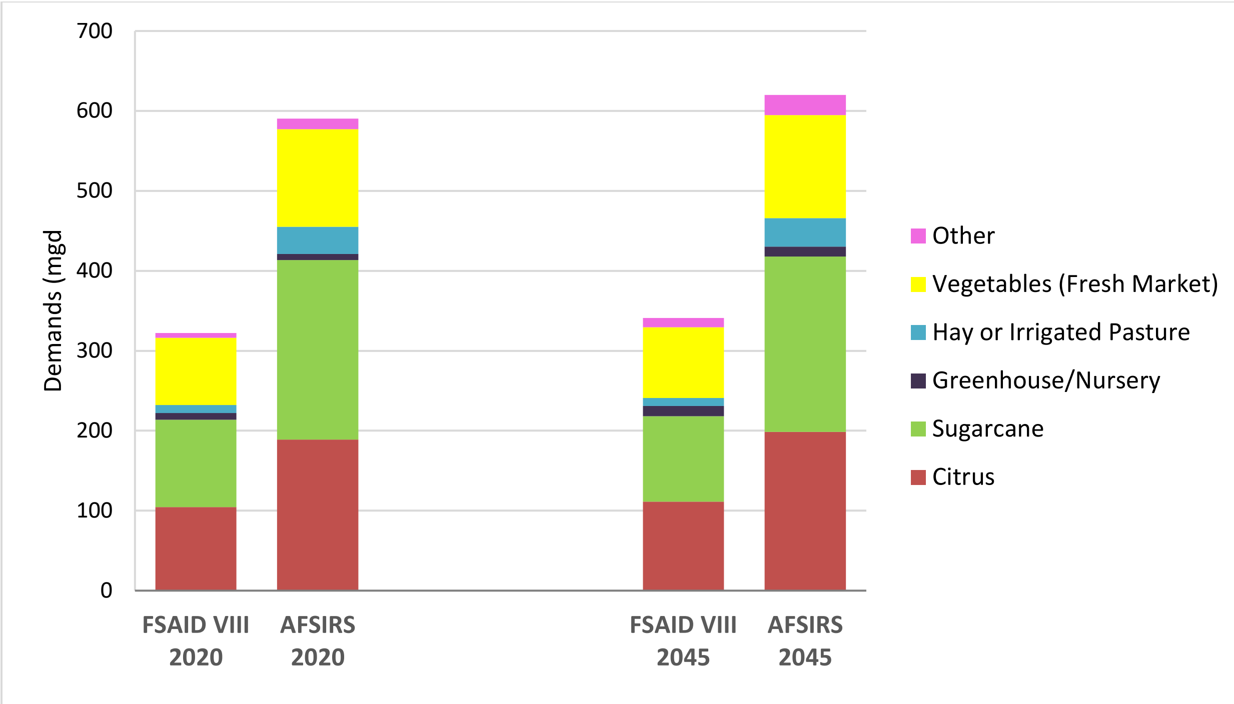

Figure A-5. Comparison of average water demands from the eighth Florida Statewide Agricultural Irrigation Demand (FSAID VIII) report and the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS). Note: The "Other" category includes commodities combined from **Table A-11** that are not graphed individually.

AG Projection Results

AG acres and water demands depend on the choices of individual agricultural producers from year to year. Those choices are affected by several factors, including weather, markets, disease, proprietary information, and urban development pressure. AG projections can be affected by population changes as well as future land use conversions.

The gross irrigation requirements for various crop types under the AG category are provided in **Tables A-12** to **A-19**. **Tables A-20** and **A-21** summarize the gross water requirements for livestock and aquaculture.

Citrus

Table A-12 presents the citrus acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-12. Gross irrigation demands (in mgd) for citrus acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	7,214	7,214	7,339	7,339	7,339	7,339
Average rainfall	13.41	13.41	13.59	13.59	13.59	13.59
1-in-10-year drought	16.41	16.41	16.72	16.72	16.72	16.72
Collier County						
Irrigated acreage	36,568	36,058	36,058	35,827	35,322	35,176
Average rainfall	56.82	55.47	55.47	53.80	53.12	52.82
1-in-10-year drought	70.58	68.00	68.00	66.01	65.25	65.31
Glades County*						
Irrigated acreage	3,258	5,852	7,906	8,035	8,210	8,416
Average rainfall	5.49	9.87	13.33	13.45	13.68	14.03
1-in-10-year drought	8.69	11.87	16.33	16.95	17.18	17.23
Hendry County*						
Irrigated acreage	59,252	60,513	62,212	62,238	62,441	62,527
Average rainfall	95.65	96.23	96.75	97.02	97.95	100.85
1-in-10-year drought	117.31	119.30	121.97	122.01	122.33	122.50
Lee County						
Irrigated acreage	11,754	11,754	11,754	11,754	11,363	11,363
Average rainfall	17.70	17.70	17.70	17.70	17.16	17.16
1-in-10-year drought	23.80	23.80	23.80	23.80	22.96	22.96
LWC Planning Area Total						
Irrigated acreage	**118,047**	**121,391**	**125,269**	**125,194**	**124,675**	**124,821**
Average rainfall	**189.07**	**192.68**	**196.84**	**195.56**	**195.50**	**198.45**
1-in-10-year drought	**236.79**	**239.38**	**246.82**	**245.82**	**244.44**	**244.72**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Citrus Grove

Sugarcane

Table A-13 presents the sugarcane acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-13. Gross irrigation demands (in mgd) for sugarcane acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Collier County						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Glades County*						
Irrigated acreage	28,684	25,777	25,784	26,018	26,290	26,466
Average rainfall	73.55	66.09	66.11	66.71	67.41	67.86
1-in-10-year drought	83.05	75.59	75.51	75.71	76.81	77.16
Hendry County*						
Irrigated acreage	59,956	60,067	60,080	60,086	60,092	60,240
Average rainfall	150.64	150.92	150.95	150.97	150.98	151.36
1-in-10-year drought	169.29	169.57	169.60	169.62	169.63	170.01
Lee County						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
LWC Planning Area Total						
Irrigated acreage	**88,640**	**85,844**	**85,864**	**86,104**	**86,382**	**86,706**
Average rainfall	**224.19**	**217.02**	**217.07**	**217.68**	**218.40**	**219.22**
1-in-10-year drought	**252.34**	**245.17**	**245.12**	**245.33**	**246.45**	**247.17**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Sugarcane

Fresh Market Vegetables

Table A-14 presents the fresh market vegetable acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions, assuming two plantings per year, lasting 4 months each.

Table A-14. Gross irrigation demands (in mgd) for fresh market vegetable acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	8,259	8,259	8,259	8,284	8,423	8,499
Average rainfall	16.00	16.00	16.00	16.05	16.32	16.47
1-in-10-year drought	17.50	17.50	17.50	17.55	17.82	17.97
Collier County						
Irrigated acreage	33,169	33,127	32,774	32,668	32,655	32,074
Average rainfall	72.11	72.02	71.25	71.02	70.99	69.73
1-in-10-year drought	83.11	83.02	82.25	82.02	81.99	80.73
Glades County*						
Irrigated acreage	907	907	907	1,835	2,592	3,280
Average rainfall	2.52	2.52	2.52	5.10	7.20	9.11
1-in-10-year drought	4.02	4.02	4.02	6.60	8.70	10.61
Hendry County*						
Irrigated acreage	14,048	14,048	14,048	14,419	14,962	15,631
Average rainfall	24.65	24.65	24.65	25.30	26.25	27.42
1-in-10-year drought	30.05	30.05	30.05	30.70	31.65	32.82
Lee County						
Irrigated acreage	3,868	3,805	3,755	3,644	3,524	3,477
Average rainfall	6.79	6.68	6.59	6.39	6.27	6.10
1-in-10-year drought	8.57	8.46	8.37	8.68	8.52	7.88
LWC Planning Area Total						
Irrigated acreage	**60,251**	**60,146**	**59,743**	**60,850**	**62,156**	**62,961**
Average rainfall	**122.07**	**121.87**	**121.01**	**123.86**	**127.03**	**128.83**
1-in-10-year drought	**143.25**	**143.05**	**142.19**	**145.55**	**148.68**	**150.01**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Hay/Pasture

Table A-15 presents the hay/pasture acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions. The FSAID acres for this category are labeled and modeled as hay/pasture. The associated demands calculated with AFSIRS are assumed to capture irrigation for hay/pasture and any irrigation used for improved pasture.

Table A-15. Gross irrigation demands (in mgd) for hay/pasture acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	408	408	408	408	408	408
Average rainfall	0.88	0.88	0.88	0.88	0.88	0.88
1-in-10-year drought	1.88	1.88	1.88	1.88	1.88	1.88
Collier County						
Irrigated acreage	655	655	655	655	655	655
Average rainfall	1.34	1.34	1.34	1.34	1.34	1.34
1-in-10-year drought	1.51	1.51	1.51	1.51	1.51	1.51
Glades County*						
Irrigated acreage	6,340	6,340	6,557	6,654	6,654	6,654
Average rainfall	14.09	14.09	14.57	14.79	14.79	14.79
1-in-10-year drought	16.21	16.21	16.69	16.91	16.91	16.91
Hendry County*						
Irrigated acreage	8,662	8,662	8,777	9,043	9,043	9,043
Average rainfall	17.50	17.50	17.73	18.27	18.27	18.27
1-in-10-year drought	20.35	20.35	20.58	21.12	21.12	21.12
Lee County						
Irrigated acreage	158	96	57	57	47	47
Average rainfall	0.22	0.14	0.08	0.08	0.07	0.07
1-in-10-year drought	0.58	0.39	0.33	0.33	0.43	0.43
LWC Planning Area Total						
Irrigated acreage	**16,223**	**16,161**	**16,454**	**16,817**	**16,807**	**16,807**
Average rainfall	**34.03**	**33.94**	**34.60**	**35.36**	**35.34**	**35.34**
1-in-10-year drought	**40.53**	**40.34**	**40.99**	**41.75**	**41.84**	**41.84**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Greenhouse/Nursery

Table A-16 presents the greenhouse/nursery acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-16. Gross irrigation demands (in mgd) for greenhouse/nursery acreage in the LWC Planning Area

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Collier County						
Irrigated acreage	480	322	322	322	322	322
Average rainfall	1.09	0.73	0.73	0.73	0.73	0.73
1-in-10-year drought	1.18	0.82	0.82	0.82	0.82	0.82
Glades County*						
Irrigated acreage	270	270	293	936	1,260	1,721
Average rainfall	0.72	0.72	0.79	2.51	3.38	4.61
1-in-10-year drought	0.79	0.84	0.93	5.51	6.38	7.61
Hendry County*						
Irrigated acreage	234	234	234	411	720	1,126
Average rainfall	0.48	0.48	0.48	0.84	1.47	2.30
1-in-10-year drought	0.56	0.56	0.56	0.92	1.55	2.38
Lee County						
Irrigated acreage	2,255	2,200	2,106	2,070	2,070	2,070
Average rainfall	5.57	5.43	5.20	5.11	5.11	5.11
1-in-10-year drought	6.01	5.87	5.64	5.55	5.55	5.55
LWC Planning Area Total						
Irrigated acreage	**3,239**	**3,026**	**2,955**	**3,740**	**4,372**	**5,239**
Average rainfall	**7.86**	**7.37**	**7.20**	**9.19**	**10.69**	**12.76**
1-in-10-year drought	**8.54**	**8.10**	**7.95**	**12.80**	**14.30**	**16.37**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Sod

Table A-17 presents the sod acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-17. Gross irrigation demands (in mgd) for sod acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	466	466	466	466	466	466
Average rainfall	1.32	1.32	1.32	1.32	1.32	1.32
1-in-10-year drought	1.72	1.72	1.72	1.72	1.72	1.72
Collier County						
Irrigated acreage	570	570	570	570	570	570
Average rainfall	1.48	1.48	1.48	1.48	1.48	1.48
1-in-10-year drought	1.76	1.76	1.76	1.76	1.76	1.76
Glades County*						
Irrigated acreage	455	455	455	455	455	487
Average rainfall	1.42	1.42	1.42	1.42	1.42	1.52
1-in-10-year drought	2.27	2.27	2.27	2.27	2.27	2.37
Hendry County*						
Irrigated acreage	1,747	1,747	1,747	1,747	1,747	1,753
Average rainfall	4.60	4.60	4.60	4.60	4.60	4.61
1-in-10-year drought	5.05	5.05	5.05	5.05	5.05	5.06
Lee County						
Irrigated acreage	90	56	56	56	12	12
Average rainfall	0.37	0.32	0.32	0.32	0.05	0.05
1-in-10-year drought	0.48	0.34	0.34	0.34	0.16	0.16
LWC Planning Area Total						
Irrigated acreage	**3,328**	**3,294**	**3,294**	**3,294**	**3,250**	**3,287**
Average rainfall	**9.20**	**9.15**	**9.15**	**9.15**	**8.88**	**8.99**
1-in-10-year drought	**11.29**	**11.15**	**11.15**	**11.15**	**10.97**	**11.08**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Sod Farm

Potatoes

Table A-18 presents the potato acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-18. Gross irrigation demands (in mgd) for potato acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Collier County						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Glades County*						
Irrigated acreage	0	0	0	264	287	304
Average rainfall	0.00	0.00	0.00	0.48	0.52	0.55
1-in-10-year drought	0.20	0.20	0.20	0.68	0.72	0.75
Hendry County*						
Irrigated acreage	131	131	131	137	175	175
Average rainfall	0.24	0.24	0.24	0.25	0.32	0.32
1-in-10-year drought	0.28	0.28	0.28	0.29	0.36	0.36
Lee County						
Irrigated acreage	1,147	1,147	1,147	1,009	1,009	719
Average rainfall	2.49	2.49	2.49	2.19	2.19	1.56
1-in-10-year drought	2.70	2.70	2.70	2.40	2.40	1.77
LWC Planning Area Total						
Irrigated acreage	**1,278**	**1,278**	**1,278**	**1,410**	**1,471**	**1,198**
Average rainfall	**2.73**	**2.73**	**2.73**	**2.92**	**3.03**	**2.43**
1-in-10-year drought	**3.18**	**3.18**	**3.18**	**3.37**	**3.48**	**2.88**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Field Crops

Table A-19 presents the field crop acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-19. Gross irrigation demands (in mgd) for field crop acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	0	0	0	92	92	129
Average rainfall	0.00	0.00	0.00	0.22	0.22	0.31
1-in-10-year drought	0.00	0.00	0.00	0.76	0.76	0.85
Collier County						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
Glades County*						
Irrigated acreage	149	149	241	725	1,510	2,209
Average rainfall	0.40	0.40	0.65	1.95	4.06	5.94
1-in-10-year drought	0.71	0.71	0.96	2.26	4.37	6.25
Hendry County*						
Irrigated acreage	39	39	39	475	1,273	1,906
Average rainfall	0.10	0.10	0.10	1.17	3.14	4.71
1-in-10-year drought	0.18	0.18	0.18	1.25	3.22	4.79
Lee County						
Irrigated acreage	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10-year drought	0.00	0.00	0.00	0.00	0.00	0.00
LWC Planning Area Total						
Irrigated acreage	**188**	**188**	**280**	**1,292**	**2,875**	**4,244**
Average rainfall	**0.50**	**0.50**	**0.74**	**3.35**	**7.43**	**10.96**
1-in-10-year drought	**0.89**	**0.89**	**1.13**	**3.51**	**7.59**	**11.03**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Corn

Fruits (Excluding Citrus)

Table A-20 presents the fruits (excluding citrus) acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10-year drought conditions.

Table A-20. Gross irrigation demands (in mgd) for fruits (excluding citrus) acreage in the LWC Planning Area.

	2020	2025	2030	2035	2040	2045
Charlotte County*						
Irrigated acreage	0	0	0	97	97	150
Average rainfall	0.00	0.00	0.00	0.15	0.15	0.23
1-in-10-year drought	0.00	0.00	0.00	0.19	0.19	0.27
Collier County						
Irrigated acreage	80	80	80	80	80	80
Average rainfall	0.12	0.12	0.12	0.12	0.12	0.12
1-in-10-year drought	0.16	0.16	0.16	0.16	0.16	0.16
Glades County*						
Irrigated acreage	269	269	269	625	729	1,069
Average rainfall	0.45	0.45	0.45	1.03	1.21	1.77
1-in-10-year drought	1.35	1.35	1.35	1.93	2.11	2.67
Hendry County*						
Irrigated acreage	58	58	58	204	328	346
Average rainfall	0.10	0.10	0.10	0.35	0.57	0.60
1-in-10-year drought	0.12	0.12	0.12	0.37	0.59	0.62
Lee County						
Irrigated acreage	162	162	162	162	162	155
Average rainfall	0.14	0.14	0.14	0.14	0.14	0.13
1-in-10-year drought	0.18	0.18	0.18	0.18	0.18	0.17
LWC Planning Area Total						
Irrigated acreage	**569**	**569**	**569**	**1,168**	**1,396**	**1,800**
Average rainfall	**0.81**	**0.81**	**0.81**	**1.80**	**2.18**	**2.85**
1-in-10-year drought	**1.81**	**1.81**	**1.81**	**2.84**	**3.22**	**3.89**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Livestock

Table A-21 presents the FSAID VIII water demand projections for livestock. Livestock demands published in the FSAID VIII report were developed with assumed water requirements per head of livestock. Livestock demands were assumed to be the same under average rainfall and 1-in-10-year drought conditions.

Table A-21. Gross water demands (in mgd) for livestock in the LWC Planning Area.

2020	2025	2030	2035	2040	2045
Charlotte County					
0.18	0.18	0.18	0.18	0.18	0.18
Collier County					
0.12	0.12	0.12	0.12	0.12	0.12
Glades County					
0.28	0.28	0.28	0.28	0.28	0.28
Hendry County					
0.40	0.40	0.40	0.40	0.40	0.40
Lee County					
0.15	0.15	0.15	0.15	0.15	0.15
LWC Planning Area Total					
1.13	**1.13**	**1.13**	**1.13**	**1.13**	**1.13**

LWC = Lower West Coast; mgd = million gallons per day.
Note: Water demands for livestock were obtained from the eighth Florida Statewide Agricultural Irrigation Demand (FSAID VIII) report, not calculated using the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model.

Cattle

Aquaculture

Table A-22 presents the FSAID VIII water demand projections for aquaculture. Aquaculture demands were assumed to be the same under average rainfall and 1-in-10-year drought conditions.

Table A-22. Gross water demands (in mgd) for aquaculture in the LWC Planning Area.

2020	2025	2030	2035	2040	2045
Charlotte County					
0.08	0.08	0.08	0.08	0.08	0.08
Collier County					
0.05	0.05	0.05	0.05	0.05	0.05
Glades County					
0.03	0.03	0.03	0.03	0.03	0.03
Hendry County					
0.19	0.19	0.19	0.19	0.19	0.19
Lee County					
0.09	0.09	0.09	0.09	0.09	0.09
LWC Planning Area Total					
0.44	**0.44**	**0.44**	**0.44**	**0.44**	**0.44**

LWC = Lower West Coast; mgd = million gallons per day.
Note: Water demands for aquaculture were obtained from the eighth Florida Statewide Agricultural Irrigation Demand (FSAID VIII) report, not calculated using the Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS) model.

Summary of Agricultural Results

Irrigated agricultural acres are projected to increase 5% over the planning horizon, from 291,765 to 307,062 acres (**Tables A-23** and **A-24**). The majority of the counties are projected to experience rise in demands, except for Collier and Lee counties which will continue to exhibit reduction of irrigated acres and AG demands through 2045 (**Table A-24**). AG demands across the LWC Planning Area are projected to increase approximately 5%, from 592.02 mgd in 2020 to 621.40 mgd in 2045 under average rainfall conditions. Sugarcane accounts for the largest share of AG demands: 224.28 mgd in 2020 and 219.31 mgd in 2045. Citrus and fresh market vegetables had the second and third largest AG demands, respectively, with 189.07 mgd for citrus in 2020 and 198.45 mgd in 2045, whereas fresh market vegetables accounted for 122.06 mgd in 2020 and 128.83 mgd by 2045. Field crops have the greatest demand increase over the planning period of 0.50 mgd in 2020 and 10.96 mgd by 2045.

Table A-23. Summary of gross water demands (in mgd) for all agricultural acreage, livestock, and aquaculture in the LWC Planning Area by commodity.

	2020	2025	2030	2035	2040	2045
Citrus						
Irrigated acres	118,047	121,391	125,269	125,193	124,675	124,820
Average rainfall	189.07	192.68	196.84	195.56	195.50	198.45
1-in-10-year drought	236.79	239.38	246.82	245.99	245.00	244.72
Sugarcane						
Irrigated acres	88,640	85,844	85,864	86,104	86,382	86,706
Average rainfall	224.19	217.02	217.07	217.68	218.4	219.22
1-in-10-year drought	252.34	245.17	245.12	245.33	246.45	247.17
Fresh Market Vegetables						
Irrigated acres	60,251	60,146	59,744	60,851	62,156	62,961
Average rainfall	122.06	121.86	121.02	123.86	127.03	128.83
1-in-10-year drought	143.24	143.05	142.19	145.80	148.88	150.87
Hay/Pasture						
Irrigated acres	16,223	16,161	16,454	16,816	16,806	16,806
Average rainfall	34.03	33.94	34.6	35.36	35.34	35.34
1-in-10-year drought	40.53	40.34	40.98	41.75	41.84	41.84
Greenhouse/Nursery						
Irrigated acres	3,239	3,026	2,955	3,740	4,372	5,239
Average rainfall	7.86	7.37	7.20	9.19	10.69	12.76
1-in-10-year drought	8.54	8.10	7.95	12.80	14.30	16.37
Sod						
Irrigated acres	3,328	3,294	3,294	3,294	3,250	3,287
Average rainfall	9.2	9.15	9.15	9.15	8.88	8.99
1-in-10-year drought	11.29	11.15	11.15	11.15	10.97	11.08
Potatoes						
Irrigated acres	1,279	1,279	1,279	1,410	1,471	1,199
Average rainfall	2.73	2.73	2.73	2.92	3.03	2.43
1-in-10-year drought	3.18	3.18	3.18	3.37	3.48	2.88
Field Crops						
Irrigated acres	188	188	281	1,292	2,875	4,244
Average rainfall	0.50	0.50	0.74	3.35	7.43	10.96
1-in-10-year drought	0.89	0.89	1.13	3.51	7.59	11.03
Fruits (excluding citrus)						
Irrigated acres	570	570	570	1,169	1,397	1,800
Average rainfall	0.81	0.81	0.81	1.8	2.18	2.85
1-in-10-year drought	1.81	1.81	1.81	2.84	3.22	3.89
Livestock						
Irrigated acres	--	--	--	--	--	--
Average rainfall	1.13	1.13	1.13	1.13	1.13	1.13
1-in-10-year drought	1.13	1.13	1.13	1.13	1.13	1.13

Table A-23. Continued.

	2020	2025	2030	2035	2040	2045
Aquaculture						
Irrigated acres	--	--	--	--	--	--
Average rainfall	0.44	0.44	0.44	0.44	0.44	0.44
1-in-10-year drought	0.44	0.44	0.44	0.44	0.44	0.44
LWC Planning Area Total						
Irrigated acres	**291,765**	**291,899**	**295,709**	**299,869**	**303,384**	**307,062**
Average rainfall	**592.02**	**587.62**	**591.72**	**600.44**	**610.05**	**621.40**
1-in-10-year drought	**700.18**	**694.63**	**701.90**	**714.11**	**723.30**	**731.42**

LWC = Lower West Coast; mgd = million gallons per day.

Table A-24. Summary of gross water demands (in mgd) for all agricultural acreage, livestock, and aquaculture in the LWC Planning Area by county.

	2020	2025	2030	2035	2040	2045
Charlotte County						
Irrigated acres	16,347	16,347	16,472	16,686	16,825	16,991
Average rainfall	31.88	31.88	32.06	32.48	32.75	33.06
1-in-10-year drought	37.52	37.52	37.83	38.83	39.10	39.42
Collier County						
Irrigated acres	71,522	70,812	70,459	70,122	69,604	68,877
Average rainfall	133.13	131.33	130.57	128.66	127.95	126.39
1-in-10-year drought	158.30	155.28	154.50	152.28	151.49	150.29
Glades County						
Irrigated acres	40,332	40,019	42,412	45,547	47,987	50,605
Average rainfall	98.95	95.87	100.14	107.75	113.97	120.49
1-in-10-year drought	117.29	113.06	118.25	128.82	135.44	141.57
Hendry County						
Irrigated acres	144,127	145,499	147,326	148,760	150,780	152,746
Average rainfall	294.54	295.40	296.18	299.37	304.14	311.02
1-in-10-year drought	343.18	345.45	348.38	351.33	355.50	359.66
Lee County						
Irrigated acres	19,434	19,220	19,037	18,752	18,187	17,843
Average rainfall	33.52	33.14	32.76	32.17	31.23	30.43
1-in-10-year drought	42.32	41.74	41.36	41.28	40.20	38.92
LWC Planning Area Total						
Irrigated acres	**291,762**	**291,897**	**295,706**	**299,868**	**303,383**	**307,062**
Average rainfall	**592.02**	**587.62**	**591.72**	**600.44**	**610.05**	**621.40**
1-in-10-year drought	**700.18**	**694.63**	**701.90**	**714.11**	**723.30**	**731.42**

LWC = Lower West Coast; mgd = million gallons per day.

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL

The CII water use category includes water demands associated with commercial and industrial operations for processing, manufacturing, and technical needs such as concrete, citrus processing, and mining operations. Commercial or industrial or commercial users that receive water from PS utilities or use recirculated water in closed-loop geothermal heating and cooling systems are not included in CII demand calculations. Although a large portion of CII water used by the mining industry for activities such as rock washing is returned to the source, all mining water use is included in demand estimates and projections. All CII demand estimates and projections are presumed to be the same for average rainfall and 1-in-10-year drought conditions.

CII Projection Methodology

CII estimates and projections are based on water use data from the SFWMD's regulatory database. If an active CII permit holder did not report water use, demand estimates were calculated as described in the *2020 Estimated Water Use Report* (SFWMD 2022).

Increases in the CII category are expected to be driven by growth of the regional economy and permanent resident population. Therefore, CII projections are anticipated to increase steadily as county permanent resident populations increase. Previous analyses of the relationship between CII demands and population growth support this approach.

CII Projection Results

Table A-25 summarizes the current and projected CII demands in the LWC Planning Area in 5-year increments through 2045. Glades and Lee counties maintain the two-dominant share of the region's CII demands over the planning horizon.

Table A-25. CII demand projections in the LWC Planning Area.

County	Demand (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte*	0.07	0.08	0.08	0.09	0.09	0.09
Collier	7.52	8.19	8.76	9.29	9.75	10.14
Glades*	13.76	14.45	15.03	15.48	15.94	16.26
Hendry*	4.59	4.82	5.02	5.17	5.27	5.38
Lee	11.79	13.09	14.14	14.98	15.73	16.36
LWC Planning Area Total	**37.73**	**40.63**	**43.03**	**45.01**	**46.78**	**48.23**

CII = Industrial/Commercial/Institutional; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

LANDSCAPE/RECREATIONAL

L/R water demands include irrigation for golf courses and other landscaped areas such as parks, sports fields, and common areas of residential developments. Demands were calculated using a combination of water use reported to the SFWMD as part of its regulatory compliance program and reclaimed water use reported by wastewater utilities to the FDEP. Demands under the L/R category include areas permitted by the SFWMD and areas not permitted but relying solely on reclaimed water for supplemental or backup supply.

There are two types of irrigated landscaped areas outside those permitted by the SFWMD that are excluded from the L/R demands. The first type includes landscaped areas irrigated with potable water provided PS utilities. These demands are accounted for in PS estimates and projections. The second type is irrigated landscaped areas served by individual residential wells permitted by rule (Rule 40E-2.061, Florida Administrative Code) rather than with an individual water use permit.

L/R Projection Methodology

L/R 2020 water use data reported to the SFWMD and estimated data for those not required to report are available in the *2020 Estimated Water Use Report* (SFWMD 2022). The individual reuse inventory reports for the year 2020 (unless otherwise noted for individual facilities) filed by each wastewater utility to the FDEP (FDEP 2021) provided actual wastewater and reclaimed water use data. The use data from both sources were considered representative of demands under average rainfall conditions for 2020.

Both the SFWMD's reported water use and the individual reuse inventory reports filed by wastewater utilities allow for the disaggregation of L/R demands into the landscape and golf irrigation subcategories. Irrigated landscape and golf course acres indicated in **Table A-26** were calculated using the permitted L/R acreage from the SFWMD's regulatory database. L/R acreages reflect only the acres under water use permits and do not include acres irrigated solely with reclaimed water that do not have a water use permit for supplemental or backup supply.

The distinction is made between L/R acres and demands for golf courses and other landscaped areas because they are projected to grow at different rates. Landscape irrigation was assumed to increase at the same rate as the counties' permanent resident populations. Golf course acreage and associated water demands are projected to remain stable through 2045. This approach is used in other planning areas within the SFWMD and by other water management districts in Florida.

Table A-26. L/R permitted acres in the LWC Planning Area.

Land Use	Permitted Acres					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Landscape	220	238	234	248	260	270
Golf	0	0	125	125	130	130
Charlotte County Total	**220**	**238**	**359**	**373**	**390**	**400**
Collier County						
Landscape	9,369	10,212	10,927	11,583	12,162	12,648
Golf	8,166	8,166	8,166	8,166	8,166	8,166
Collier County Total	**17,535**	**18,378**	**19,093**	**19,749**	**20,328**	**20,814**
Glades County*						
Landscape	191	201	209	215	221	225
Golf	52	52	52	52	52	52
Glades County Total	**243**	**253**	**261**	**267**	**273**	**277**
Hendry County*						
Landscape	1,763	1,851	1,925	1,983	2,023	2,063
Golf	134	134	134	134	134	134
Hendry County Total	**1,897**	**1,985**	**2,059**	**2,117**	**2,157**	**2,197**
Lee County						
Landscape	10,933	12,136	13,107	13,893	14,588	15,172
Golf	5,015	5,015	5,015	5,015	5,015	5,015
Lee County Total	**15,948**	**17,151**	**18,122**	**18,908**	**19,603**	**20,187**
LWC Planning Area Total						
Landscape	**22,476**	**24,638**	**26,402**	**27,922**	**29,254**	**30,378**
Golf	**13,367**	**13,367**	**13,492**	**13,492**	**13,497**	**13,497**
LWC Planning Area Total	**35,843**	**38,005**	**39,894**	**41,414**	**42,751**	**43,875**

L/R = Landscape/Recreational; LWC = Lower West Coast.
* Values listed are only for the area within the LWC Planning Area boundary.

L/R Projection Results

Gross water demands for L/R were met with a combination of traditional water sources (groundwater and surface water) and reclaimed water. **Table A-27** shows that groundwater and surface water supply sources met approximately 64% of the 2020 L/R water demands, with reclaimed water supplementing the remaining 36%.

Table A-27. L/R gross water demands in the LWC Planning Area by county and source.

Source	Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Groundwater/Surface Water	1.87	2.02	2.19	2.30	2.39	2.48
Reclaimed Water	0.81	0.81	0.81	0.81	0.81	0.81
Charlotte County Total	**2.68**	**2.83**	**3.00**	**3.11**	**3.20**	**3.29**
Collier County						
Groundwater/Surface Water	57.89	63.11	67.52	71.58	75.16	78.16
Reclaimed Water	26.91	29.35	31.23	32.94	34.83	36.81
Collier County Total	**84.80**	**92.46**	**98.75**	**104.52**	**109.99**	**114.97**
Glades County*						
Groundwater/Surface Water	0.18	0.19	0.20	0.20	0.20	0.20
Reclaimed Water	0.00	0.00	0.00	0.00	0.00	0.00
Glades County Total	**0.18**	**0.19**	**0.20**	**0.20**	**0.20**	**0.20**
Hendry County*						
Groundwater/Surface Water	0.64	0.67	0.70	0.72	0.73	0.74
Reclaimed Water	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**0.64**	**0.67**	**0.70**	**0.72**	**0.73**	**0.74**
Lee County						
Groundwater/Surface Water	79.12	86.18	90.96	95.35	99.22	102.48
Reclaimed Water	51.75	56.49	60.03	62.90	65.43	67.55
Lee County Total	**130.87**	**142.67**	**150.99**	**158.25**	**164.65**	**170.03**
LWC Planning Area Total						
Groundwater/Surface Water	**139.70**	**152.17**	**161.57**	**170.15**	**177.70**	**184.06**
Reclaimed Water	**79.47**	**86.65**	**92.07**	**96.65**	**101.07**	**105.17**
LWC Planning Area Total	**219.17**	**238.82**	**253.64**	**266.80**	**278.77**	**289.23**

L/R = Landscape Recreational; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

L/R gross irrigation demand projections under average rainfall conditions with reclaimed water are presented in **Table A-28**. The volume of reclaimed water meeting future L/R demands was increased at the same rate as the counties' permanent resident populations from 2020. This volume was then apportioned into landscape and golf by maintaining 2020 golf course utilization volumes (since acreage was relatively constant), and the remainder was assigned to landscape irrigation. **Table A-29** shows the estimated quantity of water needed to meet projected demands during 1-in-10-year drought conditions which includes reclaimed water.

Table A-28. L/R gross irrigation demands under average rainfall conditions in the LWC Planning Area.

Land Use	Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Landscape	2.24	2.39	2.51	2.62	2.71	2.80
Golf	0.44	0.44	0.49	0.49	0.49	0.49
Charlotte County Total	**2.68**	**2.83**	**3.00**	**3.11**	**3.20**	**3.29**
Collier County						
Landscape	44.34	52.00	58.29	64.06	69.53	74.51
Golf	40.46	40.46	40.46	40.46	40.46	40.46
Collier County Total	**84.80**	**92.46**	**98.75**	**104.52**	**109.99**	**114.97**
Glades County*						
Landscape	0.13	0.14	0.15	0.15	0.15	0.15
Golf	0.05	0.05	0.05	0.05	0.05	0.05
Glades County Total	**0.18**	**0.19**	**0.20**	**0.20**	**0.20**	**0.20**
Hendry County*						
Landscape	0.64	0.67	0.70	0.72	0.73	0.74
Golf	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**0.64**	**0.67**	**0.70**	**0.72**	**0.73**	**0.74**
Lee County						
Landscape	100.75	112.55	120.87	128.13	134.53	139.91
Golf	30.12	30.12	30.12	30.12	30.12	30.12
Lee County Total	**130.87**	**142.67**	**150.99**	**158.25**	**164.65**	**170.03**
LWC Planning Area Total						
Landscape	**148.10**	**167.75**	**182.52**	**195.68**	**207.65**	**218.11**
Golf	**71.07**	**71.07**	**71.12**	**71.12**	**71.12**	**71.12**
LWC Planning Area Total	**219.17**	**238.82**	**253.64**	**266.80**	**278.77**	**289.23**

L/R = Landscape/Recreational; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Table A-29. L/R gross irrigation demands under 1-in-10-year drought conditions in the LWC Planning Area.

Land Use	Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Landscape	2.82	3.01	3.16	3.30	3.41	3.53
Golf	0.57	0.57	0.64	0.64	0.64	0.64
Charlotte County Total	**3.39**	**3.58**	**3.80**	**3.94**	**4.05**	**4.17**
Collier County						
Landscape	55.87	65.52	73.45	80.72	87.61	93.88
Golf	52.60	52.60	52.60	52.60	52.60	52.60
Collier County Total	**108.47**	**118.12**	**126.05**	**133.32**	**140.21**	**146.48**
Glades County*						
Landscape	0.16	0.18	0.19	0.19	0.19	0.19
Golf	0.07	0.07	0.07	0.07	0.07	0.07
Glades County Total	**0.23**	**0.24**	**0.25**	**0.25**	**0.25**	**0.25**
Hendry County*						
Landscape	0.81	0.84	0.88	0.91	0.92	0.93
Golf	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**0.81**	**0.84**	**0.88**	**0.91**	**0.92**	**0.93**
Lee County						
Landscape	126.95	141.81	152.30	161.44	169.51	176.29
Golf	39.16	39.16	39.16	39.16	39.16	39.16
Lee County Total	**166.10**	**180.97**	**191.45**	**200.60**	**208.66**	**215.44**
LWC Planning Area Total						
Landscape	**186.61**	**211.36**	**229.98**	**246.56**	**261.64**	**274.82**
Golf	**92.40**	**92.40**	**92.47**	**92.47**	**92.47**	**92.47**
LWC Planning Area Total	**279.01**	**303.76**	**322.45**	**339.03**	**354.11**	**367.29**

L/R = Landscape/Recreational; LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

POWER GENERATION

Demands under the PG category include use of groundwater, fresh surface water, or reclaimed water by thermoelectric power generation facilities. There are two power generation plants currently operating in Lee County that are addressed in this plan update: Florida Power & Light (FPL) Fort Myers and Lee County Solid Waste Energy Recovery Facility.

The FPL Fort Myers facility mainly uses brackish surface water from the Caloosahatchee River Estuary for its cooling tower technology as a one-time pass-through and is returned to the river. As a result, this is not considered as part of the demands, only the groundwater portion is considered. Groundwater is used for makeup water for steam generators, inlet spray coolers, and other industrial uses. For the planning period 2020 to 2045, the FPL Fort Myers facility is estimated to have a constant PG demand of 0.53 mgd. This demand is based on the average daily use in 2020 from groundwater sources.

The Lee County Solid Waste Energy Recovery Facility relies entirely on reclaimed water provided by the City of Fort Myers and is anticipated to continue relying on reclaimed water through the planning horizon. In 2020, 1.01 mgd of reclaimed water was supplied to this facility, and demands are anticipated to increase to 1.50 mgd by 2045.

No new power generation facilities are planned for construction or operation through 2045, and PG demands are projected to remain stable (**Table A-30**). All PG demand estimates and projections are presumed to be the same for average rainfall and 1-in-10-year drought conditions.

Table A-30. Average gross water demand for PG in the LWC Planning Area between 2020 and 2045.

Facilities	Gross Water Demand (mgd)					
	2020	2025	2030	2035	2040	2045
FPL – Fort Myers	0.53	0.53	0.53	0.53	0.53	0.53
Lee County Solid Waste	1.01	1.08	1.16	1.50	1.50	1.50
LWC Planning Area Total	**1.54**	**1.61**	**1.69**	**2.03**	**2.03**	**2.03**

FPL = Florida Power & Light; LWC = Lower West Coast; mgd = million gallons per day; PG = Power Generation.

SUMMARY OF DEMAND PROJECTIONS

Total demands for the LWC Planning Area are anticipated to increase by 165.95 mgd. AG demands are projected to increase modestly from 2020 to 2045, with 592.02 mgd to 621.40 mgd. PS and DSS are expected to increase due to the projected population growth of 439,947 permanent residents, reaching a combined demand of 218.48 mgd by 2045. Also driven by population growth, L/R demands are projected to reach 289.23 mgd by 2045. The demands for all remaining categories (CII and PG) are small and projected to be 50.26 mgd, combined, in 2045. Gross water demands in 5-year increments, by county and water use category, are provided in **Table A-31** for average rainfall conditions and **Table A-32** for 1-in-10-year drought conditions.

Table A-31. Summary of gross water demands under average rainfall conditions in the LWC Planning Area by water use category.

Water Use Category	Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Public Supply	0.37	0.49	0.65	0.88	1.20	1.66
Domestic Self-Supply	0.15	0.19	0.22	0.24	0.24	0.25
Agriculture	31.88	31.88	32.06	32.48	32.75	33.07
Commercial/Industrial/Institutional	0.07	0.08	0.08	0.09	0.09	0.09
Landscape/Recreational	2.68	2.83	3.00	3.11	3.20	3.29
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Charlotte County Total	**35.15**	**35.47**	**36.01**	**36.80**	**37.48**	**38.36**
Collier County						
Public Supply	58.58	62.97	67.32	71.41	75.17	78.73
Domestic Self-Supply	12.09	13.73	14.42	14.69	14.69	14.44
Agriculture	133.13	131.33	130.57	128.66	127.95	126.39
Commercial/Industrial/Institutional	7.52	8.19	8.76	9.29	9.75	10.14
Landscape/Recreational	84.80	92.46	98.75	104.52	109.99	114.97
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Collier County Total	**296.12**	**308.68**	**319.82**	**328.57**	**337.55**	**344.67**
Glades County*						
Public Supply	0.82	0.87	0.91	0.94	0.97	0.99
Domestic Self-Supply	0.61	0.64	0.66	0.67	0.68	0.69
Agriculture	98.95	95.87	100.14	107.75	113.97	120.49
Commercial/Industrial/Institutional	13.76	14.45	15.03	15.48	15.94	16.26
Landscape/Recreational	0.18	0.19	0.20	0.20	0.20	0.20
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Glades County Total	**114.32**	**112.02**	**116.94**	**125.04**	**131.76**	**138.63**
Hendry County*						
Public Supply	3.71	3.75	3.79	3.82	3.85	3.87
Domestic Self-Supply	0.78	0.90	1.00	1.07	1.13	1.19
Agriculture	294.54	295.40	296.18	299.36	304.14	311.01
Commercial/Industrial/Institutional	4.59	4.82	5.02	5.17	5.27	5.38
Landscape/Recreational	0.64	0.67	0.70	0.72	0.73	0.74
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**304.26**	**305.54**	**306.69**	**310.14**	**315.12**	**322.19**
Lee County						
Public Supply	75.22	81.17	87.38	91.91	96.73	101.56
Domestic Self-Supply	10.64	13.14	13.81	15.09	15.38	15.09
Agriculture	33.52	33.14	32.76	32.18	31.23	30.45
Commercial/Industrial/Institutional	11.78	13.09	14.14	14.98	15.73	16.36
Landscape/Recreational	130.87	142.67	150.99	158.25	164.65	170.03
Power Generation	1.54	1.61	1.69	2.03	2.03	2.03
Lee County Total	**263.57**	**284.82**	**300.77**	**314.44**	**325.75**	**335.52**

Table A-31. Continued.

Water Use Category	Demand – Average Rainfall Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
LWC Planning Area Total						
Public Supply	**138.70**	**149.25**	**160.05**	**168.97**	**177.93**	**186.82**
Domestic Self-Supply	**24.27**	**28.60**	**30.10**	**31.76**	**32.12**	**31.66**
Agriculture	**592.02**	**587.62**	**591.71**	**600.43**	**610.04**	**621.40**
Commercial/Industrial/Institutional	**37.73**	**40.63**	**43.03**	**45.01**	**46.78**	**48.23**
Landscape/Recreational	**219.17**	**238.82**	**253.64**	**266.8**	**278.77**	**289.23**
Power Generation	**1.54**	**1.61**	**1.69**	**2.03**	**2.03**	**2.03**
LWC Planning Area Total	**1,013.43**	**1,046.53**	**1,080.22**	**1,115.00**	**1,147.67**	**1,179.37**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

Table A-32. Summary of gross water demands under 1-in-10-year drought conditions in the LWC Planning Area by water use category.

Water Use Category	Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Charlotte County*						
Public Supply	0.39	0.51	0.68	0.92	1.26	1.74
Domestic Self-Supply	0.16	0.20	0.23	0.25	0.25	0.26
Agriculture	37.52	37.52	37.83	38.83	39.10	39.42
Commercial/Industrial/Institutional	0.07	0.08	0.08	0.09	0.09	0.09
Landscape/Recreational	3.39	3.58	3.80	3.94	4.05	4.17
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Charlotte County Total	**41.53**	**41.89**	**42.62**	**44.03**	**44.75**	**45.68**
Collier County						
Public Supply	63.05	67.75	72.42	76.81	80.84	84.66
Domestic Self-Supply	13.05	14.83	15.57	15.87	15.87	15.60
Agriculture	158.30	155.28	154.50	152.28	151.49	150.29
Commercial/Industrial/Institutional	7.52	8.19	8.76	9.29	9.75	10.14
Landscape/Recreational	108.47	118.12	126.05	133.32	140.21	146.48
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Collier County Total	**350.39**	**364.17**	**377.30**	**387.57**	**398.16**	**407.17**
Glades County*						
Public Supply	0.87	0.92	0.96	1.00	1.03	1.05
Domestic Self-Supply	0.65	0.68	0.70	0.71	0.72	0.73
Agriculture	117.29	113.06	118.25	128.82	135.44	141.57
Commercial/Industrial/Institutional	13.76	14.45	15.03	15.48	15.94	16.26
Landscape/Recreational	0.23	0.24	0.25	0.25	0.25	0.25
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Glades County Total	**132.80**	**129.35**	**135.19**	**146.26**	**153.38**	**159.86**

Table A-32. Continued.

Water Use Category	Demand – 1-in-10-Year Drought Conditions (mgd)					
	2020	2025	2030	2035	2040	2045
Hendry County*						
Public Supply	3.93	3.98	4.02	4.05	4.08	4.10
Domestic Self-Supply	0.82	0.96	1.06	1.14	1.20	1.26
Agriculture	343.18	345.45	348.38	351.33	355.50	359.66
Commercial/Industrial/Institutional	4.59	4.82	5.02	5.17	5.27	5.38
Landscape/Recreational	0.81	0.84	0.88	0.91	0.92	0.93
Power Generation	0.00	0.00	0.00	0.00	0.00	0.00
Hendry County Total	**353.33**	**356.05**	**359.36**	**362.60**	**366.97**	**371.33**
Lee County						
Public Supply	78.98	85.22	91.74	96.51	101.57	106.64
Domestic Self-Supply	11.18	13.8	14.5	15.84	16.15	15.85
Agriculture	42.32	41.74	41.36	41.28	40.2	38.92
Commercial/Industrial/Institutional	11.79	13.09	14.14	14.98	15.73	16.36
Landscape/Recreational	166.1	180.97	191.45	200.6	208.66	215.44
Power Generation	1.54	1.61	1.69	2.03	2.03	2.03
Lee County Total	**311.91**	**336.43**	**354.88**	**371.24**	**384.34**	**395.24**
LWC Planning Area Total						
Public Supply	**147.22**	**158.38**	**169.83**	**179.29**	**188.78**	**198.20**
Domestic Self-Supply	**25.86**	**30.46**	**32.06**	**33.80**	**34.19**	**33.70**
Agriculture	**700.18**	**694.63**	**701.9**	**714.11**	**723.3**	**731.42**
Commercial/Industrial/Institutional	**37.73**	**40.63**	**43.03**	**45.01**	**46.78**	**48.23**
Landscape/Recreational	**279.01**	**303.76**	**322.45**	**339.03**	**354.11**	**367.29**
Power Generation	**1.54**	**1.61**	**1.69**	**2.03**	**2.03**	**2.03**
LWC Planning Area Total	**1,191.54**	**1,229.47**	**1,270.96**	**1,313.27**	**1,349.20**	**1,380.87**

LWC = Lower West Coast; mgd = million gallons per day.
* Values listed are only for the area within the LWC Planning Area boundary.

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B

Public Supply Utility Summaries

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PUBLIC SUPPLY UTILITY SUMMARIES

This appendix includes summaries of the Public Supply (PS) utilities that have an allocation of 0.10 million gallons per day (mgd) or greater of gross (raw) water in the Lower West Coast (LWC) Planning Area (**Table B-1**). The utility summaries were updated with data from the Florida Department of Environmental Protection (FDEP) Drinking Water Database (FDEP 2021a), population estimates from the 2020 Decennial Census (United States Census Bureau 2020), the individual reuse inventory reports for the year 2020 (unless otherwise noted for individual facilities) filed by each wastewater utility to the FDEP (FDEP 2021b), and the SFWMD's water use regulatory database. In addition, proposed water supply projects were updated based on utility reports provided to the SFWMD in November 2021 and through direct contact with utilities in 2020-2021. To help understand the information in the utility summaries, a sample profile with descriptions is provided. The utility summaries are ordered alphabetically by county for easy navigation. **Figures B-1** and **B-2** show the current (2020) and future (2045) PS service areas and wellfields in Lee and Charlotte counties, respectively. **Figures B-3** and **B-4** show the current and future PS service areas and wellfields in Collier County, respectively. **Figures B-5** and **B-6** show the current and future PS service areas and wellfields in Hendry and Glades counties, respectively. A discussion of utilities and the local governments they serve is provided at the end of the appendix. Potential future water conservation savings are not included in the utility summaries. **Chapter 3** of this plan update addresses conservation and potential water savings.

INFO

Acronyms and Abbreviations

ASR – aquifer storage and recovery

FAS – Floridan aquifer system

FDEP – Florida Department of Environmental Protection

IAS – intermediate aquifer system

LTA – Lower Tamiami aquifer

mgd – million gallons per day

MHA – Mid-Hawthorn aquifer

PS – Public Supply

RO – reverse osmosis

SA – Sandstone aquifer

SAS – surficial aquifer system

UFA – Upper Floridan aquifer

WTA – water table aquifer

WTP – water treatment plant

WWTF – wastewater treatment facility

Table B-1. Summary of the Public Supply utilities with a capacity of 0.10 mgd or greater in the LWC Planning Area.

Supply Entity – Facility	SFWMD Permit Number	Gross (Raw) Water (mgd)						FDEP PWS ID	Rated Net (Finished) Capacity (mgd)
		Annual Allocation	Surface Water	SAS	IAS	FAS	ASR		
Charlotte County*									
Charlotte Correctional	08-00047-W	0.12		0.12				5084082	0.30
Town and Country	08-00122-W	2.07			1.04	1.03		5084116	0.99
Charlotte County Total		**2.19**	**0.00**	**0.12**	**1.04**	**1.03**	**0.00**		**1.29**
Collier County									
Ave Maria	11-02298-W	1.11		0.78	0.78			5114154	0.99
Collier County Utilities	11-00249-W 11-00419-W	47.90		20.90	16.00	19.52		5114069	52.00
Everglades City	11-00160-W	0.29		0.29				5110089	0.47
Immokalee (IWSD)	11-00013-W	4.15		3.45		0.70		5110142	5.60
Marco Island	11-00080-W	13.16	9.54[a]		3.62		4.15	5110183	12.67
Naples	11-00017-W	18.42		18.42				5110198	30.00
Port of the Islands	11-00372-W	0.27		0.27				5110230	0.44
STOF – Immokalee[b]	N/A	N/A		0.24				N/A	0.43
Collier County Total		**85.3**	**9.54**	**44.35**	**20.40**	**20.22**	**4.15**		**102.06**
Glades County*									
Moore Haven	22-00045-W	0.89		0.89				5220192	0.96
Silver Lake – Muse Village	22-00497-W	0.10			0.10			5284101	0.33
Glades County Total		**0.99**	**0.00**	**0.89**	**0.10**	**0.00**	**0.00**		**1.29**
Hendry County*									
Clewiston	26-00769-W	2.58				2.58		5260053	3.00
LaBelle	26-00105-W	1.06		0.14		0.92		5260050	1.50
Port LaBelle	26-00096-W	0.53			0.53			5260226	0.90
Hendry County Total		**4.17**	**0.00**	**0.14**	**0.53**	**3.50**	**0.00**		**5.40**

Table B-1. Continued.

Supply Entity – Facility	SFWMD Permit Number	Gross (Raw) Water (mgd)						FDEP PWS ID	Rated Net (Finished) Capacity (mgd)
		Annual Allocation	Surface Water	SAS	IAS	FAS	ASR		
Lee County									
Bonita Springs	36-00008-W	16.40		5.74		16.40		5360025	19.06
Cape Coral	36-00046-W	39.25				39.25		5360325	30.00
Citrus Park – Bonita Terra	36-00208-W	0.23		0.23				5360048	0.54
FGUA – Lake Fairways	36-00081-W	0.10			0.10			5364040	0.20
FGUA – Lehigh Acres	36-00166-W	3.15			3.15			5360172	3.10
Fort Myers	36-00035-W	15.25				15.25		5360102	13.00
Lee County Utilities	36-00152-W 36-00003-W 36-00122-W	57.16	4.43	9.33	11.21	34.65		5364048	52.00
Pine Island (GPIWA)	36-00045-W	2.49				2.49		5360322	3.29
Sanibel Island (IWA)	36-00034-W	5.22				5.22		5360146	5.99
Lee County Total		**139.25**	**4.43**	**15.30**	**14.46**	**113.26**	**0.00**		**127.18**
LWC Planning Area Total		**230.91**	**13.97**	**59.91**	**36.43**	**138.01**	**4.15**		**236.47**

ASR = aquifer storage and recovery; FAS = Floridan aquifer system; FDEP = Florida Department of Environmental Protection; FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IAS = intermediate aquifer system; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; mgd = million gallons per day; PWS ID = Public Water System Identification Number; RO = reverse osmosis; SAS = surficial aquifer system; SFWMD = South Florida Water Management District; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

Note: Where cells are blank, no water was allocated from that source.

* Values listed are only for the area within the LWC Planning Area boundary.

[a] Surface Water allocation includes 5.39 mgd for raw water supply and 4.15 mgd for ASR injection into FAS.

[b] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

SAMPLE UTILITY COMPANY

Service Area: Sample city and portions of unincorporated county.

Description: This description includes water sources, type of WTPs, and other issues of concern to the utility. If the utility produces reclaimed water, information regarding the quantity and customers may be included. If the utility sells or purchases bulk water, that information is listed.

Population and Finished Water Demand				
1 2	Existing	Projected		
	2020	2025	2035	2045
Population 3	100,000	110,000	120,000	130,000
Average 2016-2020 Per Capita (gallons per day finished water)	100			
Potable Water Demands (daily average annual finished water in mgd)	**10.00**	**11.00**	**12.00**	**13.00**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source 4	Permit Number 12-34567-W (expires 2040)			
Surface Water	2.00			
Surficial Aquifer System	5 14.00			
Floridan Aquifer System	0.00			
Total Allocation	**16.00** 7			
FDEP Potable Water Treatment Capacity (mgd) (PWS ID# 1234567)				
Permitted Capacity by Source 6	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
Surficial Aquifer System/Surface Water	18.00	18.00	18.00	18.00
Floridan Aquifer System	0.00	2.00	3.00	3.00
8 **Total Potable Capacity**	**18.00**	**20.00**	**21.00**	**21.00**
9 Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	1.00	1.00	4.00	4.00
10 **Total Nonpotable Capacity**	**1.00**	**1.00**	**1.00**	**1.00**

Project Summary						
Water Supply Project	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
2.00 mgd expansion of Floridan RO treatment plant	FAS	2021	$14.00	2.00	2.00	2.00
Floridan wells and RO treatment plant expansion	FAS	2029	$4.00	0.00	1.00	1.00
11		**Total Potable Water**	**$18.00**	**2.00**	**3.00**	**3.00**
Nonpotable Water 12						
3.00 mgd reclaimed water facility	Reclaimed	2029	$5.00	0.00	3.00	3.00
ASR and irrigation supply	Stormwater	2034	$2.00	0.00	1.00	1.00
13		**Total Nonpotable Water**	**$7.00**	**0.00**	**4.00**	**4.00**
14		**Total New Water**	**$25.00**	**2.00**	**7.00**	**7.00**

1 **Population** – The 2020 populations were determined by assigning 2010 United States Census block data to 2020 PS utility service areas. To project populations to 2045, the relative growth rates for PS utility service areas were developed from county population projections. (See **Appendix A** for more information.)

2 **Average 2016-2020 Per Capita** (gallons per day finished water) – A PS utility's per capita is calculated by dividing total net (finished) water produced each year (from monthly operating reports submitted by utilities to the FDEP) by the utility's permanent population for that year. Each utility's per capita was calculated for 2016 to 2020, then averaged over the 5 years.

3 **Potable Water Demands** (daily average annual finished water in mgd) – The 201920 demand was calculated using the PS utility's average 2016-2020 per capita multiplied by the 2020 service area population. The projected demands for 2020 to 2045 were calculated using the utility's average 2016-2020 per capita multiplied by the utility's projected populations for those years.

4 **Allocation from the Water Use Permit** – The total allocation is composed of gross (raw) surface water and groundwater (from the SAS and FAS) allocations, as described in the utility's water use permit. The 2020 allocation is assumed to continue through 2045 unless noted otherwise.

5 **Total Allocation** – The total gross (raw) water allocation in the water use permit. For utilities with multiple sources, total allocation may be less than the sum of the individual source allocations; this is indicated in the appropriate profiles.

6 **FDEP Permitted Capacity** – The total net (finished) water capacity of the WTPs, as provided by the FDEP (2021a). The capacity is split into the capacity available to process water from surface water as well as the SAS, IAS, and FAS.

7 **Planned Project Capacity** – The net (finished) water volumes created by projects listed in the Project Summary (Item 10). Project capacity to be completed by 2025 is shown in the 2025 column, capacity to be completed between 2026 and 2035 is in the 2035 column, and capacity to be completed between 2036 and 2045 is in the 2045 column.

8 **Total Capacity** – The existing net (finished) water capacity of the WTPs owned/operated by the utility in addition to the volumes of net (finished) water produced by future planned projects.

9 **Reclaimed Water** – The capacity of the WWTF(s) to produce reclaimed water, as provided by the FDEP (2021b). Additional capacity is from projects planned by the utility (listed under Item 12).

10 **Project Summary** – A description of the potable water supply projects the utility is proposing to construct. Only projects that produce additional potable water (e.g., wells, WTPs) are included; maintenance or replacement projects are not included. Each project has a water source, anticipated completion date, estimated total capital cost, and projected volume of treatment capacity. Proposed projects have been screened at a planning level but must meet permit issuance criteria.

11 **Total Projected Cumulative Design Capacity for 2025, 2035, or 2045** – The total volume of potable water supply projects expected to be completed by 2025, 2035, and 2045, respectively. The totals are added to the appropriate projected capacities in Item 7.

12 **Nonpotable Projects Summary** – A description of the nonpotable water supply projects the utility is proposing to construct. Only projects that produce additional nonpotable water are included; maintenance or replacement projects are not included. Each project has a water source, anticipated completion date, estimated total capital cost, and projected volume of treatment capacity.

