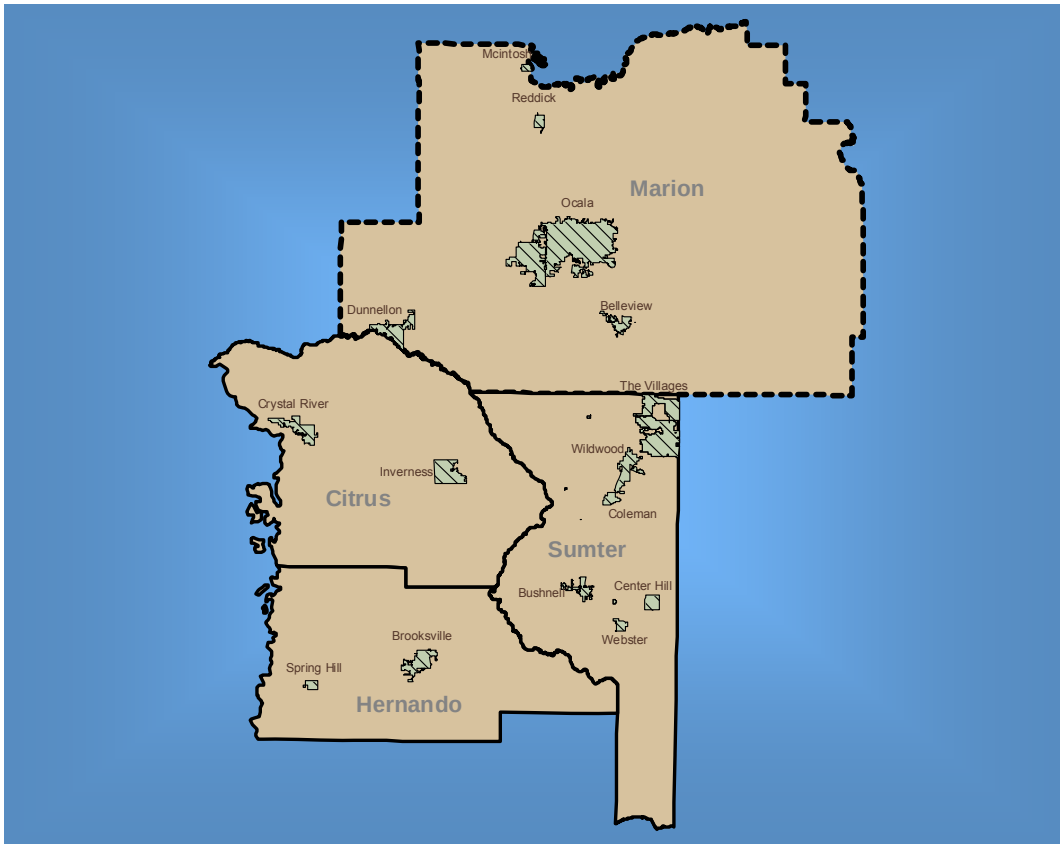
Withlacoochee Regional Water Supply Authority

REGIONAL WATER SUPPLY PLAN UPDATE - WATER SUPPLY PLANNING COMPENDIUM FOR THE INCLUSION OF MARION COUNTY



November 2009

Prepared for

WITHLACOOCHEE REGIONAL WATER SUPPLY AUTHORITY

Prepared by

WRA Water Resource Associates

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AGMOD	Agricultural Water Use Allocation Program
AWS	Alternative Water Supply
BCC	Board of County Commissioners
BEBR	Bureau of Business and Economic Research
BMF	Benchmark Farms Program
BMPs	Best Management Practices
CFCA	Central Florida Coordination Area
cfs	cubic feet per second
CIA	Cumulative Impact Analysis
Cl	Chloride
CR	County Route
CUP	Consumptive Use Permit
DSS	Domestic Self Supply
DWMP	District Water Management Plan
DWSP	District Water Supply Plan
EWUR	Estimated Water Use Report
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
FAS	Floridan Aquifer System
FAVA	Florida Aquifer Vulnerability Assessment
FDEP	Florida Department of Environmental Protection
FGDL	Florida Geographic Data Library
FYN	Florida Yards and Neighborhood program
GHB	General Head Boundary
GIS	Geographic Information Systems
GPC	Gross Per Capita
gpcd	gallon per capita per day
gpd	gallons per day
gpdph	gallons per day per hole
ICU	Intermediate Confining Unit
LCWA	Lake County Water Authority
LFA	Lower Floridan Aquifer
LOR	Lower Ocklawaha River
LOW	Lower Ocklawaha
MCAVA	Marion County Aquifer Vulnerability Assessment
MCUs	Middle Confining Units
MCUD	Marion County Utilities Department
MFLs	Minimum Flows and Levels
MGD	Million Gallons Per Day
MRWSP&IP	Master Regional Water Supply Plan & Implementation Program
MSCU/MCU	Middle Semi-Confining Unit/Middle Confining Unit

NCF	North-Central Florida
NCFCA	North Central Florida Coordination Area
ND	Northern District
NDWRAP	Northern District Water Resources Assessment Project
NGF	National Golf Foundation
NOAA	NOAA
NPS	National Park Service
OFWs	Outstanding Florida Waters
PDR	Preliminary Design Report
PF	Peninsular Florida
PG	Power Generation
Plant	Progress Energy Crystal River Power Plant
PWRCA	Priority Water Resource Caution Area
RO	Reverse Osmosis
RWSP	Regional Water Supply Plan
RWSPs	Regional Water Supply Plans
SAS	Surficial Aquifer System
SJRWMD	St. Johns River Water Management District
SPZ	Springs Protection Zones
SR	State Road
SWFWMD	Southwest Florida Water Management District
SWPCG	Subcommittee of the Water Planning Coordination Group
TDS	Total Dissolved Solids
UFA	Upper Floridan Aquifer
UORB	Upper Ocklawaha River Basin
USDA-SCS	U.S. Department of Agriculture-Soil Conservation Service
WAV	Watershed Action Volunteer
WMIS	Water Management Information System
WRA	Water Resource Associates, Inc.
WRAMS	Water Resource Assessment and Management Study
WRF	Wastewater Reclamation Facility
WRWSA	Withlacoochee Regional Water Supply Authority
WRWSA RWSPU	Withlacoochee Regional Water Supply Authority Regional Water Supply Update
WSA	Water Supply Assessment
WUP	Water Use Permit
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

I. Introduction

A. The Withlacoochee Regional Water Supply Authority

The Withlacoochee Regional Water Supply Authority (WRWSA) is one of three water supply authorities within the Southwest Florida Water Management District (SWFWMD). A portion of the WRWSA in Marion County is within the St. Johns River Water Management District (SJRWMD). Water supply authorities are multi-jurisdictional in membership and formed to jointly develop water resources for the mutual benefit of their members.[1] More specifically, water supply authorities are " … for the purpose of developing, recovering, storing, and supplying water for county or municipal purposes in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas" (Chapter 373, F.S.). The authorities have other important duties, responsibilities, and operational options including:

a. Levying ad valorem taxes;

b. Developing water supplies for county and municipal users;

c. Collecting, treating and recovering wastewater;

d. Wholesaling (not retailing) water supplies to customers;

e. Exercising the right of Eminent Domain;

f. Issuing revenue bonds;

g. Developing alternative water supplies; and

h. Ensuring consistency with the SWFWMD and SJRWMD with respect to water supply planning.

The WRWSA was founded in 1977 by Hernando, Citrus, Sumter, Marion and Levy Counties. An amendment to the WRWSA's inter-local agreement in 1984 provided for municipal membership, which allowed cities within each County to become members. In 1982, Levy County formally withdrew from the WRWSA. In 1991, Marion County became an inactive member, but the City of Ocala, an active municipal member, maintained its membership by separately paying its annual assessment.

Marion County petitioned and the WRWSA approved their request to be reinstated as an active member in 2008. The cities of Belleview, Dunnellon, McIntosh and Reddick located in Marion County also became active members of the WRWSA by provision of the WRWSA's inter-local agreement. Therefore, the current WRWSA membership includes Citrus, Hernando, Sumter, and Marion Counties and their associated municipalities. These include Belleview, Brooksville, Bushnell, Center Hill, Coleman, Crystal River, Dunnellon, Inverness, McIntosh, Ocala, Reddick, Webster, and Wildwood.

The apportionment of representatives on the WRWSA Board considers two city categories – "large city" and "small city". Large cities are those of 25,000 populations or more, which includes the City of Ocala. Large cities receive representation equal to that of the counties. The small cities category, or cities with less than 25,000 people, make up the remaining cities in the WRWSA. All of these cities must caucus and select one member to represent all small cities in each county. Therefore, in Hernando County, there are four (4) representatives from

[1] Authorized by Florida Statutes under Chapter 373.1962, F.S.

the Board of County Commissioners (BCC) and one small city representative. Citrus County qualifies for three (3) representatives from the BCC and one small city representative. Sumter County qualifies for two (2) representatives from the BCC and one small city representative. Marion County qualifies for three (3) representatives from the BCC and one small city representative. Finally, the City of Ocala, as a large city, has two representatives. Figure I-1 shows the WRWSA service area and its member governments.

B. Planning History

Since the WRWSA is mandated to develop and supply water, the Authority has historically completed water supply planning studies, constructed a regional water supply facility in Citrus County, and developed a cooperative funding program to assist member local governments in developing adequate water supply facilities and water conservation (WRWSA Website).

A water supply planning effort by the WRWSA was completed in 1996 and was entitled "Withlacoochee Regional Water Supply Authority Master Plan for Water Supply". This report followed two previous efforts that included the "Water Sources and Demand Study" (1982) and the "WRWSA Master Plan for Water Supply" (1987).

Almost ten years elapsed from the completion of the 1996 WRWSA Master Plan, when the WRWSA determined it was necessary to update the regional water supply planning process. In 2007 the WRWSA, in cooperation with the SWFWMD, completed an update of the 1996 study. This report was entitled "Withlacoochee Regional Water Supply Authority Regional Water Supply Plan Update - 2005" (WRWSA RWSPU).

C. Inclusion of Marion County to Regional Water Supply Plan Update

In broad terms, the WRWSA RWSPU provides a means for the WRWSA to determine both the existing and projected water demands for the region. Ultimately, these demands will serve as a basis for future water supply development projects for the region, which were analyzed and are outlined in the RWSPU.

The inclusion of Marion County into the WRWSA has added challenges and opportunities with respect to regionally sustainable water supply development. Geographically, the WRWSA has increased by approximately 86% from 1,892 square miles to 3,516 square miles. The existing population of the WRWSA has increased by approximately 68% from 494,931 to 732,681 (2005 estimate).

The inclusion of Marion County to the WRWSA requires that the RWSPU be appended to consider existing and projected water demands in Marion County, and that the appended RWSPU outline the basis for future water supply development in the WRWSA region including Marion County. This Compendium presents the inclusion of Marion County to the RWSPU.

The Compendium water demand estimates were analyzed over a planning horizon, from the year 2005 to 2030. The planning horizon includes a more detailed, focused and reliable forecast of water need for the region, which will help shape water supply development projects. This demand analysis will contribute to the capital improvement programs for local governments and the WRWSA in the near term.

Much of the data contained in the Compendium was obtained from the Marion County Water Resource Assessment and Management Study (WRAMS) (WRA, 2007-a). The WRAMS project employed data collection, technical evaluation and stakeholder involvement processes. It was completed and adopted by the Marion County Board of County Commissioners in 2007.

As mentioned, unlike the other counties in the WRWSA RWSPU, Marion County spans parts of both the SWFWMD and the SJRWMD (Figure I-1). The two (2) jurisdictions add complexity to the WRWSA's water supply planning efforts involving Marion County, since the SJRWMD and the SWFWMD may have differing criteria. To help address this issue, the Compendium identifies differing criteria that could lead to inconsistent planning priorities for the timing and development of water supply projects in Marion County.

D. Compendium – Document Structure

The Compendium is organized into Chapters as follows:

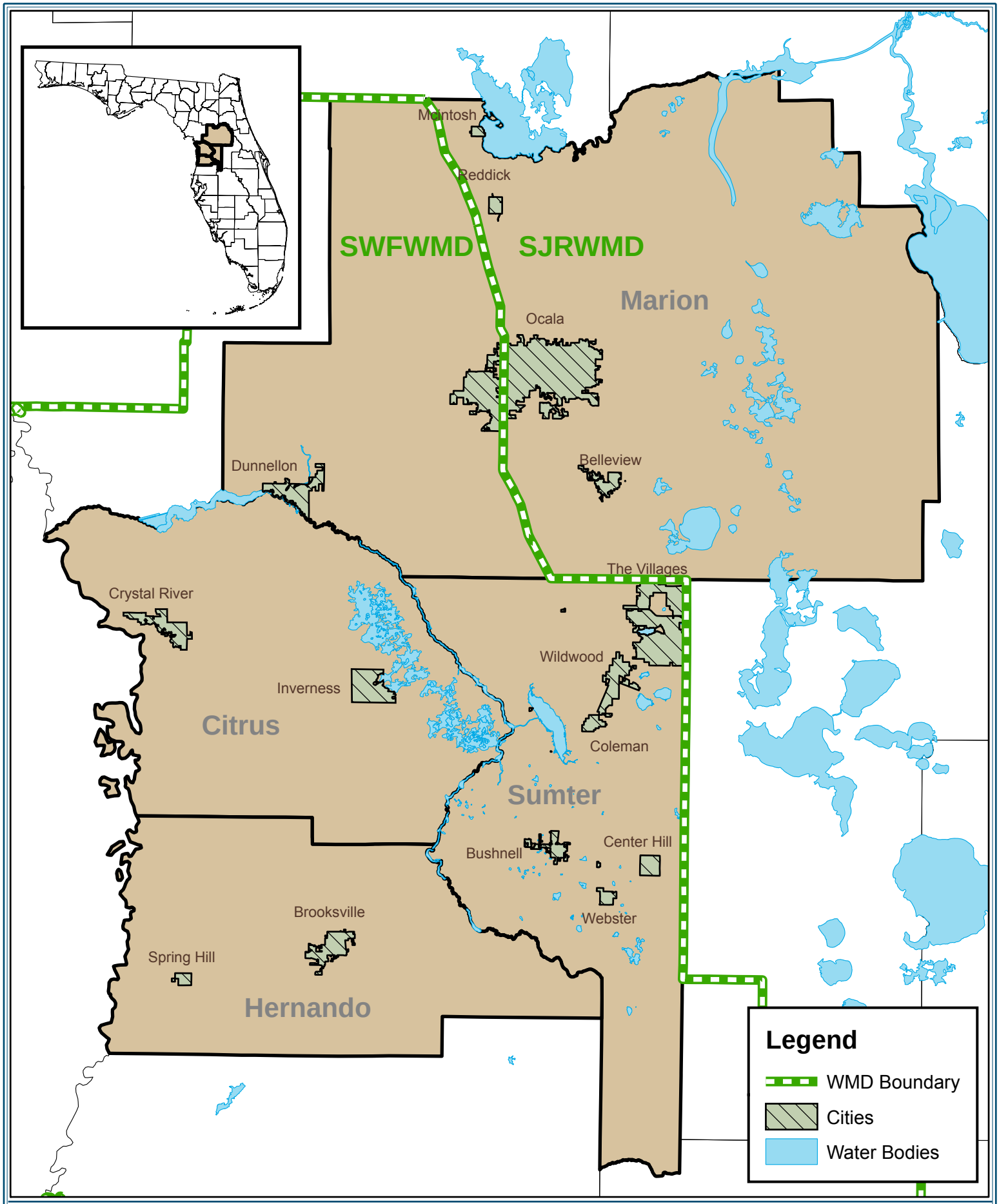
- Chapter 1 – This chapter reviews and analyzes existing water demand and projections of future demand within the WRWSA. These water demands set the stage for determining the availability of water supplies for existing and future water users. In addition, water conservation measures (demand reduction) are explored.

- Chapter 2 – This chapter reviews and characterizes traditional groundwater and alternative surface water sources relevant to water supply in Marion County. Environmental considerations of the sources are also presented.

- Chapter 3 – This chapter presents an analysis of groundwater sources in Marion County to determine their availability to serve for future water supply development. In additional, jurisdictional considerations between the SJRWMD and the SWFWMD are explored.

- Chapter 4 – This chapter delineates and evaluates new projects or project areas within each of the source types (both traditional and non-traditional). The chapter provides recommendations for further analysis of projects for future water supply development.

Phase II of the WRWSA's Master Regional Water Supply Planning & Implementation Program (MRWSP&IP) will be expanded to include Marion County. The recommended projects will receive in-depth feasibility assessment in Phase II (based on conceptual design). The Phase II projects will be evaluated, ranked and prioritized according to short-term, medium-term, and long-term planning horizons.



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PROJECT: 0576 - Withlacoochee RWSA - Marion County Modification

FIGURE I-1
WRWSA LOCATION MAP

ORIGINAL DATE:	10-19-09
REVISION DATE:	NA
JOB NUMBER:	0576
FILE NAME:	WRWSA and WMD.mxd
GIS OPERATOR:	DR

N
W E
S

1 inch equals 9 miles

Chapter 1

1.0 Determination of Existing Water Demands and Future Water Demand Projections

Key Points

- This chapter reviews existing population and water demand and projections of future population and water demand, using data provided by the Southwest Florida Water Management District (SWFWMD) and the St. Johns River Water Management District (SJRWMD).
- The existing population in 2005 for Marion County is estimated at 290,510 and is projected to increase in 2030 to 501,500, a growth of 73%. The projection is based on 2006 Bureau of Economic and Business Research (BEBR) data in the SJRWMD and 2007 BEBR data in the SWFWMD.
- The projected increase in population is apportioned spatially in Marion County using a parcel-based methodology by the SJRWMD and the SWFWMD.
- Water demand in Marion County is projected to increase in 2030 to 106.66 MGD, an overall growth of 61% from 2005. The largest projected increase is in the public supply water use category at 25.96 MGD, followed by domestic self-supply at 7.75 MGD, recreation at 4.67 MGD, industrial/commercial at 1.87 MGD, and agricultural at .07 MGD.
- Projected water use in public supply and domestic self-supply water use are based on existing per capita rates of use. The projected increases do not account for savings from additional conservation or beneficial reclaimed water supply implemented in the future.
- The SWFWMD and SJRWMD use different methods to project public supply and domestic self-supply water demands. Their respective methods are described in this chapter.
- Existing water conservation measures employed by member governments are inventoried in this chapter. These measures are categorized as regulation, education, and incentive programs.
- Existing flows from wastewater treatment facilities larger than 0.1 MGD in Marion County are estimated at 9.37 MGD in 2007. Approximately 4.16 MGD or 44% of existing wastewater flow is reused beneficially towards meeting potable water demands.
- Wastewater flows from treatment facilities larger than 0.1 MGD are projected to increase in 2030 to 16.16 MGD, an overall increase of 68% from 2007. 12.12 MGD or 75% of projected wastewater flow is projected to be reused beneficially towards meeting potable water demands.
- The WRWSA will update projected population and water demands in Marion County in Phase II of the MRWSP&IP as updates occur from the SWFWMD and the SJRWMD.

1.1 Introduction

This chapter reviews and characterizes existing water demand and projections of future water demand within Marion County. These water demands establish a baseline from which to determine the availability of water supplies for existing and future water users, and to analyze potential water supply projects to meet these needs.

The WRWSA's main responsibility is the planning and development of public water supply for its members. However, existing and future water demand in other water use categories is important to determine because it could affect the availability of traditional and alternative water sources for public supply. This chapter analyzes water demand from the following use categories:

- Public supply;
- Domestic Self-supply;
- Commercial/Industrial/Mining;
- Agricultural; and
- Recreation.

For the sake of this report, potable water includes both public supply and domestic self-supply demand. In contrast to other areas in the WRWSA, both of these uses are significant in Marion County (WRA, 2007-c). Water demand in these categories was taken from information developed by both the Southwest Florida Water Management District (SWFWMD), and the St. Johns River Water Management District (SJRWMD) for each portion of Marion County.

This chapter also includes an inventory of current conservation practices and waste water treatment facilities in Marion County that either provide or have the potential to provide reclaimed water. The use of these techniques can decrease reliance on traditional groundwater supplies and their anticipated use is related to a downward adjustment in water demand.

Water demands in this chapter will serve as a basis for future water supply development projects in Marion County and potentially within the WRWSA. Since Marion County spans parts of both the SWFWMD and SJRWMD jurisdictions, a consistent approach to the determination of demand is preferable for effective water supply planning in the region. This chapter also identifies differences in methodologies between the SJRWMD and the SWFWMD in determining existing and future potable and non-potable water use.

1.2 General Assumptions

The following general assumptions, summarized below, were used to derive the potable water demand in Marion County:

- Population projections were developed using the SWFWMD and the SJRWMD methodologies and geographic information systems (GIS)-parcel based population models;

- The planning horizon for this document is 2010-2030 using 2005 as the base year for water demand projections. This planning horizons, and base year, were chosen to maintain consistency with the water management districts and their regional water supply plans;

- Water demands are reported for the average annual effective rainfall conditions. The analysis of a one in ten (1-in-10) drought year scenario (which increases water demand during that year) is not included. This calculation is consistent with the SJRWMD and SWFWMD Regional Water Supply Plans (RWSPs); and

- The majority of the water withdrawn in Marion County is from groundwater sources, with minimal surface water withdrawals. No analysis of the division of groundwater and surface water demands is provided. Potential future surface water sources are described in Chapter 2.

1.3 Potable Water Demand

1.3.1 Introduction

Potable water demands in Marion County, including both public supply demand and domestic self-supply demand, exceeds non-potable demand such as agricultural, recreational, and commercial/industrial water demand). Potable water demand is discussed below.

1.3.2 Base Year Population

The current base year that was used for the population projections is 2005. Methodology for the base year population slightly varies between the SWFWMD and the SJRWMD.

1.3.3 Base Year Water Use

1.3.3.1 Public Supply

The base year that the SWFWMD and the SJRWMD used for determining water use in Marion County is 2005.

Within the SWFWMD, the 2005 Public Supply base year water use for each large utility is derived by multiplying the average 2003 – 2007 unadjusted gross per capita rate by the 2005 estimated population for each individual utility. Base year water use for small utilities is derived by multiplying the average 2003 – 2007 unadjusted gross county-wide per capita rate by the 2005 estimated population for the additional estimated population associated with those non-reporting utilities, contained in Table 1 of the Estimated Water Use report (2005).[1]

Within the SJRWMD, the average of annual historic water use from 1995 to 2005 was used as the starting point for projections. Water demands were projected for each public supply utility by multiplying the utility's 11-year average, gross per capita water use (in gallons per day) by its projected, served population for each of the 5-year projection periods. The average gross per capita use (GPC) is defined as total water use (including residential and nonresidential use) for each public supply utility divided by its served population. The base period for the 11-year average was 1995–2005. The GPC values were made available to the utilities and area planning organizations. For cases in which historical water use data were missing or suspect, those years were omitted from the 11-year average. When such data were available, other factors resulting in GPC adjustment included:

[1] Public supply base year water use methodology taken from Bader (2009).

- Utility meter data (sometimes reducing historical served population estimates); and
- Exclusion of data for years with unexplained variances in water use data.

The average GPC was applied to future population projections to project future water use.

Consistent with the 2003 assessment methodology, projections for a 1-in-10-year drought event were calculated using an average drought year factor of +6%. This factor was agreed to by the 1-in-10-Year Drought Subcommittee of the WPGC. The rationale for use of the +6% factor is addressed in the subcommittee's report (WPCG 1998).[2]

1.3.3.2 Domestic Self-Supply

The base year that was used for the domestic self-supply by SWFWMD and SJRWMD is 2005.

Within the SWFWMD, base year water use for domestic self-supply is calculated by multiplying the 2005 domestic self-supply population for each county by the average 2003 – 2007 residential county-wide per capita water.[3]

Within the SJRWMD, domestic self-supply water use refers to water use by individuals not served by a public supply water utility (i.e., a residence with a private well). As in WSA 2003, small public supply utility systems with average daily flows under 0.1 mgd are included with the domestic self-supply uses in this category. Domestic self-supply and small public supply may also include water use for undeveloped areas that may be publicly supplied in the future, but which are not currently part of any utility service area.

Population for the domestic self-supply and small public supply systems category was calculated by subtracting the publicly supplied population (not including small public supply systems) from the SJRWMD portion of the total county population. Projected domestic self-supply and small public supply water use was calculated by multiplying the domestic self-supply and small public supply population by that county's residential per capita use average between 1995 and 2000 (GIS Associates, 2008). The use of residential per capita excluded the nonresidential portion of the GPC, which should not be included in domestic self-supply and small public supply use.

As in WSA 2003, water use by domestic self-supply and small public supply utilities in a 1-in-10-year drought event was calculated by increasing the total projection for an average rainfall year by +6%, based on the guidance of the 1-in-10-Year Drought Subcommittee of the WPCG (WPCG 1998).[4]

1.3.4 Population Projections

Within the SWFWMD, small-area population projections were developed using a parcel based methodology (GIS Associates, 2009).

[2] Public supply base year water use methodology taken from SJRWMD (2008).
[3] Domestic self-supply base year water use methodology taken from Bader (2009).
[4] Domestic Self-Supply base year water use methodology taken from SJRWMD (2008).

