TECHNICAL PUBLICATION SJ2006-2

DISTRICT WATER SUPPLY PLAN
2005

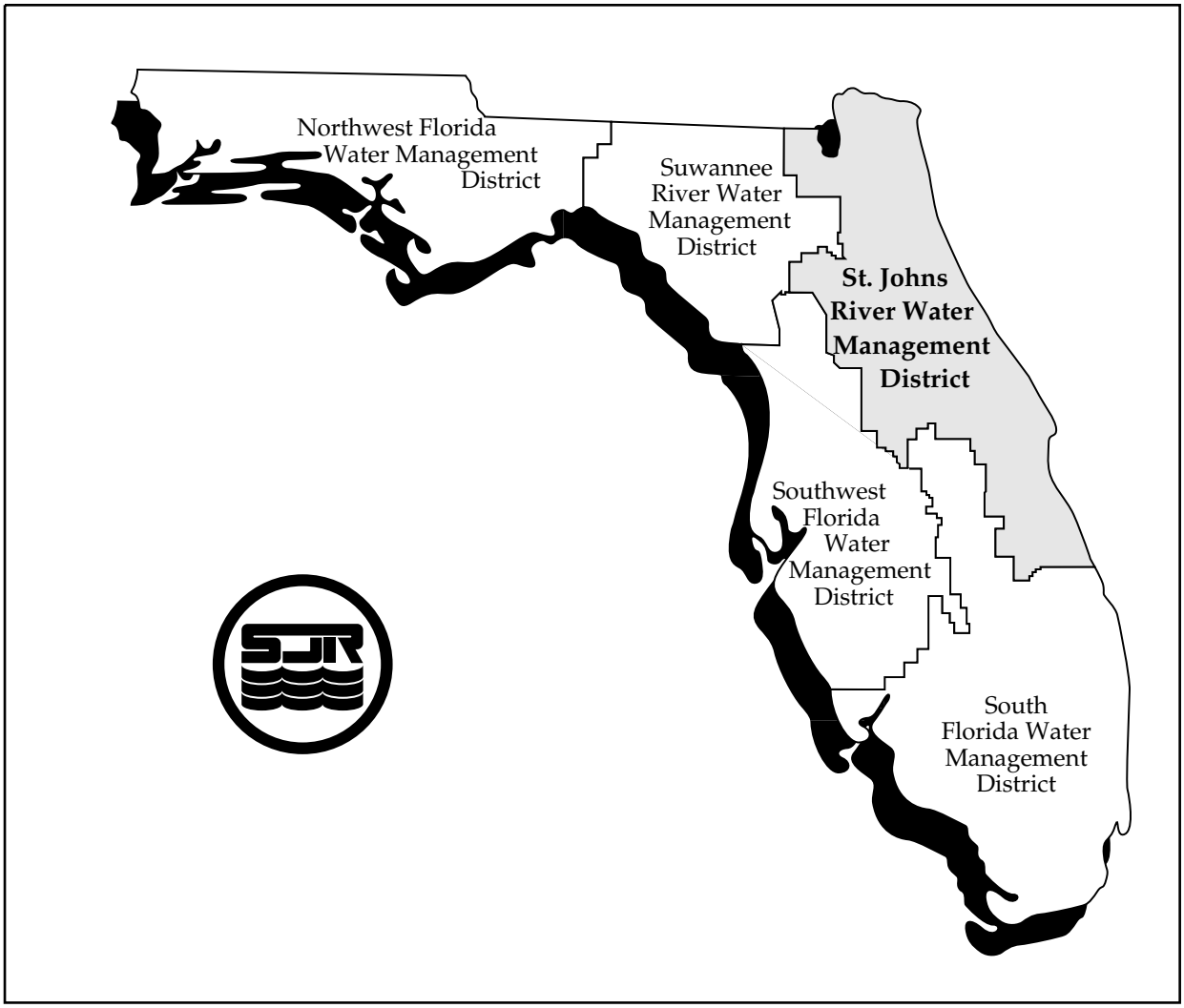
Technical Publication SJ2006-2

District Water Supply Plan

2005

St. Johns River Water Management District
Palatka, Florida

2006



The St. Johns River Water Management District (SJRWMD) was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or part of 18 counties in northeast Florida. The mission of SJRWMD is to ensure the sustainable use and protection of water resources for the benefit of the people of the District and the state of Florida. SJRWMD accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management.

This document is published to disseminate information collected by SJRWMD in pursuit of its mission. Copies of this document can be obtained from:

Library
St. Johns River Water Management District
4049 Reid Street • P.O. Box 1429
Palatka, FL 32178-1429

Phone: (386) 329-4132

EXECUTIVE SUMMARY

Located in northeastern Florida, the St. Johns River Water Management District (SJRWMD) covers approximately 12,300 square miles (about 8 million acres), or about 21% of the state's total area. SJRWMD includes all or part of 18 counties, numerous cities and towns, and the major urban centers of Jacksonville and Orlando, with a total population of almost 3.5 million people in 1995 (the base year for water resource impact projections addressed in SJRWMD's 2003 Water Supply Assessment (WSA 2003) (SJRWMD 2006) and in this document) and 3.9 million in 2000, based on population projections presented in WSA 2003. This population is projected to increase to nearly 5.9 million by 2025.

Total water use for SJRWMD is projected to increase from about 1.36 billion gallons per day in 1995 to about 1.79 billion gallons per day in 2025, and from about 1.49 billion gallons per day in 2000 to 1.79 billion gallons per day in 2025, based on water use projections developed during the WSA 2003 development process. The projected increase from 1995 to 2025 of approximately 400 million gallons per day (mgd) and the projected increase from 2000 to 2025 of approximately 300 mgd represent total districtwide increases in water use of approximately 30% and 20% respectively. Public supply increases account for about 90% of these total projected changes.

For the last 15 years, SJRWMD's water supply planning and assessment investigations have documented that the rate of withdrawal of groundwater in certain areas of SJRWMD is approaching the maximum rate that can be sustained without causing unacceptable adverse impacts to the water resources and related natural systems. Water supply planning results to date show that at some locations, withdrawal rates will likely approach or reach sustainable limits in the foreseeable future, well within the current 20-year planning horizon.

This 2005 District Water Supply Plan (DWSP 2005) addresses current and future water use and traditional and alternative water sources and water conservation required to meet 2025 water supply needs while sustaining water quality and protecting wetland and aquatic systems. DWSP 2005 is designed to meet the requirements of the water supply planning provisions of Section 373, *Florida Statutes* (F.S.), and is based on a planning horizon extending through 2025. It includes the following components:

- A water supply development component

- A water resource development component
- A minimum flows and levels component

Approximately 39% of SJRWMD are identified as priority water resource caution areas (PWRCAs) (WSA 2003). These are areas where existing and reasonably anticipated sources of water and water conservation efforts may not be adequate (1) to supply water for all existing legal uses and anticipated future needs and (2) to sustain the water resources and related natural systems. PWRCAs are the focus of DWSP 2005.

DWSP 2005 identifies water supply development project options and water resource development projects that will meet future water supply needs while sustaining water quality and protecting wetland and aquatic systems. For portions of SJRWMD not designated as PWRCAs, existing water supply sources and water supply development plans are considered reasonably adequate to meet projected needs while sustaining water quality and protecting wetland and aquatic systems.

Identified water supply source options include

- Naturally occurring sources
  - Fresh groundwater
  - Brackish groundwater
  - Surface water
  - Seawater

- Management techniques
  - Water resource development
    - Artificial recharge
    - Aquifer storage and recovery
    - Avoidance of the impacts of groundwater withdrawal through hydration
    - Water supply systems interconnections
  - Demand management (water conservation)
  - Use of reclaimed water

Water supply development projects identified in DWSP 2005 include

Brackish Groundwater Projects

1. Dunes Community Development District Brackish Groundwater Project

2. East Putnam Regional Water System Project
3. Melbourne Reverse Osmosis (RO) Water Treatment Plant Expansion Project
4. Ormond Beach Water Treatment Plant Expansion Project
5. St. Augustine Water Supply Project
6. St. Johns County Water Supply Project

Surface Water Projects

7. Lower Ocklawaha River in Putnam County Project
8. St. Johns River Near SR 50 Project
9. St. Johns River Near Lake Monroe Project
10. St. Johns River Near DeLand Project
11. St. Johns River Near Lake George Project
12. St. Johns River/Taylor Creek Reservoir Water Supply Project

Seawater Projects

13. Indian River Lagoon at FP&L Cape Canaveral Power Plant Project
14. Indian River Lagoon at Reliant Energy Power Plant Project
15. Intracoastal Waterway at New Smyrna Beach Project

Reuse Projects

16. Alafaya Reclaimed Water Storage and High Service Pump Project
17. Altamonte Springs and Apopka Project RENEW APRICOT
18. Apopka and Winter Garden Reuse Partnership Project
19. Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion Project
20. Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II
21. Clermont Reclaimed and Stormwater System Expansion Project
22. Cocoa and Rockledge Reclaimed Water Line Connection Project
23. Daytona Beach Reclaimed Water System Project
24. DeLand Reclaimed Water and Surface Water Augmentation Project

25. Eastern Orange and Seminole Counties Regional Reuse Project
26. Edgewater Reclaimed Water System Interconnection to Southeast Volusia County Project
27. Eustis Reclaimed Water System Expansion and Augmentation Project
28. Flagler County Bulow Reclaimed Water System Project
29. Holly Hill and Ormond Beach Reclaimed Water System Expansion Project
30. Lady Lake Reclaimed Water System Project, Phase II
31. Lake Utility Services (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water System Expansion Project
32. Leesburg Reclaimed Water Reuse Project
33. Melbourne Reclaimed Water System Expansion Project
34. Minneola Reclaimed Water Reuse Project
35. Mount Dora Country Club Golf Course Reclaimed Water Project
36. North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project
37. Ocoee Reuse System Expansion Project
38. Orange County Northwest Reclaimed Water System Augmentation Project
39. Orange County Southeast Reclaimed Water System Expansion Project
40. Orlando Utilities Commission Project RENEW
41. Ormond Beach North Peninsula Reclaimed Water Storage Project
42. Ormond Beach South Peninsula Reclaimed Water System Improvement Project
43. Palm Coast Reclaimed Water System Expansion Project
44. Port Orange Airport Road Reclaimed Water Transmission Main Project
45. Port Orange Pioneer Trail Storage and Pumping Facility Project
46. Port Orange Reclaimed Water Reservoir and Recharge Basin Project
47. Rockledge Reclaimed Water Storage Project
48. Rockledge Reclaimed Water System Expansion—ASR Project
49. South Daytona Reclaimed Water System Expansion Project
50. Tavares Reclaimed Water System Expansion Project

51. Volusia County Southwest Reclaimed Water System Project
52. West Melbourne Above Ground Reclaimed Water Storage Tank Project
53. Winter Garden Reclaimed Water Pumping and Transmission Project

Reuse Augmentation Projects

54. Lake Apopka Reuse Augmentation Project
55. Seminole County Yankee Lake Reclaimed Water System Augmentation Project
56. University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project
57. Winter Park Windsong Stormwater Reuse Demonstration Project
58. Winter Springs Lake Jesup Reclaimed Water Augmentation Project

Other Projects

59. Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project
60. Holloway Farms Agricultural Irrigation Rainwater Collection System Project

All of these projects are considered alternative water supply projects as defined under legislation that was enacted during the 2005 Florida Legislative Session. This legislation clarified that funding for the development of alternative water supplies shall be the primary responsibility of water suppliers and users, with the State of Florida and the water management district being responsible for providing funding assistance. The legislature established the Water Protection and Sustainability Program (WPSP) to provide state and water management district cost-sharing assistance for construction of selected alternative water supply projects.

SJRWMD's goal in allocating funds available through WPSP will be to cost-share on alternative water supply development projects that have the greatest certainty in supplying the projected demands through the 2025 planning horizon, such that

- Existing or projected water resource problems associated with PWRCAs are solved or avoided
- Identification of PWRCAs is avoided

Thus, SJRWMD's priority in funding support will be for projects that will provide significant quantities of new, naturally occurring, sources of water to users within PWRCAs or within areas that would otherwise be designated as PWRCAs.

Water resource development projects identified in DWSP 2005 include

- Abandoned Artesian Well Plugging Program
- Aquifer Protection Program
- Aquifer Storage and Recovery Construction and Testing
- Central Florida Aquifer Recharge Enhancement Program
- Cooperative Well Retrofit Project
- Demineralization Concentrate Management Project
- Facilitation of Regional Decision-Making Process
- Feasibility of Seawater Demineralization Projects
- Hydrologic Data Collection and Analysis
- Investigation of the Augmentation of Public Supply Systems With Local Surface Water / Stormwater Sources
- Lake Apopka Basin Water Resource Development Project
- Lower Lake Louise Water Control Structure Project
- Upper St. Johns River Basin Project
- Treatability of Algal Toxins Using Oxidation and Adsorption
- Wetland Augmentation Demonstration Program
- Water Resource Development Components of Water Supply Development Projects

SJRWMD is primarily responsible for implementing these projects, with assistance from water suppliers and users.

CONTENTS

FIGURES

TABLES

INTRODUCTION

PLANNING MANDATES

The St. Johns River Water Management District's (SJRWMD) 2005 District Water Supply Plan (DWSP 2005) is designed to meet the requirements of the water supply planning provisions of Chapter 373, *Florida Statutes* (F.S.). DWSP 2005 is an essential part of SJRWMD's water supply mission to implement a regional strategy to provide sufficient water for users and the environment.

DWSP 2005 is based on a planning horizon extending through 2025 and includes the following components:

- A water supply development component
- A water resource development component
- A minimum flows and levels component

Subsection 373.0361(1), F.S., requires SJRWMD to initiate water supply planning for each water supply planning region where priority water resource caution areas (PWRCAs) are identified (Figure 1). SJRWMD has designated its entire jurisdictional area as one planning region. Therefore, DWSP 2005 addresses SJRWMD's area in its entirety.

PWRCAs are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems. SJRWMD's Water Supply Assessment 2003 (WSA 2003) (SJRWMD 2006) includes a detailed description of the identification of PWRCAs.

These PWRCAs should not be confused with the water resource caution area designated pursuant to the requirements of Subsection 62-40.416(6), *Florida Administrative Code* (*F.A.C.)*. This subsection requires the water management districts to designate water resource caution areas as regions where reuse of reclaimed water would be required if economically, environmentally, and technically feasible. Prior to the implementation of Subsection 62-40.416(6), *F.A.C.*, SJRWMD's Consumptive Use Permitting Rule required reuse of reclaimed water throughout SJRWMD, where available and feasible. Therefore, when implementing the Florida Department of Environmental Protection (FDEP) Subsection 62-40.416(6) requirement, SJRWMD designated

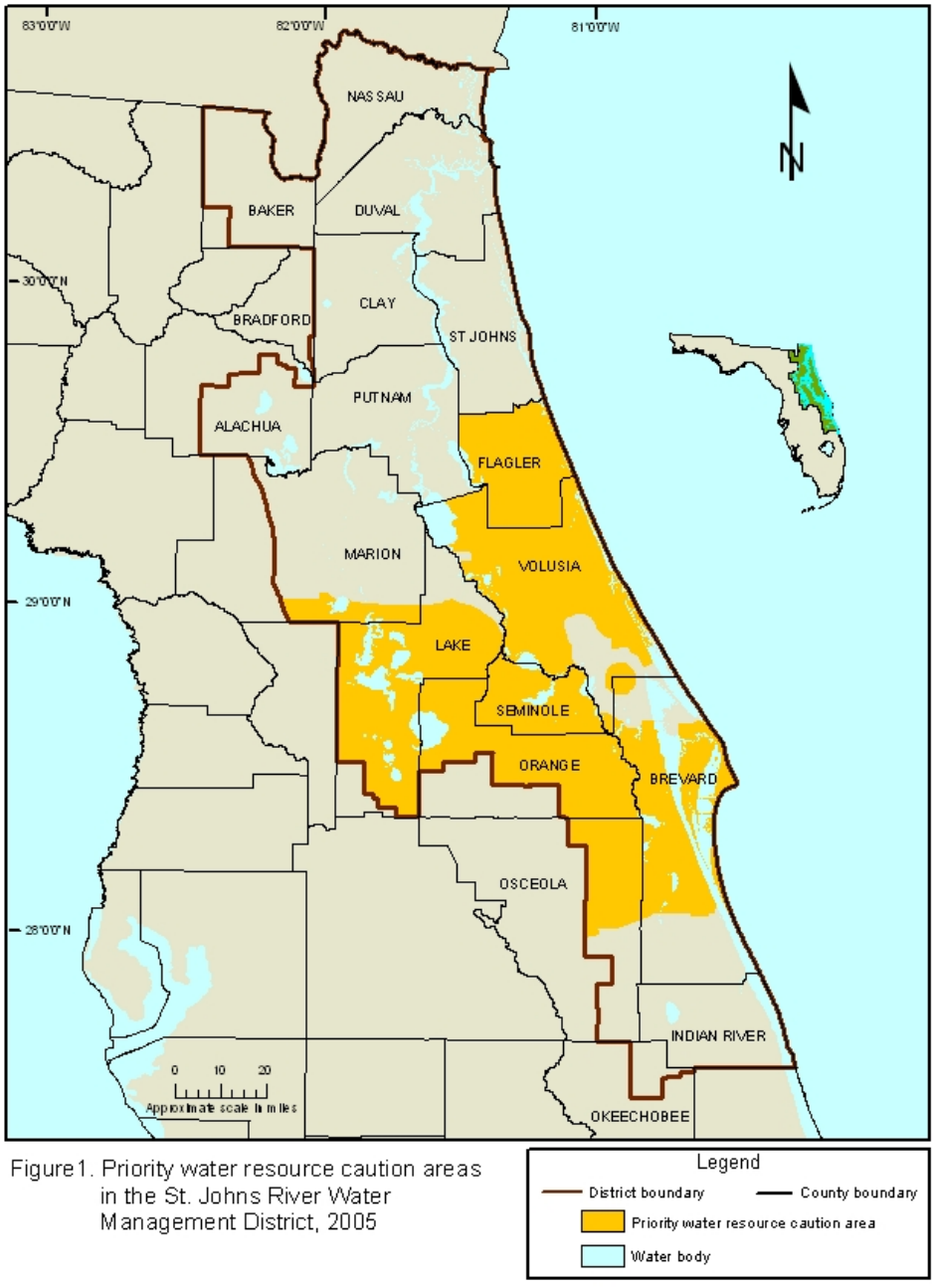


Figure 1. Priority water resource caution areas in the St. Johns River Water Management District, 2005

its entire jurisdictional area a water conservation area (40C-23.001, *F.A.C.*). SJRWMD later changed the water conservation area designation to a water resource caution area designation to conform to statewide nomenclature.

DESCRIPTION OF THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD)

Location

Located in northeastern Florida, SJRWMD covers approximately 12,300 square miles (about 8 million acres), or about 21% of the state's total area (Figure 2). Nine percent of SJRWMD's area is water. SJRWMD's jurisdictional area is bounded by the following:

- On the north, by the Florida-Georgia state line
- On the south, by its boundary with the South Florida Water Management District (SFWMD)
- On the west, by its boundary with the Southwest Florida Water Management District (SWFWMD) and the Suwannee River Water Management District (SRWMD)
- On the east, by the Atlantic Ocean

One of the most prominent natural features of SJRWMD is the St. Johns River. The St. Johns River flows northward, 310 miles from its headwaters in Indian River County through Lakes Washington, Monroe, and George, and other lakes, to Jacksonville and the Atlantic Ocean. Because of the river's very low gradient, tidal effects normally extend into and beyond Lake George, more than a hundred miles from the river's mouth.

The SJRWMD area includes all or part of 18 counties, numerous cities and towns, and the major urban centers of Jacksonville and Orlando, with a total population of almost 3.5 million people in 1995 (the base year for water resource impact projections addressed in WSA 2003 and DWSP 2005) and 3.9 million in 2000, based on population projections presented in WSA 2003. This population is projected to increase to nearly 5.9 million by 2025, a 50% increase from 2000 to 2025.

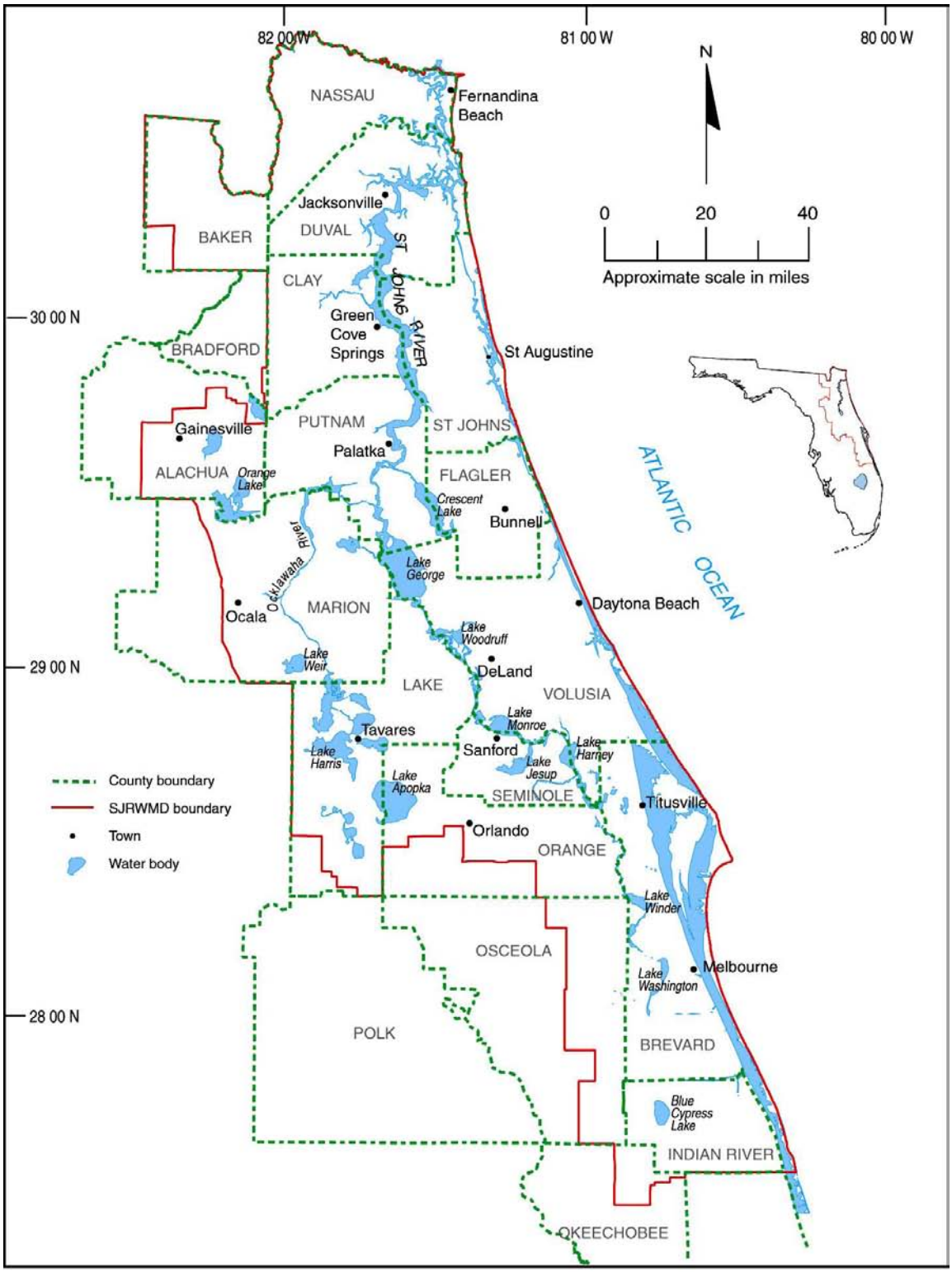


Figure 2. The St. Johns River Water Management District

Cultural Features

Tourism contributes significantly to the SJRWMD area economy. Area attractions include beaches such as Daytona Beach and Cocoa Beach along the Atlantic Coast, commercial attractions such as Silver Springs, historical sites such as St. Augustine, and Kennedy Space Center. Though the Walt Disney World complex and other attractions exist just south of SJRWMD's boundary with SFWMD, they generate substantial economic activity and water use in SJRWMD.

Four major interstate highway systems (I-4, I-10, I-75, and I-95) serve the SJRWMD area. Development, particularly along the I-4 corridor between Orlando and Daytona Beach and highways 27 and 441 in Lake and Marion counties, has been significant and is projected to continue to contribute to population growth.

Two of the nation's 10 fastest-growing counties, Flagler County (fastest growing) and St. Johns County (ninth fastest growing), are located in SJRWMD (U.S. Census Bureau 2005).

Agriculture

SJRWMD's primary agricultural activities include citrus and vegetable farming, and dairy and beef cattle ranching. Pasture for beef and dairy production comprises the largest portion of agricultural land. Although citrus acreage has declined by nearly 10% over the past 10 years, it remains a prominent crop within SJRWMD. Cabbage, potatoes, and other vegetables are grown in the northern and central portions of SJRWMD. Ornamental nurseries and fern crops account for only a small part of SJRWMD's agricultural land, but contribute significantly to the agricultural economy of the area. Of the various water use categories in SJWRMD, the agricultural self-supply category consistently had the highest use until 1997, when total agricultural water use was surpassed by total public supply water use for the first time. Since 1997, agricultural and public supply water use have generally alternated years as the category of highest water use. Agricultural acreage and associated water use are projected to decrease by about 11% through 2025, and public supply water use is expected to consistently exceed it.

Industry

Approximately half of the state's pulp and paper mills are located in SJRWMD. These are found in the northern part of SJRWMD, which

encompasses large expanses of pine forest. Although there are only five such facilities, each uses an amount of water comparable to that consumed by a small- to medium-sized city.

The second largest industrial water use is mining. There are more than 15 mining facilities in SJRWMD, located in Clay, Lake, Marion, Orange, and Putnam counties. Collectively, pulp and paper production and mining account for approximately 80% of the commercial/industrial/institutional self-supply total freshwater use.

A decrease in commercial/industrial/institutional self-supply water use of approximately 3% is projected to occur between 1995 and 2025. The total projected water use in this category may not appear to be significant in comparison to other categories. However, withdrawals of water by individual users to support demands in this category are often relatively large withdrawals that are concentrated in relatively small areas, a combination that often results in concerns regarding the hydrologic impacts of withdrawals.

SJRWMD WATER RESOURCES (MODIFIED FROM VERGARA 2006)

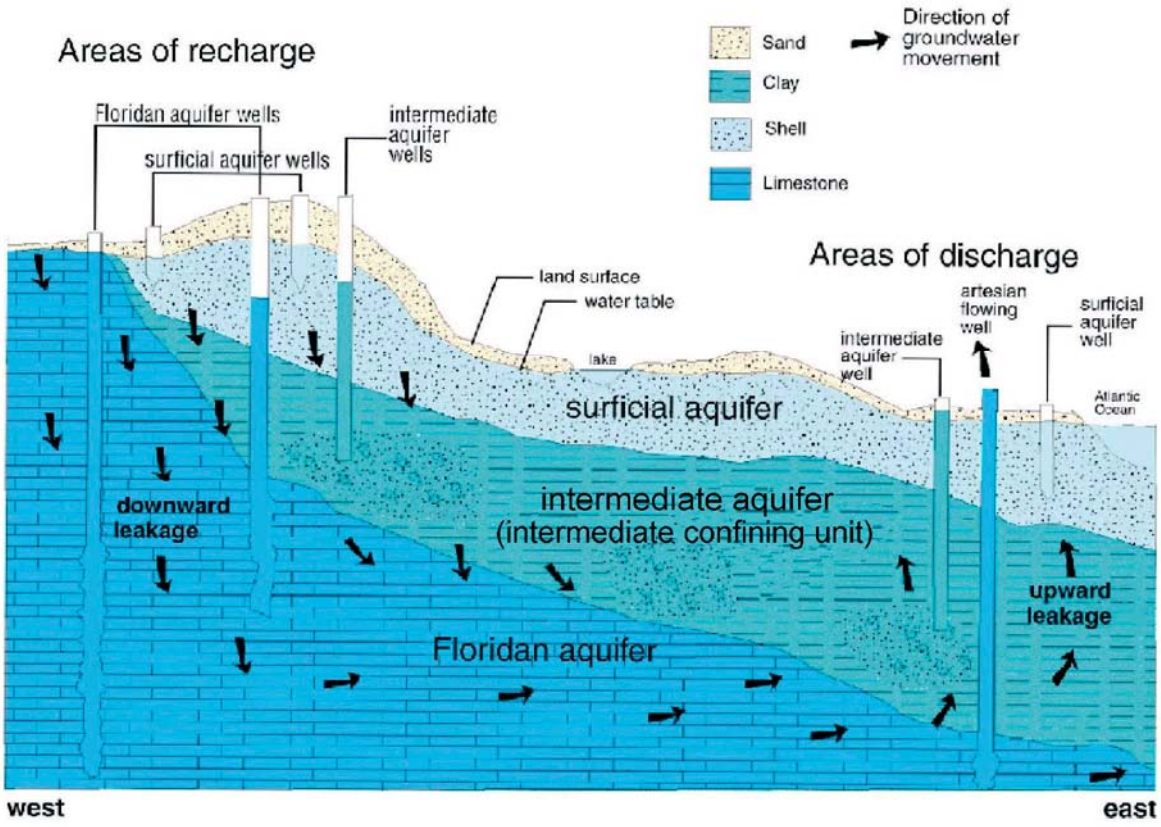
Groundwater Resources

Three aquifer systems supply groundwater in SJRWMD: the surficial, the intermediate, and the Floridan (Figure 3). The Southeastern Geological Society (1986) described the hydrogeologic nature of these aquifer systems.

Surficial Aquifer System

System Components. The surficial aquifer system consists primarily of sand, silt, and sandy clay. It extends from land surface downward to the top of the confining unit of the intermediate aquifer system, where present, or to the top of the confining unit of the Floridan aquifer system. The surficial aquifer system contains the water table, which is the top of the saturated zone within the aquifer. Water within the surficial aquifer system occurs mainly under unconfined conditions, but beds of low permeability cause semiconfined or locally confined conditions to prevail in its deeper parts.

Water Quality. Water in the surficial aquifer system is generally of acceptable quality for domestic use. Based on a review of U.S. Geological Survey (USGS) and SJRWMD data, chloride, sulfate, and total dissolved solids (TDS) concentrations generally meet the secondary drinking water standards of 250,



250, and 500 milligrams per liter (mg/L), respectively (Subsection 62-550.320(1), *F.A.C.*). Iron concentrations, however, are often high and in many places do not meet the secondary drinking water standard of 0.3 mg/L (Subsection 62-550.320(1), *F.A.C.*). In coastal areas such as the barrier islands, this aquifer system is prone to saltwater intrusion.

Water Use. The surficial aquifer system is a source of water for public supply in St. Johns, Flagler, Brevard, and Indian River counties. It is also used as a source of water for domestic self-supply, mainly along the coastal portions of SJRWMD but also in inland areas scattered throughout SJRWMD.

Intermediate Aquifer System

System Components. The intermediate aquifer system consists of fine-grained clastic deposits of clayey sand to clay interlayered with thin water-bearing zones of sand, shell, and limestone (Southeastern Geological Society

1986). In most of SJRWMD, the intermediate aquifer system yields little or no significant amounts of water. It is also known as the intermediate confining unit.

In other places, one or more low-to-moderate yielding aquifers may be interlayered with lower permeability confining beds. The aquifers within this system contain water under confined conditions. They occur in Nassau, Duval, Clay, Orange, and Indian River counties. The intermediate aquifer system occurs throughout most of SJRWMD. The strata comprising this hydrostratigraphic unit do not occur in southern Flagler, northwestern Brevard, western Alachua, western Marion, and parts of Volusia and Lake counties (Davis and Boniol 2002). This unit lies between and collectively retards the exchange of water between the overlying surficial aquifer system and the underlying Floridan aquifer system.

Water Quality. Available USGS and SJRWMD data suggest water in the intermediate aquifer system is generally of acceptable quality for domestic use in the northern part of SJRWMD, where chloride, sulfate, and TDS concentrations generally meet secondary drinking water standards. However, water quality in the southern part of SJRWMD very nearly does not meet or does not meet the secondary drinking water standards for chloride and TDS concentrations.

Water Use. The intermediate aquifer system is used as a water source for domestic self-supply in Duval, Clay, and Orange counties.

Floridan Aquifer System

System Components. The Floridan aquifer system is one of the world's most productive aquifers. The rocks, primarily limestone and dolomite, that compose the Floridan aquifer system, underlie the entire state. This aquifer system does not contain potable water at all locations. Water in the Floridan aquifer system occurs under confined conditions throughout most of SJRWMD. Unconfined conditions occur in parts of Alachua, Lake, and Marion counties, where the top of the Floridan aquifer system is at or near land surface.

Groundwater recharge to the Floridan aquifer is the addition of water to the Floridan aquifer from the overlying surficial aquifer. Recharge rates to the Floridan aquifer are based on differences between the elevation of the water table of the surficial aquifer and the elevation of the potentiometric surface of

the Floridan aquifer and on the leakance of the upper confining unit separating the aquifers.

Recharge to the Floridan aquifer occurs in areas where the elevation of the water table of the surficial aquifer is higher than the elevation of the potentiometric surface of the Floridan aquifer. In these areas, water moves from the surficial aquifer in a downward direction through the upper confining unit to the Floridan aquifer. Recharge also occurs directly from infiltrating rainfall where the limestone of the Floridan aquifer is near or at land surface. In addition, significant local recharge may occur where sinkholes have breached the upper confining unit.

Discharge from the Floridan aquifer occurs in areas where the elevation of the Floridan aquifer potentiometric surface is higher than the elevation of the water table. In these areas, water moves from the Floridan aquifer in an upward direction through the upper confining unit to the surficial aquifer. Where the elevation of the Floridan aquifer potentiometric surface is higher than land surface, springs and free-flowing artesian wells occur.

The Floridan aquifer system is subregionally divided based on the vertical occurrence of two zones of relatively high permeability (Miller 1986). These zones are called the Upper and Lower Floridan aquifers. A less permeable limestone and dolomitic limestone sequence, referred to as the middle semiconfining unit, generally separates the Upper and Lower Floridan aquifers. Throughout much of Baker, Bradford, western Alachua, and northwestern Marion counties, the middle semiconfining unit is missing and the Lower Floridan aquifer does not occur (Miller 1986).

Water Quality. USGS and SJRWMD data indicate that water quality in the Upper Floridan aquifer varies depending on its location. Water in this aquifer is generally of acceptable quality for domestic use in the northern and western portions of SJRWMD where chloride, sulfate, and TDS concentrations meet the secondary drinking water standards. Chloride and TDS concentrations in the Upper Floridan aquifer generally do not meet the secondary drinking water standards in the following areas:

- Brevard and Indian River counties
- Southern St. Johns County and most of central and northern Flagler County
- Areas bordering the St. Johns River south of Clay County
- Eastern Volusia County

Sulfate concentrations also frequently do not meet the secondary drinking water standards.

USGS and SJRWMD data indicate that water quality in the Lower Floridan aquifer also varies depending on its location in SJRWMD. Water in this aquifer is generally of acceptable quality for domestic use in the northern and western portions of SJRWMD where chloride and TDS concentrations meet the secondary drinking water standards. However, chloride concentrations in the Lower Floridan aquifer generally do not meet the secondary drinking water standards throughout the following areas (Sprinkle 1989):

- All of Flagler, Brevard, and Indian River counties
- Eastern Nassau and Volusia counties
- Areas bordering the St. Johns River in Putnam, Marion, Lake, Volusia, Seminole, Orange, and Osceola counties

TDS concentrations in the Lower Floridan aquifer generally do not meet the secondary drinking water standards throughout the following areas (Sprinkle 1989):

- All of St. Johns, Flagler, Brevard, and Indian River counties
- Most of Nassau and Duval counties
- Eastern Clay and Volusia counties
- Areas bordering the St. Johns River in Putnam, Marion, Lake, Volusia, Seminole, Orange, and Osceola counties

Water Use. The Upper Floridan aquifer is the primary source of water for public supply in SJRWMD, mainly in the northern and central portions where the aquifer contains water that generally meets primary and secondary drinking water standards. The Upper Floridan aquifer also serves as a source of water for public supply in the southern portion of SJRWMD where water withdrawn from the aquifer is treated by reverse osmosis. Although the Floridan aquifer system in the southern portion of SJRWMD generally contains water that does not meet secondary drinking water standards for chloride, sulfate, and TDS, it is generally considered acceptable for irrigation purposes.

Portions of the Lower Floridan aquifer furnish water for public supply in Duval, central and western Orange, and southern and southwestern Seminole counties.

Surface Water Resources

Streams, lakes, canals, and other surface water bodies in SJRWMD provide water for various uses. Although aquifers usually contain relatively high-quality water and are likely to remain the most widely used freshwater supply sources in SJRWMD, pressure to develop surface water sources is expected to increase as quantities of groundwater become less available. If environmentally and economically feasible, additional surface water could be made available for future use.

Surface Water Quality Issues

Water quality can limit some uses of surface water if it is not economically or environmentally feasible to treat the water to the level required for those intended uses. Natural systems requirements, treatment and storage costs, and distribution facilities can limit the amount of water developed from surface water sources.

SJRWMD surface water quality varies both spatially and temporally because of the natural processes and human activities that affect the chemical and microbiological character of water bodies. The different intended water uses determine the relationship between water quality and the potential for use of a particular surface water source. For example, some industries can use water containing TDS concentrations of 35,000 mg/L (equivalent to seawater), whereas a maximum of 500 mg/L is recommended for public supply (Prasifka 1988).

Compared to most groundwater sources in SJRWMD, surface water sources generally are of lower quality. Surface waters tend to contain silts and suspended sediments, algae, dissolved organic matter from topsoil, and chemical and microbiological contaminants from municipal wastewater discharges, stormwater runoff, and industrial and agricultural activities. The quality of surface water may vary seasonally with variation in flow rates or water levels.

Salinity is one of the most important water quality considerations in SJRWMD. In the coastal rivers of SJRWMD and the tidal reaches of the St. Johns, St. Marys, and Nassau rivers, the influx of seawater limits potential

water uses to recreation and power plant cooling unless costly treatment is implemented. Chloride concentrations generally decrease upstream from the mouths of these rivers as tidal influence diminishes.

In addition to tidal influence, inflows of brackish groundwater affect the spatial distribution of chloride concentrations in the St. Johns River. During low-flow periods when there is little dilution from freshwater inflows, higher TDS concentrations occur in the tidally influenced lower reach of the river and in portions of the upper reach. In the upper reach of the St. Johns River, the inflow of Floridan aquifer groundwater by diffuse upward leakage and possible spring discharge (Tibbals 1990) contributes to elevated TDS concentrations in the river. In some reaches of the St. Johns River, the cost of treating saline water to the degree necessary for some uses will be high.

In addition to the TDS concentrations, elevated bromide concentrations in the St. Johns River are a concern when considering the use of the river as a source for public supply systems. Raw water with elevated concentrations of bromide may require more expensive treatment in order for the treated water to meet U.S. Environmental Protection Agency (EPA) drinking water standards and regulations. The process of ozonation, one option for disinfection in the water treatment process, may produce unacceptably elevated concentrations of bromate.

Traditionally, surface water has not been used extensively for public supply in SJRWMD. SJRWMD's 2000 *District Water Supply Plan* (Vergara 2000) acknowledged the need for additional water quality monitoring and treatability testing before any new surface water source is developed for public supply. In March of 2001, the Surface Water Instream Monitoring and Treatability Studies Project began. This 3-year project addressed this need by conducting water quality monitoring and treatability testing of water withdrawn from the St. Johns River. As part of this project, a pilot plant was erected at Lake Monroe in Sanford. A major conclusion of the project, which was completed in 2004, was that the St. Johns River is a viable surface water source that could be developed for potable drinking water (CH2M HILL 2004).

Water Availability From Streams

USGS publishes *Water Resources for Northeast Florida* on a water year basis (October through September) for all active surface water gauges. These reports are the most comprehensive sets of surface water stage and discharge data available for SJRWMD water bodies.

Streamflow Characteristics. Monthly stream discharges generally reflect the seasonal distribution of annual rainfall. The highest average monthly discharges throughout SJRWMD tend to occur in August, September, and October, when summer thunderstorms are common and tropical storms are likely to occur. Streams in SJRWMD usually exhibit at least two high- and low-flow seasons over the course of the year.

The high-flow period in March and April affects the northern area of SJRWMD more than the southern area. The lowest average monthly discharges tend to occur during the late fall to early winter months (November and December) and the late spring to early summer months (May and June). Some of the highest demands for surface water occur during these low-flow periods. High irrigational water use often occurs during May, June, and December. December begins the season for frost-and-freeze protection.

USGS discharge data indicate very few sites in SJRWMD where substantial quantities of surface water are likely to be available year-round. Except for a few streams with very stable base flows stemming from constant groundwater discharge, most streams in SJRWMD would require artificial storage for an assured water supply. For example, Lake Washington, which is a natural water body with a dam to improve its water storage, is located within the St. Johns River near Melbourne. The city of Melbourne receives a portion of its water supplies from Lake Washington (about 14 million gallons per day [mgd] on an average annual basis), even though flow occasionally ceases in the St. Johns River.

Source Development Feasibility. Quantities of water that can be developed from surface water sources will be limited by the requirements of natural systems and the costs of treatment, storage, and distribution facilities. Streams with high flows generally offer greater potential as sources of water to meet projected needs. The feasibility of developing potential sites for water supply should be assessed based upon the quantity of water to be withdrawn, the associated impacts on natural systems, and the cost of treatment, storage, and distribution facilities.