13 **Total Projected Cumulative Design Capacity for Nonpotable 2025, 2035, or 2045** – The total volume of nonpotable water projects expected to be completed by 2025, 2035, and 2045, respectively. If the project provides reclaimed water, totals are added to the appropriate projected capacities in Item 9.

14 **Total Projected Cumulative Design Capacity for New Water 2025, 2035, or 2045** – The total projected cost and capacity of potable and nonpotable water supply projects the utility is proposing to construct between 2020 and 2045.

CHARLOTTE AND LEE COUNTIES

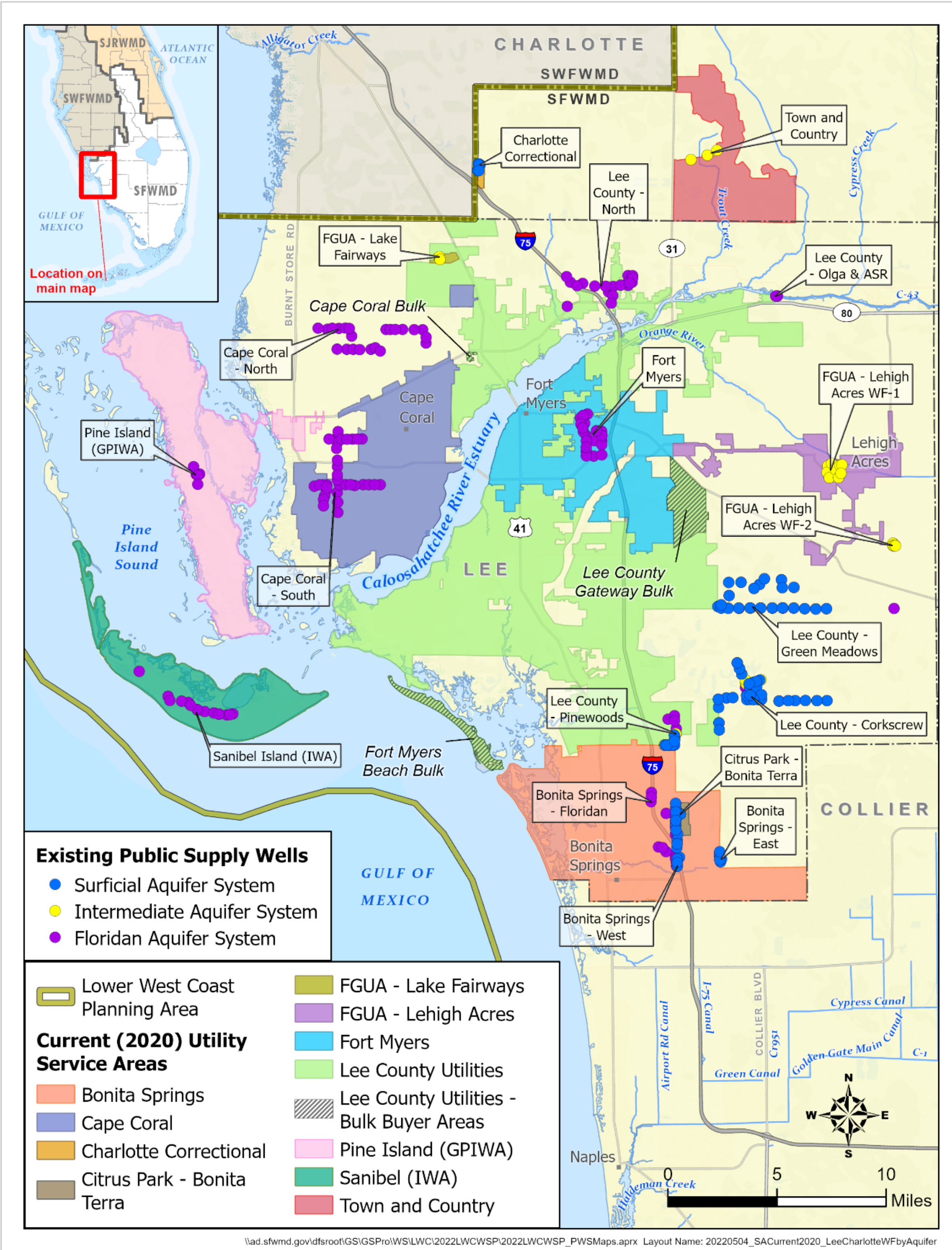

Figure B-1. Current (2020) Public Supply utility service areas and wellfields in Charlotte and Lee counties.

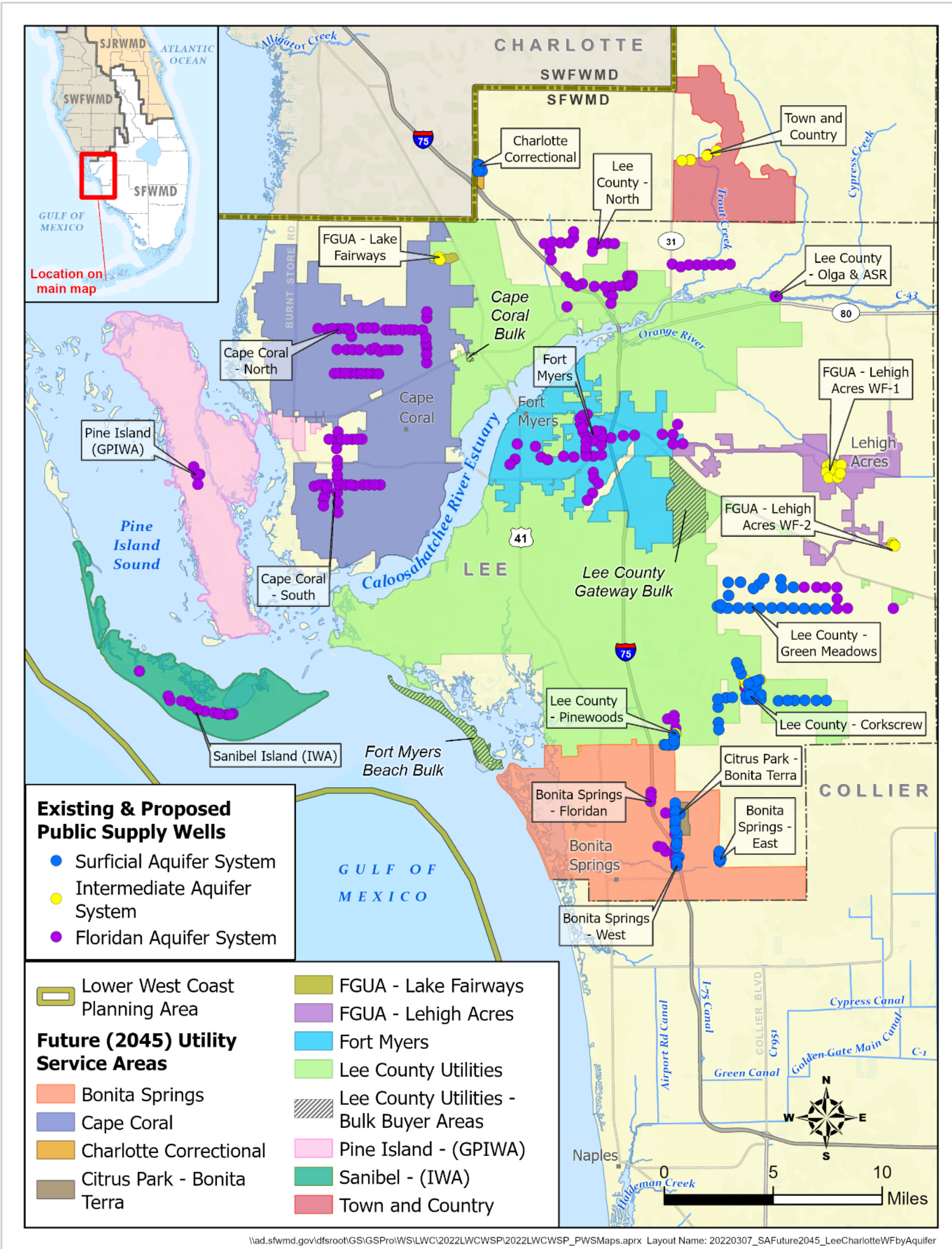

Figure B-2. Projected (2045) Public Supply utility service areas and wellfields in Charlotte and Lee counties.

CHARLOTTE

CHARLOTTE CORRECTIONAL

Service Area: Charlotte Correctional Institution

Description: Potable water supplies are obtained from the Charlotte Correctional WTA wellfield, treated at the Charlotte Correctional WTP using lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	1,278	1,278	1,278	1,278
Average 2016-2020 Per Capita (gallons per day finished water)	68			
Potable Water Demands (daily average annual finished water in mgd)	**0.09**	**0.09**	**0.09**	**0.09**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 08-00047-W (expires 2035)			
SAS	0.12			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.12**			
FDEP Potable Water Treatment Capacity (PWS ID # 5084082)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.30	0.30	0.30	0.30
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.30**	**0.30**	**0.30**	**0.30**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.25	0.25	0.25	0.25
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

TOWN AND COUNTRY

Service Area: Babcock Ranch community in unincorporated Charlotte County

Description: Potable water supplies are obtained from the SA and the UFA via the Town and Country wellfield, currently treated at the Town and Country WTP using membrane softening and ion exchange. Proposed expansions of the WTP will use RO.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population[a]	2,613	3,684	7,325	14,562
Average 2016-2020 Per Capita (gallons per day finished water)	85			
Potable Water Demands (daily average annual finished water in mgd)	**0.22**	**0.31**	**0.62**	**1.24**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 08-00122-W (expires 2026)			
SAS	0.00			
IAS	1.04			
FAS	1.03			
Total Allocation	**2.07**			
FDEP Potable Water Treatment Capacity (PWS ID # 5084116)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.99	0.99	0.99	0.99
FAS	0.00	2.50	7.01	7.01
Total Potable Capacity	**0.99**	**3.49**	**8.00**	**8.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.75	0.75	4.00	4.00
Total Nonpotable Capacity	**0.75**	**0.75**	**4.00**	**4.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
Phase 3 WTP Expansion and Supply Wells (4 wells, 2 IAS, 2 FAS)	IAS/FAS	2023	$27.21	2.50	2.51	2.51
Phase 4 RO WTP Expansion, Deep Injection Well, and Supply Wells (4 FAS wells)	FAS	2027	$14.14	0.00	2.50	2.50
Phase 5 RO WTP Expansion and Supply Wells (2 FAS wells)	FAS	2031	$14.38	0.00	2.00	2.00
Total Potable Water			**$55.73**	**2.50**	**7.01**	**7.01**
Nonpotable Water						
Phase 3 WWTF Expansion	Reclaimed	2026	$40.00	0.00	0.75	0.75
Phase 4 WWTF Expansion	Reclaimed	2029	$30.00	0.00	1.16	1.16
Phase 5 WWTF Expansion	Reclaimed	2033	$17.00	0.00	1.34	1.34
Total Nonpotable Water			**$87.00**	**0.00**	**3.80**	**3.80**
Total New Water			**$142.73**	**2.51**	**10.81**	**10.81**

[a] The 2020 population is based on data provided in support of the most recent water use permit application. Projected populations are based on the University of Florida Bureau of Economic and Business Research (BEBR) "high" growth rate.

BONITA SPRINGS

Service Area: City of Bonita Springs and portions of the Village of Estero and unincorporated Lee County

Description: Potable water supplies are obtained from two LTA wellfields (East and West) and one FAS wellfield (Floridian). Withdrawals from the LTA wellfields are treated at the Bonita Springs Lime Softening WTP. Withdrawals from the FAS are treated at the Bonita Springs Reverse Osmosis WTP.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	66,897	74,256	85,009	92,829
Average 2016-2020 Per Capita (gallons per day finished water)	**153**			
Potable Water Demands (daily average annual finished water in mgd)	**10.24**	**11.36**	**13.01**	**14.20**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	36-00008-W (expires 2042)			
SAS	5.74[a]			
IAS	0.00			
FAS	16.40			
Total Allocation	**16.40[b]**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360025)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	10.50	10.50	10.50	10.50
IAS	0.00	0.00	0.00	0.00
FAS	8.56	12.56	12.56	12.56
Total Potable Capacity	**19.06**	**23.06**	**23.06**	**23.06**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water[c]	11.00	11.00	13.00	13.00
Total Nonpotable Capacity	**11.00**	**11.00**	**13.00**	**13.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
RO Treatment Plant Expansion Phase 3 and 12 FAS Wells	FAS	2024	$45.00	4.00	4.00	4.00
Total Potable Water			**$45.00**	**4.00**	**4.00**	**4.00**
Nonpotable Water						
East WWTF Expansion	Reclaimed	2028	$38.00	0.00	2.00	2.00
Total Nonpotable Water			**$38.00**	**0.00**	**2.00**	**2.00**
Total New Water			**$83.00**	**4.00**	**6.00**	**6.00**

[a] This is a 20-year allocation expiring in 2042. A temporary 5-year allocation of 7.26 mgd expires in 2027.
[b] The permitted source allocations do not always total exactly. See the SFWMD water use permit for further information.
[c] All reclaimed water is supplied to Resource Conservation Systems.

CAPE CORAL

Service Area: Portions of the City of Cape Coral

Bulk finished water purchased from Lee County is provided by Cape Coral to a portion of Pine Island.

Description: Potable water supplies are obtained from two FAS wellfields (South and North), treated at two WTPs using RO. Cape Coral provides bulk water to Lee County on an as-needed basis.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	160,295	177,928	224,138	261,435
Average 2016-2020 Per Capita (gallons per day finished water)	81			
Potable Water Demands (daily average annual finished water in mgd)	**12.98**	**14.41**	**18.16**	**21.18**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00046-W (expires 2029)			
SAS	0.00			
IAS	0.00			
FAS	39.25			
Total Allocation	**39.25**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360325)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	30.00	30.00	30.00	30.00
Total Potable Capacity	**30.00**	**30.00**	**30.00**	**30.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water[a]	32.65	37.65	41.65	41.65
ASR/Surface Water	0.00	0.00	1.00	1.00
Total Nonpotable Capacity	**32.65**	**37.65**	**42.65**	**42.65**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
South RO WTP Replacement[b]	FAS	2028	$20.00	0.00	18.00	18.00
North RO WTP Backup Deep Injection Well[b]	FAS	2023	$9.00	9.00	9.00	9.00
North RO WTP Wells[b]	FAS	2025	$7.20	3.60	3.60	3.60
Total Potable Water			**$36.20**	**12.60**	**30.60**	**30.60**
Nonpotable Water						
Reuse Interconnect with Fort Myers[b]	Reclaimed	2023	$11.80	6.00	6.00	6.00
Southwest WWTF Expansion, 15 to 20 mgd	Reclaimed	2025	$60.00	5.00	5.00	5.00
North WWTF Phase I	Reclaimed	2035	$120.00	0.00	4.00	4.00
ASR Wells for Irrigation Supply	Surface Water	2027	$4.00	0.00	1.00	1.00
Total Nonpotable Water			**$195.80**	**11.00**	**16.00**	**16.00**
Total New Water			**$232.00**	**23.60**	**46.60**	**46.60**

[a] The Cape Coral irrigation system combines reclaimed water with surface water (Water Use Permit 36-00998-W).
[b] Does not increase the overall permitted treatment capacity.

CITRUS PARK – BONITA TERRA

Service Area: Bonita Terra (formerly known as Citrus Park), located within the City of Bonita Springs

Description: Potable water supplies are obtained from the WTA and LTA via the Citrus Park – Bonita Terra wellfield, treated using RO at the Citrus Park RV Resort WTP.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	1,368	1,560	1,645	1,754
Average 2016-2020 Per Capita (gallons per day finished water)	124			
Potable Water Demands (daily average annual finished water in mgd)	**0.17**	**0.19**	**0.20**	**0.22**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00208-W (expires 2039)			
SAS	0.23			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.23**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360048)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.54	0.54	0.54	0.54
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.54**	**0.54**	**0.54**	**0.54**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.20	0.20	0.20	0.20
Total Nonpotable Capacity	**0.20**	**0.20**	**0.20**	**0.20**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects			$0.00	0.00	0.00	0.00
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

LEE

FLORIDA GOVERNMENTAL UTILITY AUTHORITY – LAKE FAIRWAYS

Service Area: A portion of Lee County serving the Lake Fairways mobile home park in unincorporated North Fort Myers

Description: Potable water supplies are obtained from the MHA via the FGUA – Lake Fairways wellfield, treated using chlorination at the Lake Fairways MHP WTP.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	1,187	1,463	1,675	1,829
Average 2016-2020 Per Capita (gallons per day finished water)	64			
Potable Water Demands (daily average annual finished water in mgd)	**0.08**	**0.09**	**0.11**	**0.12**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00081-W (expires 2025)			
SAS	0.00			
IAS	0.10			
FAS	0.00			
Total Allocation	**0.10**			
FDEP Potable Water Treatment Capacity (PWS ID # 5364040)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.20	0.20	0.20	0.20
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.20**	**0.20**	**0.20**	**0.20**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.30	0.30	0.30	0.30
Total Nonpotable Capacity	**0.30**	**0.30**	**0.30**	**0.30**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects			$0.00	0.00	0.00	0.00
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

FLORIDA GOVERNMENTAL UTILITY AUTHORITY – LEHIGH ACRES

Service Area: A portion of unincorporated Lee County serving Lehigh Acres

Description: Potable water supplies are obtained from the two SA wellfields (WF-1 and WF-2), treated using lime softening at the Lehigh Utilities, Inc. WTP. Lehigh Acres has an interlocal agreement with the City of Fort Myers to purchase up to 2.00 mgd of treated bulk water.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	27,467	30,488	34,903	38,114
Average 2016-2020 Per Capita (gallons per day finished water)	87			
Potable Water Demands (daily average annual finished water in mgd)	**2.39**	**2.65**	**3.04**	**3.32**
Bulk Potable Water Demands (daily average annual finished water in mgd from Fort Myers)	(2.00)	(2.00)	(2.00)	(2.00)
Total Potable Water Demands (daily average annual finished water in mgd)	**2.39**	**2.65**	**3.04**	**3.32**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00166-W (expires 2035)			
SAS	0.00			
IAS	3.15			
FAS	0.00			
Total Allocation	**3.15**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360172)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	3.10	3.10	3.10	3.10
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**3.10**	**3.10**	**3.10**	**3.10**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	2.76	2.76	2.76	2.76
Total Nonpotable Capacity	**2.76**	**2.76**	**2.76**	**2.76**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects			$0.00	0.00	0.00	0.00
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

FORT MYERS

Service Area: Portions of the City of Fort Myers and unincorporated Lee County

Description: Potable water supplies are obtained from the FAS via the Fort Myers wellfield (also known as the Eastwood wellfield), treated using RO at the Fort Myers Water Dept. WTP. Fort Myers provides up to 2.00 mgd of finished bulk water to FGUA - Lehigh Acres.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	94,421	96,905	107,855	122,170
Average 2016-2020 Per Capita (gallons per day finished water)	91			
Potable Water Demands (daily average annual finished water in mgd)	**8.59**	**8.82**	**9.81**	**11.12**
Bulk Potable Water Demands (daily average annual finished water in mgd delivered directly to FGUA-Lehigh Acres)	2.00	2.00	2.00	2.00
Total Potable Water Demands (daily average annual finished water in mgd)	**10.59**	**10.82**	**11.81**	**13.12**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00035-W (expires 2040)			
SAS	0.00			
IAS	0.00			
FAS	15.25			
Total Allocation	**15.25**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360102)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	13.00	13.00	13.00	13.00
Total Potable Capacity	**13.00**	**13.00**	**13.00**	**13.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	6.00	15.00	21.00	21.00
Total Nonpotable Capacity	**6.00**	**15.00**	**21.00**	**21.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
Wellfield Expansion Wells P-21, P-22, P-1S, and P-2S [a]	FAS	2022	$6.36	2.88	2.88	2.88
Wellfield Expansion Wells P-3S, P-4S, and P-5S [a]	FAS	2025	$7.50	2.16	2.16	2.16
Backup Deep Injection Well [a]	FAS	2025	$20.00	11.00	11.00	11.00
Total Potable Water			**$33.86**	**16.04**	**16.04**	**16.04**
Nonpotable Water						
South WWTF Upgrade to Reuse and Interconnect with Cape Coral	Reclaimed	2023	$55.00	9.00	9.00	9.00
Central WWTF Expansion	Reclaimed	2026	$60.00	0.00	6.00	6.00
Total Nonpotable Water			**$115.00**	**9.00**	**15.00**	**15.00**
Total New Water			**$148.86**	**25.04**	**31.04**	**31.04**

[a] Does not increase the overall permitted treatment capacity.

LEE

LEE COUNTY UTILITIES

Service Area: Unincorporated areas of Lee County and portions of the Village of Estero and the City of Fort Myers

Lee County provides bulk finished water to Fort Myers Beach, Gateway, and Cape Coral.

Description: Potable water supplies are obtained from the SAS, IAS, and FAS via four wellfields. Groundwater is treated at four WTPs: Corkscrew, North Fort Myers, Green Meadows, and Pinewoods, using lime softening, membrane softening, ion exchange, and RO. Surface water is treated at the Olga WTP using lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	261,469	281,749	306,746	331,905
Bulk Population (Fort Myers Beach, Gateway, and Cape Coral)	11,815	13,942	15,475	16,094
Total Population	273,284	295,691	322,221	347,999
Average 2016-2020 Per Capita (gallons per day finished water)	93			
Potable Water Demands (daily average annual finished water in mgd)	**25.42**	**27.50**	**29.97**	**32.36**

SFWMD Water Use Permitted Allocation (mgd)			
Potable Water Source	36-00152-W (expires 2040)	36-00003-W (expires 2031)	36-00122-W (expires 2034)
Surface Water (C-43)	0.00	4.43	0.00
SAS	0.00	7.84	1.85
IAS	0.00	10.61	0.60
FAS	15.53	14.21	4.91
Total Allocation per Permit	**15.53**	**34.27**[a]	**7.36**
Total Allocation	**57.16**		

FDEP Potable Water Treatment Capacity (PWS ID # 5364048)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
Surface Water (C-43)/ASR	5.00	5.00	5.00	5.00
SAS	8.51	8.51	8.51	8.51
IAS	9.41	9.41	9.41	9.41
FAS/ASR	29.08	34.08	34.08	34.08
Total Potable Capacity	**52.00**	**57.00**	**57.00**	**57.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	20.38	20.38	20.38	20.38
Total Nonpotable Capacity	**20.38**	**20.38**	**20.38**	**20.38**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
North Lee County WTP and Wellfield Expansion	FAS	2025	$38.88	5.00	5.00	5.00
Green Meadows Wellfield Expansion[b]	FAS	2025	$4.00	2.90	2.90	2.90
Total Potable Water			**$42.88**	**7.90**	**7.90**	**7.90**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$42.88**	**7.90**	**7.90**	**7.90**

[a] The source allocations do not always total exactly. See the SFWMD water use permit for further information.
[b] Does not add to treatment capacity – only additional wells.

PINE ISLAND (GREATER PINE ISLAND WATER ASSOCIATION)

Service Area: Portions of unincorporated Lee County serving Pine Island, Matlacha, and a portion of Cape Coral

Description: Potable water supplies are obtained from the FAS via the Pine Island (GPIWA) wellfield, treated at the Greater Pine Island WTP using RO. Treated bulk water is purchased from Cape Coral on an as-needed basis.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	12.841	13,419	14,254	15,072
Average 2016-2020 Per Capita (gallons per day finished water)	115			
Potable Water Demands (daily average annual finished water in mgd)	**1.48**	**1.54**	**1.64**	**1.73**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00045-W (expires 2035)			
SAS	0.00			
IAS	0.00			
FAS	2.49			
Total Allocation	**2.49**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360322)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	3.29	3.29	3.29	3.29
Total Potable Capacity	**3.29**	**3.29**	**3.29**	**3.29**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.00	0.00	0.00	0.00
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

SANIBEL ISLAND (ISLAND WATER ASSOCIATION)

Service Area: Sanibel Island and a portion of unincorporated Lee County serving Captiva

Description: Potable water supplies are obtained from the FAS via the Sanibel Island (IWA) wellfield, treated at the Island Water Assoc. RO WTP.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	7,354	7,508	7,719	7,862
Average 2016-2020 Per Capita (gallons per day finished water)	509			
Potable Water Demands (daily average annual finished water in mgd)	**3.74**	**3.82**	**3.93**	**4.00**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 36-00034-W (expires 2037)			
SAS	0.00			
IAS	0.00			
FAS	5.22			
Total Allocation	**5.22**			
FDEP Potable Water Treatment Capacity (PWS ID # 5360146)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	5.99	5.99	5.99	5.99
Total Potable Capacity	**5.99**	**5.99**	**5.99**	**5.99**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	2.38	2.38	2.38	2.38
Total Nonpotable Capacity	**2.38**	**2.38**	**2.38**	**2.38**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

COLLIER COUNTY

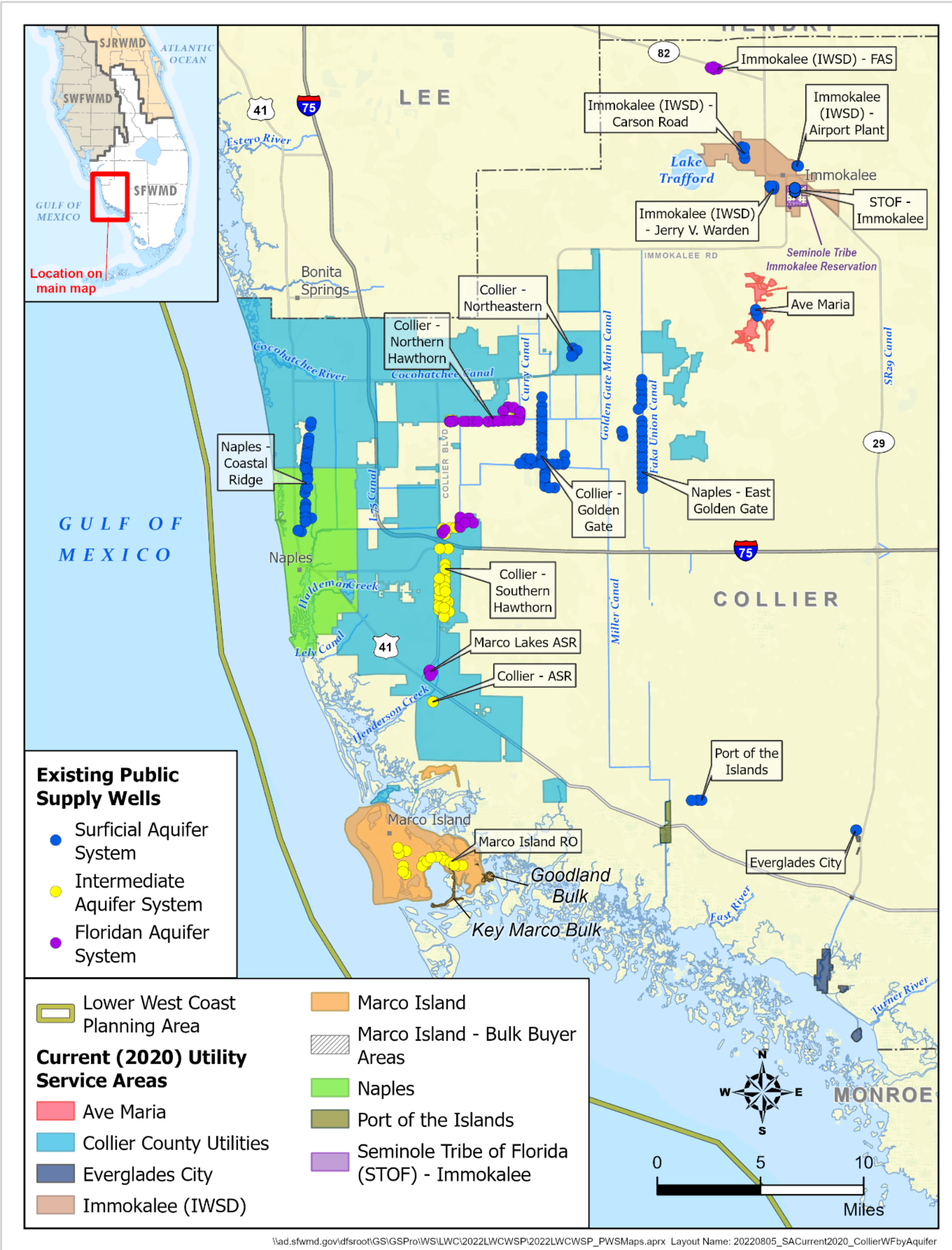

Figure B-3. Current (2020) Public Supply utility service areas and wellfields in Collier County.

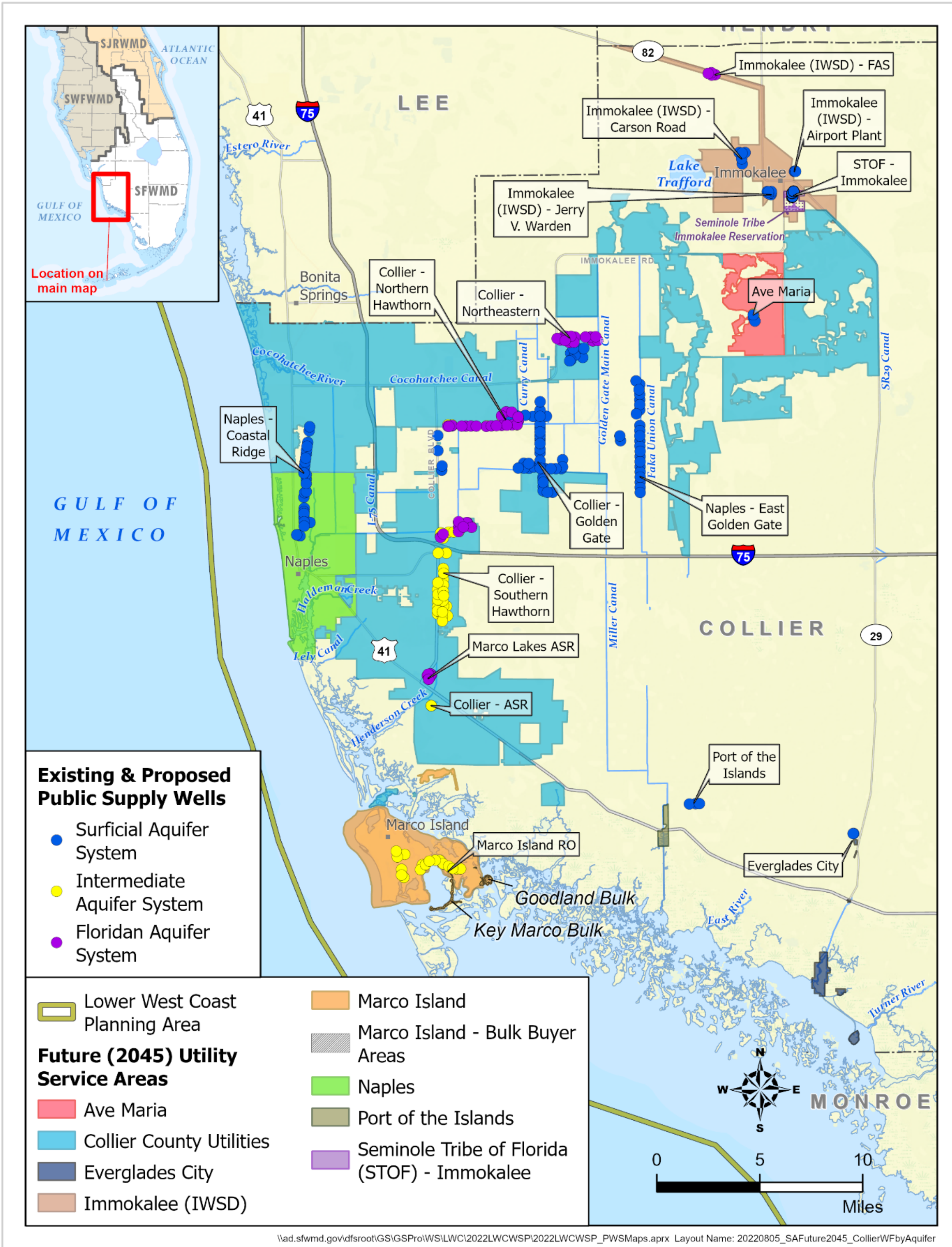

Figure B-4. Projected (2045) Public Supply utility service areas and wellfields in Collier County.

AVE MARIA

Service Area: Unincorporated areas of Collier County, and the Town of Ave Maria

Description: Potable water supplies are obtained from the LTA and SA via the Ave Maria wellfield, treated at the Ave Maria WTP using membrane softening and RO.

Population and Finished Water Demand	Existing	Projected		
	2020	2025	2035	2045
Population[a]	6,242	8,177	14,033	24,081
Average 2016-2020 Per Capita (gallons per day finished water)	89			
Potable Water Demands (daily average annual finished water in mgd)	**0.56**	**0.73**	**1.25**	**2.14**

SFWMD Water Use Permitted Allocation (mgd)	
Potable Water Source	Permit Number 11-02298-W (expires 2026)
SAS	0.78
IAS	0.78
FAS	0.00
Total Allocation	**1.11[b]**

FDEP Potable Water Treatment Capacity (PWS ID # 5114154)	Cumulative Facility & Project Capacity (mgd)			
Permitted Capacity by Source	Existing	Projected		
	2020	2025	2035	2045
SAS	0.49	0.49	0.49	0.49
IAS	0.50	0.50	0.50	0.50
FAS	0.00	0.00	2.76	2.76
Total Potable Capacity	**0.99**	**0.99**	**3.75**	**3.75**

Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.90	0.90	2.15	2.15
Total Nonpotable Capacity	**0.90**	**0.90**	**2.15**	**2.15**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
Sandstone Aquifer Wellfield Expansion[c]	SAS	2023	$3.70	2.70	2.70	2.70
Expansion of RO WTP	FAS	2031	$5.00	0.00	2.76	2.76
Total Potable Water			**$8.70**	**2.70**	**5.46**	**5.46**
Nonpotable Water						
WWTF Phase 2 Expansion	Reclaimed	2030	$6.50	0.00	1.25	1.25
Total Nonpotable Water			**$0.00**	**0.00**	**1.25**	**1.25**
Total New Water			**$15.20**	**2.70**	**6.71**	**6.71**

[a] The 2020 population is based on the 2021 United States Census Bureau population estimate. Projected populations are based on the University of Florida Bureau of Economic and Business Research (BEBR) “high” growth rate.
[b] The SAS, IAS, and FAS source allocations do not always total exactly. See the SFWMD water use permit for further information.
[c] Does not increase the overall permitted treatment capacity.

COLLIER COUNTY UTILITIES

Service Area: Unincorporated areas of Collier County.

Bulk finished water purchased from Marco Island is provided to Key Marco and Goodland.

Description: Potable water supplies are obtained from the LTA, MHA, and UFA via four wellfields. Water is treated at the North County Regional WTP using nano filtration and low-pressure RO and the South County Regional WTP using lime softening and RO.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	209,504	228,359	259,005	282,833
Average 2016-2020 Per Capita (gallons per day finished water)	130			
Potable Water Demands (daily average annual finished water in mgd)	**27.24**	**29.69**	**33.67**	**36.77**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	11-00419-W (expires 2027)		11-00249-W (expires in 2024/2037)	
SAS	2.13		18.77[a]	
IAS	0.00		16.00	
FAS	0.00		19.52	
Total Allocation per Permit	**2.13**		**45.77[b]**	
Total Allocation	**47.90**			
FDEP Potable Water Treatment Capacity (PWS ID # 5114069)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	20.80	21.68	23.68	23.80
IAS	15.60	15.60	15.60	15.60
FAS	15.60	15.60	15.60	17.60
Total Potable Capacity	**52.00**	**52.88**	**54.88**	**57.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	42.35	44.10	47.60	47.60
Total Nonpotable Capacity	**42.35**	**44.10**	**47.60**	**47.60**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
Northeast Interim WTP and NE LTA Wellfield	SAS	2024, 2028, 2032	$28.80	0.88	2.88	0.00
Northeast Ion Exchange WTP Phase I	SAS	2037	$24.20	0.00	0.00	3.00
Northeast RO WTP and FAS wells	FAS	2037	$24.20	0.00	0.00	2.00
Total Potable Water			**$77.20**	**0.88**	**2.88**	**5.00**
Nonpotable Water						
Northeast New WWTF[c]	Reclaimed	2022	$65.00	0.75	0.75	0.75
Foxfire Supplemental Wells	SAS	2023	$1.00	1.00	1.00	1.00
South County WWTF Supplemental Wells	SAS	2030	$3.00	0.00	1.00	1.00
Golden Gate WWTF Expansion	Reclaimed	2030	$86.00	0.00	2.50	2.50
Total Nonpotable Water			**$155.00**	**1.75**	**5.25**	**5.25**
Total New Water			**$232.20**	**3.38**	**8.13**	**10.25**

a A 5-year allocation of 26.50 mgd for the Lower Tamiami aquifer expires in 2024 unless it is renewed according to the criteria in the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2022).

b The SAS, IAS, and FAS source allocations do not always total exactly. See the SFWMD water use permit for information.

c Replacing the existing 0.75 mgd WWTF, increases total capacity by 0.75 mgd.

EVERGLADES CITY

Service Area: Everglades City and portions of unincorporated Collier County serving Chokoloskee Island, Plantation Island, and Seaboard Village in Copeland

Description: Potable water supplies are obtained from the SAS via the Everglades City wellfield, treated at the Everglades City WTP using membrane softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	1,069	1,165	1,322	1,444
Average 2016-2020 Per Capita (gallons per day finished water)	223			
Potable Water Demands (daily average annual finished water in mgd)	**0.24**	**0.26**	**0.29**	**0.32**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 11-00160-W (expires 2023)			
SAS	0.29			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.29**			
FDEP Potable Water Treatment Capacity (PWS ID # 5110089)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.47	0.47	0.47	0.47
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.47**	**0.47**	**0.47**	**0.47**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.16	0.16	0.36	0.36
Total Nonpotable Capacity	**0.16**	**0.16**	**0.36**	**0.36**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
New Rapid Infiltration Basins	Reclaimed	2026	TBD	0.00	0.10	0.10
R02 Effluent System Replacement	Reclaimed	2029	$3.00	0.00	0.10	0.10
Total Nonpotable Water			**$3.00**	**0.00**	**0.20**	**0.20**
Total New Water			**$3.00**	**0.00**	**0.20**	**0.20**

IMMOKALEE (IMMOKALEE WATER SEWER DISTRICT)

Service Area: Portions of unincorporated Collier County serving Immokalee

Description: Potable water supplies are obtained from the LTA via the Jerry V. Warden, Carson Road, and Airport Plant wellfields, treated at three WTPs using chlorination.

COLLIER

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	24,618	26,834	29,469	30,359
Average 2016-2020 Per Capita (gallons per day finished water)	89			
Potable Water Demands (daily average annual finished water in mgd)	**2.19**	**2.39**	**2.62**	**2.70**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 11-00013-W (expires 2031)			
SAS	3.45			
IAS	0.00			
FAS	0.70			
Total Allocation	**4.15**			
FDEP Potable Water Treatment Capacity (PWS ID # 5110142)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	5.60	5.60	5.60	5.60
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	2.50	2.50
Total Potable Capacity	**5.60**	**5.60**	**8.10**	**8.10**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	4.00	4.00	7.00	7.00
Total Nonpotable Capacity	**4.00**	**4.00**	**7.00**	**7.00**

Projects Summary						
Water Supply Project	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
2.5 mgd RO WTP	FAS	2032	$12.00	0.00	2.50	2.50
Total Potable Water			**$12.00**	**0.00**	**2.50**	**2.50**
Nonpotable Water						
Reclaimed Facility	Reclaimed	2027	$3.40	0.00	3.00	3.00
Total Nonpotable Water			**$3.40**	**0.00**	**3.00**	**3.00**
Total New Water			**$15.40**	**0.00**	**5.50**	**5.50**

MARCO ISLAND

Service Area: City of Marco Island and a portion of unincorporated Collier County. Marco Island provides bulk finished water to Goodland and Key Marco in Collier County.

Description: Potable water supplies are obtained from the MHA via the Marco Island RO wellfield and surface water from Marco Lakes and Henderson Creek canal. Groundwater from the MHA is treated at the South WTP using RO. A portion of the surface water is stored in the UFA using ASR. Recovered ASR water and direct surface water withdrawals are treated at the Northwest WTP using membrane softening and lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	16,481	17,502	19,243	20,760
Bulk Population (Goodland and Key Marco)	1,596	1,660	1,883	2,090
Total Population (Marco Island and bulk)	18,077	19,162	21,126	22,850
Average 2016-2020 Per Capita (gallons per day finished water)	425[a]			
Total Potable Water Demands (daily average annual finished water in mgd)	**7.68**	**8.14**	**8.98**	**9.71**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 11-00080-W (expires 2037)			
Surface Water	9.54[b]			
SAS	0.00			
IAS	3.62			
FAS	0.00			
Total Allocation	**13.16**			
FDEP Potable Water Treatment Capacity (PWS ID # 5110183)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
Surface Water/ASR	6.67	6.67	6.67	6.67
SAS	0.00	0.00	0.00	0.00
IAS	6.00	6.00	6.00	6.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**12.67**	**12.67**	**12.67**	**12.67**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	4.92	4.92	4.92	4.92
Total Nonpotable Capacity	**4.92**	**4.92**	**4.92**	**4.92**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
Northwest WTP Biological Activated Filter[c]	Surface Water	2023	$5.70	7.50	7.50	7.50
Northwest WTP Membranes Softening Improvements[c]	Surface Water	2025	$10.00	6.67	6.67	6.67
Total Potable Water			**$12.75**	**14.17**	**14.17**	**14.17**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$2.75**	**7.50**	**7.50**	**7.50**

[a] The estimated per capita use rate is calculated using only the permanent resident population and includes the seasonal population's water use.
[b] Surface Water allocation includes 5.39 mgd for raw water supply and 4.15 mgd for ASR injection into FAS.
[c] Does not increase the overall permitted treatment capacity.

COLLIER

NAPLES

Service Area: City of Naples and portions of unincorporated Collier County including East Naples

Description: Potable water supplies are obtained from the LTA and SAS via the Coastal Ridge and East Golden Gate wellfields, treated at the Naples Water Dept. WTP using lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	53,812	55,800	62,692	68,510
Average 2016-2020 Per Capita (gallons per day finished water)	264			
Potable Water Demands (daily average annual finished water in mgd)	**14.21**	**14.73**	**16.55**	**18.09**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 11-00017-W (expires 2030)			
SAS	18.42			
IAS	0.00			
FAS	0.00			
Total Allocation	**18.42**			
FDEP Potable Water Treatment Capacity (PWS ID # 5110198)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	30.00	30.00	30.00	30.00
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**30.00**	**30.00**	**30.00**	**30.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	10.00	10.00	10.00	10.00
Total Nonpotable Capacity	**10.00**	**10.00**	**10.00**	**10.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

PORT OF THE ISLANDS

Service Area: Portion of unincorporated Collier County serving Port of the Islands

Description: Potable water supplies are obtained from the SAS via the Port of the Islands wellfield, treated at the Port of the Islands WTP using RO.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	907	924	947	963
Average 2016-2020 Per Capita (gallons per day finished water)	85			
Potable Water Demands (daily average annual finished water in mgd)	**0.08**	**0.08**	**0.08**	**0.08**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 11-00372-W (expires 2029)			
SAS	0.27			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.27**			
FDEP Potable Water Treatment Capacity (PWS ID # 5110230)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.44	0.44	0.44	0.44
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.44**	**0.44**	**0.44**	**0.44**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.20	0.20	0.20	0.20
Total Nonpotable Capacity	**0.20**	**0.20**	**0.20**	**0.20**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

SEMINOLE TRIBE OF FLORIDA – IMMOKALEE RESERVATION

Service Area: Seminole Tribe of Florida Immokalee Reservation

Description: Potable water supplies are obtained from the LTA via four existing wells and treated at the STOF – Immokalee WTP using RO. Utility and demand information are based on data in the 32nd Annual Work Plan.[a]

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	404	474	694	944
Projected 2039 Per Capita (gallons per day finished water)	297			
Potable Water Demands (daily average annual finished water in mgd)	**0.15**	**0.18**	**0.22**	**0.26**
SFWMD Water Use Authorizations (mgd)				
Potable Water Source	32nd Annual Work Plan			
SAS	0.24			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.24**			
Potable Water Treatment Capacity				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.43	0.43	0.43	0.43
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.43**	**0.43**	**0.43**	**0.43**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.25	0.25	0.25	0.25
Total Nonpotable Capacity	**0.25**	**0.25**	**0.25**	**0.25**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

[a] The Seminole Tribe of Florida submits an Annual Work Plan to the SFWMD, per the Water Rights Compact, signed in 1987.

GLADES AND HENDRY COUNTIES

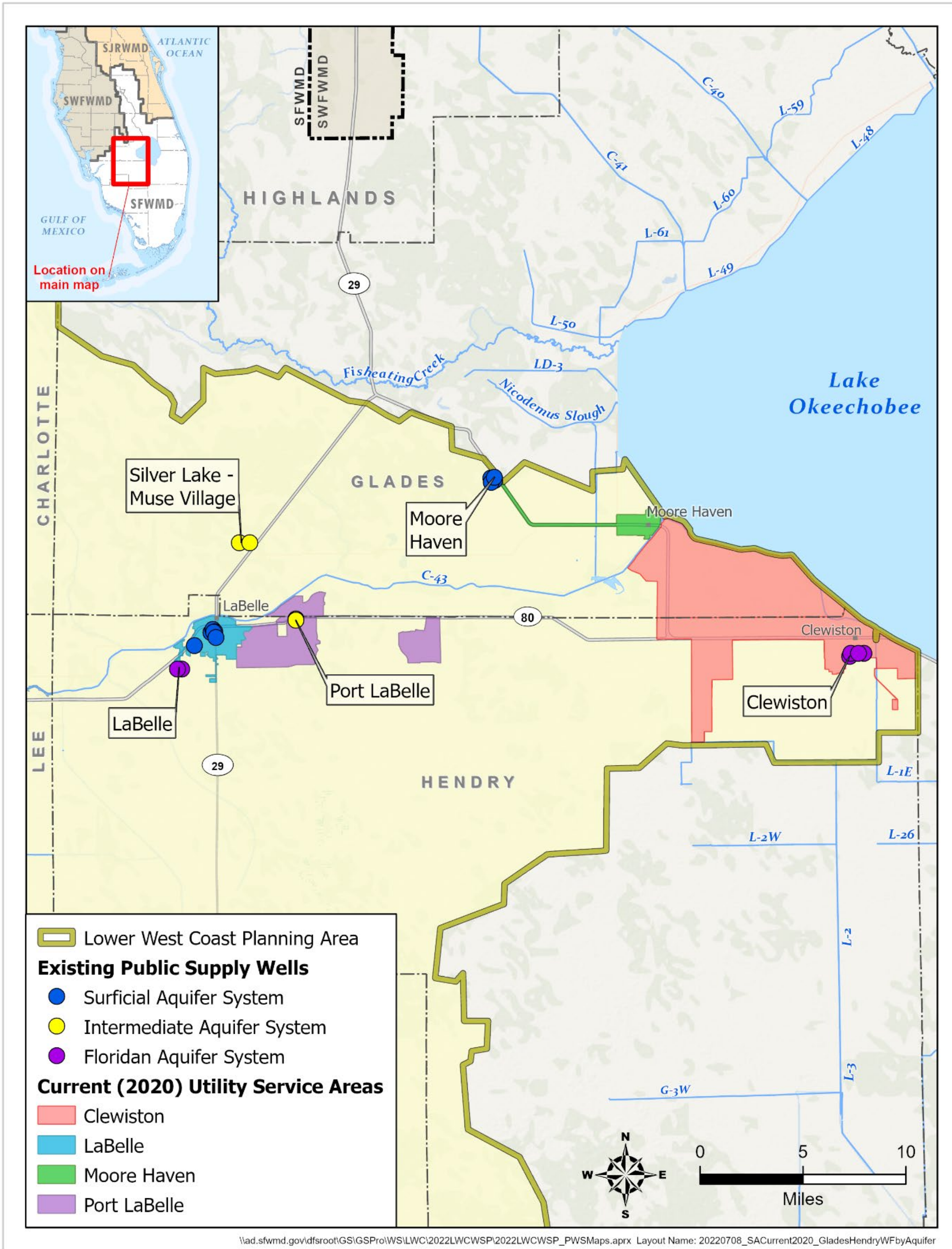

Figure B-5. Current (2020) Public Supply utility service areas and wellfields in Glades and Hendry counties.

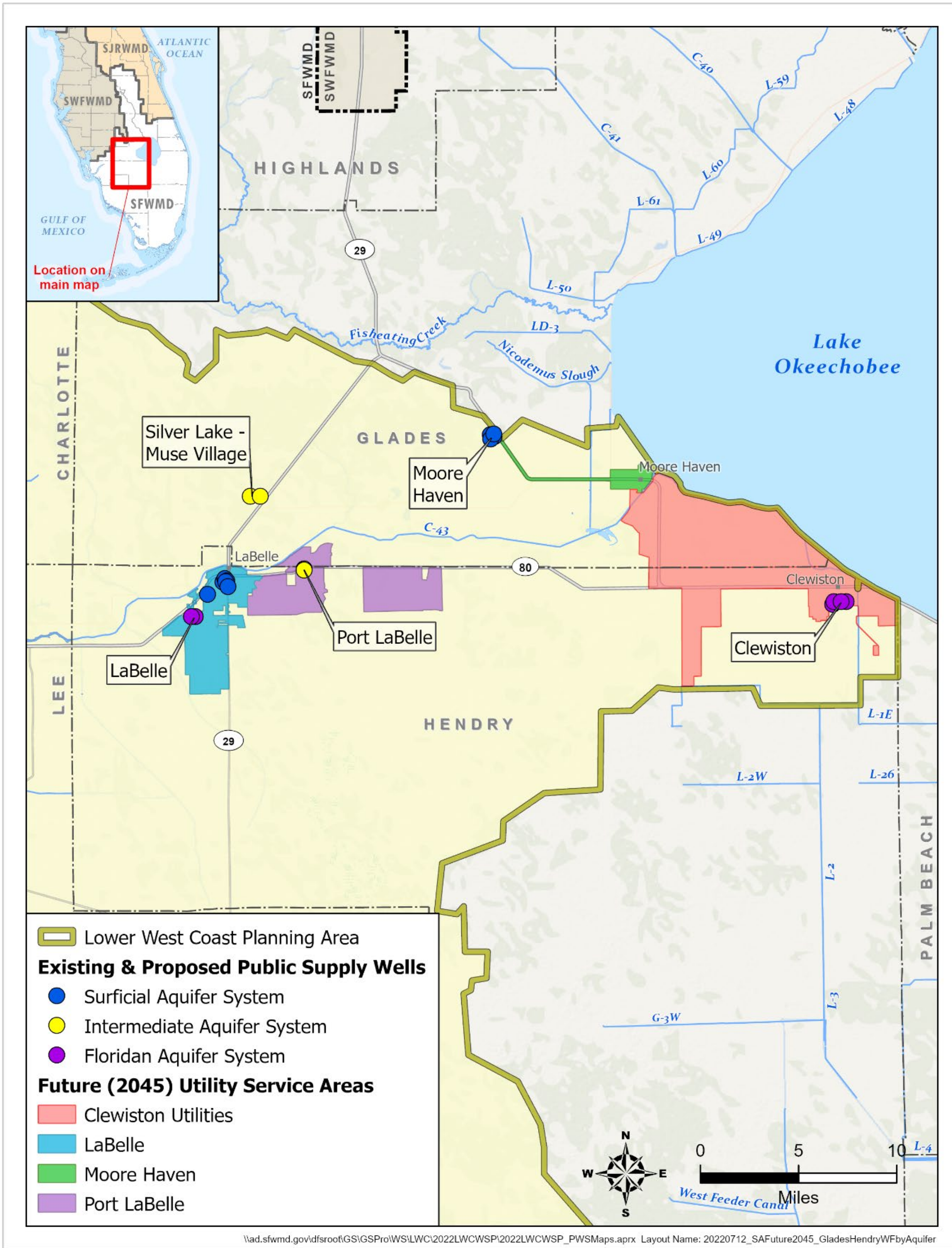

Figure B-6. Projected (2045) Public Supply utility service areas and wellfields in Glades and Hendry counties.

MOORE HAVEN

Service Area: Portion of unincorporated Glades County, Glades County Correctional, and the City of Moore Haven

Description: Potable water supplies are obtained from the LTA via the Moore Haven wellfield, treated at the Moore Haven WTP using membrane softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	3,335	3,502	3,751	3,940
Average 2016-2020 Per Capita (gallons per day finished water)	159			
Potable Water Demands (daily average annual finished water in mgd)	**0.53**	**0.56**	**0.60**	**0.63**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 22-00045-W (expires 2028)			
SAS	0.89			
IAS	0.00			
FAS	0.00			
Total Allocation	**0.89**			
FDEP Potable Water Treatment Capacity (PWS ID # 5220192)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.96	0.96	0.96	0.96
IAS	0.00	0.00	0.00	0.00
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.96**	**0.96**	**0.96**	**0.96**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.00	0.00	0.00	0.00
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

SILVER LAKE - MUSE VILLAGE

Service Area: Portion of unincorporated Glades County serving a proposed residential development and the West Glades School complex

Description: Potable water supplies are obtained from the IAS via the Silver Lake – Muse Village wellfield, treated at the Fort Basinger Housing Complex WTP using chlorination.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	200	234	320	381
Average 2016-2020 Per Capita (gallons per day finished water)	136[a]			
Potable Water Demands (daily average annual finished water in mgd)	**0.03**	**0.03**	**0.04**	**0.05**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 22-00497-W (expires 2026)			
SAS	0.00			
IAS	0.10			
FAS	0.00			
Total Allocation	**0.10**			
FDEP Potable Water Treatment Capacity (PWS ID # 5284101)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.33	0.33	0.33	0.33
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.33**	**0.33**	**0.33**	**0.33**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.00	0.00	0.00	0.00
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects						
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

a Based on county average. No historic use other than the West Glades School complex.

GLADES

CLEWISTON

Service Area: City of Clewiston, the South Shore Water Association, and portions of unincorporated Hendry and Glades counties

Description: Potable water supplies are obtained from the FAS via the Clewiston wellfield, treated at the Clewiston RO Plant.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	14,792	14,958	15,181	15,339
Average 2016-2020 Per Capita (gallons per day finished water)	**108**			
Potable Water Demands (daily average annual finished water in mgd)	**1.60**	**1.62**	**1.64**	**1.66**

SFWMD Water Use Permitted Allocation (mgd)	
Potable Water Source	Permit Number 26-00769-W (expires 2025)
SAS	0.00
IAS	0.00
FAS	2.58
Total Allocation	**2.58**

FDEP Potable Water Treatment Capacity (PWS ID # 5260053)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	3.00	3.00	3.00	3.00
Total Potable Capacity	**3.00**	**3.00**	**3.00**	**3.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	1.50	1.50	2.25	2.25
Total Nonpotable Capacity	**1.50**	**1.50**	**2.25**	**2.25**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
Reclaimed Water Production Facility and Water Main Extension	Reclaimed	2035	$0.50	0.00	0.75	0.75
Total Nonpotable Water			**$0.50**	**0.00**	**0.75**	**0.75**
Total New Water			**$0.50**	**0.00**	**0.75**	**0.75**

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LABELLE

Service Area: City of LaBelle and a portion of unincorporated Hendry county

Description: Potable water supplies are obtained from the FAS via the LaBelle wellfield, treated at the South Plant WTP using RO.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	7,923	7,998	8,096	8,164
Average 2016-2020 Per Capita (gallons per day finished water)	85			
Potable Water Demands (daily average annual finished water in mgd)	**0.63**	**0.68**	**0.69**	**0.69**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 26-00105-W (expires 2031)			
SAS	0.14[a]			
IAS	0.00			
FAS	0.92			
Total Allocation	**1.06**			
FDEP Potable Water Treatment Capacity (PWS ID # 5260050)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.00	0.00	0.00	0.00
FAS	1.50	1.50	1.50	1.50
Total Potable Capacity	**1.50**	**1.50**	**1.50**	**1.50**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.75	0.75	0.75	0.75
Total Nonpotable Capacity	**0.75**	**0.75**	**0.75**	**0.75**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
Reclaimed Water Main Extension to Proposed Golf Course [b]	Reclaimed	2027	$3.00	0.00	0.50	0.50
Total Nonpotable Water			**$5.00**	**0.00**	0.50	0.50
Total New Water			**$15.00**	**0.00**	**0.50**	**0.50**

[a] Withdrawals from the WTA wellfield were discontinued in 2019.
[b] Does not increase the overall permitted treatment capacity.

PORT LABELLE

Service Area: Portions of unincorporated Glades and Hendry counties

Description: Potable water supplies are obtained from the SA via the Port LaBelle wellfield, treated at the Port LaBelle WTP using membrane softening.