The population projections made by University of Florida Bureau of Economic & Business Research (BEBR) are generally accepted as the standard throughout the state of Florida. However, these projections are made at the county level only. Accurately projecting future water demand requires more spatially precise data than the county level BEBR projections. The SWFWMD projections are based on census block-level data, which is the smallest level of census geography. They are then disaggregated to land parcel data, which is the smallest area of geography possible for population studies.[5]

Within the SJRWMD, the 2006 projections of population growth published by the University of Florida BEBR, were used as its control for population projections for each county within SJRWMD, and were then applied to a parcel based methodology (GIS Associates, 2009).

Population for the domestic self-supply and small public supply systems category was calculated by subtracting the publicly supplied population (not including small public supply systems) from the SJRWMD portion of the total county population.[6]

1.3.5 Potable Water Demand Projections

1.3.5.1 Planning Horizon (2005 – 2030)

In the SWFWMD, water demand projections are calculated for the years 2010, 2015, 2020, 2025 and 2030. To develop these projections, the SWFWMD used the 2003 – 2007 average per capita water use rate and applied it to the projected populations (SWFWMD, 2009).

Water demand projections developed by the SJRWMD were calculated for the years 2010, 2015, 2020, 2025 and 2030 by multiplying the utility's 11-year average, gross per capita water use (in gallons per day) by its projected, served population for each of the 5-year projection periods (SJRWMD, 2008).

1.3.5.2 Public Supply Results

The public supply water demand in Marion County within the SWFWMD jurisdiction was approximately 8.85 mgd in 2005. Using the methods that were previously described, the demand is expected to increase to 21.43 mgd in 2030. This equates to a 12.58 mgd increase or a 142% increase in demand within the planning horizon.

The SJRWMD calculated the public supply water demand for their area of Marion County to be approximately 20.88 mgd in 2005. Using the methods described, the demand is expected to increase to 34.61 mgd in 2030. These equate to a 13.73 mgd increase or a 66% increase in demand within the planning horizon.

Total public supply water demand estimated by summing projections from both districts in Marion County in 2005 is 29.73 mgd. The demand is expected to increase to 56.04 mgd in 2030. This equates to a 26.31 mgd or an 89% increase in demand within the planning horizon (Table 1-1).

[5] Methodology of population projections are taken from Bader (2009).
[6] Methodology of population projections are taken from SJRWMD (2008).

Table 1-1. Public Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	9.24	21.43	132%
SJRWMD	20.88	34.61	66%
Total	**30.12**	**56.04**	**86%**

1.3.5.3 Domestic Self-Supply Results

Within the SWFWMD, the domestic self-supply water demand in Marion County was estimated to be 5.48 mgd in 2005. Using the methods that were described for SWFWMD the demand is expected to increase to 10.37 mgd in 2030. This demand equates to a 4.88 mgd or an 89% increase within the planning horizon.

Within SJRWMD, the domestic self-supply water demand in Marion County was approximately 15.14 mgd in 2005. Using the methods described, the demand is expected to increase to 18.00 mgd in 2030. These demands equate to a 2.86 mgd increase (19%) within the planning horizon.

The total domestic self-supply water demand in Marion County was 20.62 mgd in 2005. The demand is expected to increase to 28.37 mgd in 2030. This demand equates to a 7.74 mgd increase (38%) within the planning horizon (Table 1-2).

Table 1-2. Domestic Self-Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	5.48	10.37	89%
SJRWMD	15.14	18.00	19%
Total	**20.62**	**28.37**	**38%**

1.3.5.4 Total Potable Water Demand

The total Marion County potable water demand was approximately 50.74 mgd in 2005. Using the SWFWMD and the SJRWMD data, the demand is expected to be about 84.41 mgd in 2030. This demand equates to an approximate increase of 34.06 mgd (68%) within the planning horizon (Table 1-3). Figures 1-1 and 1-2, reflect the breakdown of potable water supply by water management district within the planning horizon.

Table 1-3. Total Potable Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	14.72	31.79	116%
SJRWMD	36.02	52.61	46%
Total	**50.74**	**84.41**	**66%**

1.4 Commercial, Industrial and Mining Water Demand

1.4.1 Introduction

This water demand category is associated with commercial, industrial, mining and other uses.

Within SWFWMD, this water demand is calculated as follows: I/C uses include chemical manufacturing, food processing, power generation, and miscellaneous I/C uses. While diversified, much of the water used in food processing can be attributed to citrus and other agricultural crops. For the most part, chemical manufacturing is closely associated with phosphate mining and consists mainly of phosphate processing. A number of different products are mined within the SWFWMD's boundaries, including phosphate, limestone, shell, and sand. For the purposes of the water supply planning process, thermoelectric power generation (PG) is separated out as an individual use category. While the Water Demand Projection Subcommittee (FDEP, 2001) identified 0.1 million gallons per day (mgd) as the mandatory reporting threshold for the I/C and M/D categories, the SWFWMD examined and included all permitted or reported uses, regardless of the quantity in projecting demand. The decision to include all water use permits (WUPs), regardless of size, resulted from a belief that projection accuracy would be improved by capturing all available water use data.[7]

Within SJRWMD, this demand is calculated as follows: All permitted commercial /industrial/ institutional self-suppliers listed in the SJRWMD CUP database having an average daily use of at least 0.10 mgd in 2005 were included in the projection calculations.[8]

The sections below describe the methodology and projections of water use for commercial, industrial, and mining water demand.

1.4.2 Base Year

Within the Marion County in SWFWMD jurisdiction, the base year for the purpose of developing and reporting water demand projections for the 2010 RWSP is 2005. This is consistent with the methodology agreed upon by the Water Planning Coordination Group (FDEP, 2001). The data for the baseline year consist of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands (estimated needs).[9]

[7] Commercial, Industrial and Mining water demand description taken from Wright (2009).
[8] Commercial, industrial and institutional water demand description taken from SJRWMD (2008).
[9] Base year methodology for commercial, industrial and mining water use taken from Wright (2009).

Within the area in Marion County in SJRWMD jurisdiction, the base period used for the projections was 1995–2005, and the historic water use values were calculated by averaging data over this base period. The use of average values compensated for variations in rainfall and missing or anomalous annual flow values.[10]

1.4.3 Water Demand Projections

Commercial, industrial and mining demands are shown in Table 1-4. This data was developed by the SWFWMD and the SJRWMD.

Demand projections within the SWFWMD were developed by multiplying permitted quantity data extracted from the District's Water Management Information System (WMIS) on October 23, 2008 by the percentage of actual use for the I/C and M/D categories on a county-by-county basis. The percentage of permitted quantity used in each county was calculated by dividing total estimated county use by the county's permitted quantity in each category for the years 2001 through 2006, using data extracted from the District's yearly Estimated Water Use reports. During this six year period, 38.2 percent of M/D permitted quantities, and 42.1 percent of I/C permitted quantities were actually reported as used District-wide. However, the percentage of permitted quantity actually used in the I/C and M/D categories varies significantly from county-to-county. When data was available, the percentage of permitted quantity actually used by each PG WUP holder was calculated and used to project water demand on a permit-by-permit basis. When individual power plant data was not available, the District-wide average use for PG was used to project water demand.[11]

Demand projections within the SJRWMD for commercial/industrial/institutional self-supply were divided into two groups based on entity type—those that are likely to increase in the future (e.g., educational) and those that are not (e.g., military). Historical water use for those entities of a type that are likely to increase in the future were summarized at the county level, and that total was multiplied by the population growth rate from 2005 to 2030. Historical water use for those entities of a type that are not likely to increase in the future were also summarized at the county level. Because water use for those entities is not expected to increase in the future, the 2030 projections were held at the historic levels. The 2030 projection summaries for both types were then summarized by county.[12]

1.4.4 Results

The SWFWMD estimated the commercial, industrial and mining demands for their section of Marion County in 2005 to be 0.10 mgd. By 2030 that demand is projected to increase by 0.10 mgd or a 100% increase demand for commercial, industrial and mining water use.

The SJRWMD estimated the commercial, industrial and mining demands for their section of Marion County in 2005 to be 2.83 mgd. They have projected an increase of 63% which equates to a demand in 2030 of 4.60 mgd.

Combining both the SWFWMD and SJRWMD, the commercial/industrial demand in 2030 is projected to be 4.80 mgd. This is 22% increase in the total commercial, industrial, and mining demand in Marion County in 2030 (Table 1-4).

[10] Base year methodology for commercial, industrial and institutional water use taken from SJRWMD (2008).
[11] Water demand methodologies for commercial, industrial and mining water use taken from Wright (2009).
[12] Water demand methodologies for commercial, industrial and institutional water use taken from SJRWMD (2008)

Table 1-4. Industrial/Commercial/Mining Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	0.10	0.20	100%
SJRWMD	2.83	4.60	63%
Total	**2.93**	**4.80**	**64%**

1.5 Recreational/Aesthetic Water Demand

1.5.1 Introduction

The SWFWMD includes in the recreational/aesthetic water demand the self-supplied freshwater used for the irrigation of golf courses, cemeteries, parks, and other large-scale landscapes. Golf courses are the major users within this category. The Water Demand Projection Subcommittee (2001) identified 0.5 mgd as the reporting threshold for all golf courses and others in the category. The threshold for the recreational/aesthetic category in this RWSP includes all permitted, reported, or otherwise identified uses because most golf courses and others in this category are below the identified 0.5 mgd threshold.[13]

The SJRWMD includes in the recreational/aesthetic water demand only of golf course irrigation, because SJRWMD does not have reliable estimates for other recreational uses and these other, recreational water uses (i.e., athletic field irrigation and swimming pools) are generally not significant in comparison to golf course irrigation. These other uses are often captured either in the public supply category or the commercial/industrial/institutional self-supply category.[14]

A description of the methodology and projections of water use for recreation and aesthetic within Marion County is detailed as follows.

1.5.2 Base Year

The base year used for the recreational/aesthetic water use in Marion County under SWFWMD jurisdiction is as follows: 2005 is the starting point, or baseline year, for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group. The data for the baseline year consist of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands (estimated needs).[15]

Within the area in Marion County in SJRWMD jurisdiction, water use values for each year between 1995 and 2005, where available for individual golf courses, were used as the basis of calculating an average water use per acre by individual golf course. An average water use per acre was also calculated for all golf courses in each county. For courses where water use data was incomplete, an estimation of the course's water use was calculated by multiplying the course acreage by the associated county-wide average.[16]

[13] Recreational and aesthetic water demand description taken from McGookey (2009).
[14] Recreational and aesthetic water demand description taken from SJRWMD (2008).
[15] Base year water use methodology for recreational and aesthetic water use taken from McGookey (2009).
[16] Base year water use methodology for recreational and aesthetic water use taken from SJRWMD (2008).

1.5.3 Water Demand Projections

Recreation/Aesthetic water demands are shown in Table 1-5. This data was developed by the SWFWMD and the SJRWMD.

Within the SWFWMD portion of Marion County, the methodology for recreation/aesthetic demand is as follows:

Golf Courses

Golf course demands are based on the average water use per golf course hole by county and a projection of golf course growth. The demands use the average golf course pumpage from 2003 through 2007, for permitted golf courses in the SWFWMD, to calculate the average gallons per day per golf course hole. The pumpage was derived from the SWFWMD's Regulatory database. The average annual pumpage per golf course hole is shown by golf course and by county. The county average was used to estimate future demand. Some pumpage data was not used due to inconsistencies in the data. A minimum of three years of good pumpage data was required to include the data from each golf course. The use of reclaimed water had an impact on the average use per golf course hole and was not used to calculate the average use; only the surface water and ground water pumpage was used to determine the average use per golf course hole for those golf courses that utilized reclaimed water. The historical number of golf course holes was derived from the NGF database (National Golf Foundation, 2007), the internet and data in the SWFWMD's permit file of record (WMIS, 2006). Some golf courses were contacted to verify information such as the year opened and number of current golf course holes. From this data, the historical growth of the number of existing golf course holes was used to forecast future growth. In order to forecast the average growth of golf course holes, a linear regression was performed using the historical golf course data in each county and that trend was used to project their growth to the year 2030. Although there are variations from year to year and from county to county, there is a general upward trend in the growth of golf course holes. The average annual use per hole by county was multiplied times the future growth in golf course holes to project future demands.

Aesthetic

Landscape water use includes irrigation for parks, medians, attractions, cemeteries and other large self-supply green areas. For each county, per capita water use (expressed in gallons per day per person) is obtained from a five year average (2003 to 2007) of the published estimated landscape water use from the SWFWMD Estimated Water Use Report (EWUR). Estimates of population growth from 2005 to 2030 were obtained from the 2010 RWSP (Bader, 2009) and based on BEBR. These population projections were then multiplied times the per capita landscape water use to estimate aesthetic demand by county. The District's average per capita water use for green space irrigation is 6.7 gpd per person. Projections were made in five-year increments to the year 2030.

1-in-10 Drought

The 1-in-10 drought event is an event that results in an increase in water demand of a magnitude that would have a 10 percent probability of occurring during any given year. The 1-in-10 year Drought Subcommittee of the Water Planning Coordination Group (SWPCG), as stated in their final report to the Florida Department of Environment Protection (FDEP, 2001),

determined that, methodologies for estimating the 1-in-10 year demand high for recreational self supply are similar to methodologies used to estimate agricultural demand. The optimum irrigation requirements for the 1-in-10 year event, as opposed to the average year event, were 30 percent for golf courses and 26 percent for landscape irrigation. The projected water use for an average year was multiplied by this percentage value to produce a projected water use for a 1-in-10 year rainfall.

Within the SJRWMD jurisdiction of Marion County, the methodology for recreation/aesthetic demand is as follows:

Golf Courses

SJRWMD digitized a districtwide golf course polygon GIS layer by using aerial imagery to delineate the irrigated portions of golf courses. During the digitization process, only those areas that appeared irrigated were included in defining each course's boundary. For instance, surface water bodies, forested and shrub areas, and large paved areas were excluded from irrigated acreage.

Water use projections (i.e., projected golf course development) for each county were calculated by multiplying the irrigated acreage in each county in 1995 by the respective county population growth rates between 1995 and 2030. The 2005 golf course acreage and water use data were interpolated from the acreage and water use values from the projected increase between 1995 and 2030.

It is expected that a significant portion of the projected water use will be supplied by reclaimed water and storm water. SJRWMD, through its CUP program, routinely requires the use of reclaimed water and storm water when such use is technically, environmentally, and economically feasible.

Aesthetic

SJRWMD does not calculate aesthetic water use, as it does not have reliable estimates for its recreational/aesthetic water use demands as mentioned above.

1-in-10 Drought

Water use for a 1-in-10-year drought was calculated by multiplying the projected 2030 water use by the county change ratio reported in *WSA 2003* for 2025 water use (see *WSA 2003*).[17]

1.5.4 Results

Within the SWFWMD, the water demand for recreation and aesthetic water use is expected to increase from 3.80 mgd in 2005, to a demand of 6.60 mgd in 2030. This is a 74% increase in water demand.

The SJRWMD, demand is expected to increase from 2.29 mgd in 2005, to a demand of 4.16 mgd in 2030. This is an 82% projected increase in recreational water demand.

[17] Methodologies for recreational and aesthetic water use demands taken from SJRWMD (2008).

The combined recreational demand for both SJRWMD and SWFWMD increases from 6.09 mgd in 2005 to 10.76 mgd. This is a 77% increase of recreational and aesthetic water demand for Marion County (Table 1-5).

Table 1-5. Recreational/Aesthetic Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	3.8	6.6	74%
SJRWMD	2.29	4.16	82%
Total	**6.09**	**10.76**	**77%**

1.6 Agricultural Water Demand

1.6.1 Introduction

In SWFWMD, water use demand projections were completed "for thirteen crop categories." These crops include: "include citrus, cucumbers, field crops, nursery, melons, other vegetables and row crops, and pasture, potatoes, sod, strawberries, tomatoes and blueberries" (SWFWMD, 2009).

Within the SJRWMD, agricultural water demand is assessed by crop due to specific consumption requirements. Corresponding estimates are based on a modified Blaney-Criddle model and Benchmark Farms Program data that is supplemented by U.S. Department of Agriculture-Soil Conservation Service (USDA-SCS) and National Oceanic and Atmospheric Administration (NOAA) data. Crop type and acreage data are provided through FAAS and a SJRWMD survey of county agricultural extension agents.[18]

The sections below describe the methodology and projections of water use in this category within Marion County.

1.6.2 Base Year

Within SWFWMD, "The data for the baseline year consist of reported and estimated usage for 2005" (SWFWMD, 2009).

Within SJRWMD the base year was 2005, and it was taken from the 2005 Annual Water Use Data Fact Sheet, were monthly agricultural water use data is calculated using a modified Blaney-Criddle model and data from SJRWMD's Benchmark Farms Program (BMF).

1.6.3 Water Demand Projections

Agricultural water demands are shown in Table 1-6. This data was developed by the SWFWMD and the SJRWMD.

[18] Agricultural water use description taken from SJRWMD (2006).

Within the SWFWMD portion of Marion County, the methodology for agricultural demand is as follows: Several assumptions were made, including: 1) agricultural land use conversion to residential/industrial/commercial use is irreversible; 2) water use/land use change analysis determines future agricultural land and water quantities; and 3) for purposes of the RWSP (2010), major agricultural types include citrus, cucumbers, field crops, nursery, melons, other vegetables and row crops, and pasture, potatoes, sod, strawberries, tomatoes and blueberries (added in 2008 for 2010 Plan).

The GIS model retrieved and compared the agricultural water use permitting information and land use/land cover county property appraiser's parcel data and recorded the future land use for each parcel and permitted area. The acreage increases were limited by the total available and remaining land and total water use permitted quantities. The GIS model accounted for land use transition from agriculture to residential/commercial/industrial use and a land use conversion trend was determined. Blueberry acreage was added to forecast the potential growth of this emerging crop type in the District. Aerial photography provided another layer of information for land use/land cover analysis and crop category determination.

Projected water uses associated with 'Miscellaneous' (*i.e.*, non- irrigated) agricultural operations include aquaculture, dairy, cattle, poultry, and others. The projected water use demands are presented under these two identified water use scenarios:

- Average annual effective rainfall conditions (5-in-10 year scenario); and
- A 1-in-10 drought year scenario (an event that results in an increase in water demand of a magnitude that would have a 10 percent probability of occurring during any given year)

Water use projections for permitted irrigated crop categories were determined by multiplying projected irrigated crop acreage by crop irrigation requirements (AGMOD). Acreage projections through the year 2030 were formulated based on a cumulative review of the information through GIS/permitting analysis and by other identified sources using a base year of 2005. For those counties that are not located wholly within the District (*i.e.,* Levy, Lake, Marion, Charlotte, Highlands, and Polk), only the portion of the crop acreage located within the District was considered.

Crop irrigation requirements were derived using the District's agricultural water use allocation program (AGMOD). Irrigation allocations were developed for each reporting category by using AGMOD and incorporating typical site-specific conditions for each crop, including location, climatology, soil type, irrigation system, and growing season(s). Planning level water use projections were developed through the year 2030 for average annual effective rainfall conditions and for a 1-in-10-drought year scenario.

For purposes of this analysis, the following assumptions were made with regard to crops included in the 'Vegetables, Melons, and Berries' category:

- All crops in the 'Vegetables, Melons, and Berries' category except for potatoes were assumed to be grown on plastic mulch. Although it is recognized that this is not entirely true for all operations in the planning regions (*e.g.*, some melon acreage), the impact of this assumption on the overall water use projections is not believed to be significant;

- Irrigation allocations for all crops grown on plastic mulch were calculated assuming zero effective rainfall. The result of this assumption is that projected water use needs for mulched crops are the same under both the 5-in-10 (average annual) and 1-in-10 drought year scenarios; and

- Irrigation allocations for all crops grown on plastic mulch include quantities for crop establishment.

All of the foregoing assumptions are believed to be reasonable in the context of mulched crop operations.[19]

For the demand projections of agricultural water use within SJRWMD, the district created a spatial database of 1995 and 2005 irrigated agricultural acreage for its entire jurisdictional area. Based on the information in this database, between 1995 and 2005 agricultural acreage declined by 13%; this trend is expected to continue.

This 2005 agricultural spatial database was intersected with all parcels projected to grow in population between 2005 and 2030. The population model also determines the maximum carrying capacity, in population, for a parcel that is at build-out (fully developed). A build-out percentage (ratio) can be calculated by dividing a parcel's projected population by its build-out population, which is shown:

[parcel growth build-out ratio] = ([2030 population] – [2005 population]) / [build-out population]

As stated above, parcels projected to grow in population were intersected with the database for agricultural lands. Agricultural acreage loss was calculated by multiplying the intersecting (area common to both growth parcels and agricultural acreage) area acreage by the growth- to build-out ratio for each growth parcel, that is:

[AG acres lost] = acres ([AG intersect growth parcel]) × [growth build-out ratio]

For each county (or portion thereof) in SJRWMD, the percentage change in irrigated agricultural acreage between 2005 and 2030 was calculated, as follows:

[county AG 2030 acres] = [2005 county AG acres] – [county AG acres lost]

Projected 2030 agricultural irrigation self-supply water use was calculated by multiplying the percentage change in acreage by the 2005 agricultural irrigation self-supply water use (see SJRWMD Technical Fact Sheet SJ2006-FS2 for 2005 water use).

Data from the consumptive use permitting process regarding future agricultural irrigation was taken into account in situations where agricultural irrigation was increasing significantly, but the typical assumption was that agricultural acreage will decline in the future. Therefore, it is assumed that agricultural irrigation self-supply water use will decline in the future. Water use for a 1-in-10-year drought was calculated by multiplying the projected 2030 water use by the county change ratio reported in *WSA 2003* for 2025 water use (see *WSA 2003*).[20]

[19] Agricultural water demand methodology received from Nourani (2009).
[20] Agricultural water demand methodology taken from SJRWMD (2008).

1.6.4 Results

Within the SWFWMD, the agricultural demand within Marion County is expected to increase from 3.00 mgd in 2005 to 3.30 mgd in 2030. This represents a 10% increase in agricultural demand.

Within the SJRWMD, the agricultural draft demand is expected to decrease from 3.62 mgd in 2005 to 3.39 mgd in 2030. This represents a draft 6% decrease in the agricultural demand for Marion County.

Combining both SJRWMD and SWFWMD, the agricultural demand in 2030 is 6.69 mgd. This is 30% of the total nonpotable demand for the County in 2030 (Table 1-6).

Table 1-6. Agricultural Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	3	3.3	10%
SJRWMD	3.62	3.39	-6%
Total	**6.62**	**6.69**	**1%**

1.6.5 Total Non-Potable Water Demand

Non-potable water demand includes agricultural, recreational/aesthetic, and industrial/commercial water uses discussed above. Even through the non-potable demand is minimal in comparison to potable demand in Marion County; it still is a significant amount of water. The total Marion County non-potable water demand was approximately 15.64 mgd in 2005. Using the SWFWMD and the SJRWMD data, the demand is expected to be about 22.25 mgd in 2030. This demand equates to an approximate increase of 6.61 mgd (42%) within the planning horizon (Table 1-7). Table 1-8 reflects the breakdown of non-potable water supply by water management district within the planning horizon.

Table 1-7. Total Non-Potable Supply Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	6.9	12.15	76%
SJRWMD	8.74	10.10	16%
Total	**15.64**	**22.25**	**42%**

1.7 Total Marion County Water Demand

1.7.1 Population Projections

In summary, existing and future population projections in Marion County were analyzed for each of the following categories:

- Public supply; and
- Domestic self-supply.

The total Marion County population projection was 290,510 people in 2005. Using the methods described, the population is expected to grow to 501,500 in 2030. This growth equates to a 210,990 people or a 73% increase in population during the planning horizon. Table 1-9 and Table 1-10 reflect the breakdown of populations for the public supply and domestic self-supply water use categories.

1.7.2 Total Water Demand

The total Marion County water demand for all water use categories was approximately 66.38 mgd in 2005. Using the methods described, the demand is expected to be about 106.66 mgd in 2030. These demands equate to an approximate increase of 41.32 mgd (61%) during the planning horizon (Table 1-11). The potable demand for Marion County is the biggest portion of this total water demand, making up 79% of the total use water use in Marion County in 2030, or 84.41 mgd.

Table 1-11. Total Water Demand in Marion County by Water Management District.

WMD	Water Demand (MGD)		% Increase in Water Demand
	Base Year 2005	Planning Horizon 2030	
SWFWMD	21.62	43.94	103%
SJRWMD	44.76	62.71	40%
Total	**66.38**	**106.66**	**61%**

1.8 Summary Comparison between Water Management Districts

Water demands in this chapter will serve as a basis for future water supply development projects in Marion County and potentially within the WRWSA. Since Marion County spans parts of both the SWFWMD and SJRWMD jurisdictions, a consistent approach to the determination of demand is preferable for effective water supply planning in the region. If different approaches to projecting demand were to generate significantly different results, then planning priorities in the region could be skewed by the use of different approaches.

The methods employed by the SWFWMD and the SJRWMD to estimate and project water demand were detailed earlier in this chapter. A summary comparison of key methodological tools between the SWFWMD and the SJRWMD was prepared to support coordination efforts between the two agencies. The comparison addresses public supply, domestic self-supply,

commercial/industrial & mining, recreational/aesthetic, and agricultural use categories (Table 1-12).

Table 1-12. Summary Comparison of Water Management District Demand and Population Methodologies.