SJRWMD has assessed the feasibility of withdrawing surface water from the following sources:

- St. Johns River, from its upper basin downstream to DeLand
- Ocklawaha River Basin
- Taylor Creek

As a result of these assessments, the St. Johns River, the lower and upper Ocklawaha River, and Taylor Creek have been identified as water sources with significant potential for water supply development. Estimated quantities available from these sources are

- St. Johns River, from its upper basin downstream to DeLand, 155 million gallons per day (mgd) (minimum amount always available; quantity could be increased with storage)
- Taylor Creek Reservoir / St. Johns River, 50 mgd, of which 10 mgd is already developed (this 50 mgd is included in the St. Johns River total)
- Ocklawaha River Basin
    - Lower Ocklawaha River, below its confluence with the Silver River, 100 mgd
    - Upper Ocklawaha River, 14 mgd

These estimated quantities are likely to be refined as additional water supply evaluations, particularly those associated with adopting MFLs, are performed for these water bodies.

SJRWMD has developed minimum flows and levels (MFLs) for the St. Johns River at State Road (SR) 44 and for Taylor Creek. SJRWMD is developing MFLs for other locations on the St. Johns River and the lower Ocklawaha River. Potential water supply sources identified in this document are not anticipated to be developed until an MFL is adopted for that particular surface water source and an evaluation of the impacts of the proposed withdrawal on the adopted MFL is completed. If water supplies are ultimately obtained from any of these identified sources, the withdrawals will be limited so as to not cause the surface water system to fall below the adopted MFLs.

Water Availability From Storm Water

Storm water throughout the developed areas of SJRWMD is typically captured in constructed stormwater drainage and retention / detention systems. Water from these systems can be directly used to meet many nonpotable water needs. Storm water is commonly used as a source of golf course irrigation water.

Storm water, because of its diffuse and intermittent nature, is not generally considered a viable option for direct public-supply applications where

reliability is a major consideration. However, SJRWMD, in cooperation with the city of Cocoa, plans to investigate the feasibility of augmenting public supply systems with local surface water/stormwater sources. This cooperative effort is identified as a water resource development project in the Water Resource Development Component of DWSP 2005. The project title is Investigation of the Augmentation of Public Supply Systems With Local Surface Water/Stormwater Sources. In addition, stormwater management practices that provide for increased soil infiltration and groundwater recharge opportunities should be considered as a means to protect and possibly enhance existing groundwater resources.

Water Availability From Lakes

Most of the larger lakes in SJRWMD are part of the Ocklawaha River or St. Johns River systems and the water quality and stage fluctuations of these lakes resemble those rivers of which they are a part. Major lakes in the Upper Ocklawaha River Basin include the following:

- Apopka
- Harris
- Eustis
- Griffin
- Dora

Major lakes of the St. Johns River system include the following:

- Crescent
- George
- Harney
- Monroe
- Jesup
- Poinsett
- Washington

Other major lakes, including Newnans, Lochloosa, and Orange, are located in the Lower Ocklawaha River Basin.

Reservoirs also have the potential for providing water supply. Taylor Creek Reservoir, a tributary to the St. Johns River, has been incorporated into an integrated water supply system by the city of Cocoa.

SJRWMD continues to set minimum levels for lakes pursuant to the provisions of Section 373.042, F.S. These minimum levels serve to define the maximum amount of water available from lakes. Levels established to date are included in Chapter 40C-8, *F.A.C.* (Appendix A). The plan for establishment of additional minimum levels is described in Appendix B.

Seawater Availability

Seawater and associated saline estuary and bay water provide a significant potential source of water supply. These are also an inherently reliable and virtually drought-proof source. In addition, the potential sources of supply (Atlantic Ocean and/or Intracoastal Waterway) are located in close proximity to a substantial portion of the SJRWMD population. Nine of the 18 counties contained wholly or in part within SJRWMD are coastal counties containing more than half of SJRWMD's population.

Seawater is relatively expensive and energy-intensive to treat. The TDS of seawater is approximately 35,000 mg/L, whereas the secondary drinking water standard is 500 mg/L. Thus, demineralization on the order of 99% is required to convert seawater to drinking water. Demineralization of this magnitude using current technology (reverse osmosis) will produce a concentrate byproduct stream with a TDS concentration approximately twice that of the original seawater. Management of this byproduct in an environmentally acceptable and permittable manner, can present significant challenges to the development of seawater for water supply applications.

Significant transport costs would also be incurred if the demineralized seawater were used to meet needs in water supply demand centers located inland from the coastal source of supply.

As described in the Water Resource Development Component of DWSP 2005, SJRWMD retained R.W. Beck to assess the technical, environmental, and economic feasibility of seawater demineralization as a water supply development option. The top five rated sites in SJRWMD identified through this project are

- Cape Canaveral Power Plant (owner: Florida Power and Light)
- Indian River Power Plant (owner: Reliant Energy Indian River, LLC)
- W.E. Swoope Generating Station Power Plant (owner: city of New Smyrna Beach)
- Northside Power Plant (owner: JEA)

- Daytona Beach / Bethune Point Wastewater Treatment Plant (owner: city of Daytona Beach) Note: The city of Daytona Beach has developed plans to reuse the wastewater produced at this facility. Implementation of these plans would likely render a demineralization project at this location infeasible.

In fiscal year (FY) 2004, SJRWMD began a study to evaluate site-specific potential salinity issues in the Indian River Lagoon related to the potential operation of seawater demineralization facilities at the Indian River and Cape Canaveral power plant sites. This study specifically considers the impact of concentrate discharge on Indian River Lagoon salinity levels and addresses consistency with restoration goals and strategies contained in the National Estuary Plan for the lagoon.

WATER SUPPLY PLAN DEVELOPMENT PROCESS

SJRWMD focused its 2005 water supply planning efforts within PWRCAs identified in WSA 2003.

These efforts included public workshops and meetings, distribution of a DWSP 2005 draft document for review and comment, and meetings with local governments, government-owned and privately owned utilities, self-suppliers, and other interested and potentially affected parties, as necessary to address issues identified by the planning process. Consistent with the requirements of Subsection 373,0361(1), F.S., SJRWMD held four public workshops and several public meetings to communicate the status, overall conceptual intent, and potential impacts of DWSP 2005 on existing and future reasonable-beneficial uses and related natural systems. Two of the public workshops (those held on October 22 and 29, 2004) included discussions of the technical data and modeling tools anticipated to be used to support development of DWSP 2005. Several of these public workshops and meetings also included information concerning the statutory provision that provide local governments the opportunity to prepare their own water supply assessments to determine if existing water supply sources are adequate to meet existing and projected reasonable-beneficial needs of the local governments while sustaining water resources and related natural systems. No such assessments were received during preparation of DWSP 2005.

SJRWMD considers the success of the DWSP 2005 development process to be largely dependent on the acceptability of DWSP 2005 by local governments. Local governments control the majority of the public water supply systems in SJRWMD and, therefore, must be willing to make the financial commitments

necessary to implement DWSP 2005 in order for it to be successful. In addition, these local governments make growth management decisions for their respective jurisdictions. Based on the provisions of Section 373.0395, F.S., the Legislature intends that future growth and development planning reflect the limitations of the available groundwater and other available water supplies. Therefore, the availability of water should be an important consideration in growth management decisions. Developing a water supply plan that local governments and other major water suppliers do not support or are unwilling to implement would represent a failed effort—a scenario unacceptable to SJRWMD.

Accomplishments of the District Water Supply Plan (DWSP) 2000

Implementation of the recommendations included in DWSP 2000 began following SJRWMD Governing Board approval of that document, resulting in numerous accomplishments to date.

Minimum Flows and Levels (MFLs)

SJRWMD developed annual MFLs priority lists and schedules (2001–2004) to include sites identified as potential water supply sources. Sites included were St. Johns River at SR 44 near DeLand, St. Johns River at Lake Monroe, St. Johns River at SR 50 near Christmas, St. Johns River at Lake Poinsett, St. Johns River at Lake Winder, and the Ocklawaha River at SR 40 near Ocala.

MFLs for 38 systems have been adopted by rule since approval of DWSP 2000. In addition, SJRWMD determined recommended MFLs for 44 systems. Systems with MFLs determinations currently under way include Blue Spring, Gemini Springs, Green Spring, and DeLeon Springs (Volusia County); St. Johns River at Lake Monroe (Volusia and Seminole counties); St. Johns River at SR 50 near Christmas (Brevard and Orange counties); St. Johns River at Lake Poinsett (Brevard and Orange counties); St. Johns River at Lake Winder (Brevard and Osceola counties); Apopka Spring (Lake County); Silver Springs and Silver River (Marion County); and 19 sandhill lakes in east-central Florida.

SJRWMD has continued hydrologic monitoring, as follows, for MFLs sites:

- Measured discharge at 39 sites (12 streams and 27 springs)
- Measured water levels at 283 sites (15 streams, 25 springs, 120 lakes, and 123 shallow wells) located on lake and stream floodplains, isolated wetlands, and upland plant communities

SJRWMD has also reevaluated MFLs for nine systems. Systems with re-evaluations under way include Rock and Wekiwa Springs and Lake Prevatt (Orange County); Lakes Banana, Como, Little Lake Como, and Trone (Putnam County); and Lakes Ashby, Colby, Shaw, and Three Island (Volusia County).

In addition, new surface water models have been developed for 37 lake systems and model updates have been completed for 23 systems.

Water Supply Development Projects

Since approval of DWSP 2000, SJRWMD has promoted implementation of the identified water supply development projects and, with approval of DWSP 2004 Interim Update, added additional projects for a total of 14 projects prior to development of DWSP 2005.

Project construction was completed for the city of Apopka component of the Eastern I-4 Corridor Water Project. Project construction continued on the Eastern Orange and Seminole Counties Regional Reuse Project. St. Johns County, with some cooperative funding from SJRWMD, completed planning for the North-Central St. Johns County Wellfield Project (now referred to as St. Johns County Water Supply Project) and received a consumptive use permit for the project. Project construction is scheduled to begin in the near future.

Significant facilitation efforts, consumptive use permitting actions, funding, and the cooperation of several public water supply utilities in east-central Florida have brought the Taylor Creek Reservoir Expansion Project (renamed the St. Johns River / Taylor Creek Reservoir Water Supply Project in DWSP 2005) nearer to reality. Approval of a memorandum of agreement (MOA) between project partners, will lead to the initiation of phase I of the project. At the time of preparation of DWSP 2005, all of the eight project partners had approved the MOA.

SJRWMD implemented its Strategic Water Conservation Assistance and Strategic Reclaimed Water Assistance projects. As a result, numerous small-scale water conservation projects were implemented with cost-shared funding provided by SJRWMD and local cooperators. In addition, several reclaimed water feasibility investigations were performed with cost-shared funding provided by SJRWMD and local cooperators.

Water Resource Development Projects

The progress of implementation of water resource development projects identified in DWSP 2000 has been documented annually in SJRWMD's Water Resource Development Work Program documents. Significant accomplishments are as follows:

- Plugged or repaired approximately 500 wells as part of the Abandoned Artesian Well Plugging Program
- Began Aquifer Storage and Recovery Construction and Testing projects with eight local-government cooperators in east-central Florida
- Neared completion of field investigations Phase I, Artificial Recharge Demonstration Projects, of the Central Florida Aquifer Recharge Enhancement Program
- Completed Phase II, Recharge Enhancement Evaluation and Design, of the Central Florida Aquifer Recharge Enhancement Program
- Began Phase III, Recharge Enhancement Program Implementation, of the Central Florida Aquifer Recharge Enhancement Program in FY 2004–2005
- Completed a Demineralization Concentrate Management Plan in 2004 and began implementing plan recommendations in 2004
- Facilitated organization of a multijurisdictional water supply planning agreement for development of Phase I of the St. Johns River / Taylor Creek Reservoir water supply project
- Completed a study of the feasibility of seawater demineralization projects districtwide in 2004 and began more-detailed investigations of candidate projects
- Cooperatively funded eight regional aquifer management projects
- Initiated four cooperative wetland augmentation demonstration projects
- Completed multiple studies to demonstrate the feasibility of utilizing the St. Johns River as a potable water supply
    - Surface water instream monitoring and treatability
    - Demand and affordability
    - Siting

Consumptive Use Permitting Program

SJRWMD has used the information contained in DWSP 2000, along with more site-specific information gathered in the consumptive use permit (CUP) application process, in issuing CUPs that implement solutions for sustainable water supply options in PWRCAs identified in WSA 1998 and DWSP 2000. The most notable example is in southeast Duval County and northern St. Johns County, which were identified as PWRCAs in WSA 1998 and DWSP 2000. JEA and the St. Johns County Utility Department have worked with SRJWMD through the CUP process to clearly identify sources to meet projected water use. In addition, the St. Johns County Utility Department has adjusted its original plan to produce additional water from the surficial aquifer system and is now in the process, pursuant to a recently issued CUP, of building a Floridan aquifer brackish water wellfield and low-pressure reverse osmosis water treatment plant. This should prevent unacceptable wetland impacts that would otherwise have occurred in the area of the utility's Tillman Ridge Wellfield. Because of this action, the St. Johns County Utility service area is not identified as a PWRCA in WSA 2003. In addition, saline water intrusion concerns in JEA's south grid wellfield identified in the first draft of WSA 2003 were immediately addressed by JEA, through a commitment to implement a plan to retrofit wells, so that the JEA service area is not identified as a PWRCA in the final version of WSA 2003. This plan became a condition of the CUP issued to JEA.

Throughout SJRWMD, an emphasis continues on increasing water conservation and reuse of reclaimed water so that the demand for new water supplies can be reduced from that projected in DWSP 2000. Some water users have had their groundwater allocations reduced significantly when their permits were renewed. Reclaimed water is routinely used to meet water demands within utility service areas; in addition, CUPs routinely require that reclaimed water not reused within utility service areas be provided to self supplied users, such as golf courses, and that those entities use reclaimed water instead of groundwater. Where appropriate, CUPs issued in the east-central Florida area for many public supply utilities have contained permit conditions with specific requirements to identify water supply partners and develop plans for implementation of alternative water supply projects. These permits have contributed to the involvement of public supply utilities in county-level planning efforts under way in Lake and Seminole counties, and the joint-planning effort on the St. Johns River / Taylor Creek Reservoir Water Supply Project.

Intergovernmental, Water Supplier, and Public Coordination

Coordination with other water management districts (WMDs) and the Florida Department of Environmental Protection (FDEP). SJRWMD has continued its active participation in the Water Planning Coordination Group and the Interdistrict MFLs Framework Group. This has resulted in improved understandings of the efforts of other WMDs and in improved consistency among WMDs in the water supply planning process. In addition, SJRWMD has continued to implement the provisions of its MOU with SFWMD and SWFWMD. Regular meetings among the staffs of the involved WMDs have been held, and issues of concern have been discussed. SJRWMD has worked closely with SFWMD and SWFWMD in an effort to develop a cooperative water supply planning strategy in areas that could experience interdistrict impacts. A significant example of this effort is the East-Central Florida Water Supply Planning Initiative, in which the three WMDs participated. This effort is described in more detail in the Water Resource Development chapter of this document. Coordination with the other WMDs and FDEP has occurred as necessary. An example of such coordination is that which has occurred in association with the development of an MFL for Blue Spring in Volusia County. Numerous discussions between SJRWMD and FDEP have taken place in an effort to develop an MFL recommendation that will address the requirements and concerns of both agencies. This effort is ongoing.

Coordination with local governments. SJRWMD was able to streamline its water supply planning process since 2000 to the extent that the work group process, which was such a significant element of the DWSP 2000 process (Water 2020), was not considered necessary. This was due largely to the continued coordination that occurred through the facilitated decision-making process, which is described in more detail in the Water Resource Development chapter of this document. This coordination included

- One-on-one meetings with elected officials
- Presentations to city and county commissions/councils
- Review of comprehensive plan amendments
- Assistance with development of water supply facilities work plans
- Coordination with the Brevard Water Supply Board
- Coordination with the Water Authority of Volusia

The East-Central Florida Water Supply Planning Initiative and other facilitated efforts resulted in considerable interaction with and among local governments and resulted in the identification of numerous water supply development projects, which are now being considered for implementation.

As a result of this coordination effort, Flagler, Lake, and Seminole counties are currently developing county-level water supply plans. This is being accomplished cooperatively through interlocal agreements and an MOU. A memorandum of agreement (MOA) has been approved by all eight of the partners in the st. Johns river / Taylor Creek reservoir water suply Project. This MOA will guide the development of a master facility plan and Environmental Impact Document for this alternative water supply project.

Coordination with water suppliers. SJRWMD has continued coordination with water suppliers, including both publicly and privately owned water supply utilities, agricultural water users, and other self-suppliers on matters concerning water supply planning. This coordination has been largely through the water use projection process, the facilitated decision-making process, and the WSA 2003 and DWSP 2005 workshop and document review processes. Through the workshop and document review processes, all water users have had an opportunity to participate in the development of DWSP 2005. In addition, coordination with the SJRWMD Agricultural Advisory Committee has continued. This coordination has resulted in improved understandings of agricultural water use estimates.

Coordination with the state of Georgia. SJRWMD continued its coordination with the state of Georgia concerning water supply development in northeast Florida and southeast Georgia. SJRWMD sponsored workshops among the involved agencies, local governments, and interested residents in the northeast Florida and southeast Georgia area during 2003 and 2004. In addition to these workshops, several discussions were held between executive management of SJRWMD, SRWMD, FDEP, and the Georgia Environmental Protection Division (GEPD) in an effort to assure that the water supply management efforts of both states considered the needs of the entire northeast Florida and southeast Georgia area. The state of Georgia is in the process of developing its first water supply plan. SJRWMD has shared information with the GEPD that should be helpful in this process and has offered to provide additional assistance. Coordination is ongoing.

Coordination with the federal government. SJRWMD has continued coordination with the federal government, particularly in the areas of funding and regulation. SJRWMD has continued to actively seek federal funds to support water supply development. This effort has resulted in the congressional appropriation of $9.7 million through the EPA State and Tribal Assistance Grant Program from 2000–2005. Coordination with EPA and the U.S. Army Corps of Engineers has also occurred in an effort to assure the timely implementation of water supply development projects.

Coordination with the public and other affected parties. Since DWSP 2000 was approved, SJRWMD has enhanced its efforts to coordinate with other affected parties and the public. SJRWMD allocated staff resources from the Office of Communications and Governmental Affairs to manage communications and coordination efforts.

SJRWMD educated the public and numerous affected parties through the media and encouraged involvement through public meetings. SJRWMD issued more than 85 news releases and received coverage in hundreds of news stories, including a comprehensive 12-part series on water supply in the *Orlando Sentinel*. SJRWMD, in cooperation with public supply utilities, also purchased airtime and newsprint space for more than 38,000 advertisements about water conservation.

SJRWMD held more than 70 public meetings to discuss water supply issues and/or projects and provided water supply information through various means, including a water supply section that is easily accessed through a "quick click" button on the SJRWMD Web site home page. This section contains more than 50 water supply planning project documents and information. SJRWMD produced and disseminated 13 water supply project fact sheets and 11 other water supply publications. SJRWMD maintained a database of affected parties and regularly corresponded with the parties via e-mail and direct mail. Information also was provided through SJRWMD's quarterly magazine *StreamLines*; the monthly local government newsletter, *WaterWatch*; and numerous presentations to community groups.

RESOURCE ANALYSES

The tools used by SJRWMD to conduct resource analysis include

- Water use estimates and projections
- Water resource constraints
- Groundwater flow and optimization models

WATER USE ESTIMATES AND PROJECTIONS

Water Use Projections

SJRWMD staff developed water supply projections in consultation with major water suppliers. Water supply projections for the year 2025 were estimated for the following use categories:

- Public supply
- Domestic self-supply and small public supply systems
- Commercial / industrial / institutional self-supply
- Thermoelectric power generation self-supply
- Agricultural self-supply
- Recreational self-supply

WSA 2003 presents current water supply projections for these categories as well as the methods applied to develop them. These projections address both long-term average water use and expected use during a 1-in-10-year drought. These projections were used to determine fresh groundwater source deficits within the east-central Florida and Volusia groundwater flow model domains.

Deficit Identification

A water supply deficit exists when proposed water supply sources are not able to meet projected demands. A source deficit is the difference between the projected 2025 needs and the quantity of water the source can supply in a sustainable manner. SJRWMD used regional decision models to determine groundwater source deficits by regional groundwater flow model area. These

models were used to identify maximum average annual groundwater withdrawals compatible with applicable water resource constraints.

Decision Modeling for Determining Groundwater Deficits

Decision models can be used in water resource planning to determine the least expensive water supply alternatives in accordance with water management constraints, water resource constraints, cost constraints, existing groundwater source withdrawal optimization estimates, political constraints, and alternative water sources. No one set of decision model outputs adequately addresses future water resource problems. However, a decision model may be rerun and refined as necessary to gain additional information and insight about the water supply problem, the simulation model, projected water use, and the solutions capable of meeting demands and constraints.

SJRWMD has developed and used two types of decision models for the east-central Florida and Volusia areas (Appendix C). These include

- Groundwater optimization model
- Economic optimization model

Both models rely on the widely used three-dimensional groundwater simulation model MODFLOW (McDonald and Harbaugh 1988; Harbaugh and McDonald 1996), a saltwater upconing model (CH2M HILL 1998a), the general algebraic modeling system (GAMS) (Brook et al. 1996), and the CPLEX linear and mixed integer programming solvers (CPLEX Optimization 1996).

For purposes of DWSP 2005, SJRWMD used groundwater optimization models to identify source deficits for the Floridan aquifer in the east-central Florida and Volusia areas. The models were used to calculate the maximum quantities of groundwater that could reasonably be developed without resultant unacceptable impacts to water resources and related natural systems. These differences between maximum amounts and projected water use for 2025 in both areas represent the projected groundwater deficits for these areas.

WATER RESOURCE CONSTRAINTS

The DWSP 2005 development process focused on developing an economically and technically feasible water supply plan that will meet future water supply needs in a manner that sustains the water resources and related natural

systems. Sustainable sources must be able to supply the needed amounts of water, as defined by projected water use, without causing unacceptable impacts to water quality and to wetland and aquatic systems.

The water resource constraints define thresholds, for planning purposes, beyond which unacceptable impacts to water quality and to wetland and aquatic systems are expected to occur. For the planning process, a water resource constraint serves as a tool for two types of evaluations:

- Application of constraints to analysis of a given withdrawal scenario (without optimization) identifies locations where future unacceptable impacts are expected to occur if that scenario were implemented.
- Incorporation of constraints into the decision models prevents consideration of withdrawal scenarios that will exceed the constraint values and, therefore, will not be sustainable.

SJRWMD has routinely used water resource constraints for water supply assessment and planning. For instance, in the *Needs and Sources Assessment: 1994* (Vergara 1994), the characterization of the extent and intensity of potential impacts to native vegetation due to lowered surficial aquifer water tables contributed to defining the water resource caution area boundaries.

The SJRWMD *Water Supply Assessment: 1998* (Vergara 1998) and WSA 2003 highlighted PWRCAs, which were identified based on the use of water resource constraints.

For DWSP 2005, SJRWMD used water resource constraints in the following categories to identify and estimate source deficits:

- Established MFLs
- Native vegetation (wetlands)
- Lakes
- Springs
- Groundwater quality

These water resource constraints are described in detail in WSA 2003, and for the purposes of DWSP 2005 are the bases for determining the sustainable limits of surface water and groundwater resources. These source deficit analyses were not performed at the same level of detail as that used when a proposed water use is reviewed in the SJRWMD's consumptive use permitting program. While DWSP 2005 water resource constraints and associated

analyses are conceptually consistent with the consumptive use permitting environmental protection criteria, they should not be interpreted as a final determination or application of the consumptive use permitting criteria. In addition, the consumptive use permitting rule does allow for the possibility of mitigating adverse impacts that may occur on a limited scale. Because of the site-specific nature of mitigation options and the fact that mitigation is expected to only be practical on a limited scale, it was not considered in this source deficit analysis with the exception of mitigation projects that required to be implemented by existing or proposed CUPs and those potential projects that involve the increased use of reclaimed water for lawn and landscape irrigation in identified reclaimed water service areas.

COST ESTIMATES AND ECONOMIC CRITERIA

Conceptual, planning-level cost estimates have been developed for all identified water supply and water resource development projects using the same criteria in order to provide comparable cost estimates (CH2M HILL 2005). These cost estimates allow a relative comparison of the total cost for each alternative considered. To ensure this internal comparability, the following cost-estimate and economic criteria were established:

- Construction cost
- Capital cost (total)
- Operation and maintenance cost
- Equivalent annual cost
- Unit production cost

These parameters, which are expressed in estimated year 2005 dollars, have served as the cost basis throughout DWSP 2005. Total capital costs consist of the sum of construction costs, nonconstruction capital costs, land costs, and land acquisition costs, if applicable. Nonconstruction capital costs are calculated as 45% of the estimated construction costs. These costs incorporate permitting, administration, engineering design services during construction, construction contingencies, and other miscellaneous costs associated with constructing facilities.

Equivalent annual costs, which account for all expenditures, are an estimate of life-cycle costs and are a function of the total capital costs, the expected life of the constructed facilities, the time value of money, and annual operation and maintenance costs. These cost estimates aid in comparing alternatives with differing economic characteristics. For DWSP 2005, the time value of money equals 5.625% per year.

The unit production cost equals the equivalent annual cost divided by the annual finished water production, expressed in dollars per 1,000 gallons. This final cost parameter provides the single most meaningful comparison of the relative cost of potential water supply alternatives.

Because these cost criteria were used in all economic calculations, the relative cost between alternatives is comparable. However, the unit production costs presented here are not necessarily directly comparable to unit production costs developed in other investigations. To be considered comparable, cost estimates must use the same economic criteria.

UNCERTAINTY IN RESOURCE ANALYSES

Uncertainty is inherent in the resource analyses associated with DWSP 2005 (Appendix D). Major sources of uncertainty include water use projections; groundwater, surface water, and optimization models; and water resource constraints. Water supply projections and groundwater models, as they are prepared and used by SJRWMD, are based on the assumption that average rainfall conditions will exist in 2025, the planning horizon for DWSP 2005. Therefore, if 2025 experiences below average rainfall, then the impacts are likely to be greater than projected. Likewise, if 2025 experiences above average rainfall, then the impacts are likely less than projected.

Water supply projections for a 1-in-10-year drought condition are presented in WSA 2003 and in DWSP 2005. These projections are provided so that adequate information is available for use in designing facilities that are at least capable of providing enough water to meet demands during 1-in-10-year drought conditions. Most water supply facilities in SJRWMD are capable of producing quantities of water adequate to meet demands in drier conditions than those experienced during a 1-in-10-year drought.

Climatic variations, which can be affected by short-term phenomenon such as El Nino and La Nina, and by longer-term phenomenon such as the Atlantic Multidecadal Oscillation (AMO) contribute to climatic uncertainty. Recently, speculation of a direct link between the AMO and extended periods of above and below normal rainfall has raised questions about the value of making water supply projections and using groundwater flow models that are based on average rainfall conditions. AMO is an ongoing series of periodic changes in the sea surface temperature of the North Atlantic Ocean, with cool and warm phases that may last for decades at a time. It has been associated with changes in the frequency of North American droughts and Atlantic

hurricanes. It has also been associated with rainfall increases in peninsular Florida during a warm phase. A warm phase has been in effect since the mid-1990s (NOAA 2005). SJRWMD recognizes the potential impact of AMO on the water resources within its jurisdiction. At this time, SJRWMD considers the level of uncertainty associated with predicting AMO events and associated changes in rainfall to be too great to warrant a change in its water use projection and groundwater modeling approaches. During extended periods of higher rainfall that have been associated with AMO events, periods of drought occur. Reductions in water use projections and changes in SJRWMD's groundwater models to account for possible extended periods of above average rainfall could result in the underdevelopment of water supply sources and facilities if the anticipated above normal rainfall should not occur or should shorter-term drought periods occur during these extended periods of higher rainfall. In addition, the inevitable AMO shift and associated extended periods of lower rainfall would necessitate more water supply source and facilities development than would be available if extended periods above average rainfall were used as the basis of water supply planning. Basing water supply infrastructure development on AMO wet periods is clearly a high-risk approach, considering that (1) the AMO has not been established as the long-term overriding influence on SJRWMD rainfall, (2) the change from an AMO wet period to a dry period cannot be accurately predicted, and (3) the lead time to bring new sources and facilities online would be an estimated 5 to 10 years.

Therefore, SJRWMD has based its water supply projections, groundwater models, and calculation of water supply deficits on average rainfall conditions. SJRWMD will continue to explore the link between AMO and rainfall conditions within its jurisdiction.

MINIMUM FLOWS AND LEVELS

BACKGROUND

SJRWMD is engaged in a districtwide effort to develop MFLs for protecting priority surface water bodies, watercourses, springs, and associated wetlands, and aquifers from significant harm caused by groundwater or surface water withdrawals. MFLs provide an effective tool to assist in sound water management decisions that prevent significant adverse impacts to the water resources or ecology of the area.

This chapter of DWSP 2005, pursuant to the requirements of 373.0361(2)(c), (g), and (i), F.S., describes the numerous SJRWMD initiatives associated with setting MFLs and developing and implementing MFL recovery and prevention strategies. These include the following:

- Developing districtwide lake and stream classification systems and databases
- Identifying priority water bodies for setting MFLs
- Setting minimum levels for priority aquifers and lakes, and MFLs for priority springs, streams, and rivers
- Performing applied research to support the development of MFLs
- Monitoring water levels, hydrology, soils, and biological communities to verify that established MFLs are adequate to protect the water resources
- Identifying water bodies that are not meeting established MFLs or that are projected to not meet established MFLs as a result of projected increased withdrawals
- Identifying recovery and prevention strategies for water bodies that are not meeting established MFLs or are projected not to meet established MFLs as a result of projected increased withdrawals

SJRWMD implements established MFLs primarily through its Water Supply Planning, Consumptive Use Permitting, and Environmental Resource Permitting programs.

In addition to a description of SJRWMD's MFLs Program, pursuant to the requirements of Section 373.0361(h), this chapter of DWSP 2005 describes reservations of water adopted by rule.

STATUTORY AND REGULATORY FRAMEWORK FOR ESTABLISHING AND IMPLEMENTING MFLS

The basis for establishing and implementing MFLs is provided in Chapter 373, F.S., Chapter 62-40, *F.A.C.*, and Chapter 40C-8, *F.A.C*). These documents explicitly include provisions for the establishment of MFLs for the protection of nonconsumptive uses of water and the conservation of natural systems.

Chapter 373, F.S., requires WMDs to establish MFLs. Section 373.042, F.S., requires WMDs to establish minimum flows for surface watercourses and minimum levels for both ground and surface waters, below which significant harm to the water resources or ecology of the area would result.

Chapter 62-40, *F.A.C.*, highlights the state's approach to water management (Rule 62-40.110, *F.A.C.*). Subsection 373.103(1), F.S., requires WMD programs to be consistent with Chapter 62-40, *F.A.C.* Rule 62-40.310(4)(a), *F.A.C.*, directs the establishment of MFLs to protect water resources, considering the environmental values associated with marine, estuarine, freshwater, and wetlands ecology.

Chapter 40C-8, *F.A.C.*, presents policy, purpose, and important definitions used in the implementation of MFLs, and lists all systems for which MFLs are adopted as administrative rule. Section 40C-8.011(3), *F.A.C.*, states that the WMDs shall use the best information and methods available to establish MFLs to prevent significant harm to the water resources or ecology.

MFLS PROGRAM

The SJRWMD MFLs Program addresses all of the MFLs-related requirements expressed in Chapter 373, F.S., Chapter 62-40 *F.A.C.* and Chapter 40C-8, *F.A.C.*

SJRWMD intends to continue the following efforts:

- Identify, prioritize, and schedule water resources for establishing MFLs.
- Perform data collection and research needed to support establishing scientifically sound MFLs.
- Perform more-detailed investigations and studies to establish MFLs for priority water resources.

- Perform ongoing monitoring and periodic re-evaluation of MFLs.
- Develop and refine groundwater and surface water models, including developing an interface between ground and surface water models, where appropriate, to predict if water withdrawals will cause levels and flows to fall below established MFLs.
- Provide information about MFLs to local governments for their comprehensive planning.

Priority-Setting Process

In accordance with the requirements of Section 373.042, F.S., SJRWMD has established a list of priority ground and surface waters for which MFLs will be established (Appendix B). This priority list is based upon the importance of waters to the region and the existence of or potential for significant harm to the water resources or ecology of the region. In addition, consistent with the provisions of the Wekiva Parkway and Protection Act, which was passed by the 2005 Florida Legislature, the current priority list includes the scheduled update of the MFLs for Rock Springs and Wekiwa Springs in 2007.

Additionally, SJRWMD proposes to prioritize water resource systems for the establishment of MFLs at locations where hydrologic change resulting from regional groundwater withdrawals would occur first (i.e., sentinel sites). Establishment of MFLs at these key locations within PWRCAs should not only protect the specific water resource where MFLs are established, but also provide broader regional water resource protection.

As part of determining the priority list, the following factors are considered:

- Whether the existing or projected demand for water in the area is sufficient to meaningfully affect flows and / or levels of the surface water or groundwater
- Whether any water supply development is planned in the area that may adversely affect regionally significant environmental resources
- Whether the system includes regionally significant environmental resources
- Whether the area is currently experiencing or is expected to experience stress resulting from chronic low groundwater or surface water levels or low surface water flows

- Whether historic hydrologic records (flows and/or levels) are available to allow statistical analysis and calibration of computer models when selecting particular water bodies in areas with many water bodies
- The proximity of MFLs already established for nearby water resources

Establishment of MFLs

SJRWMD's MFLs approach can be applied to lakes, rivers, springs, isolated wetland systems, and aquifers. The method is used in a regulatory water management framework to protect aquatic and wetland systems from ecological harm resulting from anthropogenic surface or groundwater withdrawals. MFLs are primarily ecologically based. Multiple MFLs, which define a minimum hydrologic regime, typically are determined for a system to ensure that high, average, and low hydrologic conditions are protected. MFLs are represented by hydrologic statistics and are implemented with output from hydrologic water budget models. The method enables water management decisions to be made in an a priority and cumulative manner, evaluating how proposed water management decisions might affect system hydrologic conditions and existing legal water users.

Development of Surface Water MFLs

SJRWMD's MFLs approach assumes that alternative hydrologic regimes exist that are less than historic or optimal, but that will protect the structure and functions of aquatic and wetland resources from significant harm. For instance, an historic condition could consist of an unaltered river or lake system with no withdrawal from local groundwater or surface water sources. A new hydrologic regime is associated with each increase in consumptive use, from very small withdrawals that have no measurable effect on the historic regime, to very large withdrawals that markedly lower the long-term hydrologic regime. A threshold hydrologic regime exists that is lower than historic, but which protects the water resource and ecology of the system from significant harm. Conceptually, the threshold regime, resulting primarily from consumptive use withdrawals, will have lower average and lower low water levels and/or flows compared to the historic regime.

The purpose of MFLs is to define this threshold hydrologic regime and allow for consumptive use while protecting the water resources and ecology from significant harm. Thus, MFLs do not represent historic, optimal, or necessarily desirable hydrologic conditions, but rather represent minimum acceptable hydrologic conditions.

Ecological criteria that protect important system structures or ecosystem functions over the range of high, average, and low water events help determine MFLs. These MFLs assimilate a series of ecological thresholds used with output from hydrologic computer simulation models, to evaluate potential environmental impacts to the ecology of aquatic and wetland habitats over a long period.

Surface Water Hydrologic Regime. The threshold hydrologic regime can be defined by a series of up to five MFLs:

- Minimum Infrequent High
- Minimum Frequent High
- Minimum Average
- Minimum Frequent Low
- Minimum Infrequent Low

MFLs are not discrete points chosen from a hydrograph. Instead, the MFLs are long-term hydrologic statistics composed of a water level or flow (how much), duration (how long), and return interval (how often). Hydrometeorologic data (e.g., rainfall, evaporation, stages, flows) are needed for developing and verifying the long-term ($\geq$30 years) water budget models used for implementing these MFLs. The actual water levels or flows of the water system will fluctuate above, among, and below the recommended MFLs during extreme wet, normal rainfall, and extreme drought periods, respectively.

This approach to setting MFLs often results in confusion during periods of extremely high rainfall when a surface water body may flood, but may be at the same time, on a long-term basis, below established MFLs. This situation can occur because these floods are driven by events beyond human control. However, once this temporary condition is over, the affect from changes such as consumptive uses will again be more evident in a water body's hydrograph.

Minimum Infrequent High. The Minimum Infrequent High flow or level floods the riparian wetlands at a frequency sufficient to support important ecological processes such as floodplain maintenance functions and the transport of sediment, detritus, nutrients, and biological propagules. Flooding upland plant communities is not required.

Minimum Frequent High. The Minimum Frequent High flow or level inundates the floodplain habitat sufficiently to allow surface water biota

access for feeding, reproduction, and refugia. Flooding should be of sufficient magnitude, duration, and frequency to maintain the floodplain plant community structure and composition adapted to periodic inundation. This level and flow should occur annually or biannually for several weeks.

Minimum Average. The Minimum Average flow or level is considered the minimum that must be sustained for extended periods to maintain riparian hydric soils and to impede the encroachment of upland plant species into the wetland plant community. This MFL should not restrict typical recreational uses of surface water.

Minimum Frequent Low. The Minimum Frequent Low flow or level is the minimum level that should occur during mild droughts. When this water level and flow does not occur too frequently or for too great a duration, there is no significant harm to lotic and floodplain communities because this level provides the drawdown condition required for regeneration by many floodplain plant species. This level may limit some recreational potential of the stream or lake.

Minimum Infrequent Low. The Minimum Infrequent Low flow or level is a very low and infrequent flow or level that may occur for short durations during more extreme droughts.

Significant ecological impacts may occur rapidly if the water flow or level falls below the specified values or may occur more frequently or for durations longer than specified. To prevent the system from deteriorating to a point from which it cannot recover, the duration and frequency of this level, as a result of human activities, must be limited.

Implementation of Surface Water MFLs

The actual implementation of MFLs typically requires the use of hydrologic water budget computer models to generate long-term ($\geq$30 years) hydrologic statistics. Using these models in water supply planning and permitting, hydrologic statistics under proposed water withdrawal scenarios can be evaluated to determine if the proposed water level condition will fall below established MFLs.

Minimum Groundwater Levels

Minimum groundwater levels are typically not expressed as absolute water table levels or potentiometric heads at specific locations because of the

dynamic nature of groundwater levels in response to recharge and withdrawal. Instead, such levels are defined by establishing impact thresholds (constraints) for listed criteria. This consideration is especially relevant when minimum groundwater levels are related to water supply planning.

An infinite combination of groundwater withdrawal points and quantities is possible. The various potential withdrawal scenarios may yield highly differing quantities of water before triggering a constraint. The same withdrawal quantities at different locations may result in different levels of drawdown, and the same levels of drawdown at different locations may impact the specified constraint to differing degrees. Furthermore, the degree of impact from withdrawals at one location may be affected by the occurrence or non-occurrence of withdrawals at various other points. Therefore, it is not generally feasible to set definite minimum groundwater levels without specifying a particular withdrawal scenario. For this reason, the application of the water resource constraints rather than minimum groundwater levels is generally used in the water supply planning process. In a few cases, minimum groundwater levels have been established by rule as a consequence of minimum flows being established for springs or minimum levels being established for lakes.

SJRWMD assessed groundwater availability in the water supply planning process based on how much water can be withdrawn without resulting in unacceptable impacts to the water resources and related natural systems. This determination included consideration of any groundwater minimum levels adopted by rule, along with the other water resource constraints that address groundwater quality and other water resource impacts.

MFLs Reassessment Process

MFLs are established based on the data available at the time. SJRWMD conducts periodic reassessment of adopted MFLs based on consideration of the significance of particular MFLs in water supply planning and the relevance of new data that may come available. To that end, SJRWMD plans to

- Collect additional hydrologic and ecologic data
- Recalibrate hydrologic/hydraulic models
- Develop and test ecologic criteria
- Compare projected scenarios with actual events

The approaches used in this process generally resemble those for setting initial MFLs. This process may substantiate earlier work or modify previously established MFLs.

MFLs Established to Date

A complete list of established MFLs is included in Section 40C-8.031, *F.A.C.* (Appendix A). Water bodies for which MFLs have been established include

- Surface watercourses
  - Wekiva River at SR 46 bridge
  - Black Water Creek at SR 44 bridge
  - St. Johns River, 1.5 miles downstream of Lake Washington Weir
  - Taylor Creek, 1.7 miles downstream of structure S-164
  - St. Johns River at SR 44 near DeLand, Volusia County
- Surface waters
  - One hundred lakes
  - Seven wetlands
- Aquifers / springs
  - Eight springs in the Wekiva River Basin (minimum spring flow and a level in the aquifer at each springhead)

A proposed MFL for Blue Spring (Volusia County) is currently the subject of rulemaking.

Water Supply Planning Constraints and MFLs

For SJRWMD water supply planning purposes, sustainable sources must be able to supply the needed amounts of water, as defined by projected water use, without causing unacceptable impacts to water resources and related natural systems. Unacceptable impacts were defined in this planning process as impacts that exceed water resource constraints. These constraints serve to limit withdrawals to a sustainable condition—a condition that is not expected to result in unacceptable impacts. The initial water resource constraint used was that established by adopted MFLs. The development of other water resource constraints, and the analyses associated with them, occurred on a regional planning-level basis, using data that were available or developed for the planning area as a whole. This process was not performed at the same level of detail as that used when a proposed water use is reviewed in SJRWMD's consumptive use permitting program. While DWSP 2005 water

resource constraints and associated analyses are conceptually consistent with the consumptive use permitting environmental protection criteria and the permit application review process, they should not be interpreted as a final determination or application of the consumptive use permitting criteria.