Population and Finished Water Demand				
	Existing	Projected		
	2020	2025	2035	2045
Population	6,207	6,397	6,771	7,052
Average 2016-2020 Per Capita (gallons per day finished water)	81			
Potable Water Demands (daily average annual finished water in mgd)	**0.50**	**0.52**	**0.55**	**0.57**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 26-00096-W (expires 2036)			
SAS	0.00			
IAS	0.53			
FAS	0.00			
Total Allocation	**0.53**			
FDEP Potable Water Treatment Capacity (PWS ID # 5260226)				
Permitted Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2020	2025	2035	2045
SAS	0.00	0.00	0.00	0.00
IAS	0.90	0.90	0.90	0.90
FAS	0.00	0.00	0.00	0.00
Total Potable Capacity	**0.90**	**0.90**	**0.90**	**0.90**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	0.50	0.50	0.50	0.50
Total Nonpotable Capacity	**0.50**	**0.50**	**0.50**	**0.50**

Projects Summary						
Water Supply Projects	Source	Completion Date	Total Capital Cost ($ million)	Projected Cumulative Design Capacity (mgd)		
				2025	2035	2045
Potable Water						
No Projects						
Total Potable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Nonpotable Water						
No Projects			$0.00	0.00	0.00	0.00
Total Nonpotable Water			**$0.00**	**0.00**	**0.00**	**0.00**
Total New Water			**$0.00**	**0.00**	**0.00**	**0.00**

UTILITIES SERVING LOCAL GOVERNMENTS

Table B-2 identifies the local governments (counties, tribal lands, and municipalities) within the LWC Planning Area served by PS utilities with allocations of 0.10 mgd or greater. **Table B-2** lists the name of the local government, whether that government owns and operates its own utility, and identifies the local government(s) or private PS utility (or utilities) providing gross (raw) or net (finished) water within the jurisdictional boundaries of the local government.

Table B-2. Local governments and the utilities and entities that serve them within the LWC Planning Area.

Local Government	Local Government Utility	Other Utility Serving Local Government
Charlotte County		
Charlotte County	Yes	Charlotte Correctional and Town and Country
Collier County		
Collier County	Yes	Ave Maria, Everglades City, Immokalee (IWSD), Marco Island, Naples, and Port of the Islands
Everglades City	Yes	--
Marco Island, City of	Yes	Collier County Utilities
Naples, City of	Yes	--
STOF – Immokalee[a]	No	--
Glades County		
Glades County	No	Port LaBelle, South Shore Water Association (distributes water purchased from Clewiston), Clewiston, and Moore Haven
Moore Haven, City of	Yes	--
Hendry County		
Clewiston, City of	Yes	--
Hendry County	Yes	Clewiston, LaBelle, Port LaBelle, and South Shore Water Association
LaBelle, City of	Yes	--
Lee County		
Bonita Springs, City of	No	Bonita Springs and Citrus Park – Bonita Terra
Cape Coral, City of	Yes	Pine Island (GPIWA) (bulk water)
Estero, Village of	No	Bonita Springs and Lee County Utilities
Fort Myers, City of	Yes	Lee County Utilities
Fort Myers Beach	Yes	Lee County Utilities (bulk water)
Lee County	Yes	Bonita Springs, Cape Coral (bulk water), Citrus Park – Bonita Terra, FGUA – Lake Fairways, FGUA – Lehigh Acres, Fort Myers, Pine Island (GPIWA), and Sanibel (IWA)
Sanibel, City of	No	Sanibel Island (IWA)
Monroe County		
Monroe County	No	--

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

[a] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table B-3 identifies the PS utilities providing gross (raw) or net (finished) water to local governments within the LWC Planning Area. The first column in **Table B-3** lists the name of the PS utility, the second column notes whether that utility is owned and operated by a local government, and the third column identifies the incorporated and unincorporated areas of the LWC Planning Area that the PS utility serves.

Table B-3. Utilities that serve local governments in the LWC Planning Area.

Utility Name	Local Government Utility	Local Governments Served
Charlotte County		
Charlotte County Utilities	Yes	Charlotte County and Lee County (serving unincorporated Burnt Store Marina)
Town and Country	No	Charlotte County (serving unincorporated Babcock Ranch)
Charlotte Correctional	No	Unincorporated Charlotte County
Collier County		
Ave Maria	No	Collier County (serving unincorporated Ave Maria)
Collier County Utilities	Yes	Collier County (serving unincorporated areas of Collier County. Bulk finished water purchased from Marco Island is provided by Collier County Utilities to unincorporated Key Marco and Goodland.
Everglades City	Yes	Everglades City and Collier County (serving unincorporated Chokoloskee Island Plantation Island and Seaboard Village in Copeland
Immokalee (IWSD)	No	Collier County (serving unincorporated Immokalee)
Marco Island	Yes	City of Marco Island and bulk finished water to Collier County Utilities (serving unincorporated Goodland and Key Marco)
Naples	Yes	City of Naples and Collier County (serving unincorporated East Naples)
Port of the Islands	No	Collier County (serving unincorporated Port of the Islands)
Glades County		
Moore Haven	Yes	City of Moore Haven and Glades County
Hendry County		
Clewiston	Yes	City of Clewiston, the South Shore Water Association, and Hendry and Glades counties
LaBelle	Yes	City of LaBelle and Hendry County
Port LaBelle	Yes	Hendry and Glades counties
Silver Lake – Muse Village	No	Glades County

Table B-3. Continued.

Utility Name	Local Government Utility	Local Governments Served
Lee County		
Bonita Springs	No	City of Bonita Springs, Village of Estero, and Lee County
Cape Coral	Yes	City of Cape Coral; Greater Pine Island (bulk water sales, purchased from Lee County); and unincorporated Lee County (as needed bulk water sales)
Citrus Park – Bonita Terra	No	City of Bonita Springs
FGUA – Lake Fairways	No	Lee County (serving unincorporated North Fort Myers)
FGUA – Lehigh Acres	No	Lee County (serving unincorporated Lehigh Acres)
Fort Myers	Yes	City of Fort Myers and Lee County (sells bulk water to FGUA – Lehigh Acres)
Pine Island (GPIWA)	No	Lee County (serving unincorporated Pine Island and Matlacha) and a portion of the City of Cape Coral
Sanibel Island (IWA)	No	City of Sanibel and Lee County (serving unincorporated Captiva)
Lee County Utilities	Yes	Lee County, Village of Estero, City of Fort Myers, and bulk finished water to Fort Myers Beach, Gateway, and Cape Coral

FGUA = Florida Governmental Utility Authority; GPIWA = Greater Pine Island Water Association; IWA = Island Water Association; IWSD = Immokalee Water Sewer District; LWC = Lower West Coast.

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C

MFLs and Recovery and Prevention Strategies

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MFLS AND RECOVERY AND PREVENTION STRATEGIES

The South Florida Water Management District (SFWMD or District) adopts minimum flows and minimum water levels (MFLs) to identify the point at which water resources, or the ecology of the area, will experience significant harm from further withdrawals. In the Lower West Coast (LWC) Planning Area, the SFWMD has adopted MFLs for the Caloosahatchee River and LWC Aquifers (**Figure C-1**). The MFL criteria and recovery and prevention strategies adopted for these two MFLs are discussed in this appendix. The MFLs and recovery strategies for Lake Okeechobee and the Everglades affect portions of the LWC Planning Area but are included in the Lower East Coast water supply plan updates. Further information on MFLs and recovery and prevention strategies can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021).

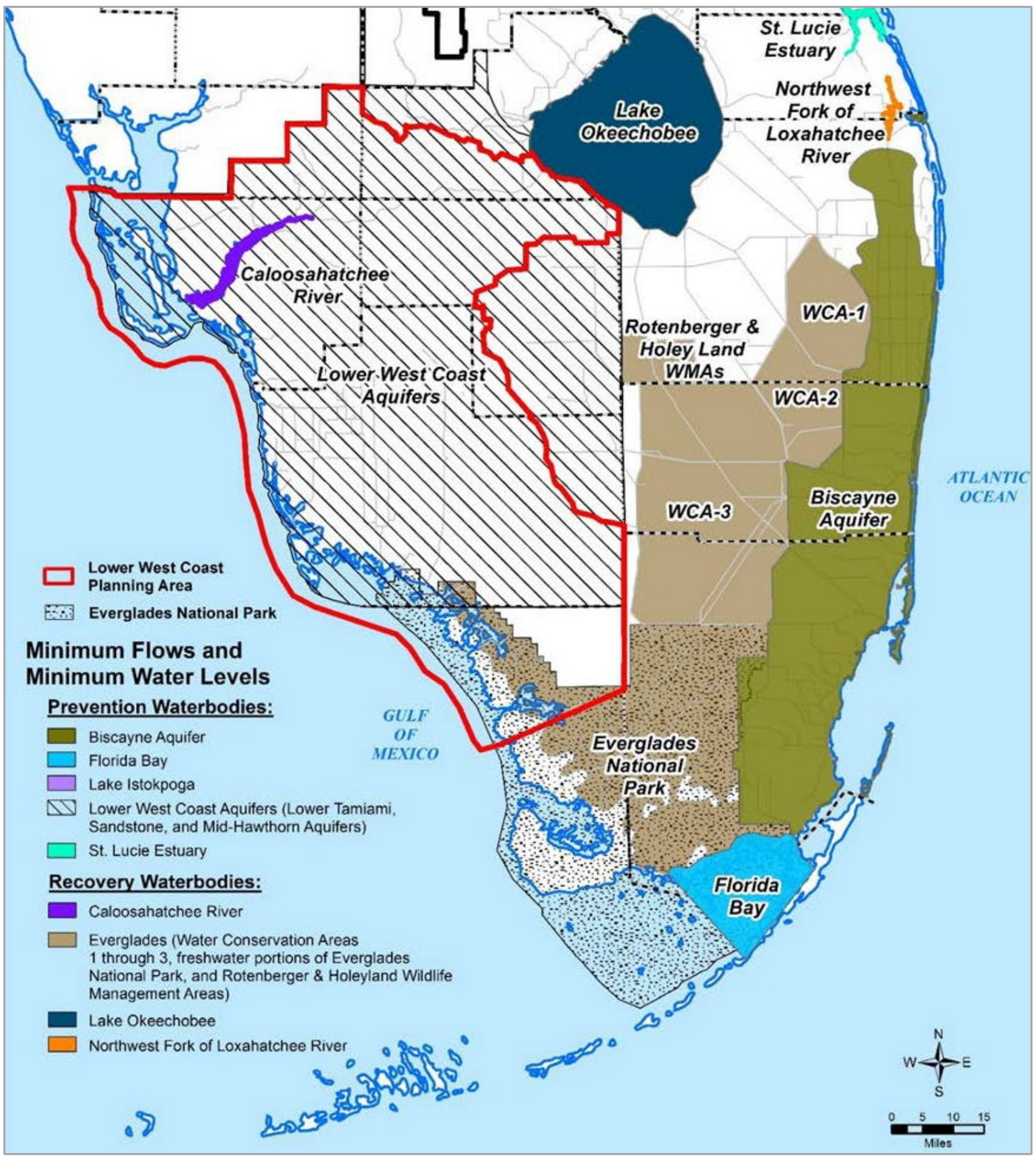

Figure C-1. Adopted minimum flows and minimum water levels in the South Florida Water Management District in relation to the LWC Planning Area.

CALOOSAHATCHEE RIVER

MFL Background

In 2001, the SFWMD adopted an MFL for the Caloosahatchee River pursuant to Subsection 40E-8.221(2), Florida Administrative Code (F.A.C.). The original MFL criterion was a minimum mean monthly flow of 300 cubic feet per second (cfs) at the S-79 structure, which was determined necessary to maintain a balanced and healthy salinity regime in order to prevent an MFL exceedance (when the MFL is not met) and sustain submerged aquatic vegetation in the Caloosahatchee River Estuary. The Caloosahatchee River MFL waterbody is defined in Subsection 40E-8.021(2), F.A.C., as the surface waters that flow through the S-79 water control structure, combined with tributary contributions below the structure that collectively flow southwest to San Carlos Bay (**Figures C-1** and **C-2**). The portion of the waterway located upstream of the S-79 structure is considered the C-43 Canal.

Figure C-2. Caloosahatchee River minimum flow and minimum water level waterbody (downstream of S-79), showing the hydrologic connection to Lake Okeechobee.

Analyses completed for the *2000 Lower East Coast Water Supply Plan* (SFWMD 2000) showed that long-term regional storage was necessary to meet the proposed MFL criteria, and that MFL violations would continue until a recovery strategy was fully implemented. As a result, the SFWMD determined a recovery strategy based on construction of regional storage would be necessary to achieve the MFL. Historical information on the MFL waterbody and the basis of the current MFL criteria can be found in technical documentation reports available on the SFWMD webpage (http://www.sfwmd.gov/mfls).

MFL Reevaluation

A reevaluation of the Caloosahatchee River MFL began in 2013. The reevaluation included application of new and updated models as well as a resource-based approach to evaluate multiple indicators using historical and new data and information regarding the Caloosahatchee River. The reevaluation sought to

- Evaluate alterations in the Caloosahatchee River watershed and the effects on flows;
- Better understand water sources and tidal contributions to the Caloosahatchee River;
- Assess responses of multiple ecological indicators to various flow scenarios;
- Evaluate the performance of the MFL recovery strategy; and
- Reevaluate current MFL criteria to protect the Caloosahatchee River in light of new analyses.

SFWMD staff researched effects of flow scenarios on a suite of environmental indicators in the Caloosahatchee River, including oysters (*Crassostrea virginica*), blue crabs (*Callinectes sapidus*), ichthyoplankton, zooplankton, phytoplankton, smalltooth sawfish (*Pristis pectinata*), benthic macrofauna, and tape grass (*Vallisneria americana*). SFWMD staff also assessed the effect of low flows on the aforementioned environmental indicators and summarized the associated science (SFWMD 2018). This information was presented to the public at the Caloosahatchee Science Symposium (September 15-16, 2016) to gain public input on the completed low-flow assessment. SFWMD staff then completed additional data collection and analyses as well as model development updates, and an application to predict environmental responses to flow and salinity conditions in the Caloosahatchee River was developed. The sum of this information was included in the technical document supporting the reevaluation (SFWMD 2018). An independent, scientific peer review of the technical document, reevaluation approach, and MFL criteria was conducted after the draft MFL technical document was developed. The public participated in the public peer-review session. The final peer-review report was received in October 2017.

In December 2017, the District's Governing Board authorized rulemaking to revise the MFL rule set forth in Subsection 40E-8.221(2), F.A.C. The public participated in the rulemaking effort during two rule development workshops. In September 2018, the District's Governing Board adopted a minimum flow criterion of 400 cfs at the S-79 structure and revisions to the duration and return frequency components. A rule challenge was filed, and an administrative hearing occurred in October 2018. In March 2019, the administrative law judge issued a final order and determined the rule was a valid exercise of delegated legislative authority.

In April 2019, the District's Governing Board directed staff to further engage with stakeholders and evaluate supplemental mathematical and statistical approaches, within the framework of the existing science, to increase the minimum flow above 400 cfs. SFWMD staff held three additional public workshops (May, June, and September 2019). During the last (September) public workshop, the SFWMD presented a final revised MFL rule based on one of the supplemental approaches evaluated. The new minimum flow was set at 457 cfs. This final MFL rule was adopted by the District's Governing Board at its October 2019 meeting and became effective on December 9, 2019. Further information about the MFL and reevaluation can be found on the SFWMD webpage (http://www.sfwmd.gov/mfls).

Recovery Strategy

The revised recovery strategy includes implementation of a research and monitoring plan; completion of construction of the Caloosahatchee River (C-43) West Basin Storage Reservoir (C-43 Reservoir); evaluations to determine if additional storage is needed; identification, design, and construction of potential projects to provide additional storage, as needed; and an implementation timeline. The specifics of the recovery strategy for the Caloosahatchee River MFL include the following:

- The *Caloosahatchee River MFL Research and Monitoring Plan* (SFWMD 2019) will evaluate indicator responses to freshwater inflows and will be implemented before and after operation of the C-43 Reservoir during the wet and dry seasons;
- The adoption of a water reservation, reserving all water released from the C-43 Reservoir from consumptive uses per Subsection 40E-10.041(3), F.A.C.;
- Development of a water control plan governing operation of the C-43 Reservoir; and
- If necessary, additional capital projects designed to capture excess water during the wet season and make environmental deliveries during the dry season to provide a stable salinity regime.

The timeline for completion of the modified recovery strategy components is provided in **Table C-1**.

Table C-1. Timeline of the Caloosahatchee River minimum flow and minimum water level modified recovery strategy components.

Completed	Near Term (2020-2024)	Long Term (2022-2027)
Obtain project funding and initiate construction of the C-43 Reservoir	Implement baseline MFL Research and Monitoring Plan	If needed, evaluate project(s) to meet potential unmet requirements – storage, volume, and type
Establish water reservation rule for the C-43 Reservoir	Complete construction of the C-43 Reservoir	Select additional project(s) and obtain federal and/or state funding for selected project(s), if needed
	Develop C-43 Reservoir Water Control Plan	Complete C-43 Reservoir testing
	Re-assess C-43 Reservoir performance	Implement post-operation MFL research and monitoring plan
		Design and construct selected project(s)

MFL = minimum flow and minimum water level.

Completed

Project Funding and Initiation of Construction

Project funding for the C-43 Reservoir was obtained in 2014. Construction of the reservoir began in 2015 and is expected to be completed by 2024. The C-43 Reservoir site is located on a 10,700-acre parcel, formerly known as Berry Groves, in Hendry County, southwest of the S-78 structure and the City of LaBelle, as shown in **Figure C-3** and described in Appendix 1-12 of Chapter 40E-10, F.A.C. The SFWMD is the state-designated local sponsor of the reservoir project with the United States Army Corps of Engineers (USACE).

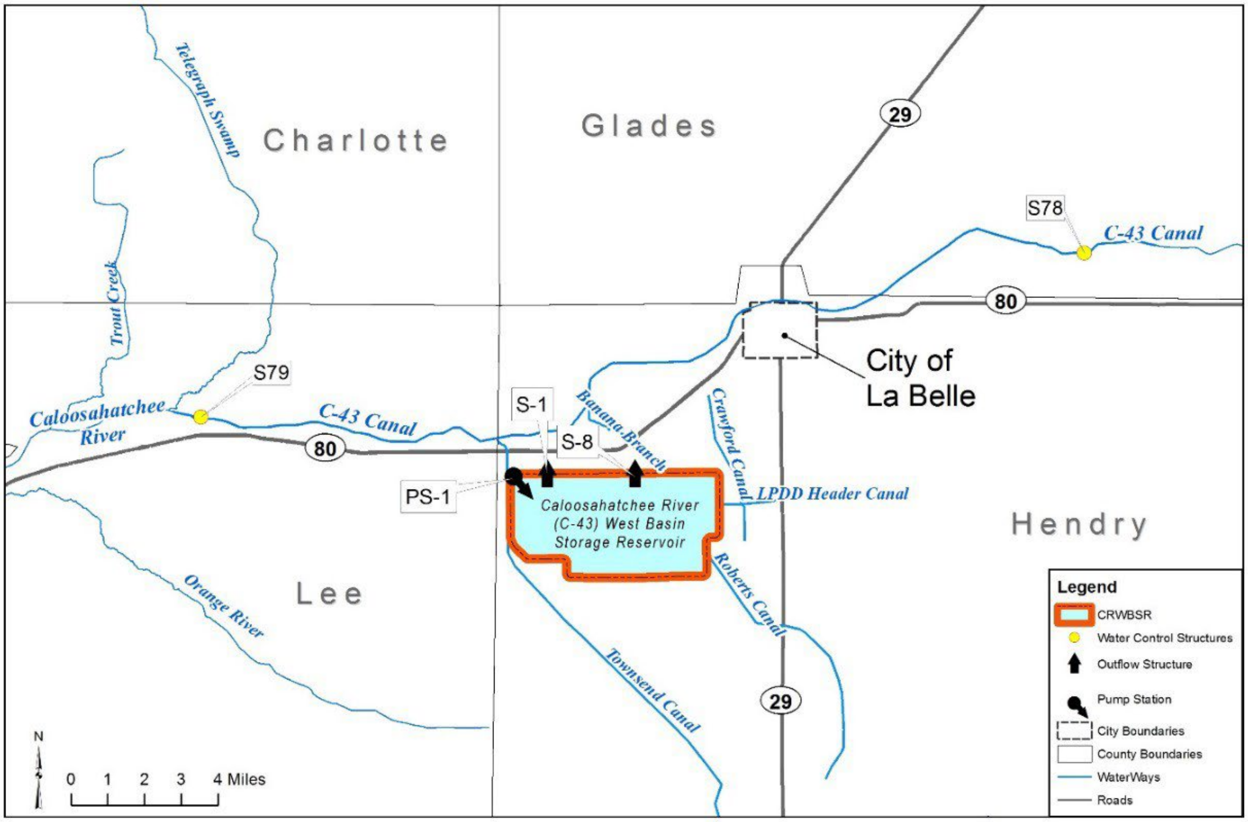

Figure C-3. Location of the Comprehensive Everglades Restoration Plan (CERP) Caloosahatchee River (C-43) West Basin Storage Reservoir.

Water Reservation

A water reservation for the C-43 Reservoir was adopted in 2014. The rule reserves all water within and released from the reservoir for the benefit of fish and wildlife in the Caloosahatchee River downstream of the S-79 structure. Consumptive uses are prohibited from using the reserved water.

Near Term (2020-2024)

Implement Baseline Component of the Caloosahatchee River MFL Research and Monitoring Plan

In 2021, the SFWMD began implementing the baseline component of the *Caloosahatchee River MFL Research and Monitoring Plan* (SFWMD 2019). This component is designed to provide information about the ecological indicators in the mesohaline and oligohaline zones of the upper estuary before the C-43 Reservoir begins operating and releasing additional freshwater flows. The research and monitoring plan incorporates the recommendations provided in the 2017 final peer-review report (Buskey et al. 2017) for monitoring future ecological indicators. SFWMD staff will revise and update the research and monitoring plan as needed to reflect results of the initial studies, current scientific evaluations, and a review of any remaining knowledge gaps and uncertainties.

C-43 Reservoir Construction Completion

In 2001, when the MFL for the Caloosahatchee River was originally adopted, analyses showed long-term regional storage was necessary to meet the MFL criteria. The storage project identified at that time was the Comprehensive Everglades Restoration Plan (CERP) C-43 Reservoir. The C-43 Reservoir was designed and is being constructed with a discharge capacity of 450 cfs, which would meet the original MFL criterion of 300 cfs as well as the CERP restoration target flows for the river. However, the MFL reevaluation (described earlier) resulted in a higher flow criterion of 457 cfs at the S-79 structure. The MFL reevaluation also concluded that once the C-43 Reservoir is constructed and operational, excess flows during the wet season will be captured and stored in the reservoir, then released to the Caloosahatchee River during the dry season to provide the additional flows needed to meet the recommended MFL criteria and prevent significant harm.

CERP identifies restoration of the Caloosahatchee River as an integral step in achieving systemwide benefits in the South Florida ecosystem. Promoting a balanced and healthy salinity regime in the Caloosahatchee River is essential for maintaining the ecological integrity and associated economic benefits of this unique habitat on Florida's southwest coast. Flows to the Caloosahatchee River will be moderated by capturing a portion of the basin's surface water flows and of Lake Okeechobee regulatory releases in the C-43 Reservoir during wet periods and releasing water from the reservoir to the Caloosahatchee River during dry periods. This will provide a more natural, consistent flow of fresh water to the Caloosahatchee River and a more balanced salinity regime by improving the timing, quality, and quantity of water inflows.

Key features of the reservoir include the following:

- 170,000 acre-feet of water storage (>55 billion gallons) stored in two cells (**Figure C-4**)
- Normal pool depth when full: 15 to 25 feet
- External and internal embankments and canals
- Two pump stations (S-470 and S-476)
- Sixteen internal control and outflow water control structures
- Environmental features to provide fish and wildlife habitat and recreational opportunities for the public

Finalizing construction of the C-43 Reservoir is a high a priority for the SFWMD. The reservoir is scheduled to be completed in 2024. The State provided funding to expedite completion of the project in advance of receipt of federal cost-share monies. The total construction cost associated with the C-43 Reservoir is approximately $725 million.

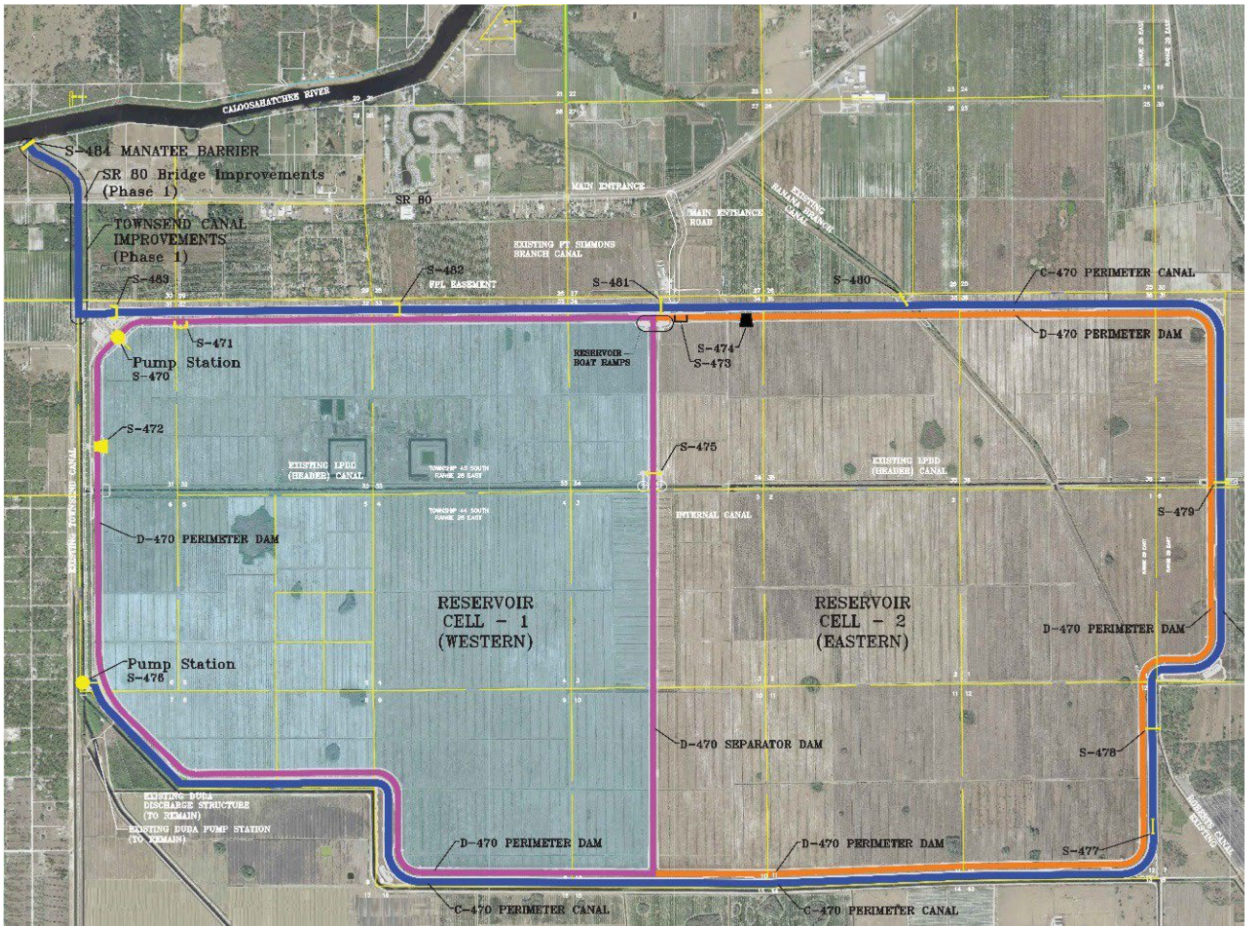

Figure C-4. Caloosahatchee River (C-43) West Basin Storage Reservoir site plan.

Development of a Water Control Plan

A critical component of the C-43 Reservoir is the water control plan (also known as the project operation manual). Significant work will be required to develop this plan in partnership with the USACE. The water control plan will incorporate the Lake Okeechobee System Operating Manual update, which is anticipated to be completed in 2023), and the water reservation requirements. Once the water control plan is completed, it will be submitted to the Florida Department of Environmental Protection with a future Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) Operations Permit application for operation of the C-43 Reservoir.

Re-assess C-43 Reservoir Performance

This component of the recovery strategy will be implemented once the water control plan is completed. The SFWMD will re-assess the C-43 Reservoir's performance in meeting the MFL. Additional storage may be required as the C-43 Reservoir was originally designed to deliver 450 cfs. This assessment is expected to require a modeling evaluation to determine the additional storage needed to meet the MFL (i.e., to ensure the MFL is not violated). The appropriate modeling tool(s) will be used and evaluated to understand additional storage requirements to meet the MFL.

Long Term (2022-2027)

Evaluate Project to Meet Potential Unmet Requirements – Storage Volume and Type

This component of the recovery strategy involves evaluation of potential water resource development projects within the C-43 watershed (upstream of the S-79 structure) to provide additional storage, if needed, to meet the MFL. Project location(s) will be within the Caloosahatchee River MFL watershed (**Figure C-5**). This component includes evaluating the potential storage types and capacities associated with each project using a preliminary design. The types of storage that will be evaluated to meet any storage deficit include shallow and deep storage along with the storage benefits associated with aquifer storage and recovery.

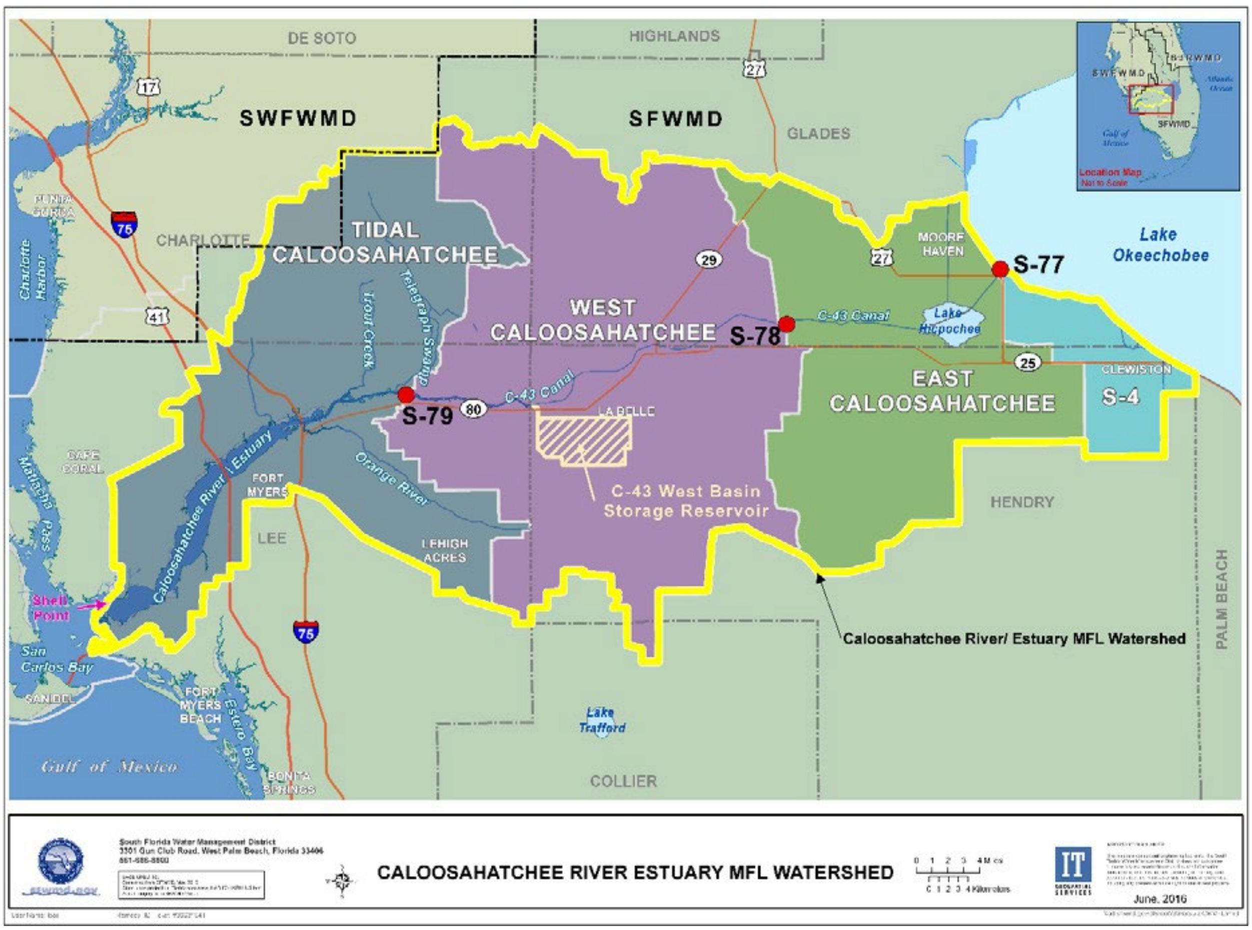

Figure C-5. Caloosahatchee River minimum flow and minimum water level watershed.

Select Additional Project(s) and Obtain Federal and/or State Funding for Selected Projects, If Needed

This component of the recovery strategy involves the selection of appropriate projects to fulfill the potential unmet storage needs to meet the MFL. The specific projects will be determined based on the amount of storage each project is capable of providing using the preliminary design information. This component also involves obtaining federal and/or state funding to complete the project(s).

Complete Operational Testing of the C-43 Reservoir

Once construction of the C-43 Reservoir is complete, a testing period is necessary to ensure the reservoir can be operated as envisioned and to determine if additional efficiencies are possible. Final testing of all infrastructure to ensure it will operate as designed and constructed is expected to take at least 1 year.

Implement Post-operation Caloosahatchee River MFL Research and Monitoring Plan

This phase of the *Caloosahatchee River MFL Research and Monitoring Plan* (SFWMD 2019) will be implemented after the C-43 Reservoir is constructed and operational. The purpose of this phase is to understand the responses of ecological indicators to increased freshwater flows from the reservoir within the mesohaline and oligohaline zones of the upper estuary.

Design and Construct Selected Projects

This component is the last step in the Long Term portion of the MFL recovery strategy. Once funding is secured, project design and construction will be initiated, if needed.The design and permitting of large-scale projects can take 1 to 2 years to complete. Once all appropriate state and federal permits have been issued, the construction process will begin. Construction of large-scale projects can take 2 to 3 years. Once construction is complete, theproject will enter a testing phase to ensure the infrastructure is meeting design specifications.

Further information about the MFL recovery strategy for the Caloosahatchee River, including the *Caloosahatchee River MFL Research and Monitoring Plan* (SFWMD 2019), can be found on the SFWMD webpage (http://www.sfwmd.gov/mfls) and in Subsection 40E-8.421(2), F.A.C. More informationon the water reservation rule can be obtained in Subsection 40E-10.041(3), F.A.C., and on the SFWMD webpage (http://www.sfwmd.gov/reservations). Information specific tothe Caloosahatchee River CERP (C-43) West Basin Storage Reservoir project is available at https://www.evergladesrestoration.gov and in the *Caloosahatchee River (C-43) West Basin Storage Reservoir Facts & Information* (USACE 2021).

LOWER WEST COAST AQUIFERS

MFL Criteria

The LWC Aquifers comprise the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers. In 2001, the SFWMD adopted an MFL specifying the minimum water levels for the LWC Aquifers must equal the structural top of the aquifers (Rule 40E-8.331, F.A.C.). In 2015, the SFWMD published a set of regional maps (**Figures C-6** to **C-8**) showing the elevations of the structural top of the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers (Geddes et al. 2015). The maps were developed based on the best hydrogeologic information available at the time; however, local and isolated variations in aquifer elevations may not be depicted on the maps as they are regional in nature and new data may be available.

A violation of the MFL criteria occurs when water levels in the aquifers drop below the top of the uppermost geologic strata that composes the aquifer at any point in time. Water level measurements used to determine the conditions of the aquifers for the purpose of this rule are collected no closer than 50 feet from any existing pumping well, as required pursuant to Rule 40E-8.331, F.A.C. Further information about the MFL for the LWC Aquifers can be found on the SFWMD webpage (http://www.sfwmd.gov/mfls).

Prevention Strategy

In 2001, when the MFL for the LWC Aquifers was adopted, the water level criteria of the MFL were not violated, and water levels in the aquifers were well above the MFL criteria. However, to minimize the likelihood of a violation and to prevent water levels within the aquifers from declining below the MFL criteria in the future, a prevention strategy was adopted for the aquifers simultaneously with the MFL per Subsection 40E-8.421(4), F.A.C. The prevention strategy for the aquifers consists of the following components:

- Establish “no harm” maximum permittable levels for each aquifer (regulatory levels) for a 1-in-10-year drought level of certainty.
- Implement rule criteria to prevent harm through the water use permitting process, including conditions for permit issuance in Rule 40E-2.301, F.A.C.
- Construct and operate water resource and supply development projects.
- Implement the water shortage plan in Chapter 40E-21, F.A.C., as needed to prevent serious harm during drought conditions in excess of a 1-in-10-year drought level of certainty.

In order to prevent the LWC Aquifers from falling below the minimum water level, the SFWMD adopted maximum developable limits (MDLs) in 2003. The MDLs, contained in the *Applicant’s Handbook for Water Use Permit Applications within the South Florida Water Management District* (Applicant’s Handbook; SFWMD 2022), prohibit water withdrawals that lower the potentiometric head (water level) within the Lower Tamiami, Sandstone, and Mid-Hawthorn aquifers to less than 20 feet above the top of the uppermost geologic strata of the aquifer at any point during 1-in-10-year drought conditions (**Chapter 6** and **Appendix D**). MDLs are permitting constraints that prevent the region’s aquifers from experiencing harm due to withdrawals.

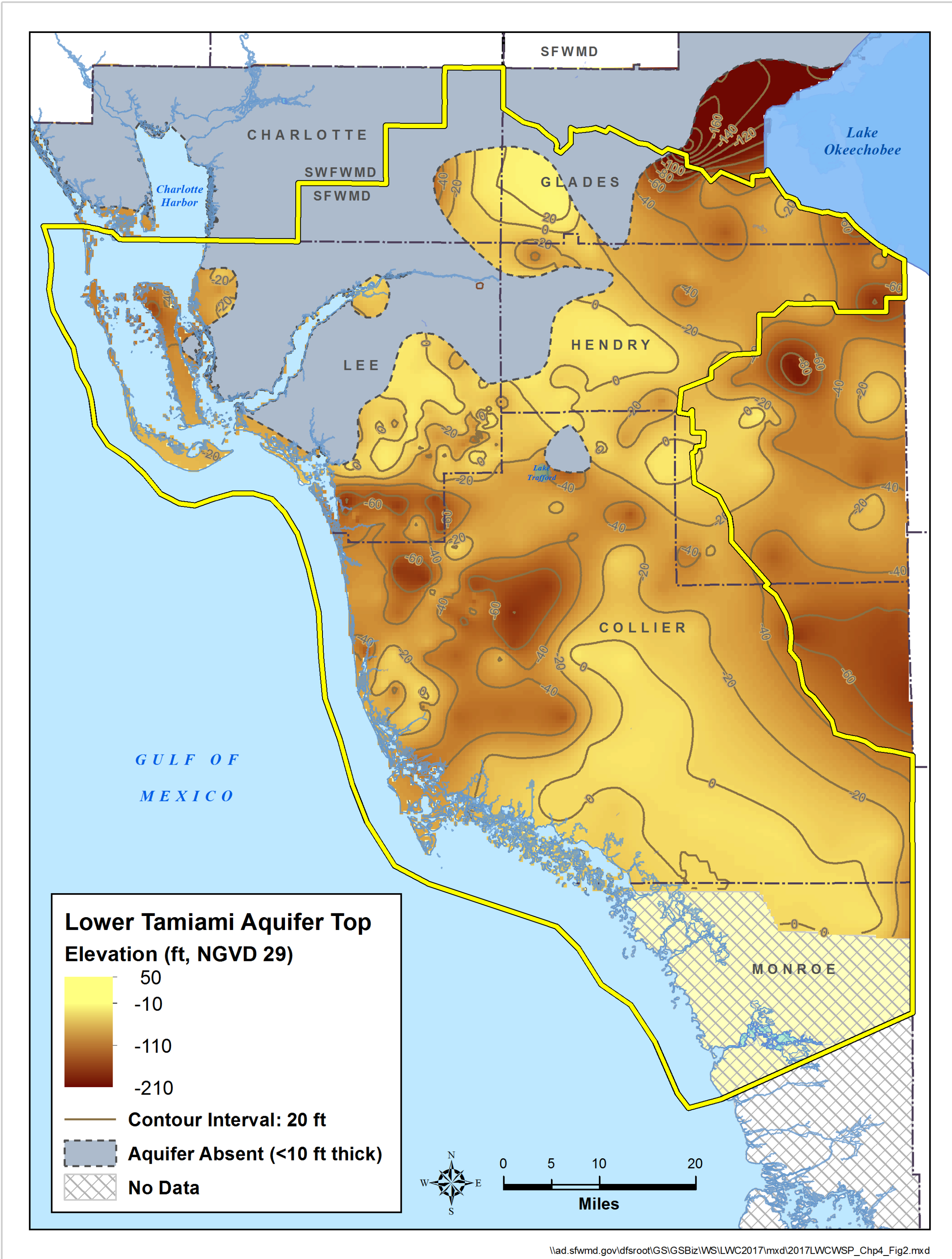

Figure C-6. Structural top (MFL) of the Lower Tamiami aquifer in the LWC Planning Area.

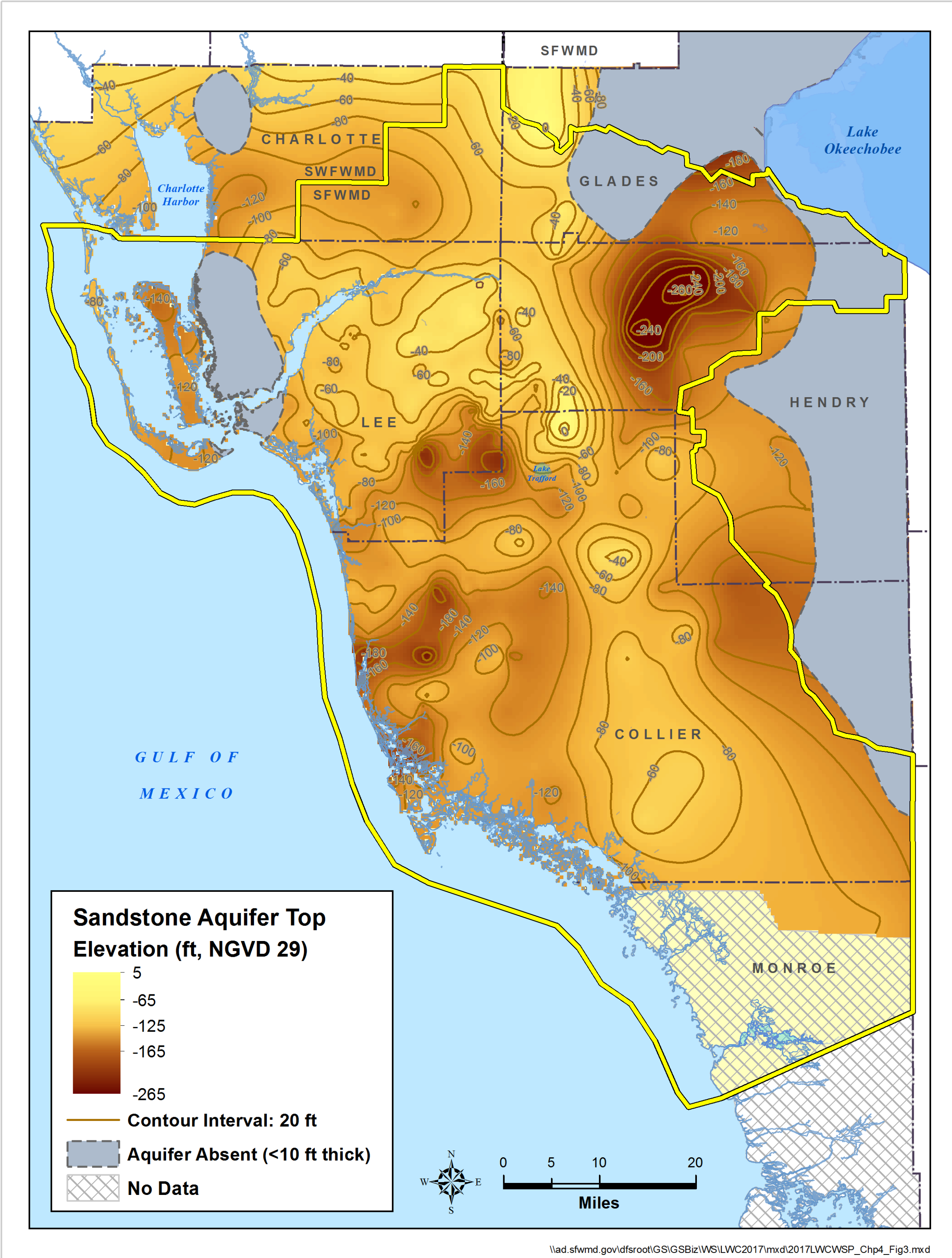

Figure C-7. Structural top (MFL) of the Sandstone aquifer in the LWC Planning Area.

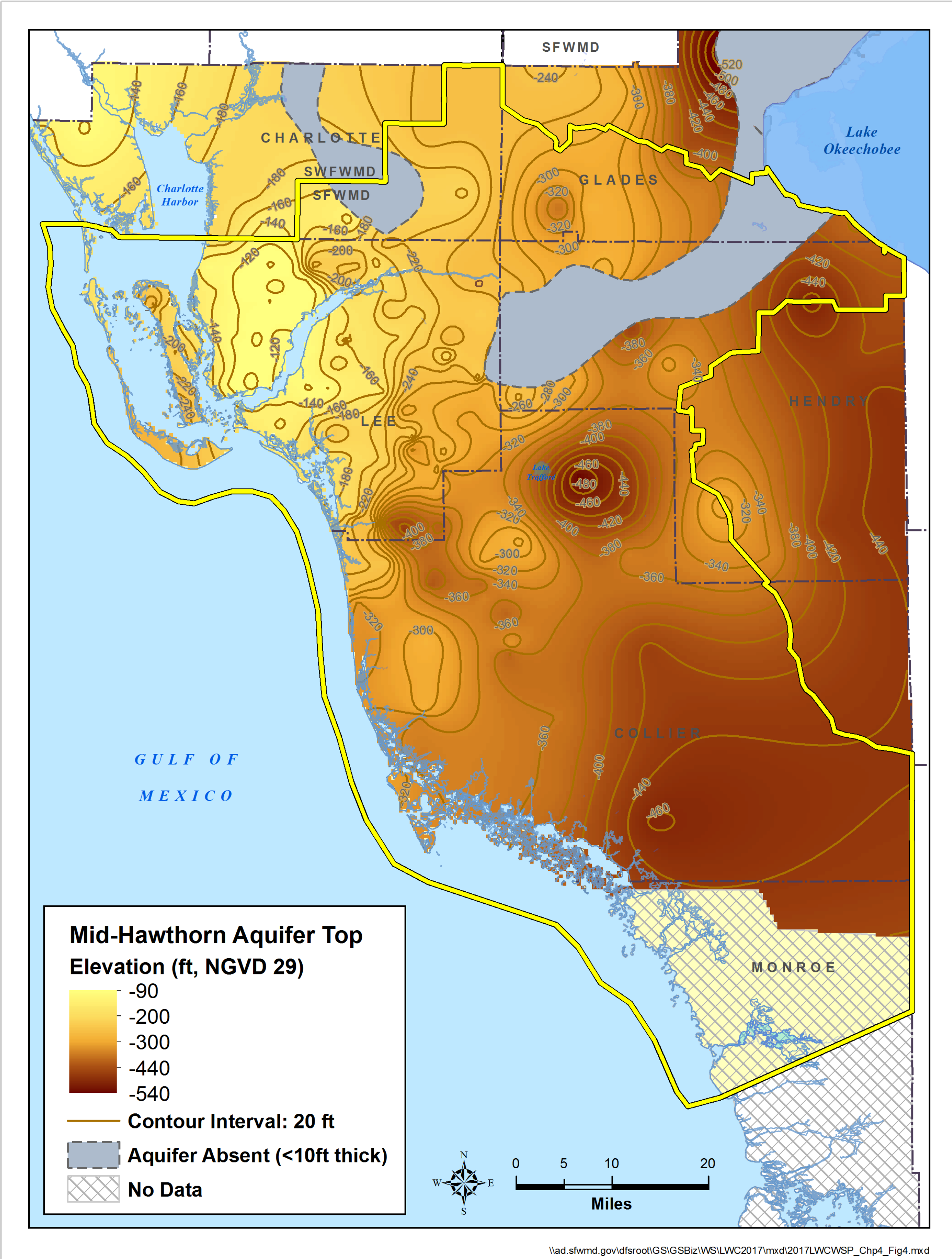

Figure C-8. Structural top (MFL) of the Mid-Hawthorn aquifer in the LWC Planning Area.

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Groundwater Monitoring and Analyses

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SALTWATER INTERFACE MAPPING

Saltwater intrusion monitoring is an important component of water management, resource protection, and water supply planning. For example, if coastal wellfields are overpumped, salt water can be drawn into the wells, resulting in the need to shut down operations, relocate wellfields, or develop alternative water supply (AWS) sources. The South Florida Water Management District (SFWMD or District) periodically develops maps estimating the position of the coastal saltwater interface (250 milligrams per liter [mg/L] isochlor line) using salinity data to identify wellfields and coastal aquifers that could be affected. Salinity data from monitor wells are compiled from multiple sources (e.g., United States Geological Survey [USGS], SFWMD, water use permittees) and contoured to estimate the position of the saltwater interface.

The *2022 Lower West Coast Water Supply Plan Update* (2022 LWC Plan Update) integrates data from the SFWMD saltwater interface mapping effort. To date, three series of maps have been developed (2009, 2014, and 2019), with plans to update the maps every 5 years. This approach tracks the position of the saltwater interface over time, can be used to identify areas of concern that may need additional monitoring, and may suggest the need for changes in wellfield operations. The SFWMD's saltwater interface monitoring and mapping program is described by Shaw and Zamorano (2020). Poster versions of the maps for 2009, 2014, and 2019 are available on the SFWMD's webpage at https://www.sfwmd.gov/documents-by-tag/saltwaterinterface.

Four saltwater interface maps were produced for the LWC Planning Area and are included as **Figures D-1** to **D-4**. There has been little movement of the saltwater interface in this region, as evidenced by all three historic isochlor lines on each map (2009, 2014, and 2019). In general, the 2019 maps are similar to the 2014 maps; however, relatively small differences indicate the interface is regionally dynamic, with inland movement in some areas and seaward movement in other areas. In other areas, new groundwater data were collected, or new wells were installed and sampled, causing a shift in the isochlor line, which may not be indicative of rapid changes in the saltwater interface since 2014. Local-scale investigation of the saltwater interface position could be warranted in some areas, depending on the network of monitor wells available, the proximity of salt water to wellfield locations, and withdrawal rates.

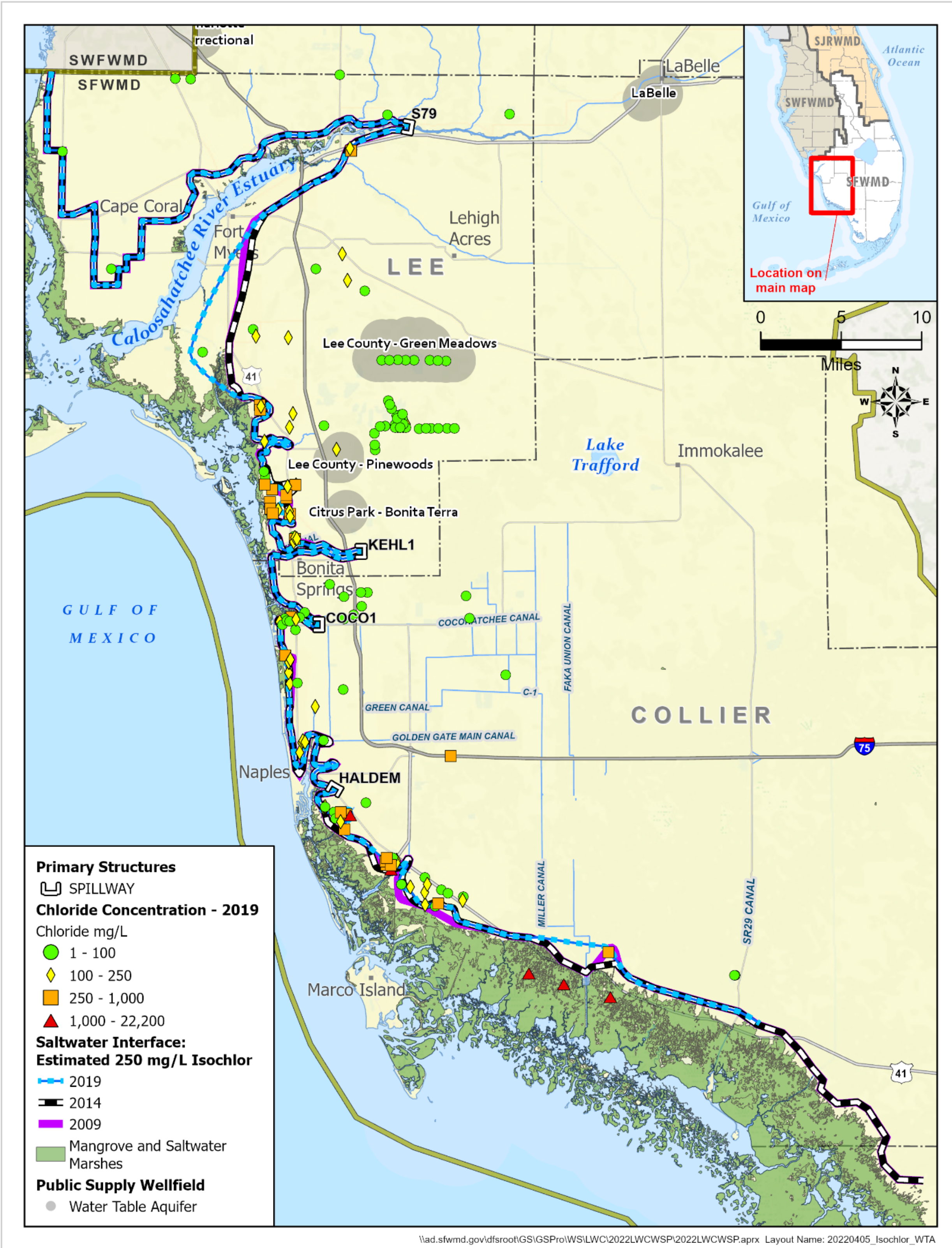


Figure D-1. Estimated position of the saltwater interface in 2009, 2014, and 2019 in the Water Table aquifer in Lee and Collier counties.

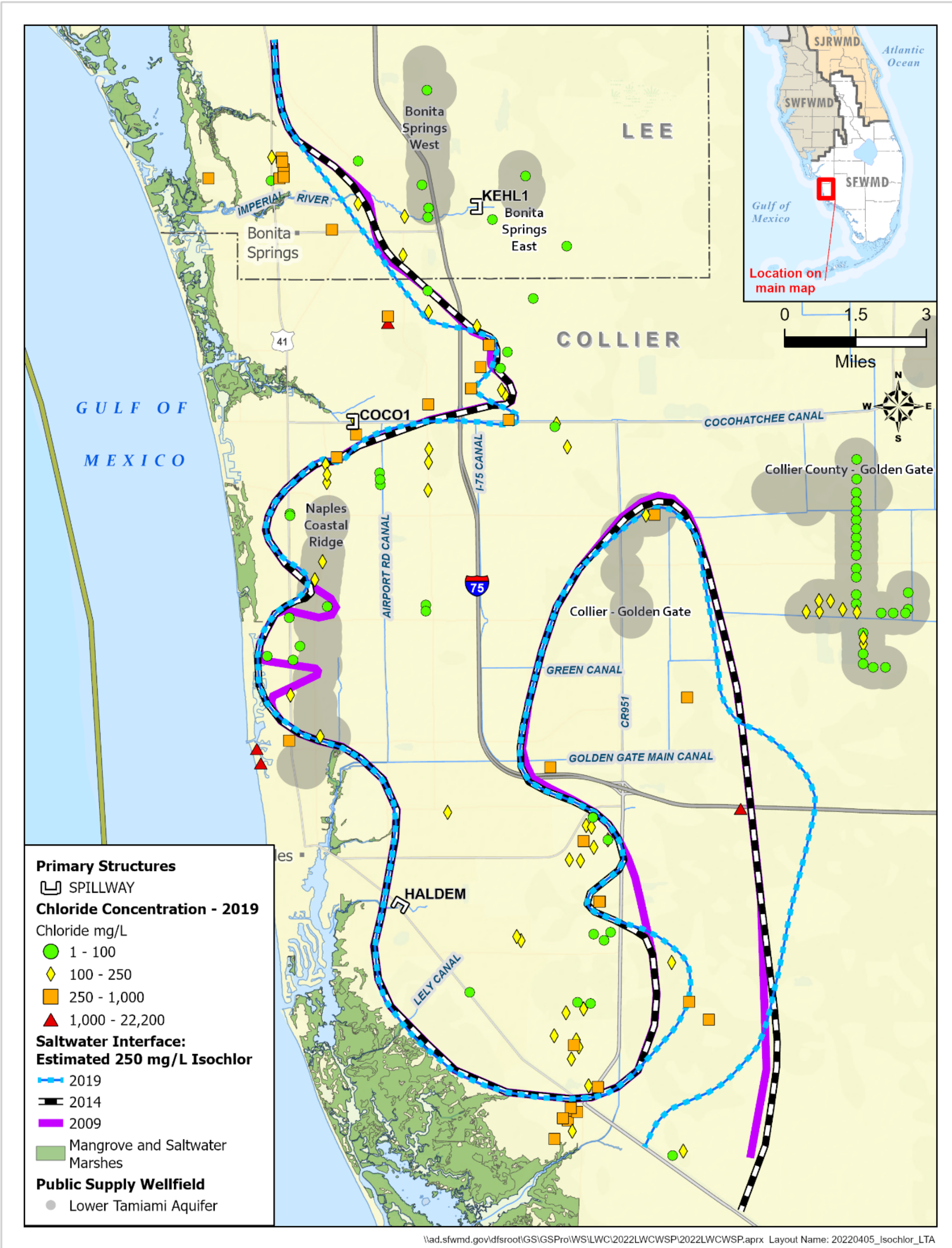


Figure D-2. Estimated position of the saltwater interface in 2009, 2014, and 2019 in the Lower Tamiami aquifer in Lee and Collier counties.