Description	SWFWMD	SJRWMD
Population Forecast	2007 BEBR for projections	2006 BEBR for projections
Historic Per Capita Rate	5 year per capita (2003-2007)	11 year per capita (1995-2005)
Public Supply Demand	Public supply population multiplied by the residential 5 year per capita (2003-2007)	Public supply population multiplied by the residential 11 year per capita (1995-2005)
Domestic Self-Supply Demand	Domestic self supply population multiplied by the residential 5 year per capita (2003-2007)	Domestic self-supply population multiplied by the residential 6 year per capita (1995-2000)
Commercial/Industrial & Mining Demand	Includes power generation	Power generation is its own water use category
	2005 used as base year	Average of the historic water use (1995-2005) used as base year
Recreational/Aesthetic Demand	Includes golf courses, cemeteries, parks, and other large scale recreational uses	Consists of golf courses only
Agricultural Demand	Uses a GIS-based model to determine acreages, and AGMOD to determining irrigation requirements	Uses the Blaney-Criddle model and data from SJRWMD's Benchmark Farms Program (BMF).

Both the SJRWMD and SWFWMD have common and consistent resource management strategies in the region. The purpose of the summary comparison is to document the methodologies that are in use for determining water demand. The Phase II update to this chapter will maintain the common resource management strategies while using water demand determined by each agency.

1.9 Water Conservation

1.9.1 Introduction

Water conservation was identified in the RWSPU as an essential component of water supply planning. It allows for management of water demands from existing and anticipated growth without requiring major capital outlays. A toolkit of conservation best management practices (BMPs) was compiled and an inventory of local government conservation programs was prepared in the RWSPU (Table 1-13). Key conservation practices were evaluated, compared to existing programs and recommended for consideration by local governments.

The RWSPU identified three general categories of conservation BMP's:

- Regulation;
- Education; and
- Incentives.

This section includes an inventory of conservation BMP's in use within Marion County. For consistency with the RWSPU, this report categorizes conservation BMP's in Marion County according to those categories. Conservation measures in the compendium are only inventoried with information received from the utilities, and do not go into detail regarding the effectiveness of these measures. A local government selection of BMP's within a conservation program must consider careful consideration of consumers and apply the BMP's most likely to reduce demand.

1.9.2 Regulation

The RSWPU regulation category includes watering restrictions, inverted rate structures, mandatory dual lines for new development, water audits, metering programs, leak detection, prevention and repair, pressure monitoring and control, and landscape ordinances. These items are inventoried below with respect to local governments within and including Marion County.

City of Belleview

The City of Belleview has recently increased the cost of water in their adopted tiered rate structure for water and wastewater. This rate structure is the same for residential and commercial users; however the City of Belleview has classified water used for construction and water used for irrigation, separate from the rate structure for commercial users. The cost of construction and irrigation water is higher than the cost of water for residential and commercial users (See Appendix A). The inverted rate structure has 4 tiers for the residential and commercial water use: 0-7,000 gallons, 8,000-20,000 gallons, 20,000-30,000 gallons, and greater than 30,000 gallons. The city also conducts water audits to ensure there are no leaks in the distribution system.

The city currently has an ordinance that requires the use of Florida Friendly landscaping, and requires developments to use Florida Friendly Landscaping practices (See Appendix A). The city currently has in place lawn watering restrictions for the users it serves, and it adheres to SJRWMD watering restrictions.

The city performs periodic water audits that compare water sales, metered and estimated usages to water pumpage data. These audits ensure the city, that there isn't a loss of water (i.e. leaks) in their distribution system. The city performs a pressure control test in the distribution line to ensure that leaks and high flow rates are avoided.

The city currently does not require new developments to install dual lines, to provide reclaimed water for irrigation once it is available. The City of Belleview also does not enforce watering restrictions against users who do not adhere to the watering restrictions.

Town of McIntosh

The Town of McIntosh has adopted an inverted rate structure in which water rates increase for consumer uses that are higher than normal (See Appendix A). The inverted rate structure has 3 tiers: 0-5,000 gallons, 5,001-10,000 gallons, and greater than 10,000 gallons.

The Town of McIntosh also conducts water audits. The town also regularly monitors meter readings to ensure there isn't a leak in the town distribution system, and performs pressure control tests in the system to prevent leaks.

The Town of McIntosh does not enforce SJRWMD watering restrictions, and does not have a landscape ordinance requiring Florida Friendly landscaping. The town does not require that new developments install dual lines to provide reclaimed water for irrigation when it is available.

City of Dunnellon

The City of Dunnellon has recently increased the cost of water in their adopted rate structure for water and wastewater. This new structure went into effect on November 1, 2008. The rate structure differentiates residential customers, commercial, and industrial customers, and takes into account the meter size (Appendix A). The inverted rate structure for residential users has 5 tiers: 0-4,000 gallons, 4,001-8,000 gallons, 8,001-12,000 gallons, 12,001-20,000 gallons, and greater than 20,000 gallons.

The city performs periodic water audits to minimize the loss of water in their distribution system. The city is also currently monitoring unusually high meter readings to ensure there are no leaks in individual user's water systems.

The City of Dunnellon does not enforce SJRWMD watering restrictions, and does not have a landscape ordinance that requires the use of Florida Friendly landscaping. The City of Dunnellon is not requiring developments to install dual lines to provide reclaimed water for irrigation when it becomes available.

City of Ocala

The City of Ocala has adopted a tiered rate structure for their water users. Although the rate structure does not differentiate for the type of users, it does take into account the meter size when determining a base charge for water use. The inverted rate structure is set up in 5 tiers: 0-1,400 cubic feet, 1,400-2,000 cubic feet, 2,001-5,000 cubic feet, 5,001-10,000 cubic feet, and greater than 10,000 cubic feet. The city currently requires that dual lines for development to provide reclaimed water for irrigation be installed within a prescribed distance of areas where existing reuse lines are available. The city also plans on constructing more reuse lines to provide other parts of the city with reclaimed water when it is available.

The City of Ocala currently enforces SJRWMD watering restrictions. Although the city does not have a landscape ordinance requiring Florida Friendly landscaping, a draft plan for this ordinance has been created and will be going to the city council for consideration by the end of 2009.

The city is currently developing a plan to account for water loss in their distribution system. It is also implementing an automatic meter reading program that detects leaks in their distribution

system, which will be on-line by the first of the year. The city also monitors unusual water use quantities to ensure that there are no leaks in the distribution system.

Marion County

Marion County has put into place a tiered rate structure for their water users which went into effect in the spring of 2009. Marion County does not currently have a uniform rate structure for all of their customers. The Silver Springs Regional service area has a different rate structure than the rest of Marion County service areas. The rate structure differentiates residential, non residential, and irrigation users and takes into account the meter size of each user. However, only residential and irrigation water use are on a tiered rate structure (See Appendix A). The inverted rate structure for the Silver Springs Regional service area has 5 tiers: 1-6,000 gallons, 6,001-10,000 gallons, 10,001-13,000 gallons, and greater than 13,001 gallons. The inverted rate structure for the rest of the county also has five tiers but varies in the quantity of water in tier: 1-6,000 gallons, 6,001-12,000 gallons, 12,001-20,000, and greater than 20,001 gallons.

Marion County currently enforces SJRWMD watering restrictions which dictate the time and days for outdoor watering. To enforce watering restrictions, the county has set up penalties for those users who violate the restrictions (See Appendix A). Marion County does not currently require dual lines for new developments to provide reclaimed water for irrigation when it is available, however many of the developments within Marion County have made concessions to add reuse distribution lines based on recommendations from the county during the entitlement process.

Marion County has a landscape ordinance that supports and encourages the use of Florida Friendly Landscaping but it is not required. The landscape ordinance does not allow Homeowner Associations and Developers to prevent the use of Florida friendly landscaping.

Marion County currently conducts annual water audits to measure leakage in their distribution system. The County also has planned to upgrade to a fully automated meter reading system that will allow them to better monitor small leaks in the distribution system. The county currently performs pressure tests in their water system to prevent leaks.

1.9.3 Education Programs

Education and outreach are essential elements to a successful conservation program. The RSWPU public education categories include bill stuffers, education programs and dedicated conservation staff. Details and proposed measures are inventoried and discussed below.

City of Belleview

The City of Belleview is working with SJRWMD to develop a water conservation campaign. Its focus is to educate water customers on the importance and benefits of water conservation. The city has posted on their website ways in which citizens may reduce their water consumption.

The City of Belleview currently does not have dedicated staff for water conservation. The city also does not send any educational materials or bill stuffers to their customers, and doesn't participate in any other educational or outreach activities to promote conservation.

Town of McIntosh

The Town of McIntosh has posted water conservation techniques on their website. The town has also posted links to the SJRWMD website which explain current watering restrictions.

The Town of McIntosh does not have a staff that is dedicated to water conservation. McIntosh doesn't send any educational materials or bill stuffers to their customers, and doesn't participate in any other educational or outreach activities to promote conservation.

City of Dunnellon

The City of Dunnellon does not have staff that is dedicated to water conservation. The city does not participate in any educational or outreach activities related to water conservation. The city currently does not send out any educational materials regarding water conservation, or provide any bill stuffers to their customers.

City of Ocala

The City of Ocala is partnering with SJRWMD in its water conservation campaign. The city targets high consumption water users, and users who violate watering restrictions for outdoor watering, and informs them of conservation. The city currently has a conservation program with dedicated staff primarily focused on water and electrical conservation. The city sends educational material regarding water conservation to certain water users, but relies mainly on the conservation coordinators to inform its users on water conservation.

Marion County

Marion County holds workshops for high water use housing developments, the general public, and promotes conservation during other public events. The county has hired a landscape irrigation consultant that is working on an irrigation evaluation and education program for residents designated as high water users.

The county has one person dedicated to water conservation for the County. The water conservation coordinator sends personal letters to water users that exceed 30,000 gpm. The county has also gone through a water conservation media campaign. The county uses bill stuffers for their water customers, purchased space for 22 billboards across the county emphasizing water conservation, and placed conservation information on newspapers, television commercials, as well as on radio broadcasts.

1.9.4 Incentives

This section inventories incentives as a conservation initiative. Incentives include toilet rebates, rain sensors and plumbing retrofit programs. The following sections discuss information that was provided by the WRWSA governments on current and proposed incentive programs.

City of Belleview

The City of Belleview is not participating in any incentive programs that promote conservation.

Town of McIntosh

The Town of McIntosh is not participating in any incentive programs that promote conservation.

City of Dunnellon

The City of Dunnellon is not participating in any incentive programs that promote conservation.

City of Ocala

The City of Ocala provides low flow shower heads, low-volume toilets, and low-flow shower heads when funding is available, and is not participating in any other incentive programs to promote conservation.

Marion County

Marion County is not participating in any incentive programs that promote conservation. However, the county is working on a new irrigation evaluation and education program were they will be providing rain sensors to serve 150 high water use homes.

1.10 Reuse Water

1.10.1 Introduction

Reclaimed water is defined by the Florida Department of Environmental Protection (FDEP) as water that is beneficially reused after being treated to at least secondary treatment standards by a domestic wastewater treatment plant (WWTP), wastewater treatment facility (WWTF), or a wastewater reclamation facility (WRF). Beneficial reuse can be applied in a number of ways to decrease reliance on traditional water supplies (Water Reuse Program, 2006).

Beneficial reuse was identified in the RWSPU as an important component of water resource management. It can be used to offset, or replace, quantities of conventional groundwater or surface water sources. The utilization of WWTP flows in reclaimed water systems typically varies with population density and is also limited by seasonal supply and demand. Both the SJRWMD and the SWFWMD actively cooperate with utilities to help identify ways to increase reclaimed water utilization and offset potable water uses. Reclaimed water is discussed in further detail in the RWSPU.

An inventory of existing WWTP, WWTF, WRF and reuse data in the WRWSA was compiled in the RWSPU. Future wastewater and reuse water flows were projected. This section includes an inventory of existing WWTP and reuse data in Marion County, and future wastewater and reuse water flows are projected.

1.10.2 Existing Reuse in Marion County

1.10.2.1 Methodology

Locations of the WWTP's, WWTF's, and WRF's in Marion County with capacity greater than 0.1 mgd are shown in Figure 1-3 and listed in Table 1-14. The list was extracted from the Florida

Department of Environmental Protection's (FDEP) 2007 Reuse Inventory (FDEP, 2008), and member government information. Data on wastewater and reuse capacities and flows were compiled from the Reuse Inventory and information provided by member governments, whichever was more current.

1.10.2.2 Reuse Facilities Summary

There are seventeen wastewater reuse facilities in Marion County. Of these facilities, seven facilities provide beneficial reuse, while the others use spray irrigation or rapid infiltration basins for discharge (non-beneficial reuse). None of these seven facilities that provide beneficial reuse are within the SWFWMD jurisdiction of Marion County.

1.10.3 Future Reuse

Wastewater flows are typically proportional to public supply water use where public supply populations are served by central treatment facilities. Projections for future wastewater flow rates were calculated based on the percentage increase in public supply population for Marion County for 2005 to 2030. This methodology is consistent with the RWSPU. The projected 2030 wastewater flow rates equal 16.15 mgd as shown on Table 1-14.

Projected 2030 reuse flows were calculated from the 2030 wastewater flows by assuming a 75% beneficial utilization of wastewater flows. This potential utilization percentage is used by the SWFWMD and SJRWMD as an estimation of potential use if seasonal storage BMPs are used. However, in order to accommodate this relatively high utilization rate, storage and distribution capabilities will need to be addressed and infrastructure upgrades constructed to provide public access water quality. Chapter 4 includes further discussion of beneficial reuse project opportunities.

1.11 Stormwater

Stormwater is defined as water that accumulates on land as a result of storms and can include runoff from urban areas such as roads and roofs (www.water-technology.net, 2006). Stormwater as discussed here is usually not identified as a water supply source per se since water supply plans tend to focus on the larger supplies available in surface waters (e.g., SWFWMD, 2006; SJRWMD, 2006). However, stormwater is commonly utilized as a supplemental non-potable water supply source (FDEP, 2005), and additional stormwater supply projects are planned (SJRWMD, 2006; Hartman, 2006). Stormwater is a potential alternate water supply source in Marion County. More information on stormwater is available in the RWSPU.

Utilization

Florida has identified stormwater supplementation as part of a statewide strategy to increase the efficiency and effectiveness of reuse (FDEP, 2003). Utilization of stormwater for water supply generally takes one of two forms, which use stormwater to extend the reach of other supplies.

- Supplementation – use to augment potable or reuse supplies (primarily to manage seasonal variations, and/or to meet peak demands); and
- Irrigation – use to augment agricultural or landscape irrigation supplies.

Reuse supplementation is facilitated by Chapter 62-610, F.A.C., which provides for storage of reclaimed water in stormwater management systems and covers relevant NPDES surface water discharge requirements. There are no regulatory requirements for the water supply use of stormwater on a developed site, but consideration of its use is now commonly expected by the SWFWMD and SJRWMD in water use permit applications for new development.

Use of Stormwater Within Marion County

Existing uses of stormwater in Marion County are difficult to estimate. They include the Villages development traversing parts of Sumter and Marion Counties, which uses stormwater in an irrigation system to reduce their groundwater withdrawals. According to Villages staff, their stormwater irrigation system reduces groundwater irrigation withdrawals by 30-40% annually, depending on weather conditions.
Although stormwater will be a relatively small component of the overall water supply budget, as part of an integrated, balanced water resource management plan, the utilization of stormwater in various applications should be considered, potentially including:

- Irrigation in new developments to meet potable offset requirements, using wet ponds / retention and dedicated infrastructure;
- Supplementation of reuse supplies with stormwater and/or surface water; and
- Farm and agricultural area retrofits for stormwater irrigation.

The future of stormwater as a water source will likely be driven by the regulatory programs of both FDEP and the water management Districts to extend the reach of other sources.

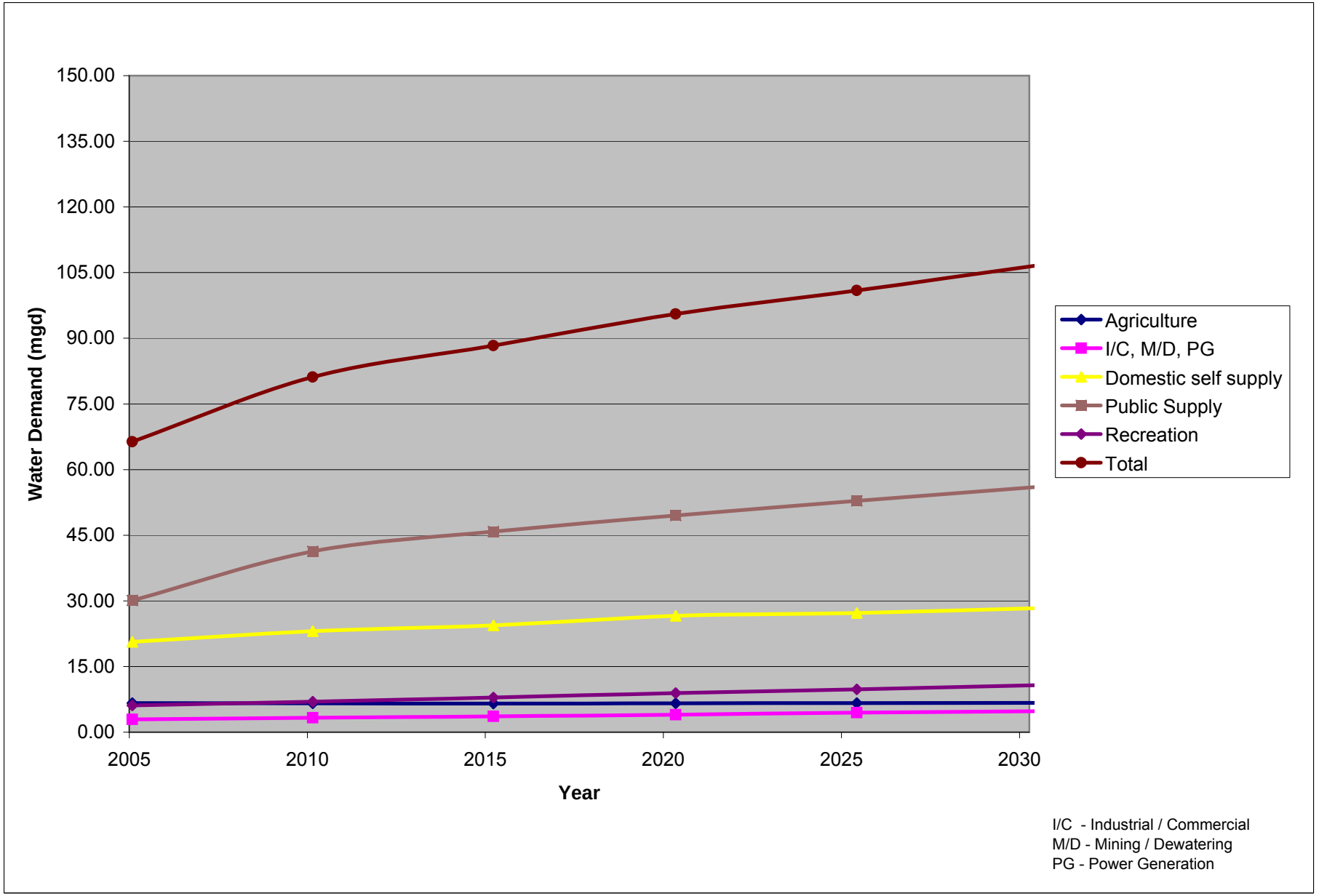


Figure 1-1 - Total Existing and Projected Water Demand in Marion County (Trend)

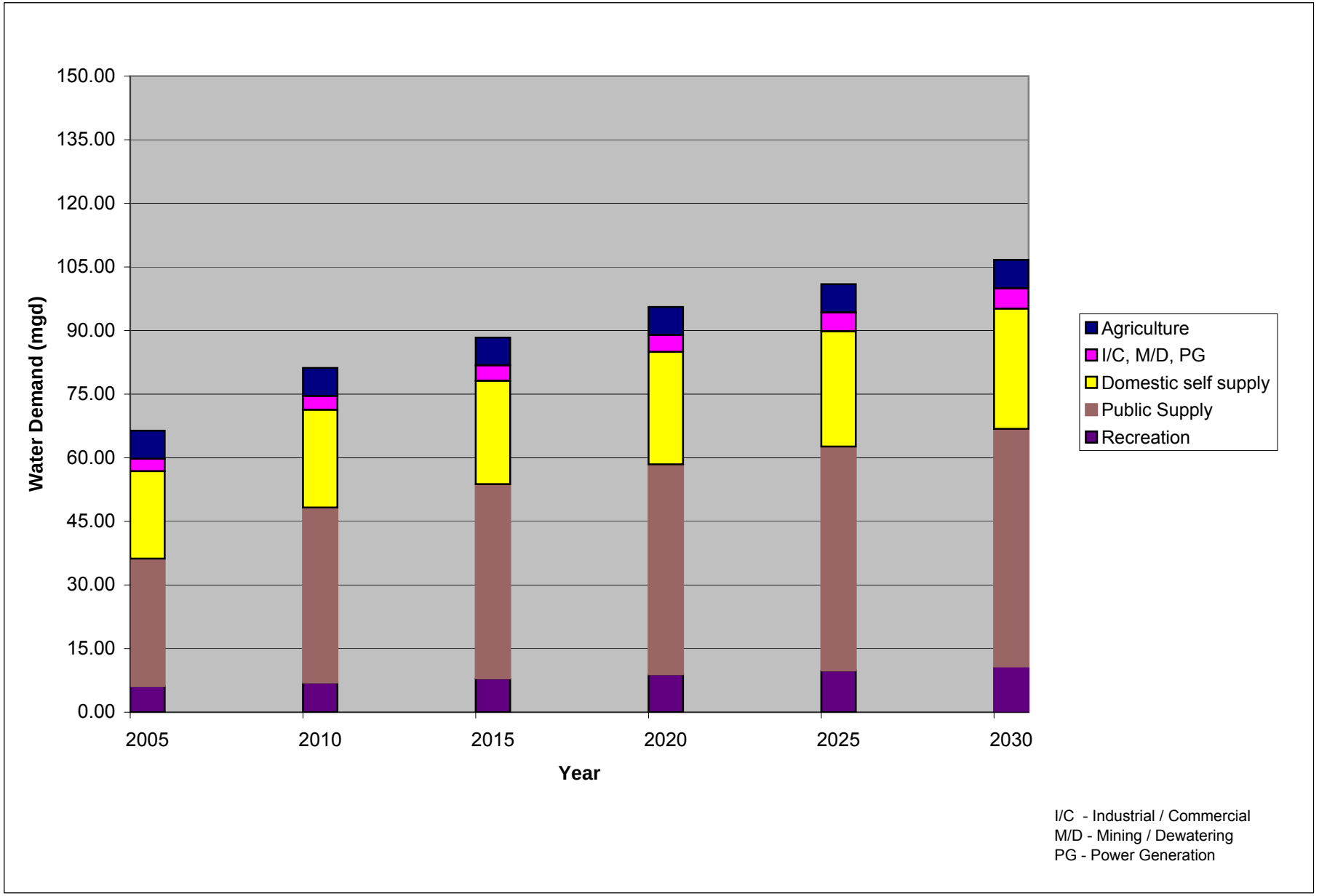
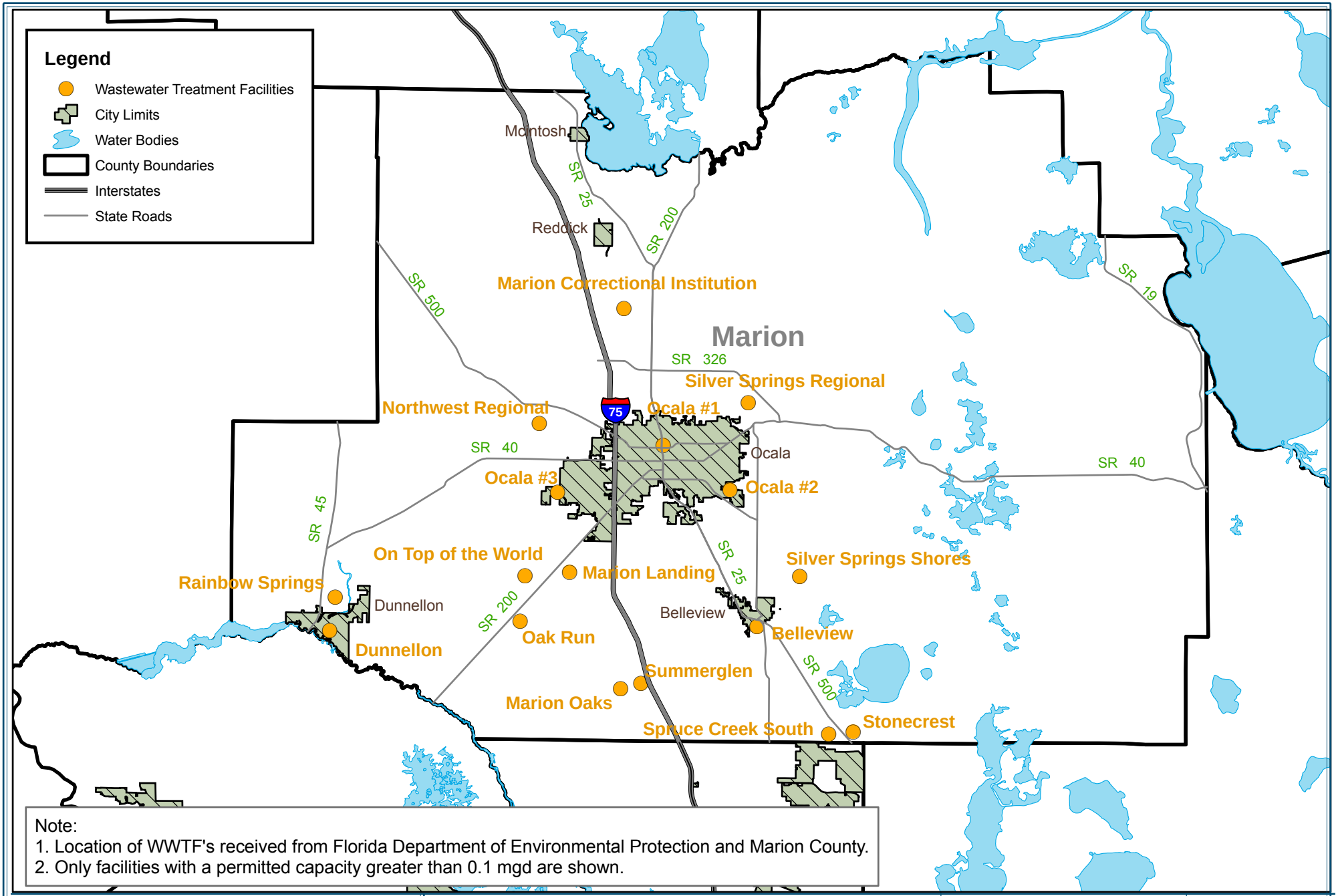