As discussed elsewhere in this document, the SJRWMD water supply planning process defines unacceptable impacts as the limits of water resource impacts beyond which unacceptable impacts to water quality and to wetland and aquatic systems would occur (as defined by a constraint). SJRWMD used the following four natural systems water resource constraints:

- Established MFLs
- Native vegetation (wetlands)
- Lakes
- Springs

PREVENTION AND RECOVERY STRATEGIES

Subsection 373.0421(2), F.S., requires that a recovery or prevention strategy be developed if the existing flow or level in a water body is below, or within 20 years is expected to fall below, established MFLs. When MFLs for a water body / system are not being met or are not expected to be met in the future, SJRWMD will first examine the established MFLs in light of any newly obtained scientific data or other relevant information to determine whether the MFL should be reassessed. If no reassessment is necessary, a number of management tools are available to prevent water levels or flows from being lowered such that MFLs are not met or to restore the water body / system to meet MFLs.

Prevention Strategy

SJRWMD has identified several water bodies that would likely not meet established MFLs if all proposed water use through 2025 were implemented (SJRWMD 2006). These water bodies, in alphabetical order, include

- Lakes
  - Apshawa North (Lake County)
  - Apshawa South (Lake County)
  - Brantley (Seminole County)
  - Cherry (Lake County)
  - Colby (Volusia County)

- Cow Pond (Volusia County)
- Daugharty (Volusia County)
- Davis (Volusia County)
- Emporia (Volusia County)
- Helen (Volusia County)
- Louisa (Lake County)
- Lower Louise (Volusia County, currently not meeting MFL)
- Minneola (Lake County)
- Sylvan (Seminole County)
- Three Island (Volusia County)
- Upper Louise (Volusia County)

- Springs
  - Starbuck Spring (Seminole County)

SJRWMD's general strategy to prevent water levels or flows from falling below established MFLs in these water bodies includes

- Not issuing CUPs that would allow water levels and flows to fall below established minimums
- Identifying alternative water supply development projects that, if implemented, would prevent water levels and flows from falling below established minimums and assisting, as appropriate, in the implementation of these projects
- Identifying water resource development projects that, if implemented, would prevent water levels and flows from falling below established minimums and implementing these projects

SJRWMD has identified more specific strategies for individual water bodies or groups of water bodies, as follows:

- Lakes Apshawa North, Apshawa South, Brantley, Cherry, Louisa, and Minneola, Sylvan, and Starbuck Spring

These water bodies are located in the East-Central Florida Regional Groundwater Flow Model domain. The general strategy, not issuing CUPs that would allow water levels and flows to fall below established minimums, is applicable to all of these water bodies. Implementation of alternative water supply development projects and water resource development projects identified for the east-central Florida area will contribute to preventing water levels in these water bodies from falling below established minimums. These

projects are identified and described in the water supply and water resource development components of this document.

- Cow Pond and Lakes Colby, Daugharty, Davis, Emporia, Helen, Three Island, Lower Louise, and Upper Louise

These lakes are all located in the Volusia Regional Groundwater Flow Model domain. Lower Lake Louise, which is currently not meeting its MFLs, is the subject of specific recovery strategies and, therefore, is not included in this strategy description. The general strategy, not issuing CUPs that would allow water levels and flows to fall below established minimums, is applicable to all of these water bodies. Implementation of alternative water supply development projects and water resource development projects identified for the Volusia area will contribute to preventing water levels in these water bodies from falling below established minimums. These projects are identified and described in the water supply and water resource development components of this document.

Recovery Strategy

SJRWMD has identified only one water body that is not currently meeting established MFLs. This water body is Lower Lake Louise in Volusia County.

SJRWMD has identified the following specific recovery strategy for Lower Lake Louise.

- Lower Lake Louise is located in northern Volusia County. The adopted Minimum Average level is currently not being met primarily due to a pre-existing outlet canal. SJRWMD is proposing to develop and implement a water resource development project, which will include the construction of an operable weir at the lake's outlet. The weir will be designed and operated in a manner that will slightly raise the water level of the lake so that the minimum average level will be met but will not cause adverse flooding. The project will allow existing surface water and groundwater withdrawals to continue. This recovery strategy will be carried out in coordination with potentially affected parties.

STATUTORY AND REGULATORY FRAMEWORK FOR ESTABLISHING AND IMPLEMENTING RESERVATIONS OF WATER

Section 373.223(4), F.S., provides

> *The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.*

SJRWMD has established only one reservation of water pursuant to the provisions of Section 373.223(4), F.S. That reservation is related to flow through Prairie Creek and Camps Canal south of Newnans Lake in Alachua County and was adopted by rule (Section 40C-2.302, *F.A.C.*), as follows.

> *The Governing Board finds that reserving a certain portion of the surface water flow through Prairie Creek and Camps Canal south of Newnans Lake in Alachua County, Florida, is necessary in order to protect the fish and wildlife which utilize the Paynes Prairie State Preserve, in Alachua County, Florida. The Board therefore reserves from use by permit applicants that portion of surface water flow in Prairie Creek and Camps Canal that drains by gravity through an existing multiple culvert structure into Paynes Prairie. This reservation is for an average flow of 35 cubic feet per second (23 million gallons per day) representing approximately forty five percent (45%) of the calculated historic flow of surface water through Prairie Creek and Camps Canal.*

This rule is implemented through the water supply planning and CUP processes in a manner similar to that used to address MFLs.

WATER SUPPLY DEVELOPMENT COMPONENT

This portion of DWSP 2005 has been prepared to meet the requirements of Paragraph 373.0361(2)(a), F.S. This paragraph requires that DWSP include the following:

1. A quantification of the water supply needs for all existing and future reasonable-beneficial uses within the planning horizon. The level-of-certainty planning goal associated with identifying the water supply needs of existing and future reasonable-beneficial uses shall be based upon meeting those needs for a 1-in-10-year drought event.

2. A list of water supply development project options, including traditional and alternative water supply project options, from which local government, government-owned and privately owned utilities, regional water supply authorities, multijurisdictional water supply entities, self-suppliers, and others may choose for water supply development, which will exceed the needs identified in subparagraph 1, and which take into account water conservation and other demand management measures, as well as water resource constraints, including adopted minimum flows and levels and water reservations.

3. For each project option identified, the estimated amount of water to become available through the project, the time frame in which the project option should be implemented, the estimated planning level costs for capital investment and operating and maintaining the project, an analysis of funding needs and sources of possible funding options, identification of the entity that should implement each project option, and the current status of project implementation.

In addition, pursuant to the requirements of Subsection 373.0361(2)(e), F.S, for each identified project option, SJRWMD has considered and reported in this chapter of DWSP 2005 how the public interest is served by the project or how the project will save costs overall by preventing the loss of natural resources or avoiding greater future expenditures for water resource development or water supply development. Unless adopted by rule, these considerations do not constitute final agency action.

Based on the definition of water supply development included in Section 373.019(21), F.S., SJRWMD considers a water supply development project one that contributes to 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.

Based on the provisions of Section 373.019(1), F.S., alternative water supplies are water supplies from sources including salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater; water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; storm water; and any other water supply source that is designated as nontraditional in DWSP 2005.

This section of DWSP 2005 focuses on future water supply needs and the water supply sources and facilities required to meet the projected needs through 2025. SJRWMD developed water supply needs estimates for a number of use categories, including public supply and agricultural irrigation, the largest use categories within SJRWMD. Water supply needs for 2025 are summarized by county as well as by use category. The impact of the 1-in-10-year drought is also addressed.

SJRWMD anticipates the most significant growth in water supply needs will be related to expected growth in public supply water use. This is particularly true in PWRCAs (Figure 1). Except where specifically noted, DWSP 2005 does not identify water supply development project options for water use categories other than public supply because existing and reasonably anticipated sources of water for those uses are considered adequate.

Pursuant to the provisions of Subsection 373.0361(2)(j)(6), F.S., nothing in DWSP 2005 requires local governments, government-owned or privately owned water utilities, special districts, self-suppliers, regional water supply authorities, multijurisdictional water supply entities, or other water suppliers to select a water supply development project identified in DWSP 2005 merely because it is identified in DWSP 2005.

WATER SUPPLY NEEDS

Water Use Estimates and Projections

SJRWMD determined water supply needs based on the requirements of Subparagraph 373.036(2)(b)4a, F.S., following guidelines and conventions developed by the Water Planning Coordination Group. Existing legal uses of water for 1995, the base year for making water resource impact projections, and anticipated reasonable-beneficial needs for 2025 have been estimated for the following water use categories:

- Public supply
- Domestic self-supply and small public-supply systems
- Commercial / industrial / institutional self-supply
- Thermoelectric power generation self-supply
- Agricultural self-supply
- Recreational self-supply

The SJRWMD goal in projecting water use was to reasonably estimate needs based on the best information available. The methodology used to develop estimates of existing and projected water use is described in WSA 2003. Water use projections in all use categories are based on the assumption that current efforts to promote water conservation and the use of reclaimed water will continue through 2025, except for specific instances in which public supply utilities have proposed specific, improved water conservation and reuse plans.

SJRWMD developed water use projections for a 1-in-10-year drought for the public supply, domestic self-supply and small public supply systems, agricultural self-supply, and recreational self-supply categories. Drought events do not significantly impact water use in the remaining categories, because water use in these categories is related primarily to processing and production needs.

SJRWMD made its own water use projections based on estimates of population growth within the service area boundaries of public suppliers. SJRWMD provided these projections to the suppliers for review along with a request for additional information if the projections did not seem reasonable to the suppliers. SJRWMD did not formally solicit estimates from suppliers; however, if a supplier provided estimates, SJRWMD compared these estimates to SJRWMD estimates and reviewed them in detail with the supplier. Supplier projections were not relied upon exclusively because of the

many different ways in which their estimates were calculated and interpreted. In many cases, the supplier provided additional information that led to a new, mutually acceptable SJRWMD estimate.

SJRWMD projections were used in the WSA 2003 process as input to the regional groundwater flow models, which were used to project impacts to water resources. These impacts were the basis of identifying PWRCAs that are the focus of DWSP 2005.

Summary of SJRWMD Water Use for 1995, 2000 and 2025

Total water use in SJRWMD is projected to increase from 1,363 mgd in 1995, the base year for assessing the impacts of water use on water resources and related natural systems, to 1,786 mgd in 2025 (Table 1). This growth represents an overall increase of 31%. Total water use from 2000–2025 is projected to increase from 1,486 mgd to 1,786 mgd, an increase of about 20%.

Within the same time period, the public supply category of water use is projected to grow by 84%, from 453 to 836 mgd (Table 2). SJRWMD acknowledges uncertainty in public supply water use projections as well as in other aspects of the water supply planning process (Appendix D). However, the impact of this uncertainty on the planning process relates primarily to the planning horizon. If these projections prove correct, then the quantities of water identified in this document will be needed by 2025 to fully meet projected water supply needs. If the projections prove to be low, then more than the identified quantities will be needed before 2025. If the projections prove to be too high, then the identified quantities will not be needed until sometime after 2025. SJRWMD plans to monitor the actual water use that occurs compared to the projections included in WSA 2003 and DWSP 2005 and to revise the projections in future updates of these documents. If growth projections prove to be too high or additional levels of water conservation or reuse can be achieved on a regional scale, then water use projections can be reduced.

For the remaining use categories, projected shifts are minor. The net change in agricultural irrigation is expected to be insignificant; changes in acreage and crops in specific locations are expected to balance one another out so that the net change is negligible. Conservation efforts in agriculture may result in improved efficiencies at the farm level. However, at this time, no major changes are anticipated in technology that would substantially reduce irrigation needs.

Table 1. St. Johns River Water Management District (SJRWMD) total water use, by county, from 1995 to 2025, in 5-year increments

County	Water Use		Projected Water Use							
	1995	2000	2005	2010	2015	2020	2025 Average Rainfall Year	% Change 1995–2025	2025 1 in 10 RainfallYear	% Change 1995–2025
Alachua	35.63	38.17	41.43	44.33	47.22	50.12	53.02	49	56.27	58
Baker	4.63	7.29	5.55	6.01	6.47	6.93	7.39	60	7.86	70
Bradford	0.29	.32	0.33	0.35	0.36	0.38	0.40	38	0.43	48
Brevard	194.47	208.47	192.36	191.31	190.26	189.20	188.15	-3	200.26	3
Clay	21.60	33.74	31.31	36.17	41.03	45.88	50.74	135	53.47	148
Duval	141.45	154.82	158.77	167.44	176.10	184.76	193.42	37	203.11	44
Flagler	15.92	28.08	21.71	24.61	27.50	30.40	33.29	109	35.83	125
Indian River	259.49	248.54	265.03	267.80	270.57	273.34	276.11	6	331.69	28
Lake	108.73	99.10	121.54	127.94	134.34	140.75	147.15	35	156.32	44
Marion	34.92	45.85	41.84	45.30	48.75	52.21	55.67	59	59.36	70
Nassau	61.67	46.97	73.76	79.80	85.84	91.89	97.93	59	100.17	62
Okeechobee	14.25	15.24	14.00	13.87	13.74	13.62	13.49	-5	16.24	14
Orange	155.35	164.43	181.28	194.24	207.20	220.17	233.13	50	249.74	61
Osceola	16.56	48.54	16.57	16.58	16.59	16.60	16.60	0	18.16	10
Putnam	82.55	89.41	84.94	86.14	87.33	88.53	89.72	9	93.81	14
St. Johns	50.89	55.65	61.25	66.43	71.60	76.78	81.96	61	91.35	80
Seminole	68.60	90.03	83.27	90.61	97.94	105.28	112.61	64	119.58	74
Volusia	96.65	111.72	109.49	115.91	122.32	128.74	135.16	40	145.60	51
Total	1,363.65	1486.37	1,504.43	1,574.84	1,645.17	1,715.58	1,785.94	31	1,939.25	42

Figures only include water withdrawn in SJRWMD. Water use totals include public supply, domestic, agriculture, recreation, commercial/industrial, and power generation.

2000 was a significantly dry year in SJRWMD.

Table 2. St. Johns River Water Management District total water use (A) for 1995, 2000 and 2025 by source and category of use, and (B) from 1995 to 2025 by category of use, in five-year increments

A.

Category	Actual Use						2025 Projected Water Use			
	1995			2000			Average Rainfall Year			
	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Change
Public Supply	441.11	12.15	453.26	549.47	14.08	563.55	809.88	25.68	835.56	84%
Domestic and Small Public Supply	71.09	0.00	71.09	64.50	0.00	64.50	100.68	0.00	100.68	42%
Agricultural Irrigation	361.16	223.15	584.31	387.85	213.74	601.59	306.93	215.18	522.11	-11%
Recreational Irrigation	68.78	30.35	99.13	72.66	31.94	104.60	107.77	48.67	156.44	58%
Commercial/Industrial/Institutional	95.55	38.13	133.68	90.56	31.80	122.36	98.63	30.67	129.30	-3%
Thermoelectric Power Generation	7.68	14.50	22.18	10.86	18.91	29.77	13.42	28.44	41.86	89%
Total	1,045.37	318.28	1,363.65	1,175.90	310.47	1,486.37	1,437.31	348.64	1,785.95	31%

B.

Category	Actual Use		Projected Water Use					
	1995	2000	2005	2010	2015	2020	2025	Change*
Public Supply	453.26	563.55	580.69	644.41	708.13	771.84	835.56	84%
Domestic and Other Small Public Supply	71.09	64.50	80.95	85.88	90.81	95.75	100.68	42%
Agricultural Irrigation	584.31	601.59	563.58	553.21	542.84	532.48	522.11	-11%
Recreational Irrigation	99.13	104.60	118.23	127.79	137.34	146.89	156.44	58%
Commercial/Industrial/Institutional	133.68	122.36	132.22	131.49	130.76	130.03	129.30	-3%
Thermoelectric Power Generation	22.18	29.77	28.74	32.02	35.30	38.58	41.86	89%
Total	1,363.65	1,486.37	1,504.42	1,574.80	1,645.18	1,715.56	1,785.95	31%

Notes: All water use in million gallons per day.
2025 public supply includes 1.72 mgd from an unspecified source and provider in Volusia County.
2000 was a significantly dry year in SJRWMD.
*Percent change between 1995 and 2025.

EVALUATION OF WATER SOURCE OPTIONS

Water supply options applicable to DWSP 2005 include these naturally occurring sources:

- Fresh groundwater
- Brackish groundwater
- Surface water
- Seawater

In addition, a number of management techniques can enhance the source of supply, sustain the water resources and related natural systems, or otherwise optimize water supply yield. These techniques include the following:

- Water resource development
  - Artificial recharge
  - Aquifer storage and recovery
  - Avoidance of the impacts of groundwater withdrawal through artificial hydration
  - Water supply systems optimization and interconnections
- Demand management (water conservation)
- Use of reclaimed water

Naturally Occurring Sources

Fresh Groundwater

Fresh groundwater occurs in all three of the aquifer systems in SJRWMD: the Floridan, the surficial, and the intermediate. However, the distribution of fresh groundwater in these aquifer systems is variable. These aquifer systems and this variability in their water quality are described in the Introduction section of DWSP 2005.

The availability of water for reasonable-beneficial use from these aquifer systems is controlled by the extent to which groundwater withdrawals from these aquifer systems will impact water quality and wetland and aquatic systems. The water resource constraints described in the Resource Analysis section of this document represent the limits of such impacts that are acceptable to SJRWMD for water supply planning purposes.

Groundwater flow and optimization models have been used by SJRWMD to assess the extent to which groundwater withdrawals, particularly from the Floridan aquifer, can occur in a sustainable manner. Evaluations using these models indicate that some additional fresh groundwater can be developed from the Floridan aquifer in much of SJRWMD. The quantity of additional fresh groundwater that can be developed is dependent on the locations of withdrawals and the rates of withdrawals at those locations. Within much of SJRWMD's PWRCAs, fresh groundwater withdrawals are nearing sustainable limits, and alternative sources and/or management techniques will be needed to fully meet future needs without incurring unacceptable impacts to water quality and to wetlands and aquatic systems.

Brackish Groundwater

Brackish groundwater from the Floridan aquifer is an abundant potential water source in much of the coastal area of SJRWMD and currently meets all or a portion of the water supply needs for several local governments (Table 3). However, brackish groundwater is considerably more expensive to treat than fresh groundwater because it requires demineralization, and management of the demineralization concentrate often complicates implementation.

Table 3. Brackish water demineralization facilities in the St. Johns River Water Management District

County	Owner/Operator	Water Treatment Facility
Brevard	Melbourne, City of	Melbourne
Brevard	Palm Bay Utilities	Palm Bay
Brevard	South Brevard Water Coop	South Brevard
Flagler	Palm Coast, City of	Palm Coast
Indian River	Indian River County Utilities	Hobart Park
Indian River	Indian River County Utilities	South County
Indian River	Vero Beach, City of	Vero Beach
St. Johns	Hastings, Town of	Hastings
St. Johns	North Beach Utilities	North Beach
St. Johns	St. Johns County Utilities	Northwest
Volusia	Ormond Beach, City of	Ormond Beach
Volusia	Volusia County Utilities	Halifax Plantation
Volusia	Volusia County Utilities	Spruce Creek Fly-In

The potential for developing brackish groundwater resources for public supply purposes has been evaluated at a number of sites within the PWRCAs, including potential withdrawal sites located in northern and southern Brevard County, eastern Orange and Seminole counties, north-central Volusia County, and north-central St. Johns County (CH2M HILL 1998a). Treatment requirements and costs have also been investigated for these sites (CH2M HILL 1997d, 1998b).

The results of these investigations indicate that substantial quantities of slightly to moderately brackish groundwater could be developed in the coastal areas. Any long-term withdrawal of significant quantities of brackish groundwater would result in some deterioration in water quality. However, the rate of change in water quality can be controlled by careful wellfield design and operation. Anticipated changes in water quality would not impact treatability. A low-pressure membrane process would be sufficient to treat these brackish groundwater resources.

Although there is abundant brackish groundwater available for development in SJRWMD, prospective developers of this source should consider two challenges that may be encountered in its development. These challenges are (1) impacts on groundwater levels and (2) demineralization concentrate management.

Withdrawals of brackish groundwater will result in declines in Floridan aquifer and surficial aquifer water levels. Such declines would contribute to impacts to water resources and must be considered along with declines resulting from freshwater withdrawals in order to avoid unacceptable adverse impacts to the water resources and related natural systems.

Approximately 15% to 20% of water withdrawn for brackish water demineralization would become waste concentrate containing dissolved constituent concentrations approximately 4.5 to 6 times the raw water concentrations. Environmentally sound and permittable management of this waste concentrate presents an important challenge to the development of significant quantities of brackish groundwater within SJRWMD. To assist in addressing these challenges, SJRWMD developed a demineralization concentrate management plan (Reiss 2003) as part of its Water Resource Development Work Program. This plan is currently being implemented.

Brackish groundwater from the Floridan aquifer can be blended with freshwater from the intermediate or shallow aquifers, or other available sources, to meet both peak demand and average day demand. This technique

is currently used by several public supply utilities in SJRWMD and can be expanded further to meet future demands.

Surface Water

Surface water is also a potential water supply source. Surface water is currently used in limited quantities to meet both public supply and agricultural needs. Several surface water systems can potentially supply water to SJRWMD and have been considered in the development of DWSP 2005. These systems include the following:

- St. Johns River
- Ocklawaha River
- Taylor Creek Reservoir (in Osceola and Orange counties)

St. Johns River. DWSP 2004 Interim Update (Vergara 2004) identifies five potential water supply projects dependent on withdrawals from the St. Johns River. An earlier alternative water supply strategies investigation (CH2M HILL 1996) identified four possible withdrawal sites located on the St. Johns River.

Though the St. Johns River can supply a large quantity of raw water, this water varies in both quantity and quality. The St. Johns River, like most rivers, is subject to floods and droughts. To accommodate these fluctuations, significant amounts of raw and/or finished water storage would be required to ensure a reliable water supply at some locations.

SJRWMD has established MFLs for the river just downstream from the Lake Washington Weir and at SR 44 near DeLand (Chapter 40C-8, *F.A.C.*). Based on the adopted MFLs for the river near DeLand and evaluations performed by SJRWMD (Robison 2004), the St. Johns River from DeLand upstream to its headwaters can support a maximum withdrawal of about 155 mgd (240 cubic feet per second) at all times. Greater quantities can be supported during high-flow periods. SJRWMD is in the process of developing MFLs for the St. Johns River at Lake Monroe and at SR 50. Adoption of MFLs at these additional locations will allow for more refined estimates of water availability from this source.

During low-flow periods, water in the St. Johns River is slightly to moderately brackish. Flow diverted during these times would require partial demineralization and associated demineralization concentrate management. Based on discussions to date with FDEP staff, SJRWMD anticipates that

demineralization concentrate resulting from the treatment process would be discharged to the St. Johns River downstream of points of withdrawal.

In addition, the need to control disinfection byproducts may increase membrane treatment requirements even further than required for mineral removal. With ozone disinfection of brackish waters, bromate formation can be a major concern that could control the amount of diverted water needing membrane treatment and, therefore, overall water supply development costs.

The St. Johns River, as well as the upper Ocklawaha River, experience blue-green algae blooms, which generate toxins under certain conditions. SJRWMD, as part of its Water Resource Development Work Program, is exploring algal toxin treatment technologies. This effort is described in more detail in the Water Resource Development component of this document.

Surface water is generally more difficult to treat than groundwater because of the inherent flow and raw water quality variability. Given the partial demineralization it requires (with associated demineralization concentrate management) and the potential additional treatment to control unwanted disinfection byproducts, the St. Johns River is a more difficult and expensive water source than many other river systems.

SJRWMD performed surface water instream monitoring and treatability studies of the St. Johns River as part of its Water Resource Development Work Program. The results indicate that several effective and efficient water treatment combinations can be used to treat water withdrawn from the St. Johns River to a quality suitable for use in public supply systems and at an affordable cost (CH2M HILL 2004; Burton and Associates 2004).

Two public supply utilities currently use surface water from the St. Johns River Basin to supply their systems. These utilities belong to the cities of Melbourne and Cocoa in Brevard County. The city of Melbourne currently obtains a portion of its water supply from Lake Washington, located on the main stem of the St. Johns River. Lake Washington is located in the upper reaches of the St. John River. Because the salinity of the St. Johns River generally tends to increase downstream, Lake Washington water is much less saline than water at downstream locations. Raw water withdrawn from Lake Washington meets primary and secondary drinking water standards for dissolved salts and only requires conventional surface water treatment.

The city of Cocoa currently withdraws about 10 mgd of surface water on an average annual basis from the Taylor Creek Reservoir, located in Osceola and

Orange counties. Taylor Creek, within which the reservoir is located, is a tributary to the St. Johns River. The DWSP 2004 Interim Update identifies the Taylor Creek Reservoir Expansion Project as a water supply development project that would assist in meeting the projected future water supply needs of the east-central Florida area. This project, now named the St. Johns River/Taylor Creek Reservoir Water Supply Project, is described in more detail in the Water Supply Development Projects section of this document.

Ocklawaha River. Two candidate Ocklawaha River watershed surface water withdrawal sites were considered. The first is within the upper basin and was included in the alternative water supply strategies investigation (CH2M HILL 1996). An estimate of potential yield was made based on long-term flow records available from Haines Creek, which connects Lake Eustis to Lake Griffin in northern Lake County. Although Haines Creek flow records were used in the preliminary water supply analysis, there is considerable flexibility in the location of the actual water supply withdrawal points. They could be located anywhere in the Upper Ocklawaha River Basin in northern Lake County. A potential water supply yield of 14 mgd has been estimated for the Upper Ocklawaha River Basin. Although limited in quantity, the raw water is always fresh and will not require demineralization.

Determination of exact treatment requirements will require additional water quality monitoring and treatability testing.

The upper Ocklawaha River has been identified as a likely source of water to supplement reclaimed water supplying reuse systems. SJRWMD has specifically investigated the concept of withdrawing and treating water from Lake Apopka for this purpose (CH2M HILL 2001) and has identified a water supply development project for the city of Apopka based on this concept. In addition, SJRWMD has identified a water resource development project for the Lake Apopka basin, which will integrate efforts to maximize water supply storage with ongoing restoration efforts at Lake Apopka.

SJRWMD plans to develop environmental restoration projects along the Ocklawaha River. The amount, duration, and/or frequency of water needed to meet project restoration goals may affect the amount, duration, and/or frequency of withdrawals from surface water sources for water supply. In most cases, water needs for restoration are still being analyzed and developed. When the SJRWMD Governing Board makes decisions on restoration project plans, it will consider environmental restoration needs and water supply needs, and the preliminary estimate of available water supply may be revised.

The second Ocklawaha River site is located in the lower basin just upstream of the St. Johns River. Unique hydrologic factors make this location favorable for surface water supply development. Inflow to the lower reaches of the Ocklawaha River Basin includes discharge from Silver Springs, located near Ocala, in Marion County. Silver Springs is the largest spring in SJRWMD, with a long-term average discharge of about 876 mgd. It accounts for about 93% of spring discharge in the Ocklawaha River watershed and about 60% of the total outflow from Rodman Reservoir, located just upstream of the St. Johns River.

The water quality of the lower Ocklawaha River is very good, due in large part to the substantial fresh groundwater contribution of Silver Springs. The water is always fresh and would require only conventional surface water treatment prior to transport and distribution. The combination of good raw water quality and significant base flow makes this an attractive candidate site for surface water supply development. Neither expensive membrane treatment nor raw or finished water storage facilities would be required.

The water supply potential of the Lower Ocklawaha River Basin was investigated by Hall (2005). The analysis focused on the environmental impact of withdrawal both to Rodman Reservoir and to the downstream portion of the Ocklawaha River Basin. It was concluded that an environmentally safe water supply yield of at least 107 mgd (reported in other places in this document as 100 mgd) could be developed. Hall concluded that this water supply yield is environmentally feasible with or without Rodman Reservoir. The lower Ocklawaha River, particularly Rodman Reservoir, is currently the subject of a planned restoration effort. Implementation of this restoration is not expected to reduce these estimated quantities of water available from this system.

The main disadvantage of the Lower Ocklawaha River Basin potential withdrawal point is its distant location relative to areas with significant projected water use increases. Significant and costly finished water transport facilities would need to be constructed to meet identified public supply needs.

The DWSP 2004 Interim Update identifies a water supply development project on the lower Ocklawaha River in Putnam County. More information about this project can be found in the Water Supply Development Projects section of this document.

Taylor Creek Reservoir. Taylor Creek Reservoir is located in Osceola and Orange counties near the city of Cocoa's Dyal Water Treatment Plant. This reservoir contains freshwater which is generally of better quality than in the St. Johns River. Taylor Creek Reservoir raw water is always freshwater. The city of Cocoa currently uses the Taylor Creek Reservoir as a water supply source, and SJRWMD has issued a CUP for water supply withdrawal from Taylor Creek Reservoir. Potential water supply yield from the reservoir is likely to be on the order of 35 mgd. This quantity can be increased by pumping additional water from the St. Johns River to the reservoir. SJRWMD identified the Taylor Creek Reservoir Expansion Project in its DWSP 2004 Interim Update and has identified the St. Johns River / Taylor Creek Reservoir Water Supply Project in this DWSP. More information about this project can be found in the Water Supply Development Projects section of this document.

Seawater

Seawater can meet public water supply needs. However, seawater is currently a relatively expensive water supply option compared to other water supply options that have been identified and investigated to meet projected needs in the priority water resource caution areas. Demineralization of seawater to meet anticipated public water supply needs would generate a large waste concentrate stream. Environmentally and economically feasible concentrate management solutions will pose significant challenges to implementation of seawater demineralization projects. To assist in addressing these challenges, SJRWMD developed a demineralization concentrate management plan (Reiss 2003) as part of its Water Resource Development Work Program. This plan is currently being implemented.

It is reasonable to assume that seawater, including water from intracoastal areas of SJRWMD, will be developed as a water supply source within SJRWMD in the future. Seawater demineralization technology is continually advancing, and the relative cost between seawater and other alternative public supply sources is narrowing. Coastal areas are more likely than inland areas to develop seawater resources. Special case situations, such as co-siting a seawater desalting plant with an electric power plant or sizeable reclaimed water discharge facility, may make this water supply source more competitive with the development of other water supply sources. SJRWMD, as part of its Water Resource Development Program, has investigated the technical, environmental, and economic feasibility of co-siting seawater desalting facilities with specific electric power plants (R.W. Beck 2003a). This investigation resulted in the identification of 11 potential seawater or intracoastal water supply projects. Of these 11, five were identified as the top

five sites. Projects at three of these sites, two in northern Brevard County and one in Volusia County, are identified as water supply development projects in the DWSP 2004 Interim Update. More information about these three projects can be found in the Water Supply Development Projects section of this document.

Management Techniques

Water Resource Development

SJRWMD has identified several water resource development techniques that, if implemented, would increase the availability of water supplies.

Artificial Recharge. Artificial recharge is the replenishment of groundwater by means of spreading basins, recharge wells, or other induced infiltration techniques. Landscape and crop irrigation also induces some artificial recharge, although most applied irrigation water is lost to plant uptake or to the atmosphere through evapotranspiration. Source water can be surface water, reclaimed water, or irrigation water.

Managed artificial recharge can be used to help offset aquifer potentiometric surface declines resulting from groundwater withdrawals, thereby effectively increasing available supply. Hydraulically, the most effective artificial recharge techniques are those that maximize emplacement of water in the pumped aquifer(s).

Aquifer recharge wells (commonly referred to as drainage wells) have been used for drainage and lake-level control in the Orlando area since 1905. These wells emplace surface water directly into the Floridan aquifer, thereby increasing available water supply. Current artificial recharge via recharge wells, in east-central Florida, is estimated to be between 39 mgd and 52 mgd (CH2M HILL 1997c). Therefore, existing recharge wells provide a significant quantity of artificial recharge.

It is technically possible to substantially increase artificial recharge in east-central Florida by construction of additional artificial recharge wells. However, existing regulatory policy discourages the construction of new artificial recharge wells. Current policy will not permit the emplacement of additional water in the Floridan aquifer unless all primary and secondary drinking water standards are met at the wellhead. This policy presents a difficult economical challenge in urban drainage and lake-level control applications.

SJRWMD is performing an artificial recharge demonstration project (Central Florida Aquifer Recharge Enhancement Program Phase I) to further investigate the potential for use of new recharge wells to increase available fresh groundwater supplies. This project, which is part of SJRWMD's Water Resource Development Work Program, is described in more detail in the Water Resource Development Component of this document.

In addition to investigating the feasibility of increasing available groundwater through the use of new recharge wells, SJRWMD has investigated the feasibility of other artificial recharge approaches that would utilize the placement of reclaimed water or surface water at land surface in areas and in a manner that would result in increased recharge and an increase in available groundwater. This investigation, Central Florida Aquifer Recharge Enhancement Program Phase II, is described in more detail in the Water Resource Development Component of this document. Implementation of projects identified through this investigation is under way as part of Central Florida Aquifer Recharge Enhancement Program Phase III.

Aquifer Storage and Recovery. Aquifer storage and recovery (ASR) systems store treated drinking water underground in a suitable aquifer when sufficient water production capacities are available. The aquifer stores this treated water for later withdrawal and distribution, when water supply demands exceed the water supply. Although not a direct water source, ASR can be used to help manage and develop water supplies.

ASR has two major potential applications for public water supply development: (1) to provide system reliability and (2) to help meet peak flow demands.

Some sources of supply, including many surface water supply options, can be intermittent and therefore inherently unreliable. In this case, an ASR system can be used to store large quantities of finished water for distribution and use during drought periods when allowable surface water flow diversions are inadequate to meet the water supply demands.

ASR can also be used to help manage peak flow conditions. Without significant finished water storage capabilities, water supply treatment plants must be designed to supply the peak demand. Maximum day demands are typically 30% to 80% greater than average day demands. ASR can reduce the required maximum treatment rate, which in turn reduces the treatment plant size and operation costs. Specifically, water treatment plants can

accommodate peak demand by combining real-time treatment with ASR system withdrawal.

SJRWMD is investigating the feasibility of using ASR as part of its Water Resource Development Work Program. Information about this effort can be found in the Water Resource Development Component of this document.

Avoidance of the Impacts of Groundwater Withdrawal Through Hydration. In many of the PWRCAs, the potential impacts of groundwater withdrawal on wetlands are a major concern. In many cases, the possibility of dehydrating wetlands limits the quantity of freshwater that can be withdrawn from the Floridan aquifer.

Lower water levels impact wetlands. These impacts include changes in natural vegetation patterns. Groundwater withdrawals reduce the potentiometric surface of the aquifer, which can, in turn, lower surficial aquifer water levels and water levels in nearby wetlands. Many wetland systems are sensitive to relatively small changes in long-term average water levels. To avoid adverse impacts to native wetland systems, groundwater withdrawal must be managed to avoid excessively dehydrating wetlands, on both a local and a regional scale.

Although this DWSP is primarily designed to prevent adverse impacts from occurring by limiting groundwater withdrawal quantities and utilizing management techniques such that unacceptable adverse impacts to wetlands do not occur, hydration may be a potential additional tool to avoid adverse impacts.

The concept of wetland impact avoidance through hydration techniques is being investigated by SJRWMD through its Wetland Augmentation Demonstration Program as described in the Water Resource Development Component of this DWSP.

Water Supply Systems Optimization and Interconnections. Groundwater withdrawals can be optimized to increase the quantities of water produced while maintaining acceptable environmental impacts. Such optimization could have significant benefits for public supply wellfields or groups of wellfields that share the impacts of groundwater withdrawals. Typically, optimization of groundwater withdrawals would be achieved by reducing withdrawals in locations where withdrawals result in greater environmental impacts and increasing withdrawals in other locations where increased withdrawals would have lesser environmental impacts. SJRWMD has

prepared groundwater optimization models for the east-central Florida and Volusia areas. These models can be used to evaluate the benefits of groundwater optimization in these areas.

A system interconnection is a water supply management technique that allows utilities with available supply to supplement a nearby service area. Judicious use of system interconnections would allow optimization of groundwater withdrawals, thus maximizing the quantity of fresh groundwater that can be developed regionally. In this manner, the need for developing alternative water supply sources, including brackish groundwater and surface water, would be delayed.

Interconnections typically require a water transmission main, ground storage reservoirs, and a pump station. If interconnecting water supply systems produce finished water that differs significantly in quality, the water may need to be chemically adjusted. In some cases such water quality differences may prohibit interconnection on a permanent basis. Maintaining water quality in distribution systems is a complex matter that must be addressed in any interconnection strategy. Interconnections can also be designed to supply emergency flows. As with ASR, system interconnections alone will not increase the total water supply but can help manage or optimize the available resource.

Several local governments in Volusia County are implementing a systems interconnection project, and an expanded effort is being considered in association with a wellfield optimization investigation being performed as part of the Water Authority of Volusia's master water facilities planning process.

Demand Management (Water Conservation)

Water conservation is generally defined as the process of efficient and effective use of water. Water conservation is typically practiced for the purpose of sustaining, or at least extending, existing water supplies. SJRWMD strives to maximize water conservation within its jurisdiction to the extent economically, environmentally, and technically feasible through its regulatory, water supply planning, and public outreach programs.

SJRWMD addresses water conservation in Chapter 40C-2, F.A.C., "Permitting of Consumptive Uses of Water." Guidance for applying Chapter 40C-2, F.A.C., is provided in the SJRWMD *Consumptive Use Permit Handbook.*

Water conservation is required of all users. All water users are regulated by SJRWMD rules, unless specifically exempted by rule or statute. Larger water users are required to obtain a permit from SJRWMD, while the smallest uses such as landscape irrigaton by individual businesses or homeowners, are permitted by rule. The most prominent SJRWMD water conservation rule provisions currently affecting all water users concern landscape irrigation and ornamental fountains, as follows:

- **Irrigation Hours.** Irrigation is prohibited by all users between the hours of 10:00 a.m. and 4:00 p.m. daily to minimize evaporative water loss. Exemptions to this rule are provided for some agricultural purposes and other specific uses.
- **Ornamental Fountains.** All ornamental fountains must use recirculating systems that produce no off-site discharge.

New conservation provisions affecting irrigation uses. Lawn and landscape irrigation can account for more than 50% of total water use at residential and commercial locations. To ensure efficient and effective use of water for lawn and landscape irrigation, SJRWMD has just completed the rulemaking process to amend its permanent year-round water conservation rule provisions regulating lawn and landscape irrigation. Based on this amendment, landscape irrigation is limited to no more than two days per week, with some exceptions. Many public supply utilities in east-central Florida reported water use reductions when a similar requirement was implemented by the SJRWMD as a temporary water shortage order in 2000 and enforced by the local government utilities. SJRWMD is conducting additional statistical evaluations to better quantify the benefits, based on data collected during the water shortage order period that was implemented by SJRWMD in east-central Florida in 2001. While the study has not been finalized, preliminary indications are that this water conservation practice, when enforced on a local level, significantly reduced outdoor water use by water customers within many utility service areas.

According to the University of Florida Institute of Food and Agricultural Sciences, established Florida lawns and landscapes need watering only two to three times per week in the dry season. The recent rule amendment, limiting irrigation to no more than two days per week, is expected to provide for ample irrigation to keep nearly all landscapes healthy and to reduce wasteful irrigation practices.

This rule amendment also authorizes and encourages local governments to assist SJRMWD by enforcing these regulations within their jurisdictions by

adopting them by local ordinance. The proposed rule prescribes which days of the week landscape irrigation may be allowed by a local government ordinance. Local governments with a jurisdiction divided between SJRWMD and another WMD may propose an alternative schedule of days. Based on expected results in water savings, SJRWMD encourages local governments to adopt such ordinances, as provided for under SJRWMD rules, in order to enforce this provision within their jurisdictions.

Specific Water Conservation Required by Consumptive Use Permits

Chapter 40C-2, *F.A.C.*, requires the issuance of permits for large-volume water users, based on reasonable-beneficial, interference, and public interest criteria. Water users who are required to have an individual permit include those whose average annual daily withdrawal exceeds 100,000 gallons, whose capacity to withdraw water exceeds a million gallons per day, or those with a well of six inches in diameter or greater.

Chapter 40C-2, *F.A.C.*, requires water conservation as a part of all CUPs and states that "All available water conservation measures must be implemented unless the applicant demonstrates that implementation is not economically, technically, and environmentally feasible… (Subsection 40C-2.301(4)(e) Conditions for Issuance of Permits)"

Public supply utilities in SJRWMD are required to have programs designed to insure utility operating efficiency and achieve water conservation among individual customers. Section 12.2.5 of the *Consumptive Use Permit Handbook* specifies water conservation practices for public supply CUPs. These conditions are summarized below.

- Perform a systemwide audit of the amount of water used in the applicant's production and treatment facilities, transmission lines, and distribution system.
- Perform a meter survey, and correct the water audit to account for meter error if the initial unaccounted for water is 10% or greater based on the results of the initial water audit.
- Perform a leak detection evaluation or develop an alternative plan of corrective action if the system survey shows greater than 10% unaccounted for water use.
- Implement a meter replacement program if the system survey indicates that a group or type of meters is less than 95% accurate.