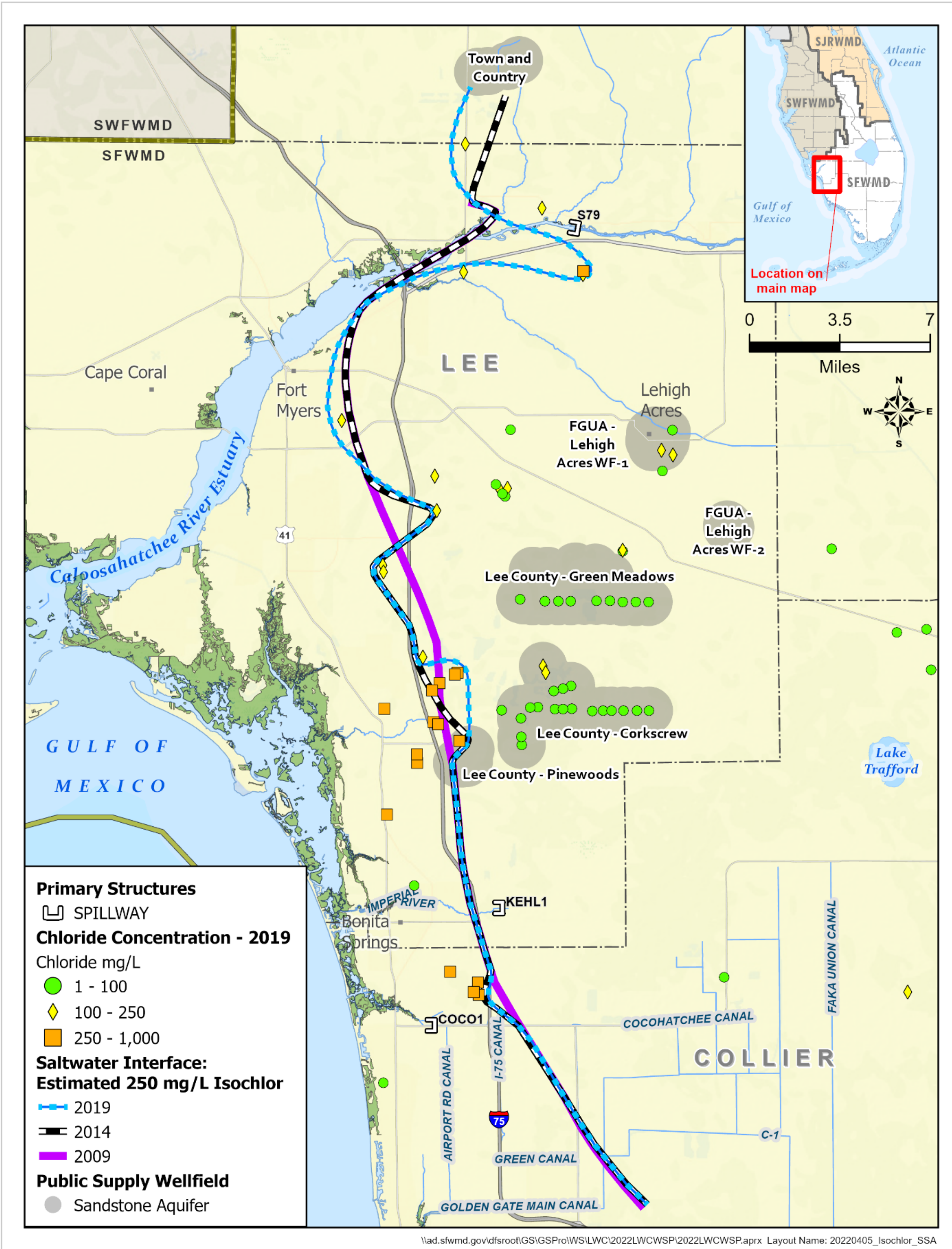


Figure D-3. Estimated position of the saltwater interface in 2009, 2014, and 2019 in the Sandstone aquifer in Lee and Collier counties.

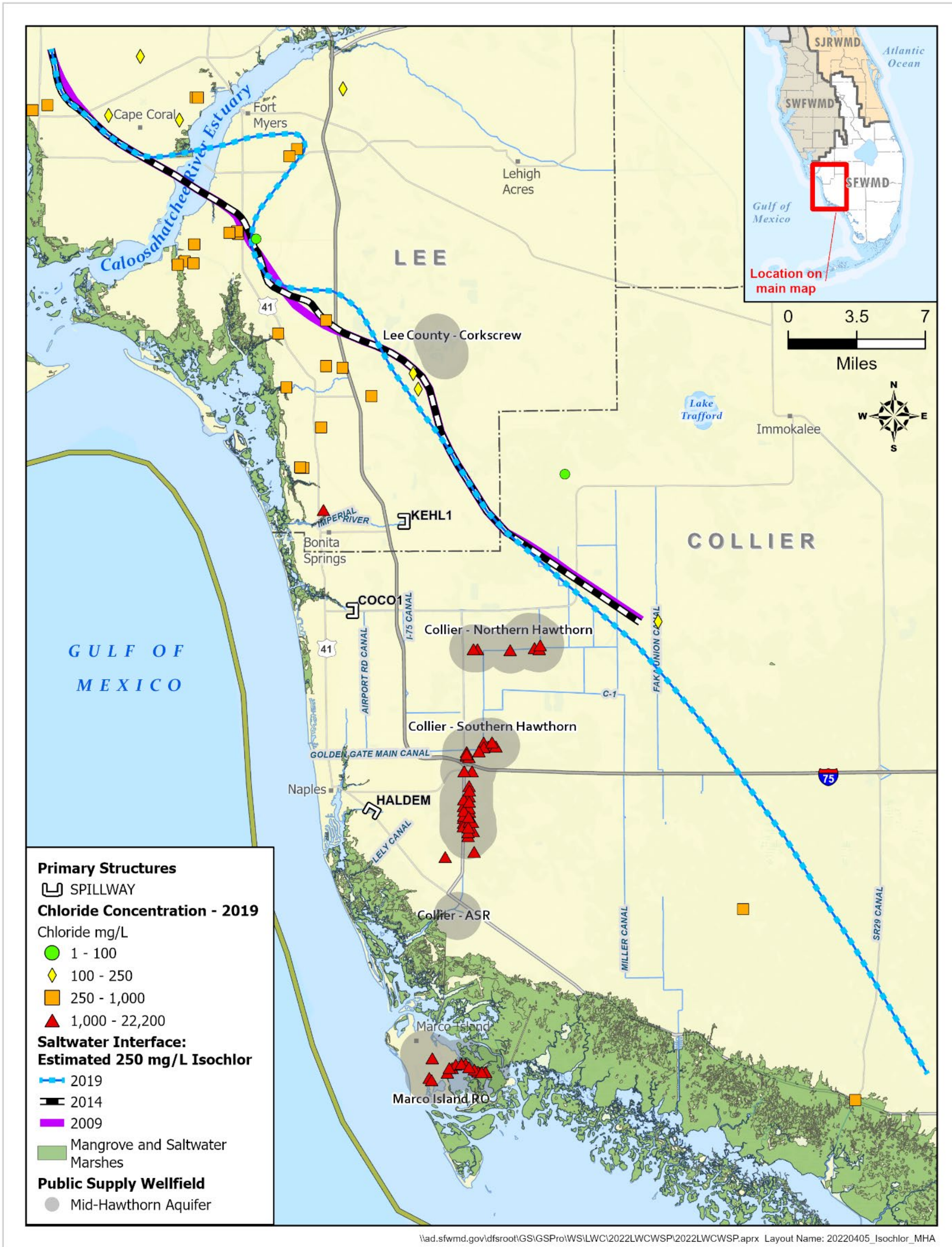


Figure D-4. Estimated position of the saltwater interface in 2009, 2014, and 2019 in the Mid-Hawthorn aquifer in Lee and Collier counties.

UTILITIES VULNERABLE TO DRY CONDITIONS

During the 2007 drought, the SFWMD evaluated and identified Public Supply (PS) utilities throughout the District that had water supply sources near the saltwater interface and that potentially were vulnerable to saltwater intrusion or reduced availability during drought conditions (SFWMD 2007). The primary purpose of the SFWMD's evaluation was to increase awareness of the potential for saltwater intrusion in groundwater (due to lowered water tables, reduced precipitation, and resulting lowered recharge) and surface water (due to the migration of saltwater or limited availability). The SFWMD's evaluation identified utilities' existing water supply sources, including alternative sources, and future, planned projects and initiatives to diversify water supply sources, reduce vulnerability, and ensure a more reliable water supply during future dry periods. These considerations are regional and subregional assessments for water supply planning purposes only, and do not constitute any regulatory determination or agency action regarding the utilities noted herein.

Considerations used in this evaluation included whether the utility had wellfields near the saltwater interface or relied on surface water sources, the availability of other water sources (e.g., inland wellfield, interconnects with other utilities), and the ability of the alternatives to meet demands. Utilities in the LWC Planning Area identified during the 2007 SFWMD's evaluation were as follows:

- **Cape Coral (IQ System)** – Cape Coral operates a dual water system utilizing two separate piping systems. The potable water system is supplied by wellfields developed in the Floridan aquifer system (FAS) and treated by reverse osmosis (RO) plants; therefore, it is less vulnerable to drought and has sufficient capacity to meet all potable demands. An irrigation-quality (IQ) water system is used primarily for landscape irrigation but also supports a portion of Cape Coral's fire hydrants. The IQ system is supplied from the utility's reclaimed water facilities and supplemented by fresh water stored in the city's canal system when IQ water demand is more than the reclaimed water facilities produce. During times of severe drought, the canal system is susceptible to extreme low water conditions that can render it incapable of providing water supply for fire protection. Since the 2017 LWC Plan Update, Cape Coral has secured a surface water supply source from a rock pit located in Charlotte County to provide supplemental water to the city's canal system during dry periods.
- **Marco Island (Marco Lakes)** – Marco Island operates two water treatment plants (WTPs): South and North located on Marco Island. The South WTP has a brackish wellfield developed in the Mid-Hawthorn aquifer using RO treatment. The North WTP is supplied via an 8-mile pipeline extending to Marco Lakes on mainland Florida. Marco Lakes captures surface water from Henderson Creek, which is vulnerable to droughts. Marco Island has constructed an ASR system to store excess surface water from Marco Lakes. Marco Island (Marco Lakes) remains vulnerable to dry conditions because of the South WTP's dependence on Henderson Creek for supply; however, the ASR system can offset much of the capacity deficit.

- **Bonita Springs** – Bonita Springs operates two supply wellfields in the Lower Tamiami aquifer and the Upper Floridan aquifer (UFA). The Lower Tamiami aquifer source is near the regional saltwater interface. An East wellfield approximately 2 miles farther inland allows for operational flexibility to shift groundwater withdrawals away from the coast during drought conditions. The brackish water supply at the East wellfield from the UFA reduces the utility's dependence on the Lower Tamiami aquifer. The utility has proposed projects to expand its RO treatment capacity to meet future demands and reduce its vulnerability to saltwater intrusion.
- **Naples** – Naples maintains two wellfields, both developed in the Lower Tamiami aquifer: Coastal Ridge and East Golden Gate. The utility is considered vulnerable due to the proximity of the Coastal Ridge wellfield to the saltwater interface. The East Golden Gate wellfield is located farther inland and accounts for more than 70% of the utility's total supply. The utility has implemented a robust reclaimed water distribution system expansion to reduce potable water per capita rates. However, due to the proximity of the regional saltwater interface, the utility's Coastal Ridge wellfield remains vulnerable.
- **Lee County Utilities (Olga)** – Lee County Utilities operates the Olga WTP, which draws surface water from the C-43 Canal upstream of the S-79 water control structure. During severe droughts, the risk of salt water reaching the surface water intake at the Olga WTP rises as freshwater discharges from Lake Okeechobee to the canal are reduced. In order to safeguard the system, Lee County Utilities has constructed potable water distribution line connections between the Olga WTP and the North Lee County and Green Meadows WTPs. Additionally, Lee County has constructed expansions and diversified sources at these facilities that allows Lee County to shut down the Olga facility during droughts and still have the capacity to meet demands.

LOWER WEST COAST SURFICIAL AND INTERMEDIATE AQUIFER SYSTEMS MODEL

The Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) is a groundwater model encompassing the District's LWC Planning Area (**Figure D-5**). The model simulates regional groundwater levels and flows in response to withdrawals. The model cells are 1,000 feet by 1,000 feet in size. An independent peer review of the model was completed in 2020 and the panel's comments were incorporated into the LWCSIM. Full documentation reports of the model setup and scenario applications can be found in Bandara et al. (2020).

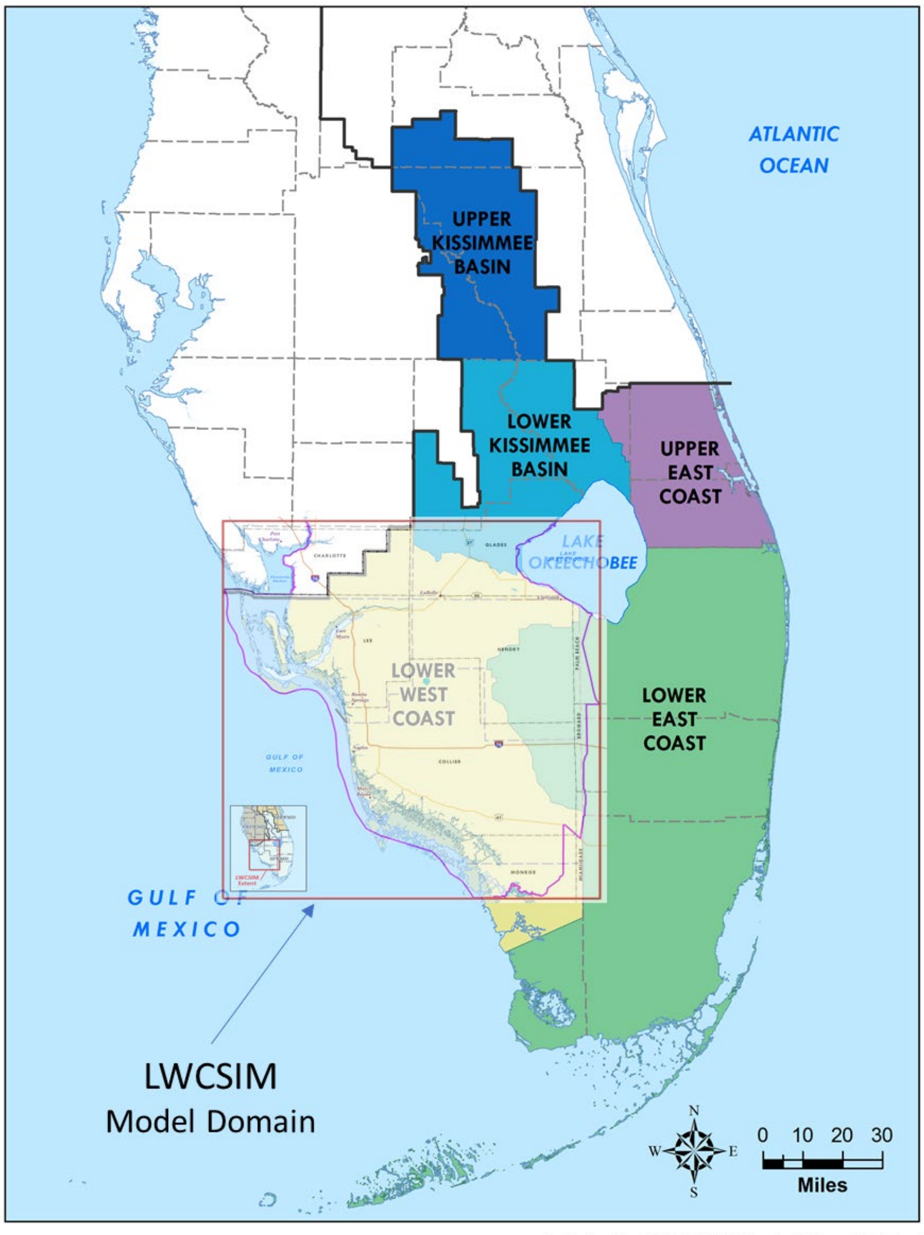


Figure D-5. Location of the LWC Planning Area and the Lower West Coast Surficial and Intermediate Aquifer Systems Model domain.

The LWCSIM was developed for regional water supply planning purposes and uses the best available data regarding aquifer characteristics. The model was designed with nine layers including the Water Table aquifer, Lower Tamiami aquifer, Sandstone aquifer (clastic and carbonate zones), Mid-Hawthorn aquifer, and the associated confining units that separate them (**Figure D-6**).

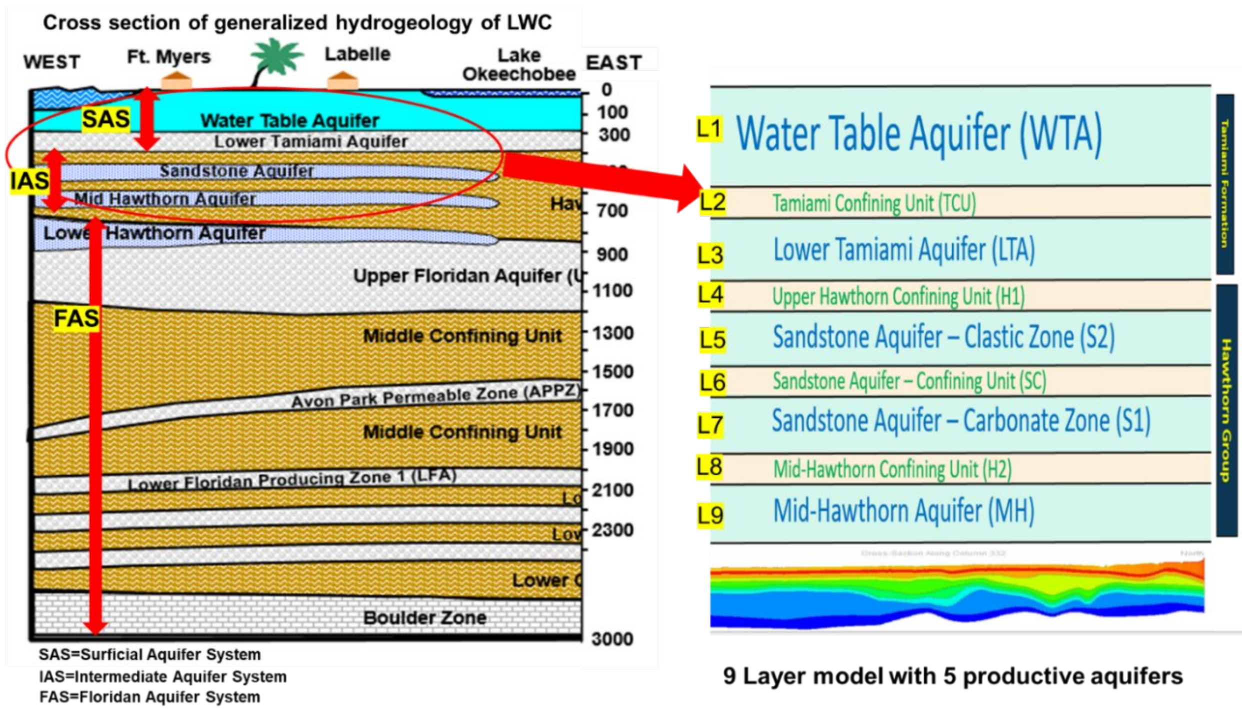


Figure D-6. Model layers as based on updated hydrogeologic framework from Geddes et al. (2015).

Water use data included the location of existing wells in addition to reported, estimated, or projected water use. The LWCSIM was designed to evaluate the sustainability of existing and projected future LWC Planning Area demands from the surficial aquifer system (SAS) and intermediate aquifer system (IAS). The LWCSIM was used to identify areas and evaluate where cumulative water use withdrawals may harm existing groundwater resources and natural systems (e.g., wetlands). The modeling effort also investigated the potential for increased risk of saltwater intrusion in the SAS and IAS.

Model Setup

For each permitted SAS/IAS user, pumping volumes and well/wellfield locations were input to the LWCSIM for the 2014 and 2040 simulations. **Table D-1** presents current and future projected water demands for each county in the LWCSIM, divided by water use category, for the 2014 and 2040 scenarios. Although this 2022 LWC Plan Update has demands projected to 2045, the previous 2017 LWC Update Plan demand quantities for 2040 are about 4% greater. Therefore, the modeled results are considered to be representative of the future demands.

Table D-1. Water use modeled amounts by county and use type within the LWC Planning Area.

County	2014 (mgd)	2040 (mgd)	Difference (mgd)
Agriculture			
Charlotte*	8.32	9.08	0.76
Collier	136.74	140.40	3.66
Glades*	6.97	20.80	13.83
Hendry	158.03	157.22	-0.81
Lee	34.09	48.06	13.97
Total	**344.15**	**375.56**	**31.41**
Landscape/Recreational			
Charlotte*	0.01	0.01	0.00
Collier	37.16	48.08	10.92
Glades*	0.25	0.76	0.51
Hendry	1.86	2.65	0.79
Lee	51.05	80.61	29.56
Total	**90.33**	**132.11**	**41.78**
Public Supply			
Charlotte*	0.10	0.88	0.78
Collier	45.15	56.17	11.02
Glades*	0.50	0.66	0.16
Hendry	0.90	0.55	-0.35
Lee	21.70	27.65	5.95
Total	**68.35**	**85.91**	**17.56**
Domestic Self-Supply			
Charlotte*	0.05	0.07	0.02
Collier	4.41	6.91	2.50
Glades*	0.01	0.02	0.01
Hendry	0.04	0.05	0.01
Lee	36.97	47.59	10.62
Total	**41.48**	**54.64**	**13.16**
Reclaimed			
Collier	22.79	28.84	6.05
Lee	39.72	75.38	35.66
Total	**62.51**	**104.22**	**41.71**

mgd = million gallons per day.
* Values for Charlotte and Glades counties reflect only what is contained within the active model domain.

General descriptions of the pumping volumes and locations used in the model are as follows:

- For the agricultural (AG) water use category, permit data were compared to information published by the Florida Department of Agriculture and Consumer Services (FDACS 2017) in the Florida Statewide Agricultural Irrigation Demand (FSAID) report. The FSAID report contains estimated and projected agricultural acreage and water use demand throughout Florida. The Agricultural Field-Scale Irrigation Requirements Simulation (AFSIRS; Smajstrla 1990) model was run based on FSAID estimated and projected AG and landscape/recreational (L/R) acreages to estimate irrigation demands for 2014 and 2040. AG and L/R represent the largest water users in the LWC Planning Area (**Table D-1**).

- The 2014 modeled PS demands were based on historical water use information collected by the SFWMD's Water Use Bureau. Proposed future pumping wells were added in the 2040 scenario based on locations provided by utilities. PS well withdrawals for 2014 and 2040 were simulated based on annual estimated and projected demands from the 2017 LWC Plan Update. The biggest projected increase (approximately 6 million gallons per day [mgd]) is associated with the Naples Water Table aquifer wellfield. The Golden Gate Lower Tamiami wellfield has a projected demand increase of approximately 2 mgd, and the Bonita Springs Lower Tamiami wellfield has a projected demand increase of 1.95 mgd. These increases in demand are relatively modest over a 20-year planning horizon and reflect the fact that the SAS and IAS are traditional sources that are approaching their maximum use without causing harm to natural resources or at risk to causing saltwater intrusion.
- Monthly Domestic Self-Supply (DSS) demands were estimated based on county-wide average per capita use rates and projected population growth. The projected increase in DSS demand occurs primarily in Lehigh Acres in eastern Lee County. For the 2040 scenario, new DSS wells were placed in areas of projected population expansion or to increase DSS pumping rates in existing DSS wells.
- Commercial/Industrial/Institutional (CII) demands were minimal compared to the other water use categories and were simulated using permitted allocations.

Model Scenarios

The 2014 reference condition consisted of average pumping conditions from 2014, including monthly variations in demand, as taken from the calibrated 1999 to 2014 transient, calibrated model. The yearly pumping conditions were repeated for 16 years, using 192 monthly stress periods of changing rainfall, evapotranspiration, and recharge conditions. The 2040 future scenario consisted of projected 2040 pumping demands from the 2017 LWC Plan Update. Monthly simulated pumpages were based on historical patterns to reflect changes in demands associated with seasonal variations in climate and population.

Model Scenario Results

The simulation results are presented as changes to average water levels and changes in average horizontal and vertical groundwater flow direction (using velocity vectors) between 2014 and 2040. The results show that, in places, water levels are predicted to decline due to projected increases in pumping and rebound in other areas due to projected decreases in pumping or removal of pumps. Regional changes in water levels in wetland areas due to well withdrawals were explored by comparing the 2014 reference condition and 2040 future scenarios. Groundwater velocity vectors, which change in direction and magnitude (size) in response to increases or decreases in pumping, are useful for saline intrusion analyses.

Discussion of Groundwater Level Variations

The potentiometric head difference between the 2040 future pumping condition and 2014 reference pumping condition are shown in **Figures D-7** to **D-11** for each of the SAS and IAS aquifers, respectively. In other words, the figures show additional drawdowns or rebounds of the potentiometric surface of each aquifer due to increased or decreased withdrawals. Shades of orange to red represent additional drawdowns (i.e., decreasing water levels), while shades of yellow to blue represent additional rebounds (i.e., increasing water levels). Areas where the aquifer is thin or absent are shown in gray.

In **Figures D-7** to **D-10**, representing the Water Table aquifer, Lower Tamiami aquifer, Sandstone aquifer clastic zone, and Sandstone aquifer carbonate zone, respectively, slight drawdowns (0.5 to 3 feet) can be seen in areas that correspond to changing AG demands (western Lee and Hendry counties) and projected population growth resulting in DSS well increases in Lehigh Acres (eastern Lee County). In **Figures D-9** and **D-10**, the increase in drawdown in the Sandstone aquifer clastic zone and Sandstone aquifer carbonate zone, respectively, in Charlotte County is associated with the projected increase in water withdrawals associated with the Babcock Ranch community development as well as a projected increase in AG demands of 0.69 mgd. The water level rebound around Cape Coral is the result of a decrease in DSS well use in the Mid-Hawthorn aquifer and the associated future expansion of PS utilities using the FAS as well as increasing irrigation return flow from PS and reclaimed water. This is especially clear in **Figure D-11**, where the predicted rebound is projected to be greater than 25 feet in the Mid-Hawthorn aquifer due to DSS wells being taken offline between 2014 and 2040. The Mid-Hawthorn aquifer generally is not very productive; therefore, the aquifer response to pumping changes generally is high. Other notable drawdowns occur in the Water Table aquifer and Lower Tamiami aquifer at the intersection of Lee, Collier, and Hendry counties (**Figures D-7** and **D-8**, respectively), where the Lower Tamiami aquifer and Sandstone aquifer are thinner (approximately 20 feet) and less productive.

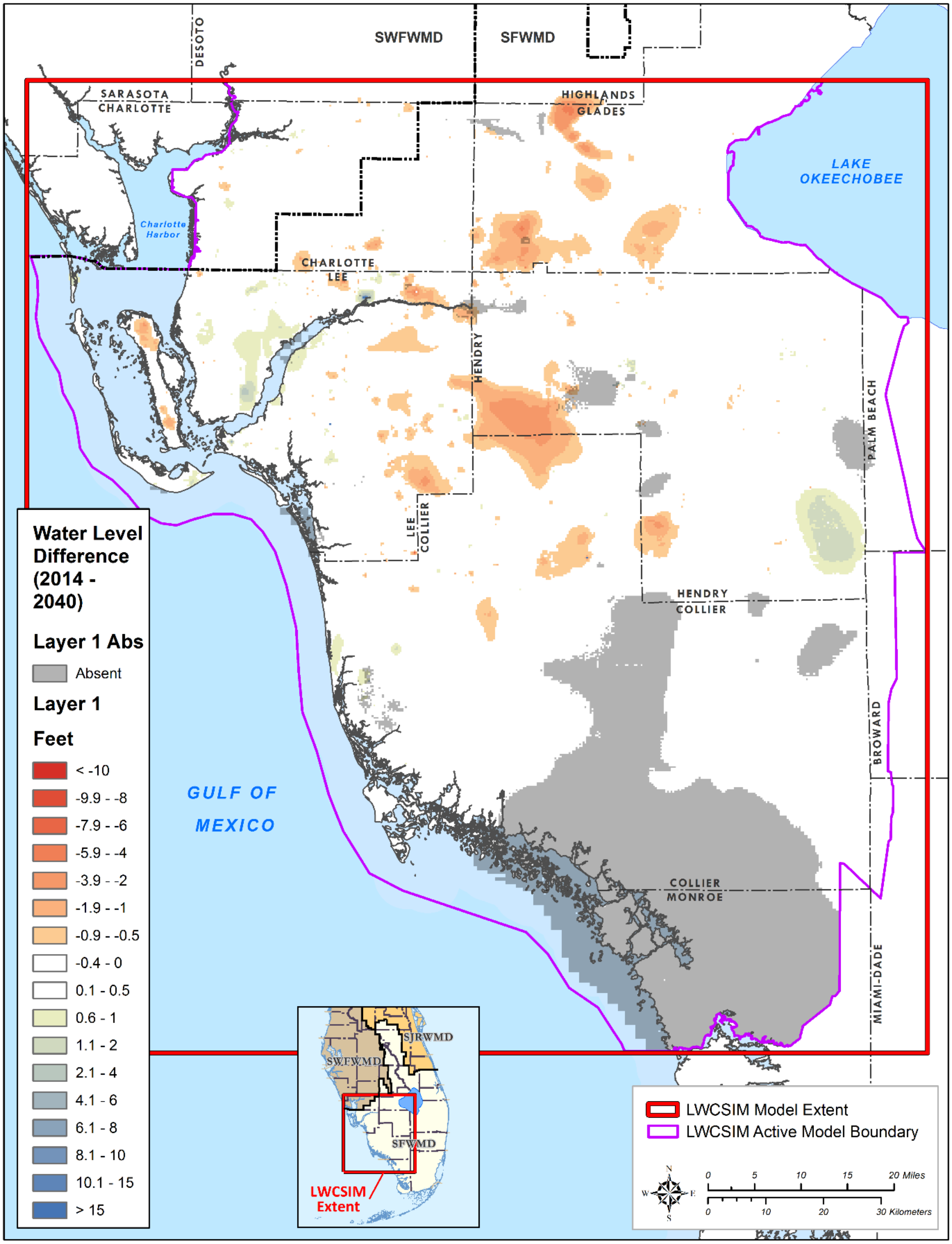


Figure D-7. 2014 to 2040 water level difference in the Water Table aquifer.

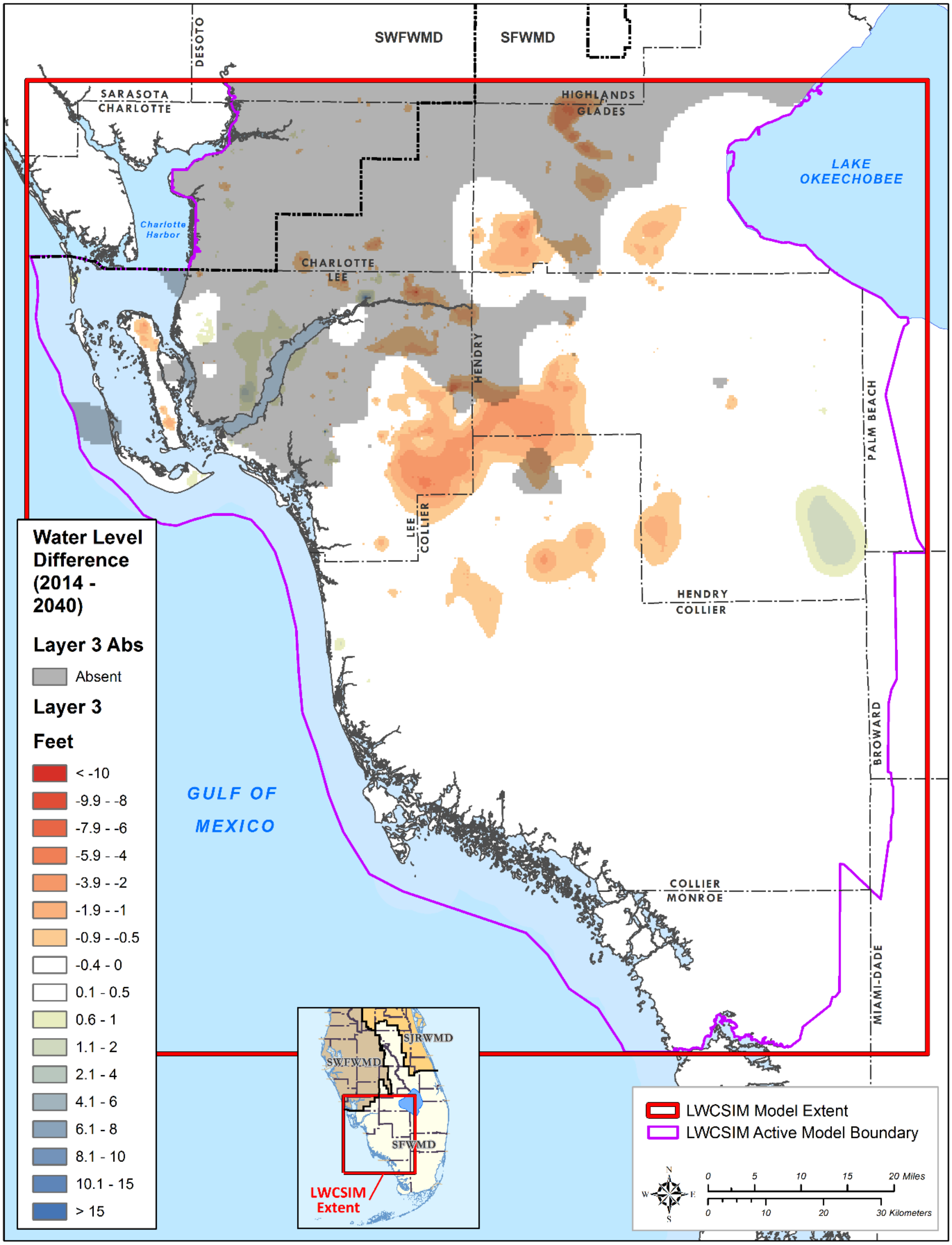


Figure D-8. 2014 to 2040 water level difference in the Lower Tamiami aquifer.

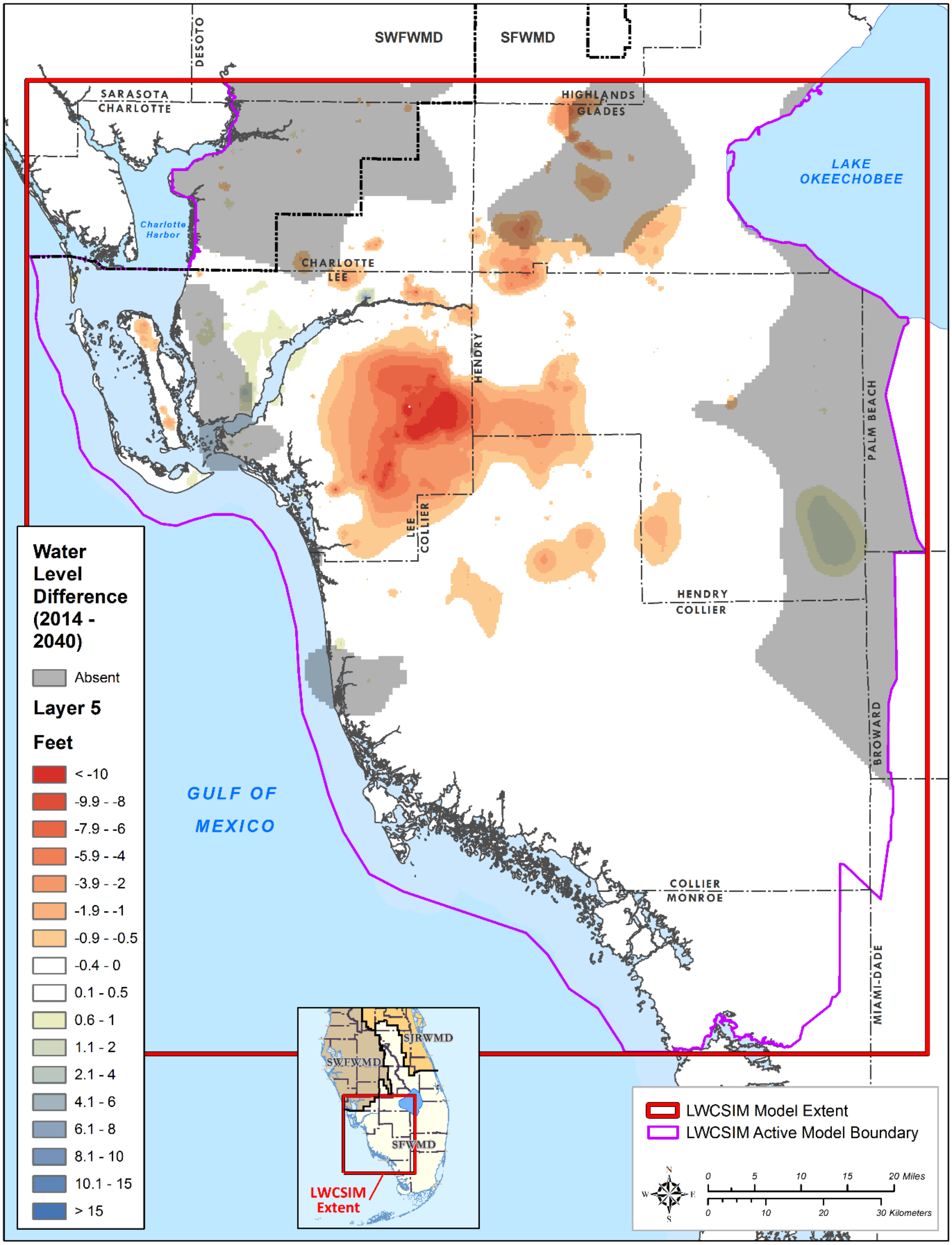


Figure D-9. 2014 to 2040 water level difference in the Sandstone aquifer clastic zone.

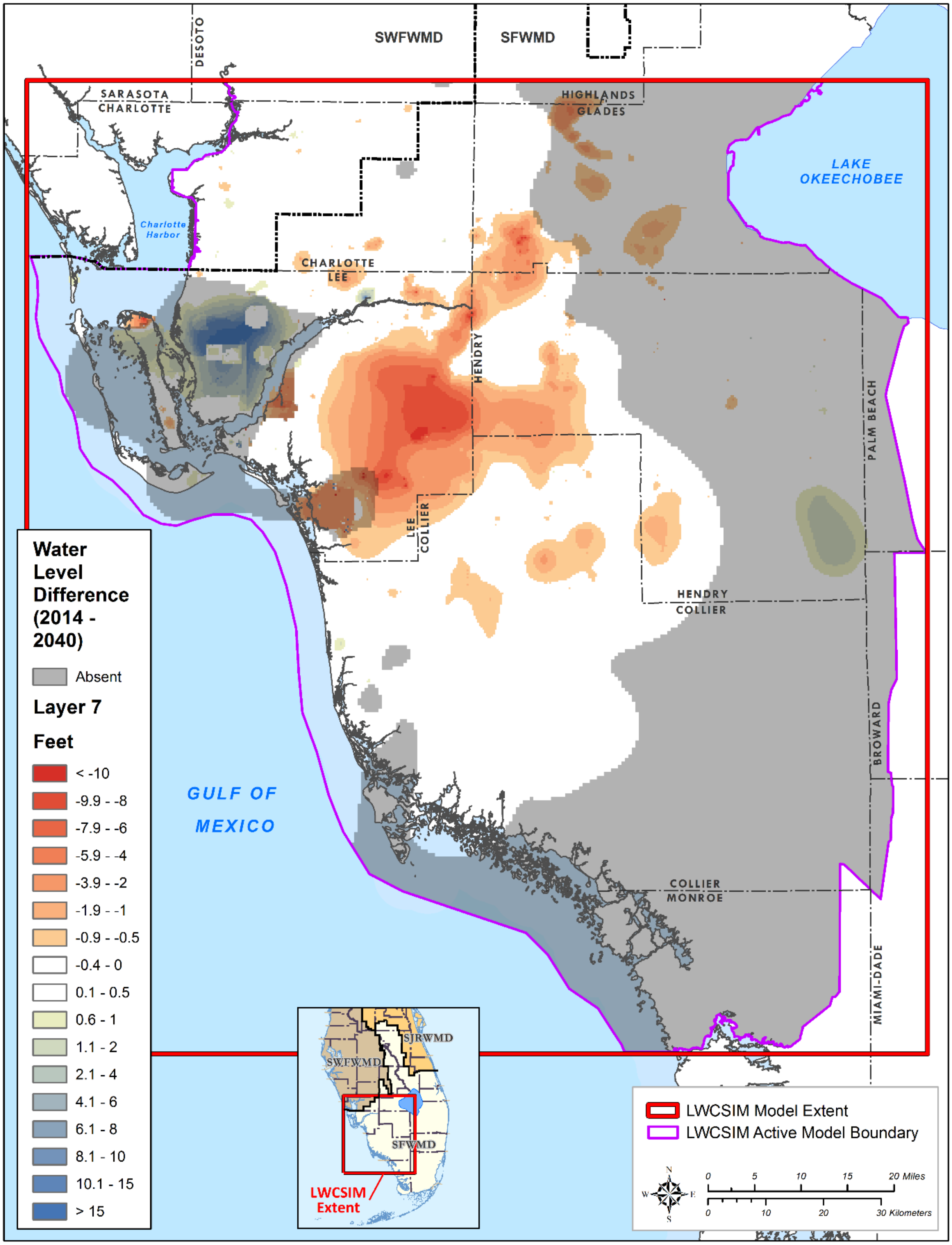


Figure D-10. 2014 to 2040 water level difference in the Sandstone aquifer carbonate zone.

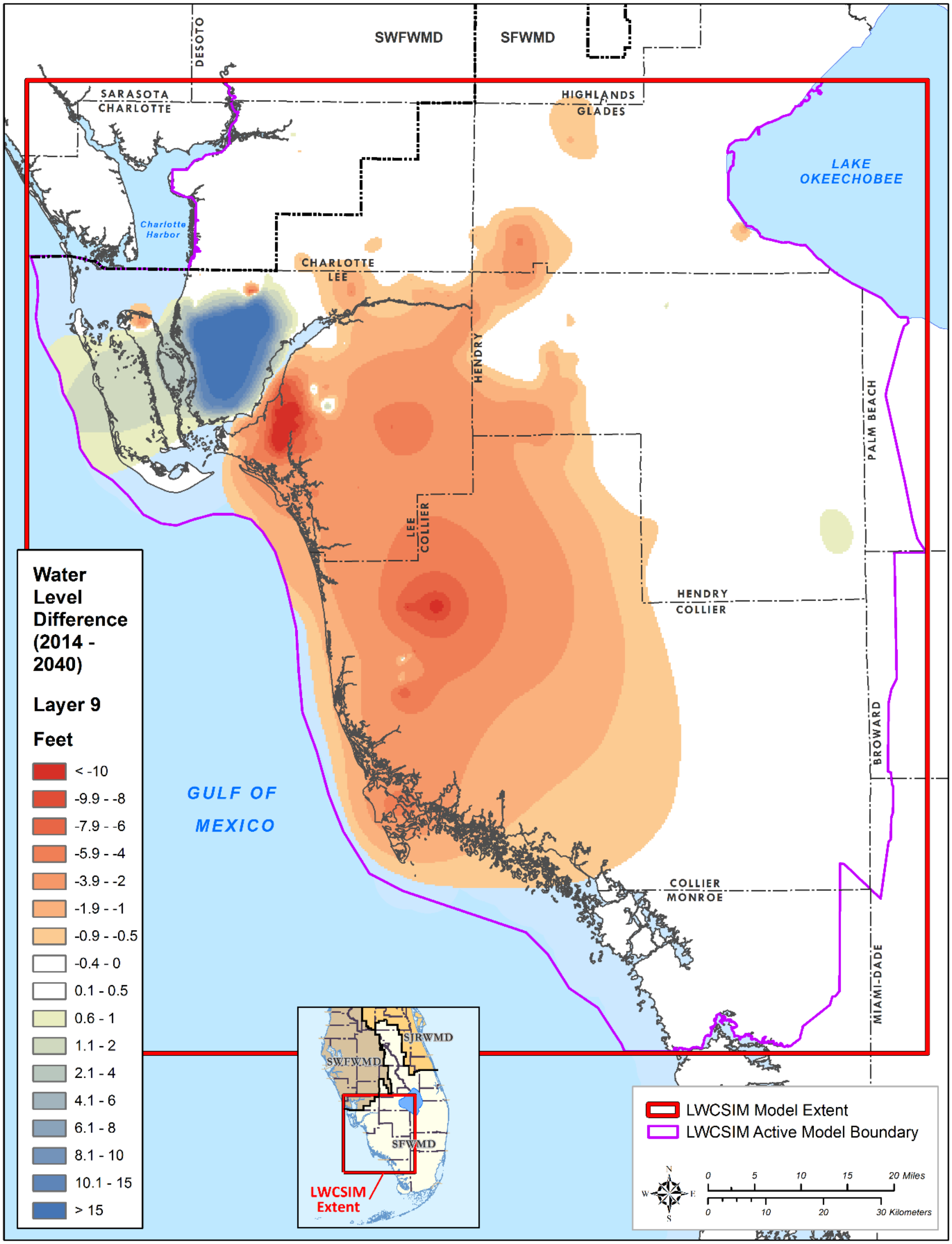


Figure D-11. 2014 to 2040 water level difference in the Mid-Hawthorn aquifer.

Velocity Vectors Around Public Supply Wellfields

The LWCSIM simulates groundwater flow but is not capable of simulating solute transport (i.e., it is not a density-dependent model). Therefore, the LWCSIM cannot explicitly simulate intrusion of denser salt water into freshwater portions of aquifers. However, groundwater flow vectors (or velocity vectors) can be an indication of the direction of movement of the saltwater-freshwater interface, which could be used to identify any increased threat of lateral saltwater intrusion under the influence of the projected water demand increases.

Velocity Vectors and the Saltwater Interface

Velocity vectors were generated from the 2014 and 2040 scenarios to illustrate the groundwater flow field around major PS pumping wellfields close to the Gulf Coast and, therefore, adjacent to the saltwater interfaces in the Water Table aquifer, Lower Tamiami aquifer, and Sandstone aquifer. Saltwater interfaces represent 250 milligrams per liter (mg/L) chloride isochlors as estimated in the previously discussed saltwater interface mapping efforts. **Figures D-12** to **D-16** illustrate how groundwater moves near major PS wellfields and the mapped saltwater interface locations that are used for reference but were not generated as part of the groundwater model.

Figures D-12 to **D-15** illustrate that, in the cases of Bonita Springs, Naples (coastal), and Golden Gate—all in the Lower Tamiami aquifer—and Lee County Utilities in the Sandstone aquifer clastic zone, groundwater flow is generally towards the saltwater interface and does not change between 2014 and 2040. The velocity vectors generally are small and indicate groundwater movement under the regional flow gradient that is not significantly perturbed near the saltwater interface. In other words, for the Bonita Springs, Naples (coastal), and Golden Gate permits, the modest increases in projected PS withdrawals do not significantly influence the normal regional flow of groundwater near the saltwater interface. However, for Lee County Utilities in the Sandstone aquifer carbonate zone, there is some indication of groundwater velocity vectors turning slightly towards the wellfield and inland from the saltwater interface (**Figure D-16**). The groundwater flow velocities are small (small vector arrows), and the influence of the pumping wells is not significant; however, there appears to be some influence exerted by the wellfield beyond the expected influence very near the pumping wells. Also, a slight increase in the size of the vectors in 2040 indicates increased flow towards the wellfield due to a proposed increase in demand (0.79 mgd).

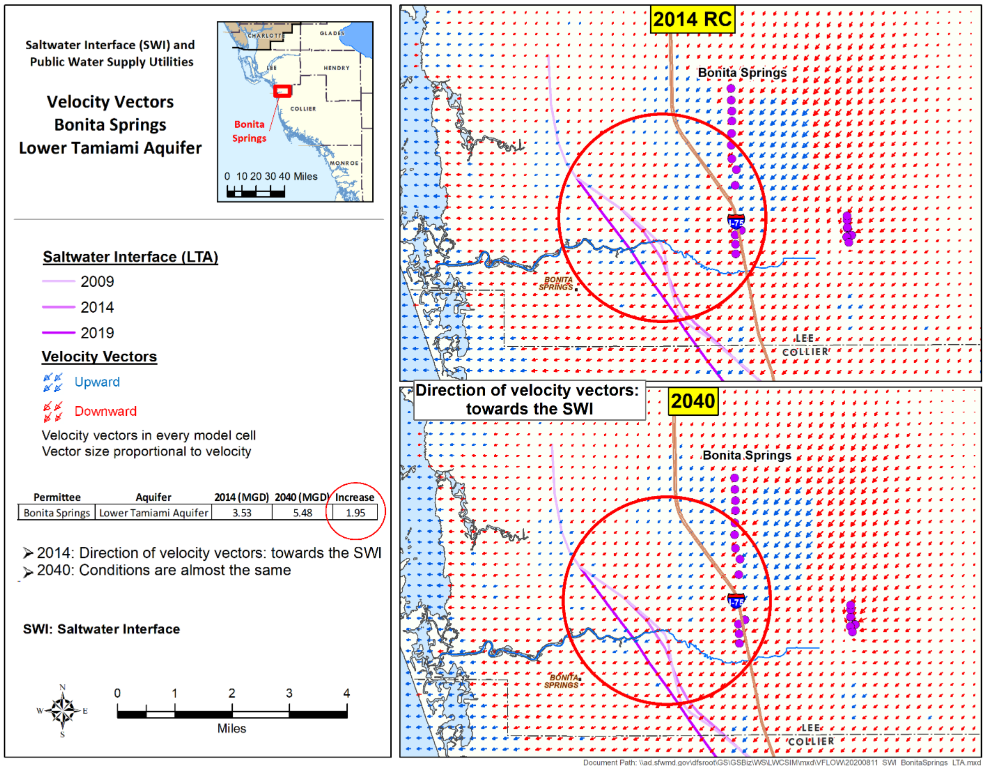


Figure D-12. Velocity vectors (magnitude in feet/day) in the Lower Tamiami aquifer near the Bonita Springs wellfield.

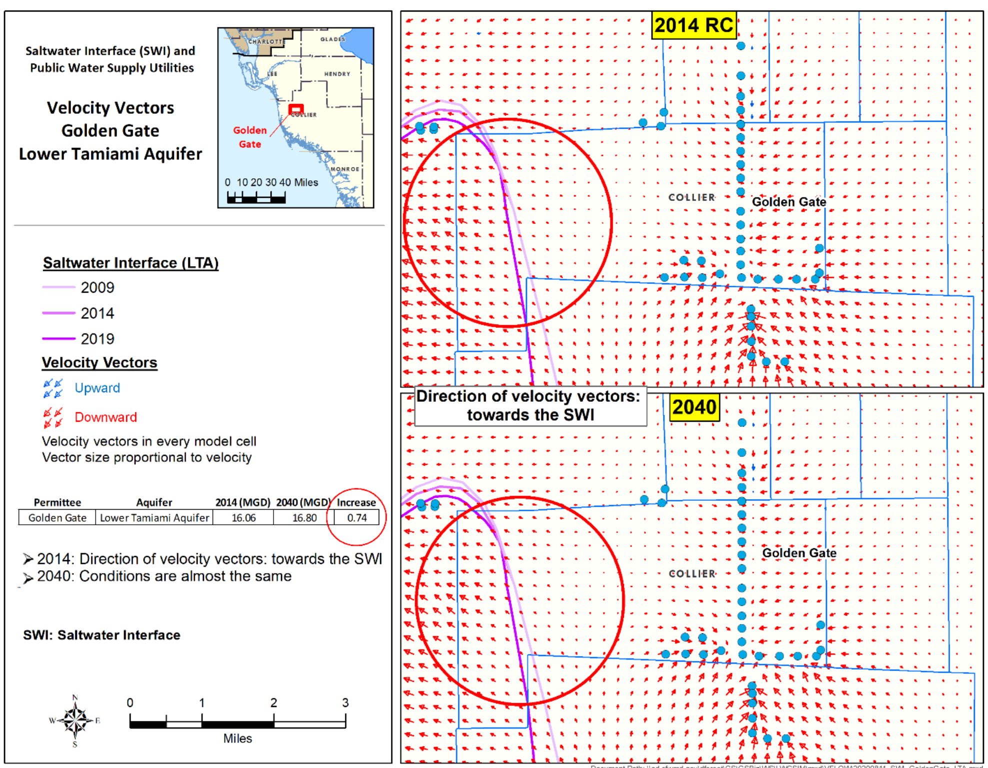


Figure D-13. Velocity vectors (magnitude in feet/day) in the Lower Tamiami aquifer near the Golden Gate wellfield.

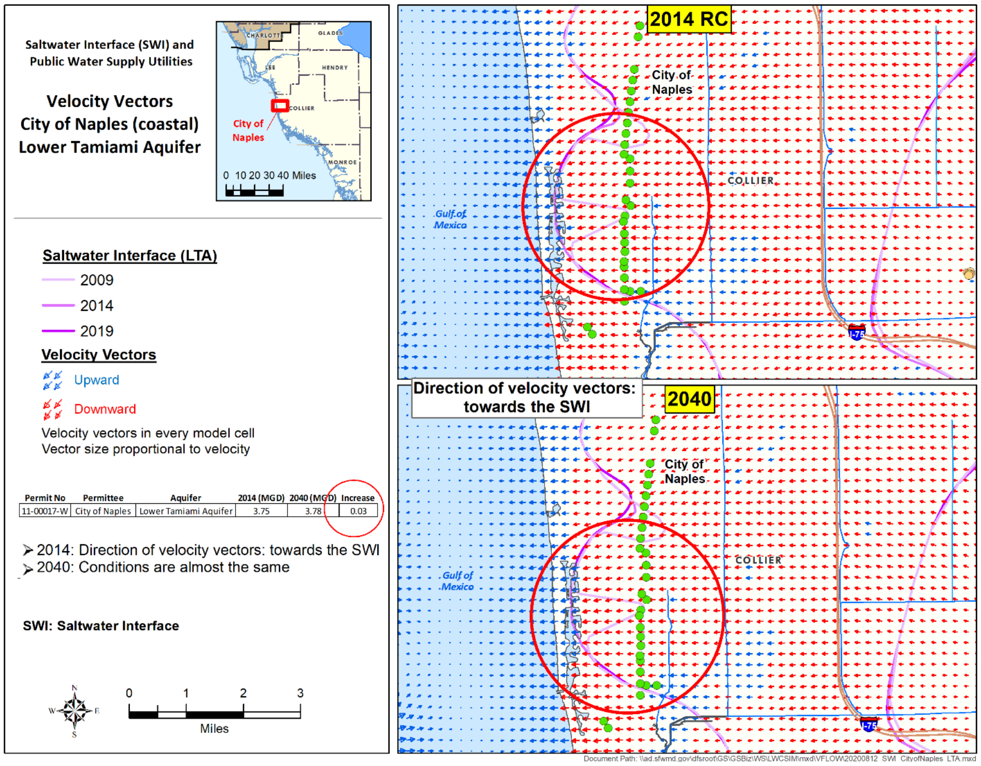


Figure D-14. Velocity vectors (magnitude in feet/day) in the Lower Tamiami aquifer near the Naples (coastal) wellfield.

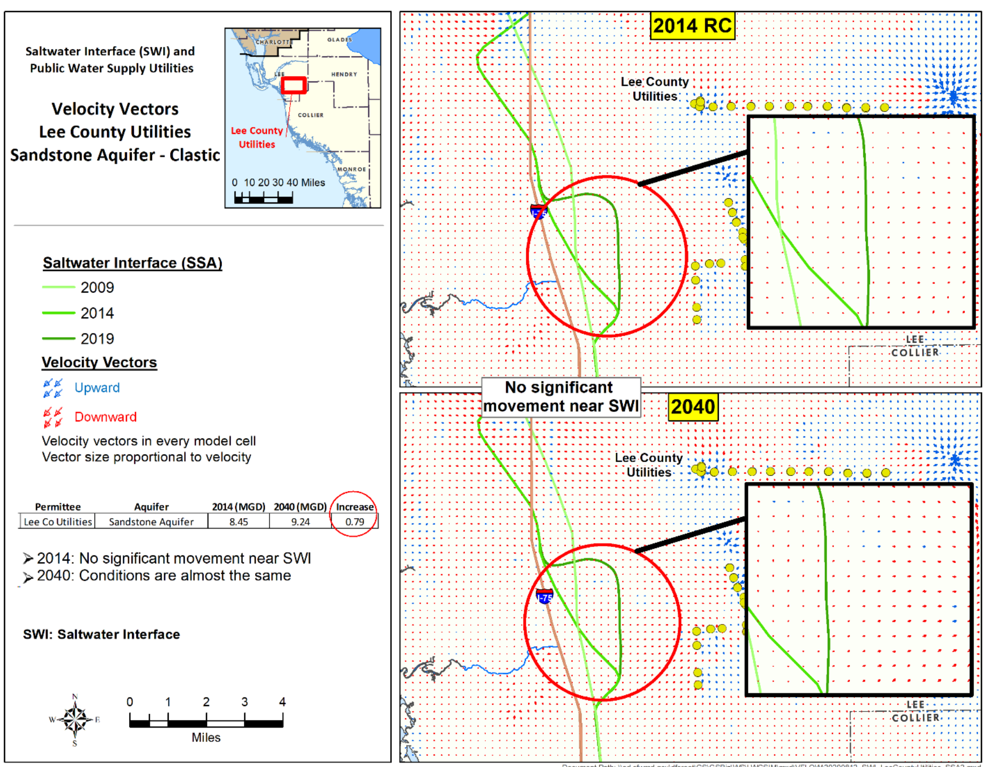


Figure D-15. Velocity vectors (magnitude in feet/day) in the Sandstone aquifer clastic zone near the Lee County Utilities wellfield.