Figure 1-2 - Total Existing and Projected Water Demand in Marion County



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PROJECT: 0576 - Marion County Compendium

Figure 1-3
Existing Wastewater Treatment Facilities in Marion County

ORIGINAL DATE: 11/03/2008
REVISION DATE: 11/17/2008
JOB NUMBER: 0576
FILE NAME: WWTF's.mxd
GIS OPERATOR: DR

N W E S

1 inch equals 7 miles

	2005			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.62	2.83	2.29	**8.74**
SWFWMD	3.00	0.10	3.80	**6.90**
TOTAL				**15.64**

	2010			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.57	3.18	2.66	**9.42**
SWFWMD	3.00	0.10	4.30	**7.40**
TOTAL				**16.82**

	2015			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.53	3.54	3.04	**10.11**
SWFWMD	3.00	0.10	4.90	**8.00**
TOTAL				**18.11**

	2020			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.48	3.89	3.41	**10.79**
SWFWMD	3.10	0.10	5.50	**8.70**
TOTAL				**19.49**

	2025			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.43	4.25	3.79	**11.47**
SWFWMD	3.20	0.20	6.00	**9.40**
TOTAL				**20.87**

	2030			
	Agricultural MGD	I/C, M/D MGD	Recreational MGD	Yearly Total MGD
Marion				
SJRWMD	3.39	4.60	4.16	**12.15**
SWFWMD	3.30	0.20	6.60	**10.10**
TOTAL				**22.25**

All Values shown are mgd
I/C - Industrial/Mining
M/D - Mining/Dewatering

Table 1-8 - Projected Nonpotable Demand for Marion County

Service Area	Population						Average GPCD[3]	Projected public supply water demand (mgd)					
	2005	2010	2015	2020	2025	2030	2005	2005	2010	2015	2020	2025	2030
Located in SWFWMD [1]													
PUBLIC UTILITIES													
Marion County Utilities (6151)	9,093	12,603	13,718	14,506	15,264	15,870	179	1.628	2.256	2.456	2.597	2.732	2.841
Marion County Utilities - Summerglen (377)	9,248	16,883	24,142	29,103	34,399	39,787	128	1.184	2.161	3.090	3.725	4.403	5.093
Marion County Utilities (11752)	80	1,833	1,886	1,950	2,038	2,149	536	0.043	0.982	1.011	1.045	1.092	1.152
Marion County Utilities - Spruce Creek (12218)	1,200	1,430	1,530	1,662	1,802	1,914	487	0.584	0.696	0.745	0.809	0.878	0.932
Marion County Utilities - Qual Meadow (8165)	500	1,009	1,051	1,107	1,189	1,295	217	0.109	0.219	0.228	0.240	0.258	0.281
City of Dunnellon (8339)	2,770	6,135	7,064	8,166	9,255	10,151	125	0.346	0.767	0.883	1.021	1.157	1.269
PRIVATE UTILITIES													
On Top of the World Communities Inc (1156)	5,824	8,443	9,100	9,603	10,023	10,645	277	1.613	2.339	2.521	2.660	2.776	2.949
Marion Utilities Inc (2999)	681	681	681	681	681	681	187	0.127	0.127	0.127	0.127	0.127	0.127
Rainbow Springs Utilities LC (4257)	2,774	3,013	3,448	3,807	4,107	4,424	221	0.613	0.666	0.762	0.841	0.908	0.978
Utilities Inc of Florida - Golden Hills (5643)	1,785	1,841	1,945	2,063	2,217	2,449	97	0.173	0.179	0.189	0.200	0.215	0.238
Sateke Village Utilties HOA (6290)	76	87	87	87	88	88	124	0.009	0.011	0.011	0.011	0.011	0.011
Sun Communities Operating LP (6792)	845	845	845	845	845	845	146	0.123	0.123	0.123	0.123	0.123	0.123
Marion Utilities Inc (7849)	807	954	1,055	1,109	1,138	1,166	185	0.149	0.176	0.195	0.205	0.211	0.216
Century Fairfeild Village LTD (8005)	513	513	513	513	513	513	208	0.107	0.107	0.107	0.107	0.107	0.107
Marion Landing HOA (8020)	1,144	1,196	1,196	1,196	1,196	1,196	157	0.180	0.188	0.188	0.188	0.188	0.188
Marion Utilities Inc - Spruce Creek (8481)	3,000	5,533	6,469	6,903	7,100	7,246	241	0.723	1.333	1.559	1.664	1.711	1.746
Windstream Utilties Co (9360)	1,440	2,333	2,518	2,700	2,903	3,152	409	0.589	0.954	1.030	1.104	1.187	1.289
Upchurch Marinas - Sweetwater (9425)	249	452	452	452	452	452	277	0.069	0.125	0.125	0.125	0.125	0.125
Small Utilities	4,925	6,657	7,776	8,724	9,541	9,973	177	0.872	1.178	1.376	1.544	1.689	1.765
TOTAL SWFWMD	**46,954**	**72,441**	**85,476**	**95,177**	**104,751**	**113,996**		**9.24**	**14.59**	**16.73**	**18.34**	**19.90**	**21.43**
Located in SJRWMD [2]													
PUBLIC UTILITIES													
City of Belleview (3137)	10,227	12,802	14,895	16,723	17,691	17,691	77	0.790	0.996	1.159	1.301	1.376	1.376
City of Ocala (50324)	52,760	66,121	75,293	84,447	93,525	102,604	185	9.740	12.520	13.970	15.540	16.960	18.601
Marion County Utilities - Deerpath (50381)	1,936	2,452	2,706	2,960	3,215	3,489	64	0.123	0.199	0.219	0.239	0.260	0.281
Marion County Utilities - Raven Hill Subdivision (51172)	686	689	689	689	689	689	159	0.109	0.137	0.137	0.137	0.137	0.137
Marion County Utilities - Silver Springs Regional Water and Sewer (4578)	1,025	1,230	1,233	1,253	1,335	1,335	272	0.279	0.335	0.336	0.341	0.364	0.364
Marion County Utilities - Silver Spring shores (3054)	16,908	24,849	30,348	34,081	36,010	36,010	76	1.290	1.596	1.741	1.834	1.906	1.906
Marion County Utilities - South Oak Subdivision (51173)	953	971	974	974	974	974	140	0.133	0.179	0.179	0.179	0.179	0.179
Marion County Utilities - Spruce Creek Golf and Country Club (399)	4,899	6,730	6,758	6,759	6,759	6,759	394	1.929	2.968	3.123	3.243	3.322	3.345
Marion County Utilities - Spruce Creek South (82827)	2,733	2,751	2,751	2,752	2,752	2,752	260	0.710	0.906	0.906	0.907	0.907	0.907
Marion County Utilities - Stonecrest (71676)	10,200	13,983	16,566	17,837	20,339	20,339	99	1.007	1.647	2.005	2.005	2.005	2.005
PRIVATE UTILITIES													
Aqua Utilities of Florida Inc	3,414	3,570	3,638	3,663	3,673	3,673	104	0.354	0.456	0.464	0.467	0.469	0.469
Marion Utilities Inc	4,979	5,043	5,058	5,074	5,089	5,089	153	0.760	0.770	0.770	0.770	0.780	0.780
Ocala East Villas	0	458	459	461	461	461	328	0.000	0.150	0.150	0.151	0.151	0.151
Sunshine Communities	4,342	4,977	5,277	5,579	5,770	5,770	343	1.487	1.705	1.808	1.912	1.977	1.977
The Villages of Marion	8,863	8,890	8,890	8,890	8,890	8,890	245	2.168	2.133	2.133	2.133	2.133	2.133
TOTAL SJRWMD	**123,925**	**155,516**	**175,535**	**192,142**	**207,172**	**216,525**		**20.88**	**26.70**	**29.10**	**31.16**	**32.93**	**34.61**
Total County	**170,879**	**227,957**	**261,011**	**287,319**	**311,923**	**330,521**		**30.12**	**41.29**	**45.83**	**49.50**	**52.82**	**56.04**

(1) Projected population and public supply water demand based on Southwest Florida Water Management Districts 2010 Draft RWSP Update.
(2) Projected population and public supply water demand based on St. Johns River Water Management District's 2008 Draft Water Supply Assessment.
(3) Gross per capita rates represent total water demand within a service area divided by the total service area population. Gross per capita rates, therefore, encompass small commercial and industrial water users supplied by a utility. They are not directly comparable for different utilities.

Table 1-9 - Marion County Public Supply Water Demand and Population

WMD	Population						Average GPCD	Projected Domestic Self-Supply water demand (mgd)					
	2005	2010	2015	2020	2025	2030	2005	2005	2010	2015	2020	2025	2030
Total SWFWMD [1]	40,906	41,678	49,077	57,172	66,761	77,352	134	5.481	5.585	6.576	7.661	8.946	10.365
Total SJRWMD [2]	78,725	89,445	92,670	98,283	95,089	93,627	192	15.140	17.200	17.820	18.900	18.280	18.000
Total Marion County	**119,631**	**131,123**	**141,747**	**155,455**	**161,850**	**170,979**		**20.621**	**22.785**	**24.396**	**26.561**	**27.226**	**28.365**

(1) Domestic self supply water use based on SWFWMD 2010 Draft RWSP Update
(2) Domestic self supply water use based on SJRWMD 2010 Draft RWSP Update

Table: 1-10 - Marion County Domestic Self-Supply Water Demand and Population

	REGULATION								EDUCATION			INCENTIVES		
	Watering Restrictions	Inverted Rate Structure	Mandatory Dual Lines for New Development	Metering Programs	Leak detection, Prevention, and repair	Water Audits	Pressure Monitoring and Control	Landscape Ordinance/Florida Friendly Landscaping	Dedicated Staff	Bill Stuffers, Door Hangers, etc.	Education Programs	Toilet Rebates	Rain Sensors	Retrofit Packages (Aerators, Toilet Dams, Shower Heads, etc.)
Belleview	✓	✓	×	✓	✓	✓	×	✓	×	×	✓	×	×	×
Dunnellon	×	✓	×	✓	✓	×	✓	×	×	×	×	×	×	×
Marion County	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	×	×	✓	✓
McIntosh	✓	✓	×	✓	✓	✓	✓	×	×	×	✓	×	×	×
Ocala	✓	✓	✓	✓	✓	×	✓	×	✓	×	✓	✓	✓	✓
Reddick [1]														

✓ Indicates existing programs or programs planned to be implemented
× Indicates programs not currently implemented or planned

(1) No conservation measures were available at the time of this report.

Table 1-13 - Conservation Program Inventory

	2007 WWTF[1]		2007 Reuse				2030 WWTF		2030 Reuse	
FACILITY NAME	Capacity (mgd)	Flow (mgd)	Reuse Type	Capacity (mgd)	Flow (mgd)	Projected 2007-2030 % Population Increase (excludes DSS)	Capacity (mgd)	Flow (mgd)	Capacity (same as WWTF flow) (mgd)	Utilization (75%) (mgd)
Marion County										
Belleview[2]	0.76	0.37	GCI	0.76	0.35		1.19	0.60	0.60	0.45
			OC		0.29		0.99	0.49	0.49	0.37
Dunnellon	0.25	0.15	OC	0.25	0.12		0.41	0.20	0.20	0.15
Lowell (Marion) Correctional Institution	0.65	0.36	OC	0.65	0.36		1.23	0.61	0.61	0.46
Marion Landing	0.11	0.05	RIB	0.15	0.05		0.17	0.09	0.09	0.06
Marion Oaks	0.23	0.23	RIB	0.26	0.23		0.78	0.39	0.39	0.29
Marion/Oak Run[3]	0.8	0.41	GCI	0.80	0.17		0.58	0.29	0.29	0.22
			RIB	0.80	0.24		0.82	0.41	0.41	0.31
Northwest Regional [3]	0.2	0.01	GCI	0.02	0.00		0.02	0.01	0.01	0.01
Ocala # 1 WWTF[4]	2.47	1.09	GCI	1.82	0.75		2.56	1.28	1.28	0.96
			OPAA	0.65	0.21		0.72	0.36	0.36	0.27
Ocala # 2 WRF[4]	6.63	2.52	GCI	0.35	0.16	70.63%	0.55	0.27	0.27	0.20
			OC	5.83	2.30		7.85	3.92	3.92	2.94
			OPAA	0.39	0.06		0.20	0.10	0.10	0.08
			RIB	0.06	0.00		0.00	0.00	0.00	0.00
Ocala # 3 WWTP[4]	4.00	2.05	OPAA	4.09	2.05		7.00	3.50	3.50	2.62
On Top of The World/Bay Laurel	0.75	0.39	OC	0.75	0.39		1.33	0.67	0.67	0.50
Rainbow Springs	0.23	0.15	OC	0.23	0.15		0.51	0.26	0.26	0.19
Silver Springs Regional[3]	0.45	0.15	RIB	0.45	0.15		0.50	0.25	0.25	0.19
Silver Springs Shores[3]	1.5	0.95	OC/RIB	1.00	0.95		3.24	1.62	1.62	1.21
Spruce Creek South	0.45	0.12	RIB	0.45	0.12		0.41	0.20	0.20	0.15
Stonecrest	0.23	0.17	RIB	0.23	0.17		0.58	0.29	0.29	0.22
Summerglen[3]	0.2	0.2	GCI	0.20	0.20		0.68	0.34	0.34	0.26
County Total	**19.91**	**9.37**		**20.19**	**9.47**		**32.32**	**16.16**	**16.16**	**12.12**

(1) Only facilities with permitted capacity greater than 0.1 MGD are shown. Data taken from the FDEP 2007 Reuse Inventory unless otherwise indicated.
(2) Belleview wastewater treatment facility capacity, and golf course irrigation flows taken from the consumptive use permit issued by SJRWMD in 2009. The Other Crop reuse flow taken from FDEP Reuse Inventory (2007).
(3) Wastewater treatment facility and reuse capacities/flows provided by Marion County.
(4) Future Wastewater treatment facility capacities and flows taken from the Integrated Water Resources Plan for the City of Ocala.

Reuse Type Abbreviations:

GCI Golf Course Irrigation
OC Other Crops (Spray irrigation)
RIB Rapid Infiltration Basins
RI Residential Irrigation
OPAA Other Public Access Areas

Table 1-14 - Existing and Projected Wastewater and Reuse Capacities and Flows

Chapter 2

2.0 Water Resources Assessment

Chapter 2 reviews and characterizes groundwater, surface water and seawater resources relevant to water supply within Marion County. Conventional groundwater and surface water sources will, in most circumstances, meet the majority of a region's water supply needs within the planning horizon. Groundwater is considered a traditional source by the SWFWMD and the SJRWMD, while surface water, seawater, and reclaimed water are considered alternative sources.[1] The use of alternative water supplies is essential to meeting water supply needs, because the supply of conventional sources is limited. This section analyzes groundwater, surface water and seawater sources to assess their potential to serve as sources for future water supply development.

Key Points

- This chapter reviews and characterizes groundwater, surface water, and seawater resources relevant to water supply within Marion County. The Floridan aquifer system and the Withlacoochee River and Ocklawaha River in Marion County are reviewed.
- The Floridan aquifer system provides approximately 98 percent of Marion County's water supply.
- Natural springs, including Silver, Rainbow, and Silver Glen, play a significant role in the overall water resource and socio-economic base of Marion County.
- The SJRWMD has initiated facilitation and planning efforts with local governments to consider the Lower Ocklawaha River (e.g., downstream of the confluence with Silver River) for water supply in a service area that includes Lake, Marion, and Putnam Counties.
- Large seasonal and interannual flow variations in the Upper Ocklawaha River (e.g., upstream of the confluence with Silver River) will affect any future surface water withdrawals there. Ongoing restoration efforts and water withdrawals in the Upper Ocklawaha River Basin in Marion and Lake Counties may affect withdrawals available for water supply.
- The WRWSA does not anticipate developing a Phase II conceptual design for water supply development from the Ocklawaha River.
- The WRWSA has established proxy Minimum Flows and Levels (MFLs) to constrain withdrawals from its conceptual designs along the Withlacoochee River.
- Water resource constraints such as MFLs may affect future groundwater and surface water development. SWFWMD is scheduled to begin adopting MFLs for the Withlacoochee River and Rainbow River in 2010. SJRWMD is scheduled to adopt MFLs for the Lower Ocklawaha River and the Silver River in 2011.

[1] Reclaimed water is analyzed in Chapter 1.

2.1 Identification and Characterization of Groundwater Resources

The surficial and Floridan aquifers are the principal sources of groundwater within Marion County. Since a large portion of central and western Marion County does not have an extensive aquifer confining layer, most of the County does not have a surficial aquifer. In central and western Marion County, the surficial aquifer is generally less than 25 feet thick where it is present. In upland areas of the Brooksville Ridge and Fairfield and Ocala Hills, however, the surficial aquifer may exceed 50 feet in thickness (Faulkner, 1973; Wolansky and others, 1979).

Since the Floridan aquifer is generally unconfined throughout most of Marion County, significant recharge occurs. Recharge throughout most of the County is characterized as high, defined as greater than 10 inches per year. The geology of Marion County is generally characterized as karst, meaning a landscape containing numerous sinkholes, lack of surface drainage, and undulating topography (WRA, 2005). Stratigraphic and hydrostratigraphic units in the study area are listed and described in Table 2-1.

The Floridan Aquifer System (FAS) is the principal source of water in the County. The freshwater-bearing part of the aquifer is known as the Upper Floridan Aquifer (UFA). The UFA is composed of the Ocala Limestone and upper portions of the Avon Park Formation. The Floridan Aquifer was subdivided by Miller (1986) into a UFA and a Lower Floridan Aquifer (LFA). Miller (1986) proposed that middle confining units within the Avon Park Formation separated the UFA from the LFA. In some areas, the LFA contains poor-quality water and is not used as a potable water source. However, high sulfate concentrations have been observed in the UFA in western parts of Marion County. They are found in UFA wells less than 250 feet deep in the Rainbow Springs area and can be found at depths of 200 feet or less (Martin and Basso, pers. comm., 2008).

Discharge from the FAS takes place at springs throughout the County. Total spring discharge exceeds 1 billion gallons per day under average hydrologic conditions, and ranges from a high of 525 MGD at Silver Springs to a few MGD at smaller spring systems including Camp Seminole and Orange.

It is estimated that in Marion County the FAS constitutes 97.6 percent of all groundwater utilized within the County, with the remaining 2.4 percent coming from the surficial aquifer (Marella, 2008).

Table 2-1. Stratigraphic and Hydrostratigraphic units in Marion County (modified from Sacks (1996 and Jones and others (1996)).

APPROXIMATE NUMBER OF YEARS AGO	SYSTEM	SERIES	STRATIGRAPHIC UNIT	GENERAL LITHOLOGY	HYDROGEOLOGIC UNIT		THICKNESS (feet)
Present to 2,000,000	Quaternary	Holocene - Pleistocene	Undifferentiated Holocene deposits, Beach ridge and dune deposits, and Alluvium	Sand and clay	Surficial aquifer system		0 to 100
2,000,000 To 65,000,000	Tertiary	Pliocene	Cypresshead Formation	Sand and some clay	Surficial aquifer system		0 to 100
		Miocene	Hawthorn Group	Phosphatic sand and clay	Intermediate Confining Unit		0 to 140
		Eocene	Ocala Limestone	Limestone, fossiliferous to micritic	Floridan aquifer system	Upper Floridan aquifer	0 to 100
			Avon Park Formation	Upper part, limestone and dolostone		Middle Confining Unit	800 to 1,100
				Lower part, dolostone with intergranular gypsum; some bedded gypsum, peat, and chert			
			Oldsmar Limestone	Limestone and dolostone, some evaporites and chert		Lower Floridan aquifer	500 to 650
		Paleocene	Cedar Keys Formation	Dolostone with evaporites			400 to 700

Groundwater is presently the preferred potable water supply source in Marion County. Regulatory constraints designed to prevent ecological harm to springs, rivers, lakes, and wetlands will restrict the amount of groundwater withdrawals in the future. A planning estimate of this limitation is shown graphically in Figure 2-1, where the maximum available groundwater yield is estimated on a countywide basis at 110 mgd (based on the projected screening flow reduction at Silver Springs) using the SJRWMD North-Central Florida (NCF) groundwater flow model and groundwater withdrawals within the model domain. Due to the projected limit on groundwater withdrawals, other sources will be necessary to meet the potable demand after the withdrawal of additional groundwater is restricted. The estimated constraint on withdrawal is subject to change once the actual MFL for Silver Springs is adopted by the SJRWMD (WRA, 2007-c).

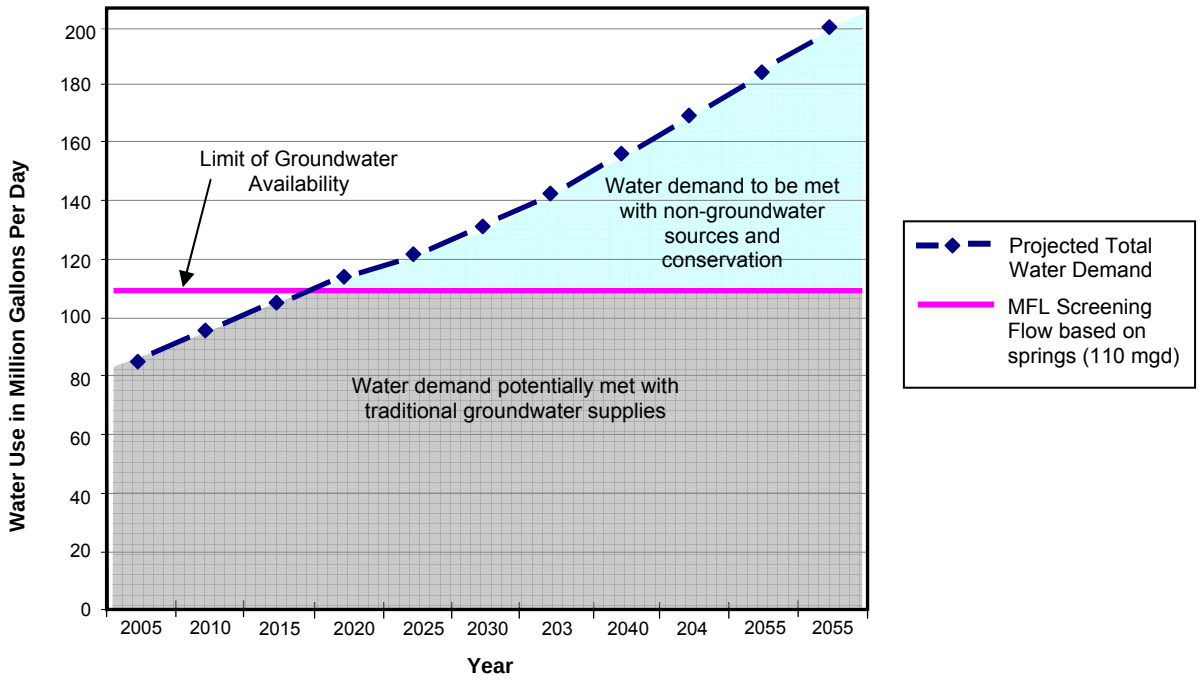


Figure 2-1. Marion County Unplanned Groundwater Supply Projection.

The protection of groundwater quality is important for Marion County since the FAS provides approximately 98 percent of the County's water supply. A comprehensive analysis of Floridan aquifer vulnerability throughout Marion County was completed (Advanced Geospatial, 2007). Overall, groundwater quality within Marion County is currently fair to good in terms of meeting current government drinking water standards (WRA, 2005); however, nitrate concentrations in the central and western parts of the County are increasing as evidenced by several studies completed since the 1980s (Jones, G.W., Upchurch, S.B. and Champion, K.M., 1996; Phelps, 2004). This decline in groundwater quality is linked to pollution from stormwater, fertilizers, domestic waste and animal waste disposal activities (WRA, 2005).