- Implement a customer and employee water conservation education program.
- Implement a water conservation promoting rate structure or amend an existing conservation rate structure to improve its effectiveness unless the cost is not justified because it will have little or no effect on reducing water use.
- Submit a management plan designed to minimize the need for augmentation if the permit includes a backup water source to meet peak demands for reclaimed water.
- Additional water conservation measures may be required when an audit and/or other available information indicates there is a need.

Other types of water users, including agriculture and industry, have a similar list of specific water conservation requirements. In the case of agriculture, emphasis is placed on upgrading irrigation systems to improve efficiencies, the capture and use of stormwater for irrigation, and the use of reclaimed water from nearby utility providers. For industrial users, emphasis is on water saving process improvements, recycling of water, and use of lower quality sources.

Recent Rule Revisions. SJRWMD has completed the rulemaking process to amend Section 40C-2.042, *F.A.C.*, General Permit by Rule, to further limit landscape irrigation to reduce excessive and unneeded water use through a districtwide limit of landscape irrigation to two days per week, except for micro-irrigation systems and hand watering with an automatic shutoff device. The rule revision also includes an exception for irrigation of new landscaping at any time of day on any day for the initial 30 days and every second day for the next 30 days for a total of one 60-day period. In addition, a general permit would be available to users who demonstrate the need to irrigate up to three days per week.

The rule amendment also authorizes local governments to enforce these regulations within its jurisdiction by adopting them by ordinance. The rule amendment prescribes which days of the week landscape irrigation may be allowed by a local government ordinance. Local governments with a jurisdiction divided between SJRWMD and another WMD may propose an alternative schedule of days.

Water Use Projections. The water use projections presented in WSA 2003 and addressed in this DWSP assume that existing water conservation practices and programs will remain in effect through the projection period without

additional water saving measures being undertaken, except for specific instances in which public supply utilities have proposed specific, improved water conservation plans. The projections are based on water use data from 1995 to 1999, and should reflect the beneficial impacts of SJRWMD's comprehensive water conservation amendments to Chapter 40C-2, *F.A.C.* that occurred in the early 1990s, as well as the state of Florida and federal new construction requirements, which became effective from 1984–1991, for use of low-flush toilets, low-flow showerheads, sink aerators, rain sensor automatic shutoff devices on irrigation systems, and water use standards for appliances. Sufficient time has passed since these water conservation requirements were implemented to allow for these expected water savings to be realized. Thus, the 2003 WSA assessment water use projections were used to provide a conservative estimate of the potential impacts resulting from ground and surface water withdrawals to best determine the total shortfall that may need to be met. Additional water conservation efforts are then considered in the plan development process as one means by which to meet projected shortfalls.

Water Conservation Potential. There are several additional water conservation options that public supply utilities can use to reduce their future water supply demands. Analysis indicates a reasonable possibility that a substantial portion of the projected increase in SJRWMD water use between 2005 and 2025 could be met through improved water use efficiency, provided aggressive programs are implemented and funded by water supply utilities and local governments to promote and enforce the necessary practices. However, considerable uncertainty exists regarding the actual results of water conservation programs and projects. A high potential exists for improved efficiency, but the actual degree that will be attained cannot be known until it is accomplished. Success of this approach is highly dependent upon aggressive local implementation, which is not under direct SJRWMD control. Furthermore, the aggregate cost for extensive retrofits, better irrigation systems, and other practices needed to reach the projected potential water savings would be measured in hundreds of millions of dollars, just as the development of alternative water supplies would be, and those costs would be incurred without certainty of the amount of water that would be made available.

Estimated water savings and initial capital costs per gallon of water savings for five groups of conservation practices are shown in Table 4. The 20-year (2005 through 2025) total cost of outreach and education types of practices are integrated into the total costs for other water conservation practices. Costs are calculated only for new water savings and are incremental to the cost of

existing programs and practices. Descriptions and critiques of available conservation practices and a list of those considered to be cost-effective and potentially applicable in SJRWMD appear in Appendix E. Explanations of the methodologies used to derive estimated water savings and costs for individual conservation practices are provided in Appendix F. Additional tables providing the results of calculations of water savings and costs for individual conservation practices are found in Appendix G.

The capital costs for individual conservation practices range up to $14.17 per gallon per day of water saving capacity. These costs are comparable to the costs of constructing water supply production capacity for alternative water supply projects identified in DWSP 2005. Ongoing operation and maintenance costs comparable to the unit production cost of water supply facilities also would be incurred. The ongoing costs for some practices, such as retrofitted low-flow toilets, may be no more than the cost of maintaining existing older toilets, but the cost of other practices, such as ordinance enforcement, may be substantial.

Several factors limit the precision of these estimates: (1) The actual market penetration that will be obtained is unknown. It is not possible to determine in advance how many people in the target groups will adopt any specific conservation practice, particularly voluntary practices. Therefore, the relatively conservative target population penetration rate of 50% over the 20-year planning period through 2025 is used throughout for voluntary conservation practices in order to avoid unrealistically high expectations. (2) The aggregate impact of more than one practice addressing savings from the same type of water use is uncertain. Attempts have been made to avoid double or multiple counting of the same water saved by two or more practices. The assumptions used in this process are described in Appendix G. (3) It is not always possible to determine with reasonable certainty which cost resulted in what specific water savings. For example, no specific amount of water savings can be attributed to the money spent on outreach and education, but they are believed to contribute to the adoption of various practices that result in known water savings and which may not be adopted otherwise. SJRWMD expects that many of these factors contributing to

Table 4. Water savings (millions of gallons per day) and costs (millions of dollars) by county by conservation practice group.

County	Existing Indoor Use		Existing Outdoor Use		New Construction Indoor		New Construction Outdoor		General		Total Water Saved	Total Cost
	Saving	Cost	Saving	Cost	Saving	Cost	Saving	Cost	Saving	Cost		
Alachua	4.42	18.69	0.93	7.18	0.43	4.55	3.29	37.64	1.38	0.00	10.46	68.06
Baker	0.44	1.14	0.15	0.82	0.00	0.03	0.59	2.35	0.22	0.00	1.41	4.34
Bradford	0.03	0.08	0.00	0.04	0.00	0.00	0.00	0.06	0.00	0.00	0.03	0.19
Brevard	13.00	51.22	2.63	20.43	0.77	8.07	9.49	83.35	4.04	0.00	29.92	163.06
Clay	3.35	16.47	0.89	6.70	0.21	1.92	3.71	42.54	1.45	0.00	9.60	67.62
Duval	22.17	114.19	5.36	26.52	1.31	12.92	18.63	101.16	7.82	0.00	55.29	254.79
Flagler	1.01	6.11	0.41	4.00	0.11	1.19	3.16	33.18	1.11	0.00	5.80	44.47
Indian River	3.02	17.91	0.76	5.90	0.35	3.83	2.98	33.56	1.21	0.00	8.31	61.20
Lake	4.86	25.58	3.30	12.66	0.33	3.44	10.31	94.86	3.83	0.00	22.63	136.54
Marion	4.34	22.66	0.93	10.56	0.13	1.37	3.71	39.58	1.48	0.00	10.58	74.17
Nassau	1.37	7.45	1.04	3.22	0.10	0.95	3.37	14.49	1.20	0.00	7.08	26.11
Okeechobee	0.02	0.08	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.00	0.02	0.16
Orange	17.13	89.89	4.73	29.14	1.99	18.81	17.48	122.70	6.73	0.00	48.05	260.54
Osceola	0.04	0.20	0.00	0.10	0.01	0.08	0.00	0.93	0.00	0.00	0.05	1.31
Putnam	1.84	8.83	0.47	2.77	0.01	0.08	1.48	3.94	0.62	0.00	4.43	15.63
St. Johns	2.83	17.09	0.93	7.96	0.39	3.95	5.89	45.11	2.11	0.00	12.15	74.11
Seminole	9.81	53.21	3.10	15.44	0.92	8.73	11.70	76.53	4.66	0.00	30.19	153.91
Volusia	12.28	67.01	2.89	17.35	0.60	6.43	11.33	69.56	4.64	0.00	31.74	160.35
Education		12.75		3.56		0.96		11.65		5.31		38.10
SJRWMD TOTAL	101.96	530.55	28.50	174.39	7.66	77.28	107.11	813.23	42.50	5.31	287.73	1,604.64
Cap. cost per gal	5.20		6.12		10.09		7.59		0.13		5.58	

uncertainty will be addressed through the ongoing Conserve Florida Water Conservation Program, a cooperative effort between DEP, the water management districts, American Water Works Association (AWWA), and various public supply utilities. The emphasis of the this program is to develop a clearinghouse and detailed database documenting individual utility service area characteristics, water conservation practices, and water use data documenting the beneficial impacts. The information will then be used by water management districts and water supply utilities to maximize water conservation benefits based on the utility customer characteristics. SJRWMD proposes to support this effort through its Water Resource Development Work Program.

Public Outreach

Educating the public about the importance of water conservation and changing water use behaviors are major components of SJRWMD's Outreach Program. Since 2002, the program has included sponsoring an annual Water Conservation Public Awareness Campaign, a multimedia advertising campaign, developed and implemented cooperatively with other water management districts and public supply utility partners, that has successfully increased public awareness of water conservation and changed water use behaviors. Surveys conducted between 2002 and 2004 demonstrated that during this time period, 50% of the public recalled seeing the advertisements and 17% admitted to changing their water use behaviors as a result. These percentages mean that approximately 700,000 people within SJRWMD may have improved their water conservation practices as a result of this campaign. However, corresponding water use reductions have not been calculated. SJRWMD has budgeted the annual Water Conservation Public Awareness Campaign for FY 2005–2006 and expects to continue the program for the foreseeable future. It is anticipated that the benefits of the program in terms of changing the public's attitude and practices will grow with time. SJRWMD encourages all water utilities to consider joining with those utilities and local governments already co-funding the program with SJRWMD. SJRWMD is investing the feasibility of undertaking an evaluation to quantify not only the attitude shifts, but also quantitative water savings.

SJRWMD also implements traditional educational practices, including seeking media coverage and public service announcements, conducting presentations for community groups, hosting seminars and in-school programs, providing displays for community events, and producing printed materials for general distribution.

Water Conservation Projects. The following projects are in progress to support SJRWMD's conservation efforts:

- Conserve Florida Water Conservation Information Clearinghouse
- Model Landscape Water Conservation Ordinance
- Water Conservation Public Awareness Campaign

These projects are described in the Other Water Supply Projects section of this document**.**

Use of Reclaimed Water

Reclaimed water is water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility. Reuse is the deliberate application of reclaimed water, in compliance with FDEP and WMD rules, for beneficial purposes. Uses for reclaimed water include landscape irrigation, agricultural irrigation, aesthetic uses, groundwater recharge, industrial uses, environmental enhancement, fire protection, or other beneficial purposes.

SJRWMD regards reclaimed water as an alternative water supply source that should be used to make more water available for reasonable-beneficial use, provided the use of reclaimed water is technically, environmentally, and economically feasible. SJRWMD seeks to achieve a water resource benefit with reclaimed water by

- Using reclaimed water in place of higher quality water for uses that do not require higher quality
- Using reclaimed water to augment water supply sources, typically by groundwater recharge

SJRWMD has a variety of programs to require, promote, and facilitate reuse in order to achieve water resource benefits through the use of reclaimed water. SJRWMD practice has been to encourage or require reuse to the extent feasible in accordance with state of Florida objectives concerning water conservation and reuse (373.250(1), F.S.; 403.064(1), F.S.; and 62-40, *F.A.C.*).

SJRWMD has designated its entire jurisdiction as a water resource caution area for the purpose of requiring reuse feasibility studies by FDEP during the

wastewater treatment facilities permitting process (62-610.820, *F.A.C.*). All SJRWMD programs pertaining to reuse are applied districtwide.

SJRWMD has evaluated the availability of reclaimed water for the 2025 planning horizon and has considered potential uses for that reclaimed water. This evaluation was accomplished by performing the following tasks:

- Collection of information for existing and planned domestic wastewater treatment facilities, including quantities of domestic wastewater from each existing facility currently being used as reclaimed water to achieve a water resource benefit and the remaining amount of this water available to be used as reclaimed water to achieve a water resource benefit
- Projection of 2025 quantities of domestic wastewater from each existing and planned domestic wastewater treatment facility, including quantities that are likely to be available for use as reclaimed water to achieve a water resource benefit
- Identification of potential uses of reclaimed water
- Identification of specific reuse projects

Existing and Planned Domestic Wastewater Treatment Facilities. SJRWMD compiles and evaluates information on wastewater treatment facilities and reuse projects within its boundaries. This information is used both in the water supply planning process and in the regulatory program to identify feasible opportunities to increase the use of reclaimed water to achieve a water resource benefit. SJRWMD updates information for wastewater treatment facilities that are permitted to treat at least 0.1 mgd. Information includes wastewater service area boundaries, transmission line size and location, and reuse service area information. At the time of preparation of DWSP 2005, SJRWMD's information on wastewater treatment facilities and associated reuse service areas was current through 2001.

FDEP produces an annual reuse inventory with information about each permitted wastewater treatment facility. The inventory includes the level of treatment, permitted capacity, the total flow amount during the year, the amount of flow that is reused including the general category of reuse, and the amount of flow to disposal. SJRWMD used the 2001 FDEP Annual Reuse Inventory (FDEP 2002) and SJRWMD information current through 2001 as baseline information to project future availability of reclaimed water.

There were 141 domestic wastewater treatment facilities in SJRWMD in 2001 with permitted capacities of 0.1 mgd or greater. These facilities produced

354.8 mgd of treated wastewater in 2001. SJRWMD estimates that approximately 134.1 mgd of this flow was being reused to achieve a water resource benefit.

Projected Quantities of Reclaimed Water. Historical data indicate that wastewater production trends are closely related to trends in potable water use. Therefore, SJRWMD used its projections for public water supply quantities in 2025 to calculate 2025 wastewater flows. The following methodology was used for each county, or portion of county, within SJRWMD:

- **Step 1—Calculate the growth factor for public water supply demand**. The growth factor representing the projected increase in public water supply demands from 2001 to 2025 is the ratio of the 2025 public water supply demands to the 2001 public water supply demands. The methodology for calculating the 2025 public water supply demands is documented in WSA 2003.
- **Step 2—Calculate 2025 wastewater flows**. The 2001 treated wastewater flows were multiplied by the growth factor calculated in step 1 to calculate the 2025 treated wastewater flows. The total quantity of treated wastewater in SJRWMD in 2025 is projected to be 567.2 mgd.
- **Step 3—Calculate additional wastewater available for reuse in 2025**. The amount of reclaimed water being used to achieve a water resource benefit in 2001 was subtracted from the 2025 wastewater flows to calculate the additional treated wastewater supply available for reuse in 2025. SJRWMD estimates that an additional 433.1 mgd will be available for reuse in 2025.

Although SJRWMD estimates that there will be an additional 433 mgd of treated wastewater available in 2025 (Table 5), only half will likely be reused without construction of additional seasonal reclaimed water storage or reuse augmentation facilities. Thus, SJRWMD anticipates that there will be additional reuse of approximately 217 mgd in 2025 without these additional capital facilities. A larger proportion of the reclaimed water supply could be utilized if additional seasonal storage and augmentation facilities are constructed.

Availability of reclaimed water varies geographically within SJRWMD. Reclaimed water is well utilized in some locations, and less so in others. Much of the current reclaimed water supply in the high growth areas of

Table 5. St. Johns River Water Management District 2025 projected available reuse, by county

County	2025 Projected Wastewater Flows (A)	2001 Reuse That Provides a Water Resource Benefit (B)	2025 Projected Wastewater Flows Available for Reuse (A minus B)
Alachua*	21.13	4.02	17.11
Baker*	0.68	0.00	0.68
Bradford*	0.00	0.00	0.00
Brevard	57.48	15.84	41.64
Clay	20.99	1.08	19.91
Duval	111.39	7.14	104.25
Flagler	22.98	3.87	19.11
Indian River	12.14	5.82	6.32
Lake*	21.81	2.44	19.37
Marion*	11.97	1.93	10.04
Nassau	7.63	0.63	7.00
Okeechobee*	0.00	0.00	0.00
Orange*	113.15	56.80	56.35
Osceola*	0.00	0.00	0.00
Putnam	3.40	0.03	3.37
St. Johns	27.61	3.39	24.22
Seminole	76.59	14.57	62.02
Volusia	58.26	16.58	41.68
Total	567.21	134.14	433.07

Wastewater flows and reuse amounts in million gallons per day
*Projected increase in available reuse is for the SJRWMD portion of the county.

Orange and Seminole counties is already committed, and some reuse systems in these areas are also supplemented by surface water or groundwater. Moreover, additional beneficial reuse has been developed since 2001. Thus, the potential additional supply of reclaimed water in 2025 may be different than is shown in Table 6. The 2001 quantities of reuse that provided a water resource benefit included flows to rapid infiltration basins (RIBs), but did not include flows for wetland augmentation. SJRWMD does not have adequate data to account for the water delivered to wetland augmentation to achieve a water resource benefit.

Potential Uses of Reclaimed Water. SJRWMD identified potential uses of reclaimed water by (1) identifying types of reuse that provide water resource benefits in SJRWMD and (2) identifying the locations where significant supplies of reclaimed water are projected to be available.

Table 6. St. Johns River Water Management District 2025 projected sources of available reuse greater than 4 million gallons per day, by county

County	Owner or Operator	2025 Projected Wastewater Flows (A)	2001 Reuse That Provides a Water Resource Benefit (B)	2025 Projected Wastewater Flows Available for Reuse (A minus B)
Alachua	Gainesville Regional Utilities	18.64	2.84	15.80
Brevard	Brevard County	9.23	0.99	8.24
Brevard	Melbourne, City of	10.90	1.20	9.70
Clay	Clay County Utilities Authority	6.21	0.00	6.21
Duval	JEA	82.88	6.77	76.11
Flagler	Palm Coast, City of	12.00	1.70	10.30
Lake	Leesburg, City of	4.01	0.00	4.01
Marion	Ocala, City of	6.30	0.22	6.08
Nassau	Fernandina Beach, City of	4.75	0.00	4.75
Orange	Orange County	35.30	8.41	26.89
Orange	Orange County (SFWMD)	51.87	23.91	27.96
Orange	Orlando, City of (SFWMD)	16.50	12.00	4.50
Orange	Reedy Creek Improvement District (SFWMD)	13.57	5.07	8.50
Seminole	Altamonte Springs, City of	9.14	5.13	4.01
Seminole	Orlando, City of	44.39	16.50	27.89
Seminole	Sanford, City of	6.38	2.05	4.33
St. Johns	St. Augustine, City of	12.14	0.29	11.85
St. Johns	St. Johns County	4.48	0.28	4.20
Volusia	Daytona Beach, City of	17.44	3.30	14.14
Volusia	New Smyrna Beach Utilities Commission	3.95	0.00	3.95
Volusia	Ormond Beach, City of	5.93	1.91	4.02
Volusia	Port Orange, City of	8.98	3.53	5.45
Total		384.99	96.10	288.89

Wastewater flows and reuse amounts in million gallons per day
SFWMD = South Florida Water Management District

The following types of reuse are considered to provide water resource benefits in SJRWMD:

- Well-accepted reuse technologies as defined by FDEP
- Groundwater recharge and indirect potable reuse
- Satellite and subregional facilities for sewer mining
- Toilet flushing
- Industrial uses
- Wetland creation and augmentation

Wastewater utilities with treated wastewater flows of 4 mgd or more in 2025 will account for most of the projected wastewater (Table 6). Approximately another 50 wastewater treatment facilities producing less than 4 mgd for additional reuse in 2025 are expected to yield a total of about 100 mgd for additional reuse in 2025.

The water resource benefit of reusing reclaimed water includes an increase in aquifer recharge as well as a reduction in potable water used for nonpotable purposes. The groundwater models used to estimate deficits in fresh groundwater supply for the east-central Florida area included increased recharge resulting from expansion of reclaimed water systems and RIBs. This increased recharge has the effect of lowering the potential groundwater supply deficits. Table 7 shows the estimated amount of increased recharge associated with land application of reclaimed water through RIBs or irrigation in the east-central Florida area. Table 8 also includes an estimate of recharge derived from septic systems in high recharge areas of Volusia County.

Table 7. Recharge rates used in the east-central Florida regional groundwater flow model by method of land application of reclaimed water

County	1995		2025	
	Spray Irrigation	RIBs	Spray Irrigation	RIBs
Brevard	6.19	0.00	15.68	0.00
Lake	8.69	1.11	22.07	3.25
Orange	12.21	29.37	75.60	42.30
Osceola	3.26	6.53	5.54	13.06
Seminole	10.05	0.48	35.88	2.06
Volusia	4.19	0.00	24.20	10.00
Total	44.59	37.49	178.97	70.67

Recharge amounts in million gallons per day.
RIB = rapid infiltration basin

Source: Brian McGurk, pers. com. 2004

Reclaimed water supplies reduce the need for potable water supplies. SJRWMD evaluated the extent to which the use of reclaimed water might be able to offset the need for potable water in priority water resource caution areas in 2025. The baseline evaluation used the following assumptions:

Table 8. St. Johns River Water Management District recharge rates used in the Volusia regional groundwater flow model to account for land application of wastewater and reclaimed water

Utility/Facility	Type	1995	2025	Difference
Daytona Beach	Golf course irrigation	3.50	0.00	-3.50
	Residential/public access reuse	1.50	6.85	5.35
DeLand—Brandywine	Residential/public access reuse	0.12	0.46	0.34
DeLand—Regional	Golf course irrigation	0.27	0.40	0.13
	RIBs and/or septic tanks	2.04	4.01	1.97
Edgewater	Residential/public access reuse	0.48	1.32	0.84
New Smyrna Beach	Golf course irrigation	0.60	0.60	0.00
	Residential/public access reuse	0.50	4.49	3.99
Port Orange	Golf course and residential/public access reuse	1.00	5.78	4.78
Holly Hill	Golf course and residential/public access reuse	0.50	0.65	0.15
Ormond Beach	Golf course irrigation	0.29	0.30	0.01
	Residential/public access reuse	2.21	3.20	0.99
Breakaway Trails	Residential/public access reuse	0.11	0.12	0.01
Tymber Creek	Residential/public access reuse	0.04	0.04	0.00
Seabridge	Residential/public access reuse	0.06	0.06	0.00
Deltona, City of	Golf course irrigation	0.89	0.60	-0.29
	RIBs and/or septic tanks	5.95	7.66	1.71
Lake Helen	RIBs and/or septic tanks	0.18	0.69	0.51
Orange City	RIBs and/or septic tanks	1.00	2.50	1.50
VC—Southwest	RIBs and/or septic tanks	0.58	3.65	3.07
	Golf course irrigation	0.40	0.60	0.20
VC—Four Townes	Residential/public access reuse	0.20	0.60	0.40
VC—Hacienda	RIBs and/or septic tanks	0.03	0.14	0.11
VC—Indian Harbor	RIBs and/or septic tanks	0.00	0.14	0.14
VC—Lighthouse Point	RIBs and/or septic tanks	0.00	0.07	0.07
VC—Deltona North	RIBs and/or septic tanks	0.31	1.21	0.90
VC—Spruce Creek	RIBs and/or septic tanks	0.17	0.46	0.29
VC—Northeast	RIBs and/or septic tanks	0.14	0.56	0.42
VC—Ag. Center	RIBs and/or septic tanks	0.01	0.02	0.01
VC—Cassadaga	RIBs and/or septic tanks	0.01	0.04	0.03
Total		23.09	47.22	24.13

Recharge amounts in million gallons per day.
RIB =rapid infiltration basin
VC =Volusia County

Source: Stan Williams, pers. com. 2004

- Amount of reclaimed supply available for reuse

Because of variations in reclaimed water supply and demand, SJRWMD assumed that only 50% of the projected additional annual supply of reclaimed water (the total 2025 treated wastewater flows less the amounts that provided a water resource benefit in 2001) could be practically available to supply reuse systems without the construction of seasonal reclaimed water storage or reclaimed water augmentation systems (Table 9). However, SJRWMD will encourage and support the development of sources of reuse augmentation and adequate storage to reasonably work toward achieving 100% reuse of available reclaimed water to achieve a water resource benefit by 2025.

Table 9. St. Johns River Water Management District potential annual average water use offset in counties within priority water resource caution areas

County	A	B	C
	2025 Projected Wastewater Flows (A)	2001 Reuse That Provides a Water Resource Benefit (B)	2025 Projected Reuse That Provides a Water Resource Benefit (A minus B)
Brevard	57.46	15.84	41.62
Flagler	22.98	3.87	19.11
Lake	21.80	2.44	19.36
Marion	11.90	1.93	9.97
Orange	100.50	56.80	43.70
Seminole	76.60	14.60	62.00
Volusia	58.30	16.58	41.72
Total	349.54	112.06	237.48

Projected reuse amounts are available without the addition of long-term storage facilities. Wastewater flows and reuse amounts in million gallons per day.

- Effective replacement rate for potable supplies

In the past, reclaimed water supplies have often been priced lower than potable water supplies, thus there is less economic incentive to limit its use to the amount needed. Because of this and because of various regulatory requirements, there is not always a 1-to-1 match between the amount of reclaimed water that is used and the associated reduction in the need for potable water. SJRWMD has set a planning goal of a 100% reduction in

potable water supplies from reuse on a gallon for gallon basis. Thus, for every 100 gallons of reuse there would be a 100-gallon reduction in potable water use. SJRWMD recognizes that this goal is not met today in most systems and that current regulatory requirements may not make it possible to meet this goal for the 2025-planning horizon for all systems (Table 9). However, effective conservation rate structures in reclaimed water pricing could help considerably in meeting this goal.

Identification of projects using reclaimed water. SJRWMD identified projects that could be implemented to achieve a water resource benefit using additional reclaimed water projected to be available in 2025. Projects were identified by

- Review of the project plans of individual domestic wastewater utilities
- Facilitated planning for the East-Central Florida Water Supply Planning Initiative
- Cooperative investigations with domestic wastewater providers

These projects include

- Alafaya Reclaimed Water Storage and High Service Pump Project
- Altamonte Springs and Apopka Project RENEW APRICOT
- Apopka and Winter Garden Reuse Partnership Project
- Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion Project
- Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II
- Clermont Reclaimed and Stormwater System Expansion Project
- Cocoa and Rockledge Reclaimed Water Line Connection Project
- Daytona Beach Reclaimed Water System Project
- DeLand Reclaimed Water and Surface Water Augmentation System Project
- Eastern Orange and Seminole Counties Regional Reuse Project
- Edgewater Reclaimed Water System Interconnection to Southeast Volusia County Project
- Eustis Reclaimed Water System Expansion and Augmentation Project

- Flagler County Bulow Reclaimed Water System Project
- Holly Hill and Ormond Beach Reclaimed Water System Expansion Project
- Lady Lake Reclaimed Water System Project, Phase II
- Lake Utility Services (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water System Expansion Project
- Leesburg Reclaimed Water Reuse Project
- Melbourne Reclaimed Water System Expansion Project
- Minneola Reclaimed Water Reuse Project
- Mount Dora Country Club Golf Course Reclaimed Water Project
- North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project
- Ocoee Reuse System Expansion Project
- Orange County Northwest Reclaimed Water System Augmentation Project
- Orange County Southeast Reclaimed Water System Expansion Project
- Orlando Utilities Commission Project RENEW
- Ormond Beach North Peninsula Reclaimed Water Storage Project
- Ormond Beach South Peninsula Reclaimed Water System Improvement Project
- Palm Coast Reclaimed Water System Expansion Project
- Port Orange Airport Road Reclaimed Water Transmission Main Project
- Port Orange Pioneer Trail Storage and Pumping Facility Project
- Port Orange Reclaimed Water Reservoir and Recharge Basin Project
- Rockledge Reclaimed Water Storage Project
- Rockledge Reclaimed Water System Expansion—ASR Project
- South Daytona Reclaimed Water System Expansion Project
- Tavares Reclaimed Water System Expansion Project
- Volusia County Southwest Reclaimed Water System Project
- West Melbourne Above Ground Reclaimed Water Storage Tank Project
- Winter Garden Reclaimed Water Pumping and Transmission Project

For additional information regarding these projects please see the Water Supply Development Projects section of this document.

ROLE OF POLITICAL BOUNDARIES IN WATER SUPPLY PLANNING

Political boundaries generally do not pose physical limitations to transfers of water for reasonable-beneficial use. However, transfers of water across political boundaries often raise political and legal concerns. Although Chapter 373, F.S., does not prohibit transfers of water across political boundaries, it does specifically address transfers across water management district (WMD) and county boundaries.

Transfers of Groundwater Across WMD Boundaries

Section 373.2295, F.S., describes a process to be followed by Florida's WMDs when reviewing applications for consumptive uses of water that involves the withdrawal of groundwater from a point in one WMD for use outside the boundaries of that WMD except in cases where the withdrawal and use occurs within the same county. Such transfers of groundwater are referred to as interdistrict transfers of groundwater. As part of its CUP application review, the WMD within which the groundwater withdrawal proposed is required to make a public interest determination and give other evidence on future needs of the areas. Included in a public interest determination would be consideration of projected populations as contained in the future land use elements of local comprehensive plans in areas where the water is proposed to be withdrawn and used. A CUP for the proposed withdrawal is to be issued if statutory and rule requirements are met and the needs of the areas within which the water is proposed to be withdrawn and used can be satisfied.

SJRWMD, in this DWSP, has not tried to specifically evaluate the feasibility of implementation of any water supply solutions based on the provisions of Section 373.2295, F.S.

Transfers of Water Across County Boundaries

During its 1998 session, the Florida Legislature amended the consumptive use permitting provisions (Section 373.223(3), F.S.) to include several factors to be considered by Florida's WMDs when evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest. This amendment, commonly referred to as

"local sources first," could impact the development of water supply projects that are technically, environmentally and economically feasible. The amendment language is as follows:

(3) Except for the transport and use of water supplied by the Central and Southern Florida Flood Control Project, and anywhere in the state when the transport and use of water is supplied exclusively for bottled water as defined in s. 50003(1)(d), any water use permit applications pending as of April 1, 1998, with the Northwest Florida Water Management District and self-suppliers of water for which the proposed water source and area of use or application are located on contiguous private properties, when evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest, pursuant to paragraph (1)(c), the governing board or department shall consider

(a) The proximity of the proposed water source to the area of use or application

(b) All impoundments, streams, groundwater sources, or watercourses that are geographically closer to the area of use or application than the proposed source, and that are technically and economically feasible for the proposed transport and use

(c) All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and storm water, and aquifer storage and recovery

(d) The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of the other water sources identified in paragraphs (b) and (c)

(e) Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located

(f) Consultations with local governments affected by the proposed transport and use

(g) The value of the existing capital investment in water-related infrastructure made by the applicant

Where districtwide water supply assessments and regional water supply plans have been prepared pursuant to Section 373.036 and Subsection 373.036(1), F.S., the governing board or the department shall use the applicable plans and assessments as the basis for its consideration of the applicable factors in this subsection.

SJRWMD, in DWSP 2005, has not tried to specifically evaluate the feasibility of implementation of any identified water supply projects based on "local sources first" criteria. However, information in this plan may be useful to CUP applicants in addressing "local sources first" criteria in the CUP process.

RELATIONSHIP BETWEEN DWSP 2005 AND WATER SUPPLY ENTITIES

A water supply entity, for purposes of DWSP 2005, is a local government, government-owned or privately owned public supply utility, special district, regional water supply authority pursuant to the provisions of Section 373.1962, F.S., multijurisdictional water supply entity, self supplier, or other water supplier. A multijurisdictional water supply entity, as described in Section 373.019(12), F.S., means two or more water utilities or local governments that have organized into a larger entity, or entered into an interlocal agreement or contract, for the purpose of more efficiently pursuing water supply development projects identified in DWSP 2005.

Consistent with the provisions of Subsection 373.061(7)(a), F.S., within 6 months of approval or amendment of DWSP 2005, SJRWMD will notify by certified mail each entity identified in association with a water supply development project identified in the water supply development section of this document. The notification will identify that portion of DWSP 2005 relevant to each entity. Upon request of such an entity, SJRWMD will appear before and present its findings and recommendations to the entity.

Consistent with the provisions of Subsection 373.061(7)(b), F.S., within 1 year of notification, notified entities are required to provide SJRWMD written notification of the following:

- The alternative water supply projects or options identified in Subparagraph 373.061(2)(a)3d, F.S., which it has developed or intends to develop, if any; an estimate of the quantity of water to be produced by each project; and the status of project implementation, including

development of the financial plan, facilities master planning, permitting, and efforts in coordinating multijurisdictional projects, if applicable.

- In addition, the information provided in the notification shall be updated annually and a progress report shall be provided by November 15 of each year to SJRWMD.

Also consistent with the provisions of Subsection 373.061(7)(b), F.S., if an entity does not intend to develop one or more of the alternative water supply project options identified in DWSP 2005, the entity shall propose, within 1 year after notification by SJRWMD pursuant to Subsection 373.061(7)(a), F.S., another alternative water supply project option sufficient to address the needs identified in Paragraph 373.061(2)(a), F.S., within the entity's jurisdiction and shall provide an estimate of the quantity of water to be produced by the project and the status of project implementation including development of the financial plan, facilities master planning, permitting, and efforts in coordinating multijurisdictional projects, if applicable. The entity may request that SJRWMD consider the other project for inclusion in updates of DWSP 2005.

RELATIONSHIP BETWEEN DWSP 2005 AND LOCAL GOVERNMENT COMPREHENSIVE PLANS

Subsection 163.3177(6)(c), F.S., requires a direct link between local government comprehensive plans and regional water supply plans prepared by water management districts. Based on the provisions of this subsection, within 18 months of SJRWMD Governing Board approval of DWSP 2005, local governments in SJRWMD must update their comprehensive plans to include

- Alternative water supply project(s) selected by the local governments from DWSP 2005, or proposed by the local government under Subsection 373.0361(7), F.S.
- Alternative and traditional water supply projects and conservation and reuse necessary to meet the water needs identified in DWSP 2005 within the local government's jurisdiction
- A 10-year work plan for building public, private, and regional water supply facilities, including development of alternative water supplies, to serve existing and new development

RELATIONSHIP BETWEEN DWSP 2005 AND CONSUMPTIVE USE PERMITTING

Chapter 373, F.S., includes specific language describing the relationship between regional water supply plans and consumptive use permitting. This language is included in Section 373.223(5), F.S., and in Section 373.0361(6), F.S.

Pursuant to the provisions of Section 373.223(5), F.S., in evaluating an application for consumptive use of water which proposes the use of an alternative water supply project identified in DWSP 2005 and provides reasonable assurances of the applicant's capability to design, construct, operate, and maintain the project, the SJRWMD Governing Board or FDEP is required to presume that the alternative water supply use is consistent with the public interest under Section 373.223(1)(c), F.S. However, where the SJRWMD Governing Board identifies the need for a multijurisdictional water supply entity or water supply authority to develop the water supply project pursuant to Section 373.0361(2)(a)2, F.S., the presumption shall be accorded only to that use proposed by such entity or authority. This does not effect evaluation of the use pursuant to the provisions of Subsections 373.223(1)(a) and (b), (2), and (3), 373.2295, and 373.233, F.S.

Pursuant to the provisions of Section 373.0361(6), F.S., except as provided in Sections 373.223(3) and (5), F.S., DWSP 2005 may not be used in the review of CUPs unless DWSP 2005 or an applicable portion of it has been adopted by rule. However, this subsection does not prohibit SJRWMD from using the data or other information used to establish DWSP 2005 in review of CUPs, nor does it limit the authority of FDEP or the SJRWMD Governing Board under Chapter 373, Part II, F.S.

ESTIMATED QUANTITY OF WATER AND COSTS

For portions of SJRWMD not included in a PWRCA, existing water supply sources and water supply development plans are considered reasonably adequate to meet projected needs while sustaining wetland and aquatic systems. Freshwater from the Floridan aquifer currently meets most of these needs, and this traditional source of supply should continue to be adequate through 2025 in these areas.

Total average day water use in SJRWMD is expected to grow by about 30% between 1995 and 2025, an increase of 411 mgd (Table 2). Public supply water use is projected to increase by 371 mgd, making this category responsible for about 84% of the overall increase. Clearly, the challenge for meeting future

water supply needs is to provide for the projected increase in public supply needs.

The focus of DWSP 2005 is the identification of water supply and water resource development projects that are at least adequate to meet projected public water supply needs in SJRWMD through 2025. The feasibilities of these projects were evaluated using similar technical, environmental, and cost criteria.

Identifying Groundwater Resource Limitations

In order to estimate the potential environmental and hydrogeologic impacts to SJRWMD groundwater resources due to projected public water supply demands, SJRWMD has developed several tools to evaluate the impacts of groundwater withdrawals on environmental resources. These include regional groundwater flow models and groundwater optimization (deficit) models used for identification of groundwater resource limitations and deficits. SJRWMD deficit models were developed to identify likely locations and associated quantities where groundwater resources would not be adequate to meet anticipated future needs based on environmental and operational constraints. In general, these are optimization models developed with a specific objective and a set of constraints that set environmental and hydrologic limits that cannot be exceeded in the process of allocating groundwater resources to provide for future water supply demands. The objective of the groundwater deficit modeling effort associated with this DWSP was to identify total groundwater deficits in the east-central Florida and Volusia model areas subject to the following constraints:

- Wetland drawdown limits—ranges from 0.35 foot to 1.2 feet, depending on wetland vegetation type
- Spring discharge reduction limits—spring discharges may not fall below an established MFL, or in cases where an MFL has not been established, spring discharge may not decrease by more than 15% of the long-term average
- Water quality change limits—no well may exceed a chloride concentration of 250 mg/L or if currently over 250 mg/L, then the chloride concentration cannot increase
- Equity limits—sets modelwide limits on the amount any one particular utility's total projected water use can be reduced to meet the objective; the constraint is designed to preserve existing infrastructure

In areas of SJRWMD located in PWRCAs but not located in the east-central and Volusia model domains, SJRWMD did not calculate groundwater deficits. The Flagler County area, which is the only such area identified, represents only a relatively small portion of the regional groundwater flow model used by SJRWMD to assess impacts in that area. This portion is too small to allow for reasonable results from a groundwater deficit analysis using the applicable regional flow model. Potential water supply solutions and costs in this area have been developed based on more subjective analyses.

East-Central Florida Area

The east-central Florida area, for purposes of this DWSP, is defined by the boundaries of SJRWMD's East-Central Florida Groundwater Flow Model domain, which includes all or parts of nine counties: Brevard, Lake, Marion, Orange, Osceola, Polk, Seminole, Sumter, and Volusia (Figure 4).

East-central Florida is a rapidly growing area that covers about 5,000 square miles, including the Orlando metropolitan area and environs, and is not wholly contained within SJRWMD. This area includes portions of both SFWMD and SWFWMD.

Consideration of this large and diverse area was necessary because nearly all of the water supply in this area is taken from a single freshwater source, the Floridan aquifer. Brevard County, however, has limited freshwater resources and has historically used a variety of sources to meet water supply needs, including surficial aquifer water, surface water from the St. Johns River and Taylor Creek Reservoir, brackish groundwater from the Floridan aquifer, and fresh groundwater from the intermediate and Floridan aquifers in Orange County.

There are more than 60 major public water supply utilities withdrawing water from more than 1,000 wells in east-central Florida. Aquifer interactions among these withdrawals are complex, and the cumulative impacts of these withdrawals are a significant concern. Therefore, individual withdrawals cannot be considered in isolation. A regional analysis is necessary to adequately account for the number and magnitude of water withdrawals occurring from a single source, the Floridan aquifer (CH2M HILL 2000).

SJRWMD has developed comprehensive groundwater flow and optimization models for east-central Florida to assist in the resource evaluation, impacts analysis, and groundwater deficit identification (Figure 4).