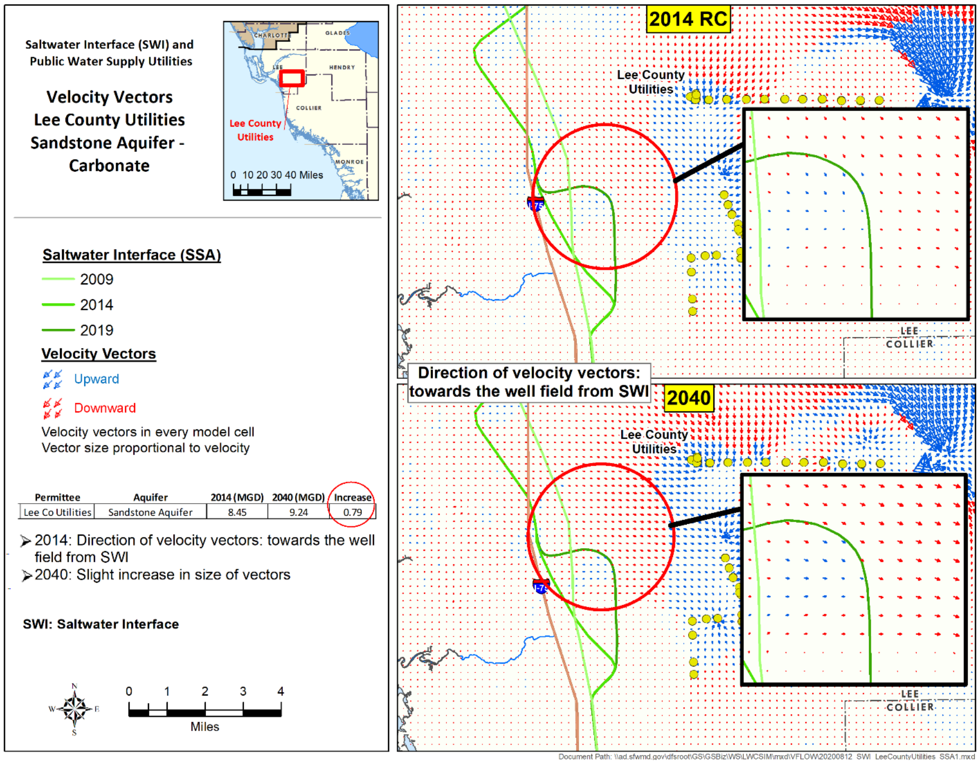


Figure D-16. Velocity vectors (magnitude in feet/day) in the Sandstone aquifer carbonate zone near the Lee County Utilities wellfield.

Potential Effects of Pumping on Wetlands

The goal of the wetland impact analysis was to identify wetland areas that warrant further investigation and evaluation under 2040 projected pumping conditions. **Figure D-17** illustrates the wetland areas potentially impacted by increased cumulative withdrawals in 2040. There are areas of measurable water level change in the Water Table aquifer that correspond to mapped wetlands. After running the simulations and comparing the results, the areas of water level change in the Water Table aquifer were laid over the current mapped wetland areas to determine the wetland areas potentially under the influence of changing well withdrawals. In **Figure D-17**, wetlands in an area of 1 foot or more drop in water level due to a change in pumping are shown in red, and wetlands in areas that rebounded to less than 1 foot of drawdown are shown in blue. Wetlands from the 2014 land use/land cover map are shown in light green. It is important to note that this exercise was an attempt to isolate the potential impacts of changing groundwater withdrawals on wetland systems. The effects of drainage and development (i.e., changes in land use over time), which can be significant, were not considered as they are outside the model scope.

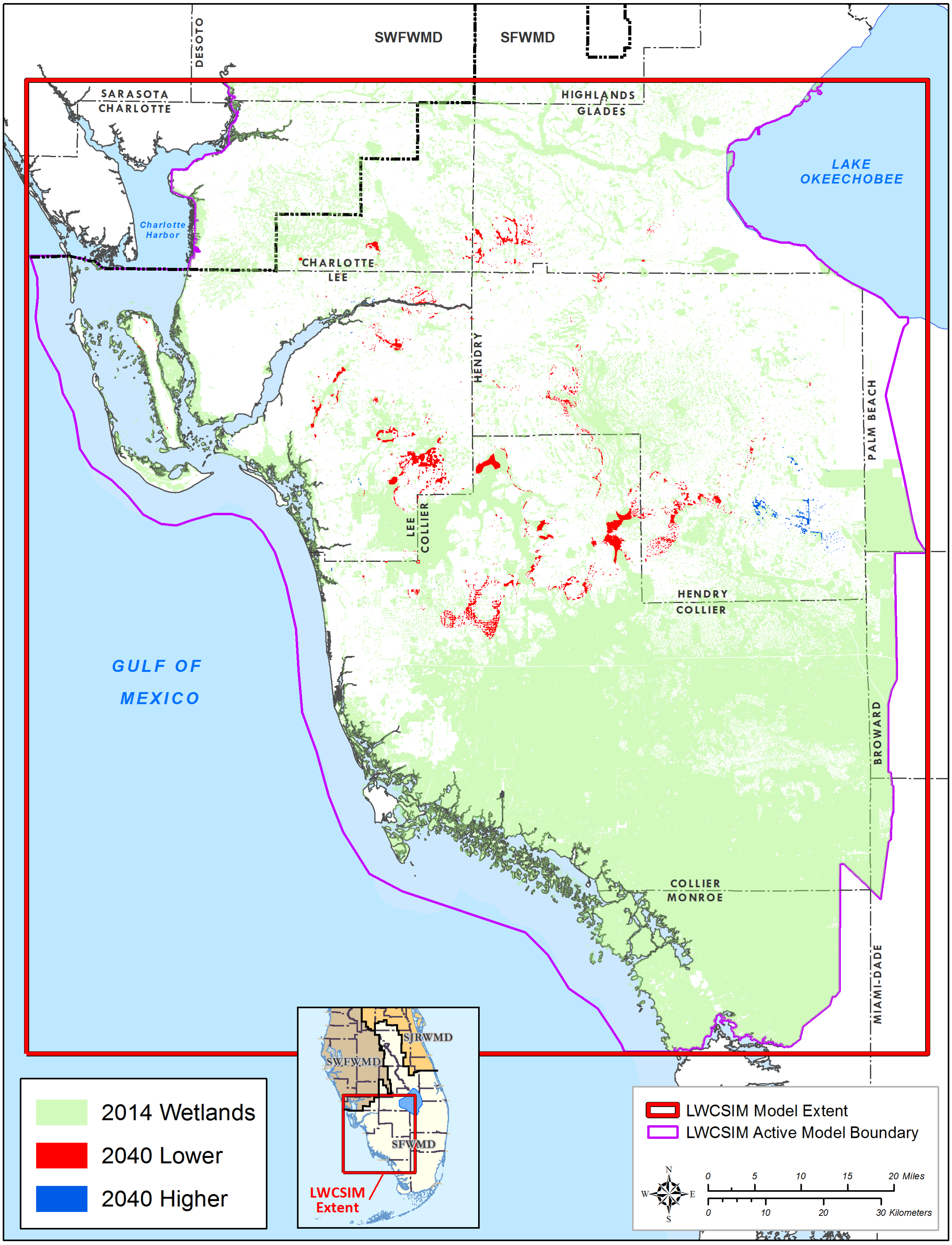


Figure D-17. Wetlands potentially affected by projected pumping in 2040.

Analysis of Results

The LWCSIM results presented herein must be considered in the proper context. First, these are planning-level evaluations. Second, the model is regional in nature, extending from Central Florida to Monroe County, Florida with a model cell size of 1,000 feet by 1,000 feet. Third, the model simulates continuous pumping for 26 years of 2014 or 2040 demands, but withdrawals would realistically increase gradually over time. Therefore, the simulations presented herein are considered conservative in nature. Fourth, the regional nature of the model limits the ability to account for specific wellfield operations used by utilities to manage the resource. For these reasons, the model results should be used as indicators for where potential problems could be experienced. Despite these limitations, the LWCSIM results indicate that 2040 SAS/IAS demands in the LWC Planning Area can be met.

Analysis of LWCSIM results indicated the following:

- **Water Level Differences** – The differences in potentiometric head in each aquifer between 2014 and 2040 clearly show areas where water levels are predicted to decrease or increase under the projected changes in demands. In general, as demands increase, there will be subtle declines in water levels (1 to 5 feet) in each aquifer. A few areas could experience declines between 5 and 10 feet. The most notable increase in potentiometric head (25 feet) was observed in the Mid-Hawthorn aquifer around Cape Coral, where users are expected to switch from DSS wells to PS wells that utilize the FAS in 2040. Another area of concern is the Sandstone aquifer in the Lehigh Acres, indicating an additional drawdown of 15 feet. Permitted groundwater withdrawals from the AG, PS, and DSS categories are contributing to this groundwater level decline.
- **Saltwater Intrusion Potential** – Groundwater velocity vector analyses show that, in general, large PS wellfields (current and future) do not significantly influence groundwater flow except very near the pumping wells. With the exception of Lee County Utilities in the Sandstone aquifer carbonate zone, groundwater flow generally follows the regional flow gradient and is not significantly influenced near the saltwater interfaces. Therefore, no significant increased potential for lateral saltwater intrusion was identified due to the projected pumping increase in 2040. This result is partly due to the modest increase in projected withdrawals around the wellfields of historical concern with respect to saltwater intrusion.
- **Potential Effects of Changing Demands on Wetlands** – Increasing or decreasing future demands may slightly influence wetlands, particularly in areas already extensively used for groundwater extraction. The changes in groundwater drawdowns between the 2014 and 2040 scenarios indicate a potential for some localized impact to wetland areas. Some wetlands may experience an increase in areas that lie within 1 foot of additional drawdown, while some may experience a decrease where the groundwater level is projected to rebound due to decreased withdrawals.

Conclusions

The results from the model simulations indicated that no widespread impacts are anticipated from groundwater withdrawals from the SAS/IAS through 2040 in the LWC Planning Area. However, the LWCSIM indicated a few localized areas that may require continued monitoring, additional planning, and adaptive management strategies to prevent harmful impacts to groundwater resources and wetlands. The LWCSIM also indicated that groundwater withdrawals at the projected 2040 demand levels do not pose an increased risk of saltwater intrusion near major public supply wellfields in the coastal portions of the SAS and IAS.

WEST COAST FLORIDAN MODEL

Groundwater modeling was conducted to evaluate the sustainability of existing and projected future FAS demands in the LWC Planning Area using the West Coast Floridan Model (WCFM) (Giddings et al. 2020) to support the planning process. The WCFM is a three-dimensional groundwater flow and transport model used to simulate water levels and total dissolved solids concentrations (i.e., water quality) within the FAS for the southwestern portion of Florida. The model was developed using the USGS SEAWAT model code, Version 4.0 (Langevin et al. 2008, USGS 2012). The WCFM domain extends from Central Florida near Lake Wales to the Florida Keys and from the Dry Tortugas to the approximate center line of the Florida peninsula (**Figure D-18**).

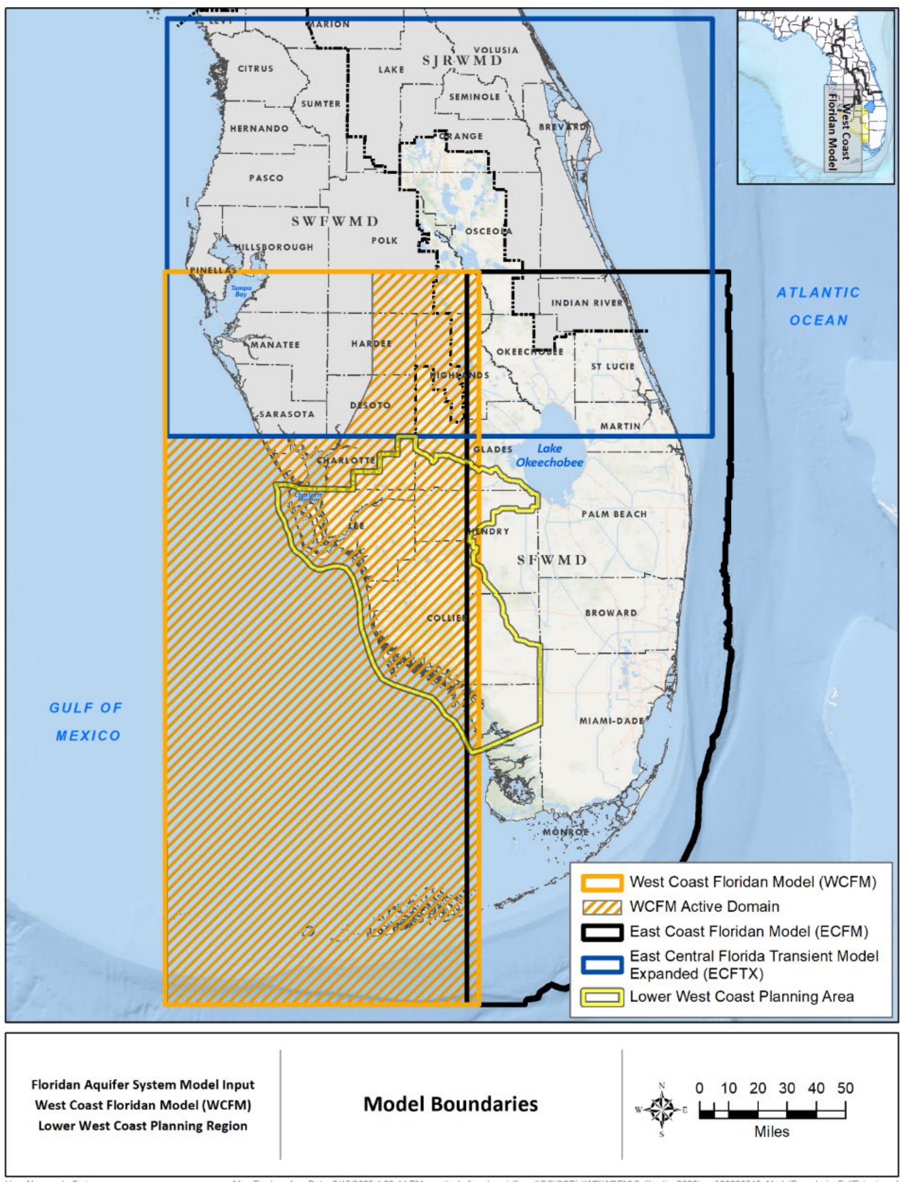


Figure D-18. Model boundaries of three Floridan aquifer system regional groundwater models in Central and South Florida.

The active portion of the WCFM domain encompasses this entire area, except for the northwestern corner, which is inactive west of State Road 17. The WCFM has a slight overlap on the eastern border with the East Coast Floridan Model (ECFM), and the portion of the WCFM domain north of the Charlotte County border overlaps with the East-Central Florida Transient Expanded Model (ECFTX). The northern WCFM boundary was extended beyond the LWC Planning Area to include the FAS recharge area in Central Florida. The WCFM domain was divided into a uniform grid with spacing of 2,400 feet.

Figure D-19 shows a generalized geologic cross section of the WCFM domain from Fort Myers to Lake Okeechobee. The top layers from the Water Table aquifer through the Hawthorn confining zone are simulated in the LWCSIM (Bandara et al. 2020). Vertically, the WCFM is composed of seven layers, starting with the UFA and each consisting of a confining unit or primary aquifer (**Table D-2**). The WCFM can simulate aquifer response to stresses such as wellfield pumpage, ASR systems, reductions in recharge, and increasing sea level, among others. Additional information on WCFM development and calibration can be found in the model documentation report (Giddings et al. 2020).

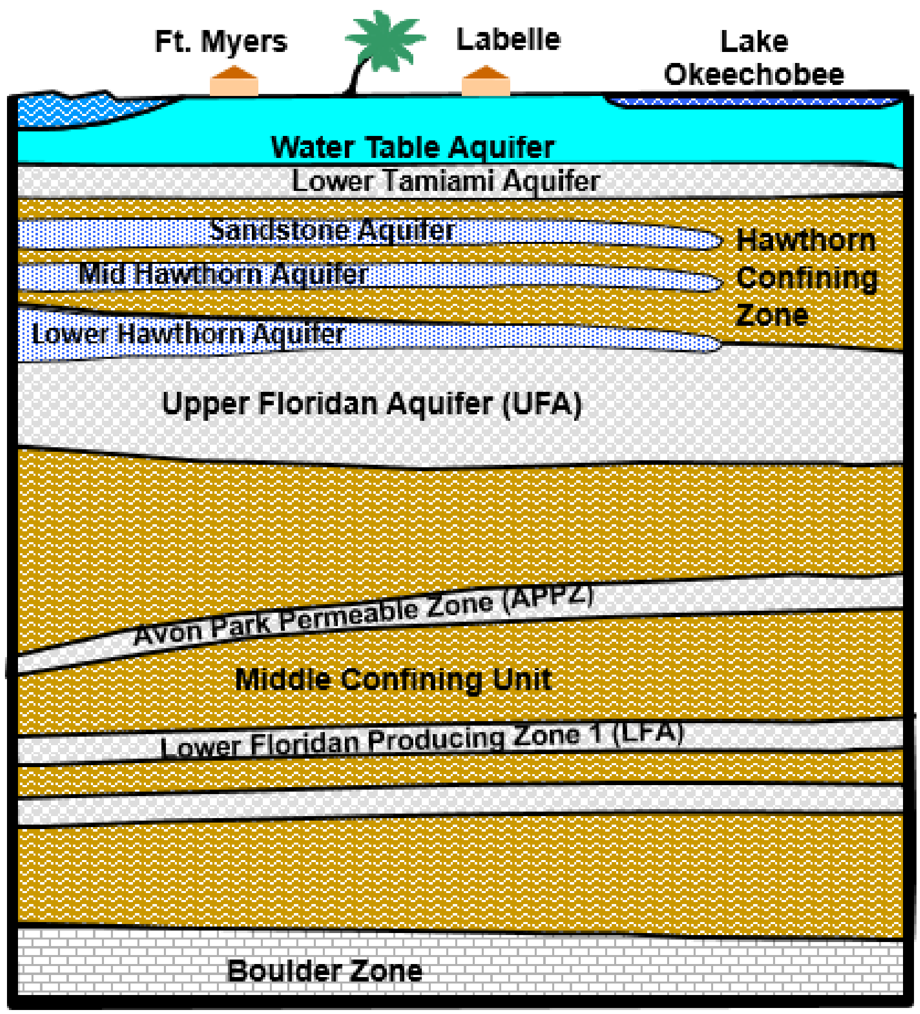


Figure D-19. Generalized geologic cross section through the West Coast Floridan Model domain.

Table D-2. Model layers and corresponding hydrogeologic units of the West Coast Floridan Model.

Model Layer	Hydrogeologic Unit	Abbreviation
1	Upper Floridan aquifer	UFA
2	Ocala-Avon Park low-permeability zone	OCAPlpz
3	Avon Park permeable zone	APPZ
4	Middle confining unit	MCU
5	Lower Floridan aquifer – first permeable zone	LF1
6	Boulder Zone confining unit	BC
7	Boulder Zone	BZ

Model Setup

For each permitted FAS user, pumping volumes and well/wellfield locations were input to the WCFM for the 2014 and 2040 simulations. The model simulated the 2014 withdrawals from actual reported pumpage or estimated data, and 2040 withdrawals were obtained from the projected demands identified in **Chapter 2** and **Appendix B** of the 2017 LWC Plan Update. General descriptions of the pumping volumes and locations used in the model are as follows:

- For PS utilities, CII, and L/R irrigation, estimates of FAS withdrawals were based on actual data from permittees for 2014 and projected demands based on population growth rates for 2040, with consideration given to water use permit information (e.g., available allocation, wellfield operations, proposed wellfield) and discussions with utility staff.
- AG irrigation demands were derived from the Agricultural Field-Scale Irrigation System (AFSIRS) model using 2012 land use data for the 2014 base conditions. For 2040, irrigation demands were estimated using AFSIRS based on 2040 Florida Statewide Agricultural Irrigation Demands (FSAID) land use data.
- Although there was an overall increase in AG and L/R irrigation demand projected in the 2017 LWC Plan Update, the increase was not expected to be met with water from the FAS; therefore, 2040 modeled demands within the LWC Planning Area are equal to 2014 estimated demands for AG and L/R irrigation use classes.
- Most agricultural operations in the region use a combination of surface water and groundwater from the SAS and IAS with limited use of the FAS to meet crop irrigation needs. The distribution between these sources was estimated from actual operations, site-specific model calibration, water supply plan estimates, and water use permit facility information.
- Existing well locations were determined using information in water use permits. For proposed PS wells not yet permitted, information was provided by utilities.
- Actual well withdrawals were used for the 2014 simulation, except for AG irrigation withdrawals, which were calculated from AFSIRS. For the 2040 simulation, total demand for each user typically was distributed evenly among the user's existing and proposed wells. Historical use patterns were considered, along with wells removed from service or minimally used when distributing demands.

- If distributing 2040 demands to all of a user's permitted wells resulted in less than 0.50 mgd per well, not all wells were used. Increased demands were distributed among existing wells if additional wells were not listed in the water use permit or provided by the utility.
- Many PS utilities have implemented specific wellfield operation strategies to manage water quality changes, including rotating wells, reducing withdrawals, and resting wells for longer periods of time. Because of the regional nature of the WCFM, the model's monthly time increments, and utility-specific operations, these strategies were not simulated in the model.
- CII water users typically do not use the FAS as a source of water; however, within the LWC Planning Area, there are a few permits that allocate water from the UFA. Demands for those permits were set at the current water use permit FAS source allocation, or a ratio was developed based on individual permit facility information to determine the amount of water that would be withdrawn from the FAS. Demands were not projected to increase between the 2014 and 2040 modeled simulations.
- The model does not simulate a gradual annual demand growth as would realistically occur. Simulated demands in 2014 and projected demands in 2040 are withdrawn from the model instantly, starting at stress period 1, and continuing throughout the simulation period. The 2014 base condition simulates aquifer conditions that would occur if the 2014 demands were repeatedly realized every year for the 24-year period of record, with the climatic conditions from 1989 through 2012. The 2040 future condition simulates aquifer conditions that would occur if the projected demands were repeatedly realized every year for the 24-year period of record, with climatic conditions from 1989 through 2012.

Model Scenarios

The WCFM (Giddings et al. 2020) was used to evaluate potential changes in the FAS as a result of projected groundwater withdrawals in the LWC Planning Area. The WCFM simulates the three primary aquifers in the FAS: the UFA, the Avon Park permeable zone (APPZ), and the first permeable zone of the Lower Floridan aquifer. In the LWC Planning Area, the APPZ and the first permeable zone of the Lower Floridan aquifer generally are too saline and not productive, so there currently are no users withdrawing water from these aquifers.

Two scenarios were simulated with the WCFM (**Table D-3**). The 2014 base condition was developed as the basis for comparing the results of the 2040 future simulation. The scenario was developed to represent aquifer conditions that would be expected if the modeled 2014 demands were repeatedly realized over the 24-year period. Modeled groundwater withdrawals for the 2014 base condition represent the pumping required to meet the demands for water as they occurred in 2014 given the rainfall that occurred over the period from 1989 through 2012. The modeled groundwater withdrawals for the 2040 future simulation represent the pumping required to meet the demands for water as they are projected for 2040, given the rainfall that occurred over the period from 1989 through 2012. **Table D-4** summarizes the demands by use type within the LWC Planning Area for the 2014 base condition and 2040 future simulation. The modeled demands in the WCFM are a portion of the total demands for the LWC Planning Area because surface water and groundwater from the SAS and IAS are the primary sources of water for the region, and only a fraction of demands are met from the FAS.

Table D-3. Model scenario descriptions.

Model Run	Description
2014 Base Condition	The WCFM with historical PS use, permitted allocations for CII use, and AFSIRS estimated demands for AG and L/R irrigation.
2040 Future Simulation	The WCFM with planning projections for PS, AG, and L/R irrigation and permitted allocations for CII use.

AFSIRS = Agricultural Field-Scale Irrigation Requirements Simulation; AG = Agriculture;
CII = Commercial/Industrial/Institutional; L/R= Landscape/Recreational; PS = Public Supply WCFM = West Coast Floridan Model.

Table D-4. Simulated water use demands within the LWC Planning Area for the 2014 base condition and 2040 future simulation.

Water Use Type	Simulated Average FAS Withdrawals (mgd)	
	2014 Base Condition	2040 Future Simulation
Public Supply	43.04	108.17
Agriculture	16.56	16.56
Landscape/Recreational*	4.25	4.25
Commercial/Industrial/Institutional	0.02	0.02
Total	**63.87**	**129.00**

FAS = Floridan aquifer system; mgd = million gallons per day.
*Includes water used for golf courses.

The western portion of the LWC Planning Area has predominantly PS wells, with some golf course and landscape irrigation wells within Lee and Collier counties. All PS wells in the planning area are completed in the UFA, which generally is productive and has better water quality north of Collier County.

Model Scenario Results

The simulation results are presented in three ways: 1) changes to water levels between simulations; 2) changes in water quality, including horizontal or vertical movement (upconing) of poorer quality water within or between aquifers; and 3) an evaluation of changes in horizontal flow direction and magnitude within a single aquifer layer. Potential areas of concern were identified based on groundwater level drawdown and water quality degradation between the 2014 base condition and 2040 future simulation. The results discussion is focused on the area of interest simulated by the WCFM for the LWC Planning Area, primarily Lee and Collier counties where demands are largest. When reviewing the graphics in this section, the UFA maps show PS wells as green circles for the 2014 base condition and pink circles for the 2040 future simulation. **Tables D-5** and **D-6** describe the range of values from the model results and identifies users in the areas where the lowest simulated water levels and highest total dissolved solids concentrations were observed.

Table D-5. Summary of West Coast Floridan Model results for water levels and water quality, 2014 and 2040 simulations of the Upper Floridan aquifer.

Upper Floridan Aquifer			
Parameter	Range of Values	Value for Identifying Affected Users	Affected Users
2040 - 2014			
Water Level	-10 to -68 ft	36 ft	Cape Coral South
		26 ft	Fort Myers
		68 ft	Pinewoods (Lee County)
		12 ft	Collier County North
		11 ft	Collier County NERWTP
TDS	<200 to 1,850 mg/L	200 to 500 mg/L	Cape Coral South
		200 to 500 mg/L	Fort Myers
		200 to 1,000 mg/L	Pinewoods (Lee County)
		1,850 mg/L	Bonita Springs
		200 to 700 mg/L	Green Meadows (Lee County)
2040			
Water Level	<-10 to +50	-10 to -20 ft	Cape Coral South
		-10 to -20 ft	Fort Myers
TDS	500 to 30,000 mg/L	500 to 3,000 mg/L	Most
		5,000 to 6,000 mg/L	Bonita Springs
2014			
Water Level	<-10 to +50	10 to 20 ft	Cape Coral South
		10 to 20 ft	Fort Myers
TDS	500 to 30,000 mg/L	500 to 3,000 mg/L	All

ft = foot; mg/L = milligrams per liter; NERWTP = Northeast Regional Water Treatment Plant; TDS = total dissolved solids.

Table D-6. Summary of West Coast Floridan Model results for water levels and water quality, 2014 and 2040 simulations of the Avon Park permeable zone.

Avon Park Permeable Zone			
Parameter	Range of Values	Value for Identifying Affected Users	Affected Users
2040 - 2014			
Water Level	-20 to +50 ft	<17 ft	Cape Coral South
		+7 ft	Fort Myers
TDS	-750 to 1,000 mg/L	500 to 1,000 mg/L	Green Meadows (Lee County)
2040			
Water Level	-20 to +50 ft	<-41 ft	Cape Coral South
		<-19 ft	Fort Myers
TDS	<3,000 to >30,000 mg/L	None	None
2014			
Water Level	-20 to +50 ft	<-24 ft	Cape Coral South
		<-26 ft	Fort Myers
TDS	<3,000 to >30,000 mg/L	None	None

ft = foot; mg/L = milligrams per liter; TDS = total dissolved solids.

Water Level Variations

Figures D-20 and **D-21** show the spatial distribution of water levels in the UFA for the 2014 and 2040 model runs, respectively. The spatial distribution of UFA water level differences between the 2014 base condition and 2040 future simulation is shown in **Figure D-22**. Although water level changes are mostly related to differences in withdrawal quantities, some are due to changes in the locations of withdrawal points and distribution of demands within individual utility wellfields. Changes in water levels compare the final condition (stress period 288, representing December 2012) of the 2040 future simulation minus the final condition of the 2014 base condition.

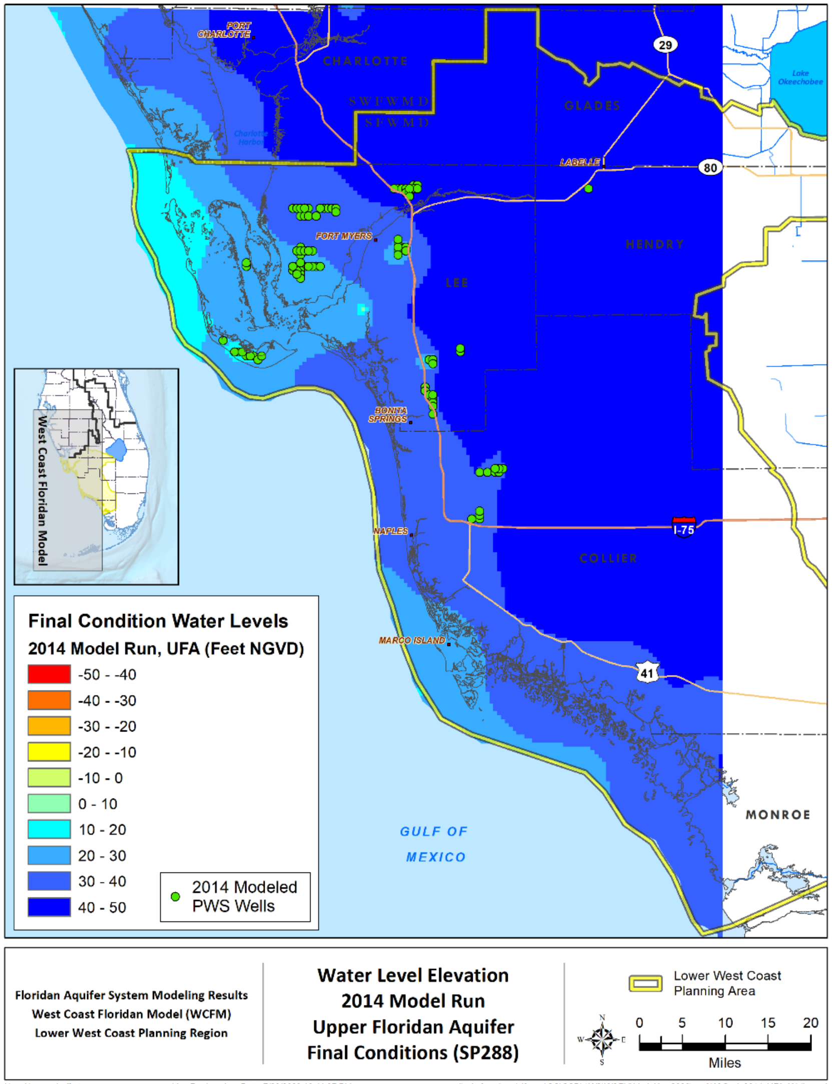


Figure D-20. Upper Floridan aquifer water levels for the final condition of the 2014 model run.

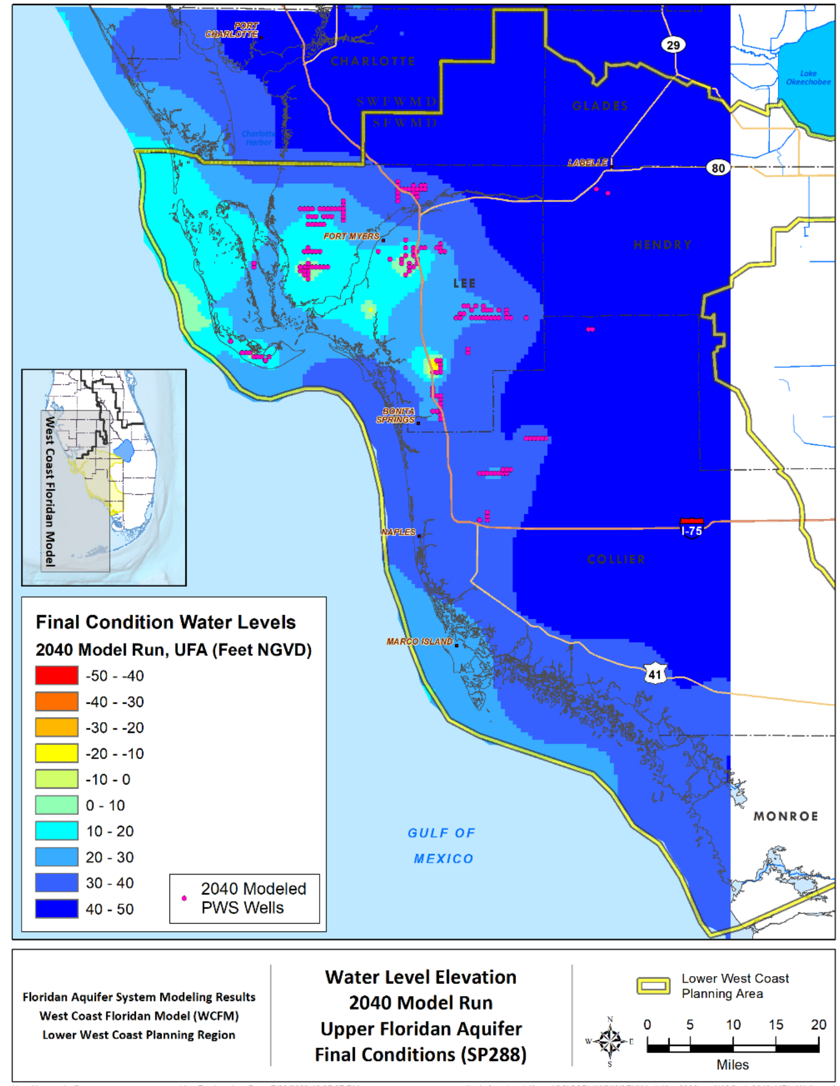


Figure D-21. Upper Floridan aquifer water levels for the final condition of the 2040 model run.

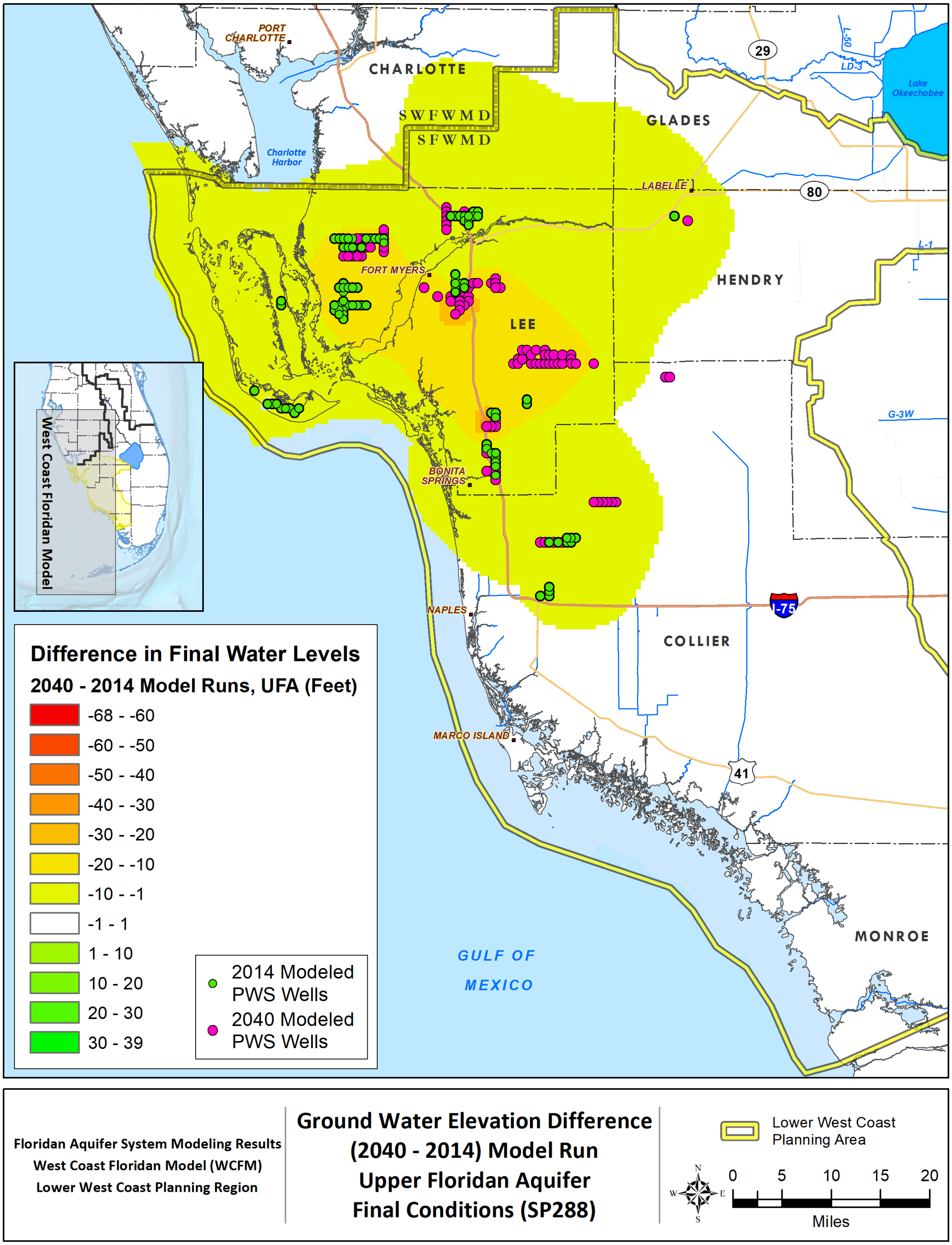


Figure D-22. Upper Floridan aquifer water level differences between 2014 and 2040.

Figures D-23 and **D-24** show the spatial distribution of water levels in the APPZ for the 2014 and 2040 model runs, respectively. Across the LWC Planning Area, APPZ water levels typically are between -20 and +50 feet of head, with some localized low areas around large wellfields. **Figure D-25** shows the APPZ water level differences between the 2040 future simulation and 2014 base condition. In **Figure D-25**, differences in yellow and red colors represent a drawdown effect, with water levels in 2040 being lower than the water level in the 2014 base condition. Differences shown in green represent an increase in water level for the 2040 final condition compared to the 2014 final condition. There is less than 10 feet of additional drawdown between the two model scenarios. Two main areas have apparent increases in additional drawdowns: Cape Coral South wellfield and Fort Myers wellfield. Both areas of increased drawdown are a direct result of the significant increase in pumping from the overlying UFA. Near the Cape Coral wellfield, the 2014 final condition water level is -17 feet of head, and the 2040 final condition water level is -41 feet of head, resulting in -24 feet of additional drawdown. The water level difference in the Fort Myers wellfield is 26 feet of additional drawdown, with water levels going from +7 feet of head in 2014 to -19 feet of head in 2040.

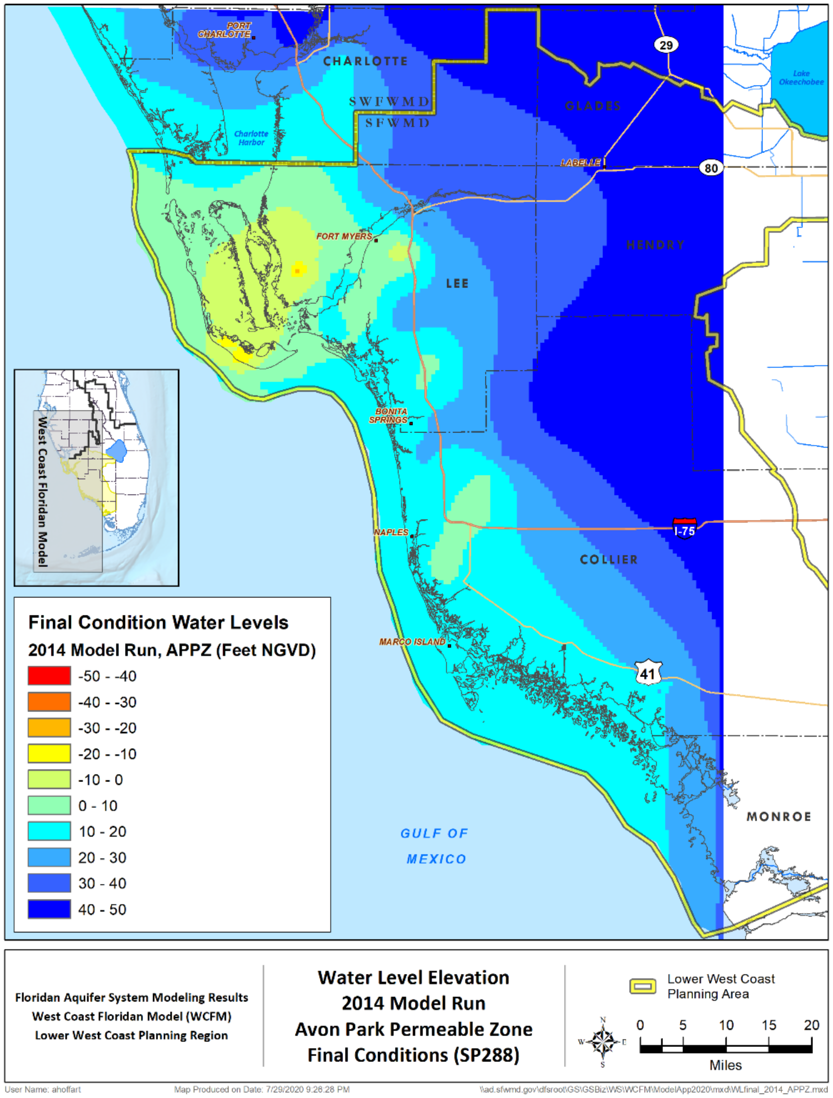


Figure D-23. Avon Park permeable zone water levels for the final condition of the 2014 model run.

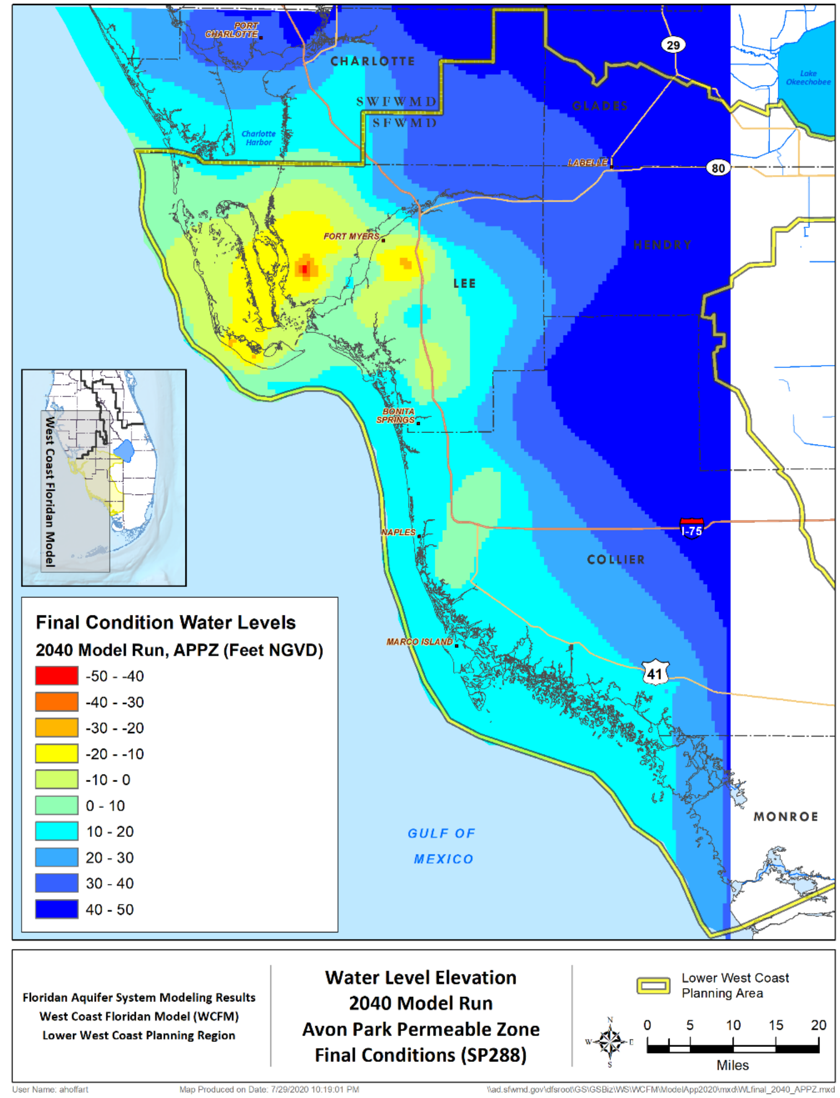


Figure D-24. Avon Park permeable zone water levels for the final condition of the 2040 model run.

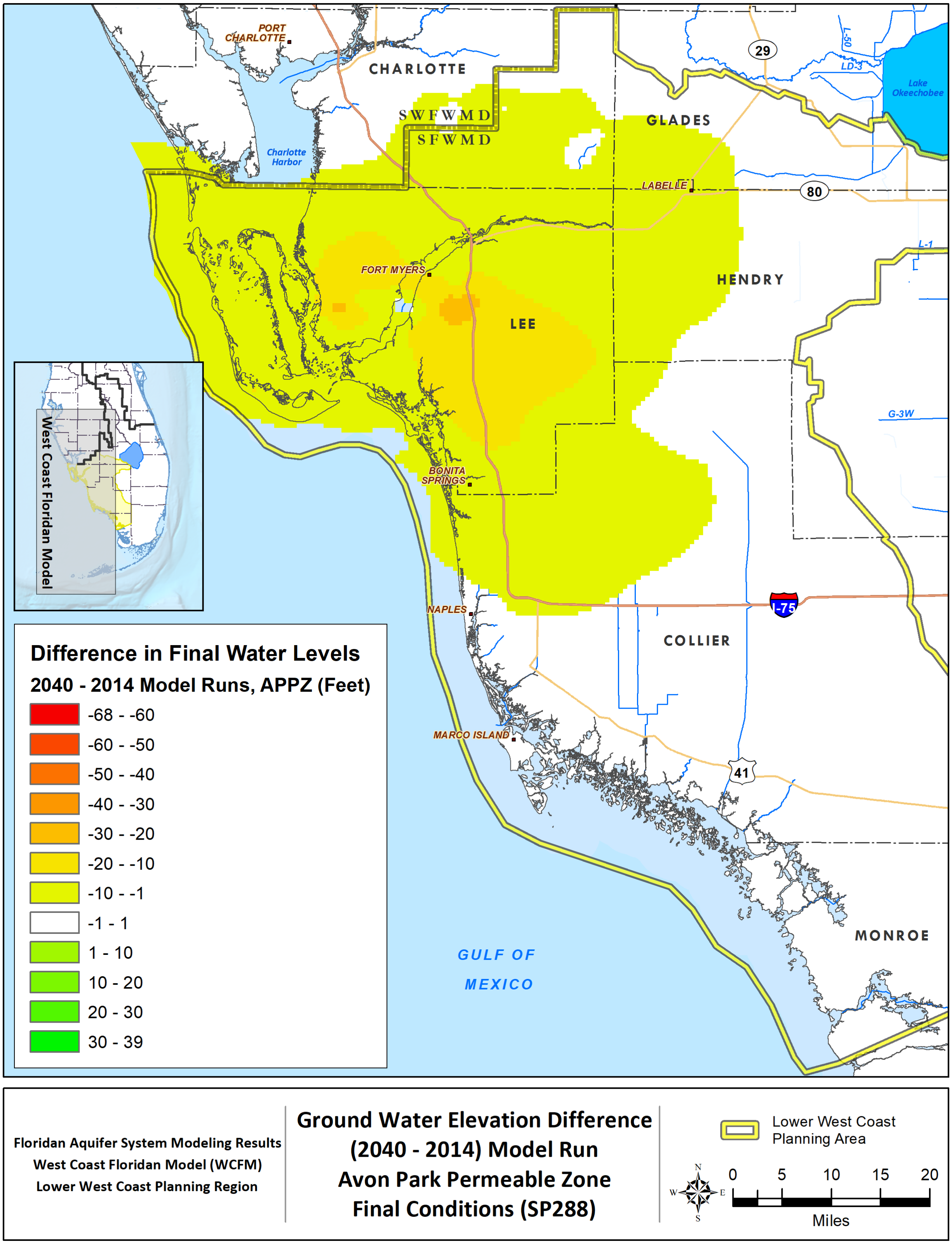


Figure D-25. Avon Park permeable zone water level differences between 2014 and 2040.

Water Quality Variations

Figures D-26 and **D-27** show the spatial distribution of UFA water quality (represented by total dissolved solids concentrations) for the 2014 and 2040 model runs, respectively. Across the LWC Planning Area, total dissolved solids concentrations in the UFA vary between 500 and 30,000 mg/L (in coastal areas). The spatial distribution of UFA water quality differences for the 2014 base condition and 2040 future simulation is shown in **Figure D-28**. PS wells that were simulated in the WCFM are shown in green for the 2014 base condition and in pink for the 2040 future simulation. In general, the simulated total dissolved solids concentrations remain steady throughout the model domain, except in Lee County where there are slight increases associated with the projected 2040 demands. Changes in water quality compare the final condition (stress period 288, representing December 2012) of 2040 to the final condition of 2014. As a reminder, the future condition assumes pumping the full 2040 demands continuously for 24 years. Differences in gray and purple colors represent a degradation in water quality, with total dissolved solids concentrations in 2040 being higher than in 2014. Differences shown in green represent improvements in water quality for the 2040 final condition compared to the 2014 final condition. Water quality changes of less than 200 mg/L were predicted in most counties, suggesting no major issues with water quality for the planning area, even with the significant increase in demand.

Figure D-28 shows the UFA water quality difference between the 2040 final condition and the 2014 final condition. Overall, there is very little change in total dissolved solids concentrations across the LWC Planning Area. There is one area of noticeable water quality degradation around the Bonita Springs wellfield, and there are several areas of slight water quality degradation near all Lee County Utilities wellfields, Island Water Association wellfield, and Cape Coral wellfield. Bonita Springs is close to the saltwater interface along the west coast of Florida, and just north of the Collier-Lee County line, where water quality in the UFA starts to noticeably degrade. With an increase in demand of 5.1 mgd from 2014 to 2040, there is a potential for lateral flow of water from the coast towards the wellfield and lateral movement of water from northern Collier County towards the wellfield. This results in a water quality degradation maximum of 1,800 mg/L within the vicinity of the wellfield. Water quality degradation near the Lee County Utilities Pinewoods wellfield is between 200 and 1,000 mg/L and is a result of the significant increase in demand, which almost triples from 2014 to 2040. Water quality degradation near the Lee County Utilities Green Meadows wellfield is between 200 and 700 mg/L and is a result of the new wellfield coming online in the 2040 future simulation with an average demand of 12.7 mgd. Water quality degradation within the Cape Coral and Fort Myers wellfields are on the order of 200 to 500 mg/L, which is a result of the increase in water use in these areas.

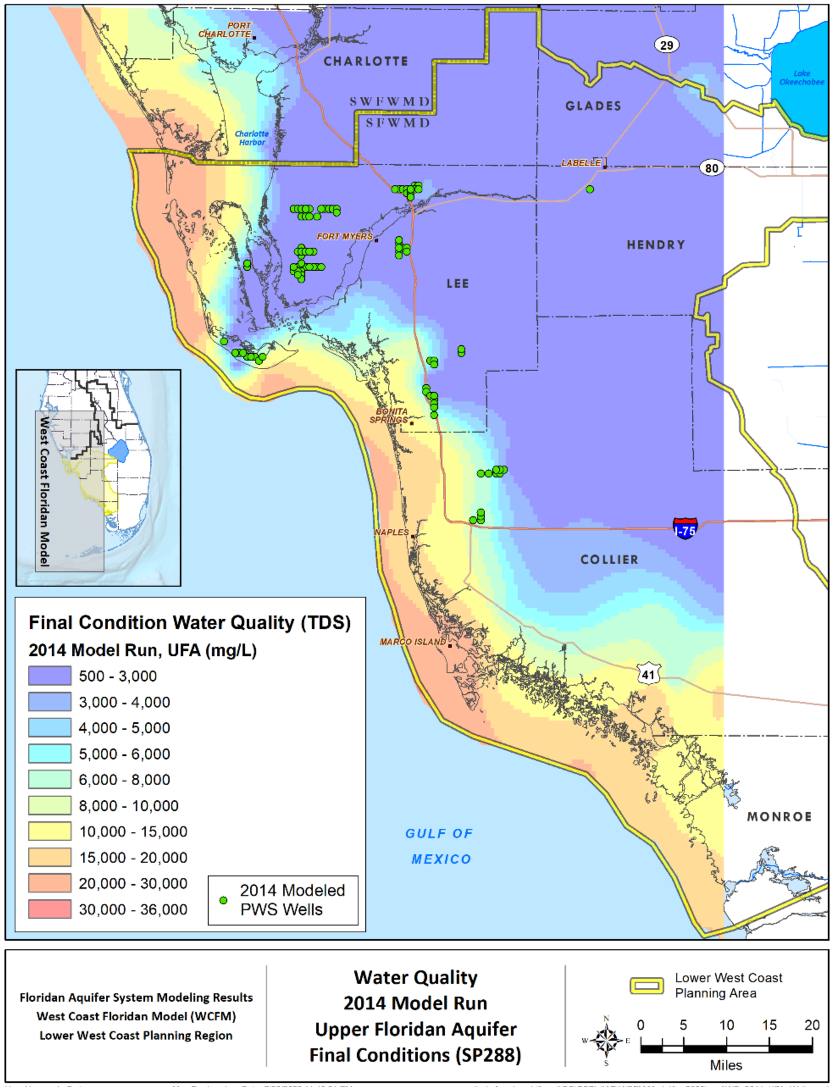


Figure D-26. Upper Floridan aquifer water quality (total dissolved solids concentrations) for the final condition of the 2014 model run.

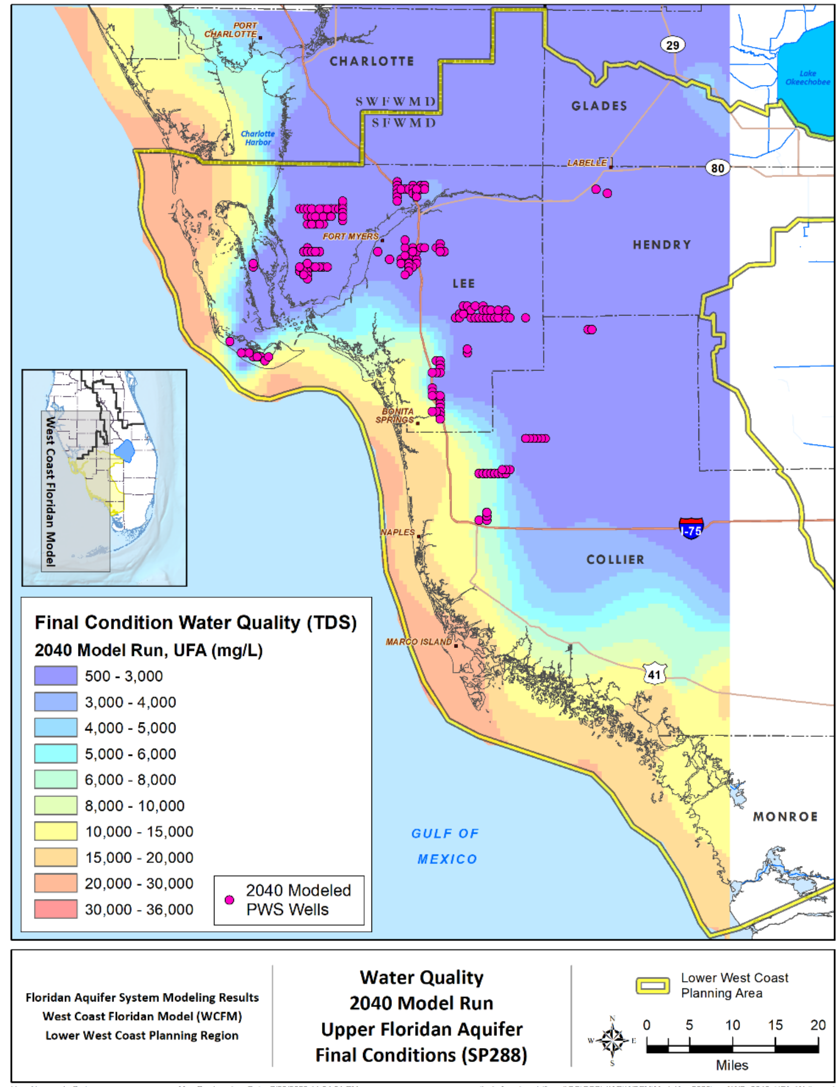


Figure D-27. Upper Floridan aquifer water quality (total dissolved solids concentrations) for the final condition of the 2040 model run.