2.2 Springs

Natural springs play a significant role in the overall water resource base of Marion County. They act as regional discharge points for ground water in the Floridan aquifer and serve as

important ecologic habitats for a number of aquatic species of fish and mammals, and submerged aquatic vegetation. Springs are important socio-economic factors for the County, providing recreational opportunities for local residents and visitors, as well as jobs and revenues from tourist attractions and state parks at the springs. The SJRWMD and FDEP have evaluated the economic impact of Silver and Silver Glen Springs (Bonn, 2004) and Rainbow Springs (FDEP, 2004). These evaluations provide the following facts to characterize the magnitude of economic impact these springs have on Marion County.

- These two springs draw approximately three-quarters of a million visitors from outside the County annually;
- Residents of Marion County comprise an estimated 30% of attendance at these springs;
- Silver Glen Spring had a direct annual spending impact in Marion County of $348,770 from visitors outside the County;
- Silver Springs had a direct annual spending impact in Marion County of approximately $61 million from visitors outside the County; and
- Rainbow River has approximately 220,000 visitors annually and an annual direct economic impact of $6.9 million from visitors outside the County.

The flow generated by the springs in Marion County is a direct reflection of the groundwater hydrology that characterizes the County. Pervious soils, sinkholes and karst geology allow significant amounts of rainfall to recharge the Florida aquifer and ultimately discharge at the springs. Travel times for groundwater migration to the springs vary throughout the County based on geologic features such as existence of fracture zones. Jones and others (1996) showed that the average monthly flow at Rainbow Springs exhibits significant seasonality, reaching a minimum at the end of the dry season in June and peaking in October, after the end of the summer wet season. This pattern indicates that the lag time between seasonal changes in rainfall and the response of the springs is very rapid. Also, this is an indication that the groundwater flow system which supplies water to the springs is very open and active and is recharged by precipitation falling in close proximity (5 to 10 mile radius) to the springs, in addition to precipitation falling at a greater distance from the springs.

In comparing the flow rates of the County's two largest springs, Silver and Rainbow, the average daily flow records since 1965 show they respond in a very similar manner over time (Figure 2-2). Increases and decreases in flow are generally attributable to precipitation patterns. During the period from the late 1980's to present, the comparative flow of Silver Springs to Rainbow Springs shows a decline of Silver Springs relative to Rainbow Springs (Figure 2-3) (WRA, 2005). The specific reasons for this change are under investigation by the SJRWMD, SWFWMD and USGS. The resolution of the flow decline question at Silver Springs may affect the timing of SJRWMD Minimum Flow and Level (MFL) establishment for Silver Springs, which is scheduled for 2010. MFLs are discussed in more detail later in this chapter.

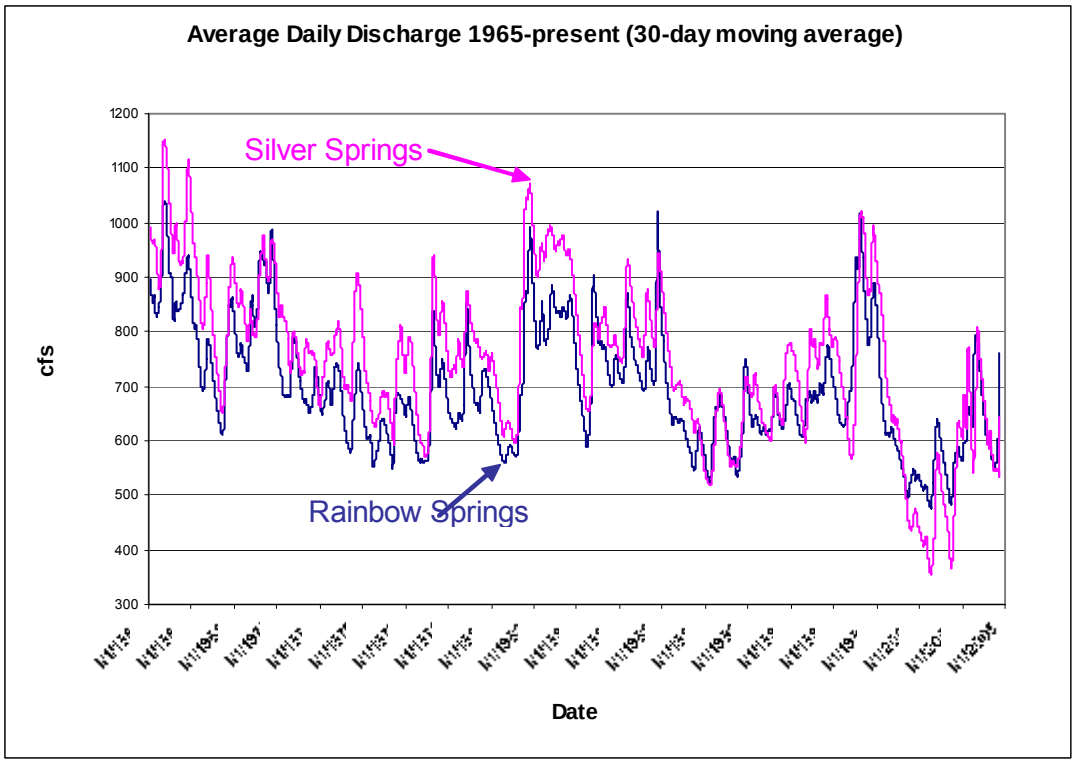


Figure 2-2. Average Daily Rainbow and Silver Springs Discharge 1965 – Present. (30-day moving average) (Based on USGS Data)

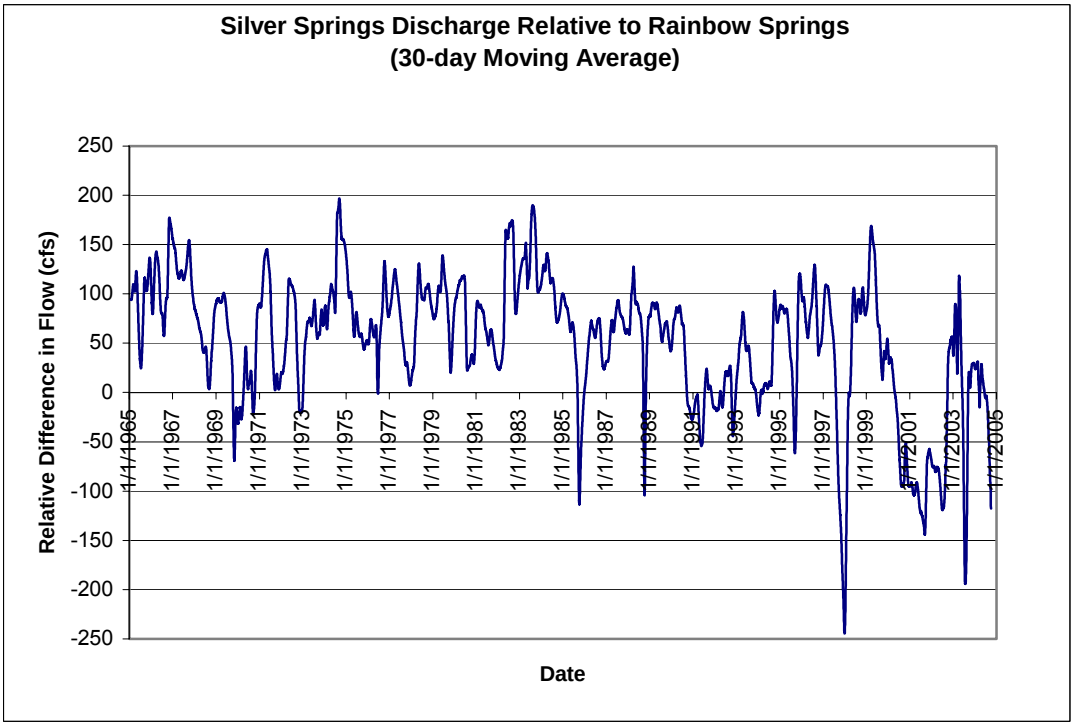


Figure 2-3. Silver Springs Discharge Relative to Rainbow Springs. (30-day moving average) (Based on USGS Data)

2.3 Identification and Characterization of Surface Water Resources

Surface water sources are not currently utilized for potable water supply in Marion County, though minor quantities of surface water are used for irrigation (WRA, 2007-c). Relative to groundwater supplies, utilization of surface waters for potable supply entails management of variability in supply quantity and quality, and management of the associated environmental impacts to downstream ecology and water resources. Surface water has sophisticated and costly treatment requirements that vary with the quality of the source, and may involve filtration or reverse osmosis. For effective utilization of surface waters, these characteristics of surface water supplies should be identified and addressed at the planning level.

Since surface water is not currently utilized for potable water supply in Marion County, only certain principal surface water bodies are selected for characterization. These are surface waters that consolidate surface water runoff and groundwater flows from within the watershed, and collect and integrate flows from watershed sub-basins. The principal surface waters are anticipated to be the most cost-effective sources for supply development, due to their larger and more regular flows in comparison to the individual watershed sub-basins. Principal surface water bodies and major watersheds in Marion County are shown on Figure 2-4. They include rivers and lakes and are discussed below.

2.3.1 Rivers[2]

There are three principal rivers with water supply potential that flow through or along the boundaries of Marion County. These include the Withlacoochee, Ocklawaha, and St. Johns Rivers. Within these larger watersheds are two smaller, yet equally important surface water features: the Silver and Rainbow Rivers. Both of these rivers are large spring runs that discharge to the larger drainage-basin features (WRA, 2005).

2.3.1.1 Ocklawaha River

The Ocklawaha River flows from south to north through the eastern half of Marion County, having traveled from its headwaters in Lake County some 15 miles upstream (Figure 2-4). The Ocklawaha River is the largest drainage basin in Marion County having a watershed of approximately 2,747 square miles. The characterization of the Ocklawaha River in this section is taken from WRA (2007-c) and complemented with additional analysis based on the methods in the RWSPU.

Flow from the Upper Ocklawaha River enters southern Marion County from Lake Griffin which is part of the Harris Chain of Lakes in Lake County. The Moss Bluff lock and dam, located northeast of Lake Weir, and about nine (9) miles north of the Marion/Lake County line, helps regulate the water levels upstream, including the levels in Lake Griffin. Further upstream in Lake County, the Burrell lock and dam, helps regulate water levels in lakes Harris and Eustis and other upstream lakes.

The Upper Ocklawaha River upstream and immediately downstream of Moss Bluff is heavily channelized. The lakes and natural streams in Lake County have also been altered for recreational and navigational use in Lake County. Lake levels are regulated by the SJRWMD using a series of control structures at Moss Bluff, in the Harris Chain of Lakes, and Lake

[2] Information regarding water supply projects that use rivers as a source is provided in Chapter 4.

Apopka. The regulation schedules and historic alterations to the watershed have led to a reduction in historic streamflow at Moss Bluff. The reduction in streamflow is thought to be coincident with the construction of the Moss Bluff and Burrell structures in the 1960's (Tibbals et al, 2004).

The Silver River discharges to the Ocklawaha River just east of the City of Ocala in central Marion County. The confluence with Silver River marks the beginning of the Lower Ocklawaha River and lower basin. Silver River is a five-mile long spring run from Silver Springs, and contributes an average 820 cfs or 40 percent of the average flow of water to the Ocklawaha River downstream of the Moss Bluff Dam (WRA, 2007-c).

Orange and Eaton Creeks are major tributaries to the Lower Ocklawaha River downstream of the Silver River. Dams, locks, and control structures regulate portions of the flow in the Ocklawaha River. Near the exit from Marion County to Putnam County in the north, the Lower Ocklawaha River was dammed by the construction of the Rodman Reservoir in 1968 for the Cross Florida Barge Canal, which was never completed (SJRWMD, 2005). Rodman Reservoir occupies much of the reach of the river between Putnam and Marion Counties. Flow from the Lower Ocklawaha River exits Marion County via Kenward Gap and turns sharply eastward to the St. Johns River.

Historical Flow Data

Historical daily flow and stage data for surface water within the Ocklawaha River Basin is generally available from USGS hydrologic gages, and this data provides the basis for the estimated system flows presented in this report. Table 2-2 summarizes the flow and stage data reviewed. Each gage used for the evaluation contains a minimum 20-year dataset; some datasets had periods of missing data which were excluded from the analysis. Periods of records for each gage were not matched; available data was fully utilized to provide a best historical estimate for each location.[3] The location of the USGS hydrologic gage stations used is shown on Figure 2-5.

[3] Historic structural alterations in the Ocklawaha River system and the Atlantic Multi-decadal Oscillation (AMO) (Kelly, 2004) may affect the utility of historic time frames in determining yield, particularly in the vicinity of Moss Bluff and Rodman Reservoir. Hydrologic assessment of these factors is beyond the scope of this report. A modeling approach and composite datasets have been used for hydrologic evaluations in the vicinity of Rodman Reservoir (SJRWMD, 2005; Wycoff, 2008).

Table 2-2. Ocklawaha River Flow and Stage Data Summary.

Name	USGS Gage	Type	Data Analyzed	Data Analyzed
			Start	Finish
Ocklawaha River at Moss Bluff, Fl [1]	02238500	Daily Stage/Flow	10/1/1943	9/18/2008
Ocklawaha River NR Conner, Fl [2]	02240000	Daily Stage/Flow	2/13/1930	9/18/2008
Ocklawaha River at Eureka, Fl [3]	02240500	Daily Stage/Flow	3/1/1930	9/18/2008
Ocklawaha River at Rodman Dam Near Orange Springs, Fl	02243960	Daily Stage [4]	10/1/1969	9/18/2008
		Daily Flow [4]	10/1/1968	9/18/2008

[1] There was no data available from October 1955 through September 1967.
[2] There was no data available from October 1946 through September 1977.
[3] There was no data available from October 1934 through September 1943, and from January 1953 through January 1981.
[4] Data retrieved from this gage is not a daily level but an average for the day.

The USGS stations and their associated data are used to generate the flow records in this report. Table 2-3 summarizes the historic dataset for each gage station and the p85 (low flow) and p50 (median flow) values. The historical flow data that support this summary for each gage location are included as Figures 2-6 through 2-9.

Table 2-3. Ocklawaha River Basin Flow Characteristics.

Surface Water	Contributing Watershed Area	Flow Characteristics	
		p85	p50
	(MI^2)	(MGD)	(MGD)
Ocklawaha at Moss Bluff [1]	879	15.5	34.2
Ocklawaha near Conner [2]	1,196	423.2	585.8
Ocklawaha at Eureka [3]	1,367	427.7	645.2
Ocklawaha at Rodman Dam	2,747	351.0	658.1

[1] Data analyzed for the Moss Bluff Gauge covers from October 1943 until September 1955, and continues then from September 1967 to current day.
[2] Data analyzed for the Conner gauge covers from February 1930 until September 1946, and then continues from October 1977 to current day.
[3] Data analyzed for the Eureka gauge covers from March 1930 until December 1952, and then continues from February 1981 to current day.

Several estimates have been made as to the potential water supply yields from the Lower Ocklawaha River. The SJRWMD estimated a yield potential of 107 MGD (daily average) at the Rodman Reservoir (SJRWMD, 2005) as it is currently operated. WRA (2007-c) listed a potential withdrawal limit range of 70 to 100 MGD for the lower reach in Marion County. Silver Springs 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 (SJRWMD, 2005). Silver Springs accounts for much of the expected water supply yield

downstream. Therefore, water supply yield from the Lower Ocklawaha River will be sensitive to reductions in flow at Silver Springs.

Hydrologic Characteristics

The Upper Ocklawaha River generates peak ("flash") flows well above typical baseflows, which are generally low. This characteristic has been amplified by development and channelization in the upper basin. Significant flows are generated during high rainfall periods, and flow eliminated under drought conditions.[4] These hydrologic characteristics will influence any future water supply development upstream of the confluence with the Silver River.

The peak flows generated in Lake County progress downstream through Moss Bluff and a channelized reach in southern Marion County towards the confluence with the Silver River. The peak flows are heavily moderated by inflows from the Silver River, and other surface water contributions downstream of its confluence.

Flow distributions are highly skewed (i.e., averages are more heavily weighted by higher values) in the Upper Ocklawaha, and become more evenly skewed when the confluence with the Silver River is reached. Table 2-4 shows the ratio of the average to the median flow for each hydrologic station, as a measure of skew, based on the flow data described above.

Table 2-4. Ocklawaha River Skew Indices.

Surface Water	Average Flow (CFS)	Median Flow (CFS)	Ratio of Average To Median
Ocklawaha River at Moss Bluff	242	53	4.6
Ocklawaha River at Conner	1,044	908	1.1
Ocklawaha River at Eureka	1,152	1,000	1.2
Ocklawaha River at Rodman Dam Near Orange Springs	1,292	1,020	1.3

Flow duration curves also describe the flow distribution of the Ocklawaha River. Historical daily flow duration curves (using a logarithmic scale) for the Ocklawaha River system are presented in Figures 2-10 through 2-13. The slope of the duration curves increase drastically at the confluence with the Silver River, indicating a more even flow distribution with the introduction of Silver River discharge. The historic minimum flow is less than 1 cfs, indicating that flow can cease in this reach. In contrast, the historic minimum flow at Conner is 397 cfs.

Future water supply development must accommodate the various flow conditions present in the Ocklawaha River system. Generally, an even flow distribution, such as that present at Conner, will be the most accommodating for future water supply development due to the consistency of flows over time. An uneven flow distribution, such as that at Moss Bluff, will be the least accommodating for future water supply development due to the inconsistency of flows. However, the extent to which the skew of the distribution is relevant to is also affected by the

[4] Historically, the Upper Ocklawaha basin surface waters received a considerable portion of their total water budget from groundwater (Canfield, 1981), as portions of the river valley intersected the potentiometric surface of the Floridan aquifer. SJRWMD (2005) evaluated the effect of projected reductions in spring discharge on the Lower Ocklawaha River, but the Upper Ocklawaha River in Marion County was not evaluated.

available yield of the distribution.

Restoration efforts are ongoing in Lake County by the SJRWMD and the Lake County Water Authority (LCWA) (e.g., Harris Bayou, Lake Apopka) to help address the historic alterations to the upper basin. A wetland restoration project located on the Sunnyhill Farms tract in southeastern Marion County was considered by the SJRWMD in the late 1990's, but the project involved the use of a surface water reservation and was never completed (SJRWMD, 2008). Depending on the soils and geology of the tract, the Sunnyhill Farms restoration might have provided aquifer recharge. The completion of restoration efforts in the upper basin may lead to a more even flow distribution at Moss Bluff.

Water Quality

Surface water inflows in the upper basin begin in calcareous, nutrient-rich soils, and lead to naturally eutrophic surface conditions (SJRWMD, 2005). Urbanization and agriculture have accelerated this process, and most of the upper basin lakes are listed as impaired for phosphorus and have adopted total maximum daily loads (Magley, 2003). The Upper Ocklawaha River and its headwaters, the Harris Chain of Lakes, suffer from degraded water quality resulting from nutrient runoff (Fernald and Purdum, 1998). The current condition of degraded water quality results in a river system with a higher algae content (WRA, 2005).

Water quality in the Silver River is considered good due to low mineral and color contents. It meets primary and secondary water quality standards established by the FDEP (WRA, 2005). The water quality of the Lower Ocklawaha River is also considered good, due in large part to the substantial fresh groundwater contribution of the Silver River. Expensive membrane treatment is not expected to be required for water supply, because the water is always fresh (SJRWMD, 2006).

Both the Silver and Ocklawaha Rivers are designated Outstanding Florida Waters (OFWs), which prevents the lowering of existing water quality. MFLs for the Ocklawaha River are currently being developed by the SJRWMD and will be set concurrently with the Silver Springs MFL in 2011. The MFLs will be protective of significant water quality declines due to water withdrawals.

2.3.1.2 Withlacoochee River

The Withlacoochee River flows along the southwestern boundary of Marion and Citrus Counties (Figure 2-4), traveling from its headwaters in the Green Swamp some 75 miles upstream before emptying into the Gulf of Mexico near Yankeetown. West of Marion County, the Withlacoochee River has been dammed to form Lake Rousseau, which occupies much of the reach of the river between Citrus and Marion counties southwest of the City of Dunnellon. The Rainbow River discharges to the Withlacoochee River just upstream of Lake Rousseau. More information regarding these Withlacoochee River features is provided in the RWSPU. The following is a brief overview of the Withlacoochee River system and description of its water supply development potential in the vicinity of Marion County, based on analyses in the RWSPU.

Basin Overview

In Sumter County upstream of Marion County, Lake Panasoffkee drains a 390 mi^2 contributing area (Florida Board of Conservation, 1969) and has a surface area of approximately 3800

acres, making it the largest lake in Sumter County. Lake Panasoffkee flows to the Withlacoochee River via the Outlet River in Sumter County. The Outlet River flows over a two-mile watercourse from the western shore of the lake and serves as the sole discharge from the lake to the river.

The Tsala Apopka Chain of Lakes is located west of the Withlacoochee River in Citrus County. Tsala Apopka consists of a series of ponds, marshes, and pools, with three primary pools – the Floral City Pool, the Inverness Pool, and the Hernando Pool. Tsala Apopka discharges to the Withlacoochee River, just upstream of the USGS gage at Holder through the Tsala Apopka outfall canal (C-331).

Rainbow Springs is the fourth largest first magnitude spring in Florida and forms the headwaters of the Rainbow River in Marion County. The River discharges into the Withlacoochee River, just upstream of Lake Rousseau.

Downstream of the confluence with Rainbow River, the Withlacoochee River discharges into Lake Rousseau, formed by the Inglis Dam. The lake covers 4,263 acres (Downing et. al., 1989) and drains a 2,020 mi^2 contributing area at its discharge – the bulk of the Withlacoochee River Basin.

Water Supply Description

The Tsala Apopka outfall canal (C-331) and the S-353 water control structure control discharge from the lake system back to the Withlacoochee River, just upstream of the USGS gage near Holder. The Withlacoochee River downstream of the Holder gage was identified in the RWSPU as a potential supply source that requires further hydrologic investigation. The WRWSA proxy MFL for the Withlacoochee River at Holder was used to determine that a reservoir would be needed to store water for potable water supply at this location.

The largest potential water supply yield within the basin is estimated at Lake Rousseau downstream of the confluence with Rainbow River. The Inglis Dam restricts flow from Lake Rousseau to the Lower Withlacoochee River by 7 to 10%. Across the Inglis Dam and bypass channel, potentially available yield declines slightly due to the restriction in flow by the dam, but still shows significant availability. Based on the proxy MFLs for the Withlacoochee River at Holder and the baseflow contribution from Rainbow River, no reservoir was included to store water in the Phase II conceptual design for Lake Rousseau. Lake Rousseau has water resource issues including coliforms from failing septic systems, dissolved oxygen, nutrients, excessive aquatic plant growth and tussock formation, muck and eutrophication (FDEP, 2005).

Conventional surface water treatment (e.g, no demineralization/desalination) is anticipated for the fresh potable water supply from the Withlacoochee River at Holder or Lake Rousseau. More information on potential water supply from Withlacoochee River system features in the vicinity of Marion County is available in the RWSPU.

Water Supply Yield

The potentially available yield is a SWFWMD screening-level estimate that represents the average annual daily water withdrawal that may be anticipated from each location, assuming non-cumulative withdrawals. Potentially available water supply yield was calculated in the RWSPU on an individual basis for locations on the Withlacoochee River using daily historical

flow and stage data. SWFWMD planning criteria were used for the calculations. Table 2-5 shows the p85, p50 (median flow), and calculated potentially available yield for gaged locations in the Withlacoochee River Basin, as discussed in the RWSPU.

Table 2-5. Withlacoochee River Potentially Available Yield.

Surface Water	Contributing Watershed Area	Flow Characteristics		Potentially Available Yield
		p85	p50	
	(MI^2)	(MGD)	(MGD)	(MGD)
Withlacoochee River near Holder	1820	152	377	52
Rainbow Springs near Dunnellon(1)	0	377	450	40
Withlacoochee River at Confluence with Rainbow River(2)	1960	N/A	N/A	98
Lower Withlacoochee River, at Inglis(3)	2020	503	794	87

(1) The Rainbow River watershed area is approximately 73 mi^2; however, the headwaters at Rainbow Springs are groundwater fed.

(2) Flow data is not measured at this location. The potentially available yield was estimated by adding the flows from the Holder and Rainbow Springs gages, and determining the potentially available yield for the summed flow. Since the summed yield does not include additional contributing areas downstream of both measured gages, the Holder gage yield was multiplied by the contributing watershed area at the confluence divided by the watershed area at the Holder gage. The difference between the multiplied Holder gage yield and the Holder gage yield (7 mgd) was then added to the summed potentially available yield to generate an estimated potentially available yield.

(3) The sum of the Inglis Bypass Channel and Inglis Dam flows was used.

Subsequent to the completion of the RWSPU, the WRWSA further evaluated potential withdrawals by developing proxy MFLs for the river. They were developed to ensure that the WRWSA projects on the Withlacoochee River are cognizant of approximate MFL-withdrawal constraints, given that MFLs have not been adopted for the Withlacoochee River by SWFWMD.