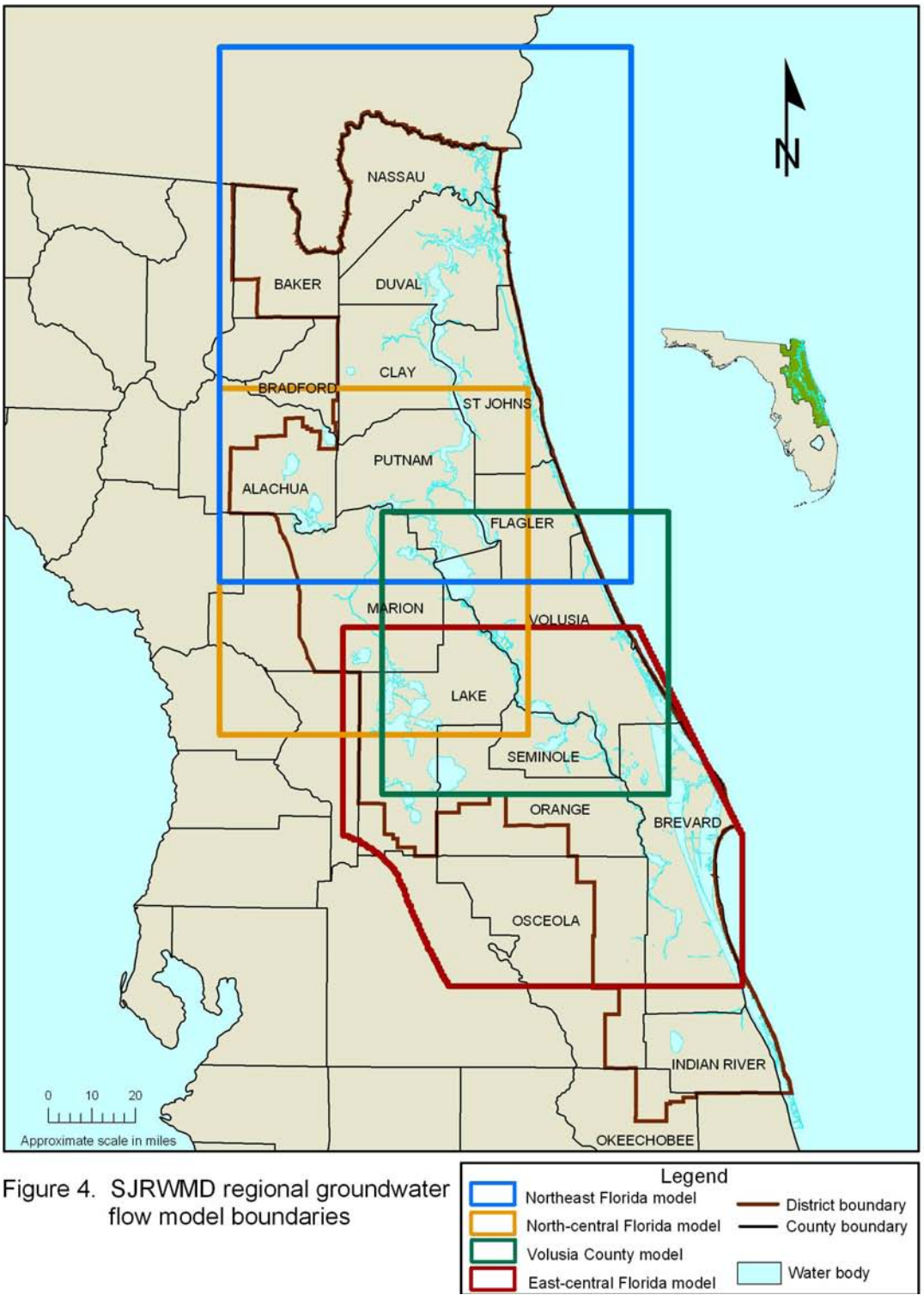


Figure 4. SJRWMD regional groundwater flow model boundaries

The east-central Florida regional groundwater flow model accounts for Floridan aquifer water use in all, or portions of, nine counties. The total projected increase in Floridan aquifer water use for the planning period within the east-central Florida area is approximately 256 mgd, a 52% increase over 1995 use (Tables 10 and 11).

Table 10. East-central Florida groundwater flow model, Floridan aquifer withdrawals, by county

County	1995 Withdrawal	2025 Projected Withdrawal	Percent Change
Brevard	13.40	19.46	45
Lake	74.40	104.53	40
Marion	9.69	10.30	6
Orange	204.19	316.97	55
Osceola	65.14	89.28	37
Polk	65.89	59.27	-10
Seminole	57.09	96.15	68
Sumter	2.57	28.28	1002
Volusia	37.74	63.49	68
Total	530.11	787.72	49

Note: Table includes Floridan aquifer water use only, within the total model area that includes areas in the South Florida Water Management District, the Southwest Florida Water Management District and the St. Johns River Water Management District.

Providing for the projected increase in water use in east-central Florida in a sustainable and affordable manner will be a significant challenge to SJRWMD, the public water supply utilities, local governments, FDEP, and all other interested and concerned parties. Application of the east-central Florida groundwater flow model indicates that current individual utility plans to increase withdrawals from the Floridan aquifer through 2025 will not be sustainable without causing unacceptable adverse impacts to water resources and related natural systems. If all current water supply plans through 2025 are implemented, surficial aquifer water level declines will result in regional dewatering of sensitive wetlands sufficient to result in unacceptable impacts. These wetlands impacts would occur regionally, but the ridge region of Lake County, which is generally characterized by thinner confining units above the Floridan aquifer than in other parts of the area, would likely experience the greatest impact.

Table 11. East-central Florida groundwater flow model, Floridan aquifer withdrawals by county, water management district and water use category

Water Management District	Water Use Category	1995 Withdrawal	2025 Projected Withdrawal	Percent Change
Brevard County				
SJRWMD	Public Supply	3.92	12.17	210
	Domestic Self-Supply	0.00	0.00	0
	Agriculture/Recreational	7.41	6.70	-10
	Commercial/industrial	0.59	0.59	0
	Free Flowing Wells	1.470	0.00	-100
	Total	**13.40**	**19.46**	**45**
Lake County				
SJRWMD	Public Supply	25.96	64.22	148
	Domestic Self-Supply	6.09	6.09	0
	Agriculture/Recreational	15.59	6.94	-55
	Commercial/industrial	25.67	25.87	1
	Free Flowing Wells	0.02	0.00	-100
	Total	**73.33**	**103.45**	**41**
SWFWMD	Domestic Self-Supply	.04	.04	0
	Agriculture/Recreational	1.03	1.03	0
	Total	**1.07**	**1.07**	**0**
Marion County				
SJRWMD	Public Supply	1.32	1.99	51
	Domestic Self-Supply	5.85	5.85	0
	Agriculture/Recreational	1.41	1.35	-4
	Commercial/industrial	1.10	1.10	0
	Free Flowing Wells	0.01	0.00	-100
	Total	**9.69**	**10.30**	**6**
Orange County				
SFWMD	Public Supply	69.73	120.71	73
	Domestic Self-Supply	4.07	4.07	0
	Agriculture/Recreational	7.90	3.91	-51
	Commercial/industrial	1.82	1.82	0
	Total	**83.51**	**130.50**	**56**
SJRWMD	Public Supply	104.60	173.19	66
	Domestic Self-Supply	3.54	3.54	0
	Agriculture/Recreational	8.71	6.56	-25
	Commercial/industrial	3.75	3.17	-15
	Free Flowing Wells	0.07	0.00	-100
	Total	**120.68**	**186.47**	**55**

Table 11—*Continued*

Water Management District	Water Use Category	1995 Withdrawal	2025 Projected Withdrawal	Percent Change
Osceola County				
SFWMD	Public Supply	21.83	53.02	143
	Domestic Self-Supply	5.65	5.65	0
	Agriculture/Recreational	35.06	28.15	-20
	Commercial/industrial	0.00	0.00	0
	Total	**62.54**	**86.81**	**39**
SJRWMD	Domestic Self-Supply	.78	.78	0
	Agriculture/Recreational	1.82	1.69	-7
	Total	**2.60**	**2.47**	**-5**
Polk County				
SFWMD	Public Supply	1.18	6.36	438
	Domestic Self-Supply	.44	.44	0
	Agriculture/Recreational	9.39	9.77	4
	Total	**11.01**	**16.58**	**51**
SWFWMD	Public supply	7.60	8.83	16
	Domestic Self-Supply	2.09	2.09	0
	Agriculture/Recreational	31.89	27.41	-14
	Commercial/industrial	13.30	4.77	-64
	Total	**65.89**	**59.67**	**-9**
Seminole County				
SJRWMD	Public Supply	50.70	91.73	81
	Domestic Self-Supply	2.56	2.56	0
	Agriculture/Recreational	3.15	1.80	-43
	Commercial/industrial	0.06	0.06	0
	Free Flowing Wells	0.63	0.00	-100
	Total	**57.09**	**96.15**	**68**
Sumter County				
SWFWMD	Public Supply	0.14	26.71	19119
	Domestic Self-Supply	0.02	0.02	0
	Agriculture/Recreational	2.41	1.55	-36
	Commercial/industrial	0.00	0.00	0
	Total	**2.57**	**28.28**	**1002**

Table 11—*Continued*

Water Management District	Water Use Category	1995 Withdrawal	2025 Projected Withdrawal	Percent Change
Volusia County				
SJRWMD	Public Supply	27.47	53.45	95
	Domestic Self-Supply	4.97	4.91	
	Agriculture/Recreational	4.61	4.44	-4
	Commercial/industrial	0.69	0.69	0
	Free Flowing Wells	0.07	0.00	-100
	Total	**37.74**	**63.49**	**68**

Note: SFWMD = South Florida Water Management District
SJRWMD = St. Johns River Water Management District
SWFWMD = Southwest Florida Water Management District

Commercial/industrial category includes water used in thermoelectric power generation.

A groundwater optimization model was used to estimate the sustainable yield of the Floridan aquifer, to assess impacts from increases in the projected groundwater withdrawals in the east-central Florida area for the 1995 to 2025 planning period, and to identify groundwater deficits. Based on the specific scenarios and assumptions used, optimization model results indicate that the sustainable yield of the Floridan aquifer in the east-central Florida area ranges from 594–709 mgd (Agyei 2005, Appendix H and Wycoff 2005, Appendix I). Based on the projected increase in Floridan aquifer withdrawals of 256 mgd from 1995 to 2025, the modeling results indicate that there is an anticipated Floridan aquifer groundwater deficit ranging from 79–194 mgd (Agyei 2005, Appendix H and Wycoff 2005, Appendix I).

These estimates consider the impacts of the reuse of reclaimed water as it is accounted for in the east-central Florida regional groundwater flow model. However, the estimates do not consider the potential impacts of additional reclaimed water that is projected to be available for reuse in the east-central Florida area (Table 9). Careful use of this reclaimed water to achieve water resource benefits should result in reductions in the identified deficit. However, it is difficult to reasonably estimate the extent of such a deficit reduction.

DWSP 2005 is designed to contribute to the prevention of unacceptable impacts to the water resources and related natural systems, including MFL exceedences and other excessive lake and wetland water level reductions,

spring flow reductions, and saltwater intrusion. Many different water supply development scenarios could be implemented to meet projected 2025 water use without resultant unacceptable impacts. These scenarios could include implementation of various combinations of the water supply development projects identified on the water supply development project options list in DWSP 2005 and other suitable projects that may be identified in the future.

Volusia Area

The Volusia area, for purposes of this DWSP, is defined by the boundaries of SJRWMD's Volusia Regional Groundwater Flow Model, which includes Volusia County, a small portion of southern Flagler County, southeastern Putnam County, and a small portion of northern Brevard County (Figure 4). It is bounded to the east by the Atlantic Ocean and to the west by the St. Johns River.

The primary source of freshwater used in the Volusia model area is groundwater from the Floridan aquifer. The Floridan aquifer in the Volusia model area is often referred to as the Volusia-Floridan Sole Source Aquifer, because of its designation by EPA as a sole source aquifer. Other less extensively used sources of freshwater include groundwater from the surficial aquifer that is used for domestic self-supply and irrigation, surface water used for agricultural and recreational / golf irrigation, and reclaimed water used for nonpotable irrigation in public supply utility service areas and for recreational / golf facilities.

For the Volusia area, the public supply category is expected to experience the greatest increase in water supply needs from 1995 to 2025. Public supply needs are projected to increase by nearly 100%, from about 59 mgd in 1995 to about 118 mgd in 2025. Total water use in the model area is projected to increase by about 43%, from about 23 mgd in 1995 to 76 mgd in 2025 (Table 12). Projected water use information is provided in greater detail in WSA 2003.

Because of the large projected increase in public supply water use in the Volusia area, this DWSP focuses on meeting the public water supply needs in the area. The projected increase in public water supply cannot be sustained from existing and utility-proposed sources without causing unacceptable impacts to water resources and related natural systems.

Table 12. Volusia regional groundwater flow model area water use projections

Category	1995 Water Use	2025 Projected Water Use	Percent Change
Public supply	59.30	117.80	99
Domestic self-supply	11.30	13.10	16
Agriculture/recreational	26.80	30.40	13
Commercial/industrial/ institutional	2.10	2.70	29
Free-flowing wells	23.10	11.80	-49
Total	122.60	175.70	43

All water use in million gallons per day

A groundwater optimization model of the Volusia area was used to estimate the sustainable yield of the Floridan aquifer, to assess impacts of projected groundwater withdrawals in the area for the 1995–2025 planning period and to identify groundwater deficits. Based on the specific scenarios and assumptions used, optimization model results indicate that the sustainable yield of the Floridan aquifer in the Volusia area ranges from 91–111 mgd (Burger 2005, Appendix J and Wycoff 2005, appendix I). The use of this model indicates that current individual utility plans to increase withdrawal from the Floridan aquifer, if implemented, would result in regional dewatering of wetlands and lowering of lake levels sufficient to result in unacceptable adverse impacts. In addition, chloride concentrations would increase to unacceptable levels in some Floridan aquifer wells and the discharge of Gemini Spring would be reduced to levels that could result in unacceptable impacts. Further, the discharge of Blue Spring would fall below the proposed MFL that is currently the subject of ongoing SJRWMD rulemaking. Optimization modeling results indicate that about 6–25 mgd of alternative water supply sources may need to be utilized by public supply utilities in the Volusia County portion of the model domain by 2025 (Burger 2005, Appendix J and Wycoff 2005, Appendix I).

These estimates consider the impacts of the reuse of reclaimed water as it is accounted for in the Volusia regional groundwater flow model. However, the estimates do not consider the potential impacts of additional reclaimed water that is projected to be available for reuse in the Volusia area (Table 9). Careful use of this reclaimed water to achieve water resource benefits should result in reductions in the identified deficit. However, it is difficult to reasonably estimate the extent of such a deficit reduction.

Alternative water supply sources investigated to meet the future public water supply needs in Volusia County include new fresh groundwater, brackish groundwater, surface water, seawater, and reclaimed water. Several water supply development projects that could be implemented to meet projected water use in the area are identified on the water supply development project options list in DWSP 2005.

In addition, several water resource development projects that could make more groundwater available in the area are identified in the Water Resource Development Component of this DWSP.

Other Priority Water Resource Caution Areas

Flagler Area. The Flagler area includes all of Flagler County, the fastest growing county in the nation (U.S. Census Bureau 2005). Currently, public supply in the area is developed from fresh groundwater withdrawn from the surficial and Upper Floridan aquifers. Public supply water use is projected to increase in the area by about 17.0 mgd or nearly 400%, raising the 1995 average day demand of 4.4 mgd to 21.4 mgd in 2025.

WSA 2003 indicates that current public supply utility plans to increase withdrawals from surficial and Floridan aquifers, if implemented, are likely to result in unacceptable impacts to wetlands, lakes, and groundwater quality. Alternative water supply sources would likely have to be developed to avoid these projected unacceptable impacts. Several water supply development projects that could be implemented to meet projected water use in the area have been identified. These projects are identified on the water supply development project options list in DWSP 2005.

SJRWMD expects other projects to be identified through the county-level water supply planning process that is currently under way. This process is being carried out based on the provisions of a memorandum of understanding between all governments in Flagler County. This process is an outgrowth of the Facilitation of Regional Decision Making Process, which is part of SJRWMD's Water Resource Development Work Program. The purpose of this effort is the cooperative development of a water supply plan for the Flagler County area that will identify water supply sources and projects that will affordably meet the needs of the area through 2025 without resultant unacceptable impacts to water resources and related natural systems. SJRWMD is funding this effort and expects the results to be available to support development of future water supply plan updates.

WATER SUPPLY DEVELOPMENT FUNDING SOURCES

Subparagraph 373.0361(2)(a)3, F.S., requires that SJRWMD identify potential sources of funding for water supply development for the identified source options. Although nontraditional funding sources such as a local option gross receipts tax on water could become available in the future, SJRWMD has identified only the more-traditional funding sources that are likely to be available. The potential funding sources identified are as follows:

- Water supply utility revenues from customer charges
- State of Florida Water Protection and Sustainability Program
- SJRWMD ad valorem tax revenues
- Impact fees for new development
- Contributions in aid of construction
- Florida Forever Trust Fund
- Federal revenues
- Local government ad valorem tax revenues
- Local government special assessments
- Private investment

Water Supply Utility Revenues From Customer Charges

This source of revenue has historically been the primary and, in most instances, the sole source of funding for water supply development. The Florida Legislature has expressed its intent, based on the provisions of Paragraph 373.0831(2)(c), F.S., that

1. local governments, regional water supply authorities, and government-owned and privately owned water utilities take the lead in securing funds for and implementing water supply development projects; and
2. generally, direct beneficiaries of water supply development projects should pay the costs of the projects from which they benefit, and water supply development projects should continue to be paid for through local funding sources.

SJRWMD recognizes that water supply development, including alternative water supply development projects, can generally be financed through revenues from user charges. To be successful in financing alternative water

supply projects through user charges, SJRWMD has concluded that water utilities must generally

- Recognize the need to develop alternative water supply projects well in advance
- Use rate indexing well in advance of capital expenditures to reduce rate spikes
- Enter into interlocal agreements or other institutional arrangements to jointly develop alternative water supplies in the most cost-effective manner
- Develop blended rates for existing inexpensive groundwater supplies and more expensive alternative water supplies

Water utilities in SJRWMD have already implemented alternative water supplies through revenues from user charges. For example, the city of Melbourne has developed public supplies using surface water from Lake Washington. The city of Cocoa has developed a portion of its supply using surface water from Taylor Creek Reservoir. Indian River County, the city of Vero Beach, and the city of Melbourne all use brackish groundwater from the Floridan aquifer as a source of supply.

However, despite the conclusion that funding the development of alternative sources through user fees is generally affordable, there are significant obstacles to overcome in funding water supply development through user fees, including the following:

- Political difficulty in implementing even modest rate increases
- Uncertainties about when new, more expensive water supply sources will be needed
- No history of interlocal cooperation on water supply development that will be necessary to develop many alternative water supply projects in a cost-effective manner
- Poor history of interlocal cooperation on other issues, leading to lack of trust
- Potential inequities among rate payers within different water supply utilities

In the east-central Florida area, alternative water supply projects may need to be operational before 2010 (Vergara 2004). Water users must move forward

expeditiously and in a coordinated fashion to prevent water supply shortfalls in the future and higher rate impacts to users of water from public supply systems. Significant delays or lack of cooperation could make alternative water supply development much more costly.

Notwithstanding this, water is predicted to be affordable if alternative water supply requirements are planned for properly and timely; however, even with proper planning, increases in local utility rates in the order of 50% or more, or rate spikes, may be required to finance required alternative water supply facilities (Burton and Associates 2004). This raises the question of financial feasibility in the form of the willingness of local officials to enact large rate increases to fund the required alternative water supply facilities.

Although annual rate indexing and alternative revenue sources such as taxing districts may provide partial local solutions to this issue of financial feasibility, supplemental funding can also help mitigate the rate spikes necessary to finance alternative water supply facilities.

However, supplemental funding may play an even more important role in serving as the catalyst for local utilities to begin the alternative water supply development process in earnest. The inclusion of supplemental funding, even in modest amounts, may also make it easier for affected customers to accept the required rate increases.

For these reasons, SJRWMD recognizes the importance of supplemental funding as an incentive for the expeditious implementation of some water supply projects identified in DWSP in order to minimize costs and ensure that alternative water supply development projects remain affordable to water users and are financially feasible to implement.

State of Florida Water Protection and Sustainability Program (WPSP)

This new program was created in the 2005 legislative session in SB 444 and SB 360. State funds from the program shall be made available for financial assistance for project construction costs of alternative water supply development projects selected by a water management district governing board for inclusion in the program.

The program provides an appropriation of $25 million of state funds to SJRWMD for the program in FY 2005–2006, and is anticipated to result in $15 million of additional state funds to be made available to SJRWMD for the program annually in future years, although these funds will need to be

appropriated in future state budgets. The state funds provided in the program serve to supplement existing WMD funding assistance for alternative water supply. Therefore, the Legislature has set the goal for each water management district to include funding in the annual budgets for water resource development projects that support alternative water supply projects, and funding for alternative water supply projects in this program, that together match the state funding of the program.

SJRWMD intends to make these funds available each year to encourage the construction of alternative water supply projects contained in DWSP 2005 and future updates. To be eligible for funding consideration, projects must be identified in DWSP. However, identification of a water supply development project in DWSP 2005 or in future water supply plans does not assure that it will receive funding through the Water Protection and Sustainability Program. SJRWMD expects to update DWSP 2005 to include additional projects expected to result from ongoing county-level planning efforts.

Although the program allows that a water supplier or water user may request funding assistance from the program for up to 40% of the construction costs, the level of funding assistance for selected projects is to be determined by the WMD governing boards. Within SJRWMD, funding assistance for projects selected for the program may be less than 40% of construction costs of selected projects, in order to provide significant incentives for the greatest number of alternative water supply projects identified in DWSP 2005.

SJRWMD plans to consider all the projects for which a water supply entity is prepared to enter into an agreement committing to the timely construction and operation of the project. In selecting projects for funding assistance, the SJRWMD Governing Board will hold one or more meetings to solicit public input on the eligible projects. SJRWMD will then select projects after considering the factors in 373.1961(3)(f), F.S. and additional factors as deemed appropriate.

SJRWMD's goal in allocating funds available through WPSP will be to cost-share on alternative water supply development projects that have the greatest certainty in supplying the projected demands through the 2025 planning horizon, such that:

- Existing or projected water resource problems associated with PWRCAs are solved or avoided
- Identification of PWRCAs is avoided

Thus, SJRWMD's priority in funding support will be for projects that will provide significant quantities of new, naturally occurring, sources of water to users within PWRCAs or within areas that would otherwise be designated as PWRCAs.

SJRWMD Ad Valorem Revenues

This funding source is an important component of the new state of Florida Water Supply Protection and Sustainability Program discussed in the previous section. This program places the priority for SJRWMD ad valorem funding on construction of alternative water supply projects. SJRWMD plans to meet the legislative goal of matching state funds in the Program, but does not anticipate making ad valorem funds available for any water supply development projects other than alternative water supply projects as provided for under the state Water Supply Protection and Sustainability Program. However, if ad valorem funds were used for any other water supply development assistance, then such project(s) would need to meet the criteria contained in Section 373.0831(4)(a) and (b), F.S.

Local Government Impact Fees

Local government impact fees can be used as a means of recovering capital costs for the funding of a variety of infrastructure projects, including water and wastewater projects. Local governments in Florida can adopt ordinances levying impact fees against new development to help pay for capital costs associated with water and wastewater projects. The fees can only be levied against new development to pay for the construction or expansion of off-site capital improvements that are required to support that new development. A detailed study must be completed to support the fees established in the ordinance. Some local governments in SJRWMD have impact fees for water infrastructure, but road and school fees are more common. Impact fees are typically paid by a homeowner or business at the time of application for, or issuance of, a building permit. Often the developer/builder pays this fee and includes it in the purchase price of the home/building. Because water and wastewater facilities must be in place prior to the development that will benefit from them, impact fees are an after-the-fact funding source. Also, because of the uncertainty of growth projections, the municipal bond market usually requires that rate revenues (which are considered to be a more secure revenue source than impact fees) be adequate to cover debt service. Because of this, local governments must establish user rates that are adequate to cover 100% of the debt service associated with funding infrastructure facilities but may use funds generated by impact fees to pay for the portion of debt service

associated with providing excess capacity to accommodate future growth. In a case such as this, the funds generated by user fees to "cover" debt service, which are freed up by using impact fees to pay for the portion of debt service associated with provision of excess capacity, can be placed in a reserve account to pay for future infrastructure development, renewal and replacement, repairs, or other utility related costs.

In summary, impact fees are not commonly considered a significant source of revenue to support capital costs associated with current water and wastewater utility projects because (1) they are generated by growth that occurs after the infrastructure facilities must be funded and (2) although they can be used to pay for the portion of debt service associated with excess capacity to accommodate growth (thus freeing up rate revenue which is *not* restricted for use related to capital costs of capacity expansion), the capital markets typically require that rates be sufficient to "cover" at least 100% of debt service, thus limiting the ability of impact fees to reduce current rates.

Impact fees provide the most benefit for the next "generation" of infrastructure expansion because (1) reserves are built up as growth "fills up" the current expanded facilities (reserves are built up either from impact fees or freed up rate revenue when impact fees are used to pay for expansion related debt service) and (2) these reserves can be used to reduce required borrowing for the next expansion, thus reducing the future debt service and consequently reducing pressure on future rates.

Contributions in Aid of Construction

Private utilities that are regulated by the Florida Public Service Commission (FPSC) have a system that resembles impact fees but is governed by the FPSC. Contribution-in-aid-of-construction (CIAC) means any amount or item of money, services, or property received by a utility, from any person or governmental agency, any portion of which is provided at no cost to the utility, which represents an addition or transfer to the capital of the utility, and which is utilized to offset the acquisition, improvement, or construction costs of the utility's property, facilities, or equipment used to provide utility services to the public. The term includes, but is not limited to, system capacity charges, main extension charges, and customer connection charges.

Florida Forever Trust Fund

The Florida Forever Trust Fund was established by the 2000 Florida Legislature to provide a source of funding for land acquisition and water resource development projects. Funds to support the Florida Forever program are generated from the sale of bonds. A portion of the state documentary stamp tax is used to retire these bonds. Funds from the Florida Forever Trust Fund are not authorized for the acquisition of lands for water supply development, but, pursuant to Subsections 259.105(5) and 373.1391(5), F.S., lands which are purchased with Florida Forever funds may be used for water supply development projects that are funded through other sources. SJRWMD receives 25% of the state's annual Florida Forever Trust Fund allocation. SJRWMD's FY 2004–2005 budget includes about $20 million for land acquisition and $6.75 million for water resource development projects. SJRWMD proposes to fund some water resource development components of water supply development projects identified in DWSP 2005 from the Florida Forever Trust Fund.

Federal Revenues

For the past several years, SJRWMD has annually requested appropriations to support water supply development projects from the U.S. Congress through the State and Tribal Assistance Grants (STAG) program. From 2000 to 2005, SJRWMD received $9.7 million in STAG appropriations. These funds are available through EPA, based on an established application process. The federal government requires that local government cooperators provide about a 45% match for these funds. SJRWMD's practice has been to identify appropriate local government cooperators and to assist the cooperators in completing the EPA application process required to secure the funds. To date, SJRWMD has contributed a modest level of in-kind services to support the acquisition and use of these revenues but has not contributed with cash to the required match. SJRWMD proposes to contribute $300,000 to $500,000 in in-kind services, in the form of project administration, to the required STAG cooperator match for the St. Johns River / Taylor Creek Reservoir Water Supply Project. This contribution represents about 10% of the cost of plan development for this project. This same approach could be used on other future water supply development projects if the need arises.

Local Government Ad Valorem Tax Revenues

Local government ad valorem tax revenues are not typically used to fund water supply development. In some instances, an advance or transfer from a

local government's general fund may be used as seed money to establish a water system. Advance payments of this sort are often repaid to the general fund from utility revenues from customer charges. This potential source is not expected to generate significant funds for future water supply development projects.

Local Government Special Assessments

Local government special assessments are typically used to fund portions of water supply development projects at the subdivision or neighborhood level. Because special assessments are levied against taxable property, the portions funded must directly benefit the taxable property. This usually includes only distribution lines to individual residences. This potential source of funding is not expected to contribute significantly to the implementation of water supply development projects.

Private Investment

Private investment is a potential source of funds to support water supply development in SJRWMD. A range of public/private ownership and investment options is available. These options range from all-public ownership and operation to all-private ownership and operation. Typically, in projects that depend heavily on the use of private investment, that investment is used to support initial capital costs. In these cases, funds to pay back the private capital investment and to support project operation and maintenance ultimately come from revenues from customer charges. However, competition among private investors desiring to fund water supply development projects could act to reduce project costs, potentially resulting in lower customer charges. The financial dynamics of the regulated, ratemaking process make it difficult for a private owner to maintain profitability over the life of a large water supply facility such as a water treatment plant. For this reason, public/private partnerships are often more feasible. An SJRWMD consultant, Burton and Associates, has prepared a discussion of principles relative to private investment in water supply facilities (Appendix K).

WATER SUPPLY DEVELOPMENT PROJECTS

The provisions of subsection 373.019(24), F.S., define a water supply development project as a project that includes 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. Subparagraph 373.0361(2)(a)2, F.S., requires that this DWSP include a list

of water supply development project options, from which local government, government-owned and privately owned utilities, regional water supply authorities, multijurisdictional water supply entities, self-suppliers, and others may choose for water supply development.

Alternative water supply development projects are projects that use alternative water supplies as a source, such as salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater, water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; storm water and any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan (Subparagraph 373.019(1))

SJRWMD has identified and described alternative water supply development project options that can be developed to assist in meeting water supply needs in PWRCAs and in areas that would likely be identified as PWRCAs if alternative water supply projects are not implemented (Figures 5 and 6, Tables 13, 14, 15, and 16). Traditional water supply development projects, which rely on fresh groundwater as a source of water supply, are not identified in DWSP 2005. Although these traditional-source projects are projected to supply a significant portion of the total water use through 2025, new water supply development to support increased demands in PWRCAs is expected to come largely from alternative sources.

Following is a list, by project name, in alphabetical order of water supply development project options identified by SJRWMD in DWSP 2005. SJRWMD plans to select projects for funding through the Water Protection and Sustainability Program (WPSP) from those on this list. However, inclusion of a project on this list is not assurance that the project will receive WPSP funding. Some of these projects are single-entity projects that clearly will serve only one water supply entity. Others are suitable for development by more than one entity. SJRWMD has identified the water supply entities that should consider developing each of these listed alternative water supply development projects (except those that are clearly single-entity projects) to assure adequate supplies of water to meet projected water use through 2025 in their respective service areas (Table 14). These water supply entities include publicly and privately owned public supply utilities that are projected to need quantities of water greater than or equal to 0.1 mgd by 2025.

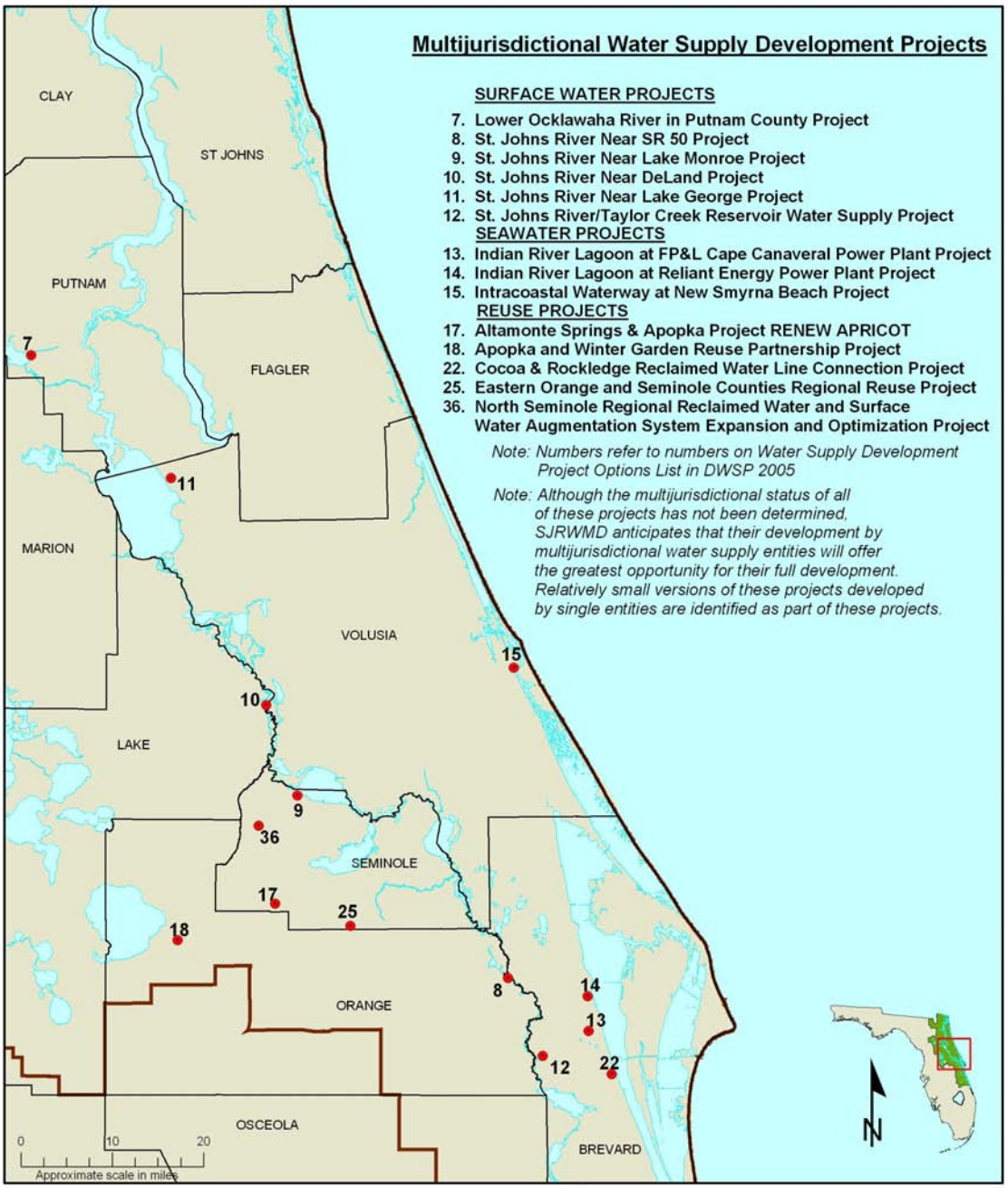


Figure 5. Multijurisdictional water supply development projects 2005

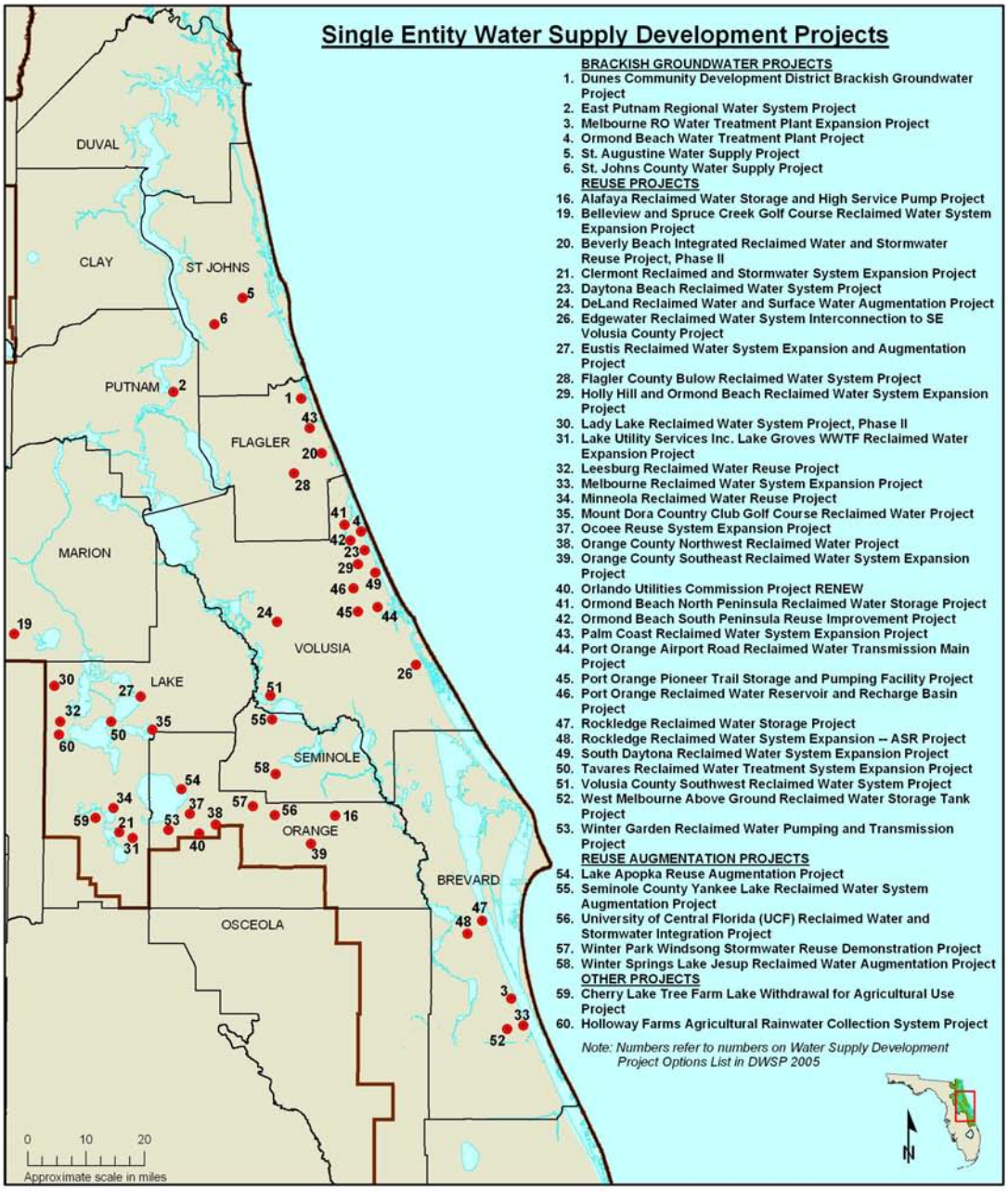


Figure 6. Single entity water supply development projects 2005

Table 13. Quantities and estimated costs of alternative water supply development projects

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Costs			
			Construction $M	Total Capital $M	O&M $M/yr	Unit Production $/1,000 gallons
1	Dunes Community Development District Brackish Groundwater Project	1.00	$9.50	$10.40	$0.183	$2.65
2	East Putnam Regional Water System Project	0.63	$10.91	$11.22	$0.400	$5.39
3	Melbourne Reverse Osmosis (RO) Plant Expansion	2.50	$4.80	$5.80	$2.827	$3.54
4	Ormond Beach Water Treatment Plant Expansion Project	2.00	$10.90	$12.02	$0.427	$0.69
5	St. Augustine Water Supply Project	5.00	$12.80	$14.70	$1.980	$1.69
6	St. Johns County Water Supply Project	6.66	$20.00	$22.00	$2.000	$1.51
Brackish Groundwater Subtotals		17.79	$68.91	$76.14	$7.82	
7	Lower Ocklawaha River in Putnam County Project	20.00	$201.00	$266.00	$5.790	$3.16
8	St. Johns River Near DeLand Project	20.00	$182.58	$239.52	$8.578	$3.40
9	St. Johns River Near Lake George Project	33.00	$313.00	$402.00	$13.670	$3.39
10	St. Johns River Near Lake Monroe Project	50.00	$387.56	$505.68	$21.003	$3.04
11	St. Johns River Near SR 50 Project	10.00	$76.00	$95.00	$4.350	$3.01
12	St. Johns River/Taylor Creek Reservoir Water Supply Project	40.00	$174.00	$215.00	$11.830	$1.87
Surface Water Subtotals		173.00	$1,334.14	$1,723.20	$65.22	
13	Indian River Lagoon at FP&L Cape Canaveral Power Plant Project	15.00	$111.00	$140.00	$7.510	$3.43
14	Indian River Lagoon at Reliant Energy Power Plant Project	15.00	$113.00	$141.00	$8.100	$3.57
15	Intracoastal Waterway at New Smyrna Beach Project	15.00	$134.00	$168.00	$8.840	$4.05
Seawater Subtotals		45.00	$358.00	$449.00	$24.45	
16	Alafaya Reclaimed Water Storage and High Service Pumps Project	0.41	$2.02	$2.44	$0.033	$1.25
17	Altamonte Springs & Apopka Project RENEW APRICOT	6.63	$11.19	$13.52	$0.195	$0.46
18	Apopka & Winter Garden Reuse Partnership Project	3.00	$4.31	$5.21	$0.071	$0.38
19	Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion Project	1.00	$1.64	$2.37	$0.032	$0.55
20	Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II	0.50	$2.25	$2.64	$0.049	$1.28

Table 13—*Continued*

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Costs			
			Construction $M	Total Capital $M	O&M $M/yr	Unit Production $/1,000 gallons
21	Clermont Reclaimed and Stormwater System Expansion Project	5.10	$18.77	$22.68	$0.923	$1.28
22	Cocoa and Rockledge Reclaimed Water Line Connection Project	0.25	$1.07	$1.29	$0.021	$1.14
23	Daytona Beach Reclaimed Water System Project	26.00	$20.33	$25.41	$1.826	$0.36
24	DeLand Reclaimed Water and Surface Water Augmentation Project	1.70	$4.83	$5.55	$0.328	$1.15
25	Eastern Orange and Seminole Counties Regional Reuse Project	20.00	$28.94	$28.94	$0.364	$0.32
26	Edgewater Reclaimed Water System Interconnect to Southeast Volusia County Project	1.00	$5.22	$6.30	$0.146	$1.49
27	Eustis Reclaimed Water System Expansion and Augmentation Project	1.10	$1.87	$2.26	$0.096	$0.60
28	Flagler County Bulow Reclaimed Water System Project	1.70	$1.77	$2.14	$0.185	$0.53
29	Holly Hill Reuse System to Ormond Beach	0.60	$0.40	$0.49	$0.048	$0.36
30	Lady Lake Phase II Reclaimed Water System	0.50	$2.00	$2.20	$0.229	$2.05
31	Lake Utility Services (Utilities Inc. of Florida) - Lake Groves WWTF Reclaimed Water System Expansion Project	1.00	$3.60	$4.35	$0.219	$1.43
32	Leesburg Reclaimed Water Reuse Project	7.05	$23.02	$27.82	$0.334	$0.88
33	Melbourne Reclaimed Water System Expansion Project	1.50	$4.03	$4.87	$0.373	$1.30
34	Minneola Reclaimed Water Reuse Project	1.00	$7.78	$11.46	$0.140	$1.01
35	Mount Dora Country Club Golf Course Reclaimed Water Project	0.26	$0.33	$0.40	$0.021	$0.49
36	North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project	7.76	$8.78	$10.30	$0.505	$0.43
37	Ocoee Reuse System Expansion Project	0.35	$2.33	$2.69	$0.001	$1.33
38	Orange County Northwest Reclaimed Water Project	3.00	$10.00	$10.25	$0.300	$0.87
39	Orange County Southeastern Reclaimed Water System Expansion Project	12.50	$13.21	$13.21	$0.351	$0.27
40	Orlando Utilities Commission Project RENEW	9.20	$51.93	$62.75	$1.612	$1.66
41	Ormond Beach North Peninsula Reclaimed Water Storage Project	0.49	$2.46	$2.97	$0.142	$1.94
42	Ormond Beach South Peninsula Reuse Improvement Project	2.13	$8.20	$9.91	$0.194	$1.06
43	Palm Coast Reclaimed Water System Expansion Project	8.23	$13.91	$16.61	$1.232	$0.77

Table 13—*Continued*

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Costs			
			Construction $M	Total Capital $M	O&M $M/yr	Unit Production $/1,000 gallons
44	Port Orange Airport Road Reclaimed Water Transmission Main Project	1.00	$1.60	$1.93	$0.080	$0.56
45	Port Orange Pioneer Trail Storage and Pumping Facility Project	2.00	$2.34	$2.83	$0.183	$0.50
46	Port Orange Reclaimed Water Reservoir and Recharge Basin Project	2.70	$8.78	$10.06	$0.107	$0.82
47	Rockledge Reclaimed Water Storage Project	0.16	$1.68	$2.03	$0.013	$2.36
48	Rockledge Reclaimed Water System Expansion -- ASR Project	0.55	$2.01	$2.43	$0.045	$1.25
49	South Daytona Reclaimed Water System Expansion Project	0.14	$0.72	$0.87	$0.011	$1.32
50	Tavares Reclaimed Water Treatment System Expansion Project	0.60	$4.71	$5.69	$0.048	$1.86
51	Volusia County Southwest Reclaimed Water System Project	0.20	$1.18	$1.43	$0.016	$1.46
52	West Melbourne Above Ground Reclaimed Water Storage Tank	2.48	$2.51	$2.76	$0.100	$0.31
53	Winter Garden Reclaimed Water Pumping and Transmission Project	4.00	$14.40	$17.40	$0.496	$1.09
Reuse Subtotals		139.79	$296.12	$348.46	$11.07	
54	Lake Apopka Reuse Augmentation Project	1.00	$7.27	$8.79	$0.114	$1.99
55	Seminole County Yankee Lake Reclaimed Water System Augmentation Project	10.00	$25.08	$31.36	$3.156	$1.43
56	University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project	0.41	$0.88	$1.06	$0.052	$0.80
57	Winter Park Windsong Stormwater Reuse Demonstration Project	0.10	$0.43	$0.52	$0.030	$1.72
58	Winter Springs -- Lake Jessup Reclaimed Water Augmentation Project	2.25	$6.70	$6.70	$0.150	$0.75
Reuse Augmentation Subtotals		13.76	$45.36	$56.61	$3.50	
59	Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project	0.77	$0.68	$0.82	$0.062	$0.42
60	Holloway Farms Agricultural Irrigation Rainwater Collection System Project	0.08	$1.29	$1.55	$0.002	$3.66

Table 13—*Continued*

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Costs			
			Construction $M	Total Capital $M	O&M $M/yr	Unit Production $/1,000 gallons
Other Subtotals		0.85	$1.97	$2.36	$0.06	
Alternative Water Supply Development Projects Total		388.19	$2,099.50	$2,647.59	$112.12	

mgd = million gallons per day

Note: Alternative water supply projects are defined, to the extent possible, on the basis of complete water production, treatment, storage and transmission systems. Complete projects may include several hydraulically connected major projects elements under single ownership.