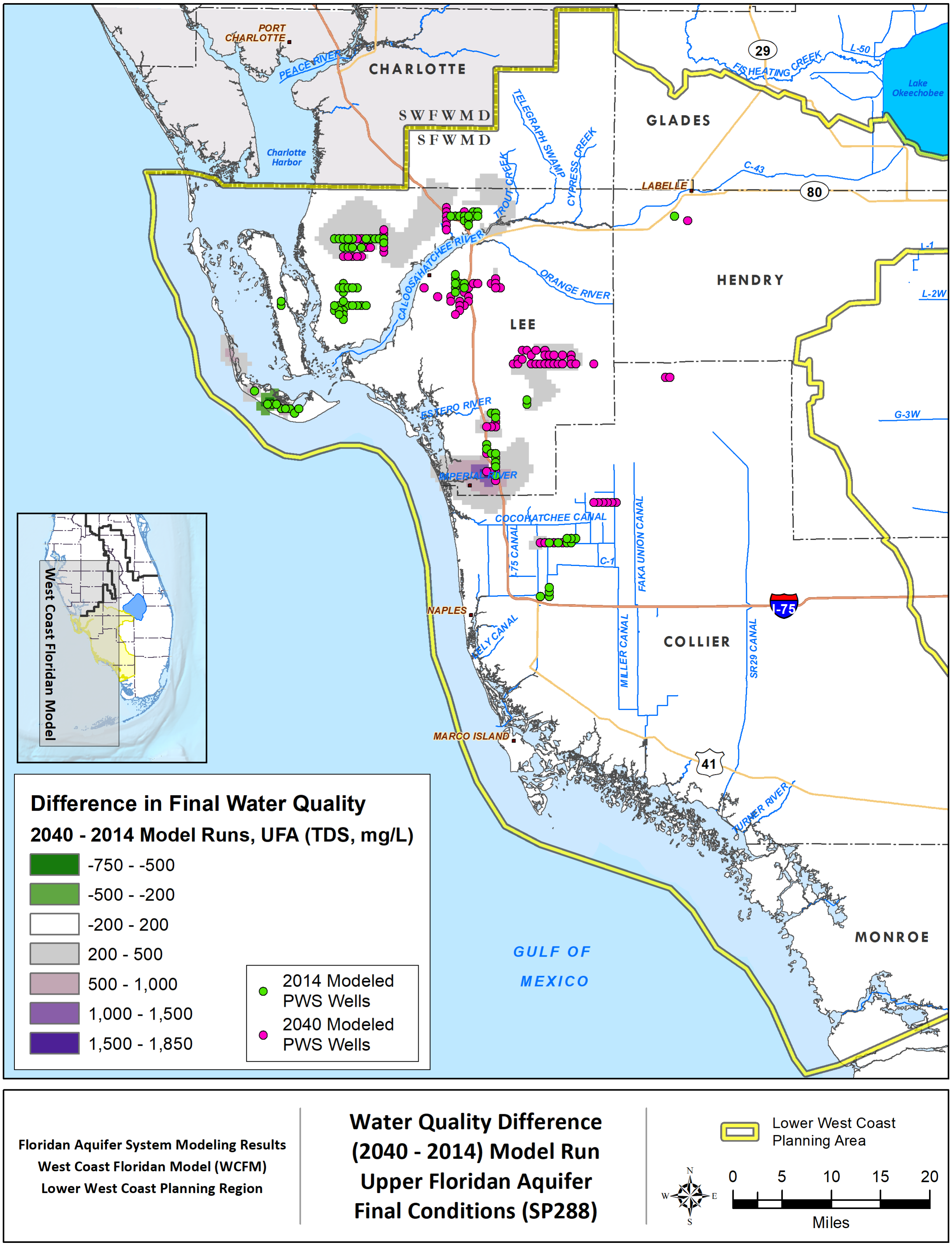


Figure D-28. Upper Floridan aquifer water quality (total dissolved solids concentration) difference between 2014 and 2040.

Figures D-29 and **D-30** show the spatial distribution of APPZ water quality for the 2014 and 2040 model runs, respectively. Across the LWC Planning Area, total dissolved solids concentrations in the APPZ vary between less than 3,000 mg/L in northeastern Collier County to more than 30,000 mg/L near the coast. **Figure D-31** shows the APPZ water quality difference between the 2040 final condition and 2014 final condition. Overall, there is very little difference in total dissolved solids concentrations across the LWC Planning Area, largely because no PS wellfields withdraw from the APPZ. There is one area of noticeable water quality degradation near Lee County Utilities new Green Meadows wellfield, and there are three areas of slight water quality improvement: east of Lee County Utilities Pinewoods wellfield and on either side of Lee County Utilities North wellfield. The area of water quality degradation is a direct result of the new Green Meadows wellfield coming online in the 2040 future simulation. Although the demand will be met with water from UFA wells, water quality degradation is seen in the APPZ due to an increase in lateral flow from the south. The area south of the Green Meadows wellfield has slightly higher total dissolved solids concentrations, resulting in a maximum water quality degradation of 1,000 mg/L. Water quality improvement near the Pinewoods wellfield, on the order of 300 to 600 mg/L, is a result of lateral flow in the APPZ from the east, where there is noticeably fresher water. Water quality improvement east and west of Lee County Utilities North wellfield is on the order of 200 to 500 mg/L and is a result of lateral water movement from the northern portion of the model domain, which is the known FAS recharge area for the LWC Planning Area and has significantly fresher water.

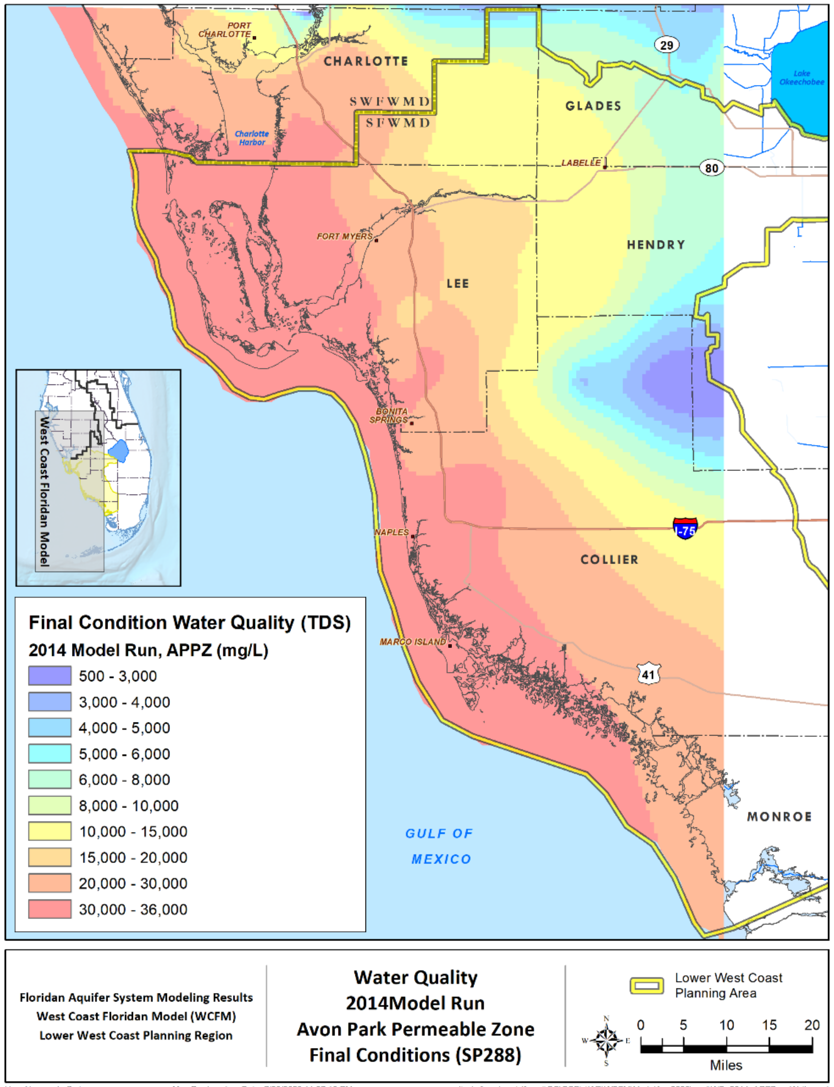


Figure D-29. Avon Park permeable zone water quality (total dissolved solids concentrations) for the final condition of the 2014 model run.

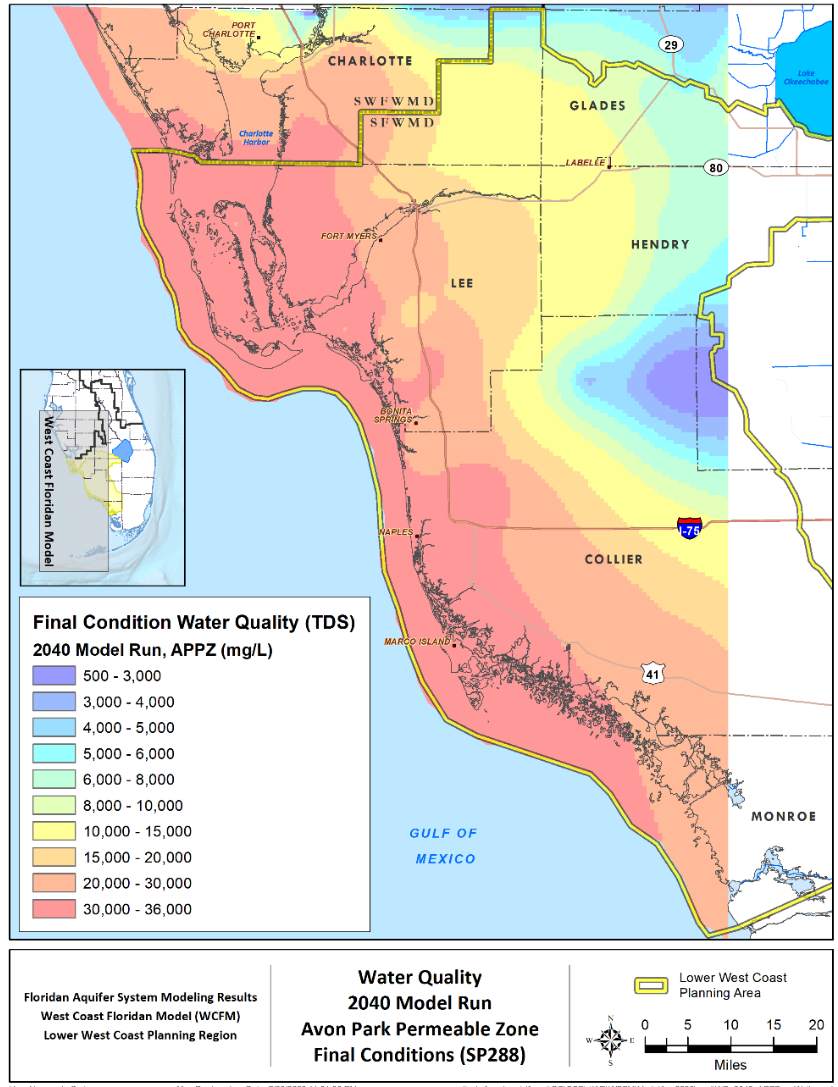


Figure D-30. Avon Park permeable zone water quality (total dissolved solids concentrations) for the final condition of the 2040 model run.

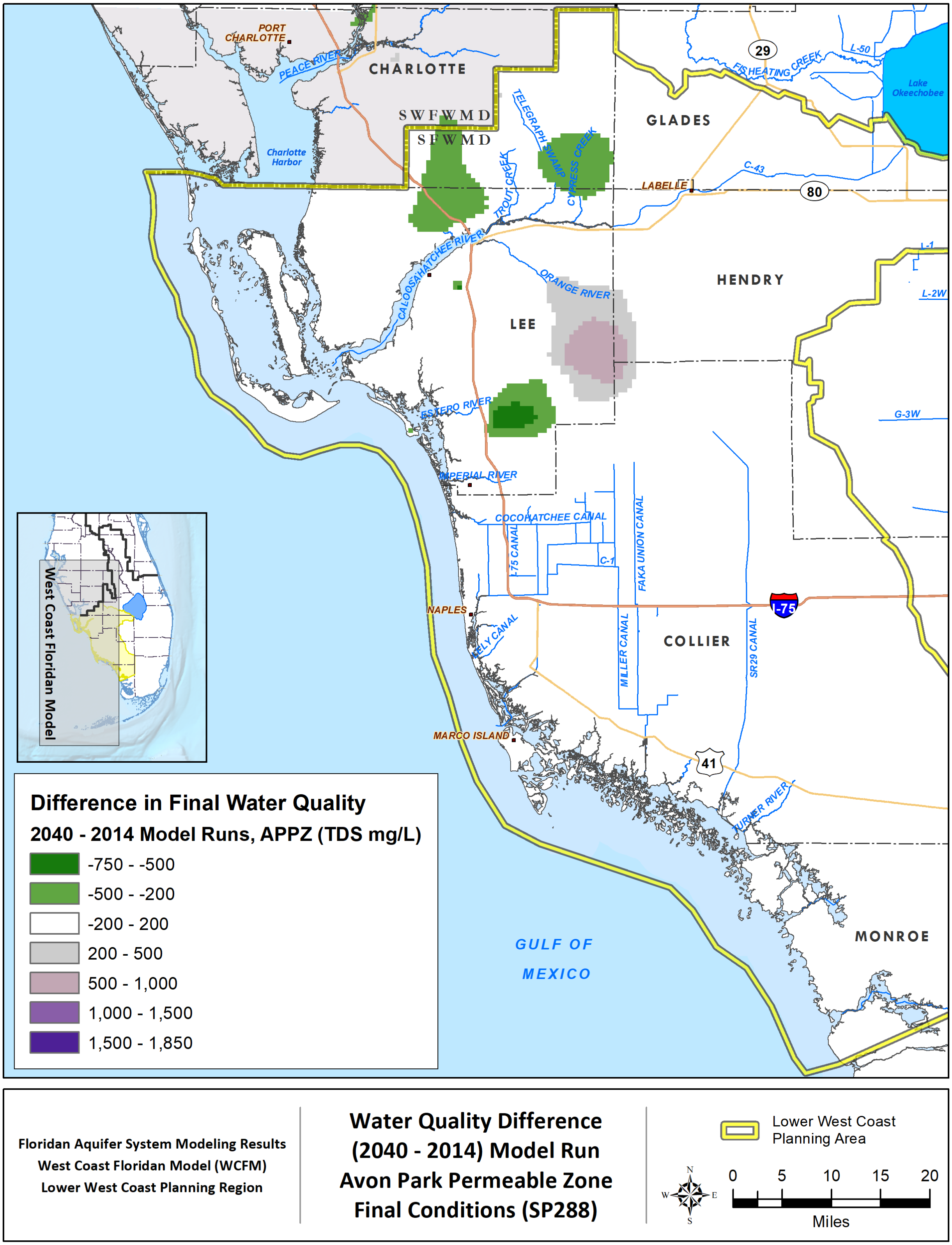


Figure D-31. Avon Park permeable zone water quality (total dissolved solids concentration) difference between 2014 and 2040.

Flow Vectors

Horizontal flow vectors show the magnitude and direction of lateral flow for the final condition (stress period 288, which represents December 2012) for the 2014 and 2040 simulations. A side-by-side comparison of the flow vectors is necessary to understand changes in the magnitude and direction of flow resulting from the difference in water use demand and wellfield expansions. The horizontal flow vectors shown in **Figures D-32** to **D-35** represent a resampling of five model cells by five model cells, and the vectors represent the average conditions for the specific grouping of those 25 cells. **Figures D-32** and **D-34** show the resampled horizontal flow vectors for the 2014 base condition in the UFA and APPZ, respectively, and **Figures D-33** and **D-35** show the resampled horizontal flow vectors for the 2040 future simulation in the UFA and APPZ, respectively. As illustrated in each figure, water moves into the model domain from the northern recharge area located along the Lake Wales Ridge and the potentiometric high in Polk County, which provide the only FAS recharge in South Florida. Overall, the flow pattern in the graphics has a general northeast to southwest flow, as expected based on historical, regional potentiometric water levels (Meyer 1989, Miller 1990).

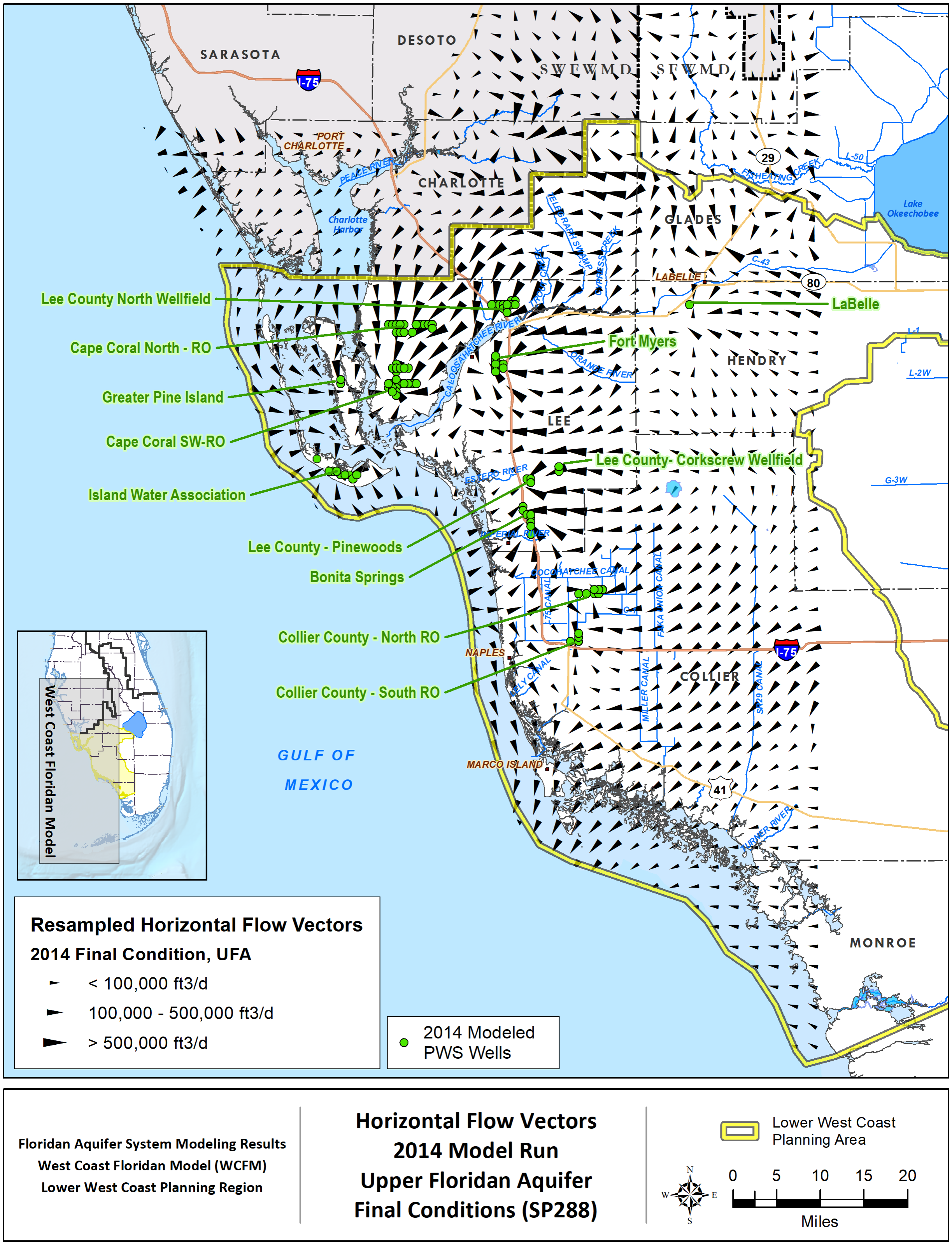
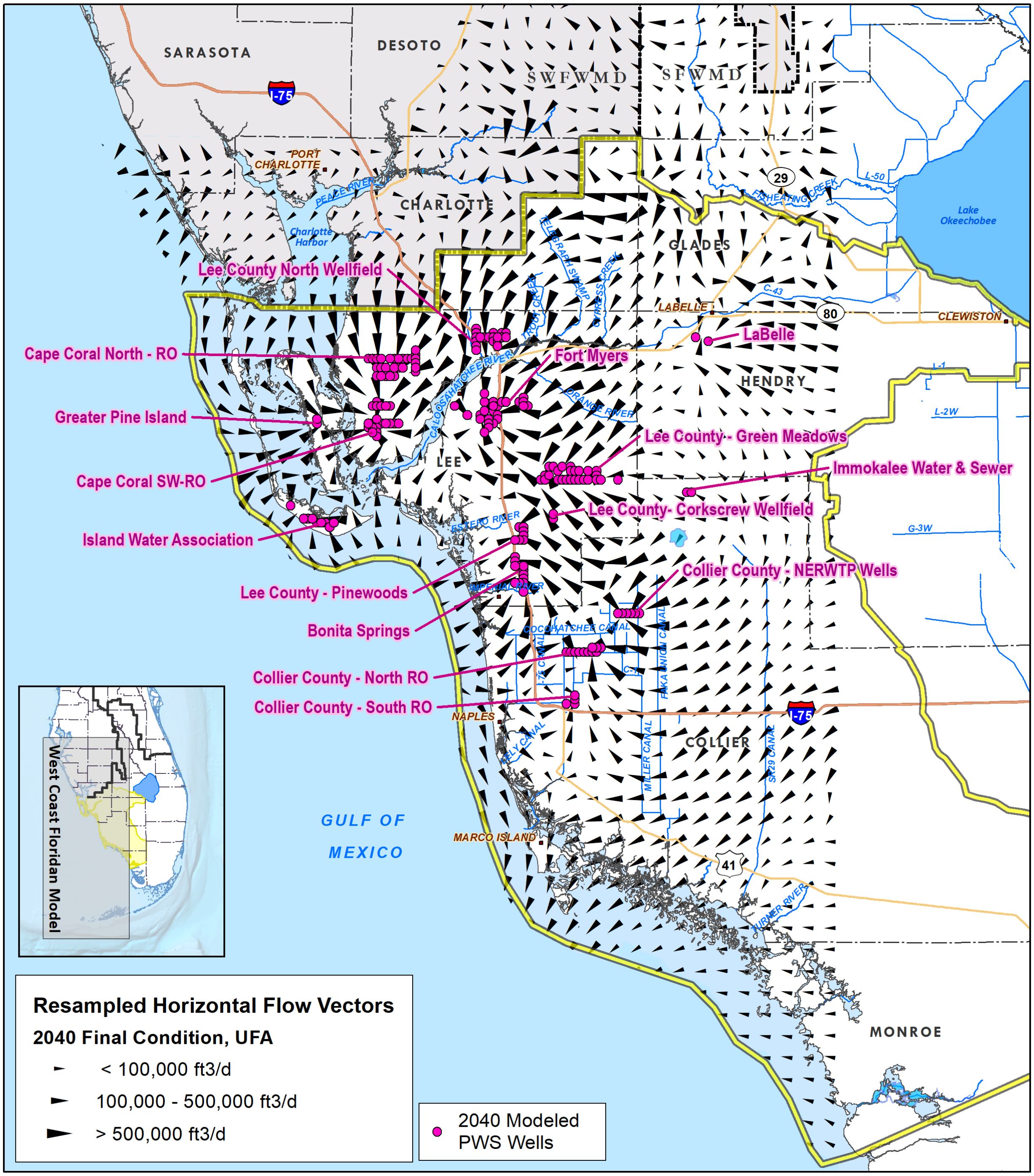


Figure D-32. Resampled horizontal flow vectors for the final condition of the 2014 model simulation in the Upper Floridan aquifer.



Floridan Aquifer System Modeling Results
West Coast Floridan Model (WCFM)
Lower West Coast Planning Region

Horizontal Flow Vectors
2040 Model Run
Upper Floridan Aquifer
Final Conditions (SP288)

Lower West Coast Planning Area

0 5 10 15 20
Miles

User Name: ahoffart Map Produced on Date: 10/15/2020 5:35:22 PM \\ad.sfwmd.gov\dfsroot\GS\GSBiz\WS\WCFM\ModelApp2020\mxd\20201015_HFV_2040_UFA_welllabels.mxd

Figure D-33. Resampled horizontal flow vectors for the final condition of the 2040 model simulation in the Upper Floridan aquifer.

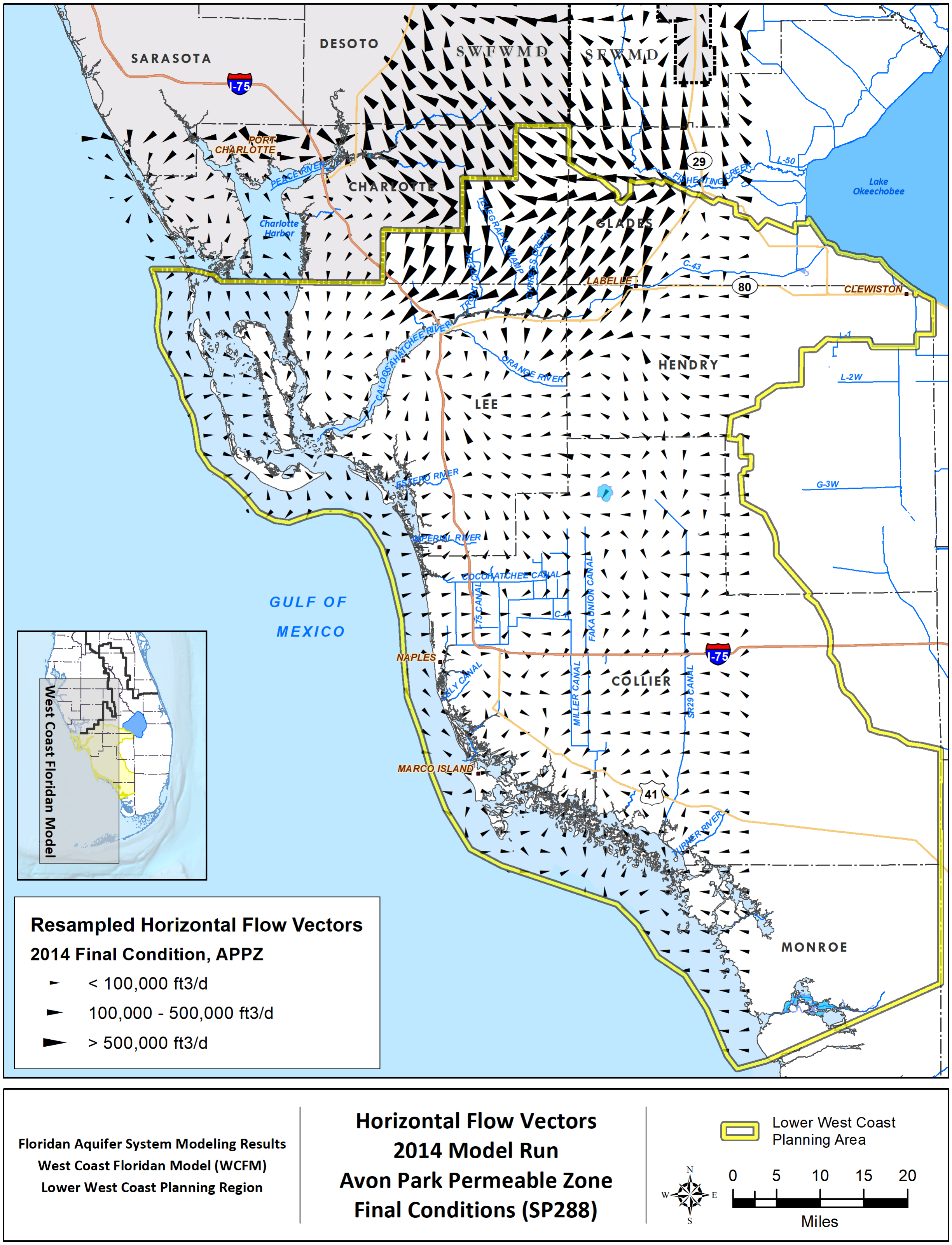


Figure D-34. Resampled horizontal flow vectors for the final condition of the 2014 model simulation in the Avon Park permeable zone.

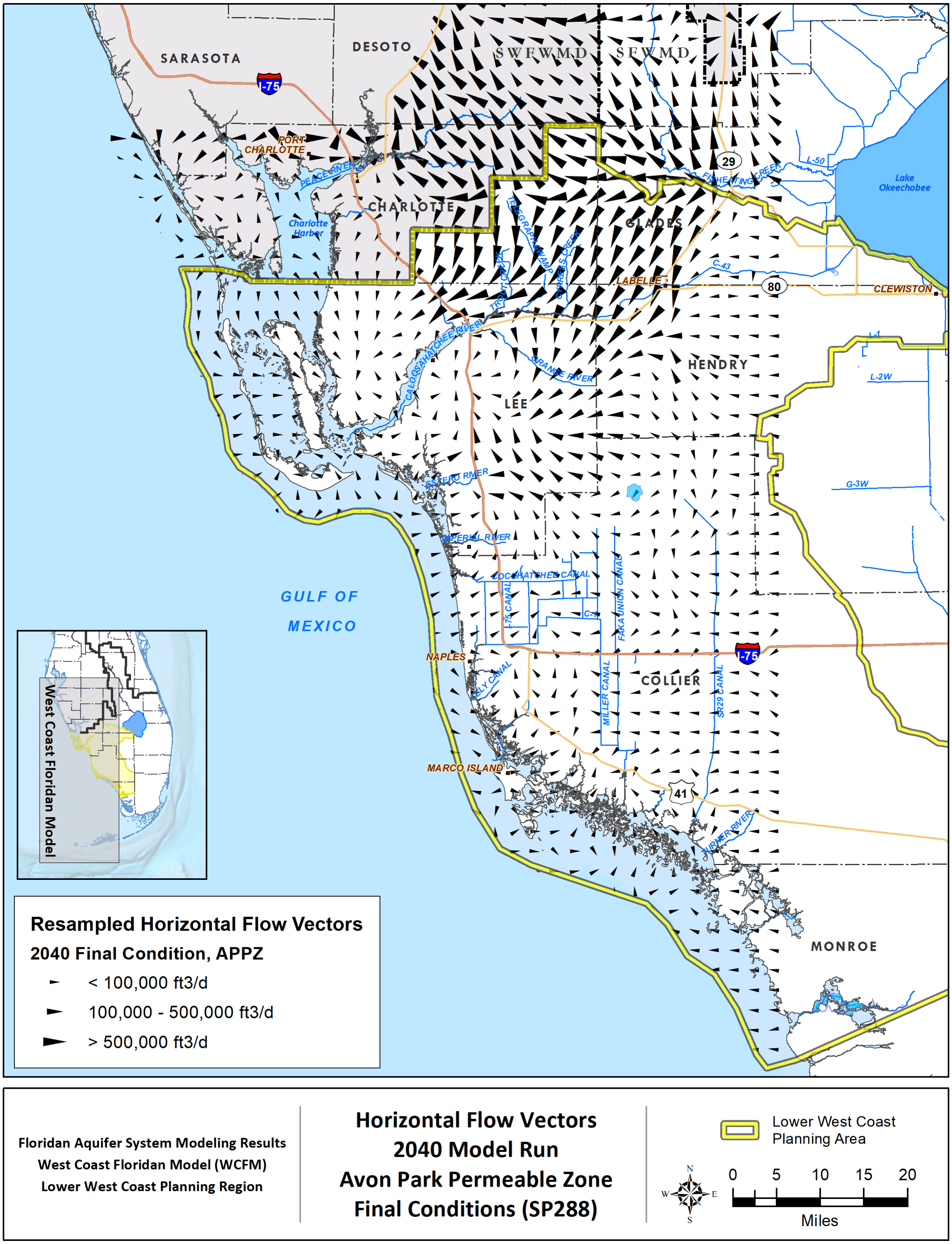


Figure D-35. Resampled horizontal flow vectors for the final condition of the 2040 model simulation in the Avon Park permeable zone.

Analysis of Results

The WCFM results presented herein must be considered in the proper context. First, these are planning-level evaluations. Second, the model is regional in nature, extending from Central Florida to mainland Monroe County, with a model cell size of 2,400 feet by 2,400 feet. Third, the model simulates continuous pumping for 26 years of 2014 and 2040 demands, but withdrawals realistically would increase gradually over time; therefore, simulations herein are conservative in nature. Fourth, the regional nature of the model limits the ability to account for specific wellfield operations used by utilities to mitigate water quality degradation observed at individual wells. For those reasons, the model results should be used as indicators of where potential problems could be experienced if no wellfield design or operational plan is implemented to minimize movement of poor-quality water. Despite these limitations, the WCFM results indicate 2040 demands in the LWC Planning Area can be met.

Analysis of the WCFM results indicates the following:

- In both the UFA and APPZ, water levels generally declined 1 to 10 feet between the 2014 and 2040 scenarios near areas of future increases in pumping withdrawals.
- The largest projected difference in UFA water level (approximately 68 feet of drawdown) between the 2014 and 2040 scenarios was observed at the Lee County Utilities Pinewoods wellfield. The 2040 demand at this location is projected to be 3.91 mgd, entirely from the UFA. The Fort Myers wellfield has maximum additional drawdown of approximately 26 feet. This most likely is attributed to the 8.56 mgd increase in PS demands from 2014 to 2040. The head differences at the Cape Coral South wellfield are a direct result of the close proximity of the wells to each other, with multiple wells occurring in a single model cell. Additionally, the wellfield demand doubles between 2014 and 2040, which puts additional stress on the aquifer.
- Changes in APPZ water levels are due to withdrawals from the overlying UFA. Where APPZ water levels decline near UFA withdrawals, upward movement of poor-quality water from below is predicted. The degree of confinement between the UFA and APPZ is relatively low, as shown in simulated drawdowns and water quality changes.
- In general, the areas with the largest water quality changes in the UFA and APPZ are the areas with the largest withdrawals and water level declines, which result in upconing of poor-quality water from underlying aquifer layers.
- There are minimal (< 200 mg/L total dissolved solids) to no change in water quality in the UFA throughout most of the model domain between 2014 and 2040. The most notable increase in total dissolved solids concentration (1,850 mg/L) between 2014 and 2040 was at the Bonita Springs wellfield.
- Water quality degradation near the Bonita Springs wellfield is a result of lateral saltwater intrusion from the west (i.e., the Gulf of Mexico) and lateral water movement from northern Collier County, which has a higher salinity than water in Bonita Springs. This conclusion is supported by analysis of the velocity vector maps. Spatial expansion of the wellfield towards the northeast, farther from the coast and Collier County, should be considered.

- On a local scale, spatial expansion of wellfields in Fort Myers and Cape Coral, combined with the lateral recharge from the northeast, tended to minimize potential drawdown impacts despite a significant increase in demands. Expansion of the spatial extent of the wellfields (i.e., spreading out withdrawals with an increased number of wells over a larger footprint) also minimized potential water quality degradation.
- Although there are localized areas of noticeable drawdowns and water quality degradation, based on planning projections, with wellfield management, the 2040 model results do not indicate a significant adverse impact to groundwater levels or water quality, which indicates that prolonged use of the FAS is sustainable for the 20-year planning horizon.

Conclusions

Numerical modeling was conducted using the WCFM to simulate the 2014 and projected 2040 FAS demands to provide analysis of this alternative water supply source and support water supply planning in the LWC Planning Area. Review and analysis of water levels, water quality (represented by total dissolved solids concentrations), and flow vectors showed the WCFM is performing as expected, given the current understanding of water demands and the regional groundwater system.

Historical chloride data and the WCFM results indicate that properly designed and managed wellfields appear able to meet projected FAS demands through 2040 in the LWC Planning Area. The planning-level WCFM simulations and analyses are considered conservative and provide insight to potential water level and water quality changes that may occur in the FAS over time if no wellfield design and operations plans are implemented to minimize movement of poor-quality water. The model results identified some potential issues that may require further evaluation. The FAS will continue to provide a substantial and increasing portion of water needed to meet 2040 demands. Water quality should be adequate to meet drinking water standards for all users utilizing reverse osmosis treatment.

Several FAS wellfields in the LWC Planning Area have experienced some water quality degradation, but current operations have shown this can be managed through appropriate wellfield operating protocols and treatment plant design. A list of FAS wellfield management activities is provided in **Chapter 6**. In addition, monitor wells can provide early warning of the need for changes to wellfield operations to minimize upconing or lateral movement of poor-quality water.

Next Steps

The assumptions used in the WCFM and the potential issues that require further evaluation should be assessed through a coordinated effort with PS utilities and other stakeholders considering the use of the FAS. The following suggestions are provided to guide future efforts to ensure long-term sustainability of the water resource.

FAS users should consider the following guidance:

- Implement wellfield designs and operations that increase the sustainability of the FAS (e.g., additional wells with greater spacing between them, reduced pumping from each well to minimize upconing of poor-quality water).

- Continue to refine wellfield operational plans and communicate these refinements to the SFWMD for incorporation into future WCFM update efforts.
- Coordinate FAS drilling and testing programs with SFWMD staff prior to drilling to maximize collection of mutually beneficial data.

The SFWMD will

- Continue to coordinate with PS utilities to facilitate long-term management of the FAS.
- Incorporate additional well construction, aquifer test, lithologic, water level, water quality, and other data into the WCFM from monitor wells, water supply wells, and deep injection wells. Packer test results from confining layers would enhance the WCFM's representation of confining layers.
- Evaluate the effects of water quality degradation on the sustainability of the FAS for existing legal uses. Considerations may include water quality thresholds for membrane treatment processes, treatment costs, clarification of impact criteria, monitoring guidelines, potential for conflicts with other regulatory programs, and if warranted, regulatory strategies to maintain the long-term viability of the FAS as a water supply source.

CLIMATE CHANGE AND SEA LEVEL RISE

Observed Effects

The combination of sea level rise, changes in temperature, rainfall patterns, and tropical storm activity is altering how the District achieves its mission elements to safeguard and restore South Florida's water resources and ecosystems, protect communities from flooding, and meet the region's water needs. The District's resiliency approach focuses on 1) understanding the impacts climate change may have on water resources and future water supply sources, and 2) determining how to respond based upon best available science while achieving the agency's mission elements through planning, proactive action, and adaptive management.

Air Temperature Rise, Precipitation Regimes, and Storm Frequency

Current predictions, from multiple climate models summarized by the Intergovernmental Panel on Climate Change (IPCC 2021), state that global temperatures are expected to reach or exceed 1.5°C of warming at a minimum by 2040. Warmer air temperatures will increase evaporation, resulting in lower surface water levels (e.g., in lakes, canals, rivers), increased irrigation demands, and impacts to stormwater runoff, soil moisture, groundwater recharge, and water quality. Additionally, increased air temperatures contribute to sea level rise through thermal expansion of ocean waters and through glacial melt releasing large volumes of water into the oceans.

According to a National Oceanic and Atmospheric Administration (NOAA) technical report (Sweet et al. 2018), the average daily maximum temperature for Collier County is projected to increase from 86.8°F during the 2020s to 88.4°F in 2040 and 89.2°F in 2050 at the high end and at the low end to 87.7°F in 2040 and 88.1°F in 2050. (**Figure 36**). The figure is generated from a climate toolkit developed by an interagency team, including NOAA, National Aeronautics and Space Administration (NASA), United States Environmental Protection Agency (USEPA), USGS, United States Bureau of Reclamation (USBR), National Environmental Modeling and Analysis Center (NEMAC), and United States Global Change Research Program (USGCRP).

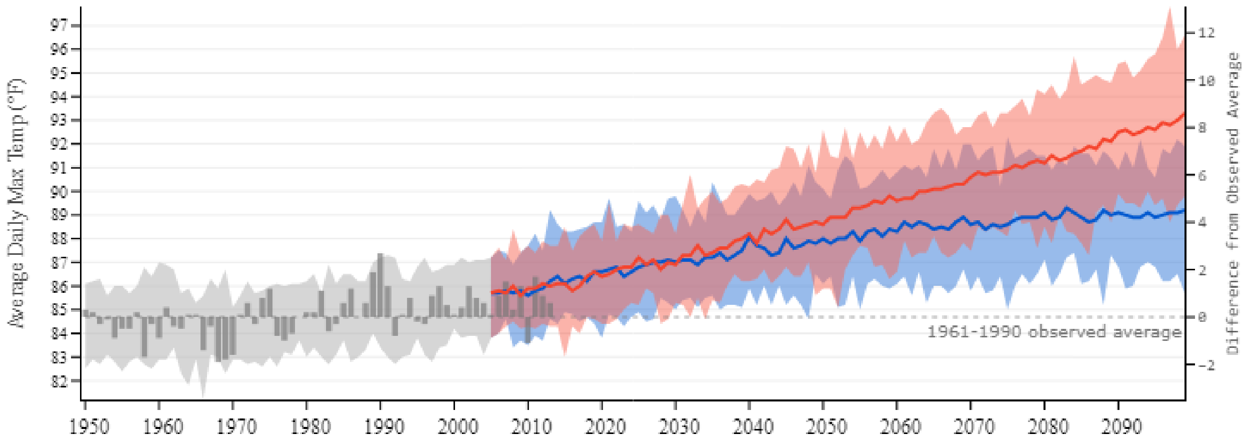


Figure D-36. Projected average daily maximum temperature in Collier County (Data from NOAA, NASA, USEPA, USGS, USBR, NEMAC, and USGCRP 2021; Sweet et al. 2018).

In 2021, the District conducted an initiative to implement a set of water and climate resilience metrics districtwide. These science-based metrics are being developed with the goal of tracking and documenting shifts and trends in District-managed water and climate observed data, supporting the assessment of current and future climate condition scenarios and related operational decisions, and informing District resiliency investment priorities.

More frequent, intense rainfall events with longer interim dry periods could increase total annual rainfall but decrease effective rainfall (i.e., aquifer recharge) as more water may be lost to runoff, prompting the need for storage alternatives. In addition, longer interim dry periods could increase the need for supplemental irrigation of agricultural crops and landscaped areas. Global Climate Models and downscaling datasets available for Florida currently have relatively high uncertainties on estimating future rainfall. A collaboration effort between the SFWMD, Florida International University, and the USGS is under way to estimate future rainfall conditions, intensity-duration-frequency scenarios, rainfall probability analyses, and extreme weather events projections based on available datasets. An ensemble method is being applied to determine median change factors as well as variability (model spread) at each National Oceanic and Atmospheric Administration Atlas station, of which two are located in the LWC Pl anning Area (Fort Myers and Naples). Results will 1) help the District manage drainage and water supply protection infrastructure by providing an evaluation of predicted rainfall and runoff, and 2) lead to more accurate simulations of effects of rainfall extremes and other meteorologic factors. A final report of the results is expected in September 2022.

With regards to observed conditions, in 2021, the District evaluated the entire period of record for rainfall data and found a significant upward trend of average wet season rainfall for the area encompassing the LWC Planning Area (**Figure 37**). This indicates that the wet seasons will continue to get wetter which may have an effect on flood management, surface water quality, and water demand and availability (SFWMD 2021).

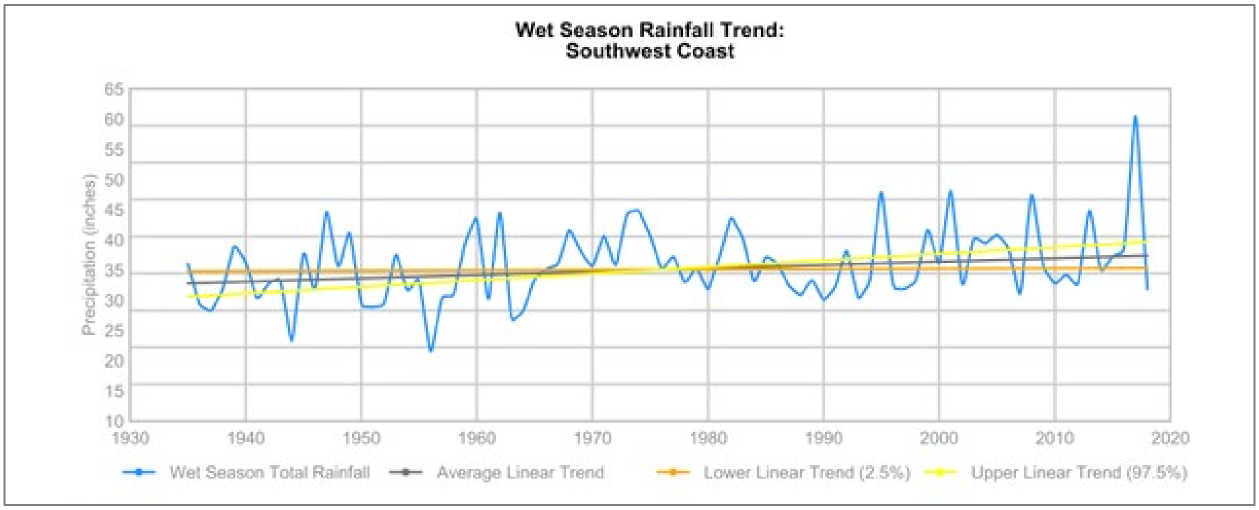


Figure D-37. Trend analyses of average rainfall during the wet season in the southwest coast rainfall basin shows a statistically significant upward trend.

Several ongoing research studies are focusing on the implications of future temperature changes on evapotranspiration losses. The District has conducted and commissioned studies on the predictive skills of climate models and has evaluated available downscaled datasets for application specific to Florida. Efforts to improve climate prediction models are under way, and the District will incorporate the improved models and future estimates into planning and operations, as appropriate. In 2021, the District assessed observed evapotranspiration patterns and found a statistically significant upward trend (**Figure 38**). The effect of this increase on water demand and availability is being evaluated in South Florida through advanced hydrology and hydraulics models. It is likely that as evapotranspiration increases, water demand for irrigation needs will also increase and aquifer recharge might be affected (Cortez et al. 2022, SFWMD 2021).

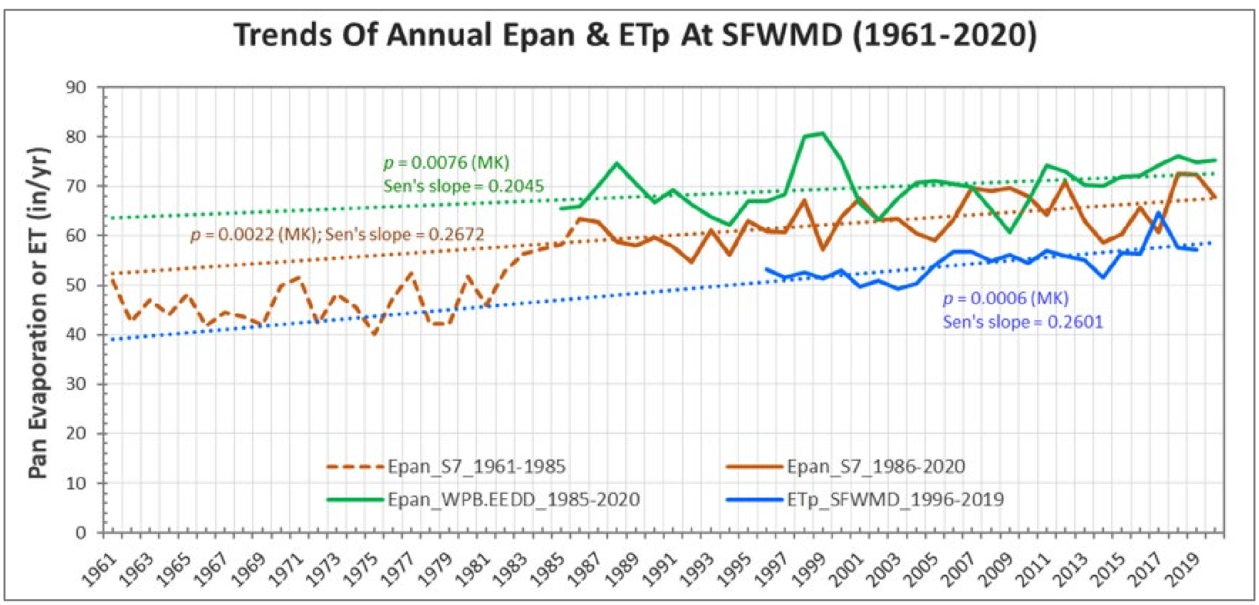


Figure D-38. Trend of annual pan evaporation (Epan) and potential evapotranspiration (ETp) across the District, 1961 to 2020.

Sea Level Rise

The effects of rising sea levels are most easily observed when water overtops seawalls and floods urban areas during seasonal high tides. Higher sea levels also contribute indirectly to flooding by increasing groundwater levels and decreasing the capacity of the drainage network. As groundwater levels rise, soil storage capacity, which typically helps minimize flooding after rain events, is reduced.

Rising seas also can impact South Florida's drinking water supplies. As the rate of sea level rise increases, inland movement of the saltwater interface could accelerate. As sea level continues to rise, saltwater intrusion may require some coastal wellfields in the LWC Planning Area to be relocated farther inland, change treatment processes, or be replaced by alternative water sources. Since 2000, 25 PS wells in the District have been abandoned due to saltwater intrusion (SFWMD 2022, Shaw and Zamorano 2020).

In general, water levels in South Florida canals are maintained lower than land surface so they can drain the surrounding areas in response to heavy rains. Coastal canals stages are maintained higher than sea level to prevent saltwater from moving inland. If canal water levels cannot be maintained higher than sea level, then salinity control structures are closed to prevent entry of saltwater into fresh surface water bodies. More frequent structure closures due to higher sea levels can lead to increased risk for flooding and need for flood control modifications. The effects from sea level rise on these structures is expected to be minimal through the planning horizon and future conditions modeling to plan for the effects of climate change is under way.

Along South Florida's west coast, historical observational trends from 1965 to 2021 show that sea levels have risen by a rate of 3.29 millimeters/year in Fort Myers (**Figure 39**). It is important to examine how the period of record effects the trends. A longer period with linear averaging shows a flatter shorter trend line, yet if we examine the acceleration and nonlinear trends, the rate of sea level rise increases substantially.

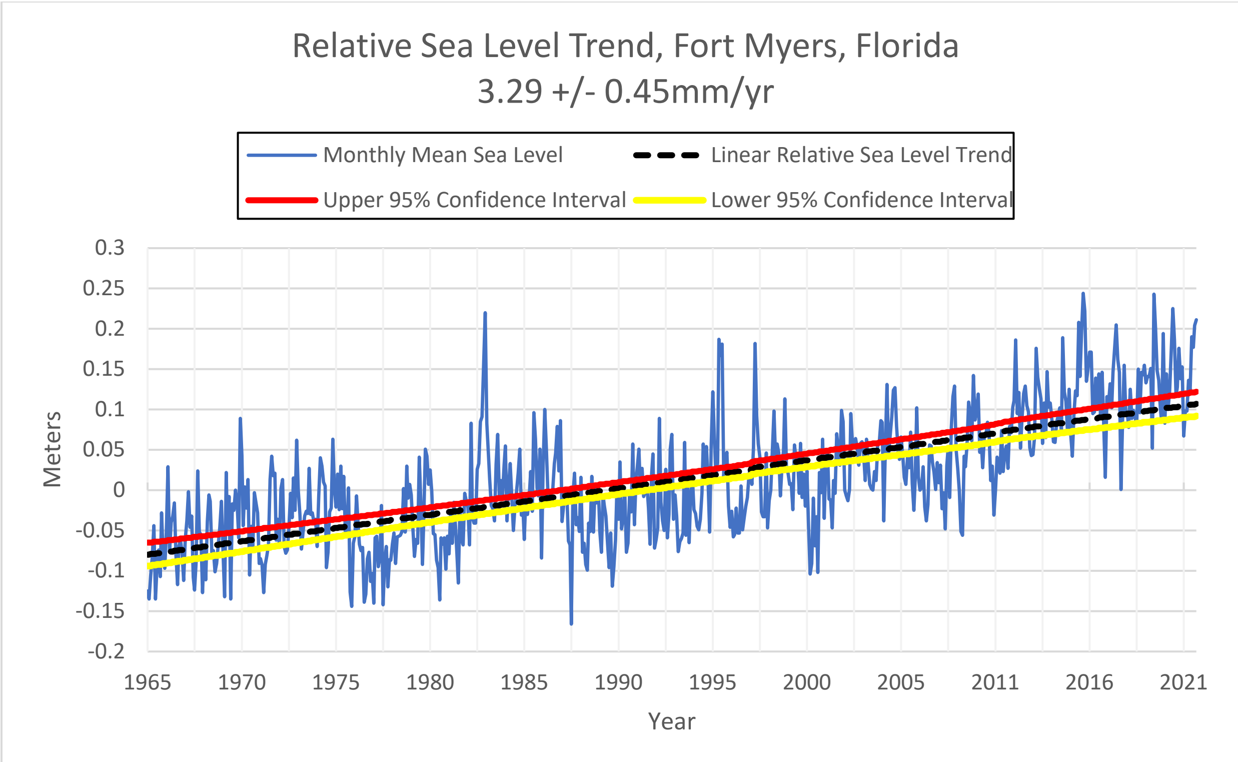


Figure D-39. Relative sea level trend in Fort Myers, Florida (Data from NOAA 2022; Sweet et al. 2022).

In 2021, the Florida Legislature passed Section 380.093(3)(d), Florida Statutes, specifying the requirements for the Florida Department of Environmental Protection to include "At least two local sea level rise scenarios, which must include the 2017 National Oceanic and Atmospheric Administration intermediate-low and intermediate-high sea level rise projections." In 2022, NOAA updated its 2017 projections reducing the uncertainties through applying the latest scientific methodologies and updated data. By 2050, sea levels are projected to rise in Naples by an additional 1.35 feet per the Intermediate High curve and 1.00 foot per the Intermediate Low curve (**Figure 40**).

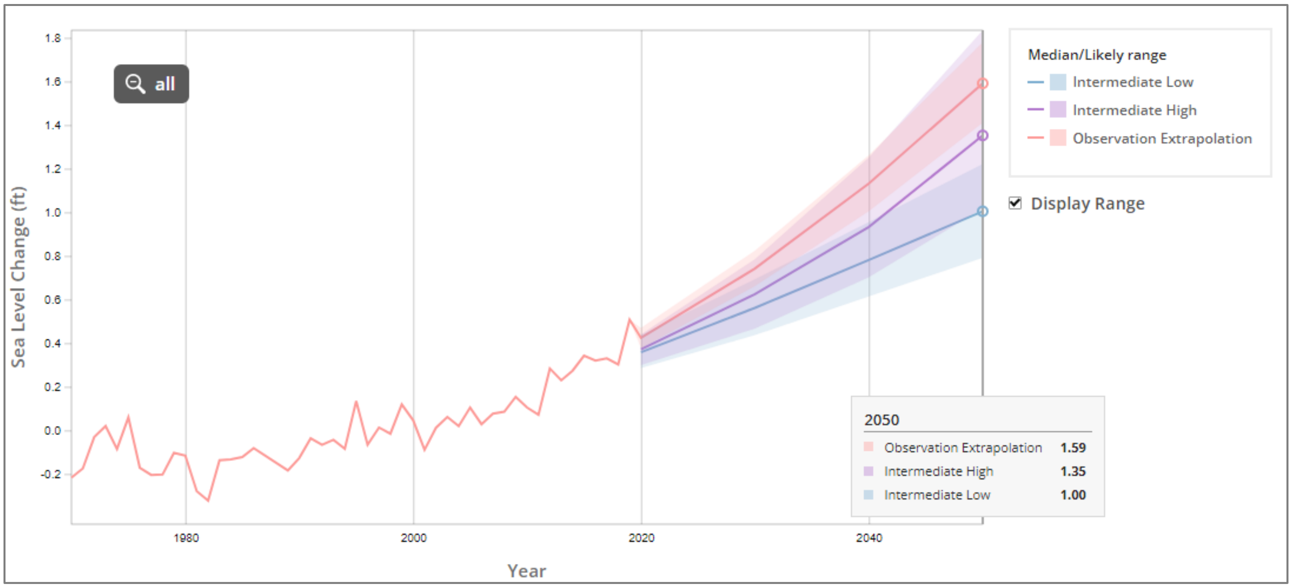


Figure D-40. Future sea level rise projections for Naples, Florida (Data from NASA, NOAA, USEPA, Rutgers, and USGS 2022; Sweet et al. 2022).

District Initiatives to Support Planning Efforts

The District has been evaluating climate change and sea level rise since 2008 to determine the best short- and long-term strategies for water resource management and to prepare for related impacts (Obeysekera et al. 2011, SFWMD 2009). Long-established networks of rainfall and surface water flow data, many with real-time electronic reporting, provide continuous data to monitor changes in local hydrology. In addition, an extensive network of coastal and inland surface water and groundwater monitoring sites collect water level and quality data, including information about saltwater intrusion.

The earlier mentioned metrics effort is the District's first comprehensive effort to quantify and clarify which elements of resiliency are most influential to the District's responsibilities. This initiative will continue to develop and improve as more data and further analyses are incorporated.

Data from coastal monitor wells are being used to calibrate advanced groundwater models designed to support the evaluation of sea level rise and climate change scenarios and simulate future saltwater inland movement. Additionally, the District has formed a workgroup tasked with incorporating sea level rise in groundwater demand and availability models for water supply planning efforts. This initiative is expected to be completed for the LWC Planning Area for subsequent water supply plans.

Lastly, the District publishes an annual resiliency plan (SFWMD 2021) that will incorporate all existing and future projects related to resiliency efforts in flood control, ecosystem restoration, and water supply.

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E

Wastewater Treatment Facilities

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WASTEWATER TREATMENT FACILITIES

Wastewater generated by homes and businesses is either directed to an on-site septic tank for treatment and disposal or collected via sanitary sewer and conveyed to a wastewater treatment facility (WWTF) for treatment and disposal or reuse. WWTFs can either be smaller "package plants" or larger, more regional, facilities. This appendix focuses on the larger facilities with a Florida Department of Environmental Protection (FDEP) permitted treatment capacity of 0.10 million gallons per day (mgd) or greater in the Lower West Coast (LWC). These larger treatment facilities allow economy of operation, reduce risk of treatment upset, and have sufficient flows that, if properly treated and reused as reclaimed water, could positively impact water resources.