The proxy MFLs are a detailed, interim estimate of potentially available withdrawals, based on typical seasonal thresholds used in MFL establishment. The constraints on withdrawal estimated in the proxy MFLs are subject to change once the actual MFLs are adopted by the SWFWMD. The proxy MFLs are described in Phase II and VII -- Technical Memorandum No. 1.

Comparative Discussion of Withlacoochee and Ocklawaha Rivers

Both the Withlacoochee and Ocklawaha Rivers in Marion County have potential for water supply development. The Withlacoochee River downstream of the confluence of Rainbow River has potentially available yield, a relatively even flow distribution supported by Rainbow River, and raw water quality expected to be suitable for potable water supply development.[5] The Lower Ocklawaha River downstream of the confluence of Silver River has been identified as having potential for water supply development (SJRWMD, 2006; WRA, 2007-c). It has a relatively even flow distribution supported by Silver River, and raw water quality expected to be suitable for potable water supply development.

[5] Withlacoochee River system water quality is discussed in the RWSPU.

The Withlacoochee River confluence with the Rainbow River is located at the head of Lake Rousseau, an impounded and developed area established by the construction of the Inglis Dam. In contrast, the Ocklawaha River confluence with the Silver River and the Lower Ocklawaha River reach in Marion County is within a relatively undeveloped and unaltered river channel and contributing basin, upstream of the Rodman Reservoir. Permitting and siting issues associated with the scenic and recreational values of these areas may be obstacles to water supply development.

Upstream of its confluence with Rainbow River, the Withlacoochee River has significant potential yield and a moderately skewed flow distribution. The WRWSA has prepared a conceptual design for a potable water supply project involving a reservoir in this area near Holder. The WRWSA has also prepared a conceptual design for a potable water supply project involving conjunctive use of surface water and groundwater near Wysong-Coogler Water Conservation Structure.

Further upstream beyond the Outlet River from Lake Panasoffkee, the Withlacoochee River has more limited potential yield and a heavily skewed flow distribution. The WRWSA has prepared a conceptual design for an aquifer recharge project in Hernando County. Similar to Withlacoochee River in this area, the Ocklawaha River upstream of its confluence with Silver River also has more limited potential yield and a heavily skewed flow distribution. The completion of restoration efforts in the upper basin may lead to a more even flow distribution in this reach.

The WRWSA proxy MFLs discussed above were developed to ensure that the WRWSA projects on the Withlacoochee River are cognizant of approximate MFL-withdrawal constraints, given that MFLs have not been adopted for the Withlacoochee River by the SWFWMD. The WRWSA does not anticipate developing proxy MFLs or projects for the Ocklawaha River system since this work is underway at the SJRWMD.

2.3.1.3 St. Johns River

The St. Johns River (see Figure 2-4) flows along a small segment of the eastern boundary of Marion County, traveling from its headwaters in St. Lucie County some 140 miles upstream. The Ocklawaha River joins the St. Johns River just to the east of Marion County at Little Lake George. A second connection of the Ocklawaha River to the St. Johns River passes from Rodman Reservoir to the St. Johns River through a section of the Cross Florida Barge Canal

The water quality of this portion of the St. Johns River turns brackish during low flow periods and will require demineralization/desalination for potable use (SJRWMD, 2006). The St. Johns River is located further from the population centers in Marion County than the Lower Ocklawaha River. The Lower Ocklawaha River is a superior surface water source than the St. Johns River with regard to its potential for service to WRWSA members.

2.3.2 Lakes

There are 226 lakes in Marion County covering a total of approximately 45 mi^2. The two largest lakes, Lake Kerr and Lake Weir, cover approximately 4 mi^2 and 8 mi^2, respectively, of eastern and central Marion County. The lack of significant surface water features in the central and western parts of the County reflects the highly permeable and porous nature of the surficial sand and limestone throughout the region. Lakes become more common east of the

Ocklawaha River as a result of clay-rich geologic strata in the subsurface, which lead to perched conditions where clay impedes the vertical movement of groundwater into the Floridan aquifer. The water supply potential from Marion County lakes is limited due to their connectivity to the Floridan aquifer. Drawing water from these seepage lakes would not be a practical approach to the developing water sources other than very small irrigation needs for residences. Since the lakes are seepage lakes with a relative good connection to the Floridan aquifer, the preferred method of developing water source is to access the water supply indirectly through the groundwater system via a well. In this way, the quality of the water would be free from surface containments such as algae, oils, greases and other pollutants that would require treatment prior to most uses. However, there will be limits as to how much water can be withdrawn in the vicinity of the lakes since lake elevation drawdown can be rapid and severe if the withdrawal exceeds recharge. Such withdrawals would therefore be limited to the amount that would not draw down the elevation of the lake to an unacceptable level with respect to ecological and recreational concerns (WRA, 2007-c).

2.4 Minimum Flows and Levels

MFLs will help to dictate the viability of water supply from surface water bodies and groundwater by imposing limits to withdrawals as they are adopted. MFLs are the minimum water levels and/or flows adopted by the SJRWMD and SWFWMD as necessary to prevent significant harm to the water resources or ecology of the area resulting from permitted water withdrawals. Their establishment is required under 373.042, F.S. New water withdrawals must not cause water levels or flows to decrease below MFL criteria, unless the withdrawal is part of a recovery strategy that includes a water supply benefit.

Table 2-6 lists the surface water bodies in Marion County for which MFLs have already been adopted. Table 2-7 lists the priority water bodies that are scheduled for MFLs.

Table 2-6. Adopted MFLs in Marion County

Water Body Type	Water Body Name	WMD
Lake	Charles	SJRWMD
Lake	Weir	SJRWMD
Lake	Halfmoon	SJRWMD
Lake	Hopkins Prairie	SJRWMD
Lake	Kerr	SJRWMD
Lake	Nicotoon	SJRWMD
Lake	Smith	SJRWMD

Table 2-7. Priority Water Bodies Scheduled for MFLs in Marion County

Proposed MFLs			
Water Body Type	**Water Body Name**	**WMD**	**Year**
River	Lower Ocklawaha at SR 40	SJRWMD	2011
River / Spring	Silver River / Springs	SJRWMD	2011
River	Middle Withlacoochee	SWFWMD	2010
River	Rainbow River / Springs (including Bubbling Springs and Waterfall Springs)	SWFWMD	2010
Lake	Kerr[(1)]	SJRWMD	2012
Lake	Bonable	SWFWMD	2011
Lake	Little Bonable	SWFWMD	2011
Lake	Tiger	SWFWMD	2011
Spring	Gum Springs Group[(2)]	SWFWMD	2010
Spring	Silver Glen	SJRWMD	2013

(1) Re-evaluation of an adopted MFL.
(2) The discharge for the Gum Springs Group is in Sumter County, but the springshed extends into Marion County.

The SJRWMD and SWFWMD have implemented specific methodologies for establishing MFLs for both rivers and lakes, including regulatory criteria to prevent significant harm. A number of lake MFLs have been adopted in the WRWSA and in Marion County, but no river MFLs have been adopted. SWFWMD MFL criteria for lakes are discussed in the RWSPU. SJRWMD MFL criteria for lakes include up to five levels as described below:

- Minimum infrequent high – a chronically high surface water level or flow with an associated frequency and duration that allows for inundation of the floodplain at a depth and duration sufficient to maintain wetland functions;
- Minimum frequent high – an acutely high surface water level or flow with an associated frequency and duration that is expected to be reached or exceeded during or immediately after periods of high rainfall so as to allow for inundation of the floodplain at a depth and duration sufficient to maintain biota and the exchange of nutrients and detrital material;
- Minimum average – the surface water level or flow necessary over a long period to maintain the integrity of hydric soils and wetland plant communities;
- Minimum frequent low -- a chronically low surface water level or flow that generally occurs only during periods of reduced rainfall. This level is intended to prevent deleterious effects to the composition and structure of floodplain soils, the species composition and structure of floodplain and instream biotic communities, and the linkage of aquatic and floodplain food webs; and
- Minimum infrequent low – an acutely low surface water level or flow with an associated frequency and duration which may occur during periods of extreme drought below which there will be a significant negative impact on the biota of the surface water which includes associated wetlands.

Since MFLs have not been adopted for the Withlacoochee River, the WRWSA established proxy MFLs in Phase II and Phase VII Technical Memorandum #1 to serve as interim

withdrawal constraints for the WRWSA conceptual projects along the river.

2.5 Identification and Characterization of Seawater Resources

2.5.1 Introduction

Seawater is not currently utilized for potable water supply by WRWSA members. This water typically reflects oceanic salinities and contains high concentrations of chloride, sulfate, and other mineral ions that must be removed from the water (demineralized) at significant expense. However, co-locating seawater reverse osmosis (RO) potable water treatment facilities[6] with electric power plants has been demonstrated to provide significant volumes of potable water at moderate cost. Co-location realizes extensive cost and environmental compliance benefits from the disposal of desalination process concentrate by blending it with power plant cooling water discharge. The RWSPU considered a non co-located seawater source, and eliminated it from further consideration due to the high cost and environmental compliance issues of independent seawater desalination.

Because of its historical high cost and the environmental issues with concentrate discharge, seawater desalination is often not considered in traditional water supply planning. Desalination is also a riskier technological approach, as the performance of RO membranes and salt rejection is not fully understood. However, seawater provides a stable and drought-resistant water supply source that is increasingly attractive as the availability of traditional supplies diminishes. Recent advances in membrane and turbine efficiency have, and are expected to continue, to lower desalination unit costs. As a result, all three major water management districts in Florida have identified seawater as a potable water supply source, co-located with power plants.

Marion County and the City of Ocala have identified seawater as a potentially viable source to serve future demands. This section characterizes potential potable yield from seawater within the WRWSA.[7]

2.5.2 Potable Yield Analysis

The yield characterization considers the Progress Energy Crystal River Power Plant (Plant) in Citrus County, which is the only large coastal power plant adjacent to WRWSA members. The major seawater flows associated with the Plant are once-through cooling flows from the two coal-fired units (Units 1 and 2) and the nuclear unit (Unit 3). These units have a combined maximum permitted discharge flow of 1,898 mgd. The seawater intake and discharge are through a lengthy canal/jetty system that discharges the cooling flow beyond the shoreline. The cooling flow would be used to dilute concentrate discharge from the potential desalination facility.

The RWSPU identified a potential potable yield of over 100 MGD if the cooling flows were fully utilized for dilution, based on a typical dissolved solids concentration for seawater. It is unlikely that a project of that size would be pursued within the planning horizon for WRWSA members, including those located in Marion County. The RWSPU identified a 25 MGD potable yield as a conservative estimate, with the understanding that additional yield may be available with further

[6] Distillation or thermal treatment processes are also used, particularly in the Middle East, but have a lower market share than RO and incur greater capital and energy costs (Ebensperger and Isley, 2005).
[7] Seawater supply potentially available from areas outside of the WRWSA is not considered in this report.

analysis. Further assessment of potential seawater yield may occur as existing and future water supply demand in Marion County is reviewed.

2.5.3 Seawater Supply Development

A conceptual design for a co-located desalination supply project was prepared in Phase II – Technical Memorandum No. 1. The design is currently being reviewed by Progress Energy and the WRWSA to identify other potential feasibility issues associated with the development of a co-located seawater project at the Plant.

2.6 Brackish Groundwater Source Characterization

2.6.1 Introduction

Brackish groundwater is defined by its exceedance of potable water quality standards relative to dissolved solids. Brackish groundwater must have a chloride (Cl) concentration greater than 250 mg/L or a total dissolved solids (TDS) concentration greater than 500 mg/L (often primarily sulfate). In comparison, true seawater has a TDS concentration of about 35,000 mg/L. Brackish groundwater applications for water supply typically utilize sources that slightly or moderately exceed potable water quality standards.

Brackish groundwater is treated by medium or low-pressure RO membranes. Aquifer dissolved solids concentrations greater than about 10,000 mg/L require high-pressure RO membranes, and this water quality threshold generally distinguishes the upper limit of brackish groundwater source feasibility. Brackish groundwater is a more expensive source than fresh groundwater due to the advanced treatment requirements, and therefore is limited in use. However, low pressure membrane advances have begun to reduce costs for new facilities (SWFWMD, 2006).

Brackish groundwater is found inland, at depth in the transition between the UFA and the LFA. The brackish transition adds complexity to obtaining sustainable withdrawal rates, as reductions in hydraulic head will cause movement of the transition interface. Withdrawal quantities for brackish groundwater sources are typically determined by modeling on a site-specific basis or within a small planning region (see CH2M Hill, 2001; TBW, 2000).

Brackish groundwater is not currently utilized for potable water supply in Marion County. However, brackish groundwater is relied upon for potable supply in coastal areas with confined aquifers, such as Sarasota County, portions of the SJRWMD and the SFWMD. In addition, groundwater with slightly elevated TDS concentrations is used for non-potable supply in Sumter County (The Villages). The LFA is identified by the SWFWMD as an alternative water source. The objective of this section is to characterize the general suitability of brackish groundwater within the Marion County for source development, relative to the LFA.

2.6.2 The Lower Floridan Aquifer

The Floridan aquifer system generally consists of the UFA and the LFA, which are separated by one or two middle confining units (MCUs) of lesser, but highly variable permeability (Miller, 1986). MCU 1 is elevated higher and is more frequently present in eastern Marion County, while MCU 2 is elevated lower and is more frequently present in western Marion County. One or both confining units may be present at the same location, and their level of confinement (leakiness) may vary.

MCU 1 has lower levels of gypsum and anhydrite than does MCU 2. The dissolution of these evaporite minerals is a source of sulfate to adjacent groundwater (Sacks, 1996). In some areas, the LFA contains poor-quality water and is not used as a potable water source. In areas near Sumter County, the LFA can meet potable standards and be used as a water-supply source for irrigation (SWFWMD, 2007). In eastern and central Marion County, water quality can be potable in the LFA. This is due to the presence in eastern and southeastern portions of Marion County of the largely carbonate MCU 1, rather than the evaporitic MCU 2.

SWFWMD defines the LFA as that beneath MCU 2. The SJRMWD defines the Lower Floridan aquifer as that beneath MCU 1. Since the boundaries of the upper and lower aquifers are delineated with respect to permeability, their boundaries coincide with the freshwater and brackish water interfaces. The Floridan aquifer below MCU 1 is used for potable water supply in the SJRWMD, but the LFA has been thought to be too brackish for development in the SWFWMD and NWFWMD. (SWFWMD, 2006; SJRWMD, 2005; NWFWMD, 2006), and is not identified as an alternative supply source by the SRWMD (SRWMD, 2006).

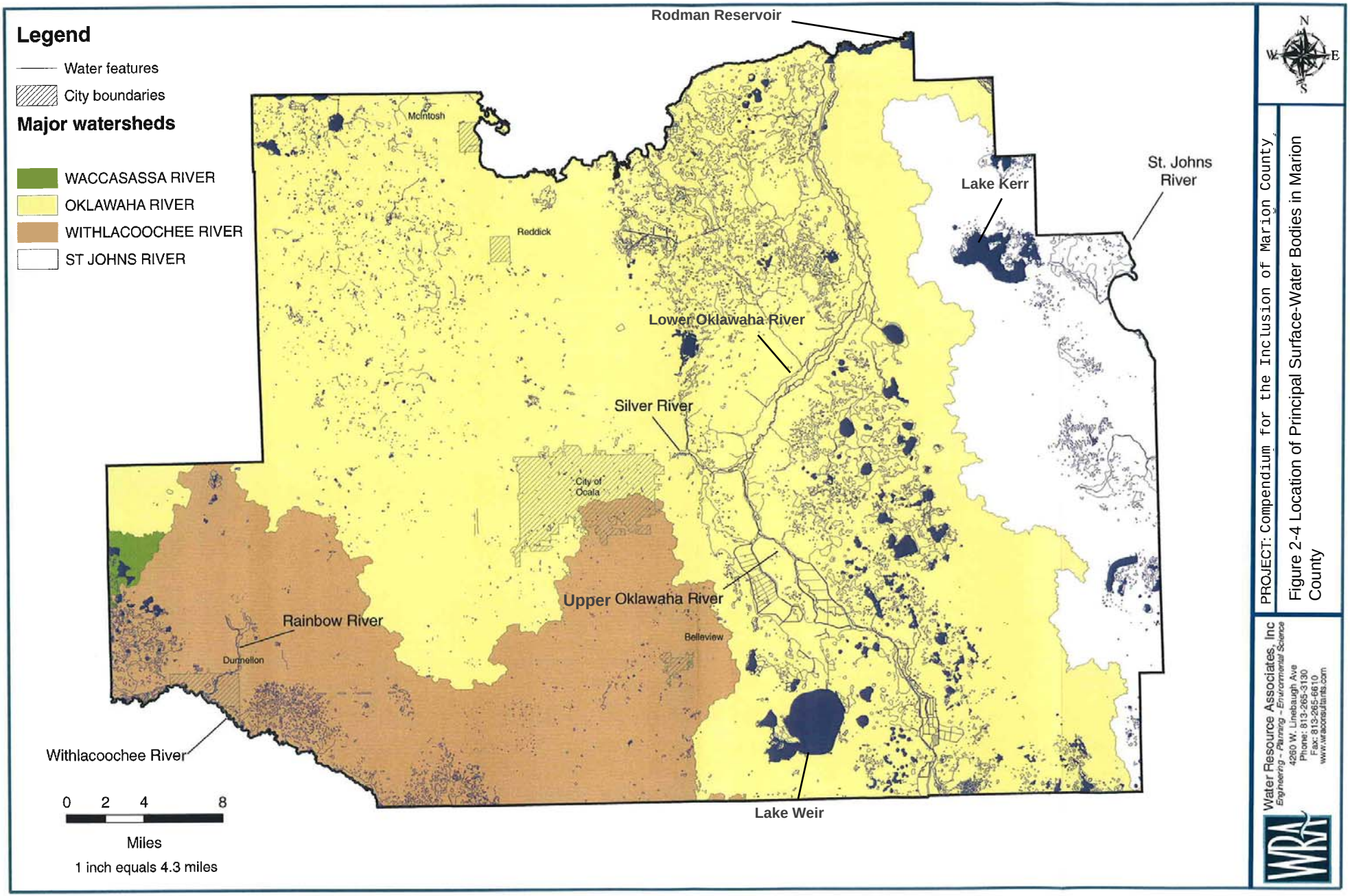
The geologic characteristics of the LFA are not as well known as that of the UFA, because the LFA is at greater depth and is less utilized for water supply. As a result, the SWFMWD and SJRWMD are coordinating on borehole testing to collect data on the geology, hydrostratigraphy, hydraulics, and water quality of the aquifer systems, including the lateral and vertical extension of the confining units. The City of Ocala is also considering the LFA as a potential water supply source and has budgeted a test well program. The general approach to testing is described in the RWSPU.

Based on the preliminary testing, brackish groundwater within the LFA may have some water supply development potential in Marion County. However, further testing is needed to better define this potential.

2.7 Offshore Springs Source Characterization

The possibility of tapping offshore springs for potential water supply has been a topic of discussion for many years. It is estimated that springs along the coastal areas of the SWFWMD, including inshore and offshore, account for as much as one (1) billion gallons per day of water from the UFA. These offshore springs have been popular diving and fishing spots discovered by recreational users over the years.

The RWSPU reviewed offshore springs as a potential water supply sources. Water quality and quantity available from these resources vary dramatically and each appears to have unique environmental characteristics. Relative to other alternative sources, tapping offshore springs will be an expensive project, with design, permitting, treatment, and transmission costs likely to be higher than other available alternatives.



PROJECT: Compendium for the Inclusion of Marion County,

Figure 2-4 Location of Principal Surface-Water Bodies in Marion County

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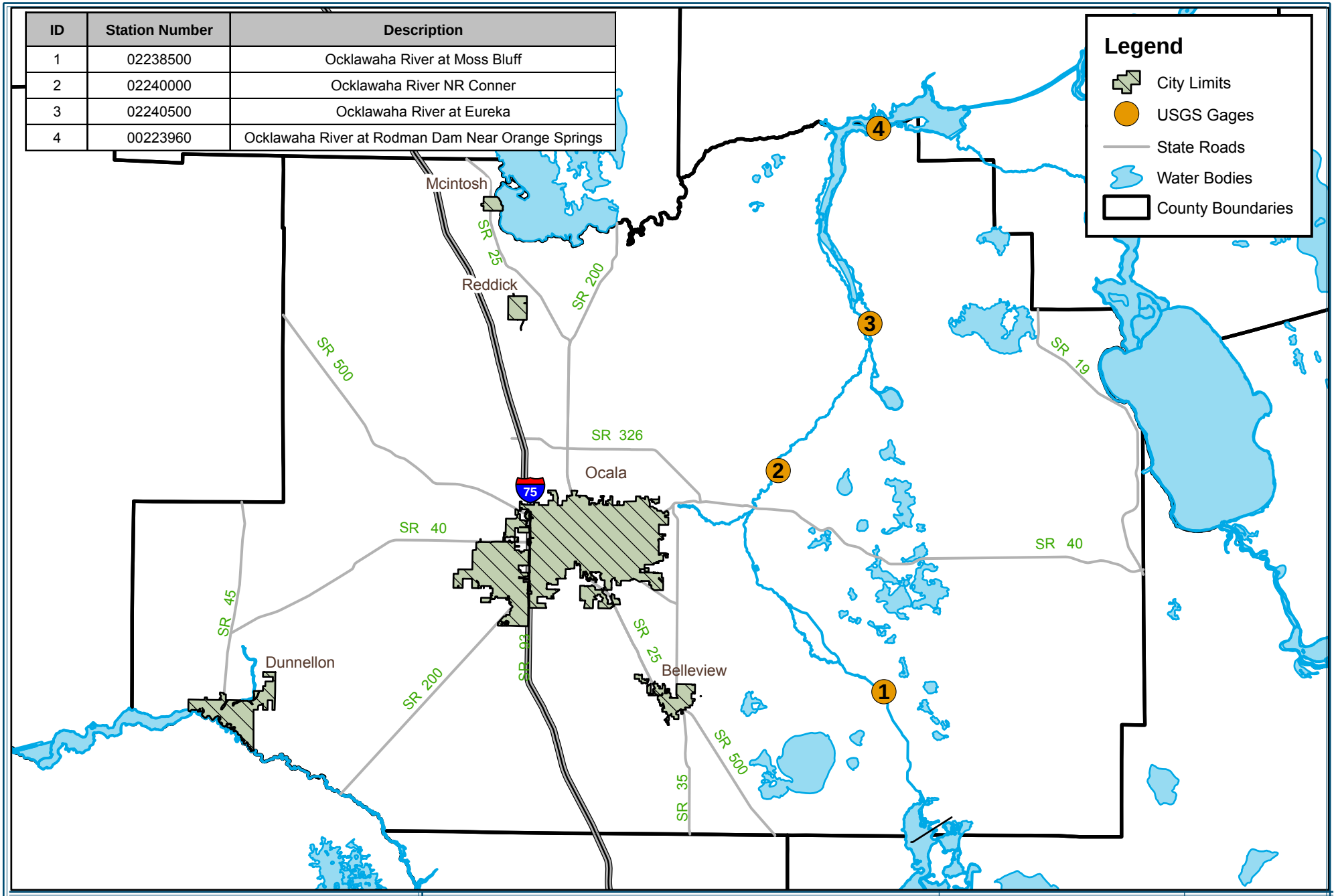
ID	Station Number	Description
1	02238500	Ocklawaha River at Moss Bluff
2	02240000	Ocklawaha River NR Conner
3	02240500	Ocklawaha River at Eureka
4	00223960	Ocklawaha River at Rodman Dam Near Orange Springs



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Fax: 813-265-6610
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PROJECT: 0576 - Withlacoochee RWSA - Marion County Modification