Cost estimates are presented for various levels of project development, ranging from order of magnitude conceptual planning level, to final design. Actual project costs will vary from these estimates, which are presented herein only to provide an overview of potential alternative water supply project costs.

Construction cost estimates may include construction contingencies as appropriate.

Total capital costs include estimated construction cost plus allowance for non construction capital items which may include land, land acquisition, planning, permitting, design and services during construction as applicable to a given project.

Cost totals for project categories have been rounded.

Table 14. SJRWMD—Public water supply entities and associated alternative water supply development projects

Water Supply Entities	Apopka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Eastern Orange and Seminole Counties Regional Reclaimed Water Reuse System	Indian River Lagoon at FP&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Altamonte Springs and Apopka Project RENEW APRICOT	Orange County Southeastern Reclaimed Water System Expansion Project	St. Johns River Near SR 50	St. Johns River Near Lake Monroe	St. Johns River Near DeLand	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Entity Project Number
Priority Water Resource Caution Areas (PWRCAs)																
East-Central Florida Area																
Alafaya Utilities (Lake)																16
Altamonte Springs, City of (Seminole)									●			●	●			
Apopka, City of (Orange)	●								●			●	●			54
Aqua Utilities Inc. (Lake)												●	●			
Aquasource Utility Inc. (Lake)												●	●			
Belleview, City of (Marion)																19
Casselberry, City of (Seminole)												●	●			
Chateau Land Development Co. (Orange)												●	●			
Chateau Land Dev.- Orange Lk MHP (Lake)												●	●			
Cherry Lake Tree Farm (Lake)																59
Clerbrook Golf & RV Resort (Lake)												●	●			
Clermont, City of (Lake)												●	●			21
Cocoa, City of (Brevard)		●		●	●										●	
East-Central Florida Svcs. (Brevard/Orange)															●	
Eatonville, Town of (Orange)												●	●			
Eustis, City of (Lake)												●	●			27
Groveland, City of (Lake)												●	●			
Harbor Hills Utilities LP (Lake)												●	●			
Hawthorne at Leesburg (Lake)												●	●			
Holloway Farms (Orange)																60
Howey-in-the-Hills, Town of (Lake)												●	●			
Lady Lake, Town of (Lake)												●	●			30
Lake Griffin Isles (Lake)												●	●			
Lake Harney Water Assn (Seminole)												●	●			
Lake Mary, City of (Seminole)								●				●	●			
Leesburg, City of (Lake)												●	●			32
Longwood, City of (Seminole)												●	●			
Maitland, City of (Orange)												●	●			
Mascotte, Town of (Lake)												●	●			
Melbourne, City of (Brevard)																3, 33
Mid Florida Lakes MHP (Lake)												●	●			
Minneola, City of (Lake)												●	●			34
Monteverde, Town of (Lake)												●	●			
Mount Dora, City of (Lake)												●	●			35
Oak Springs MHP (Lake)												●	●			
Ocoee, City of (Orange)												●	●			37
Orlando, City of (Orange)			●							●						

Table 14—*Continued*

Water Supply Entities	Apopka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Eastern Orange and Seminole Counties Regional Reclaimed Water Reuse System	Indian River Lagoon at FP&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Altamonte Springs and Apopka Project RENEW APRICOT	Orange County Southeastern Reclaimed Water System Expansion Project	St. Johns River Near SR 50	St. Johns River Near Lake Monroe	St. Johns River Near DeLand	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Entity Project Number
Orange County Utilities (Orange)			●	●	●					●						38, 39
Orlando Utilities Commission (Orange)			●	●	●					●						40
Oviedo, City of (Seminole)			●									●	●			
Pennbrooke Utilities Inc. (Lake)												●	●			
Rock Springs MHP (Orange)												●	●			
Rockledge, City of (Brevard)		●														47, 48
Sanford, City of (Seminole)								●				●	●			
Seminole County Utilities (Seminole)			●					●				●	●			55
Shadow Hills MHP (Orange)												●	●			
Southlake Utilities (Lake)												●	●			
Sunlake Estates (Lake)												●	●			
Tavares, City of (Lake)												●	●			50
Titusville, City of (Brevard)				●	●											
Toho Water Authority															●	
University of Central Florida (Orange)																56
Utilities Inc. of Florida (Lake)												●	●			31
Utilities Inc. of Florida (Seminole)												●	●			
Wedgewood Homeowners Assn. (Lake)												●	●			
West Melbourne, City of (Brevard)																52
Winter Garden, City of (Orange)	●											●	●			53
Winter Park, City of (Orange)												●	●			57
Winter Springs, City of (Seminole)												●	●			58
Zellwood Station Utilities (Orange)												●	●			
Zellwood Water Association (Orange)												●	●			
Flagler Area																
Beverly Beach, Town of														●		
Bunnell, City of														●		
Dunes Community Development														●		1
Flagler Beach, City of														●		
Flagler County														●		20, 28
Marineland, Town of														●		
Palm Coast, City of														●		43
Volusia Area																
Water Alliance of Volusia (WAV)						●						●	●			
Daytona Beach, City of						●						●	●			
DeLand, City of												●	●			24
Deltona - Deltona Lakes												●	●			

Table 14—*Continued*

Water Supply Entities	Apopka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Eastern Orange and Seminole Counties Regional Reclaimed Water Reuse System	Indian River Lagoon at FP&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Altamonte Springs and Apopka Project RENEW APRICOT	Orange County Southeastern Reclaimed Water System Expansion Project	St. Johns River Near SR 50	St. Johns River Near Lake Monroe	St. Johns River Near DeLand	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Entity Project Number
Edgewater, City of						●						●	●			26
Holly Hill, City of						●						●	●			29
Lake Beresford Water Assn.												●	●			
Lake Helen, City of												●	●			
New Smyrna Beach						●						●	●			
Orange City, Town of												●	●			
Ormond Beach, City of						●						●	●			4, 41, 42
Pierson, Town of												●	●	●		
Port Orange, City of						●						●	●			44, 45, 46
South Daytona Beach																49
Volusia County Utilities						●						●	●			51
Areas that would be identified as PWRCAs if proposed alternative water supply development projects were not implemented																
East Putnam Water System (Putnam)																2
St. Augustine, City of (St. Johns)																5
St. Johns County Utilities (St. Johns)																6

Notes: Inclusion of a project on this table is not assurance that the project will receive funding through the Water Protection and Sustainability Program (WPSP).

Any water supply development option could be used by any water supply entity. However, the development of some options are less reasonable that others because of factors such as distance and cost. The water supply development project options identified on this table in association with specific water supply entities are those that SJRWMD considers most reasonable.

*Single water supply entity project numbers are identified beginning on page 116

Table 15. Status of water supply development projects

Projects	Multi-jurisdictional entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Brackish Groundwater Source									
Dunes Community Development District Brackish Groundwater Project	no	Yes	Dunes Community Development District	1.00 mgd	Dunes Community Development District, others to be identified	Complete	In progress	Complete	2005 - 2007
East Putnam Regional Water System Project	no	yes	Putnam County	0.93 mgd	US Department of Agriculture Rural Development Fund, Florida Department of Environmental Protection grant, SJRWMD funding requested	Complete	In progress	In progress	2005-2007
Melbourne RO Plant Expansion	no	yes	City of Melbourne	2.50 mgd	City of Melbourne, SJRWMD funds requested	2006	2008	2008-2009	2009-2010
Ormond Beach Treatment Plant Expansion Project	no	yes	City of Ormond Beach	2.00 mgd	City of Ormond Beach, SJRWMD funding requested	2005	2005 - 2006	2006	2006-2007
St. Augustine Water Supply Project	no	yes	City of St. Augustine	6.00 mgd	city of St. Augustine, SJRWMD funding requested	Complete	In progress	In progress	2006 - 2007
St. Johns County	no	Yes	St. Johns County	8.00 mgd	St. Johns County, SJRWMD funding requested	Complete	In progress	In progress	2005 - 2006
Surface Water Source									
Lower Ocklawaha River in Putnam County Project	*To be determined	no	to be identified	20.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near DeLand Project	*To be determined	no	to be identified	up to 20.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near Lake George Project	*To be determined	no	to be identified	up to 33.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near Lake Monroe Project	*To be determined	Yes	City of Sanford	2 mgd	City of Sanford, SJRWMD funding requested	In progress	2006	2006	2007–2008
St. Johns River Near SR 50 Project	*To be determined	no	to be identified	up to 10.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River/Taylor Creek Reservoir Water Supply Project	Yes	yes	City of Cocoa, city of Titusville, East Central Florida Services, Inc., Orange County, Orlando Utilities Commission, South Florida Water Management District, St. Johns River Water Mgt. District, TOHO Water Authority	up to 40.00 mgd	project sponsors, State and Tribal Assistance Grant	2005 - 2008	2008 - 2009	2008 - 2009	2010 - 2012
Seawater Source									
Indian River Lagoon at FP&L Cape Canaveral Power Plant Project	*To be determined	no	to be identified	up to 30.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Indian River Lagoon at Reliant Energy Power Plant Project	*To be determined	no	to be identified	up to 30.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Intracoastal Waterday at New Smyrna Beach Project	*To be determined	no	to be identified	15.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Reclaimed Water Source									
Alafaya Utilities Alafaya Reclaimed Water Storage and High Service Pumps	no	yes	Alafaya Utilities	0.41 mgd	Alafaya Utilities, SJRWMD funding requested	Complete	Complete	2006	2006
Altamonte Springs & Apopka Project RENEW APRICOT	yes	yes	Altamonte Springs, Apopka	6.63 mgd	Project sponsors, SJRWMD funding requested	Complete	2006	2006	2007
Apopka & Winter Garden (or Northwest Orange County) Regional Reuse Partnership Project	yes	yes	Apopka, Winter Garden	3.00 mgd	Project sponsors, SJRWMD funds requested	Complete	Not scheduled	Not scheduled	Not scheduled

Table 15—*Continued*

Projects	Multi-jurisdictional entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion	yes	yes	Belleview, Spruce Creek	1.00 mgd	Project sponsors, SJRWMD funds requested	Complete	2005 - 2006	2006	2006 - 2007
Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II	no	yes	Flagler County	0.50 mgd	Flagler County, Rural Development, SJRWMD funds requested, others to be identified	Complete	2006	2006	2006 - 2007
Clermont Reclaimed and Stormwater System Expansion	no	yes	City of Clermont	5.10 mgd	City of Clermont, SJRWMD funds requested	2004-2006	2005-2007	2006-2007	2007-2008
Daytona Beach Reclaimed Water System	no	yes	City of Daytona Beach	26.00	City of Daytona Beach, SJRWMD funds requested	Complete	2005-2006	2006-2007	2007-2008
DeLand Reclaimed Water and Surface Water Augmentation Project	no	yes	City of DeLand	1.70 mgd	City of DeLand, SJRWMD (Florida Forever Trust Fund)	Complete	Complete	2004-2006	2004 - 2009
Eastern Orange and Seminole Counties Regional Reuse Project	yes	yes	City of Orlando, Orange County, Orlando Utilities Commission, Seminole County, city of Oviedo, University of Central Florida	20.00 mgd	Project partners, State and Tribal Assistance Grant	Complete	Complete	2007	2004 - 2007
Edgewater Reclaimed Water system Interconnect to SE Volusia County	no	yes	City of Edgewater	1.00 mgd	City of Edgewater, SJRWMD funds requested	Complete	2006	2006-2007	2007
Eustis Reclaimed Water System Expansion and Augmentation	no	yes	City of Eustis	1.10 mgd	City of Eustis, SJRWMD funds requested	Complete	2006-2008	2007-2009	2009-2012
Flagler County Bulow Reuse Water System	no	yes	Flagler County	1.70 mgd	Flagler County, SJRWMD funds requested	Complete	2006-2007	2007	2007-2008
Holly Hill Reuse System to Ormond Beach	no	yes	City of Holly Hill	0.60 mgd	City of Holly Hill; SJRWMD funds requested	Complete	2006-2007`	2007	2008
Lady Lake Phase II Reclaimed Water System	no	yes	Town of Lady Lake	0.50 mgd	Town of Lady Lake; SJRWMD funds requested	Complete	2006	2007-2008	2008-2009
Lake Utility Services Inc. (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water Expansion	no	yes	Utilities Inc. of Florida	1.00 mgd	Utilities Inc. of Florida, SJRWMD funds requested	Complete	2005-2006	2006	2006-2007
Leesburg Reclaimed Water Reuse Project	no	yes	City of Leesburg	7.10 mgd	City of Leesburg, SJRWMD funds requested	Complete	Complete	2006	2006-2007
Melbourne Reclaimed Water System Expansion	no	yes	City of Melbourne	1.50 mgd	City of Melbourne, SJRWMD funds requested	Complete	2005-2006	2006	2006-2007
Minneola Reclaimed Water Reuse Project	no	yes	City of Minneola	1.50 - 2.50 mgd	City of Minneola, SJRWMD funds requested	Complete	Complete	Complete	2005 - 2006
Mount Dora Country Club Golf Course Reclaimed Water Project	no	yes	City of Mount Dora	0.26 mgd	City of Mount Dora, SJRWMD funds requested	Complete	Not scheduled	Not scheduled	Not scheduled
North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	yes	yes	City of Sanford, city of Lake Mary, Seminole County	7.80 mgd	project partners, SJRWMD (Florida Forever Trust Fund)	Complete	In progress	In progress	2005 - 2009

Table 15—*Continued*

Projects	Multi-jurisdictional entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Ocoee Reuse System Expansion	no	yes	City of Ocoee	0.35 mgd	City of Ocoee, SJRWMD funds requested	Complete	2005-2006	2006	2006
Orange County Northwest Reclaimed Water Augmentation	no	yes	Orange County	3.00 mgd	Orange County, SJRWMD funds requested	Complete	2006	2006-2007	2006-2010
Orange County Southeastern Reclaimed Water System Expansion	no	yes	Orange County	12.50 mgd	Orange County, SJRWMD funds requested	Complete	2005-2006	2006-2008	2006-2010
Orlando Utilities Commission Project RENEW	no	yes	Orlando Utilities Commission	9.20 mgd	Orlando Utilities Commission, SJRWMD funds requested	2005-2007	2008-2009	2009-2010	2009-2011
Ormond Beach North Peninsula Reclaimed Water Storage Project	no	yes	City of Ormond Beach	0.49 mgd	city of Ormond Beach, SJRWMD (Florida Forever Trust Fund)	Complete	In progress	In progress	2005 - 2006
Ormond Beach South Peninsula Reuse Improvements	no	yes	City of Ormond Beach	2.13	City of Ormond Beach, SJRWMD funds requested	Complete	2006-2007	2006-2009	2007-2010
Palm Coast New Reclaimed Water System Expansion	no	yes	City of Palm Coast	8.23	City of Palm Coast, SJRWMD funds requested	Complete	2005-2007	2006-2009	2006-2009
Port Orange Airport Road Reclaimed Water Transmission Main	no	yes	City of Port Orange	1.00 mgd	City of Port Orange, SJRWMD funds requested	Complete	Complete	2006	2006
Port Orange Pioneer Trail Storage and Pumping Facility	no	yes	City of Port Orange	2.00 mgd	City of Port Orange, SJRWMD funds requested	Complete	2006	2008	2006
Port Orange Reclaimed Water Reservoir and Recharge Basin	no	yes	City of Port Orange	2.70 mgd	city of Port Orange, SJRWMD (Florida Forever Trust Fund)	Complete	Complete	Complete	2004 - 2006
Rockledge Reclaimed Water Storage	no	yes	City of Rockledge	0.16 mgd	City of Rockledge, SJRWMD funds requested	Complete	Not scheduled	Not scheduled	Not scheduled
Rockledge Reclaimed Water System Expansion -- ASR	no	yes	City of Rockledge	0.55 mgd	City of Rockledge, SJRWMD funds required	Complete	Complete	2005-2006	2006
South Daytona Reclaimed Water System Expansion	no	yes	City of South Daytona	0.14 mgd	City of South Daytona, SJRWMD funds requested	Complete	2005-2006	2006-2007	2006-2007
Tavares Reclaimed Water Treatment System Expansion	no	yes	City of Tavares	0.6 mgd	City of Tavares, SJRWMD funds requested	2006	2007	2007	2008
Volusia County SW Reclaimed Water System	no	yes	Volusia County	0.20 mgd	Volusia County, SJRWMD funds requested	Complete	2006	2006	2007
West Melbourne Above Ground Reclaimed Water Storage Tank	no	yes	City of West Melbourne	2.48 mgd	City of West Melbourne, STAG funds	Complete	2006	2006	2006-2007
Winter Garden Reclaimed Water Pumping and Transmission	no	yes	City of Winter Garden	4.00 mgd	City of Winter Garden, SJRWMD funds required	Complete	2005-2006	2006	2006-2008
Reuse Augmentation									
Lake Apopka Reuse Augmentation Project	no	yes	City of Apopka	1.00 mgd	City of Apopka, SJRWMD funds requested	In progress	In progress	2006	2007-2008

Table 15—*Continued*

Projects	Multi-jurisdictional entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Seminole County Yankee Lake Reclaimed Water System Augmentation	no	yes	Seminole County	10.00 mgd	Seminole County, SJRWMD funds requested	Complete	2006	2006	2006-2007
University of Central Florida (UCF) Reclaimed Water and Stormwater Integration	no	yes	University of Central Florida	0.41 mgd	University of Central Florida, SJRWMD Stormwater Cost-share funding	Complete	2006	2006	2006
Winter Park Windsong Stormwater Reuse Demo	no	yes	City of Winter Park	0.10 mgd	City of Winter Park, SJRWMD Stormwater Cost-share funding	Complete	2006	2006	2006
Winter Springs -- Lake Jesup Reclaimed Water Augmentation	no	yes	City of Winter Springs	2.25 mgd	City of Winter Springs, SJRWMD funds requested	2006	2006	2006-2007	2008-2010
Other									
Cherry Lake Tree Farm Lake Withdrawal for Agricultural Use	no	yes	Cherry Lake Tree Farm	0.77 mgd	Cherry Lake Tree Farm, SJRWMD funds requested	Complete	2006	2006	2007
Holloway Farms Agricultural Rainwater Collection System	no	yes	Holloway Farms	0.08 mgd	Holloway Farms, SJRWMD funds requested	Not scheduled	Not scheduled	Not scheduled	Not scheduled

mgd = million gallons per day

*Although the multijurisdictional status of these projects has been not been determined, SJRWMD anticipates that their development by multijurisdictional water supply entities will likely offer the greatest opportunity for their full development. Relatively small versions of these projects, which are to be developed by single entities, are identified as part of these projects.

Table 16. Typical alternative water supply project delivery schedules

Project Type	Major Activity	Duration in Years						
		1	2	3	4	5	6	7
Brackish Groundwater / Surface Water / Seawater Projects								
Brackish Groundwater Single Entity	Consultant Selection							
	Planning							
	Design / Permit / Bid							
	Construction / Start Up							
Surface Water Single Entity	Consultant Selection							
	Planning							
	Design / Permit / Bid							
	Construction / Start Up							
Surface Water or Seawater Project Multijurisdictional	Partnering Agreement(s)							
	Consultant Selection							
	Planning							
	Design / Permitting / Bid							
	Construction / Start Up							
Reclaimed Water Reuse Projects								
Reclaimed Water Reuse Single Entity	Consultant Selection							
	Planning							
	Design / Permit / Bid							
	Construction / Start Up							
Reclaimed Water Reuse Project Multijurisdictional	Partnering Agreement(s)							
	Consultant Selection							
	Planning							
	Design / Permitting / Bid							
	Construction / Start Up							

These utilities represent 99% of projected 2025 water use in PWRCAs and in areas that would likely be identified as PWRCAs if alternative water supply projects were not implemented.

Pertinent information concerning these projects is included in Tables 13 and 15. All of the identified projects are considered to serve the public interest by contributing in an affordable manner to the solution to the problem of projected short falls of groundwater to meet projected water supply demands.

Water Supply Development Project Options List
(* indicates projects that will service only one water supply entity)

Brackish Groundwater Projects

1. Dunes Community Development District Brackish Groundwater Project*
2. East Putnam Regional Water System Project*
3. Melbourne Reverse Osmosis (RO) Water Treatment Plant Expansion Project*
4. Ormond Beach Water Treatment Plant Expansion Project*
5. St. Augustine Water Supply Project*
6. St. Johns County Water Supply Project*

Surface Water Projects

7. Lower Ocklawaha River in Putnam County Project
8. St. Johns River Near SR 50 Project
9. St. Johns River Near Lake Monroe Project
10. St. Johns River Near DeLand Project
11. St. Johns River Near Lake George Project
12. St. Johns River / Taylor Creek Reservoir Water Supply Project

Seawater Projects

13. Indian River Lagoon at FP&L Cape Canaveral Power Plant Project
14. Indian River Lagoon at Reliant Energy Power Plant Project
15. Intracoastal Waterway at New Smyrna Beach Project

Reuse Projects

16. Alafaya Reclaimed Water Storage and High Service Pump Project*
17. Altamonte Springs and Apopka Project RENEW APRICOT
18. Apopka and Winter Garden Reuse Partnership Project
19. Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion Project
20. Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II*
21. Clermont Reclaimed and Stormwater System Expansion Project*
22. Cocoa and Rockledge Reclaimed Water Line Connection Project
23. Daytona Beach Reclaimed Water System Project*
24. DeLand Reclaimed Water and Surface Water Augmentation Project*
25. Eastern Orange and Seminole Counties Regional Reuse Project
26. Edgewater Reclaimed Water System Interconnection to Southeast Volusia County Project*
27. Eustis Reclaimed Water System Expansion and Augmentation Project*
28. Flagler County Bulow Reclaimed Water System Project*
29. Holly Hill and Ormond Beach Reclaimed Water System Expansion Project*
30. Lady Lake Reclaimed Water System Project, Phase II*
31. Lake Utility Services (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water System Expansion Project*
32. Leesburg Reclaimed Water Reuse Project*
33. Melbourne Reclaimed Water System Expansion Project*
34. Minneola Reclaimed Water Reuse Project *
35. Mount Dora Country Club Golf Course Reclaimed Water Project*
36. North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project
37. Ocoee Reuse System Expansion Project*
38. Orange County Northwest Reclaimed Water System Augmentation Project*
39. Orange County Southeast Reclaimed Water System Expansion Project*

40. Orlando Utilities Commission Project RENEW
41. Ormond Beach North Peninsula Reclaimed Water Storage Project*
42. Ormond Beach South Peninsula Reclaimed Water System Improvement Project*
43. Palm Coast Reclaimed Water System Expansion Project*
44. Port Orange Airport Road Reclaimed Water Transmission Main Project*
45. Port Orange Pioneer Trail Storage and Pumping Facility Project*
46. Port Orange Reclaimed Water Reservoir and Recharge Basin Project*
47. Rockledge Reclaimed Water Storage Project*
48. Rockledge Reclaimed Water System Expansion – ASR Project*
49. South Daytona Reclaimed Water System Expansion Project*
50. Tavares Reclaimed Water System Expansion Project*
51. Volusia County Southwest Reclaimed Water System Project*
52. West Melbourne Above Ground Reclaimed Water Storage Tank Project*
53. Winter Garden Reclaimed Water Pumping and Transmission Project*

Reuse Augmentation Projects

54. Lake Apopka Reuse Augmentation Project*
55. Seminole County Yankee Lake Reclaimed Water System Augmentation Project*
56. University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project*
57. Winter Park Windsong Stormwater Reuse Demonstration Project*
58. Winter Springs Lake Jesup Reclaimed Water Augmentation Project*

Other Projects

59. Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project*
60. Holloway Farms Agricultural Irrigation Rainwater Collection System Project*

OTHER WATER SUPPLY PROJECTS

In addition to water supply development projects, SJRWMD has identified projects that will provide water supply benefits but that do not qualify as water supply development projects based on the provision of Section 373.019(24), F.S. These projects include

- Conserve Florida Water Conservation Information Clearinghouse
- Model Landscape Water Conservation Ordinance
- Water Conservation Public Awareness Campaign

Conserve Florida Water Conservation Information Clearinghouse

SJRWMD is a participant in the development of a comprehensive statewide water conservation program for public water supply. This effort includes FDEP, the five WMDs, the Florida Rural Water Association, and organizations representing public water supply utilities. As part of this effort, the development of a clearinghouse for water conservation information is planned. SJRWMD proposes to support this effort in hopes that it will provide information valuable to determining the cost and effectiveness of various water conservation approaches. This project is included in the Hydrologic Data Collection and Analysis Project, which is described in the Water Resource Development Component of this document.

Model Landscape Water Conservation Ordinance

SJRWMD is developing a document to provide guidance and example language for the creation of local landscape water conservation ordinances that meet the requirements specified in Section 373.185, F.S. Local governments are required by Sections 125.568 and 166.048, F.S., to consider adopting ordinances that will reduce the amount of water used to irrigate landscape.

SJRWMD is also contributing technical expertise to the statewide effort, required by Section 373.228, F.S., to develop landscape irrigation and Xeriscape design standards for new construction. These standards are to incorporate scientifically based model guidelines for urban, commercial, and residential landscape irrigation, including drip irrigation, for plants, trees, sod, and other landscaping. Section 373.228, F.S., requires local governments to use these standards and guidelines when developing landscape irrigation and Xeriscape ordinances.

Water Conservation Public Awareness Campaign

SJRWMD partners with local governments and water supply utilities to conduct an annual paid-advertising, multimedia campaign, which has included television, radio, newspaper, the Internet, direct mail and billboard advertising, a Web site, and printed materials. The budget for the campaign in FY 2004–2005 was $1.848 million. This campaign has successfully increased public awareness of water conservation.

WATER RESOURCE DEVELOPMENT COMPONENT

SJRWMD has developed a water resource development program in association with its regional water supply planning effort. This water resource development program includes water resource development projects based on the provisions of Paragraph 373.0361(2)(b), F.S. This paragraph requires that DWSP include

A water resource development component that includes the following:

1. A listing of those water resource development projects that support water supply development
2. For each water resource development project listed
    a. An estimate of the amount of water to become available through the project
    b. The time frame in which the project option should be implemented and the planning-level costs for capital investment and for operating and maintaining the project
    c. An analysis of funding needs and sources of possible funding options
    d. Identification of the entity that should implement each option and the current status of project implementation

In addition, pursuant to the requirements of Subsection 373.0361(2)(d), F.S., this chapter of DWSP 2005 describes a funding strategy for water resource development projects, which is considered by SJRWMD to be reasonable and sufficient to pay the costs of constructing or implementing all of the listed projects.

Based on the definition of water resource development included in Subsection 373.019(22), F.S., SJRWMD considers a water resource development project to be a project that contributes to the formulation and implementation of regional water resource management strategies. Based on the provisions of this subsection, these strategies include

- 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
- Related technical assistance to local governments and to government-owned and privately owned water utilities

DWSP 2000 identified a number of water resource development projects designed to reduce the current level of uncertainty associated with DWSP and to facilitate plan implementation. Implementation of water resource development projects is primarily the responsibility of SJRWMD. DWSP 2000 identified the following 14 water resource development projects:

1. Abandoned Artesian Well Plugging Program
2. Adaptive Management Project
3. Aquifer Protection Program
4. Aquifer Storage and Recovery Construction and Testing
5. Central Florida Aquifer Recharge Enhancement Program
6. Cooperative Well Retrofit Project
7. Demineralization Concentrate Management Project
8. Facilitation of Regional Decision-Making Process
9. Feasibility of Seawater Demineralization Projects
10. Hydrologic Data Collection and Analysis
11. Investigation of Areas Where Domestic Self-Supply Wells are Sensitive to Water Level Fluctuation
12. Regional Aquifer Management Project
13. Surface Water In-Stream Monitoring and Treatability Studies
14. Wetland Augmentation Demonstration Program

Ten of the water resource development projects identified in DWSP 2000 are still under way and are also identified in DWSP 2005. Four of the water resource development projects identified in the DWSP 2000 are not included in DWSP 2005, because they were either completed or the remaining work has been absorbed into other SJRWMD programs. These projects, as numbered above, are

Adaptive Management Project (2)

Investigation of Areas Where Domestic Self-Supply Wells are Sensitive to Water Level Fluctuation (11)

Regional Aquifer Management Project (12)

Surface Water In-Stream Monitoring and Treatability Studies (13)

The Adaptive Management Project included two major components: (1) development of a plan for a regional hydrologic monitoring network for east-central Florida and (2) development of additional hydrologic data processing tools. SJRWMD completed the plan for a hydrologic monitoring network for east-central Florida in 2004. The development of additional hydrologic data processing tools was absorbed into the critical data needs project. The purpose of the Critical Data Needs project is to identify the information needed to support the SJRWMD planning and regulatory programs.

The project, Investigation of Areas Where Domestic Self-Supply Wells are Sensitive to Water Level Fluctuation, was completed in 2004. The final report is available as SJRWMD Special Publication SJ2004-SP38 (D.L. Smith and Associates 2004).

The planning documents for the Regional Aquifer Management Project (RAMP) were completed in 2004. Implementation of some RAMP elements and initiatives was under way in 2004 with local governments in Volusia County leading the project design and building effort. SJRWMD is co-funding RAMP projects with New Smyrna Beach Utilities Commission, Volusia County, and the cities of DeLand, Ormond Beach, and Port Orange. These projects are identified in the Water Resource Development Projects section of this document. SJRWMD anticipates that additional elements and initiatives identified in the RAMP planning documents will be incorporated into the Master Water Facilities Plan for the Water Authority of Volusia.

The Surface Water In-Stream Monitoring and Treatability Studies Project was substantially completed by early 2004. This water resource development project focused on the technical and economic feasibility of using water from the St. Johns River as a potable water supply source. The results of this project were published in a series of documents, which are available on the SJRWMD Web site. Burton and Associates characterized the potential service area demand for potable water in Seminole and Volusia counties through the year 2025 (Burton and Associates 2003) and evaluated the affordability of potable water produced from the St. Johns River (Burton and Associates 2004). CH2M HILL reviewed potential surface water treatment technologies (CH2M HILL 2002a), characterized the quality of raw water from the St. Johns River (CH2M HILL 2002b), and completed a pilot project to produce potable water from the St. Johns River (CH2M HILL 2004). HDR Engineering (HDR) completed a siting study for a surface water treatment plant and developed a methodology for the siting study (HDR 2002), a public involvement plan

(HDR 2003a), and preliminary site-specific criteria (HDR 2003b), and completed a detailed site-specific analysis for a surface water treatment plant (HDR 2004). One component of this project, an algal toxin investigation, remains incomplete at this time. This project, Treatability of Algal Toxins Using Oxidation and Adsorption, is a tailored collaboration among SJRWMD, the American Water Works Association Research Foundation, the cities of Cocoa and Melbourne, and CH2M HILL. This project is identified as a stand-alone water resource development project in DWSP 2005.

SJRWMD has historically performed projects that are consistent with the definition of water resource development projects. These projects are numerous and range in significance from major flood control and environmental enhancement projects to smaller, very specialized hydrologic data collection and analysis efforts. Many of these projects are ongoing. These SJRWMD projects, although consistent with the definition of water resource development projects, are not necessarily identified as water resource development projects in DWSP. Water resource development projects identified in DWSP are projects that would increase the quantity of water available for water supply. Following is a description of SJRWMD's DWSP 2005 water resource development projects:

1. Abandoned Artesian Well Plugging Program
2. Aquifer Protection Program
3. Aquifer Storage and Recovery Construction and Testing
4. Central Florida Aquifer Recharge Enhancement Program
5. Cooperative Well Retrofit Project
6. Demineralization Concentrate Management Project
7. Facilitation of Regional Decision-Making Process
8. Feasibility of Seawater Demineralization Projects
9. Hydrologic Data Collection and Analysis
10. Investigation of the Augmentation of Public Supply Systems With Local Surface Water / Stormwater Sources
11. Lake Apopka Basin Water Resource Development Project
12. Lower Lake Louise Water Control Structure
13. Treatability of Algal Toxins Using Oxidation and Adsorption
14. Upper St. Johns River Basin Project
15. Wetland Augmentation Demonstration Program
16. Water Resource Development Components of Water Supply Development Projects

ABANDONED ARTESIAN WELL PLUGGING PROGRAM

Uncontrolled or improperly constructed artesian wells (abandoned artesian wells) can have an adverse impact on the quantity and quality of water in aquifers or other water bodies. Pursuant to the requirements of Section 373.207, F.S., SJRWMD has an active program to plug or repair abandoned artesian wells. This program is known as the Abandoned Artesian Well Plugging Program. The goal of this program is to assure the continued availability of groundwater resources by detecting, evaluating, and controlling abandoned artesian wells.

SJRWMD annually prepares a report of the status of its Abandoned Artesian Well Plugging Program. SJRWMD Technical Fact Sheet SJ2004-FS4 (December 2004) reported that SJRWMD had plugged or repaired 87 wells during FY 2003–2004. The total estimated maximum flow potential of these wells was reported to be 55 mgd. This fact sheet also included an inventory of 263 wells that had been temporarily controlled and were under investigation to be permanently plugged. Abandoned artesian wells in PWRCAs have the highest priority for plugging.

SJRWMD had identified 3,586 artesian wells through September 30, 2004. Of that total, 263 were undergoing investigation to be permanently plugged; 2,092 had been permanently plugged or repaired through the SJRWMD cost-share program; and 1,231 had been plugged or repaired by the well owners. The FY 2005 SJRWMD Water Resource Development Work Program reports expenditures of $3.041 million for the Abandoned Artesian Well Plugging Program through the end of FY 2004. This amount includes $1.836 million from SJRWMD ad valorem funding, $625,000 from Florida Forever funding, and $580,000 from cooperator funding.

Significant numbers of new abandoned artesian wells continue to be found; therefore, SJRWMD believes that this program will continue beyond FY 2009. SJRWMD projects that the program will cost $7.237 million through FY 2009. Funds to support this program historically have been supplied cooperatively by SJRWMD, individual well owners, and several counties. SJRWMD proposes to continue its Abandoned Artesian Well Plugging Program at the level of effort shown in the most recent version of the annual program document for the SJRWMD Water Resource Development Work Program (SJRWMD 2004).

AQUIFER PROTECTION PROGRAM

Protection of SJRWMD's aquifers from unacceptable contamination and loss of recharge is essential to the security of existing and future water supplies. The surficial aquifer provides an important source of water supply in parts of SJRWMD. Coastal areas such as Brevard, Flagler, and St. Johns counties make direct use of the surficial aquifers along the coastal ridges as water supply sources. The surficial aquifer sources are prone to contamination from overlying activities on the land surface. Inland, in parts of Alachua, Lake, Marion, and Orange counties, confining beds are thin or absent, making the Floridan aquifer itself similarly prone to contamination. The surficial and Floridan aquifers are projected to continue to be the primary sources of water supply in these areas of SJRWMD. Therefore, these aquifers should be protected to ensure their continued availability as water supply sources.

Release of contaminants in a surficial aquifer recharge area can quickly render an aquifer unusable. Depending upon hydrologic conditions, the contaminated surficial aquifer may have the potential to locally contaminate the intermediate and Floridan aquifers as well.

Loss of recharge may occur when development causes a loss of natural land cover and an increase of impermeable surfaces, such as parking lots and roadways. Ditching, draining, and diversion of water out of closed basins may also contribute to the problem. These changes tend to reduce recharge and increase surface water runoff. Loss of recharge in this way is often slow and incremental, but the long-term result can be devastating.

SJRWMD's continued activities relating to source-protection are guided by the State Comprehensive Plan, the Water Resources Act of 1972 (Chapter 373, F.S.), and SJRWMD rules.

Wellhead Protection

Florida's Wellhead Protection Program is one element of surficial aquifer protection. This program was developed in Florida in response to the requirements of Section 1428 of the Safe Drinking Water Act. The Wellhead Protection Program is implemented through the Minimum Criteria Rule for Review of Local Government Comprehensive Plans and Plan Amendments, Chapter 9J-5, *F.A.C.* Through this rule, local government comprehensive plans are required to address wellhead protection.

In wellhead protection zones, local governments limit or restrict land uses that have a high potential for contaminant release. Because wellhead protection is implemented at the local level, there are a variety of techniques used to identify the wellhead protection zones (areas around wellheads to be protected). Upon request from a local government, SJRWMD will assist in the determination of the area around a well that should be protected and how to protect it through local government regulations.

SJRWMD will continue to provide technical support to FDEP in efforts to implement the EPA Source Water Assessment Program within SJRWMD.

SJRWMD expended $201,000 in ad valorem funds in support of the wellhead protection component of this project through FY 2004 and anticipates cumulative expenditures of $542,000 from ad valorem sources through FY 2009.

Recharge Area Protection

Section 373.0391, F.S., requires the WMDs to provide information to local governments concerning the location of aquifer recharge areas, while Section 373.0395, F.S., requires the WMDs to include "prime groundwater recharge areas" in their groundwater availability inventories. Floridan aquifer recharge areas are well documented in SJRWMD; an updated map and related information is available on SJRWMD's Web site (*www.sjrwmd.com*); this information is provided to local governments upon request. However, recharge areas for surficial aquifers have not been extensively mapped.

FDEP's Source Water Assessment and Protection Program, which is an outgrowth of the 1996 amendments to the Safe Drinking Water Act, was designed to evaluate potential sources of pollution to public drinking water supplies and to protect those supplies through pollution prevention programs.

In DWSP 2000, SJRWMD proposed to develop a districtwide aquifer protection plan in cooperation with FDEP and local governments to identify and protect surficial aquifers, the Floridan aquifer in areas where confining beds are thin or absent, and associated recharge areas. In addition, SJRWMD proposed to integrate existing aquifer protection efforts with additional initiatives required to adequately protect the surficial and Floridan aquifers.

SJRWMD's Aquifer Protection Plan was to include groundwater quality and recharge protection goals, objectives, and implementation strategies. At a minimum, the following strategies were to be included:

- SJRWMD will cooperate with local governments to investigate specific strategies to retain and use storm water and reclaimed water to reduce existing or potential loss of recharge to reasonable levels and to potentially make more water available for potable or irrigation supply. To the extent practical, the identified strategies should include multiple objectives such as reducing development-induced freshwater discharge, as well as increasing recharge and wetlands hydration.
- SJRWMD will seek to identify strategic land acquisitions needed to implement these recharge strategies. SJRWMD will include lands identified to be strategic for recharge enhancement as a priority for land acquisition.
- SJRWMD will continue its wellhead protection technical assistance program to provide timely delineations and implementation assistance to requesting local governments.
- SJRWMD will continue a coordinated outreach program to inform local governments of the aquifer protection technical assistance available from SJRWMD upon request.
- SJRWMD will delineate surficial aquifer recharge areas and prime recharge areas as a basis for protective regulations by local governments.
- SJRWMD will consider incorporating recharge standards and criteria for important recharge areas into SJRWMD's surface water and stormwater rules.