As of 2020, there were 40 domestic WWTFs within the LWC Planning Area with a permitted treatment capacity of 0.10 mgd or greater. **Table E-1** lists those WWTFs and shows annual average daily flows for 2020 and projected flows for 2045. **Tables E-2** and **E-3** show 2020 and projected 2045 utilization of reclaimed water and methods of disposal, respectively, for those facilities. **Table E-4** shows 2020 and 2045 methods of wastewater disposal for facilities with capacities of 0.10 mgd or greater. The Fort Myers – South WWTF, also included in these tables, does not currently provide reclaimed water but is anticipated to provide reclaimed water to the City of Cape Coral starting in 2023. An additional (41st) facility, Cape Coral – North, included in these tables, is expected to come online in 2035.

The individual reuse inventory reports for the year 2020 (unless noted otherwise for individual facilities) filed by each wastewater utility to the FDEP (FDEP 2021) were analyzed for the presentation in the following sections. Flow projections for 2045 are based on utility-provided data (for average daily wastewater, total reuse, total discharges, and supplemental flows) and the changes expected over the planning horizon. Future project information which will increase reclaimed water production capacity is shown for each facility as forecast by the respective utilities.

Reuse percentage is a metric frequently used when describing reuse facilities and is intended to reflect the amount of water reused when compared with the amount of water the facility has available for reuse (or potential reuse). The potential reuse at a facility is equal to the sum of wastewater treated at the facility, water imported from another facility, and supplemental water added to the system to meet reclaimed water demands, less water exported to another facility. Because supplemental water (including, but not limited to, groundwater or surface water) is sometimes blended with reclaimed water, calculated reuse percentages may exceed the processed wastewater flow at a WWTF. In these cases, the reuse percentage exceeds 100%. However, for the purposes of this plan update, any reuse percentage more than 100% is reported as 100%. The calculated reuse percentage may also differ slightly from actual reuse flows in some cases due to metering inaccuracies or when one or more system activities occur in which reclaimed water is returned to the treatment facility after its use, especially if used at the facility itself.

INFO

Reuse Percentage:

A Metric for Reclaimed Water Use Efficiency

Reuse Percentage = Reuse / Potential Reuse

Not to exceed 100%

Potential Reuse = (Wastewater Flow + Supplemental Flow + Imports) - Exports

Table E-1. Summary of 2020 and 2045 wastewater treatment facilities with current or projected capacities of 0.10 mgd or greater in the LWC Planning Area.

County	Facility	Disinfection Level	FDEP Rated WWTF Capacity (mgd)	2020			2045		
				Average Daily WWTF Flow (mgd)	Average Daily Reuse Flow[a] (mgd)	Reuse Percentage[b]	Average Daily WWTF Flow (mgd)	Average Daily Reuse Flow[a] (mgd)	Reuse Percentage[b]
Charlotte	Charlotte Correctional	HI	0.25	0.23	0.25	100.0%	0.23	0.25	100.0%
	Town and Country (Babcock Ranch)[c]	HI	0.75	0.18	0.81	95.7%	0.97	4.41	95.7%
Charlotte County Subtotal (2 Facilities)			**1.00**	**0.41**	**1.06**	**98.0%**	**1.20**	**4.66**	**96.2%**
Collier	Ave Maria	HI	0.90	0.46	1.54	100.0%	1.76	5.94	100.0%
	Collier County – Golden Gate	HB	1.50	1.13	0.002	0.2%	4.56	3.65	80.1%
	Collier County – Northeast (NESA)[d]	BA	0.75	0.35	0.35	100.0%	1.35	1.35	100.0%
	Collier County – North	HI	24.10	10.38	16.53	80.7%	17.14	26.45	83.9%
	Collier County – South	HI	16.00	9.10			12.58		
	Everglades City	BA	0.16	0.07	0.07	100.0%	0.25	0.25	100.0%
	Immokalee	BA	4.00	1.83	0.38	20.8%	3.92	0.82	20.9%
	Marco Island	HI	4.92	2.45	1.97	79.7%	3.43	2.63	76.4%
	Naples	HI	10.00	4.73	6.12	96.7%	6.23	8.55	100.0%
	Port of the Islands – South	BA	0.20	0.14	0.37	100.0%	0.14	0.37	100.0%
	STOF – Immokalee[e]	HI	0.25	0.09	0.06	74.1%	0.17	0.17	100.0%
Collier County Subtotal (11 Facilities)			**62.78**	**30.71**	**27.39**	**79.0%**	**51.52**	**50.18**	**83.6%**
Glades	Glades Correctional[f]	HI	0.41	0.23	0.23	100.0%	0.23	0.23	100.0%
Glades County Subtotal (1 Facility)			**0.41**	**0.23**	**0.23**	**100.0%**	**0.23**	**0.23**	**100.0%**
Hendry	Clewiston[c]	BA	1.50	1.45	1.45	100.0%	1.97	0.75	38.1%
	LaBelle	BA	0.75	0.38	0.38	100.0%	1.49	1.49	99.9%
	Port LaBelle	BA	0.50	0.19	0.19	100.0%	0.35	0.35	100.0%
Hendry County Subtotal (3 Facilities)			**2.75**	**2.01**	**2.01**	**100.0%**	**3.81**	**2.59**	**68.0%**
Lee	Bonita Springs – East	HI	4.00	2.99	7.04	97.8%	5.00	10.57	97.4%
	Bonita Springs – West	HI	7.00	1.56			3.20		
	Cape Coral – Everest	HI	13.40	6.41	29.97	100.0%	7.60	90.25	100.0%
	Cape Coral – Southwest	HI	15.00	6.87			19.83		
	Cape Coral – North[g]	HI	-	-	-	-	9.74		
	Citrus Park – North	BA	0.20	0.09	0.09	100.0%	0.09	0.09	100.0%
	Cross Creek	HI	0.25	0.11	0.11	100.0%	0.11	0.11	100.0%
	Eagle Ridge[c]	HI	0.32	0.19	0.19	100.0%	0.19	0.19	100.0%
	FGUA – Del Prado (N. Fort Myers)	HI	4.25	2.96	0.64	66.0%	3.40	0.73	65.8%
	FGUA – Lake Fairways	HI	0.30	0.16	0.07	41.9%	0.16	0.07	41.9%
	FGUA – Lehigh Acres	HB	2.76	1.96	1.14	57.9%	6.70	3.29	49.1%

Table E-1. Continued.

County	Facility	Disinfection Level	FDEP Rated WWTF Capacity (mgd)	2020			2045		
				Average Daily WWTF Flow (mgd)	Average Daily Reuse Flow[a] (mgd)	Reuse Percentage[b]	Average Daily WWTF Flow (mgd)	Average Daily Reuse Flow[a] (mgd)	Reuse Percentage[b]
Lee (Continued)	FGUA – South Seas Plantation	HI	0.18	0.14	0.14	99.3%	0.14	0.14	99.3%
	Fiddlesticks	HI	0.15	0.07	0.04	53.5%	0.07	0.04	53.5%
	Forest Utilities[c]	HI	0.80	0.39	0.39	100.0%	0.41	0.41	100.0%
	Fort Myers – Central	HI	11.00	5.62	3.12	55.5%	12.03	14.78	93.0%
	Fort Myers – South	BA	12.00	7.41	-	-	12.87		
	Gasparilla Island	HI	0.71	0.42	0.33	78.1%	0.45	0.36	80.0%
	Hunter's Ridge	HI	0.10	0.05	0.35	100.0%	0.06	0.35	98.9%
	Lee County – Fiesta Village	HI	5.00	2.93	1.33	73.5%	4.04	1.73	66.3%
	Lee County – Fort Myers Beach	HI	6.00	3.20	2.46	57.2%	4.21	3.09	54.8%
	Lee County – Gateway	HI	3.00	1.48	2.86	100.0%	2.40	4.64	100.0%
	Lee County – Pine Island	HI	0.38	0.13	0.00	0.0%	0.22	0.00	0.0%
	Lee County – Three Oaks	HI	6.00	3.72	2.73	67.5%	10.13	3.93	37.1%
	Sanibel – Donax	HI	2.38	1.57	0.96	61.4%	1.90	1.17	61.5%
Lee County Subtotal (24 Facilities)			**95.17**	**50.42**	**53.97**	**77.3%**	**104.95**	**135.94**	**89.6%**
LWC Planning Area Total (41 Facilities)			**162.10**	**83.78**	**84.65**	**78.6%**	**161.71**	**193.59**	**87.7%**

BA = basic disinfection as described in Rule 62-600.440(5), Florida Administrative Code (F.A.C.); FDEP = Florida Department of Environmental Protection; FGUA = Florida Governmental Utility Authority; HB = high-level disinfection and basic disinfection for portions of treated flow; HI = high-level disinfection as described in Rule 62-600.440(6), F.A.C.; LWC = Lower West Coast; NESA = Northeast Service Area; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation; WWTF = wastewater treatment facility.

Note: All figures are in million gallons per day (mgd) except reuse percentage (described in the introduction section of this appendix); "-" indicates the facility does not produce these flows.

[a] Includes supplemental water.

[b] Reuse percentage = (Reuse / Potential Reuse). Potential reuse = (WW Flow + Supplemental + Imports) – Exports, not to exceed 100.0%.

[c] Data shown for 2020 are from the facility's 2021 Annual Reuse Report form.

[d] Data shown for 2020 are for the Collier County – Northeast facility, scheduled to be decommissioned and replaced with the NESA facility which will be operational by 2030; Data shown for 2045 are for the NESA facility.

[e] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

[f] Data shown for 2020 are from the facility's 2019 Annual Reuse Report form.

[g] Cape Coral – North facility is expected to come online in 2035.

Table E-2. 2020 utilization of reclaimed water (in mgd) from wastewater treatment facilities in the LWC Planning Area with current or projected capacities of 0.10 mgd or greater.

County	Facility	2020						
		Golf Course Irrigation	Residential Irrigation	Other Irrigation[a]	Groundwater Recharge[b]	Wetlands	Other Types of Reuse[c]	Reuse Total
Charlotte	Charlotte Correctional	0.00	0.00	0.00	0.10	0.00	0.15	0.25
	Town and Country (Babcock Ranch)[d]	0.44	0.25	0.12	0.00	0.00	0.00	0.81
Charlotte County Subtotal (2 Facilities)		0.44	0.25	0.12	0.10	0.00	0.15	1.06
Collier	Ave Maria	0.00	0.80	0.74	0.00	0.00	0.00	1.54
	Collier County – Golden Gate	0.00	0.00	0.00	0.002	0.00	0.00	0.002
	Collier County – Northeast (NESA)[e]	0.00	0.00	0.00	0.35	0.00	0.00	0.35
	Collier County – North Collier County – South	6.20	9.05	1.29	0.00	0.00	0.00	16.53
	Everglades City	0.00	0.00	0.00	0.07	0.00	0.00	0.07
	Immokalee	0.00	0.00	0.38	0.00	0.00	0.00	0.38
	Marco Island	0.52	0.00	1.45	0.00	0.00	0.00	1.97
	Naples	1.49	4.28	0.36	0.00	0.00	0.00	6.12
	Port of the Islands – South	0.00	0.37	0.00	0.00	0.00	0.00	0.37
	STOF – Immokalee[f]	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Collier County Subtotal (11 Facilities)		8.20	14.49	4.21	0.49	0.00	0.00	27.39
Glades	Glades Correctional[g]	0.00	0.00	0.00	0.23	0.00	0.00	0.23
Glades County Subtotal (1 Facility)		0.00	0.00	0.00	0.23	0.00	0.00	0.23
Hendry	Clewiston[d]	0.00	0.00	1.45	0.00	0.00	0.00	1.45
	LaBelle	0.00	0.00	0.00	0.38	0.00	0.00	0.38
	Port LaBelle	0.00	0.00	0.00	0.19	0.00	0.00	0.19
Hendry County Subtotal (3 Facilities)		0.00	0.00	1.45	0.56	0.00	0.00	2.01
Lee	Bonita Springs – East Bonita Springs – West	2.00	4.20	0.67	0.18	0.00	0.00	7.04
	Cape Coral – Everest Cape Coral – Southwest	0.00	29.97		0.00	0.00	0.00	29.97
	Cape Coral – North[h]	-	-	-	-	-	-	-
	Citrus Park – North	0.00	0.00	0.00	0.09	0.00	0.00	0.09
	Cross Creek	0.11	0.00	0.00	0.00	0.00	0.00	0.11
	Eagle Ridge[d]	0.19	0.00	0.00	0.00	0.00	0.00	0.19

Table E-2. Continued.

County	Facility	2020						
		Golf Course Irrigation	Residential Irrigation	Other Irrigation[a]	Groundwater Recharge[b]	Wetlands	Other Types of Reuse[c]	Reuse Total
Lee (Continued)	FGUA – Del Prado (N. Fort Myers)	0.63	0.00	0.01	0.00	0.00	0.00	0.64
	FGUA – Lake Fairways	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	FGUA – Lehigh Acres	0.56	0.00	0.00	0.57	0.00	0.00	1.14
	FGUA – South Seas Plantation	0.14	0.00	0.00	0.00	0.00	0.00	0.14
	Fiddlesticks	0.04	0.00	0.00	0.00	0.00	0.00	0.04
	Forest Utilities[d]	0.39	0.00	0.00	0.00	0.00	0.00	0.39
	Fort Myers – Central	1.71	0.00	0.12	0.00	0.00	1.29	3.12
	Fort Myers – South	-	-	-	-	-	-	N/A
	Gasparilla Island	0.33	0.00	0.00	0.00	0.00	0.00	0.33
	Hunter's Ridge	0.35	0.00	0.00	0.00	0.00	0.00	0.35
	Lee County – Fiesta Village	0.86	0.39	0.09	0.00	0.00	0.00	1.33
	Lee County – Fort Myers Beach	1.45	0.37	0.57	0.08	0.00	0.00	2.46
	Lee County – Gateway	0.00	0.00	2.86	0.00	0.00	0.00	2.86
	Lee County – Pine Island	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lee County – Three Oaks	2.50	0.13	0.10	0.00	0.00	0.00	2.73
	Sanibel – Donax	0.71	0.26	0.00	0.00	0.00	0.00	0.96
Lee County Subtotal (24 Facilities)		12.04	35.31	4.41	0.92	0.00	1.29	53.97
LWC Planning Area Total (41 Facilities)		20.68	50.05	10.19	2.29	0.00	1.44	84.65

FGUA = Florida Governmental Utility Authority; LWC = Lower West Coast; NESA = Northeast Service Area; STOF - Immokalee = Seminole Tribe of Florida Immokalee Reservation.

Note: All figures are in million gallons per day (mgd) except reuse percentage (described in the introduction section of this appendix); " - " indicates the facility does not produce reuse flows.

a Other irrigation includes parks, schools, common areas, etc.

b Groundwater recharge includes rapid infiltration basins and percolation ponds.

c Other types of reuse include other permitted uses, such as process water at the treatment facility, cooling water, and toilet flushing.

d Data shown for 2020 are from the facility's 2021 FDEP Annual Reuse Report form.

e Data shown for 2020 are for the Collier County – Northeast facility, scheduled to be decommissioned and replaced with the NESA facility which will be operational by 2030.

f The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

g Data shown for 2020 are from the facility's 2019 FDEP Annual Reuse Report form.

h Cape Coral – North facility is expected to come online in 2035.

Table E-3. 2045 utilization of reclaimed water (in mgd) from wastewater treatment facilities in the LWC Planning Area with current or projected capacities of 0.10 mgd or greater.

<table>
<tr><th rowspan="2">County</th><th rowspan="2">Facility</th><th colspan="7">2045</th></tr>
<tr><th>Golf Course Irrigation</th><th>Residential Irrigation</th><th>Other Irrigation[a]</th><th>Groundwater Recharge[b]</th><th>Wetlands</th><th>Other Types of Reuse[c]</th><th>Reuse Total</th></tr>
<tr><td rowspan="2">Charlotte</td><td>Charlotte Correctional</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.10</td><td>0.00</td><td>0.15</td><td>0.25</td></tr>
<tr><td>Town and Country (Babcock Ranch)</td><td>2.41</td><td>1.36</td><td>0.64</td><td>0.00</td><td>0.00</td><td>0.00</td><td>4.41</td></tr>
<tr><td colspan="2">Charlotte County Subtotal (2 Facilities)</td><td>2.41</td><td>1.36</td><td>0.64</td><td>0.10</td><td>0.00</td><td>0.15</td><td>4.66</td></tr>
<tr><td rowspan="12">Collier</td><td>Ave Maria</td><td></td><td>3.09</td><td>2.85</td><td></td><td></td><td>0.00</td><td>5.94</td></tr>
<tr><td>Collier County – Golden Gate</td><td>0.00</td><td>3.64</td><td>0.00</td><td>0.01</td><td>0.00</td><td>0.00</td><td>3.65</td></tr>
<tr><td>Collier County – NESA[d]</td><td>0.00</td><td>1.35</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>1.35</td></tr>
<tr><td>Collier County – North</td><td rowspan="2">11.63</td><td rowspan="2">13.48</td><td rowspan="2">1.34</td><td rowspan="2">0.00</td><td rowspan="2">0.00</td><td rowspan="2">0.00</td><td rowspan="2">26.45</td></tr>
<tr><td>Collier County – South</td></tr>
<tr><td>Everglades City</td><td>0.00</td><td>0.05</td><td>0.05</td><td>0.15</td><td>0.00</td><td>0.00</td><td>0.25</td></tr>
<tr><td>Immokalee</td><td>0.00</td><td>0.82</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.82</td></tr>
<tr><td>Marco Island</td><td>1.08</td><td>0.00</td><td>1.55</td><td>0.00</td><td>0.00</td><td>0.00</td><td>2.63</td></tr>
<tr><td>Naples</td><td>1.44</td><td>6.57</td><td>0.54</td><td>0.00</td><td>0.00</td><td>0.00</td><td>8.55</td></tr>
<tr><td>Port of the Islands – South</td><td>0.00</td><td>0.37</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.37</td></tr>
<tr><td>STOF – Immokalee[e]</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.17</td><td>0.00</td><td>0.00</td><td>0.17</td></tr>
<tr><td colspan="1">Collier County Subtotal (11 Facilities)</td><td>14.15</td><td>29.37</td><td>6.33</td><td>0.33</td><td>0.00</td><td>0.00</td><td>50.18</td></tr>
<tr><td>Glades</td><td>Glades Correctional</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.23</td><td>0.00</td><td>0.00</td><td>0.23</td></tr>
<tr><td colspan="2">Glades County Subtotal (1 Facility)</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.23</td><td>0.00</td><td>0.00</td><td>0.23</td></tr>
<tr><td rowspan="3">Hendry</td><td>Clewiston</td><td>0.75</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.75</td></tr>
<tr><td>LaBelle</td><td>0.54</td><td>0.27</td><td>0.00</td><td>0.67</td><td>0.00</td><td>0.00</td><td>1.49</td></tr>
<tr><td>Port LaBelle</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.35</td><td>0.00</td><td>0.00</td><td>0.35</td></tr>
<tr><td colspan="2">Hendry County Subtotal (3 Facilities)</td><td>1.29</td><td>0.27</td><td>0.00</td><td>1.02</td><td>0.00</td><td>0.00</td><td>2.59</td></tr>
<tr><td rowspan="8">Lee</td><td>Bonita Springs – East</td><td rowspan="2">3.08</td><td rowspan="2">6.31</td><td rowspan="2">1.00</td><td rowspan="2">0.18</td><td rowspan="2">0.00</td><td rowspan="2">0.00</td><td rowspan="2">10.57</td></tr>
<tr><td>Bonita Springs – West</td></tr>
<tr><td>Cape Coral – Everest</td><td rowspan="3">0.00</td><td rowspan="3" colspan="2">90.25</td><td rowspan="3">0.00</td><td rowspan="3">0.00</td><td rowspan="3">0.00</td><td rowspan="3">90.25</td></tr>
<tr><td>Cape Coral – Southwest</td></tr>
<tr><td>Cape Coral – North</td></tr>
<tr><td>Citrus Park – North</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.09</td><td>0.00</td><td>0.00</td><td>0.09</td></tr>
<tr><td>Cross Creek</td><td>0.11</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.11</td></tr>
<tr><td>Eagle Ridge</td><td>0.19</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.19</td></tr>
</table>

Table E-3. Continued.

County	Facility	2045						
		Golf Course Irrigation	Residential Irrigation	Other Irrigation[a]	Groundwater Recharge[b]	Wetlands	Other Types of Reuse[c]	Reuse Total
Lee (Continued)	FGUA – Del Prado (N. Fort Myers)	0.72	0.00	0.01	0.00	0.00	0.00	0.73
	FGUA – Lake Fairways	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	FGUA – Lehigh Acres	1.63	0.00	0.00	1.66	0.00	0.00	3.29
	FGUA – South Seas Plantation	0.14	0.00	0.00	0.00	0.00	0.00	0.14
	Fiddlesticks	0.04	0.00	0.00	0.00	0.00	0.00	0.04
	Forest Utilities	0.41	0.00	0.00	0.00	0.00	0.00	0.41
	Fort Myers – Central Fort Myers – South	5.68	6.08	1.17	0.00	0.00	1.85	14.78
	Gasparilla Island	0.36	0.00	0.00	0.00	0.00	0.00	0.36
	Hunter's Ridge	0.35	0.00	0.00	0.00	0.00	0.00	0.35
	Lee County – Fiesta Village	1.11	0.50	0.12	0.00	0.00	0.00	1.73
	Lee County – Fort Myers Beach	1.82	0.46	0.71	0.10	0.00	0.00	3.09
	Lee County – Gateway	0.00	0.00	4.64	0.00	0.00	0.00	4.64
	Lee County – Pine Island	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Lee County – Three Oaks	3.60	0.19	0.14	0.00	0.00	0.00	3.93
	Sanibel – Donax	0.86	0.31	0.00	0.00	0.00	0.00	1.17
Lee County Subtotal (24 Facilities)		20.17	104.09	7.79	2.03	0.00	1.85	135.94
LWC Planning Area Total (40 Facilities)		38.03	135.10	14.75	3.71	0.00	2.00	193.59

FGUA = Florida Governmental Utility Authority; LWC = Lower West Coast; NESA = Northeast Service Area; STOF - Immokalee = Seminole Tribe of Florida Immokalee Reservation.

Note: All figures are in million gallons per day (mgd).

[a] Other irrigation includes parks, schools, common areas, etc.

[b] Groundwater recharge includes rapid infiltration basins and percolation ponds.

[c] Other types of reuse include other permitted uses, such as process water at the treatment facility, cooling water, and toilet flushing.

[d] The Collier County – Northeast facility is scheduled to be decommissioned and replaced with the NESA facility which will be operational by 2030; Data shown for 2045 data are for the NESA facility.

[e] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

Table E-4. 2020 and 2045 methods of wastewater disposal for facilities (in mgd) with current or projected capacities of 0.10 mgd or greater in the LWC Planning Area.

County	Facility	Disinfection Level	2020		2045	
			Deep Well Injection	Surface Water Discharge	Deep Well Injection	Surface Water Discharge
Charlotte	Charlotte Correctional	HI	0.00	0.00	0.00	0.00
	Town and Country (Babcock Ranch)[a]	HI	0.00	0.00	0.00	0.00
Charlotte County Subtotal (2 Facilities)			**0.00**	**0.00**	**0.00**	**0.00**
Collier	Ave Maria	HI	0.00	0.00	0.00	0.00
	Collier County – Golden Gate	HB	1.13	0.00	0.91	0.00
	Collier County – Northeast (NESA)[b]	BA	0.00	0.00	0.00	0.00
	Collier County – North	HI	3.96	0.00	5.10	0.00
	Collier County – South	HI				
	Everglades City	BA	0.00	0.00	0.00	0.00
	Immokalee	BA	1.28	0.17	3.10	0.00
	Marco Island	HI	0.50	0.00	0.81	0.00
	Naples	HI	0.00	0.02	0.00	0.02
	Port of the Islands – South	BA	0.00	0.00	0.00	0.00
	STOF – Immokalee[c]	HI	0.00	0.00	0.00	0.00
Collier County Subtotal (11 Facilities)			**6.88**	**0.19**	**9.92**	**0.02**
Glades	Glades Correctional[d]	HI	0.00	0.00	0.00	0.00
Glades County Subtotal (1 Facility)			**0.00**	**0.00**	**0.00**	**0.00**
Hendry	Clewiston[a]	BA	0.00	0.00	1.71	0.00
	LaBelle	BA	0.00	0.00	0.00	0.00
	Port LaBelle	BA	0.00	0.00	0.00	0.00
Hendry County Subtotal (3 Facilities)			**0.00**	**0.00**	**1.71**	**0.00**
Lee	Bonita Springs – East	HI	0.16	0.00	0.28	0.00
	Bonita Springs – West	HI				
	Cape Coral – Everest	HI	0.03	0.00	0.00	0.00
	Cape Coral – Southwest	HI				
	Cape Coral – North	HI	0.00	0.00		
	Citrus Park – North	BA	0.00	0.00	0.00	0.00
	Cross Creek	HI	0.00	0.00	0.00	0.00
	Eagle Ridge[a]	HI	0.00	0.00	0.00	0.00

Table E-4. Continued.

County	Facility	Disinfection Level	2020		2045	
			Deep Well Injection	Surface Water Discharge	Deep Well Injection	Surface Water Discharge
Lee (Continued)	FGUA – Del Prado (N. Fort Myers)	HI	0.35	0.00	0.40	0.00
	FGUA – Lake Fairways	HI	0.00	0.09	0.00	0.09
	FGUA – Lehigh Acres	HB	0.99	0.00	3.38	0.00
	FGUA – South Seas Plantation	HI	0.01	0.00	0.01	0.00
	Fiddlesticks	HI	0.00	0.03	0.00	0.03
	Forest Utilities[a]	HI	0.00	0.00	0.00	0.00
	Fort Myers – Central	HI	0.00	2.88	0.51	0.00
	Fort Myers – South	BA	0.00	7.41	0.50	0.00
	Gasparilla Island	HI	0.08	0.00	0.07	0.00
	Hunter's Ridge	HI	0.00	0.00	0.00	0.00
	Lee County – Fiesta Village	HI	0.00	0.68	0.88	0.00
	Lee County – Fort Myers Beach	HI	2.02	0.00	2.55	0.00
	Lee County – Gateway	HI	0.00	0.00	0.00	0.00
	Lee County – Pine Island	HI	0.13	0.00	0.22	0.00
	Lee County – Three Oaks	HI	1.19	0.00	6.20	0.00
	Sanibel – Donax	HI	0.31	0.00	0.37	0.00
Lee County Subtotal (24 Facilities)			**5.27**	**11.10**	**15.38**	**0.12**
LWC Planning Area Total (41 Facilities)			**12.14**	**11.28**	**27.01**	**0.14**

BA = basic disinfection as described in Rule 62-600.440(5), F.A.C.; FGUA = Florida Governmental Utility Authority; HB = high-level disinfection and basic disinfection for portions of treated flow; HI = high-level disinfection as described in Rule 62-600.440(6), F.A.C.; LWC = Lower West Coast; NESA = Northeast Service Area; STOF – Immokalee = Seminole Tribe of Florida Immokalee Reservation.

Note: All figures are in million gallons per day (mgd).

[a] Data shown for 2020 are from the facility's 2021 FDEP Annual Reuse Report form.

[b] The Collier County – Northeast facility is scheduled to be decommissioned and replaced with the NESA facility which will be operational by 2030; Data shown for 2045 data are for the NESA facility.

[c] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

[d] Data shown for 2020 are from the facility's 2019 FDEP Annual Reuse Inventory Report.

WASTEWATER/REUSE FACILITY PROFILES

This section contains profiles for many of the wastewater/reuse facilities within the LWC Planning Area with a treatment capacity of 0.10 mgd or greater. Some smaller facilities are not individually profiled due to limitations in expected growth; however, their basic information is included in the tables within this appendix. The profiles are organized by county, then alphabetically by utility, development, or institution. Each profile contains the existing facility information, followed by the current (2020) and projected (2045) annual average daily flows of wastewater and reclaimed water. Existing capacity and flow information was obtained from each facility's FDEP Annual Reuse Report form for 2020, unless otherwise noted for individual facilities. Projected flows are based on information obtained from the utility, estimates of population growth in the service area, or assumptions of buildout.

Reclaimed Water Pump

To help understand the information in the utility profiles, a sample profile with descriptions is provided. **Figures E-1, E-2,** and **E-3** show WWTFs with a permitted capacity of 0.10 mgd or greater in Charlotte and Lee, Collier, and Glades and Hendry counties, respectively.

SAMPLE UTILITY NAME

Description: Descriptions include the facility's street address and utility-reported information which may include any of the following types of information, but not limited to, service area identification/description, interconnections with other facilities, and significant projects.

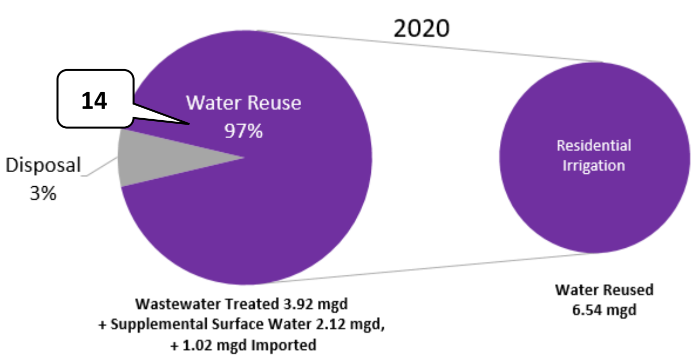
Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA99999**		
Wastewater Treatment Capacity (mgd)	**0.9**		
Disinfection[a]	High Level		
Public Access Users Served:			
Residences	10,690		
Golf Courses	0		
Parks and Schools	5		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**3.92**	**4.39**	
Total Wastewater Disposed	**0.52**	**0.58**	
Deep Injection Well	0.52	0.58	
Total Water Reused[b,c]	**6.54**	**7.32**	
Residential Irrigation	6.54	7.32	
Supplemental to Reclaimed Water	**2.12** GW	**2.37** GW	
Reclaimed Water Imports/Exports (mgd)			
Reclaimed Water Imported (mgd)	**1.02**	**1.14**	
Import Utility/Facility(ies):	Sea Grape WWTF	Sea Grape WWTF	
Reuse Percentage	**92.6%**	**92.6%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
WRF Phase II Expansion	2025	$6.5	1.25

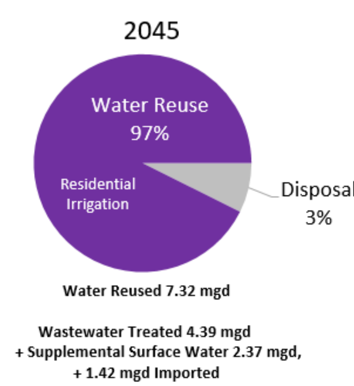
FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; StW = Stormwater; WRF = water reclamation facility.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with treated wastewater.

[c] Includes imported water blended with treated wastewater.





1 **FDEP Wastewater Facilities Regulation Identification** – This number is a unique identification number assigned by the FDEP to each domestic WWTF or master reuse system; it is also the first part of each facility's permit number.

2 **Wastewater Treatment Capacity** – The capacity of the WWTF(s) to produce treated wastewater as permitted by the FDEP, presented in mgd.

3 **Disinfection Level** – This value represents the disinfection level at the facility: basic level, as described in Rule 62-600.440(5), F.A.C. and high level, as described in Rule 62-600.440(6), F.A.C.

4 **Public Access Users Served** – Indicates the number of reclaimed water recipients in the following classes: Residential Dwellings, Golf Courses, and Schools and Parks.

5 **Facility Flows** – Flows at the facility, broken out as follows below in items 6, 7, 8, 9, 10, and 12 for the base year (2020) and the final year of the planning period (2045). The flows for 2020 appear as reported by each facility in its respective annual FDEP Annual Reuse Report form for 2020 (unless noted otherwise for individual facilities). The flow projections for 2045 are based on utility-provided data and information as well as the changes expected over the planning horizon.

6 **Total Wastewater Treated** – The net (treated) wastewater flow (mgd).

7 **Wastewater Disposed** – Wastewater flow (mgd) not reused or sent to another facility, shown as a Total Wastewater Disposed and broken out into disposal type: Deep Injection Well, Surface Water, Coastal or Estuarine, or Ocean Outfall.

8 **Water Reused** – Application (reuse) of treated wastewater, shown as a Total Water Reused and broken out into the following reuse types: Residential Irrigation; Golf Course Irrigation; Groundwater Recharge (including Rapid Infiltration Basins, Percolation Ponds, and Sprayfields); Industrial (including, but not limited to, use at the facility as part of treatment operations or at another facility, primarily for Industrial Cooling); Wetlands (reuse for recharge and hydroperiod management); Other (including, but not limited to, Toilet Flushing, Other industrial processes). All flows are shown in mgd.

9 **Supplemental to Reclaimed Water** – Supplemental flows added to reclaimed water to meet high-demand periods. Supplemental sources can include, but may not be limited to, Groundwater, Surface Water, Drinking Water, and Demineralized Concentrate. All flows are shown in mgd.

10 **Supplemental Source Indication** – Uses the following acronyms to indicate the source of supplemental flows at the facility: GW = Groundwater; SW = Surface Water; StW = Stormwater; DW = Drinking Water; and DemConc = Demineralized Concentrate.

11 **Reuse Percentage** – A metric used when describing reuse facilities intended to reflect the amount of water reused when compared with the amount of water available for reuse. Reuse Percentage = Reuse / Potential Reuse, where Potential Reuse = Wastewater Flow + Supplemental Flow + Imports) – Exports. If supplemental flows cause the calculated reuse percentage to exceed 100%, the reuse percentage will be shown as 100%.

12 **Facility Import/Export Flow Summary** – The first line indicates whether the flow is an Import or Export and shows flow in mgd. The second line indicates the facility is sending flow to the facility (for Imports) or receiving flow from the facility (for Exports).

13 **Reclaimed Water Project Summary** – Information on utility-forecasted projects that will result in increased reclaimed water production capacity including: Project Name; Completion Date (anticipated); Total Capital Cost (in $ millions); and Added Capacity (in mgd).

14 **Pie Graphs** – Showing base year (2020) and final planning year (2045) (projected) reuse and disposal flows, and percentages and breakdowns of flows for the relevant reuse types.

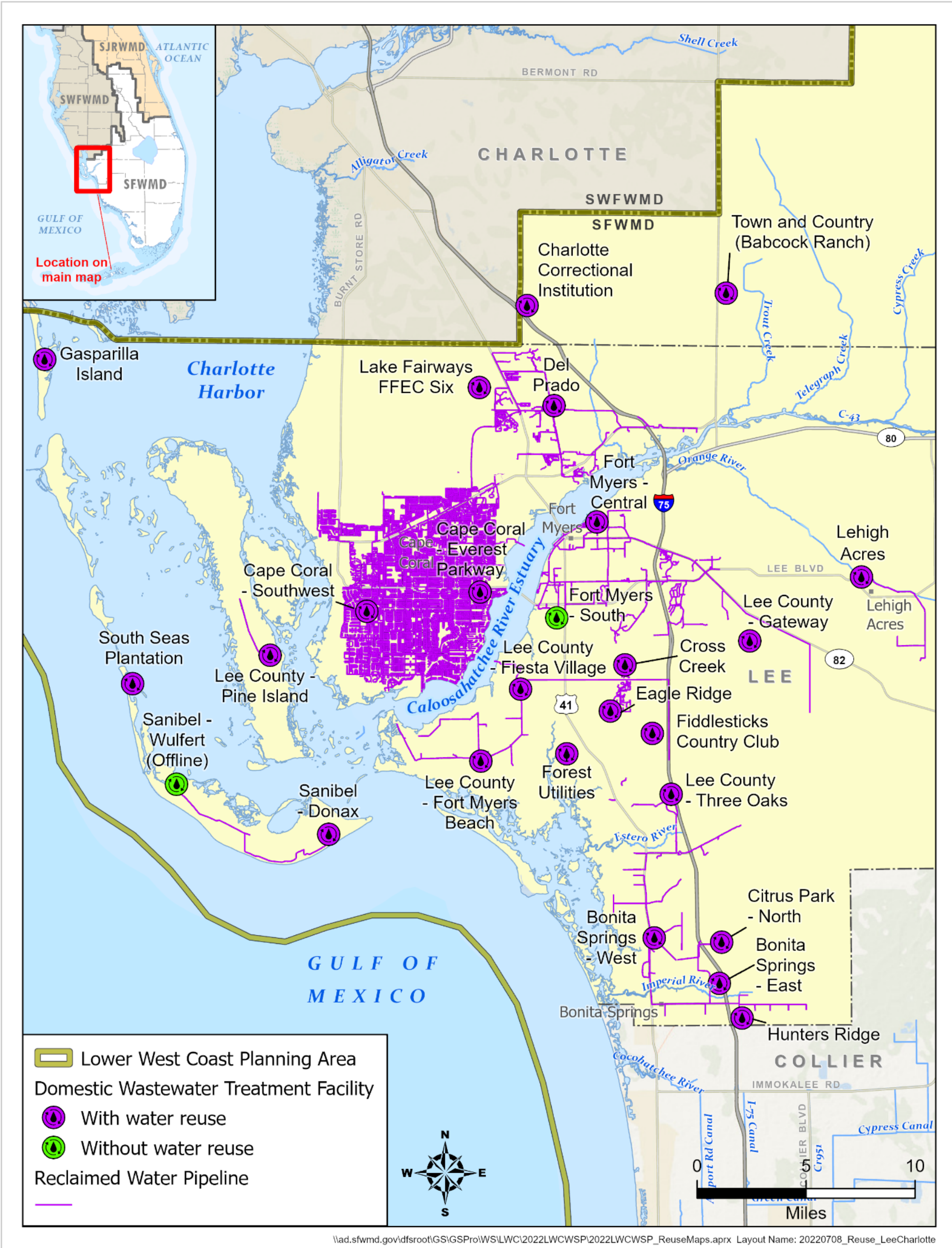


Figure E-1. Wastewater treatment facilities in Charlotte and Lee counties with a permitted capacity of 0.10 mgd or greater.

TOWN AND COUNTRY (BABCOCK RANCH)

Description: This facility provides wastewater services to approximately 3,871 residential and nonresidential properties and provides reclaimed water to one golf course, six parks, and two schools.

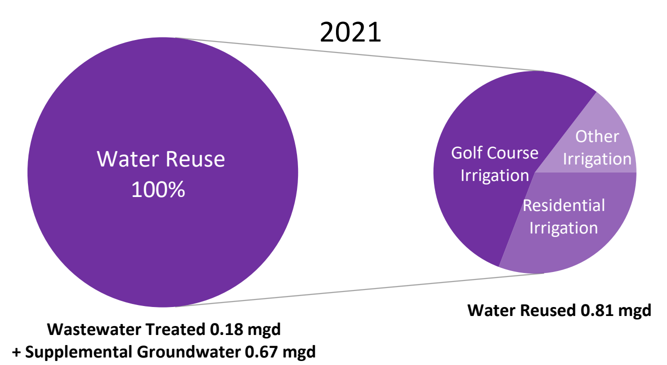
Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA665495**	
Wastewater Treatment Capacity (mgd)		**0.75**	
Disinfection[a]		High Level	
Public Access Users Served:			
Residences		1,392	
Golf Courses		1	
Parks and Schools		8	
Facility Flows (mgd)			
		2021[b]	**2045**
Total Wastewater Treated		**0.18**	**0.97**
Total Wastewater Disposed		**0.00**	**0.00**
Total Water Reused[c]		**0.81**	**4.41**
Residential Irrigation		0.25	1.36
Golf Course Irrigation		0.44	2.41
Other Irrigation		0.12	0.64
Supplemental to Reclaimed Water		**0.67** GW	**3.64** GW
Reuse Percentage		**100.0%**	**100.0%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
Phase 3- 0.75 mgd WWTF Expansion	2026	$40.00	0.75
Phase 4- 1.16 mgd WWTF Expansion	2029	$30.00	1.16
Phase 5- 1.34 mgd WWTF Expansion	2033	$17.00	1.34

FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; WWTF = wastewater treatment facility.

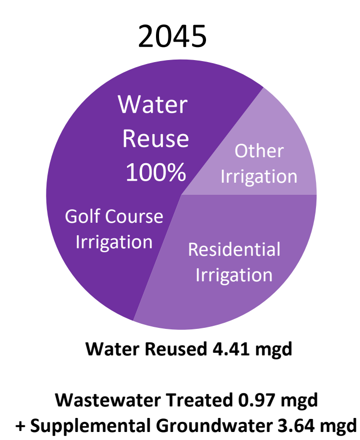
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Data shown for 2020 from the facility's 2021 FDEP Annual Reuse Report form.

[c] Includes supplemental water blended with treated wastewater.



2021 flow volumes contain errors attributed to known meter inaccuracies.



BONITA SPRINGS – EAST AND WEST

Description: Bonita Springs provides wastewater services from approximately 28,000 connections in the city and a portion of the Village of Estero. The East facility directs reclaimed water 3.5 miles away to the West facility, where it is blended with that facility's reclaimed water. Resource Conservation Systems LLC receives and provides reclaimed water for irrigation to certain communities in the service area. Excess reclaimed water is disposed via deep well injection. The East and West influent is interconnected for enhanced flexibility and allows for facility shutdown and maintenance activities.

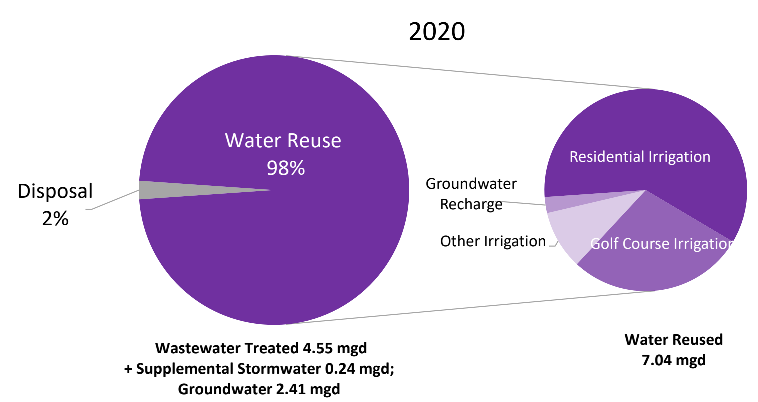
Wastewater Treatment Facility Information				
FDEP Wastewater Facilities Regulation Identification	**FLA012343 (East)**		**FLA014443 (West)**	
Wastewater Treatment Capacity (mgd)	**4.0**		**7.0**	
Disinfection[a]	High Level		High Level	
Public Access Users Served:				
Residences	6,666			
Golf Courses	6			
Parks and Schools	5			
Facility Flows (mgd)				
	2020		**2045**	
	East	**West**	**East**	**West**
Total Wastewater Treated	**2.99**	**1.56**	**5.00**	**3.20**
Total Wastewater Disposed	**0.16**		**0.28**	
Deep Injection Well	0.16		0.28	
Total Water Reused[b]	**7.04**		**10.57**	
Residential Irrigation	4.20		6.31	
Golf Course Irrigation	2.00		3.08	
Other Irrigation	0.67		1.00	
Groundwater Recharge (RIBs)	0.18		0.18	
Supplemental to Reclaimed Water	**2.65** (0.24 StW; 2.41 GW)		**2.65** (0.24 StW; 2.41 GW)	
Reuse Percentage	**97.8%**		**97.4%**	

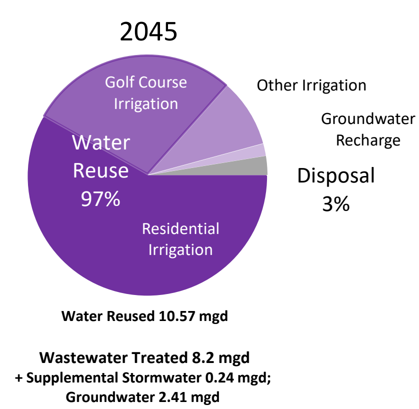
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
East 2.0 mgd WRF Expansion	2028	$38.0	2.0

FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; RIB = rapid infiltration basin; StW = Stormwater; WRF = water reclamation facility.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with reclaimed water.





CAPE CORAL – EVEREST, SOUTHWEST, NORTH

Description: These facilities provide reclaimed water for irrigation of residential lots and other green space such as parks, schools, and medians. Reclaimed water is supplemented with water from city canals.

Wastewater Treatment Facility Information					
FDEP Wastewater Facilities Regulation Identification	**FL0030007 (Everest)**		**FLA455458 (Southwest)**		**North (Anticipated 2035)**
Wastewater Treatment Capacity (mgd)	**13.4**		**15.0**		**4.0 (by 2040)**
Disinfection[a]	High Level		High Level		High Level
Public Access Users Served:					
Residences	54,097				0.00
Parks and Schools	36				
Facility Flows (mgd)					
	2020		**2045**		
	Everest	**Southwest**	**Everest**	**Southwest**	**North**
Total Wastewater Treated	**6.41**	**6.87**	**7.60**	**19.83**	**9.74**
Total Wastewater Disposed	**0.03**		**0.00**		
Deep Injection Well	0.03		0.00		
Total Water Reused[b,c]	**29.97**		**90.25**		
Residential Irrigation	29.97		90.25		
Other Irrigation					
Supplemental to Reclaimed Water	**14.68** (14.56 SW, 0.12 DW)		**41.08** SW		
Reclaimed Water Imports/Exports (mgd)					
Reclaimed Water Imported (mgd)	2.01		11.31		
Export Utility/Facility:	Del Prado		2.31 Del Prado; 9.0 Fort Myers		
Reuse Percentage	**99.9%**		**100.0%**		

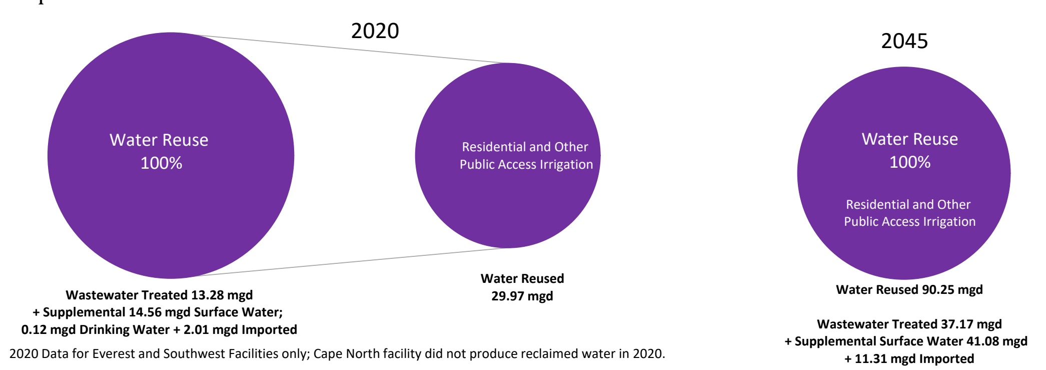
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
Reclaimed Water Interconnect with Fort Myers	2023	$11.8	6.0
Southwest WRF 5.0 mgd Expansion, 15 to 20 mgd	2025	$60.0	5.0
New 4.0 mgd North WRF Phase I	2035	$120.0	4.0

FDEP = Florida Department of Environmental Protection; DW = drinking water; SW = surface water; WRF = water reclamation facility.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with reclaimed water.

[c] Includes imported water blended with reclaimed water.



FLORIDA GOVERNMENTAL UTILITY AUTHORITY – DEL PRADO (NORTH FORT MYERS)

Description: Reclaimed water from this facility is used for irrigation at six golf courses and for various commercial users. Reclaimed water is also sent to Cape Coral. Excess reclaimed water is disposed through deep well injection.

Wastewater Treatment Facility Information	
FDEP Wastewater Facilities Regulation Identification	**FLA014548**
Wastewater Treatment Capacity (mgd)	**4.25**
Disinfection[a]	High Level
Public Access Users Served:	
Residences	0
Golf Courses	6
Parks and Schools	0

Facility Flows (mgd)	2020	2045
Total Wastewater Treated	**2.96**	**3.40**
Total Wastewater Disposed	**0.35**	**0.40**
Deep Injection Well	0.35	0.40
Total Water Reused[b]	**0.64**	**0.73**
Golf Course Irrigation	0.63	0.72
Other Irrigation	0.01	0.01
Supplemental to Reclaimed Water	**0.00**	**0.00**
Reuse Percentage	**65.9%**	**66.1%**
Reclaimed Water Imports/Exports (mgd)		
Reclaimed Water Imported	0.02 mgd from Karle Environmental Organic Recycling[c]	0.02 mgd from Karle Environmental Organic Recycling[c]
Reclaimed Water Exported	2.01 mgd to City of Cape Coral	2.31 mgd to City of Cape Coral

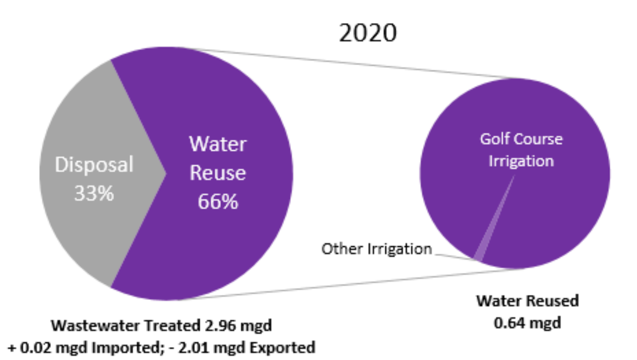
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

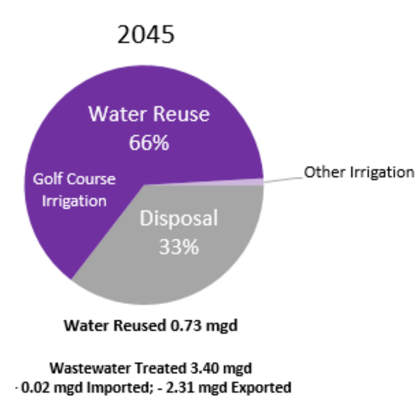
FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.

a High-level disinfection as described in Rule 62-600.440(6), F.A.C.

b Includes supplemental water blended with reclaimed water.

c Karle Environmental Organic Recycling is a biosolids processing facility.





FLORIDA GOVERNMENTAL UTILITY AUTHORITY – LEHIGH ACRES

Description: This facility provides wastewater service to residents within the Lehigh Acres system service area. Reclaimed water is provided to three golf courses.

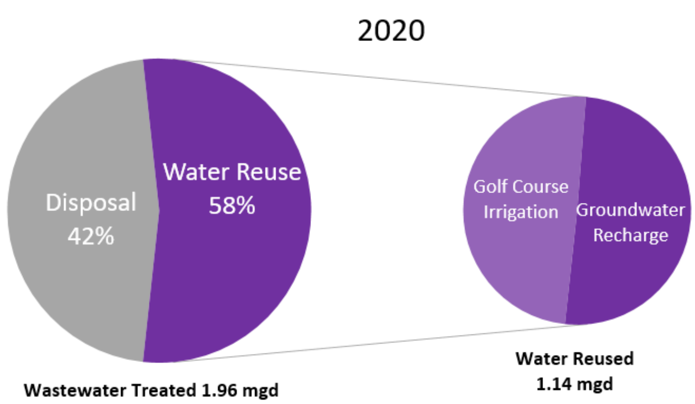
Wastewater Treatment Facility Information	
FDEP Wastewater Facilities Regulation Identification	**FLA014565**
Wastewater Treatment Capacity (mgd)	**2.76**
Disinfection[a]	High Level, Basic Level
Public Access Users Served:	
Residences	0
Golf Courses	3
Parks and Schools	0

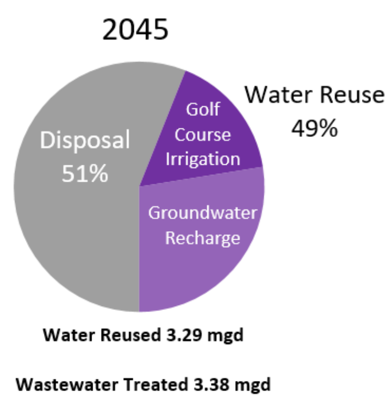
Facility Flows (mgd)		
	2020	**2045**
Total Wastewater Treated	**1.96**	**6.70**
Total Wastewater Disposed	**0.99**	**3.38**
Deep Injection Well	0.99	**3.38**
Total Water Reused	**1.14**	**3.29**
Golf Course Irrigation	0.56	1.63
Groundwater Recharge (RIBs)	0.57	1.66
Supplemental to Reclaimed Water	**0.00**	**0.00**
Reuse Percentage	**57.9%**	**49.1%**

Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin.

[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C, and high-level disinfection as described in Rule 62-600.440(6) F.A.C.





FORT MYERS – CENTRAL AND SOUTH

Description: The Central facility provides reclaimed water to one industrial facility, 13 properties operated by the city or county, and four private customers. The South facility does not currently provide reclaimed water service; all treated effluent is discharged to the Caloosahatchee River. An interconnect is planned between the city and Cape Coral's reuse system to provide 6 to 12 mgd of reclaimed water to Cape Coral's reclaimed water system.

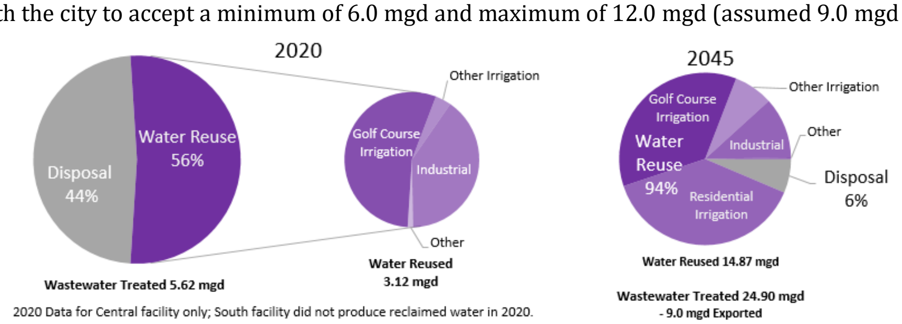
Wastewater Treatment Facility Information				
FDEP Wastewater Facilities Regulation Identification	**FL00212619 (South)[a]**		**FL0021261 (Central)**	
Wastewater Treatment Capacity (mgd)	**12.0**		**11.0**	
Current Disinfection Level[b]	Basic Level		High Level	
Future Disinfection Level[b]	High Level			
Public Access Users Served:				
Golf Courses	3			
Parks and Schools	2			
Facility Flows (mgd)				
	2020		**2045**	
	South	**Central**	**South**	**Central**
Total Wastewater Treated	**7.41**	**5.62**	**12.87**	**12.02**
Total Wastewater Disposed	**7.41**	**2.88**	**0.50**	**0.51**
Deep Injection Well	0.00	0.00	0.50	0.51
Coastal/Estuarine Waters	7.41	2.88	0.00	0.00
Total Water Reused	**N/A**	**3.12**	**14.87**	
Residential Irrigation	0.00	0.00	6.08	
Golf Course Irrigation	0.00	1.71	5.68	
Other Irrigation	0.00	0.12	1.17	
Industrial	0.00	1.25	1.81	
Other	0.00	0.04	0.04	
Supplemental to Reclaimed Water	**0.00**	**0.00**	**0.00**	
Reuse Percentage	**N/A**	**55.5%**	**93.6%**	
Reclaimed Water Imports/Exports (mgd)				
Reclaimed Water Exported (mgd)	-		9.0	
Export Utility/Facility(ies):	-		City of Cape Coral	
Reclaimed Water Project Summary				
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)	
South WWTF Interconnect with Cape Coral	2023	$55	Up to 12.0 mgd[c]	
Central 6.0 mgd WRF Expansion	2026	$60	6.0	

mgd = million gallons per day; WRF = water reclamation facility; WWTF = wastewater treatment facility.

[a] This facility does not produce reclaimed water but is anticipated to be online for reclaimed water production by 2023.

[b] Basic disinfection as described in Rule 62-600.440(5), F.A.C, and high-level disinfection as described in Rule 62-600.440(6), F.A.C.

[c] Agreement with the city to accept a minimum of 6.0 mgd and maximum of 12.0 mgd (assumed 9.0 mgd in the table).

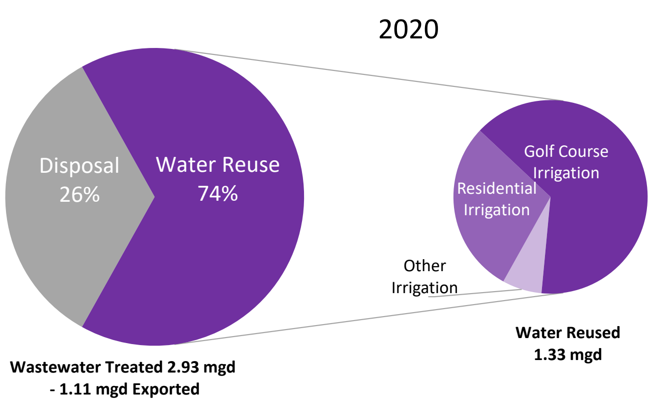


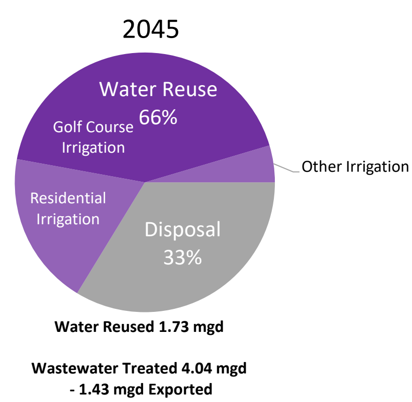
LEE COUNTY UTILITIES – FIESTA VILLAGE

Description: This facility provides reclaimed water to residential and nonresidential properties in its service area as well as supplemental reclaimed water for Fort Myers Beach water reclamation facility through a one-way interconnection pipe for the purpose of minimizing disposal into surface waters. Any remaining effluent is discharged to the Caloosahatchee River.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FL0039829**	
Wastewater Treatment Capacity (mgd)		**5.0**	
Disinfection[a]		High Level	
Public Access Users Served:			
Residences		11,700	
Golf Courses		4	
Parks and Schools		2	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**2.93**	**4.04**
Total Wastewater Disposed		**0.68**	**0.88**
Deep Injection Well		0.00	0.88
Coastal/Estuarine Waters		0.68	0.00
Total Water Reused		**1.33**	**1.73**
Residential Irrigation		0.39	0.50
Golf Course Irrigation		0.86	1.11
Other Irrigation		0.09	0.12
Supplemental to Reclaimed Water		**0.00**	**0.00**
Reuse Percentage		**73.5%**	**66.3%**
Reclaimed Water Imports/Exports (mgd)			
		2020	**2045**
Reclaimed Water Exported		1.11	1.43
Export Utility/Facility		Fort Myers Beach WRF	Fort Myers Beach WRF
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; WRF = water reclamation facility.
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.