Figure 2-5
Ocklawaha River Hydrologic Monitoring Locations

ORIGINAL DATE: 09-25-08
REVISION DATE: NA
JOB NUMBER: 0576
FILE NAME: Figue 2-5.mxd
GIS OPERATOR: DR

N W E S

1 Inch = 25,000 Feet

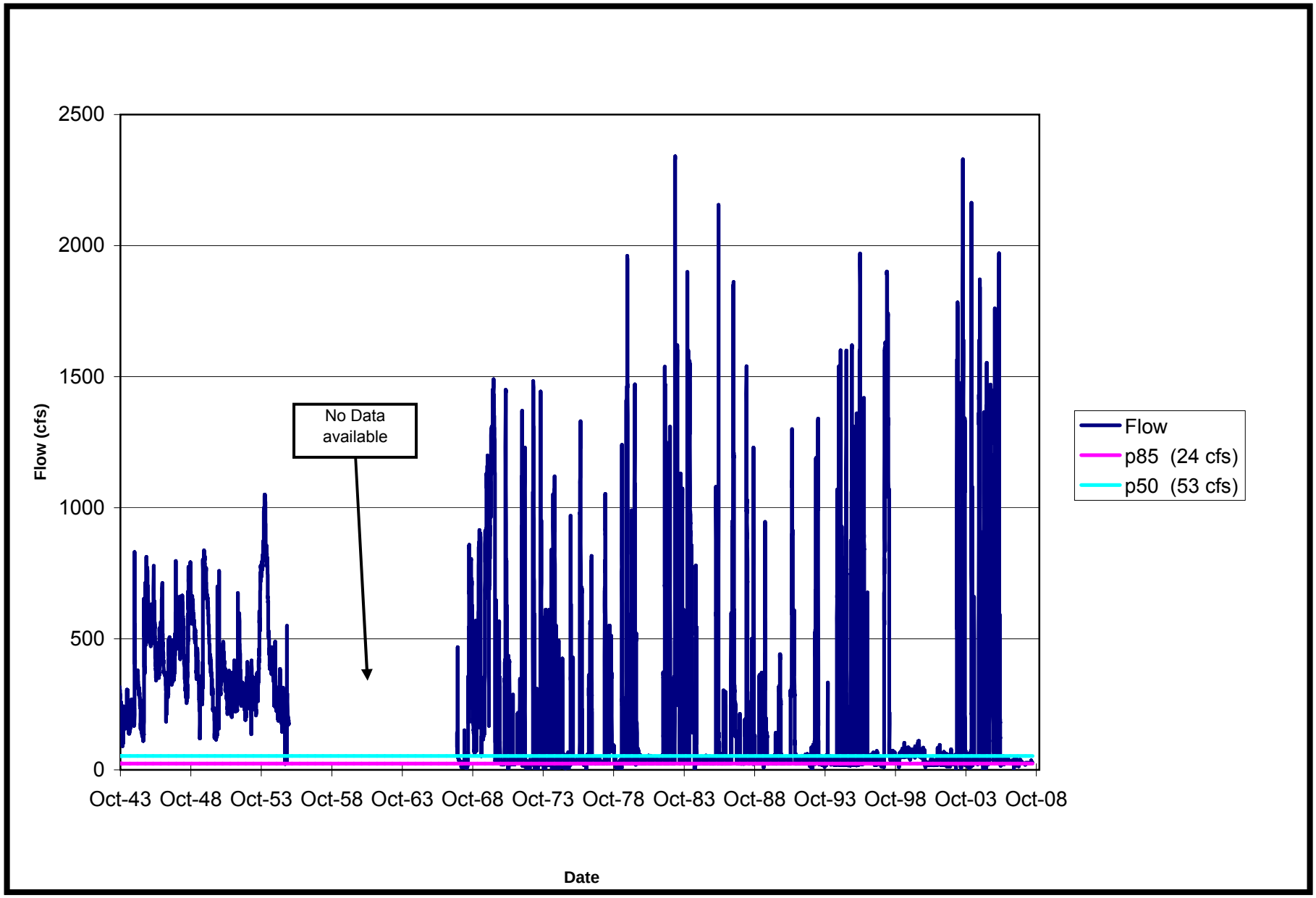


Figure 2-6 - Ocklawaha River at Moss Bluff Historical Flow

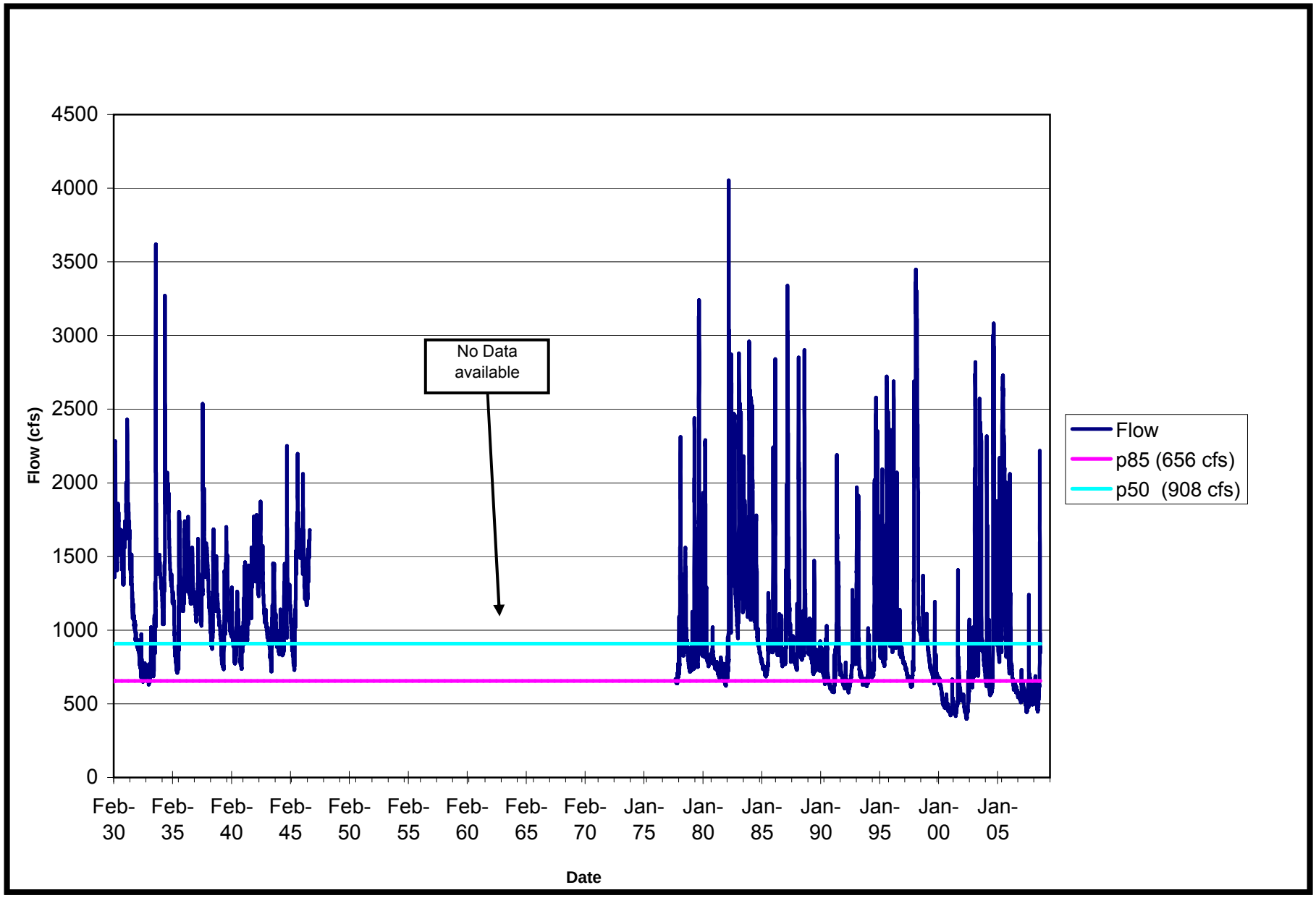


Figure 2-7 - Ocklawaha River at Conner Historical Flow

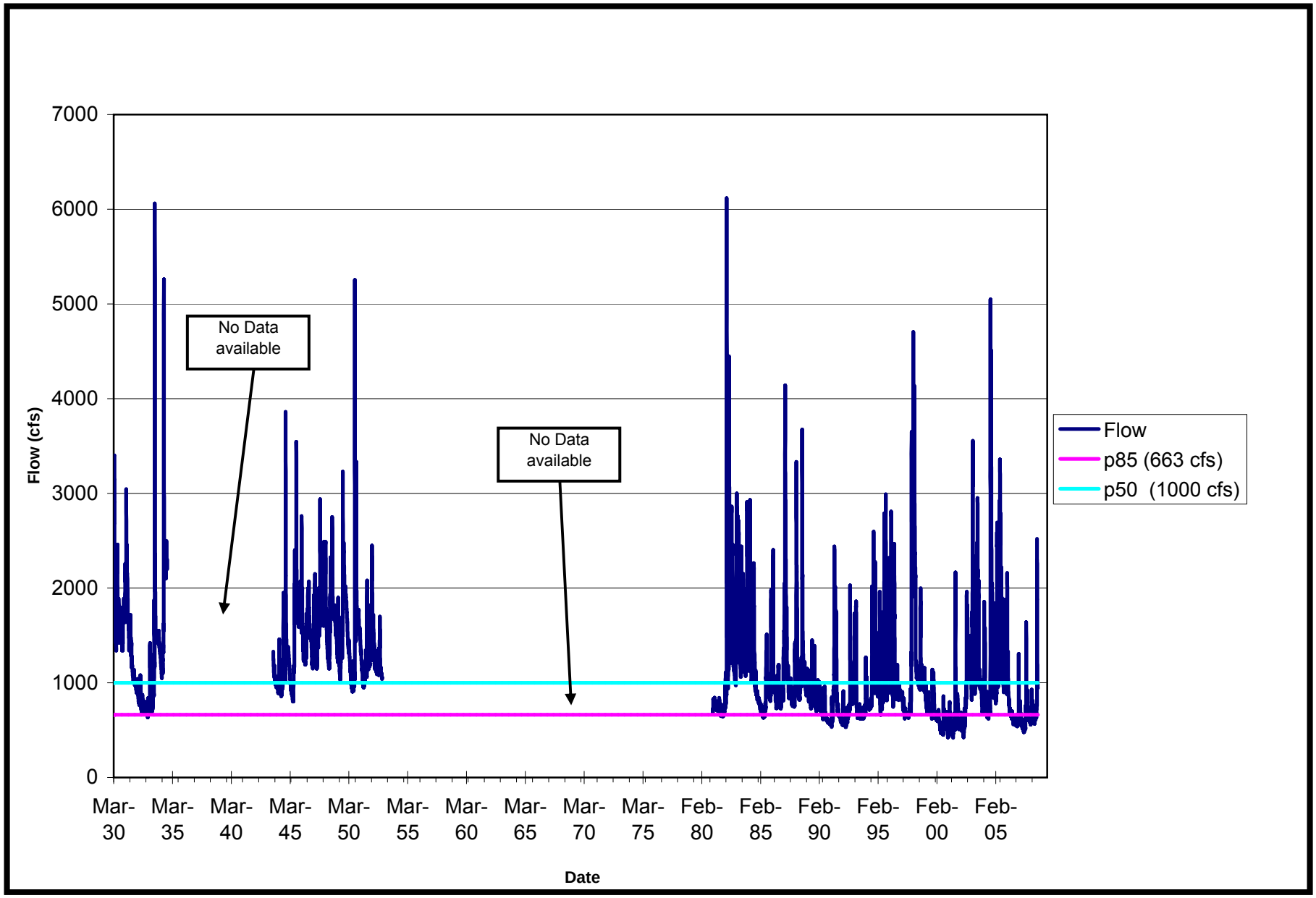


Figure 2-8 - Ocklawaha River at Eureka Historical Flow

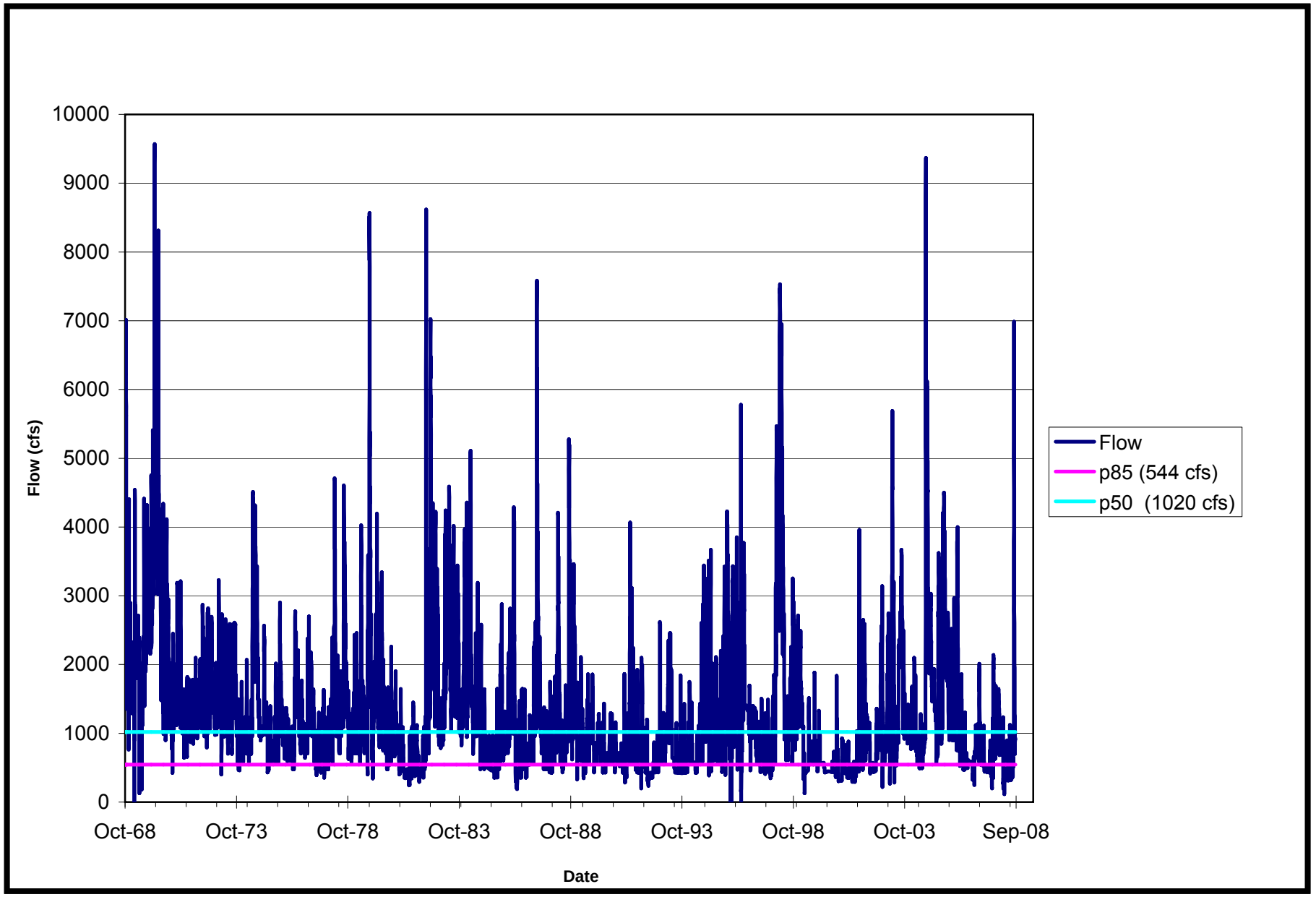


Figure 2-9 - Ocklawaha River at Rodman Dam Near Orange Springs Historical Flow

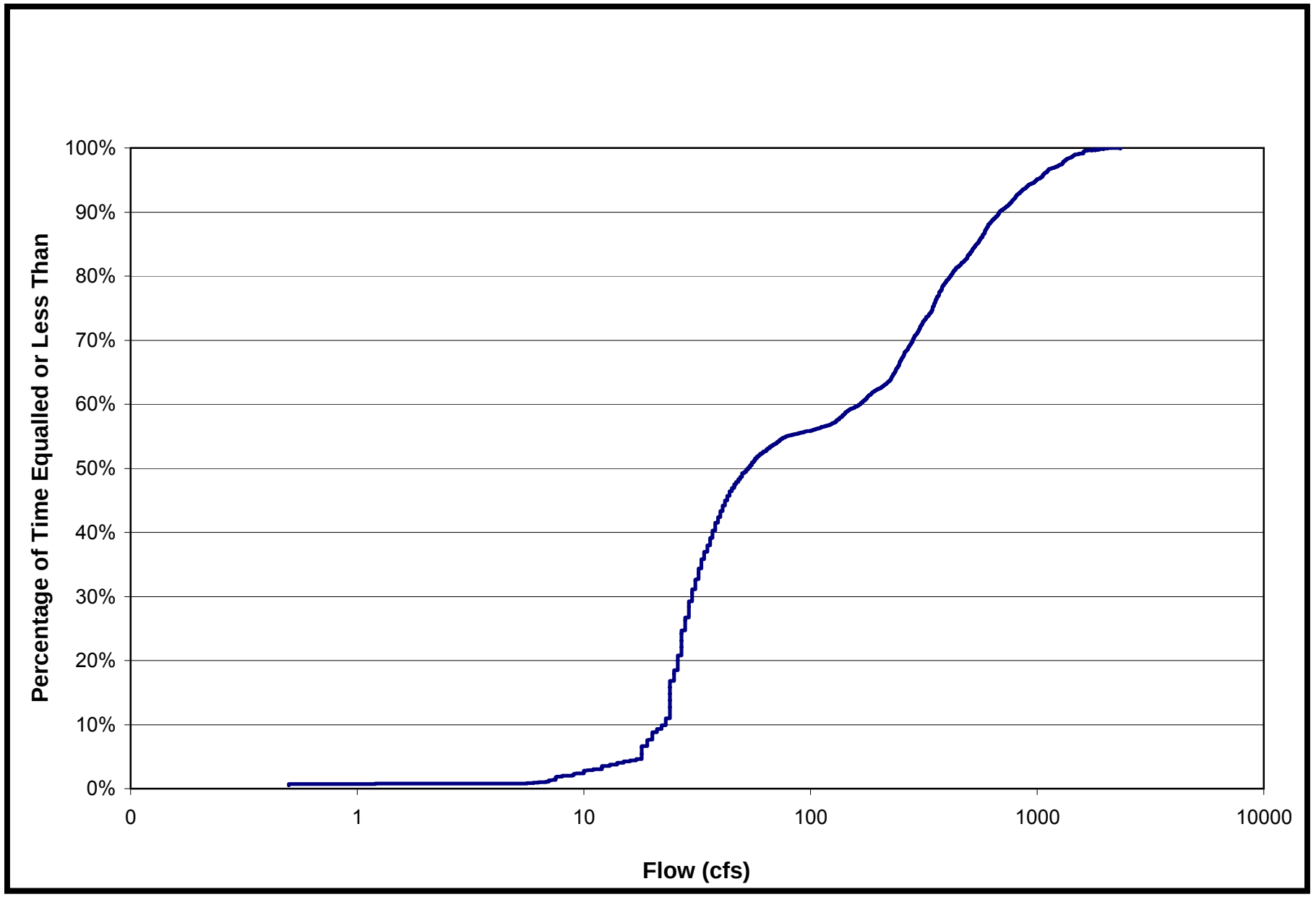


Figure 2-10 - Ocklawaha River At Moss Bluff Flow Duration Curve

Note: No data available from October 1955 through September 1967.

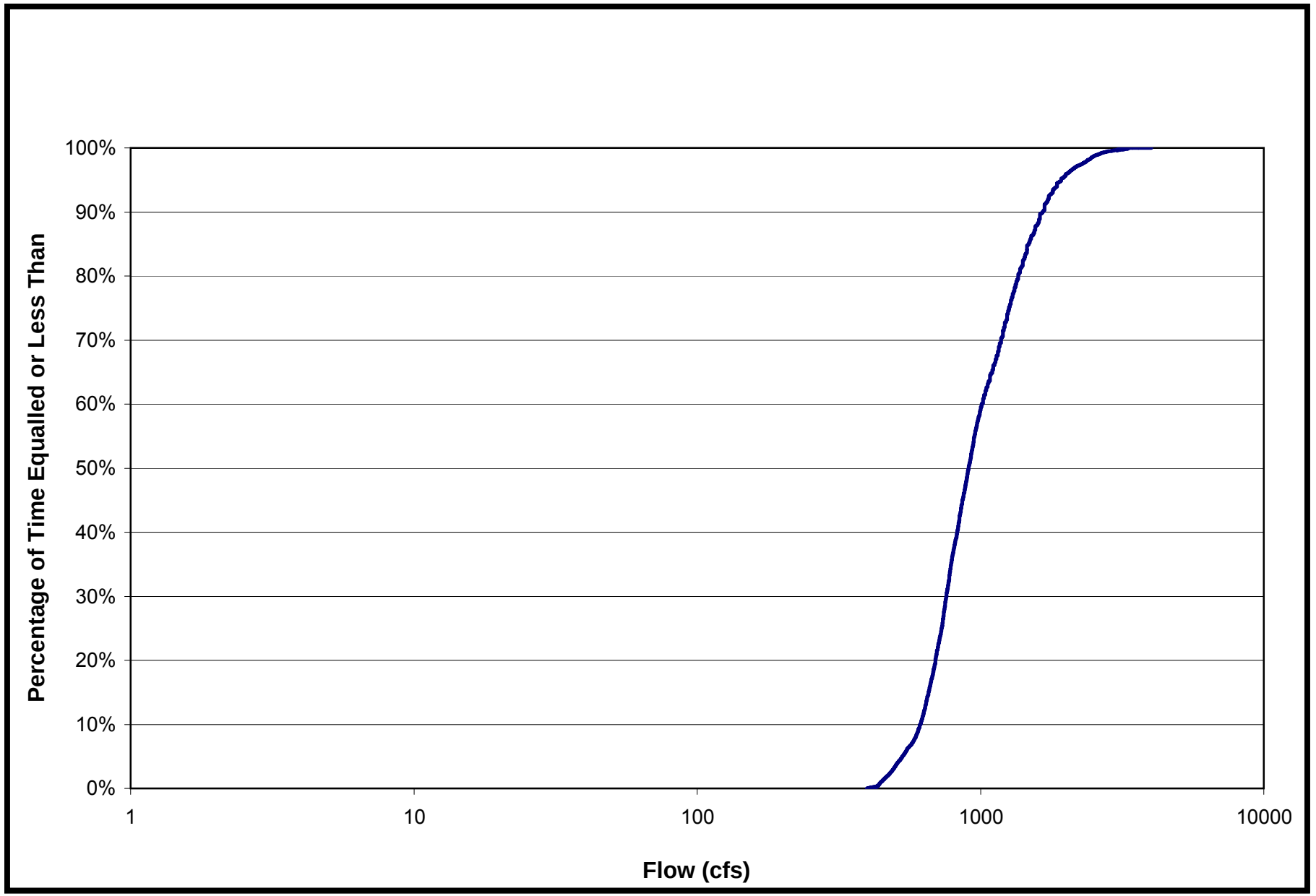


Figure 2-11 - Ocklawaha River at Conner Flow Duration Curve

Note: No data available from October 1946 through September 1977.

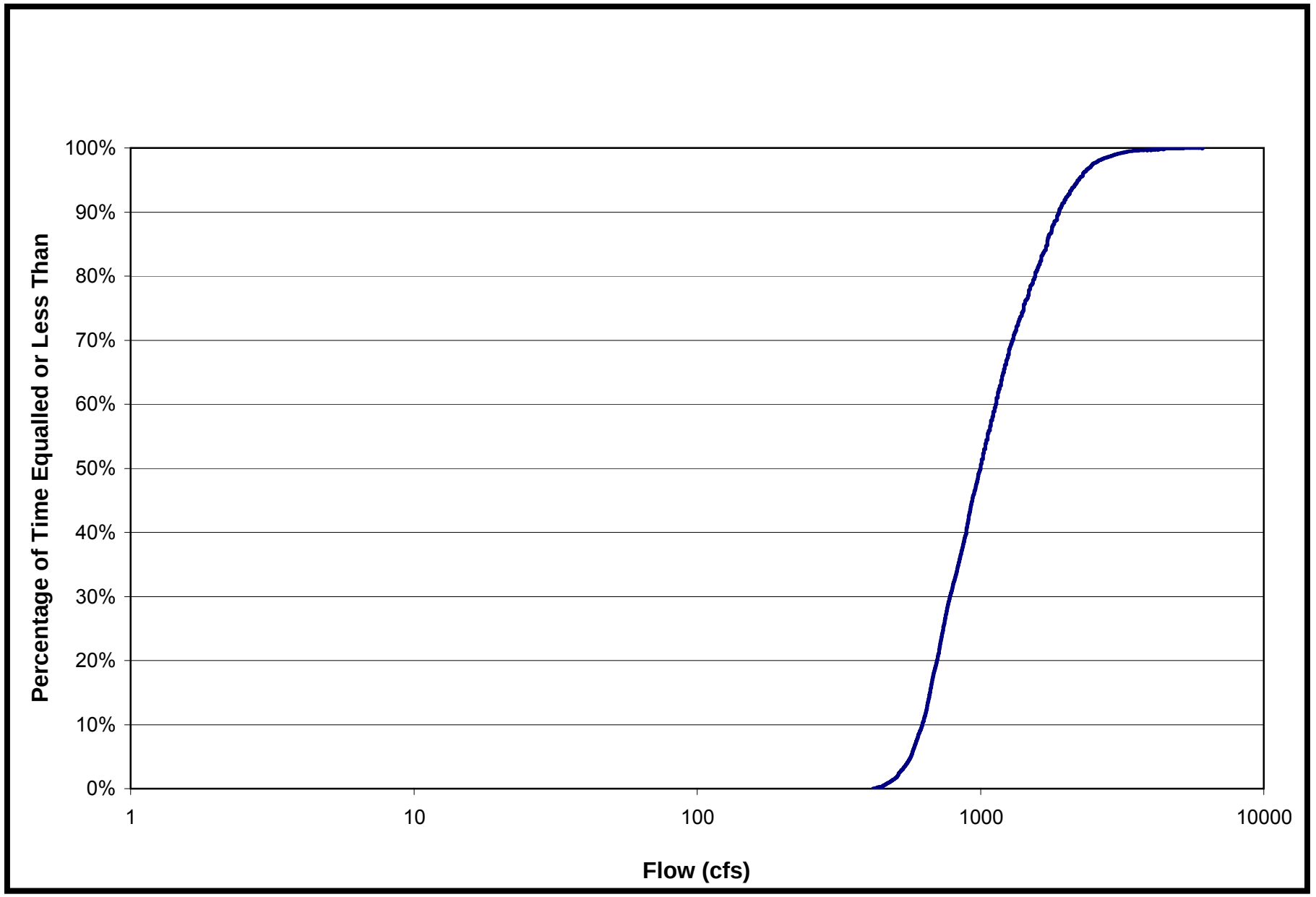


Figure 2-12 - Ocklawaha River at Eureka Flow Duration Curve

Note: No data available from October 1934 through September 1943, and from January 1953 through January 1981.