A draft plan that met the objectives described in DWSP 2000 was completed by Barnes, Ferland and Associates under contractual agreement with SJRWMD in December 2002. The following work elements were required to complete the plan:

- Public workshops for project coordination and input from interested parties
- Coordination with federal, state, and local governments and agencies
- Literature review and development of an annotated bibliography

- Review and summary of applicable statutes, rules, regulations, and ordinances, including management of groundwater, surface water, storm water, reclaimed water, and wellhead protection
- Evaluation of relationships between land use, aquifer recharge, and groundwater quality and quantity
- Peer review
- Preparation of an aquifer protection draft plan document

The draft plan is undergoing review by SJRWMD staff. Upon completion, plan implementation may include one or more of the following elements:

- Additional data collection and analysis
- Artificial recharge projects
- Groundwater quality protection
- Intergovernmental coordination and public involvement
- Technical assistance
- Regulatory program enhancements
- Plan revisions to ensure consistency with new FDEP statutory and regulatory proposals in the Wekiva Study Area once legislation and rulemaking are complete

SJRWMD expended $285,000 in ad valorem funds to complete the draft recharge area protection plan. Total costs to implement the plan are still tentative, but SJRWMD estimates expenditures at approximately $2.5 million in ad valorem funds, with an additional $2.5 million possible from cooperative funding sources.

Specific estimates of the amount of water to be made available as a result of this program have not been made by SJRWMD. However, this program has the potential of ensuring the availability of existing and future groundwater supplies in SJRWMD.

SJRWMD estimates $15 million in Florida Forever funds to implement the aquifer protection program.

AQUIFER STORAGE AND RECOVERY FEASIBILITY TESTING

Significant quantities of storage will be required to develop a reliable water supply from most candidate surface water withdrawal sites investigated in DWSP. ASR is a cost-effective method for providing the required storage and is generally feasible within SJRWMD. As part of the SJRWMD alternative water supply strategies investigations, a preliminary ASR feasibility assessment procedure was developed (CH2M HILL 1997a). This procedure may be applied to a given potential ASR location, to assess the technical feasibility of ASR relative to other storage methods. The desktop procedure relies on existing data, including general hydrogeologic characteristics of the target storage zone.

However, because a natural geologic formation would be used to store the treated water, performance uncertainties will exist until physical testing has been performed. This testing involves design, construction, and instrumentation of ASR test wells, followed by several cycles of injection and recovery.

SJRWMD has addressed issues concerning concentrations of arsenic and microbiota in water recovered from ASR wells. These issues are likely to be important regulatory considerations in the operation of ASR facilities (Pyne 2005).

SJRWMD began work on the ASR project in 2002 and completed the ASR program plan in April 2003. Exploratory drilling began in FY 2004. SJRWMD has completed desktop assessments with eight cooperators and is moving forward into testing with seven cooperators. These cooperators are Orange, Seminole, and Volusia counties and the cities of Cocoa, DeLand, Ormond Beach and Sanford. SJRWMD forecasts that the ASR program will cost approximately $27.1 million to complete by the end of FY 2008 (Table 17).

Table 17. Projected total funding amounts and sources for the aquifer storage and recovery project

Funding Source	Amount
SJRWMD, ad valorem	$1,126,671
SJRWMD, Florida Forever	$18,795,564
Cooperator capital share	$860,571
Cooperator in-kind share	$6,310,429
Total	$27,093,235

Source: SJRWMD Water Resource Development Work Program document, November 11, 2004

CENTRAL FLORIDA AQUIFER RECHARGE ENHANCEMENT PROGRAM

Providing additional aquifer recharge in central Florida could significantly increase available fresh groundwater supplies and thereby reduce or delay the need for development of alternative water supplies.

Aquifer recharge could be increased by enhancing natural recharge or by providing artificial recharge, including infiltration basins or recharge wells. Recharge enhancement can be integrated with stormwater management systems to provide needed drainage and flood control as well as increased water supply. The objectives of the Central Florida Aquifer Recharge Enhancement Program (CFARE) are to

- Maximize local recharge to the Floridan aquifer
- Minimize the impacts of groundwater withdrawals
- Enhance the sustainable fresh groundwater supply
- Reduce the need for development of alternative supplies

CFARE includes three main components:

- Phase I—Artificial Recharge Demonstration projects
- Phase II—Recharge Enhancement Evaluation and Design
- Phase III—Program Implementation

Phase I—Artificial Recharge Demonstration Projects

Artificial recharge was included in SJRWMD's alternative water supply strategies investigation. Artificial recharge using infiltration basins, as well as recharge wells, was investigated in the east-central Florida planning area. The use of RIBs to recharge high-quality reclaimed water to the surficial aquifer is a well-established and accepted practice. However, the use of recharge wells, although practiced for many years, has been the subject of much controversy. Recharge wells have historically been used in central Florida as a stormwater management and lake-level control technique. However, the aquifer recharge benefits and consequences of central Florida drainage wells have not been fully investigated. In addition, construction of new recharge wells has not been permitted in recent years due to aquifer contamination concerns. As a result, local governments have increasingly relied on diversion of storm water to nearby rivers to address flooding problems, which has resulted in losses in aquifer recharge.

SJRWMD investigated the aquifer recharge characteristics of existing recharge wells and developed a preliminary assessment of the technical feasibility of increasing this recharge, thereby increasing the water supply potential of the Floridan aquifer in east-central Florida (CH2M HILL 1997c). Aquifer recharge provided by existing aquifer recharge wells is significant (from 39 mgd to 52 mgd), and the possibility to increase recharge, and thereby supplement current groundwater supplies, exists.

The major issue preventing additional use of direct recharge wells is the potential for bacterial contamination of the aquifer. The purpose of the artificial recharge demonstration projects is to evaluate the use of recharge wells for net aquifer improvement. Net improvement may include increasing recharge volume without increasing aquifer contamination or decreasing aquifer contamination while preserving existing artificial recharge rates. Because bacteria is of primary concern, the focus of the demonstration program is

- The fate of bacteria in the Floridan aquifer
- The effectiveness of passive stormwater treatment for reducing bacteria
- The effectiveness and cost feasibility of physically reducing bacteria in lake water recharge

The increase in recharge that would result from full implementation of the net improvement concept is not precisely known, but SJRWMD believes that 50 mgd is a reasonable estimate.

The artificial recharge demonstration program is a cooperative effort among SJRWMD, SFWMD, FDEP, and EPA. Three projects were identified for this program:

- Lake Orienta Recharge Well Project (city of Altamonte Springs)
- Urban Street Drainage Treatment Project [Festival Park] (city of Orlando)
- Lake Sherwood Project (Orange County)

SJRWMD is working with the city of Altamonte Springs at the Lake Orienta site. This project originally involved construction of a new recharge well, a treatment system, and monitoring wells on Lake Orienta, which is currently served by lake-level control wells. During early stages of the project an additional existing recharge well was discovered and rehabilitated with FDEP approval. This additional recharge well eliminated the need for a new well. However, the city of Altamonte Springs continues as a willing partner in the investigation. Monitoring of both lake water quality and the receiving-aquifer

water quality was performed prior to and will be performed during and after recharge, to investigate the fate and transport of bacteria in the aquifer.

SJRWMD is working with the city of Orlando at the Festival Park site. This project is similar in scope and objective to the Lake Orienta project except that in this case, an existing street drainage well with no stormwater treatment will be retrofitted with a passive stormwater treatment system and/or a subsurface treatment system to evaluate net water quality benefits. The monitoring associated with this project is complete. Once the results of the monitoring at the Altamonte Springs site are completed, a decision can be made on retrofitting the drainage well.

The proposed Lake Sherwood project that involves comprehensive watershed planning and installation of stormwater pollutant reduction technologies to allow increased recharge volume in an existing lake-level control well without increasing pollutant loading to the aquifer was abandoned because lake levels were too low and projected to remain too low to implement the project.

These projects will provide important data on the fate and transport of constituents introduced into the aquifer via direct recharge as well as provide criteria for the design of aquifer recharge systems, including recharge water pretreatment systems.

The artificial recharge demonstration projects began in 1999 and are scheduled to extend through 2007. Projected total costs for the recharge demonstration projects and the sources of funding are provided in Table 18.

Table 18. Projected total funding amounts and sources for the aquifer recharge demonstration projects phase of Central Florida Aquifer Recharge Enhancement Program (CFARE)

Funding Source	Amount
SJRWMD[1] ad valorem	$2,599,000
SJRWMD[1] Florida Forever	$110,000
SFWMD[2]	$1,581,000
Local cooperators	$1,500,000
Total	$5,790,000

[1]St. Johns River Water Management District

[2]South Florida Water Management District

Phase II—Recharge Enhancement Evaluation and Design

SJRWMD, in cooperation with Orange County, completed Phase II of CFARE in 2004 (PB Water 2004). The results of Phase II include

- Development of a methodology to evaluate the effectiveness of artificial recharge projects in Orange County
- Identification of potential recharge projects in Orange County
- Comparison and ranking of artificial recharge projects in Orange County

The completion of Phase II resulted in the identification of 19 candidate recharge projects in Orange County. The total estimated potential recharge for all 19 projects is 17.6 mgd. The total estimated cost to construct the projects is $74.5 million.

The CFARE Phase II work was completed by PB Water through a contractual agreement with Orange County. The total cost of the work performed by PB Water was $224,055. SJRWMD contributed $112,029 from ad valorem funding to support the work, and Orange County contributed $112,026, the balance of the funding.

A related study was completed in 2004 in cooperation with Seminole County and the cities of Lake Mary and Sanford (CPH Engineers 2004). This study identified a variety of projects to optimize the use of reclaimed water among the three local partners to the study. The project identified opportunities for groundwater recharge using reclaimed water within a designated reclaimed water service area. The designated reclaimed water service area included the cities of Lake Mary and Sanford, and Seminole County's Northeast Reclaimed Water Service Area. The total cost for this study was $100,000. SJRWMD contributed $50,000 in ad valorem funding, and the three local cooperators contributed a total of $50,000.

Phase III—Program Implementation

SJRWMD has identified a number of potential recharge projects in central Florida as a result of the work performed with local cooperators. SJRWMD estimates costs of approximately $81.5 million to implement recharge projects in central Florida through FY 2009. Table 19 shows the projected costs and sources of funding to implement these projects.

Table 19. Projected total funding amounts and sources for recharge enhancement program implementation through FY 2009

Funding Source	Amount
SJRWMD[1] ad valorem	$125,000
SJRWMD[1] Florida Forever	$28,000,000
Local cooperators	$53,380,000
Total	$81,505,000

[1]St. Johns River Water Management District

Many of the projects identified for implementation involve reclaimed water and are located within the Wekiva Study Area as defined in the Wekiva River Basin Coordinating Committee final report dated March 16, 2004 (FDEP 2004). Amendments to the Wekiva Parkway and Protection Act, enacted in 2004, incorporated that definition of the Wekiva Study Area and directed FDEP to study the efficacy and applicability of water quality and wastewater treatment standards needed to achieve nitrogen reductions protective of surface and groundwater quality within the Wekiva Study Area. FDEP completed its study and prepared a report (2004) with recommendations for new wastewater treatment standards for wastewater treatment plants and reclaimed water application systems located in the Wekiva Study Area.

Additional amendments to the Wekiva Parkway and Protection Act, enacted in 2005, authorized FDEP to proceed with the development of new rules as recommended in the 2004 FDEP report. In general, the new rules are anticipated to require lower total nitrogen concentrations in treated wastewater within the Wekiva Study Area. The development of these rules may require some CFARE projects to be modified in the future to achieve lower total nitrogen concentrations. In addition, if some CFARE projects are delayed until after the new rules are adopted, these CFARE projects may not be permittable if they are located in primary protection zones in the Wekiva Study Area. SJRWMD will monitor the development of these new rules and provide FDEP with input during their development.

COOPERATIVE WELL RETROFIT PROJECT

During the *Water 2020* process, the Water Supply Planning Area IV work group, consisting of eastern Putnam County and western St. Johns County, developed a proposed solution to deal with existing and potential future interference problems in eastern Putnam County and southwestern St. Johns County. The history of this issue is discussed in more detail in the Water

Supply Development Component of DWSP 2000. The proposed solutions were successfully implemented in an effort to eliminate interference with existing legal domestic users and avoid the construction of new domestic well systems that are inadequate for producing water during the peak irrigation period. The two-pronged solution developed by the Area IV work group included a remedial component to address problems with existing wells and a regulatory component to avoid the problems with wells constructed in the future, as follows:

Eliminating the Impact of Seasonal Drawdowns on Existing Legal Domestic Users

Each loss-of-flow complaint will be investigated to verify that loss of flow is directly attributable to the drawdown and not to a well system construction, operation, or maintenance problem. If the loss of flow is clearly due to drawdown, the well system will be repaired, and SJRWMD and major area water users will share the cost. This cooperative approach is appropriate, considering the large number of consumptive use permittees whose withdrawals contribute to the interference with existing legal uses.

The funding needed to resolve this water supply issue is modest. A repair of this type typically involves adding a pump between the well and the aerator and/or increasing the length of drop pipe in the well. This type of repair is estimated to cost between $400 and $500 per well.

SJRWMD previously estimated that implementation of this component could impact the continued availability of about 12,500 gallons per day of existing domestic self-supply in the potentially affected areas of St. Johns and Putnam counties. However, SJRWMD has had only a few complaints about loss of flow in these areas over the last several years. These complaints have been investigated and the appropriate system repairs made. SJRWMD does not budget funds for this work because the level of effort and cost for this component have been minor: therefore, there are no projected costs for this effort. However, SJRWMD will continue to investigate and take corrective actions as appropriate.

Avoiding the Construction of Inadequate New Domestic Well Systems

SJRWMD has successfully worked with St. Johns County and Putnam County to develop and implement county ordinances to ensure that new domestic well installations are capable of producing water during the seasonal drawdown events. SJRWMD expended $5,000 in ad valorem funds for this effort, and cooperator funding was approximately $5,000. SJRWMD plans to

pursue the development of like ordinances in the neighboring counties of Clay, Duval, and Nassau.

DEMINERALIZATION CONCENTRATE MANAGEMENT PROJECT

SJRWMD has identified brackish and saline groundwater and surface water as potentially significant sources of supply to meet projected water use. The use of this water will require management of the waste concentrate byproduct from the demineralization process. DWSP 2000 reports SJRWMD's intention to develop management strategies through a cooperative effort with FDEP, EPA, public supply utilities, and other affected parties by taking the following actions:

- Developing acceptable management strategies for demineralization concentrate discharge that can be dependably utilized by public supply utilities and other water users
- Identifying any required technical studies, data collection, or analysis needed to formulate management strategies and monitor the effectiveness of management strategies

Through the aforementioned actions, SJRWMD successfully completed a Demineralization Concentrate Management Plan in September 2003. Reiss Environmental (Reiss) performed the work based on a contractual agreement with SJRWMD.

The plan (Reiss 2003) was based on a districtwide assessment of the suitability for disposal of concentrate by discharge to potential receiving water bodies. The potential receiving waters included surface waters, ocean waters, marine wetlands, and aquifers with a TDS of 10,000 mg/L or greater. The assessment took into consideration the proximity of disposal locations to three potential source waters: (1) brackish groundwater, (2) brackish surface water, and (3) seawater. The results were presented as a series of maps depicting the areas of highest suitability for disposal to each of the receiving water bodies based on the type of demineralization source water. Based on the results of the districtwide assessment, Reiss concluded that disposal of concentrate to the different receiving water body types was suitable at various locations within SJRWMD. However, based on the constraints utilized in the assessment, areas bordering or east of the St. Johns River and in the southern portion of SJRWMD are the most likely locations for future demineralization sites.

The Demineralization Concentrate Management Plan contains a number of recommendations to implement the plan. SJRWMD began work to implement the Demineralization Concentrate Management Plan in FY 2004. That work includes two studies:

1. Potential corrosion problems in injection wells
   This study evaluates the suitability of disposal of demineralization concentrate by subsurface injection using wells constructed in a manner similar to wells used for disposal of domestic wastewater. FDEP generally requires wells used for disposal of demineralization concentrate to be constructed using tubing and packers. This type of well construction is more costly and the disposal capacity is more limiting than a well with a design similar to that of a domestic wastewater injection well. The study concluded that corrosion is a significant potential problem for injection wells with steel casings (L.S. Sims and Associates 2005).
2. The feasibility of concentrate disposal in coastal ocean waters
   This work is an SJRWMD cooperative study with the National Oceanic and Atmospheric Administration (NOAA) to evaluate the feasibility of concentrate disposal in coastal ocean waters. The study consists of an evaluation of the physical offshore characteristics of the ocean that are important to successful integration and dilution of concentrate. These characteristics include ocean currents, water depths, water masses, and ocean floor conditions. This study is anticipated to span several years and is being conducted in coordination with FDEP.

SJRWMD proposes the continued implementation of the Demineralization Concentrate Management Plan by taking the following actions:

- Continue to evaluate cost-effective alternatives for disposal of demineralization by subsurface injection. One option may be to utilize fiberglass or other nonferrous casing materials in the well construction.
- Continue to evaluate the feasibility for disposal of concentrate in coastal ocean waters in coordination with NOAA and FDEP.
- Cooperate with other organizations and utilities that are involved in addressing the regulatory framework for concentrate disposal and in developing feasible alternatives for concentrate management. Examples of such organizations are the Concentrate Management Working Group of the American Society of Civil Engineers and the U.S. Desalination Coalition.

SJRWMD has not made specific estimates of the amount of water to be made available as a result of this project. However, because acceptable concentrate management must be associated with any demineralization project, all existing and future potential brackish groundwater, surface water, and seawater source development could be impacted.

SJRWMD had expended $533,000 in ad valorem funds through FY 2004 for the Demineralization Concentrate Management Project and forecasts total expenditures of $1.878 million in ad valorem funds. SJRWMD forecasts expenditures of another $100,000 from cooperative sources for this project.

FACILITATION OF REGIONAL DECISION-MAKING PROCESS

SJRWMD has identified water supply development project options that are adequate to meet the projected water demands of all users. However, decisions concerning the choice of options by water supply entities may greatly influence the availability of these options for other water supply entities. This is of particular concern for those options that differ significantly in cost, for example, fresh groundwater at a unit production cost typically less than $1.00 per 1,000 gallons and surface water from the St. Johns River at a unit production cost within the range of approximately $2.50 to $3.50 per 1,000 gallons. SJRWMD anticipates that less-expensive fresh groundwater will be the first option of choice for most public supply utilities. However, in east-central Florida, there may be inadequate locally available fresh groundwater to meet all projected demands. The combination of some fresh groundwater, but not enough locally available to meet demands, and the considerably higher cost of development of alternative water supplies, such as surface water and brackish groundwater, sets the stage for competition for the less expensive additional groundwater. Therefore, a regional decision-making process was recommended in DWSP 2000 as a means of avoiding unnecessary and disruptive competition for the water resource.

SJRWMD began work on this effort shortly after the completion of DWSP 2000. Initial efforts were focused on areas identified as PWRCAs in WSA 1998 that included all or part of Brevard, Duval, Flagler, Lake, Orange, Osceola, Putnam, St. Johns, Seminole, and Volusia counties.

As part of this regional decision-making process, SJRWMD has strived to maximize decision-oriented discussions between major water users, particularly public supply utilities. SJRWMD has proactively implemented this regional decision-making process by taking the following actions:

- Coordinating with local government elected officials and staffs to develop plans and schedules for each decision-making effort
- Providing facilitators at SJRWMD's expense
- Providing SJRWMD staff and consultant expertise to support facilitation processes at SJRWMD's expense
- Developing documents that describe each decision-making process and the decisions achieved through each process
- Amending and updating DWSP as necessary to incorporate sustainable water supply development project options identified through decision processes

SJRWMD believes this decision-making process is consistent with the provisions of Section 373.196, F.S., in that it fosters cooperation between counties, municipalities, regional water supply authorities, multijurisdictional water supply entities, special districts, and publicly owned and privately owned water utilities in the development of countywide and multi-countywide alternative water supply projects that will allow for the necessary economies of scale and efficiencies to be achieved in order to accelerate the development of new, dependable, and sustainable alternative water supplies.

SJRWMD facilitation efforts are currently focused on three geographic areas:

- East-central Florida
- Flagler County
- Northeast Florida

East-Central Florida Region

In 2001, SJRWMD facilitated water supply planning efforts for three subgroups of public supply utilities. A subgroup was formed for each of the following areas in east-central Florida:

- Seminole County
- North Lake and south Marion counties
- South Lake, Orange, Osceola, and Polk counties

In 2002, the facilitation process in east-central Florida was elevated to include elected officials from 10 counties in the region. The east-central Florida region includes all or part of Brevard, Lake, Marion, Orange, Osceola, Polk, Seminole, Sumter, and Volusia counties; however, Flagler County was also

involved in this process in 2002. The facilitation process became known as the East-Central Florida Water Supply Planning Initiative (Initiative). Participants in the Initiative identified six water supply related actions and made specific recommendations to carry out these actions:

- Enhance intergovernmental coordination
- Develop new water supply
- Link land use and water supply planning
- Increase use of reclaimed water
- Enhance aquifer recharge using reclaimed water
- Increase water conservation

In November 2002, the results of the Initiative were published as the East-Central Florida Water Agenda (SJRWMD 2002). Participants in the process agreed that the effort should continue into a second phase. Phase II work in 2003 was largely focused on regional water supply development. One of the principal results of the phase II work was the identification of 11 candidate water supply development projects that are included and described in the DWSP 2004 Interim Update (Vergara 2004).

In 2004, phase II work included several new county-level cooperative water supply planning and regional water supply project development efforts:

- SJRWMD facilitated the development of an interlocal agreement for county-level water supply planning in Seminole County. This agreement has been executed, and work is under way. SJRWMD is providing funding to support the effort in the amount of $150,000 during FY 2004-2005 and proposes to provide an additional $150,000 during FY 2005–2006.
- SJRWMD began facilitation efforts to develop a county-level MOU between local governments in Lake County. Following distribution of a draft MOU by SJRWMD's facilitator, local governments decided they preferred to proceed without SJRWMD's facilitation assistance. These governments have developed a proposed MOU that provides for development of a county-level plan. SJRWMD is prepared to provide funding to support this planning effort in the amount of $150,000 during FY 2004–2005 and proposes to provide an additional $150,000 during FY 2005–2006.
- SJRWMD began facilitation efforts for developing a county-level water supply plan in Orange County. However, these efforts were hampered

because of focus on hurricane recovery. A decision concerning additional efforts had not been made at the time of preparation of DWSP 2005.

- SJRWMD, along with SWFWMD, contributed the first of 3 years of funding in support of the Marion County water resource assessment and management study. SJRWMD contributed $60,000 to this study in FY 2004 and budgeted $100,000 for continuation of the work in FY 2005. SJRWMD anticipates contributing another $40,000 to complete this work in FY 2006.
- SJRWMD contributed funding to the newly formed Water Authority of Volusia for the development of a master water facilities plan. SJRWMD contributed $500,000 in FY 2004 and budgeted another $500,000 for this project in FY 2005. The master facilities plan will identify the water supply facilities needed to supply projected water use in Volusia County over the next 20 years.

Phase II work continued in 2004 and 2005 in the following areas:

- Taylor Creek Reservoir Expansion Project

SJRWMD facilitated discussions to create a regional partnership for development of the Taylor Creek Reservoir Expansion Project, which was identified as a water supply development project in the DWSP 2004 Interim Update. The project is identified in the Water Supply Development Component of this document as the St. Johns River / Taylor Creek Reservoir Water Supply Project. This project proposes to divert water from the St. Johns River into Taylor Creek Reservoir for storage and water supply. Participants in the initial planning for this project included the cities of Clermont, Cocoa, Orlando, Minneola, and Titusville, East Central Florida Services / Deseret Ranch, Orange County, Orlando Utilities Commission, Reedy Creek Improvement District, and Toho Water Authority. SJRWMD kept the cities of Groveland and Mascotte informed of the proceedings; however, these cities did not actively participate. A proposed memorandum of agreement between the partners had been approved by all eight partners at the time this document was prepared.

- Integrated Water Supply Alternatives Study

The city of Cocoa, Reedy Creek Improvement District, Orange County, and Toho Water Authority worked cooperatively to define a study that would identify water supply alternatives for themselves and possibly other public supply utilities in the region. SJRWMD and SFWMD reviewed the proposed scope of services, the estimated costs, and the project timeline. The study began in FY 2005 and should be completed by FY 2007.

The facilitation support for Lake, Marion, and Seminole counties is probably a 2- to 3-year total effort in each county; therefore, it is anticipated that the associated planned work will be completed for these counties by FY 2008. SJRWMD anticipates that projects identified through these efforts will be added to DWSP 2010 or an earlier interim update.

SJRWMD is not budgeting additional dollars for the Water Authority of Volusia beyond FY 2005; however, the work to complete the master facilities plan will not be completed until FY 2006.

SJRWMD may have some role in Taylor Creek Reservoir for as long as FY 2010; however, the time required to complete this effort is uncertain at this time.

SJRWMD funds to support this effort are ad valorem funds; however, SJRWMD has also applied for STAG funding for the Taylor Creek Reservoir Project.

The East Central Florida Planning Initiative was considered completed in December 2005, and future work efforts that came out of the Initiative described here were continued as separate project efforts (SJRWMD 2005).

Flagler County

In 2004 and 2005, SJRWMD facilitated the development of an MOU for countywide water supply planning in Flagler County. All governments in Flagler County are parties to this MOU, which provides for development of a water supply plan for the Flagler County area with funding provided by SJRWMD.

SJRWMD has also facilitated regularly occurring water utility managers' meetings in Flagler County since 2001. This group includes the cities of Bunnell, Flagler Beach, Ormond Beach, Palm Coast, and Marineland, the Dunes Community Development District, Flagler County, the Flagler County Utility Regulatory Authority, Palm Coast Community Services Corporation, and the Palm Coast Utility Advisory Committee. The main purpose of these meetings has been to provide public supply utilities and SJRWMD a forum to identify and discuss water supply related issues and concerns. The utility managers' meetings were discontinued when all parties signed the MOU.

Northeast Florida

SJRWMD has also facilitated regularly occurring water utility managers' meetings in northeast Florida since 2001. Members of this group include JEA, the cities of Atlantic Beach, Fernandina Beach, and Jacksonville Beach, Clay County Utility Authority, Nassau County, Putnam County Utilities, St. Johns County Utilities, and the U.S. Naval Air Station. As in Flagler County, the main purpose of these meetings is to provide public supply utilities and SJRWMD a forum to identify and discuss water supply related issues and concerns.

In addition to facilitating discussions among public supply utilities in northeast Florida, SJRWMD has been coordinating with the state of Georgia for more than 10 years on water resource issues in northeast Florida and southeast Georgia. In 2003, SJRWMD began a more formal facilitated discussion with the state of Georgia to address water supply issues concerning the Floridan aquifer. The primary goals of these facilitated discussions were to provide a forum for clear communication and identification of issues and concerns, as well as to ensure coordination between agencies in data collection, data sharing, methodologies, and the development of regional groundwater flow models. This formal facilitation effort has been discontinued, but regular coordination between SJRWMD and the Georgia Environmental Protection Division is expected to continue.

FEASIBILITY OF SEAWATER DEMINERALIZATION PROJECTS

DWSP 2000 identified SJRWMD's intention to investigate the technical, environmental, and economic feasibility of seawater demineralization projects. This feasibility investigation, which is under way, includes an evaluation of

- Available technologies
- Potential sites, including sites on the Atlantic Ocean and along the Atlantic Intracoastal Waterway system, with special emphasis on opportunities to co-site with an electric power plant
- Demineralization concentrate management
- Costs

SJRWMD considers seawater demineralization to be a technically feasible option. However, because the costs for desalting seawater are generally higher than other water supply options, SJRWMD believes that seawater may

not be developed as soon as some other potential alternative sources because of its relatively higher cost. However, it is reasonable to assume that significant quantities of seawater will be developed as a water supply source within SJRWMD in the future.

Seawater demineralization technology is continually advancing, and the relative cost between seawater and other alternative public supply sources will likely continue to narrow in the future. Coastal areas are more likely than inland areas to develop seawater resources. Special case situations, such as locating a seawater desalting plant with an electric power plant, may make this alternative water supply source competitive with the development of other alternative sources.

SJRWMD contracted with R.W. Beck to evaluate the feasibility of seawater demineralization in SJRWMD. R.W. Beck performed the study in conjunction with Parson Brinkerhoff Quade and Douglas and PBS&J. R.W. Beck's final report for the seawater demineralization feasibility investigation was completed in January 2004. Additional documents completed by R.W. Beck for this study include

- Demineralization treatment technologies (2002a)
- Criteria for preliminary screening of areas for potential seawater demineralization facilities (2002b)
- Applicable rules and regulations for seawater demineralization (2002c)
- Seawater demineralization annotated bibliography (2002d)
- Ranking matrix for potential seawater demineralization sites (2002e)
- Identification of favorable sites for feasible seawater demineralization (2003a)

Based on the screening criteria used for the feasibility study, R.W. Beck identified five sites that have significant potential for the development of a seawater demineralization facility:

1. Indian River Power Plant (owner: Reliant Energy Indian River, LLC)
2. Cape Canaveral Power Plant (owner: Florida Power and Light
3. Daytona Beach / Bethune Point Wastewater Treatment Plant (owner: city of Daytona Beach) Note: The city of Daytona Beach has developed plans to reuse the wastewater produced at this facility. Implementation of these

plans would likely render a demineralization project at this location infeasible.

4. W.E. Swoope Generating Station Power Plant (owner: New Smyrna Beach Utilities Commission)
5. Northside Power Plant (owner: JEA)

After completion of the final report, SJRWMD received comments from local governments and the public concerning the environmental feasibility of the sites located at the Indian River and Cape Canaveral power plants. The demineralization facilities proposed by R.W. Beck for these two sites would discharge the demineralization concentrate into the Indian River Lagoon. SJRWMD received comments expressing concern that discharge of concentrate into the Indian River Lagoon might cause harmfully excessive salinity levels in the lagoon.

Although R.W. Beck considered screening level environmental issues in its ranking of potential sites, it did not address site-specific environmental issues. Therefore, SJRWMD began a study in FY 2004 to evaluate potential salinity issues in the Indian River Lagoon related to the operation of seawater demineralization facilities at the Indian River and Cape Canaveral power plant sites.

SJRWMD proposes the following actions in connection with the Feasibility of Seawater Demineralization project:

- Pursue completion of the Indian River Lagoon Salinity Study in cooperation with the Brevard Water Supply Board and FDEP.
- Promote the feasibility of seawater demineralization in SJRWMD by continuing membership in the U.S. Desalination Coalition and participating in its associated activities.

SJRWMD had expended $485,000 in ad valorem funding for this project through FY 2004. SJRWMD projects total expenditures of $2.26 million for this project through FY 2009, with $1.46 million coming from ad valorem funding and $800,000 from cooperative sources.

HYDROLOGIC DATA COLLECTION AND ANALYSIS

SJRWMD has identified the need for hydrologic data collection and analysis in association with required 5-year revisions of DWSP and in association with

DWSP implementation. Based on this need, SJRWMD proposes the following data collection and analysis efforts.

SJRWMD's Hydrologic Data Collection Network

SJRWMD operates and maintains a hydrologic data collection network. This network provides a source of valuable hydrologic information for rainfall, evapotranspiration, surface water and groundwater flows, levels, and groundwater quality. SJRWMD proposes the following actions in association with this effort:

- Maintain the existing hydrologic network, making changes as necessary based on site evaluations, consideration of changing information needs and budget constraints.
- Utilize the information developed in the adaptive management project to select and construct monitoring systems for the surficial aquifer system within the groundwater model domains.
- Continue to improve the Upper Floridan aquifer monitoring network, as funds are available, pursuant to the geostatistical analysis completed by SJRWMD in 2000 (Osburn 2000).
- Construct additional Lower Floridan aquifer monitor wells, as funds are available, to augment SJRWMD groundwater flow modeling capabilities.
- Work cooperatively with the other WMDs and USGS to develop a network capable of measuring solar radiation for the purposes of determining amounts of potential and actual evapotranspiration rates throughout the state.

Water Use Data Management

SJRWMD collects, manages, and analyzes water use data in association with its water supply assessment and water supply planning efforts. SJRWMD's water use data management project includes verification of the location of public supply and other SJRWMD permitted wells and water treatment plants, mapping of public supply, wastewater and reclaimed service area boundaries, and development of population and water use projections for categories examined in the water supply assessment. SJRWMD proposed the following five actions in association with this effort in DWSP 2000:

1. Continue the water use data management program.

2. Expand the well and water treatment plant inventory to include all public supply utilities using at least 0.1 mgd; include country clubs with a resident population in the public supply water use category.
3. Continue efforts to make water use information available to internal and external customers, using SJRWMD's database and Internet systems.
4. Continue coordination with SJRWMD permitting staff to assure consistency between water use projections and permit allocations.
5. Develop water use projections for public supply at the water treatment plant level and, if possible, at the well level.

Actions 1, 3, and 4 are ongoing SJRWMD efforts. Action 2 was accomplished since completion of DWSP 2000. Action 5 was pursued during the 2003 water supply assessment process but was not fully accomplished. Work is continuing on this action.

SJRWMD proposes the following four actions for water use data management that include three actions that were described in DWSP 2000 and one additional action:

1. Continue the water use data management program.
2. Continue efforts to make water use information available to internal and external customers, using SJRWMD's database and Internet systems.
3. Continue coordination with SJRWMD permitting staff to assure consistency between water use projections and permit allocations.
4. Continue to work closely with public supply utilities to develop the best data sets and methodologies to utilize in water supply assessment and planning.

Hydrology of Native Plant Communities

SJRWMD recognizes the need to determine the hydrologic conditions associated with native plant communities that have not been impacted by groundwater withdrawals, surface water diversions, or other human-induced activities that would alter the natural character of the communities. SJRWMD operates and maintains a network of native vegetation monitoring sites located in native plant communities that have not been impacted by water use. Surficial aquifer monitor wells have been installed at each site for the collection of groundwater level data. In addition to groundwater level data, vegetation and soils data are collected at the sites. The network was installed in 1995 and consists of approximately 85 wells. Monitoring occurred at all

sites through 2000, and has continued to the present at most sites. SJRWMD is preparing a report documenting the results of the monitoring at all sites during the 5-year period from 1995 to 2000. The report will document the natural range of water level fluctuations in each of several native plant communities. SJRWMD plans to use the information from this report to assist with the development of MFLs for native plant communities in a variety of wetlands. SJRWMD proposes the following actions in association with this effort:

- Continue to operate and maintain the monitoring network.
- Analyze data and prepare written reports of analyses at 5-year intervals.

Groundwater Modeling

SJRWMD relies heavily on the use of groundwater models for evaluation of hydrologic data in association with its water supply planning effort. These groundwater models include regional-scale groundwater flow models, local-scale analytical flow models, and regional and subregional groundwater quality models.

SJRWMD regional groundwater flow models are currently capable of simulating only steady-state conditions. Development of transient calibrations for these regional groundwater flow models will allow for the simulation of time-varying conditions in the aquifer. The simulation of smaller time-steps than that represented by the steady-state condition can lead to improved model calibration and thus to improved confidence in SJRWMD's predictive simulations. In addition, simulation of smaller time-steps will aid in assessing the response time of water levels to pumping stresses. SJRWMD proposes the following actions in association with this effort:

- Develop a transient version of the northeast Florida regional groundwater flow model to simulate hydrologic conditions from years 1995 to 2000 for water supply planning and water use permitting purposes. With those results, perform transient predictive simulations.
- Cooperate with the Georgia Environmental Protection Division and USGS on interstate groundwater issues in northeast Florida and southeast Georgia.
- Cooperate with SFWMD and SWFWMD to develop and implement a groundwater modeling strategy for the east-central Florida area that will

meet the needs of the three WMDs. At a minimum, the following elements shall be considered in development of this strategy:

- Development of the transient east-central Florida regional groundwater flow model to be used in the water supply planning and water use permitting processes

o Development of integrated groundwater/surface water transient models for specific areas within the east-central Florida area where hydrologic and hydrogeologic conditions warrant such a model

o Improve the decision models associated with the east-central Florida and Volusia regional groundwater flow models based on flow model revisions, as necessary.

o Develop a transient version of the Volusia Regional Groundwater Flow Model to simulate hydrologic conditions for water supply planning and water use permitting purposes. With those results, perform transient predictive simulations.

o Develop a smaller localized model of the Blue Spring groundwater contributing area to conduct a more detailed evaluation of karst aquifer flow processes and the implications to water use permitting and minimum flows and levels programs.

o Continue to develop the groundwater/surface water integrated model for the coastal area of Volusia County by adding a groundwater quality component to the model.

- Complete the steady-state version of the Flagler/Palm Coast Subregional Groundwater Flow Model and the transient version of that model and simulate hydrologic conditions for water supply planning and water use permitting purposes. Perform transient predictive simulations.
- Develop a transient version of the North-Central Florida Regional Groundwater Flow Model to simulate hydrologic conditions from years 1995 to 2000 for planning and water use permitting purposes. With those results, perform transient predictive simulations.
- Maintain close coordination with USGS and the other WMDs concerning the MEGA model to ensure appropriate incorporation of boundary conditions in future predictive scenarios.
- Assess the need to develop local-scale groundwater flow and water quality models in association with proposed new wellfield sites identified as a result of the regional decision-making process; develop these models as deemed necessary.

Surface Water Modeling

SJRWMD relies heavily on the use of long-term surface water simulation models to evaluate water management alternatives in association with its consumptive use permitting and water supply planning efforts. These models use data such as rainfall, evaporation, land use, and soils in order to simulate a range of hydrologic conditions needed to properly assess any water management alternatives. The output from these models is used to compare water management alternatives with established MFLs on individual water bodies across SJRWMD.

SJRWMD proposes to take the following actions in association with this effort:

- Continue development of surface water models for water bodies with established or proposed to be established MFLs.
- Provide support to SJRWMD's consumptive use permitting program.
- Provide support necessary to evaluate alternative water supply sources such as the St. Johns River and Taylor Creek Reservoir.

Integrated Decision Modeling

SJRWMD, in cooperation with the University of Florida's Center for Applied Optimization, has developed and used decision models to assist in its water supply planning efforts in the east-central Florida and Volusia regional groundwater flow model areas. These models allow SJRWMD and water supply planning groups to identify possible regional water supply solutions based on the integration of water resource impact criteria, cost, and other considerations such as sociopolitical or regulatory restrictions. These models are based on the regional groundwater flow models and must be revised as the flow models are updated and revised. SJRWMD proposes to take the following actions in association with this effort:

- Improve the decision models associated with the east-central and Volusia regional groundwater flow models based on changes to the flow models.
- Assess the need to develop a decision model for the remaining regional and sub-regional groundwater flow models used by SJRWMD. Develop these models as deemed necessary.

Conserve Florida Water Conservation Information Clearinghouse

SJRWMD is a participant in the development of a comprehensive statewide water conservation program for public water supply. This effort includes FDEP, the five WMDs, the Florida Rural Water Association, and organizations representing public water supply utilities. As part of this effort, the development of a clearinghouse for water conservation information is planned. SJRWMD proposes to support this effort in hopes that it will provide information valuable to determining the cost and effectiveness of various water conservation approaches. This project is included in the Other Projects section of the Water Supply Development Component of this document.

INVESTIGATION OF THE AUGMENTATION OF PUBLIC SUPPLY SYSTEMS WITH LOCAL SURFACE WATER/STORMWATER SOURCES

Much effort is being focused on developing alternative water supplies from surface water bodies that have the potential to produce relatively large quantities of water. The St. Johns River is such a source. These surface water sources are often remote from the service areas where the water will be used; thus, considerable transport costs may be incurred.

Smaller quantities of surface water supplies may be available within a public supply service area. The sources of these supplies may include storm water, dewatering / drainage canals, naturally occurring or manmade water bodies, etc. Although these sources of supply may be relatively small, with adequate storage and treatment they could provide important supplemental water supplies to public supply systems.

Through this water resource development project, SJRWMD and cooperating public supply utilities will investigate the feasibility of developing local surface water sources. This investigation will address technical, environmental, and economic feasibility considerations. At the time of preparation of DWSP 2005, SJRWMD had identified only one project for inclusion in this investigation, the Bracco Reservoir Project. SJRWMD anticipates the identification of additional, similar projects for investigation in future years.

Bracco Reservoir Project

Bracco Reservoir is located in the public supply service area of the City of Cocoa. The reservoir consists of a series of storm water detention ponds, used

as a source of water to augment the City of Cocoa's reclaimed water system. The City of Cocoa proposes to study, and then to construct and operate (if feasible), a small (2–4 mgd) treatment facility. This facility would incorporate multiple barriers and modern treatment technologies to produce potable water from localized sources of runoff. Treatment options may include bank filtration, primary disinfection using ozone or UV radiation, membrane or conventional filtration and secondary disinfection.

This project would address the extent to which localized treatment could add another alternative source of supply to supplement the primary sources of public supply when excess runoff is available. The information generated by the project should be applicable districtwide.

The first phase of this project includes a bench-top study to characterize water quality and expected contaminants from Cocoa's Bracco Reservoir system and a review of applicable regulatory requirements. The cost of this phase is estimated at $40,000 and should require six months to perform.