LEE COUNTY UTILITIES – FORT MYERS BEACH

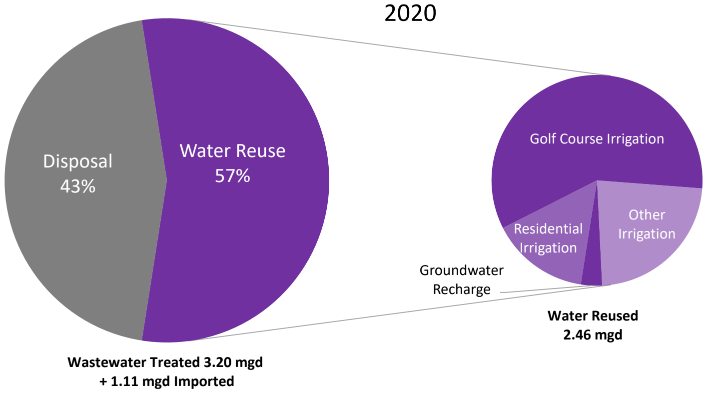
Description: This facility provides wastewater services to approximately 7,900 residential and nonresidential properties and provides reclaimed water to four golf courses and three parks. Supplemental reclaimed water is imported from Fiesta Village water reclamation facility through a one-way interconnection. One on-site percolation pond is available, if needed. The remaining reclaimed water is disposed through deep well injection.

Wastewater Treatment Facility Information		
FDEP Wastewater Facilities Regulation Identification	**FLA144215**	
Wastewater Treatment Capacity (mgd)	**6.0**	
Disinfection[a]	High Level	
Public Access Users Served:		
Residences	9 communities	
Golf Courses	4	
Parks and Schools	3	
Facility Flows (mgd)		
	2020	**2045**
Total Wastewater Treated	**3.20**	**4.21**
Total Wastewater Disposed	**2.02**	**2.55**
Deep Injection Well	2.02	2.55
Total Water Reused[b]	**2.46**	**3.09**
Residential Irrigation	0.37	0.46
Golf Course Irrigation	1.45	1.82
Other Irrigation	0.57	0.71
Groundwater Recharge (RIBs)	0.08	0.10
Supplemental to Reclaimed Water	**0.00**	**0.00**
Reuse Percentage	**57.3%**	**54.8%**
Reclaimed Water Imports/Exports (mgd)		
	2020	**2045**
Reclaimed Water Imported	1.11	1.43
Import Utility/Facility	Fiesta Village	Fiesta Village

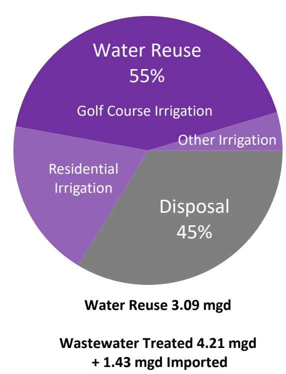
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin.
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.
[b] Includes imported reclaimed water blended with reclaimed water.

2020



2045



LEE COUNTY UTILITIES – GATEWAY

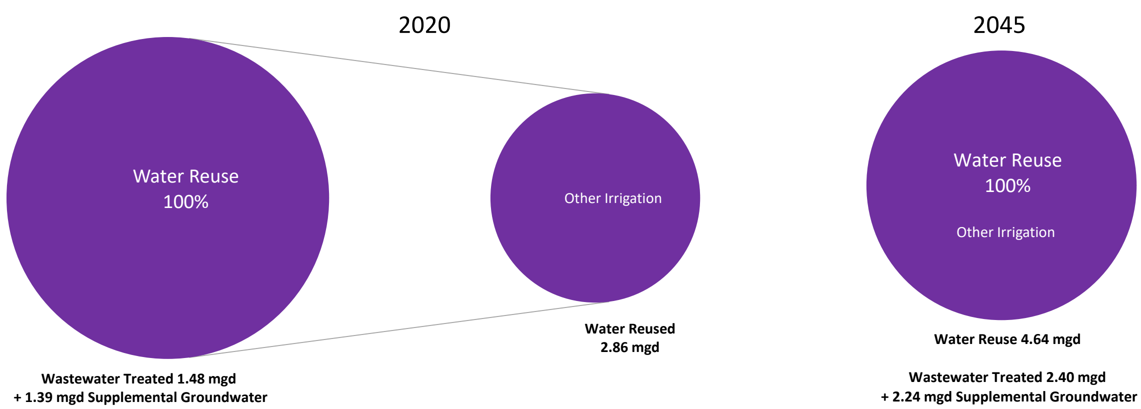
Description: This facility provides wastewater services to approximately 456 residential and nonresidential properties within the Gateway Services District. All the reclaimed water is bulk supplied to the Gateway District Services reuse system, which consists of 5,000 acres of residential irrigation, parks and playgrounds, and landscape areas.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA014542**	
Wastewater Treatment Capacity (mgd)		**3.0**	
Disinfection[a]		High Level	
Public Access Users Served:			
Residences		0	
Golf Courses		0	
Parks and Schools		0	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**1.48**	**2.40**
Total Wastewater Disposed		**0.00**	**0.00**
Total Water Reused[b]		**2.86**	**4.64**
Other Irrigation		2.86	4.64
Supplemental to Reclaimed Water		**1.39** (GW)	**2.24** (GW)
Reuse Percentage		**100.0%**	**100.0%**
Reclaimed Water Imports/Exports (mgd)			
		2020	**2045**
Reclaimed Water Imported (mgd)		2.86	4.64
Import Utility/Facility		Gateway District Services	Gateway District Services
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; GW =groundwater; mgd = million gallons per day.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with reclaimed water.

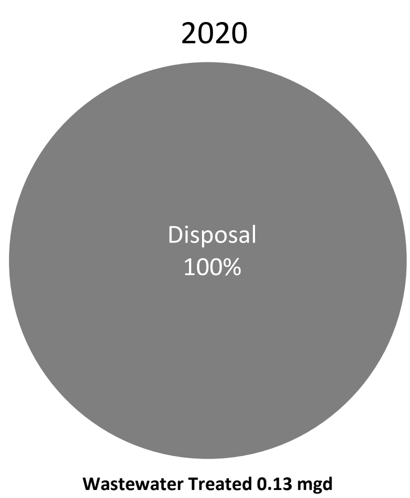


LEE COUNTY UTILITIES – PINE ISLAND

Description: This facility provides wastewater services to approximately 799 residential and nonresidential properties and provides reclaimed water to Pine Island Tree Farm. However, the reuse customer is not currently using reclaimed water. Effluent is disposed through deep well injection.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA176460**	
Wastewater Treatment Capacity (mgd)		**0.38**	
Disinfection[a]		High Level	
Public Access Users Served:			
Residences		0	
Golf Courses		0	
Parks and Schools		0	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**0.13**	**0.22**
Total Wastewater Disposed		**0.13**	**0.22**
Deep Injection Well		0.13	0.22
Total Water Reused		**0.00**	**0.00**
Reuse Percentage		**0.0%**	**0.0%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

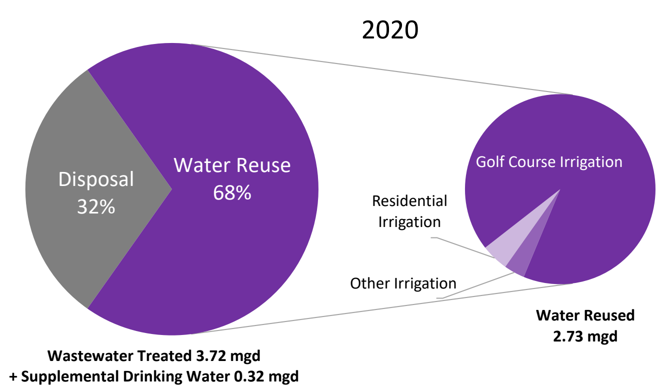


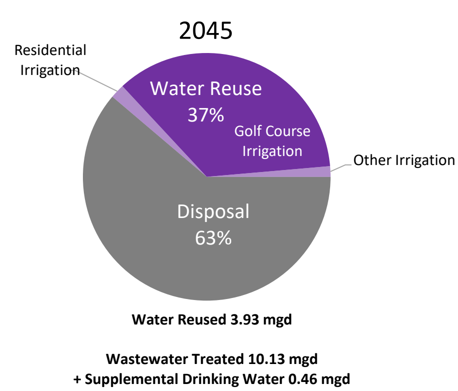
LEE COUNTY UTILITIES – THREE OAKS

Description: This facility provides wastewater services to approximately 15,463 residential and nonresidential properties and provides reclaimed water to six golf courses and one park. The remaining reclaimed water is disposed through deep well injection.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA14590**		
Wastewater Treatment Capacity (mgd)	**6.0**		
Disinfection[a]	High Level		
Public Access Users Served:			
Residences	0		
Golf Courses	6		
Parks and Schools	1		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**3.72**	**10.13**	
Total Wastewater Disposed	**1.19**	**6.20**	
Deep Injection Well	1.19	6.20	
Total Water Reused[b]	**2.73**	**3.93**	
Residential Irrigation	0.13	0.19	
Golf Course Irrigation	2.50	3.60	
Other Irrigation	0.10	0.14	
Supplemental to Reclaimed Water	**0.32** DW	**0.46** DW	
Reuse Percentage	**67.5%**	**37.1%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

DW = drinking water; FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.
[b] Includes supplemental water blended with reclaimed water.



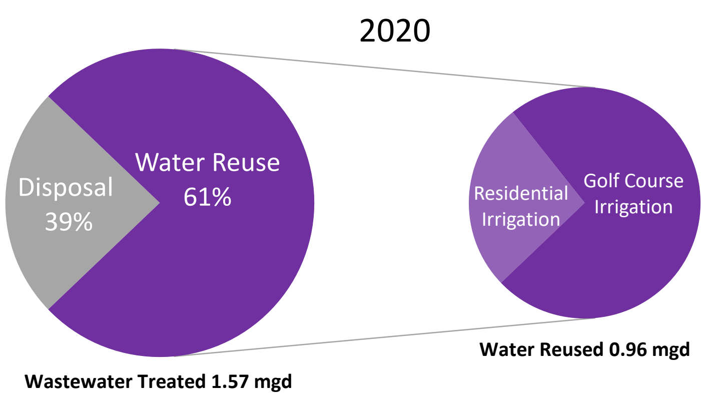


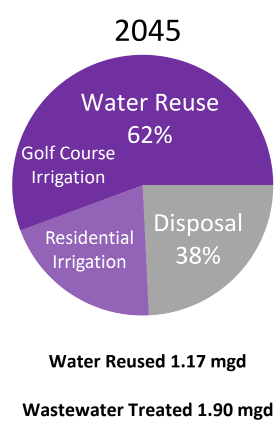
SANIBEL – DONAX

Description: This facility provides reclaimed water to the Regional Reuse Service Area (RRSA) for public access reuse. The RRSA incorporates the entire island of Sanibel. Public access reuse service consists of irrigation for 13 homes, three golf courses, one park, and one school. Excess reclaimed water is disposed through deep well injection.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA014430**		
Wastewater Treatment Capacity (mgd)	**2.38**		
Disinfection[a]	High Level		
Public Access Users Served:			
Residences	13		
Golf Courses	3		
Parks and Schools	2		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**1.57**	**1.90**	
Total Wastewater Disposed	**0.31**	**0.37**	
Deep Injection Well	0.31	0.37	
Total Water Reused	**0.96**	**1.17**	
Residential Irrigation	0.26	**0.31**	
Golf Course Irrigation	0.71	**0.86**	
Supplemental to Reclaimed Water	**0.00**	**0.00**	
Reuse Percentage	**61.4%**	**61.5%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.
[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.





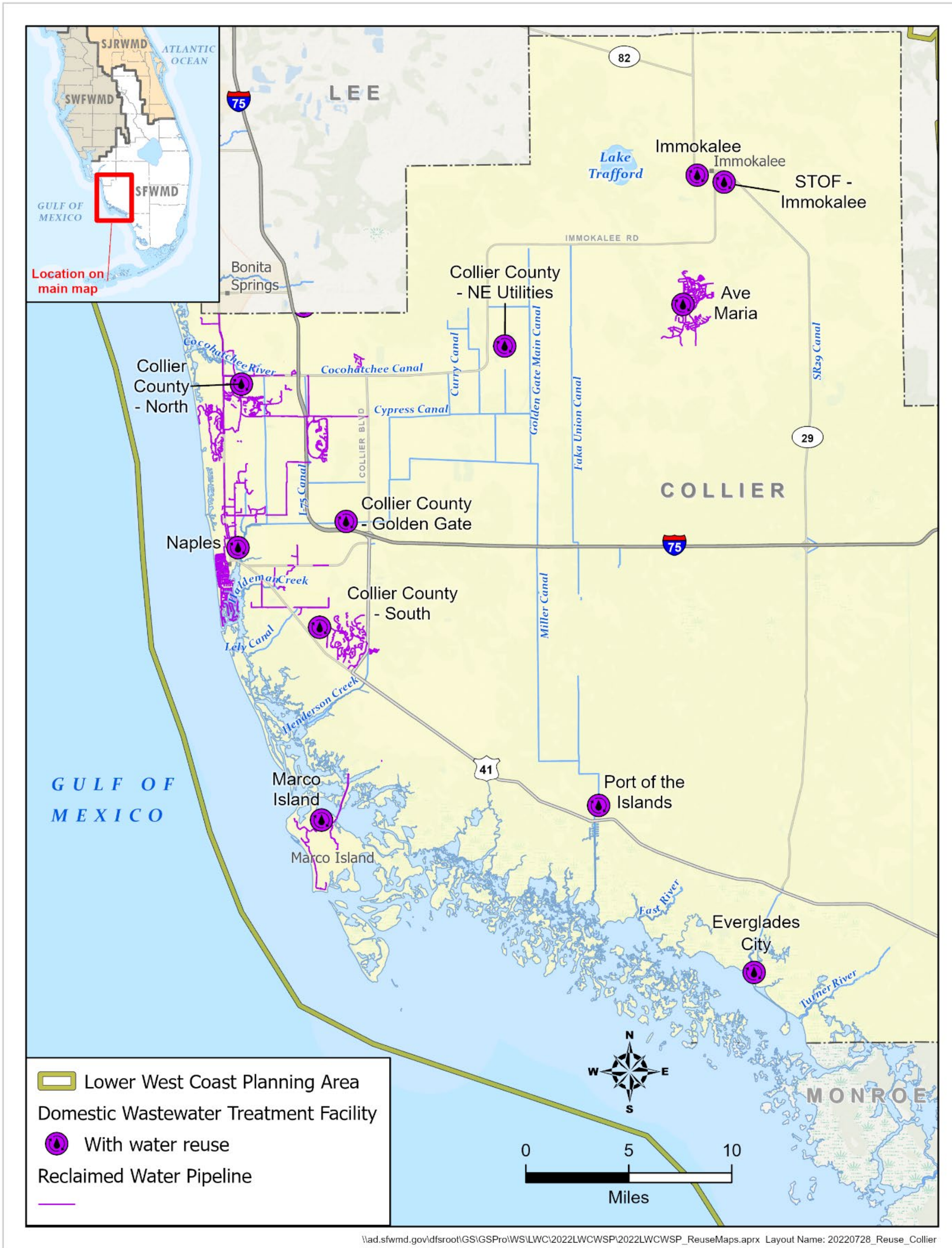


Figure E-2. Wastewater treatment facilities in Collier County with a permitted capacity of 0.10 mgd or greater.

AVE MARIA

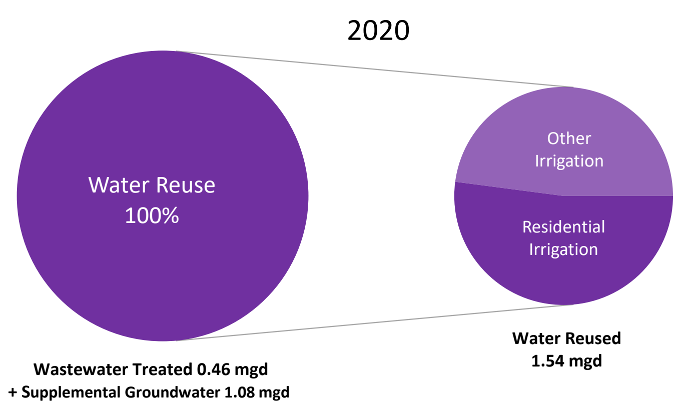
Description: This facility provides wastewater and tertiary treatment reclaimed services to approximately 1,700 residential units, three parks, and two schools. Phase 2 expansion is under way. Future service area expansions are being considered for adjacent areas to the east, southeast, and northwest of the existing service area. Supplemental wells will be added as needed to meet landscape irrigation demands.

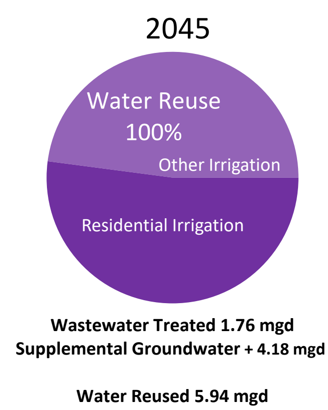
Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA376400**		
Wastewater Treatment Capacity (mgd)	**0.9**		
Disinfection[a]	High Level		
Public Access Users Served:			
Residences	1,690		
Golf Courses	0		
Parks and Schools	5		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**0.46**	**1.76**	
Total Wastewater Disposed	**0.00**	**0.00**	
Total Water Reused[b]	**1.54**	**5.94**	
Residential Irrigation	0.80	3.09	
Other Irrigation	0.74	2.85	
Supplemental to Reclaimed Water	**1.08** GW	**4.18** GW	
Reuse Percentage	**100.0%**	**100.0%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
Phase 2- 1.25 mgd WWTF Expansion	2023	$6.5	1.25

FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; WWTF = wastewater treatment facility.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with treated wastewater.





COLLIER

COLLIER COUNTY UTILITIES – GOLDEN GATE

Description: The facility's operational permit was transferred from the Florida Governmental Utility Authority to Collier County Water-Sewer District in March 2018. This facility provides wastewater services to approximately 2,300 residential and nonresidential properties in Golden Gate City. Effluent is disposed through deep well injection. Four on-site percolation ponds (rapid infiltration basins) are available, if needed.

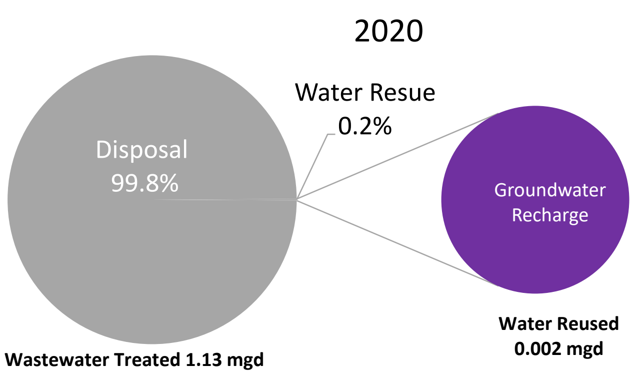
Wastewater Treatment Facility Information	
FDEP Wastewater Facilities Regulation Identification	**FLA142140**
Wastewater Treatment Capacity (mgd)	**1.5**
Disinfection[a]	High Level, Basic Level
Public Access Users Served:	
Residences	0
Golf Courses	0
Parks and Schools	0

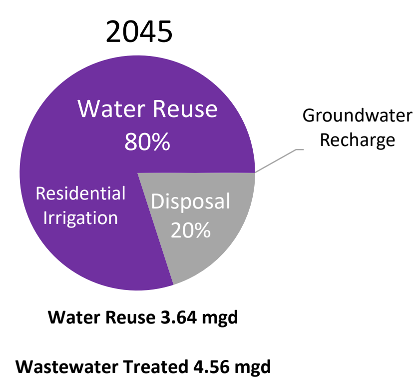
Facility Flows (mgd)	**2020**	**2045**
Total Wastewater Treated	**1.13**	**4.56**
Total Wastewater Disposed	**1.13**	**0.91**
Deep Injection Well	1.13	0.91
Total Water Reused	**0.002**	**3.64**
Residential Irrigation	0.00	3.64
Groundwater Recharge (RIBs)	0.002	0.01
Supplemental to Reclaimed Water	**0.00**	**0.00**
Reuse Percentage	**0.2%**	**80.1%**

Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
Golden Gate 2.5 mgd WWTF expansion	2030	$86	2.5

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin; WWTF = wastewater treatment facility.

[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C, and high-level disinfection as described in Rule 62-600.440(6), F.A.C.





COLLIER COUNTY UTILITIES – NORTH AND SOUTH

Description: The North facility provides reclaimed water to nine communities, six golf courses, and four parks. Any remaining reclaimed water is disposed through two deep injection wells. The South facility provides reclaimed water to two communities, 11 golf courses, and one park. Any remaining reclaimed water is disposed through two deep injection wells. The two facilities are interconnected to ensure service flexibility and reliability. Reclaimed water is supplemented with groundwater when needed to meet demands.

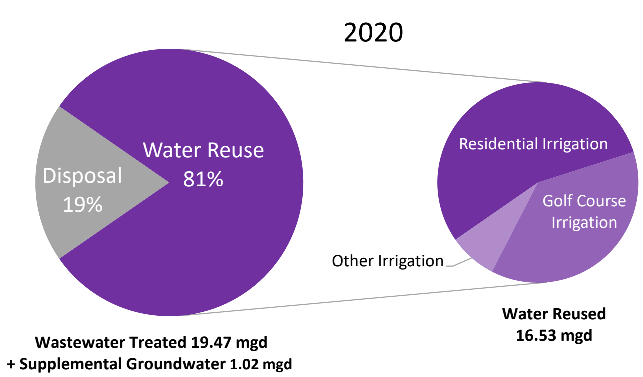
Wastewater Treatment Facility Information				
FDEP Wastewater Facilities Regulation Identification	**FL0141399 (North)**		**FL0141356 (South)**	
Wastewater Treatment Capacity (mgd)	**24.1**		**16.0**	
Disinfection[a]	High Level		High Level	
Public Access Users Served:				
Residences	20,213			
Golf Courses	17			
Parks and Schools	7			
Facility Flows (mgd)				
	2020		**2045**	
	North	**South**	**North**	**South**
Total Wastewater Treated	**10.38**	**9.10**	**17.14**	**12.58**
Total Wastewater Disposed	**3.96**		**5.10**	
Deep Injection Well	3.96		5.10	
Total Water Reused[b]	**16.53**		**26.45**	
Residential Irrigation	9.05		13.48	
Golf Course Irrigation	6.20		11.63	
Other Irrigation	1.29		1.34	
Supplemental to Reclaimed Water	**1.02** GW		**1.82** GW	
Reuse Percentage	**80.7%**		**83.9%**	

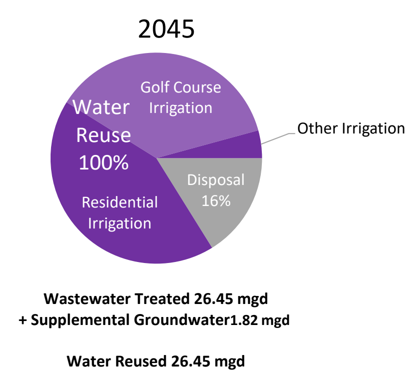
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
South County WRF Supplemental Wells	2030	$3.0	1.00
Foxfire Reclaimed Water Supplemental Wells	2023	$1.00	1.00

FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; WRF = water reclamation facility.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with reclaimed water.





COLLIER COUNTY UTILITIES – NORTHEAST

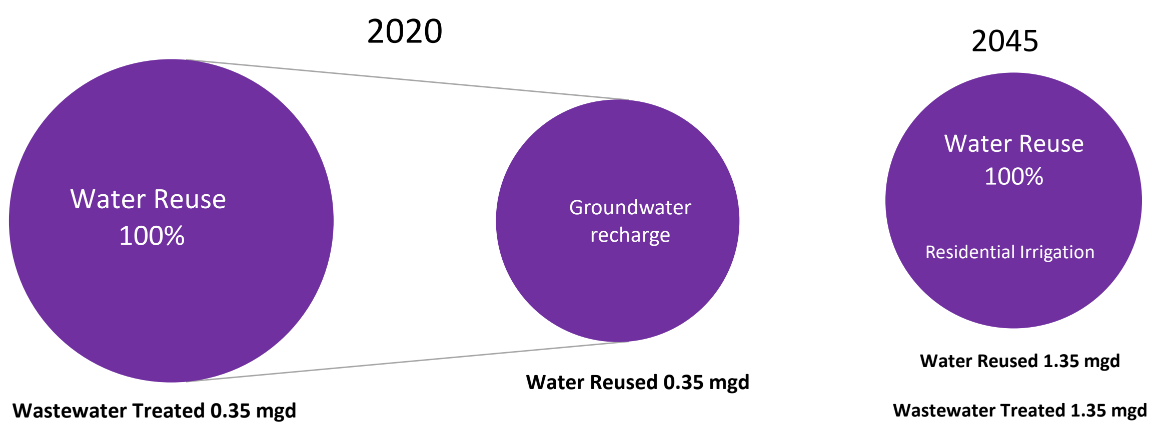
Description: The facility's operational permit was transferred from the Orange Tree Utility Company to Collier County in March 2017. This facility provides wastewater services to two major service areas connected by a corridor on 33rd Avenue NE and 33rd Avenue NW. The eastern portion is comprised of several master planned communities, two schools, and large tracts of undeveloped lands. The western portion of the service area includes the Twin Eagles development. Reclaimed water is sent to three rapid infiltration basins located adjacent to the plant. This plant will be decommissioned and replaced with the Northeast Service Area (NESA) facility and be operational by 2030.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA014165**	
Wastewater Treatment Capacity (mgd)		**0.75**	
Disinfection[a]		Basic Level	
Public Access Users Served:			
Residences		0	
Golf Courses		0	
Parks and Schools		0	
Facility Flows (mgd)			
		2020	**2045 - NESA**
Total Wastewater Treated		**0.35**	**1.35**
Total Wastewater Disposed		**0.00**	**0.00**
Total Water Reused		**0.35**	**1.35**
Residential Irrigation		0.00	1.35
Groundwater Recharge (RIBs)		0.35	0.00
Supplemental to Reclaimed Water		**0.00**	**0.00**
Reuse Percentage		**100.0%**	**100.0%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
Northeast New 1.50 mgd WWTF	2030	$65.00	0.75

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; NESA = Northeast Service Area; RIB = rapid infiltration basin; WWTF = wastewater treatment facility.

[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.

[b] This plant will be decommissioned and replaced with the NESA facility by 2030.

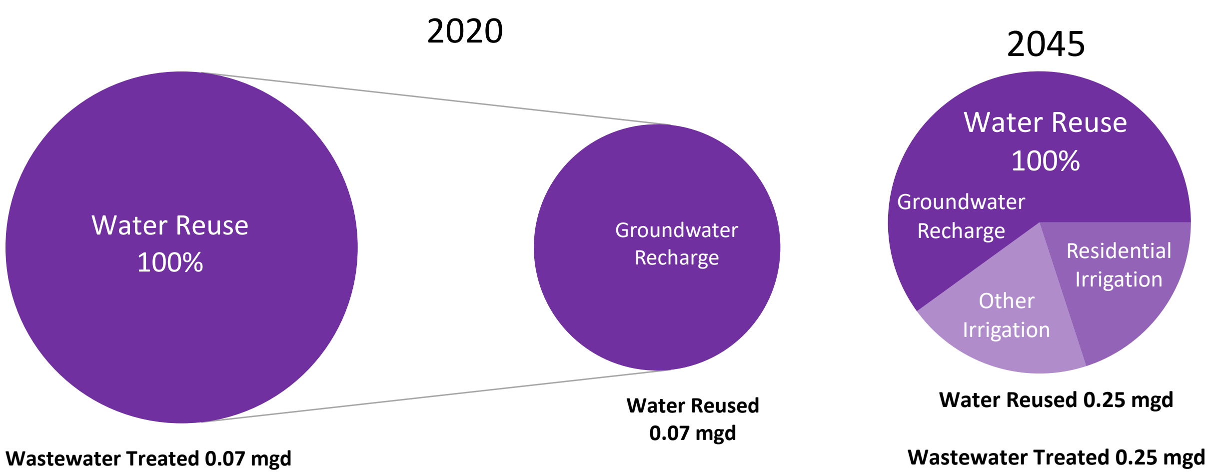


EVERGLADES CITY

Description: This facility provides wastewater services for approximately 800 residential and nonresidential properties. All reclaimed water is currently sent to rapid infiltration basins. The construction of a new WWTF is currently planned.

<table>
<tr><th colspan="4">Wastewater Treatment Facility Information</th></tr>
<tr><td colspan="2">FDEP Wastewater Facilities Regulation Identification</td><td colspan="2">FLA027618</td></tr>
<tr><td colspan="2">Wastewater Treatment Capacity (mgd)</td><td colspan="2">0.16</td></tr>
<tr><td colspan="2">Disinfection[a]</td><td colspan="2">Basic Level</td></tr>
<tr><td colspan="2">Public Access Users Served:</td><td colspan="2"></td></tr>
<tr><td colspan="2">Residences</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Golf Courses</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Parks and Schools</td><td colspan="2">0</td></tr>
<tr><th colspan="4">Facility Flows (mgd)</th></tr>
<tr><th colspan="2"></th><th>2020</th><th>2045</th></tr>
<tr><td colspan="2">Total Wastewater Treated</td><td>0.07</td><td>0.25</td></tr>
<tr><td colspan="2">Total Wastewater Disposed</td><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="2">Total Water Reused</td><td>0.07</td><td>0.25</td></tr>
<tr><td colspan="2">Residential Irrigation</td><td>0.00</td><td>0.05</td></tr>
<tr><td colspan="2">Other Irrigation</td><td>0.00</td><td>0.05</td></tr>
<tr><td colspan="2">Groundwater Recharge (RIBs)</td><td>0.07</td><td>0.15</td></tr>
<tr><td colspan="2">Supplemental to Reclaimed Water</td><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="2">Reuse Percentage</td><td>100.0%</td><td>100.0%</td></tr>
<tr><th colspan="4">Reclaimed Water Project Summary</th></tr>
<tr><th>Project Name</th><th>Completion Date</th><th>Total Capital Cost ($ million)</th><th>Added Capacity (mgd)</th></tr>
<tr><td>New RIBs</td><td>2026</td><td>TBD</td><td>0.10</td></tr>
<tr><td>0.1 mgd Reclaimed Water Production Facility</td><td>2029</td><td>$3.0</td><td>0.10</td></tr>
</table>

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin.
[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.



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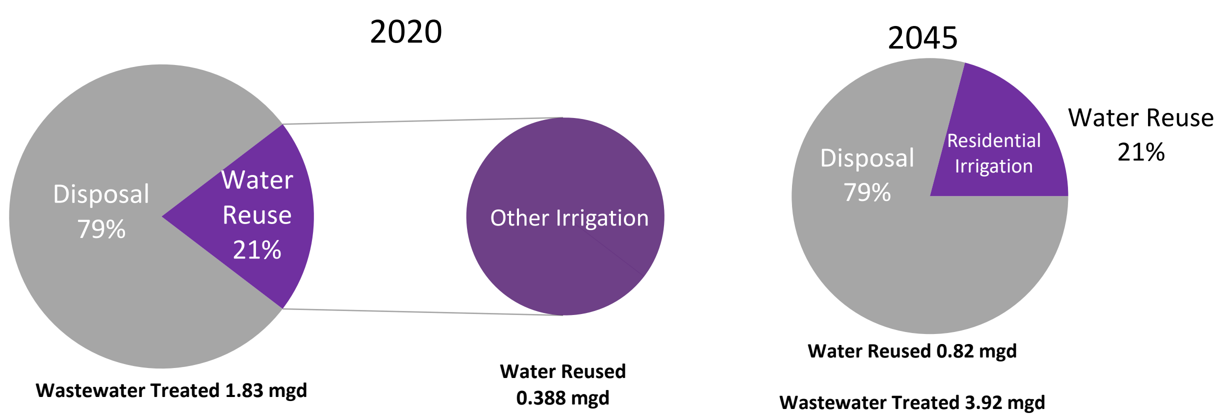
IMMOKALEE

Description: This facility provides wastewater services to approximately 6,000 residential and nonresidential properties and currently does not provide public access reclaimed water. Effluent is primarily disposed through deep well injection. Four on-site percolation ponds plus a 26-acre sprayfield with three percolation ponds are available if needed. It is anticipated the facility will provide reclaimed water service starting in 2032.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA014132**	
Wastewater Treatment Capacity (mgd)		**4.0**	
Disinfection[a]		Basic Level	
Public Access Users Served:			
Residences		0	
Golf Courses		0	
Parks and Schools		0	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**1.83**	**3.92**
Total Wastewater Disposed		**1.45**	**3.10**
Deep Injection Well		1.28	3.10
Discharge Percolation Pond (Non-reuse)		0.17	0.00
Total Water Reused		**0.38**	**0.82**
Residential Irrigation		0.00	0.82
Other Irrigation		0.38	0.00
Supplemental to Reclaimed Water		**0.00**	**0.00**
Reuse Percentage		**20.8%**	**20.9%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
3.0 mgd Reclaimed Water Production Facility and Water Main Extension	2027	$3.40	3.00

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.
[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.



MARCO ISLAND

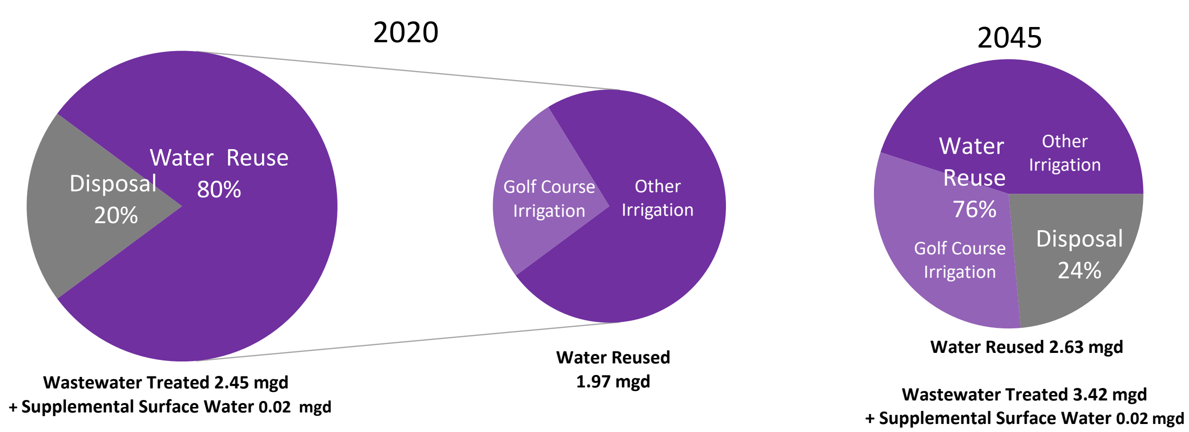
Description: This facility provides wastewater services to more than 17,600 residential and nonresidential properties and delivers reclaimed water for irrigation to three golf courses, three parks, two schools, and roadway medians. Supplemental sources include surface water from Marco Lakes. The remaining reclaimed water is disposed through deep well injection.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA014167**		
Wastewater Treatment Capacity (mgd)	**4.92**		
Disinfection[a]	High Level		
Public Access Users Served:			
Residences	0		
Golf Courses	3		
Parks and Schools	5		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**2.45**	**3.43**	
Total Wastewater Disposed	**0.50**	**0.81**	
Deep Injection Well	0.50	0.81	
Total Water Reused[b]	**1.97**	**2.63**	
Golf Course Irrigation	0.52	1.08	
Other Irrigation	1.45	1.55	
Supplemental to Reclaimed Water	**0.02** SW	**0.02** SW	
Reuse Percentage	**79.7%**	**76.4%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; SW = surface water.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with reclaimed water.



C O L L I E R

NAPLES

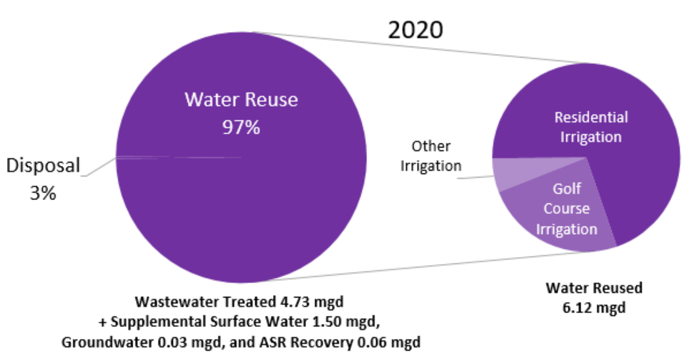
Description: This facility provides wastewater services to approximately 33,792 permanent and 54,069 peak season residences as well as nonresidential properties. The city provides reclaimed water for irrigation of residential homes, golf courses, parks, and schools within its service area. Three on-site aquifer storage and recovery (ASR) wells are used to store excess reclaimed water and excess surface water from the Golden Gate Canal for use during the dry season. Reclaimed water is supplemented with excess surface water from the Golden Gate Canal, and groundwater if surface water and ASR stored water is not available. The remaining effluent is discharged to the Gordon River.

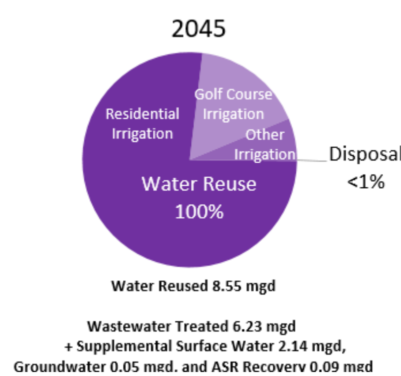
Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FL0026271**	
Wastewater Treatment Capacity (mgd)		**10.0**	
Disinfection[a]		High Level	
Public Access Users Served:			
Residences		1,378	
Golf Courses		10	
Parks and Schools		13	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**4.73**	**6.23**
Total Wastewater Disposed		**0.02**	**0.02**
Coastal/Estuarine Waters		0.02	0.02
Total Water Reused[b]		**6.12**	**8.55**
Residential Irrigation		4.28	6.57
Golf Course Irrigation		1.49	1.44
Other Irrigation		0.36	0.54
Supplemental to Reclaimed Water		**1.60** (SW 1.5, GW 0.03, ASR 0.06)	**2.28** (SW 2.14, GW 0.05, ASR 0.09)
Reuse Percentage		**96.7%**	**100.0%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

ASR = aquifer storage and recovery; FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day; SW = surface water.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Includes supplemental water blended with treated wastewater.





PORT OF THE ISLANDS – SOUTH

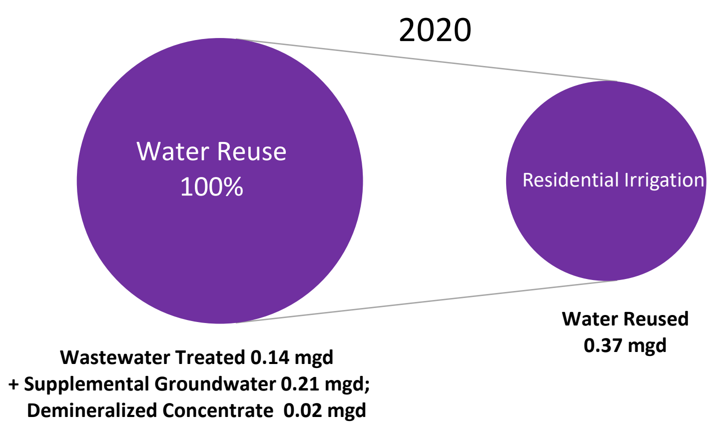
Description: This facility provides wastewater services to approximately 621 residential and nonresidential properties. All reclaimed water is used for residential irrigation.

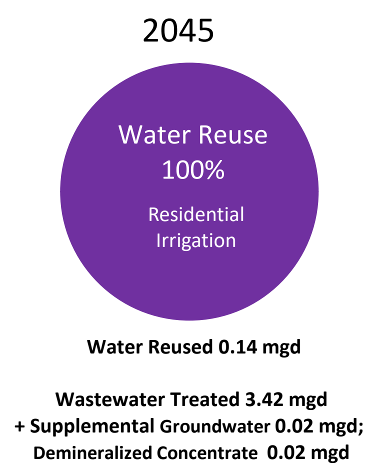
Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA141704**		
Wastewater Treatment Capacity (mgd)	**0.2**		
Disinfection[a]	Basic Level		
Public Access Users Served:			
Residences	621		
Golf Courses	0		
Parks and Schools	0		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**0.14**	**0.14**	
Total Wastewater Disposed	**0.00**	**0.00**	
Total Water Reused[b]	**0.37**	**0.37**	
Residential Irrigation	0.37	0.37	
Supplemental to Reclaimed Water	**0.23** (GW 0.208, 0.23 DemConc)	**0.23** (GW 0.208, 0.23 DemConc)	
Reuse Percentage	**100.0%**	**100.0%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects-			

DemConc = demineralized concentrate; FDEP = Florida Department of Environmental Protection; GW = groundwater; mgd = million gallons per day.

[a] Basic disinfection as described in Rule 62-600.440(5), F.AC.

[b] Includes supplemental water blended with reclaimed water.





COLLIER

SEMINOLE TRIBE OF FLORIDA – IMMOKALEE

Description: This facility provides wastewater services to the Seminole Tribe of Florida Immokalee Reservation, consisting of approximately 400 residential and nonresidential properties. Reclaimed water is disposed through on-site percolation ponds (rapid infiltration basins).

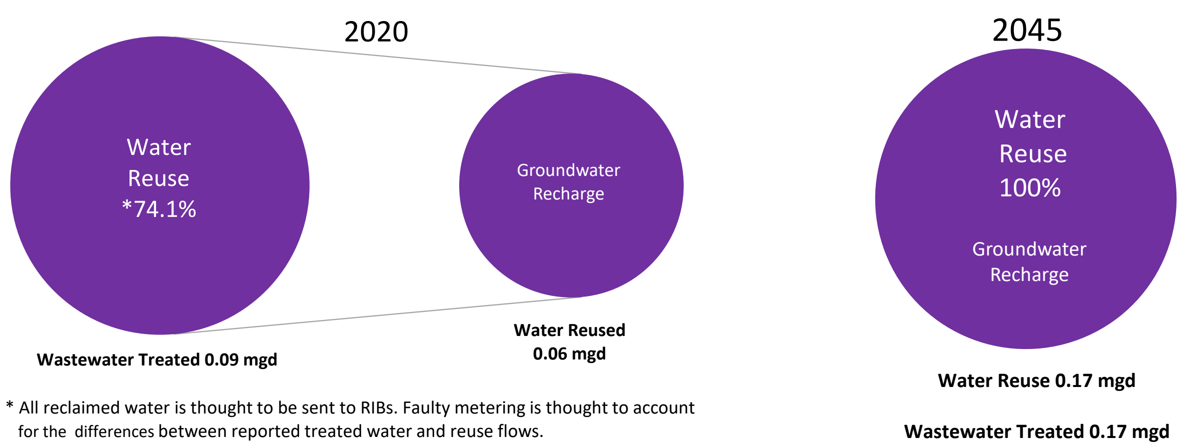
<table>
<tr><th colspan="4">Wastewater Treatment Facility Information</th></tr>
<tr><td colspan="2">FDEP Wastewater Facilities Regulation Identification</td><td colspan="2">N/A</td></tr>
<tr><td colspan="2">Wastewater Treatment Capacity (mgd)</td><td colspan="2">0.25</td></tr>
<tr><td colspan="2">Disinfection[a]</td><td colspan="2">High Level</td></tr>
<tr><td colspan="2">Public Access Users Served:</td><td colspan="2"></td></tr>
<tr><td colspan="2">Residences</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Golf Courses</td><td colspan="2">0</td></tr>
<tr><td colspan="2">Parks and Schools</td><td colspan="2">0</td></tr>
<tr><th colspan="4">Facility Flows (mgd)</th></tr>
<tr><th colspan="2"></th><th>2020</th><th>2045</th></tr>
<tr><td colspan="2">Total Wastewater Treated</td><td>0.09</td><td>0.17</td></tr>
<tr><td colspan="2">Total Wastewater Disposed</td><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="2">Total Water Reused</td><td>0.06[b]</td><td>0.17</td></tr>
<tr><td colspan="2">Groundwater Recharge (RIBs)</td><td>0.06</td><td>0.17</td></tr>
<tr><td colspan="2">Supplemental to Reclaimed Water</td><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="2">Reuse Percentage</td><td>74.1%</td><td>100.0%</td></tr>
<tr><th colspan="4">Reclaimed Water Project Summary</th></tr>
<tr><th>Project Name</th><th>Completion Date</th><th>Total Capital Cost ($ million)</th><th>Added Capacity (mgd)</th></tr>
<tr><td>No Projects</td><td></td><td></td><td></td></tr>
</table>

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin; SW = surface water.

Note: The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Collier County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Immokalee Reservation is included in the calculations for Collier County.

[a] High-level disinfection as described in Rule 62-600.440(6), F.A.C.

[b] Differences between reported wastewater treated and water reused are being investigated by the Seminole Tribe of Florida. All reclaimed water is sent to RIBs.



* All reclaimed water is thought to be sent to RIBs. Faulty metering is thought to account for the differences between reported treated water and reuse flows.

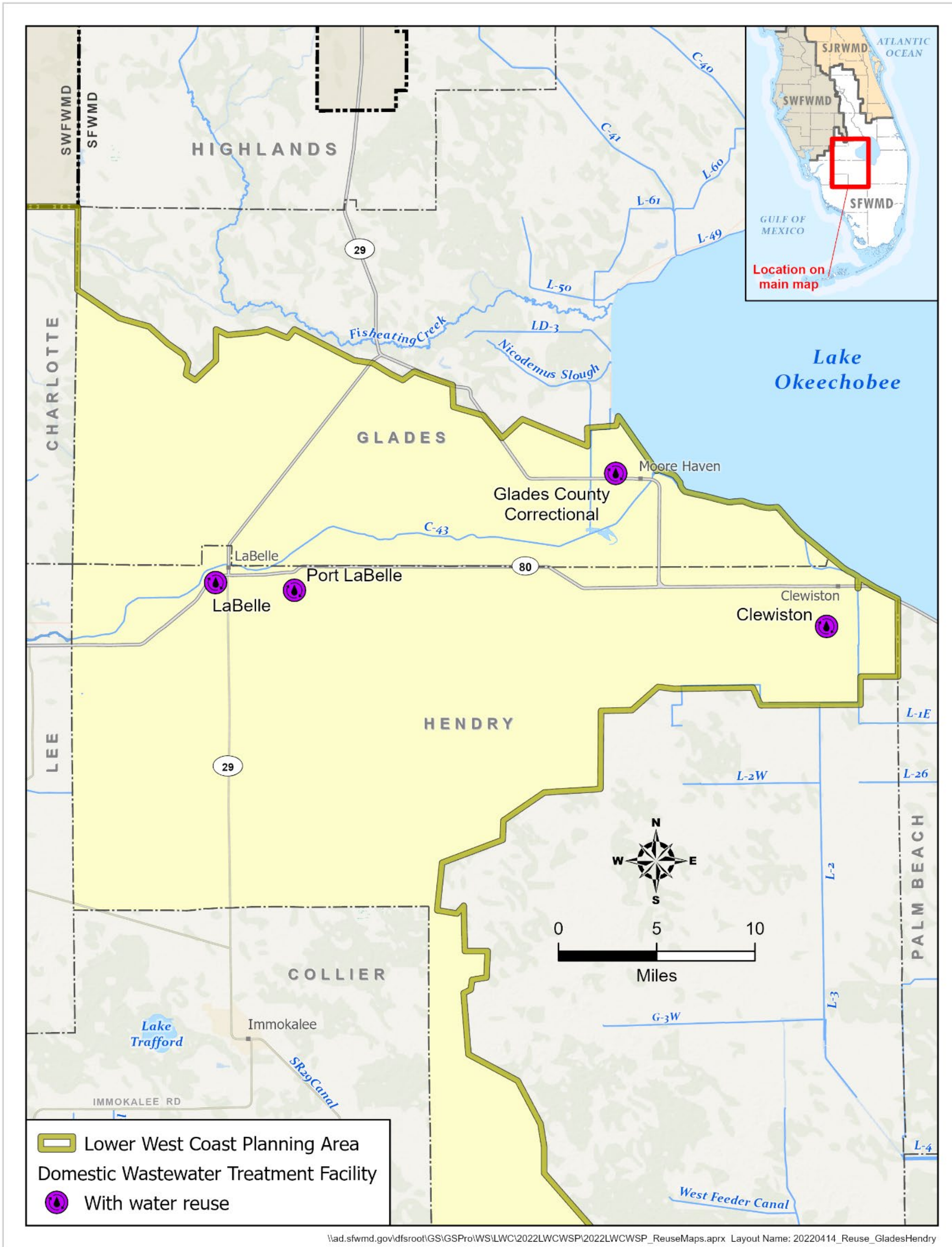


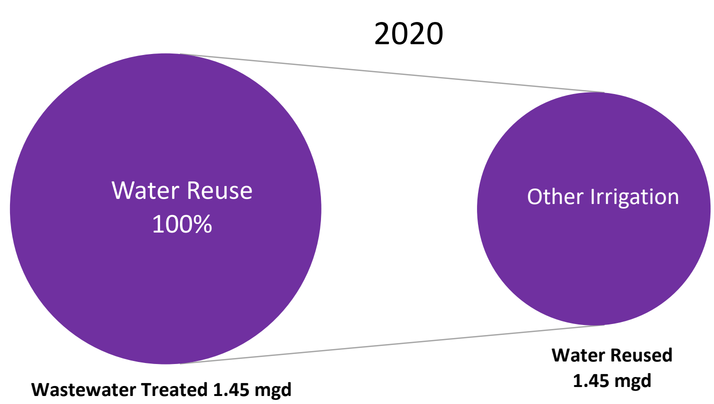
Figure E-3. Wastewater treatment facilities in Glades and Hendry counties with a permitted capacity of 0.10 mgd or greater.

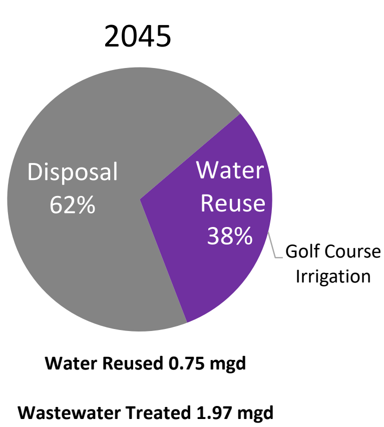
CLEWISTON

Description: This facility provides wastewater services to approximately 4,000 residential and 100 nonresidential properties in Clewiston, Harlem, and mobile home communities within the city's service area. Reclaimed water is disposed through three holding ponds, and a land application site of 24 effluent sprayfields with underdrains totaling 192.9 acres. The city is moving away from sprayfield disposal and exploring opportunities to provide reuse to possible subdivision development.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FL0040665**		
Wastewater Treatment Capacity (mgd)	**1.5**		
Disinfection[a]	Basic Level		
Public Access Users Served:			
Residences	0		
Golf Courses	0		
Parks and Schools	0		
Facility Flows (mgd)			
	2021	**2045**	
Total Wastewater Treated	**1.45**	**1.97**	
Total Wastewater Disposed	**0.00**	1.71	
Deep Injection Well	0.00	1.71	
Total Water Reused	**1.45**	**0.75**	
Golf Course Irrigation	0.00	0.75	
Other Irrigation (parks, schools, agricultural, etc.)	1.45	0.00	
Supplemental to Reclaimed Water	**0.00**	**0.00**	
Reuse Percentage	**100.0%**	**38.1%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
0.75 mgd Reclaimed Water Production Facility and Water Main Extension	2035	$0.50	0.75

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day.
[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.





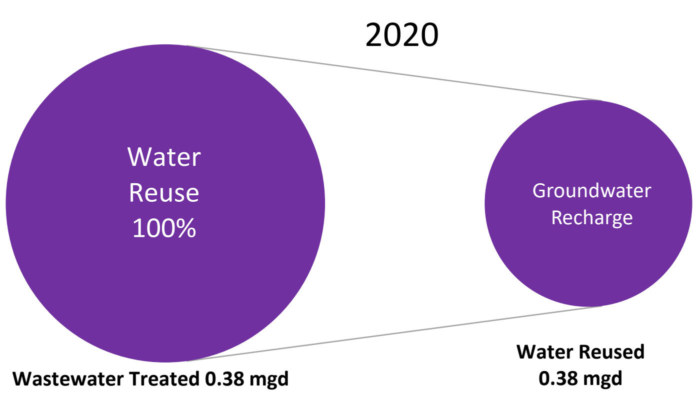
HENRY

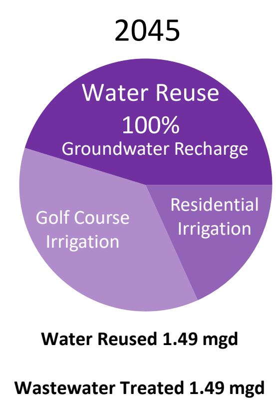
LABELLE

Description: This facility provides wastewater services to approximately 1,154 residential and 335 nonresidential properties. Reclaimed water is sent to six off-site rapid infiltration basins on 199 acres. An injection well has been added as an alternate source of disposal.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification	**FLA014283**		
Wastewater Treatment Capacity (mgd)	**0.75**		
Disinfection[a]	Basic Level		
Public Access Users Served:			
Residences	0		
Golf Courses	0		
Parks and Schools	0		
Facility Flows (mgd)			
	2020	**2045**	
Total Wastewater Treated	**0.38**	**1.49**	
Total Wastewater Disposed	**0.00**	**0.00**	
Total Water Reused	**0.38**	**1.49**	
Residential Irrigation	0.00	0.27	
Golf Course Irrigation	0.00	0.54	
Groundwater Recharge (RIBs)	0.38	0.67	
Supplemental to Reclaimed Water	**0.00**	**0.00**	
Reuse Percentage	**100.0%**	**100.0%**	
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin.
[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.





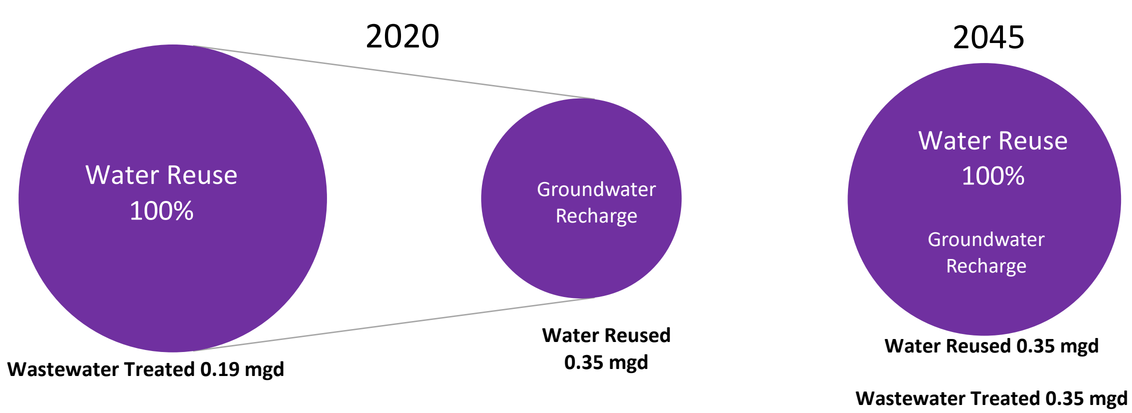
HENDRY

PORT LABELLE

Description: This facility provides wastewater services to approximately 1,079 residential and nonresidential properties. Reclaimed water is disposed through on-site percolation ponds.

Wastewater Treatment Facility Information			
FDEP Wastewater Facilities Regulation Identification		**FLA014290**	
Wastewater Treatment Capacity (mgd)		**0.50**	
Disinfection[a]		Basic Level	
Public Access Users Served:			
Residences		0	
Golf Courses		0	
Parks and Schools		0	
Facility Flows (mgd)			
		2020	**2045**
Total Wastewater Treated		**0.19**	**0.35**
Total Wastewater Disposed		**0.00**	**0.00**
Total Water Reused		**0.19**	**0.35**
Groundwater Recharge (RIBs)		0.19	0.35
Supplemental to Reclaimed Water		**0.00**	**0.00**
Reuse Percentage		**100.0%**	**100.0%**
Reclaimed Water Project Summary			
Project Name	Completion Date	Total Capital Cost ($ million)	Added Capacity (mgd)
No Projects			

FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; RIB = rapid infiltration basin.
[a] Basic disinfection as described in Rule 62-600.440(5), F.A.C.



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FDEP. 2021. *OCULUS Electronic Document Management System*. Florida Department of Environmental Protection, Tallahassee, FL. Available online at https://depedms.dep.state.fl.us/Oculus/servlet/login.

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