The second phase would include additional water quality sampling, and a treatability study and economic feasibility analysis. The cost of this phase is estimated at $400,000 and should require one year to perform.

The third and final phase would include the design, permitting, construction and operation of a demonstration treatment facility. The cost of this phase is estimated at $5,000,000 and should require two and one half years to design, permit and construct, with another three to five years to operate and monitor.

LAKE APOPKA BASIN WATER RESOURCE DEVELOPMENT PROJECT

SJRWMD has been working on the restoration of Lake Apopka since 1985. More recently, SJRWMD has identified the need for additional water supplies in the vicinity of the lake. The City of Apopka has identified Lake Apopka as a potential source of water to provide water to its reclaimed water service area. Apopka has identified an immediate need for approximately 2 mgd average annual daily flow (AADF) to augment the city's reclaimed water system. Apopka estimates that it will need an additional supply of approximately 8 mgd AADF for its reclaimed water system by the year 2010 and an additional 16 mgd by 2020. The city of Clermont has also expressed an interest in developing a reclaimed water supply from Lake Apopka.

District staff have begun evaluating the potential for developing water supplies from Lake Apopka while still achieving lake restoration goals. The

first phase of the Lake Apopka Basin Water Resource Development Project will include evaluation of the potential water supply yield from the lake. It is anticipated that project work components will include

- Hydrologic modeling
- Evaluation of alternative lake regulation schedules
- Evaluation of storage augmentation options
- Evaluation of potential impacts of management options
- Identification of potential water users including the timing and locations of withdrawals

SJRWMD plans to begin work on this project in fiscal year 2006.

Should a suitable project be identified as a result of this evaluation phase, a project implementation phase will likely be recommended. The details of this implementation phase would be reported in updates to DWSP 2005 and in future water resource development work program documents.

LOWER LAKE LOUISE WATER CONTROL STRUCTURE PROJECT

This project is an element of the recovery strategy for Lower Lake Louise, which is not meeting its established MFLs. The Minimum Average Level is not being met primarily due to a pre-existing outlet canal. SJRWMD proposes to work cooperatively with the Volusia County Council to design and construct an operable weir that that will slightly raise the water level of the lake so that the Minimum Average Level will be met.

TREATABILITY OF ALGAL TOXINS USING OXIDATION AND ADSORPTION

Algal blooms produced by *cyanobacteria* (blue-green algae) and the subsequent release of algal toxins is an emerging water supply issue. Previous studies have indicated the presence of both *cyanobacteria* and algal toxins in Florida surface waters. A study to determine the treatability of the St. Johns River was conducted from 2001 through 2004 but did not include testing for the treatability of algal toxins. This $665,000 study, a tailored collaboration among SJRWMD, The American Water Works Association Research Foundation, the cities of Cocoa and Melbourne, and CH2M Hill, has two parts:

- Raw water *cyanobacteria* and algal toxin occurrence
- Treatment of the algal toxins

The raw water testing includes enumeration and characterization of the blue-green algae during algal bloom events as well as characterization of the algal toxin produced during the bloom. The treatment of the algal toxins will evaluate removal through membranes, oxidation with ozone, and adsorption to granular activated carbon (GAC). The toxin treatment studies will be conducted on a bench-scale level. The study will identify which of the 3 advanced technologies work best for algal toxin treatment as well as report the typical design parameters necessary to achieve the desired level of toxin removal. The study is expected to be complete in September 2006.

UPPER ST. JOHNS RIVER BASIN PROJECT

The Upper St. Johns River Basin extends from the headwaters of the St. Johns River in Indian River and Okeechobee counties to the confluence of the St. Johns and Econlockhatchee rivers in Seminole County. The basin originally contained more than 400,000 acres of floodplain marsh. The Upper St. Johns River Basin Project began in the 1950s as a flood control project. By the early 1970s, 62% of the original floodplain marsh area had been drained for agricultural and flood control purposes. Canals had been constructed to divert floodwaters from the basin to the Indian River Lagoon. Impacts included a loss of water storage areas, diminished water quality, excessive freshwater going into the Indian River Lagoon, and significant decreases in fish and wildlife populations. The marsh that remained was further degraded by hydrologic alterations and nutrients in agricultural runoff.

Concerns about environmental degradation led to a comprehensive review of the project beginning in the early 1970s. Environmental restoration goals were added to the project in the 1980s. The upper basin project is now a semi-structural system of water management areas, marsh conservation areas, and marsh restoration areas covering 166,500 acres in Indian River and Brevard counties. The system is designed to reduce damage from floods, improve water quality, reduce freshwater discharges to the Indian River Lagoon, provide some water supplies, and restore or enhance wetland habitat.

SJRWMD began studies in the 1990s to evaluate the potential of the St. Johns River as an alternative source for additional public water supplies. These studies were largely driven by the need to develop additional water supplies for the east-central Florida region where traditional groundwater supplies

were nearing sustainable limits. The studies have indicated that there is a significant potential to develop additional public water supplies from the St. Johns River.

SJRWMD has identified a number of potential water supply development projects that could divert water from the St. Johns River for public water supplies. These projects were identified in the DWSP 2004 Interim Update. The Taylor Creek Reservoir Expansion Project (now referred to as the St. Johns River / Taylor Creek Reservoir Water Supply Project) is one of these projects. As currently envisioned, the St. Johns River / Taylor Creek Reservoir Water Supply Project would involve expansion of the existing Taylor Creek Reservoir water supply system, which is owned and operated by the city of Cocoa. It would require diversion facilities to transport raw water from the St. Johns River to the Taylor Creek Reservoir as well as additional treatment facilities. Raw river water would be diverted for both water supply and augmentation of Taylor Creek to avoid any adverse impacts to the Taylor Creek floodplain. Diversion facilities would include a raw water pumping station and a pipeline.

By 2004, a number of utilities in east-central Florida were involved in discussions with SJRWMD concerning development of the St. Johns River / Taylor Creek Reservoir Water Supply Project. Because of the level of interest in this project, the potential demand for water from the project may exceed the supply of water available from the river. Based on the interest that has been expressed in developing the St. Johns River / Taylor Creek Reservoir Water Supply Project, SJRWMD has begun looking at the potential to provide additional water supplies from the river by optimizing the operation and management of the Upper St. Johns River Basin Project. SJRWMD is proposing to add water supply as a third goal for the Upper St. Johns River Basin Project. The addition of water supply to the Upper St. Johns River Basin Project would significantly enhance the value of the project to the people of Florida while continuing to provide the flood control and restoration benefits of the project.

SJRWMD is proposing to expand the Upper St. Johns River Basin Project into a fully integrated, multi-objective water resource development project. SJRWMD anticipates that it will need to complete a number of tasks in conjunction with this effort. The scope of the effort has not been fully developed, but it is anticipated that the work will include

- Evaluation of the yield of the St. Johns River under current management practices

- Identification of alternative management strategies, including operating schedules and storage options
- Optimization of alternative management strategies
- Coordination with federal, state, and local government agencies
- Environmental analyses and permitting
- Addition of storage, structural improvements, and operating capacity

Preliminary estimates of additional water supply yield from the project suggest that it may be possible to develop an additional 25 mgd or more from the Upper St. Johns River Basin Project. SJRWMD currently estimates a cost of $10 to $15 million to complete the work. However, the scope of this project has not been fully developed, and therefore, these costs are preliminary.

WETLAND AUGMENTATION DEMONSTRATION PROGRAM

Augmentation of water levels in wetlands is one approach to avoid wetland impacts resulting from lowering of adjacent surficial aquifer water levels. Although this technique could be used to offset or avoid some of the undesirable impacts of groundwater withdrawals, operational experience is limited. The purpose of the impact-avoidance demonstration program is to initiate and monitor several wetland hydration projects to generate a monitoring, design, construction, and operational history that can be used in future water supply planning to fully evaluate this technique as an alternative water supply development strategy.

The feasibility of avoiding wetland impacts through hydration was assessed in SJRWMD's alternative water supply strategies investigation. The wetlands augmentation demonstration program is a continuing phase of the alternative strategies investigations documented by CH2M HILL (1997b).

The wetland augmentation demonstration program is a cooperative effort between SJRWMD and participating water supply utilities. Four demonstration projects have begun and are included in the current program:

- Project 1—Tillman Ridge wellfield, St. Johns County
- Project 2—Bennett Swamp, Volusia County
- Project 3—Port Orange wellfield, Volusia County
- Project 4—City of Titusville wellfield (Parkland Wetland), Brevard County

A fifth project, Project 5; city of Sanford wellfield, Seminole County, was listed in DWSP 2000, however, this project never came to fruition due to land availability issues and is no longer being pursued.

By the end of 2005, the Tillman Ridge project was in the fourth year of augmentation, the Bennett Swamp project was in the second year of augmentation, and the Port Orange and Titusville projects were each in the third year of augmentation.

Information provided from each wetland augmentation demonstration project will be useful in ascertaining the potential cost and effectiveness of this technology as a water supply and environmental management alternative. The specific quantity of additional groundwater that might be made available for withdrawal and use as a result of this demonstration project cannot be determined prior to completion of the demonstration projects.

SJRWMD had expended $974,000 in ad valorem funds on these projects through FY 2004, and estimates a projected total expenditure of $2.09 million in ad valorem funds through the planned completion of the projects in FY 2009.

WATER RESOURCE DEVELOPMENT COMPONENTS OF WATER SUPPLY DEVELOPMENT PROJECTS

This water resource development effort is a new addition to DWSP. SJRWMD recognizes that many of the water supply development projects identified in DWSP 2005 will include components that may be eligible for funding pursuant to the Florida Forever Act. Section 259.03(6), F.S., defines projects that are eligible for funding under the Act:

> *"Water resource development project" means a project eligible for funding pursuant to s. 259.105 that increases the amount of water available to meet the needs of natural systems and the citizens of the state by enhancing or restoring aquifer recharge, facilitating the capture and storage of excess flows in surface waters, or promoting reuse. The implementation of eligible projects under s. 259.105 includes land acquisition, land and water body restoration, aquifer storage and recovery facilities, surface water reservoirs, and other capital improvements. The term does not include construction of treatment, transmission, or distribution facilities.*

Based on the statutory definition, SJRWMD has identified five categories of water resource development components that appear to be eligible for funding under the Florida Forever Act. These categories are

- Surface water intake facilities to capture excess surface water flows
- Storage reservoirs to store excess surface water flows
- Aquifer storage and recovery facilities
- Groundwater recharge facilities
- Land acquisitions associated with these water resource development facilities

SJRWMD anticipates that a number of the water supply development projects included in this DWSP will include one or more of these water resource development components. A summary of the anticipated water resource development components associated with each of the water supply development projects is provided in Table 20.

FUNDING STRATEGY FOR WATER RESOURCE DEVELOPMENT PROJECTS

SJRWMD follows a general funding strategy for water resource development projects that is based on the use of a combination of Florida Forever funds provided by SJRWMD and funds provided by cooperating water supply entities for projects that are eligible for Florida Forever funds. For water resource development projects that are not eligible for Florida Forever funds, ad valorem funds and, as appropriate, funds provided by cooperating water supply entities are used.

For projects that are eligible for Florida Forever funds, SJRWMD may fund up to 50% of the total project cost with Florida Forever funds, but not more than the portion of the project that is eligible for Florida Forever funds.

Table 20. Potential water resource development components of water supply development projects

Water Supply Development Project	Water Resource Development Components				
	Intake Facilities	Off-Line Storage	ASR System	Aquifer Recharge	Land
DeLand Reclaimed Water and Surface Water Augmentation System	●	●		●	●
Eastern Orange and Seminole Counties Regional Reuse Project					
East Putnam Regional Water Supply System					
Indian River Lagoon at FP&L Cape Canaveral Power Plant			●		●
Indian River Lagoon at Reliant Energy Power Plant	●		●		●
Intracoastal Waterway at New Smyrna Beach	●		●		●
Lake Apopka Reuse Augmentation	●	●			●
Leesburg Reclaimed Water Reuse					
Lower Ocklawaha River in Putnam County	●				●
Minneola Reclaimed Water Reuse Project				●	●
North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project	●	●		●	●
Ormond Beach North Peninsula Reclaimed Water Storage Project		●			
Port Orange Reclaimed Water Reservoir and Recharge Basin		●		●	
St. Augustine Water Supply Project					
St. Johns County Water Supply Project					
St. Johns River Near SR 50	●	●	●		●
St. Johns River Near Lake Monroe	●	●	●		●
St. Johns River Near DeLand	●	●	●		●
St. Johns River Near Lake George	●	●	●		●
Taylor Creek Reservoir/St. Johns River	●	●	●		●

[1]Potentially need to add additional pumping equipment to supplement existing pumping capability.

RECOMMENDATIONS

SJRWMD has developed strategies for implementation of this DWSP. These implementation strategies are included in the following categories:

- Minimum flows and levels
- Water supply development projects
- Water resource development projects
- Consumptive use permitting process
- Intergovernmental, water supplier, and public coordination

Following is a discussion of the strategies by category.

MINIMUM FLOWS AND LEVELS

SJRWMD's MFLs program is described in the Minimum Flows and Levels chapter of this document. SJRWMD annually publishes an approved priority list and a schedule for establishment of MFLs for water bodies on the priority list. The current priority list and schedule has been published in the *Florida Administrative Weekly*.

Proposed Action

- Consider water supply sources identified in DWSP 2005 during the annual update to SJRWMD's Priority List and Schedule for the establishment of MFLs.
- Continue with the establishment of MFLs in accordance with the approved priority list and schedule.
- Perform ongoing monitoring and periodic re-evaluation of MFLs.
- Develop and refine groundwater and surface water models, including an interface between ground and surface water models, where appropriate, to predict if water withdrawals will cause water levels and flows to fall below established MFLs.
- Implement the general and specific prevention strategies identified in the Minimum Flows and Levels chapter of this document for those water bodies that likely would not meet established MFLs through 2025 if all proposed water use through 2025 were implemented.

- Implement specific recovery strategies for Lower Lake Louise in Volusia County as described in the Minimum Flows and Levels chapter of this document.

WATER SUPPLY DEVELOPMENT PROJECTS

DWSP 2005 identifies the following 60 water supply development project options.

Brackish Groundwater Projects

1. Dunes Community Development District Brackish Groundwater Project
2. East Putnam Regional Water System Project
3. Melbourne Reverse Osmosis (RO) Water Treatment Plant Expansion Project
4. Ormond Beach Water Treatment Plant Expansion Project
5. St. Augustine Water Supply Project
6. St. Johns County Water Supply Project

Surface Water Projects

7. Lower Ocklawaha River in Putnam County Project
8. St. Johns River Near SR 50 Project
9. St. Johns River Near Lake Monroe Project
10. St. Johns River Near DeLand Project
11. St. Johns River Near Lake George Project
12. St. Johns River / Taylor Creek Reservoir Water Supply Project

Seawater Projects

13. Indian River Lagoon at FP & L Cape Canaveral Power Plant Project
14. Indian River Lagoon at Reliant Energy Power Plant Project
15. Intracoastal Waterway at New Smyrna Beach Project

Reuse Projects

16. Alafaya Reclaimed Water Storage and High Service Pump Project
17. Altamonte Springs and Apopka Project RENEW APRICOT

18. Apopka and Winter Garden Reuse Partnership Project
19. Belleview and Spruce Creek Golf Course Reclaimed Water System Expansion Project
20. Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II
21. Clermont Reclaimed and Stormwater System Expansion Project
22. Cocoa and Rockledge Reclaimed Water Line Connection Project
23. Daytona Beach Reclaimed Water System Project
24. DeLand Reclaimed Water and Surface Water Augmentation Project
25. Eastern Orange and Seminole Counties Regional Reuse Project
26. Edgewater Reclaimed Water System Interconnection to Southeast Volusia County Project
27. Eustis Reclaimed Water System Expansion and Augmentation Project
28. Flagler County Bulow Reclaimed Water System Project
29. Holly Hill and Ormond Beach Reclaimed Water System Expansion Project
30. Lady Lake Reclaimed Water System Project, Phase II
31. Lake Utility Services (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water System Expansion Project
32. Leesburg Reclaimed Water Reuse Project
33. Melbourne Reclaimed Water System Expansion Project
34. Minneola Reclaimed Water Reuse Project
35. Mount Dora Country Club Golf Course Reclaimed Water Project
36. North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project
37. Ocoee Reuse System Expansion Project
38. Orange County Northwest Reclaimed Water System Augmentation Project
39. Orange County Southeast Reclaimed Water System Expansion Project
40. Orlando Utilities Commission Project RENEW
41. Ormond Beach North Peninsula Reclaimed Water Storage Project

42. Ormond Beach South Peninsula Reclaimed Water System Improvement Project
43. Palm Coast Reclaimed Water System Expansion Project
44. Port Orange Airport Road Reclaimed Water Transmission Main Project
45. Port Orange Pioneer Trail Storage and Pumping Facility Project
46. Port Orange Reclaimed Water Reservoir and Recharge Basin Project
47. Rockledge Reclaimed Water Storage Project
48. Rockledge Reclaimed Water System Expansion – ASR Project
49. South Daytona Reclaimed Water System Expansion Project
50. Tavares Reclaimed Water System Expansion Project
51. Volusia County Southwest Reclaimed Water System Project
52. West Melbourne Above Ground Reclaimed Water Storage Tank Project
53. Winter Garden Reclaimed Water Pumping and Transmission Project

Reuse Augmentation Projects

54. Lake Apopka Reuse Augmentation Project
55. Seminole County Yankee Lake Reclaimed Water System Augmentation Project
56. University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project
57. Winter Park Windsong Stormwater Reuse Demonstration Project
58. Winter Springs Lake Jesup Reclaimed Water Augmentation Project

Other Projects

59. Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project
60. Holloway Farms Agricultural Irrigation Rainwater Collection System Project

Proposed Action

- Continue to assist in identifying water supply development project options through the ongoing county-level planning efforts, direct

communications with water supply entities, and other means as appropriate.

- Complete timely and regular updates of DWSP as needed to incorporate additional water supply development projects.

SJRWMD should allocate funds available through WPSP to cost-share on alternative water supply development projects that have the greatest certainty in supplying the projected demands through the 2025 planning horizon, such that

- Existing or projected water resource problems associated with PWRCAs are solved or avoided

- Identification of PWRCAs is avoided

Thus, SJRWMD's priority in funding support should be for projects that will provide significant quantities of new, naturally occurring, sources of water to users within PWRCAs or within areas that would otherwise be designated as PWRCAs.

- Assist in implementing water supply development projects through technical assistance and other cooperative funding approaches.

OTHER WATER SUPPLY PROJECTS

In addition to water supply development projects, SJRWMD has identified projects that will provide water supply benefits but that do not qualify as water supply development projects based on the requirements of Paragraph 373.0361(2)(a), F.S. These projects include

- Conserve Florida Water Conservation Information Clearinghouse
- Model Landscape Water Conservation Ordinance
- Water Conservation Public Awareness Campaign

Proposed Action

- Implement these projects as described in the Water Supply Development Component of this document.

WATER RESOURCE DEVELOPMENT PROJECTS

SJRWMD has identified and described proposed water resource development projects in the Water Resource Development Component section of this document. Identified water resource development projects include the following:

- Abandoned Artesian Well Plugging Program
- Aquifer Protection Program
- Aquifer Storage and Recovery Construction and Testing Program
- Central Florida Aquifer Recharge Enhancement Program
- Cooperative Well Retrofit Project
- Demineralization Concentrate Management Project
- Facilitation of Regional Decision-Making Process
- Feasibility of Seawater Demineralization Projects
- Hydrologic Data Collection and Analysis
- Investigation of the Augmentation of Public Supply Systems With Local Surface Water / Stormwater Sources
- Lake Apopka Basin Water Resource Development Project
- Lower Lake Louise Water Control Structure Project
- Treatability of Algal Toxins Using Oxidation and Adsorption
- Upper St. Johns River Basin Project
- Wetland Augmentation Demonstration Program
- Water Resource Development Components of Water Supply Development Projects

Proposed Action

- Implement water resource development projects as described in the Water Resource Development Component section of this document.
- Complete timely and regular updates of DWSP as needed to incorporate the results of regional decision making and further feasibility investigations.

CONSUMPTIVE USE PERMITTING PROCESS

Both the water supply planning and consumptive use permitting programs are tools that the Legislature has provided SJRWMD to ensure that sufficient water will be available for existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems. A successful planning process should provide an effective means for avoiding the adverse effects of competition for water supplies, which could occur in the consumptive use permitting process. Simply put, these two processes—planning and permitting—complement each other.

SJRWMD has identified a number of actions that will help ensure that these two processes are fully complementary.

Proposed Action

- Make available all data, scientific analyses, modeling, and other information developed in the DWSP process for use by permit applicants as part of establishing that their water use meets the applicable consumptive use permitting criteria.

SJRWMD will make this information available in readily usable formats and will assist, to a reasonable extent, CUP applicants in using the modeling tools.

Although the water resource constraints used in the planning process are not direct substitutes for SJRWMD's consumptive use permitting criteria and some of the consumptive use permitting criteria (e.g., water conservation) are not encompassed within these constraints, nonetheless, the options included in the plan have withstood a rigorous planning-level analysis and should therefore be very useful to applicants seeking to focus on options that have been identified as potentially sustainable sources.

- Encourage participation by water supply utilities and other CUP applicants in a regional decision-making process in areas where such a process is important to the successful future development of regional public water supplies.

In DWSP 2000, SJRWMD identified the need for regional decision-making concerning the choice of water supply sources to meet projected water use in the east-central Florida area. Numerous public supply utilities exist in close proximity to one another in this area. These utilities prefer to use groundwater to meet most water supply needs through 2025. To successfully meet the 2025 water supply needs, a combination of additional groundwater and alternative sources has been identified as the most sustainable approach.

The alternative sources most likely to be used are surface water, brackish groundwater, and reclaimed water. The costs of developing these resources could range from about $1.00 per 1,000 gallons for additional fresh groundwater to about $2.50 to $3.50 per 1,000 gallons for surface water. This combination of some fresh groundwater, but not enough available locally to meet demands, and the considerably higher cost of development of alternative sources, such as surface water and brackish groundwater, sets the stage for competition for the less expensive additional groundwater. A regional decision-making process was recommended as a means of avoiding unnecessary and disruptive competition for the water resource. A cooperative regional decision-making process rather than a more piecemeal allocation of water among competing permit applicants pursuant to Section 373.223, F.S., is more likely to result in the most beneficial use of the water resource for all existing and reasonably anticipated future uses.

The facilitated process has been implemented and includes appropriate groupings of users. The goal of the process is to select regional water supply options (1) which meet existing and reasonably anticipated future water needs of all users while sustaining the water resources and related natural systems and (2) which the participants are willing to support and implement. SJRWMD envisions that the successful completion of this process will result in revisions to DWSP to incorporate the selected regional water supply options, as was the case with the publication of the DWSP 2004 Interim Update.

- If one or more utilities attempt to disrupt or bypass the regional decision-making process, SJRWMD should consider initiation of rulemaking to amend its consumptive use permitting rules to establish specific public interest factors to be used in the case of competing applications, pursuant to Section 373.233, F.S.

As part of its consideration, SJRWMD should weigh the public interest served by the water supply planning process, DWSP, and the regional decision-making process implemented as a recommendation of DWSP.

- Use the coordinated review of CUPs as provided for in the MOU between SJRWMD, SFWMD, and SWFWMD to address and resolve concerns about interdistrict impacts.

The east-central Florida area, which is the focus of DWSP 2005, includes portions of SJRWMD, SFWMD, and SWFWMD. Water use in those areas beyond the SJRWMD boundary could contribute to unacceptable water

resource impacts in SJRWMD, and vice versa (Vergara 1998, SJRWMD 2006). The potential for interdistrict impacts exists because the Floridan aquifer is hydrologically continuous across the jurisdictional boundaries of the three WMDs. All three WMDs have consumptive use permitting rules promulgated based on the requirements of Part II, Chapter 373, F.S. In 1998, the three WMDs entered into an MOU, which commits the districts to coordination of these permitting programs. SJRWMD should continue to participate in the MOU coordination and review process to help address interdistrict impacts.

INTERGOVERNMENTAL, WATER SUPPLIER, AND PUBLIC COORDINATION

This DWSP was developed through a public process designed to involve local governments, government-owned and privately owned utilities, self-suppliers, and other interested and potentially affected parties, pursuant to the requirements of Subsection 373.0361(1), F.S. SJRWMD recognizes the need for continued significant intergovernmental, water supplier, and public coordination in association with its water supply plan development and implementation efforts.

Implementation of this DWSP will be subject to applicable provisions of Chapters 120 and 373, F.S. Pursuant to Section 373.0361(4), F.S., any portion of this DWSP, which affects the substantial interests of a party, shall be subject to Section 120.569, F.S. Additionally, pursuant to Section 373.0361(2)(e), F.S., the considerations referenced in paragraph (e) of that subsection, unless adopted by rule, do not constitute final agency action.

Coordination With Other WMDs and the Florida Department of Environmental Protection (FDEP)

SJRWMD recognizes the importance of coordination with Florida's four other WMDs and FDEP concerning the water supply planning process. This coordination has historically been carried out primarily through the following organized efforts:

- Water Planning Coordination Group (WPCG)
- Interdistrict MFLs Framework Group
- MOU between SJRWMD, SFWMD, and SWFWMD (Appendix L)

WPCG was formed following the signing of Executive Order 96-297 and the enactment of the water supply planning provisions of Section 373.0361, F.S. WPCG is composed of representatives of FDEP and the five WMDs. The

purpose of WPCG is to deal with consistency issues among WMDs concerning water supply planning matters.

The Interdistrict MFLs Framework Group was formed by the five WMDs and FDEP for the purpose of developing consistent methodologies for the determination of MFLs.

SJRWMD, SFWMD, and SWFWMD entered into an MOU on October 28, 1998, for the purpose of establishing guidelines for interdistrict coordination of matters concerning water resource investigations, water supply planning, water use regulation, and water shortage management.

The three districts are currently involved in separate but coordinated water supply planning efforts in the area of the tri-district boundary. SFWMD is currently developing the first update of its 2000 Kissimmee Basin Water Supply Plan in the area immediately south of its boundary with SJRWMD. SWFWMD is currently developing its Southern Water Use Caution Area Management Plan in the area immediately west of its boundary with SJRWMD. These planning processes are being performed based on the requirements of Section 373.0316, F.S.

In addition to these efforts, SJRWMD coordinates on an as-needed basis with the other WMDs and FDEP concerning water supply planning matters.

Proposed Action

- Continue active participation in WPCG.
- Continue active participation in the Interdistrict MFLs Framework Group.
- Based on the provisions of the tri-district MOU, continue coordination with SFWMD and SWFWMD to assure that the interests of each WMD are considered.
- Continue coordination with other WMDs and FDEP on an as-needed basis.

Coordination With Local Governments

SJRWMD recognizes the importance of coordination with local governments on matters concerning water supply planning. SJRWMD's water supply planning process has been linked to local governments through

- The participation of local government elected officials and staff members in the facilitated decision-making process
- Public workshop process associated with development and approval of DWSP 2005
- Coordinated efforts with the Brevard Water Supply Board
- Coordinated efforts with the Water Authority of Volusia (WAV)
- Presenting several water supply planning process updates to the Lake County Water Authority
- Other communications with individual local governments

Proposed Action

Continue coordination with local governments through the facilitated decision-making process and through

- One-on-one meetings with elected officials
- Presentations to city / county commissions
- Review of comprehensive plan amendments
- Assistance with development of Water Supply Facilities Work Plans

Coordination With Water Suppliers

SJRWMD recognizes the importance of coordination with water suppliers, including publicly owned and privately owned water supply utilities, agricultural water users, and other self-suppliers on matters concerning water supply planning. SJRWMD's water supply planning process has been linked to these users primarily through SJRWMD's water use projection process, facilitated decision-making process, and DWSP review processes. In addition, SJRWMD has focused considerable attention on public supply utilities and agricultural users through the Flagler County and northeast Florida water utility managers meetings, Agricultural Advisory Committee and the consumptive use permitting process.

Proposed Action

- Continue current coordination links and develop new coordination strategies as necessary.

Coordination With the State of Georgia

SJRWMD recognizes the importance of coordination with the state of Georgia concerning water supply development in northeast Florida and southeast Georgia. SJRWMD's northern boundary is coincident with the state of Georgia's southern boundary. The Floridan aquifer is continuous throughout the coastal areas of Georgia and Florida and is the primary source of water supply in the northeast Florida / southeast Georgia area. Groundwater withdrawals in the northeast Florida area impact groundwater levels in southeast Georgia, and vice versa.

SJRWMD and the Georgia Environmental Protection Division have actively coordinated for several years concerning the potential impacts of groundwater withdrawals. This coordination has been on an as-needed basis and has included technical workshops, project development coordination and report review, and meetings as needed.

Proposed Action

- Continue coordination with the state of Georgia Environmental Protection Division.

Coordination With the Federal Government

SJRWMD recognizes the importance of coordination with the federal government in association with its water supply plan development and implementation efforts. This coordination involves primarily the areas of funding and regulation.

SJRWMD has received federal appropriations for water supply and water resource development projects for the past several years through the STAG program. This has required coordination with the local congressional delegation.

In addition to coordination on funding matters, SJRWMD coordinates with EPA concerning EPA regulation of water supply development and water resource development projects. The focus of this coordination has involved federal requirements for underground injection and discharge to surface waters, which are administered by FDEP. These requirements could impact the implementation of important water resource and water supply development projects involving demineralization concentrate management,

artificial recharge, aquifer storage and recovery, and public supply treatment technologies.

Proposed Action

- Continue to actively seek federal funding for identified water supply and water resource development projects.
- Continue to coordinate with EPA and FDEP to improve the ability to implement identified water supply development projects while ensuring necessary water resource protection.

Coordination With Other Affected Parties and the Public

SJRWMD recognizes the importance of coordination with affected parties and the public concerning water supply planning matters. This coordination has occurred mainly through the public workshop processes. SJRWMD maintains a Web site at *www.sjrwmd.com*. This Web site includes pertinent information concerning SJRWMD's water supply planning activities.

Proposed Action

- Continue to maintain the SJRWMD website, updating as necessary with pertinent water supply planning information.
- Continue the public workshop process for development of future versions of DWSP.

REFERENCES

Brook, A., D. Kendrick, and A. Meeraus. 1996. *GAMS: A user's guide*. Release 2.25. Danvers, Mass.: The Scientific Press.

Burton and Associates. 2003. *Population and water usage projection, St. Johns River Water Supply Project.* Special Publication SJ2004-SP19. Palatka, Fla.: St. Johns River Water Management District.

———. 2004. *Affordability analysis of alternative water supply, St. Johns River Water Supply Project*. Special Publication SJ2004-SP27. Palatka, Fla.: St. Johns River Water Management District.

CH2M HILL. 1996. *Water supply needs and sources assessment: Alternative water supply strategies investigation: Surface water withdrawal sites*. Special Publication SJ96-SP4. Palatka, Fla.: St. Johns River Water Management District.

———. 1997a. *Water supply needs and sources assessment: Alternative water supply strategies investigation: A tool for assessing the feasibility of aquifer storage recovery*. Special Publication SJ97-SP4. Palatka, Fla.: St. Johns River Water Management District.

———. 1997b. *Water supply needs and sources assessment: Alternative water supply strategies investigation: Conceptual design of wetland augmentation systems and recommendations for pilot augmentation projects*. Special Publication SJ97-SP13. Palatka, Fla.: St. Johns River Water Management District.

———. 1997c. *Water supply needs and sources assessment: Alternative water supply strategies investigation: Artificial recharge of the Floridan aquifer through drainage or injection wells in Orange and Seminole counties*. Special Publication SJ97-SP14. Palatka, Fla.: St. Johns River Water Management District.

———. 1997d. *Water supply needs and sources assessment: Alternative water supply strategies investigation: Brackish groundwater treatment technology assessment*. Special Publication SJ97-SP19. Palatka, Fla.: St. Johns River Water Management District.

———. 1998a. Brackish groundwater: Source identification and assessment. Technical Memorandum D.1.B. Gainesville, Fla.

———. 1998b. Brackish groundwater: Planning-level cost estimates. Technical Memorandum D.3.B. Gainesville, Fla.

———. 2000. Water 2020 Work Group Area I: East Central Florida Water Supply Plan. Gainesville, Fla.

———. 2001. Preliminary investigation of supplementing the city of Apopka reuse system with water withdrawn from Lake Apopka. Letter report. Gainesville, Fla.

———. 2002a. *Literature review of surface water treatment technologies, St. Johns River Water Supply Project*. Special Publication SJ2004-SP21. Palatka, Fla.: St. Johns River Water Management District.

———. 2002b. *Preliminary raw water characterization, St. Johns River Water Supply Project*. Special Publication SJ2004-SP22. Palatka, Fla.: St. Johns River Water Management District.

———. 2004. *Surface water treatability and demineralization study, St. Johns River Water Supply Project*. Special Publication SJ2004-SP20. Palatka, Fla.: St. Johns River Water Management District.

CPH Engineers, Inc. 2004. North Seminole regional reclaimed water and surface water augmentation system expansion and optimization study, final report.

CPLEX Optimization, Inc. 1996. *CPLEX*. Incline Village, Nev.

Davis, J.B., and D. Boniol. 2002. Visualizing hydrogeologic surfaces from a geostatistical analysis of well log data in northeast and east-central Florida. Poster presented at the Karst Waters Institute Symposium, Gainesville, Fla.

D.L. Smith and Associates. 2004. *Investigations of areas where domestic self-supply wells are sensitive to water level decline*. Special Publication SJ2004-SP38. Palatka, Fla.: St. Johns River Water Management District.

Florence, B. 1990. *Annual Water Use Survey*. Special Publication. Palatka, Fla.: St. Johns River Water Management District.

Florida Department of Environmental Protection. 2004. *A strategy for water quality protection: Wastewater treatment in the Wekiva study area.* Tallahassee, Fla.

[FDEP] Florida Department of Environmental Protection. 2002. 2001 annual reuse inventory. Tallahassee, Fla.

HDR. 2002. *Surface water treatment plant siting study, level 1 analysis: Preliminary study area screening, St. Johns River Water Supply Project*. Special Publication SJ2004-SP24. Palatka, Fla.: St. Johns River Water Management District.

———. 2003a. *Surface water treatment plant siting study, Public Involvement/Information Plan, St. Johns River Water Supply Project*. Special Publication SJ2004-SP23. Palatka, Fla.: St. Johns River Water Management District.

———. 2003b. *Surface water treatment plant siting study, level 2 analysis: Preliminary site-specific screening, St. Johns River Water Supply Project*. Special Publication SJ2004-SP25. Palatka, Fla.: St. Johns River Water Management District.

———. 2004. *Surface water treatment plant siting study, level 3 analysis: Detailed site-specific screening, St. Johns River Water Supply Project*. Special Publication SJ2004-SP25. Palatka, Fla.: St. Johns River Water Management District.

Hall G. 2005 (draft). Ocklawaha River water allocation study. St. Johns River Water Management District, Palatka, Fla.

Harbaugh, A.W., and G.M. McDonald. 1996. *Users documentation for MODFLOW-96: An update to the U.S. Geological Survey modular finite-difference ground-water flow model*. Open-file report 96-485. Denver, Colo.: U.S. Geological Survey.

L.S. Sims & Associates, Inc. 2005 (draft). Evaluation of corrosivity of demineralization concentrate on injection well materials and associated regulatory issues. Rockledge, Fla.

Marella, R. 1980. *Annual Water Use Survey*. Special Publication. Palatka, Fla.: St. Johns River Water Management District.

McDonald, G.M., and A.W. Harbaugh. 1988. *A modular three-dimensional finite-difference groundwater flow model*. Techniques of Water Resources Investigations, Book 6, Chapter A1. Denver, Colo.: U.S. Geological Survey.

Miller, J.A. 1986. *Hydrogeologic framework of the Floridan aquifer system in Florida and in parts of Georgia, Alabama, and South Carolina*. Professional Paper 1403-B. Washington, D.C.: U.S. Geological Survey.

Osburn, W. 2000. *Geostatistical analysis: Potentiometric network for the Upper Floridan aquifer in the St. Johns River Water Management District*. Technical Publication SJ2000-1. Palatka, Fla.: St. Johns River Water Management District.

PB Water. 2004. Central Florida Aquifer Recharge Enhancement Phase 2 Project. Orlando, Fla.

Prasifka, D.W. 1988. *Current trends in water supply planning: Issues, concepts and risks*. New York: Van Nostrand Reinhold Company.

Pyne, R. David G. 2005 (draft). Aquifer storage and recovery issues and concepts. St. Johns River Water Management District, Palatka, Fla.

Reiss Environmental, Inc. 2003. *Investigation of demineralization concentrate management, final report*. Special Publication SJ2003-SP1. Palatka, Fla.: St. Johns River Water Management District.

Robison, C. Price. 2004. *Middle St. Johns River minimum flows and levels hydrologic methods report*. Technical Publication SJ2004-2. Palatka, Fla.: St. Johns River Water Management District.

R.W. Beck, Inc. 2002a. *Demineralization treatment technologies for the seawater demineralization feasibility investigation*. Special Publication SJ2004-SP7. Palatka, Fla.: St. Johns River Water Management District.

———. 2002b. *Criteria for preliminary screening of areas for potential seawater demineralization facilities, Task C.1 for the seawater demineralization feasibility investigation*. Special Publication SJ2004-SP8. Palatka, Fla.: St. Johns River Water Management District.

———. 2002c. *Applicable rules and regulations for seawater demineralization, Task B.6 for the seawater demineralization feasibility investigation*. Special Publication SJ2004-SP9. Palatka, Fla.: St. Johns River Water Management District.

———. 2002d. Ranking matrix for potential seawater demineralization sites, Task C.2 for the seawater demineralization feasibility investigation. Palatka, Fla.: St. Johns River Water Management District.

———. 2002e. *Annotated bibliography, Task B.1 for the seawater demineralization feasibility investigation*. Special Publication SJ2004-SP10. Palatka, Fla.: St. Johns River Water Management District.

———. 2003a. *Identification of favorable sites for feasible seawater demineralization, Task C.4 for the seawater demineralization feasibility investigation*. Special Publication SJ2004-SP11. Palatka, Fla.: St. Johns River Water Management District.

———. 2003b. Database. Task B.3 for the seawater demineralization feasibility investigation. St. Johns River Water Management District, Palatka, Fla..

———. 2003c. GIS data layers. Task B.4 for the seawater demineralization feasibility investigation. St. Johns River Water Management District, Palatka, Fla.

———. 2003d. Estimate of conceptual costs for three potential seawater demineralization projects, Task C.5 for the seawater demineralization feasibility investigation. Technical Memorandum. St. Johns River Water Management District, Palatka, Fla.

———. 2004. *Final report on five potential seawater demineralization project sites, Task C.5*. Special Publication SJ2004-SP6. Palatka, Fla.: St. Johns River Water Management District.

[SJRWMD] St. Johns River Water Management District. 1999 (draft). Water 2020 Work Group Area IV: Western St. Johns and eastern Putnam County Work Group area summary for Water Supply Plan. Gainesville, Fla.

———. 2002. East-Central Florida Water Agenda: A report on the Water Supply Planning Initiative. St. Johns River Water Management District, Palatka, Fla.

———. 2004. Water Resource Development Work Program. St. Johns River Water Management District, Palatka, Fla.

———. 2005. East-Central Florida Water Supply Planning Initiative: Final Report. St. Johns Water Management District, Palatka, Fla.

———. 2006. *Water supply assessment 2003*. Technical Publication SJ2006-1. Palatka, Fla.: St. Johns River Water Management District.

Southeastern Geological Society. 1986. *Hydrogeological units of Florida.* Ad hoc committee on Florida hydrostratigraphic unit definition. Special Publication 28. Tallahassee, Fla.: Florida Geological Survey.

Sprinkle, C.L. 1989. *Geochemistry of the Floridan aquifer system in Florida and in parts of Georgia, South Carolina, and Alabama.* Professional Paper 1403-I. Washington, D.C.: U.S. Geological Survey.

Tibbals, C.H. 1990. *Hydrology of the Floridan aquifer system in east-central Florida.* Professional paper 1403-E. Denver, Colo.: U.S. Geological Survey.

Vergara, B.A., editor. 1994. *Water supply needs and sources assessment: 1994.* Technical Publication SJ94-7. Palatka, Fla.: St. Johns River Water Management District.

———. 1998. *Water supply assessment: 1998.* Technical Publication SJ98-2. Palatka, Fla.: St. Johns River Water Management District.

———. 2000. *District water supply plan*. Special Publication SJ2000-SP1. Palatka, Fla.: St. Johns River Water Management District.

———. 2004. *2004 Interim update to Special Publication SJ2000-SP1, District Water Supply Plan*. Special Publication SJ2004-SP28. Palatka, Fla.: St. Johns River Water Management District.

U.S. Census Bureau. 2005. Flagler, Fla., nation's fastest-growing county. Washington D.C.: U.S. Census Bureau News.

Wekiva River Basin Coordinating Committee. 2004. Final report: Recommendations for enhanced land use planning strategies and development standards to protect water resources of the Wekiva River Basin. Tallahassee, Fla.

Williams, S. 2004 (draft). Simulation of the effects of groundwater withdrawals on the Floridan aquifer system in Volusia County, Florida. St. Johns River Water Management District, Palatka, Fla.

Wycoff, R and Parks, M. 2005. *Cost estimating and economic criteria for 2005 District Water Supply Plan*. Special Publication SJ2005-SP1. Palatka, Fla.: St. Johns River Water Management District.