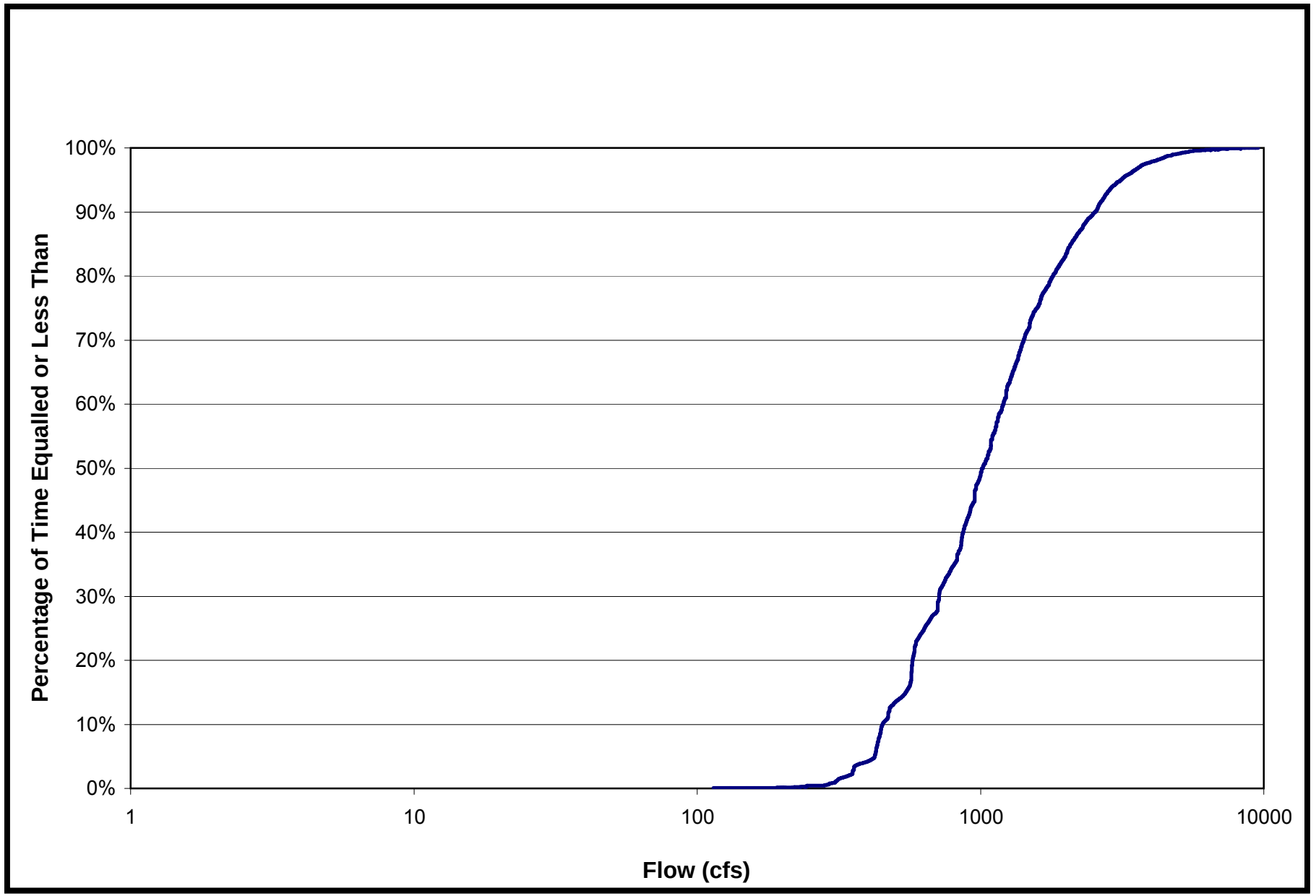


Figure 2-13 - Ocklawaha River at Rodman Dam Near Orange Springs Flow Duration Curve

Chapter 3

3.0 Groundwater Resources Assessment

Key Points

- The SJRWMD completed a comprehensive planning level analysis of the potential impacts that would result from current and projected future groundwater withdrawals (WRA, 2007-c).
- The determination of impacts from future groundwater withdrawals was based on modeling that used the SJRWMD NCF groundwater flow model (Motz and Dogan, 2004). The SJRWMD ran the NCF model based on projections and resource constraints anticipated for Marion County in years 2025 and 2055.
- The modeling suggests that if the projected water use in Marion County were to continue to rely solely on groundwater, additional groundwater withdrawals will become restricted on a countywide basis. This is based on projected reductions in spring flow.
- Silver Springs is located near the center of Marion County and is the most sensitive of the largest springs (i.e., Rainbow and Silver) in the county to projected future groundwater withdrawals, based on existing facilities and projected demand.
- Increased conservation, reuse, and/or alternative water supplies will be needed to help meet water supply needs for 2025 and 2055 planning horizons.
- The WRWSA will amend the water supply feasibility analyses and groundwater resource assessment in Phases II and VII of its MRWSP&IP to include Marion County. The groundwater resource assessment described in this section will be updated to 2030 by the Phase II and VII amendments.
- SJRWMD and SWFWMD have a common understanding of resource conditions and consistent resource management strategies in Marion County. However, water supply planning methodologies differ between the two agencies.

3.1 Introduction

Chapter 3 reviews and characterizes current knowledge relative to the ability of the groundwater resources within Marion County to support future water supply development. Existing analysis and data are reviewed to identify the current estimates of groundwater availability in Marion County.[1] Based on resource features and/or constraints, potential extraction areas are identified within Marion County boundaries for future water supply development.

This section also analyzes potential environmental issues associated with groundwater supply development. These potential issues include possible impacts to springs, lakes, and wetlands; water quality declines due to contamination or saline water intrusion; and potential cones of influence due to drawdown. These environmental and water resource concerns have the potential to affect the permittability and long-term viability of the groundwater source.

Groundwater is the primary water supply in Marion County. Since Marion County spans both the SJRWMD and the SWFWMD, a consistent approach to groundwater development between the SJRWMD and the SWFWMD is a prerequisite for effective water supply planning in the region. This section identifies methodological differences between the SJRWMD and the SWFWMD that have the potential to affect WRWSA planning efforts in Marion County. These differences include the planning application of wetland harm constraints and groundwater flow models.

Groundwater is considered a traditional source by the SWFWMD and the SJRWMD, while surface water, seawater, and reclaimed water are generally considered alternative sources. The use of alternative water supplies and demand reduction (i.e., conservation) is essential to meeting future water supply needs because the supply of traditional groundwater is limited. Chapter 4 identifies and evaluates new water supply development projects for both traditional groundwater and alternative sources.

The groundwater resource assessment is described below.

3.2 Groundwater Impact Analysis

The determination of impacts from future groundwater withdrawals in Marion County (WRA, 2007-c) was based on modeling that used the SJRWMD NCF groundwater flow model (Motz and Dogan, 2004). This is a planning level evaluation based on projected 2025 water demand. It is intended to evaluate the potential impact on aquifer levels and groundwater resources, and identify areas based on these constraints where further investigation into aquifer supplies will be required. The groundwater impact analysis discussed here will be updated by the WRWSA in Phases II and VII of its MRWSP&IP.

The NCF Model was selected for use by the SJRWMD because of the better treatment of recharge and the inclusion of the Surficial Aquifer System (SAS) as an active layer, in comparison to other available models including the Peninsular Florida (PF) Model (WRA, 2007a; also see WRA, 2007b). The SJRWMD ran the NCF Model based on projections and

[1] The Withlacoochee Regional Water Supply Authority (WRWSA) Regional Water Supply Plan Update (RWSPU), completed in 2007, determined the projected 2025 impacts to groundwater resources in Hernando, Citrus and Sumter Counties and the City of Ocala.

constraints proposed for Marion County in years 2025 and 2055. The groundwater impact analysis is discussed in this section.

3.2.1 Demand Overview

The groundwater modeling considered projections of the increases in water withdrawals in Marion County from 2005 to 2055 in five year increments. It used estimates of the locations of these projected increases. The groundwater impact analysis involved the input of the projected increases to the NCF Model. The modeling simulated aquifer effects based on current and projected withdrawals from use types including domestic self supply, public supply in existing and projected future public supply service areas, and other uses such as agriculture, recreation, and commercial/industrial (Table 3-1).

Since the projected 2025 water demand is determined assuming continued reliance on groundwater, the impact analysis does not generally consider increases in supplies of beneficial reuse, alternative water supply development, or reductions in future water demand (through conservation). Since an increase in the use of these supplies or additional demand reduction would adjust the groundwater demand, the groundwater impact analysis reflects "worst-case" potential regional conditions based on groundwater demands that are not adjusted (unadjusted).[2]

Table 3-1. Projected Countywide Water Demands Through 2055.

ADF BY USE TYPE	Year 2005 (mgd)	Year 2010 (mgd)	Year 2015 (mgd)	Year 2020 (mgd)	Year 2025 (mgd)	Year 2030 (mgd)	Year 2035 (mgd)	Year 2040 (mgd)	Year 2045 (mgd)	Year 2050 (mgd)	Year 2055 (mgd)
Public Supply	27.7	35.7	42.4	48.9	55.7	60.1	61.3	62.5	63.6	64.8	65.9
Domestic Self Supply	32.1	35.3	36.6	37.7	39.1	43.2	53.7	64.8	76.6	89.0	102.2
Commercial, Industrial, Mining	2.3	2.4	2.6	2.8	3.0	3.1	3.2	3.4	3.6	3.8	3.9
Agriculture	17.0	16.4	15.9	15.1	15.1	15.2	15.3	15.4	15.5	15.5	15.6
Recreation	7.4	8.1	8.8	9.4	10.1	10.7	11.4	12.1	12.8	13.5	14.3
TOTAL PROJECTED DEMAND	**86.3**	**97.9**	**106.4**	**114.0**	**122.9**	**132.4**	**145.0**	**158.2**	**172.1**	**186.6**	**201.9**

3.2.2 The NCF Groundwater Model

The NCF Model (Motz and Dogan, 2004) covers a rectangular domain of approximately 5,650 sq.mi. in north-central Florida. The domain, including most of Marion County, all of Putnam County, and portions of surrounding counties (Figure 3-1), is divided into 150 columns and 168 rows with uniform grid spacing of 2,500 ft (Figure 3-2). The NCF Model, developed based on the USGS MODFLOW code (McDonald and Harbaugh, 1988), has three active layers: Layer 1 - the SAS, Layer 2 – the UFA and Layer 3 - the LFA, and the Intermediate Confining Unit (ICU) and the Middle Semi-Confining Unit/Middle Confining Unit (MSCU/MCU) as vertical leakances between the three layers. An east-west cross-section showing the three aquifers and the two

[2] Actual groundwater demand in the future will vary based on a variety of additional factors, including the actual rate of population growth.

intervening units is presented in Figure 3-3. The location of the cross section is given in Figure 3-1.

Details of the three aquifers and the two intervening units are given in Motz and Dogan (2004) and references therein. It is noted by Motz and Dogan (2004) that in parts of Alachua and Marion Counties, the SAS is very thin or absent. In these areas, the UFA is considered unconfined. Areas where the UFA is considered to be unconfined are shown in Figure 3-4. The UFA is a zone of relatively high permeability which is attributed to the combination of high primary and secondary porosity of the limestone that this unit comprises (Miller, 1986). The NCF Model distribution of transmissivity in the UFA is shown in Figure 3-5. The transmissivity value is as high as 10^7 ft^2/day in Marion County. The NCF Model distribution of transmissivity in the LFA is shown in Figure 3-6. In the figure, the transmissivity value ranges from 10^5 to 10^6 ft^2/day.

High chloride concentrations (>5,000 mg/L) are present in some areas in the LFA. Areas in the southwestern and eastern parts of the model, where groundwater with a high chloride concentration occupies the full thickness of the LFA, were not considered part of the flow domain. MODFLOW cells in Layer 3 are inactive in these areas. The locations of these inactive cells are shown in Figure 3-6.

Areal recharge is applied to the uppermost active layer (the SAS where present, the UFA where the SAS is absent) over the entire model, through combined use of the Recharge and Evapotranspiration Packages in MODFLOW. A general head boundary (GHB) is assigned around the lateral boundary of the UFA and LFA using the GHB Package in MODFLOW. The River Package is used to simulate direct discharge from the SAS and UFA to the surface water system. The Drain Package is used to simulate the 46 springs found within the model area. The Well Package is used to simulate the estimated water-use within the model area.

The model was calibrated to average steady-state 1995 conditions, using 81 observation wells in the SAS and 278 observation wells in the UFA, as well as observed or estimated discharges for the 46 springs simulated in the model. The model calibration is generally excellent, with a root mean square error of 4.51 ft for the SAS and 3.27 ft for the UFA. Total simulated springflow equals 100% of the total observed or estimated springflow. The calibrated model was then used to simulate the effects of projected water use for the model area in 2020 and 2025.

The NCF model boundaries include the region in northern Sumter and northern Lake Counties, where the hydrogeologic system is more complex than in surrounding areas. Although not the focal area of the NCF model, only limited data is available to characterize this region, making interpretation of modeling results there somewhat difficult. To address this issue, the SWFWMD and the SJRWMD are developing an accelerated data collection and monitoring program that involves drilling and testing in southern Marion, northwest Lake, and northern Sumter County. Considerations regarding additional data collection and interpretation of modeling results in this region are discussed in more detail below.

3.2.3 Model Results

The model is calibrated to 1995 conditions, so drawdowns in the SAS and UFA were compared to this period.

Figure 3-7 illustrates the extents and magnitudes of potential drawdown in the SAS. Between 1995 and 2025, the model predicts there will be fairly large areas where drawdown will be roughly 0.4 to 1.0 foot, and smaller areas where it will be 1 to 2.5 foot (Figure 3-7A). By 2055, drawdowns between 0.4 to 1 foot and 1 to 2.5 foot are predicted to greatly expand and encompass the vast majority of the County (Figure 3-7B).

Note that the model predicts that drawdowns of 5 to 12 feet will occur in the SAS near major wellfields outside of Marion County by 2055. The projected drawdowns in the SAS are not a result of water use; they are a result of water supply withdrawals from the underlying UFA which reduce model water levels in the SAS.

Similarly, the UFA may experience drawdowns as indicated in Figure 3-8. By 2025, it is predicted that large areas of the southern part of the County will experience drawdowns of 0.36 – 1.00 feet (Figure 3-8A) and drawdowns up to 2 feet (Figure 3-8A) will occur near the Sumter County line.

By 2055, the possible demands indicate that the UFA will experience significant drawdown within the County. As shown in Figure 3-8B, predicted drawdowns of up to one (1) foot extend through the central part of the County, and areas near I-75 and US 301/441 will have drawdowns up to 2.5 feet (Figure 3-8B).

The UFA at Lake Weir, Marion County's largest lake, is predicted to decline by as much as 1.0 to 1.2 feet as a result of withdrawals to 2025, and as much as 1.5 to 1.8 feet by 2055.

The NCF model boundaries include the southern Marion / northern Sumter / northern Lake Counties' region, where the hydrogeologic system is more complex than in surrounding areas. Only limited data is available to characterize this region, making interpretation of modeling results somewhat difficult. Pumpage and sensitivity analyses from Phase II – Technical Memorandum No. 2 in the northern Sumter / northern Lake Counties' region have shown that predicted springs impacts and surficial drawdown can vary depending on the nature of the hydrogeologic system. Therefore, predicted model results in southern Marion County could be similarly difficult to interpret. More detail regarding the interpretation of modeling results in this region is available in Phases II and VII – Technical Memorandum No. 2.

To address this issue, the SWFWMD and the SJRWMD are developing an accelerated data collection and monitoring program that involves drilling and testing in southern Marion, northwest Lake, and northern Sumter County. In addition, permittees are performing resource monitoring that will provide supplemental data. Information gained from these efforts will provide important data for refinement of the groundwater models used in this area. More detail regarding the data collection and monitoring program is provided in Phases II and VII – Technical Memorandum No. 2.

Springs will be affected by these predicted changes in aquifer potentials. Tables 3-2 and 3-3 list the modeled reductions in spring discharge for springs in Marion County, compared to the screening discharge. A 15 percent reduction in average flow was used as a screening approximation of a regulatory limit in flow reduction for the springs (SJRWMD and CH2M Hill, 1998).[3]

[3] Most of the springs listed in Table 3-2 are not likely candidates for minimum flow and level (MFL) adoption. Springs for which MFLs will be set are typically first (≥99 cfs) and second (10-99 cfs) magnitude

Table 3-2. Estimated, Projected and Screening Spring Flows.

Spring	1995 (cfs)	2025 (cfs)	2055 (cfs)	Screening Flow (cfs)
Orange Spring	2.07	2.09	2.05	2.08
Blue Spring (nr. Orange City)	0.39	0.40	0.36	0.39
Camp Seminole Spring (nr. Orange City)	0.82	0.82	0.74	0.81
Tobacco Patch Land Spring (fort McCoy)	1.36	1.31	1.22	1.20
Well Land Spring (nr. Fort McCoy)	6.81	6.53	6.06	6.50
Salt Spring	73.70	74.04	73.28	74.03
Silver Glen Spring	105.73	105.46	104.81	105.62
Silver Springs	708.22	674.32	589.14	666.25
Sweetwater Spring	12.95	12.86	12.70	12.90
Juniper Creek tributary	1.01	0.99	0.99	1.00
Juniper Spring	24.59	23.98	23.22	24.10
Fern Hammock Spring	24.59	23.98	23.22	24.10
Rainbow Spring	651.41	640.72	595.25	616.30
Wilson Head Spring	2.14	2.04	1.81	2.01
Morman Branch seep (Juniper Creek)	5.31	4.42	3.67	4.27

Table 3-3. Reduction in Spring Flows Predicted for 2025 and 2055.

Spring	Average Flow Change 1995 - 2025	Average Flow Change 1995 - 2055
	%	%
Orange Spring	1.0%	-1.0%
Blue Spring (nr. Orange City)	2.6%	-7.7%
Camp Seminole Spring (nr. Orange City)	0.0%	-1.0%
Tobacco Patch Land Spring (fort McCoy)	-3.7%	-10.3%
Well Land Spring (nr. Fort McCoy)	-4.1%	-11.0%
Salt Spring	0.5%	-0.6%
Silver Glen Spring	-0.3%	-0.9%
Silver Springs	-4.8%	-16.8%
Sweetwater Spring	-0.7%	-1.9%
Juniper Creek tributary	-2.0%	-2.0%
Juniper Spring	-2.5%	-5.6%
Fern Hammock Spring	-2.5%	-5.6%
Rainbow Spring	-1.6%	-8.6%
Wilson Head Spring	-4.7%	-15.4%
Morman Branch seep (Juniper Creek)	-16.8%	-30.9%

springs on public lands. The SJRWMD and the SWFWMD will evaluate flow reductions for springs that do not have MFLs under 40C-2, F.A.C. and 40D-2, F.A.C water use permitting criteria

Figure 3-9 compares the projected withdrawals with reductions in flow from Silver Springs. The 1995 estimate of average flow from the springs was 708 cubic feet per second (cfs). Using the projected 2025 withdrawals, the flow model projected that spring flow would be reduced to 674 cfs, and by 2055 the projected flow would be 589 cfs. The screening discharge is based on a projected 15 percent reduction of average flow from the springs which is calculated to be 661 cfs. This screening discharge level will be met when withdrawals in the NCF Model domain reach approximately 110 mgd. The estimated constraint on withdrawal is subject to change once the actual MFL for Silver Springs is adopted by the SJRWMD (WRA, 2007-c).

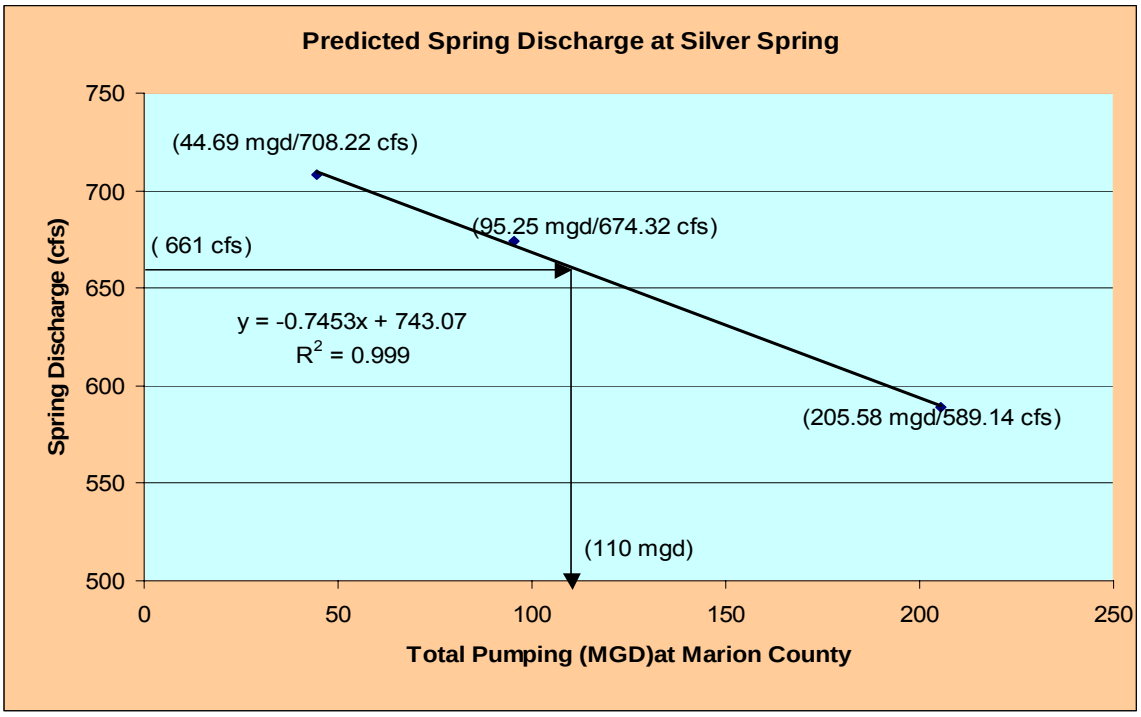


Figure 3-9. NCF Model Correspondence between Silver Springs Flow and Projected Marion County Groundwater Withdrawals.

3.3 Groundwater Source Areas

3.3.1 Public Supply

Public supply use is the main concern of the WRWSA, because ensuring an adequate public water supply is a primary responsibility of the WRWSA. Public supply is a large water use in Marion County. The City of Ocala, the City of Dunnellon, the City of Belleview, Marion County, and numerous private utilities supply residents of Marion County with potable water.

The spatial distribution of existing and future public supply groundwater withdrawals is important to the permittability and long-term viability of groundwater to serve this use. For example, existing source areas near to potential pollution sources will be more likely to see water quality declines or contamination that could affect treatment needs and affect the long-term viability of the withdrawal. If not properly planned, large or poorly located withdrawals have more potential

to cause adverse environmental impacts to lakes, springs, and wetlands. Existing source areas in Marion County also have projected increases in demand in many cases.

The section includes an approximate spatial distribution of existing and potential future public supply groundwater withdrawals in Marion County, similar to those developed for the RWSPU. These areas were primarily determined using well information provided by the SJRWMD and SWFWMD (Figure 3-10). The intent is to develop a simple depiction of these areas for use in the WRWSA planning process. [4] The characterization of existing and future groundwater source areas in Marion County is presented in the following section.

3.3.1.1 Public Supply Source Area Selection

Existing source areas with projected increases in demand were determined using projections provided by the SWFWMD and SJRWMD in Chapter 1 (M1 through M9; Figure 3-11). The groundwater system in Marion County is a highly karstic environment with sporadic confinement that increases in frequency towards the eastern portion of the County, particularly east of the Ocklawaha River. Confinement is sparse in the western portion of Marion County. Confinement is sparse to moderate in the central and southern portions of the County (along US 301 and US 27) where the largest increases in future demand are projected (WRA, 2005).

Groundwater quality in Marion County is currently fair to good as measured by drinking water standards. However, groundwater quality in Marion County is a reflection of land use activity (WRA, 2005; WRA, 2007-a). The eastern portion of the County within the Ocala National Forest contains undeveloped and low-intensity land uses, in comparison to more intense land uses in the central portion of Marion County.

Potential future groundwater source areas (M10 through M12; Figure 3-11) are placed in locations identified for wellfield analyses in WRA (2007-c). These locations including along SR 40 in the Ocala National Forest, in the vicinity of Eureka north of CR 316, and west of US 441 near Reddick. Generally, the WRA (2007-c) locations reflect regions of higher elevation in eastern and northern Marion County where the UFA may be overlain by moderate thicknesses of confining units of the Hawthorn group, which will help minimize drawdown in the SAS where these units are present.

An additional future source area (M13) was located in west-central Marion County in relative proximity to demand centers in the south. This location generally reflects a potential dispersal option between the Rainbow and Silver springsheds, and considers the relatively high transmissivity of the UFA in this area.

3.3.2 Other Water Use Categories

Attempts were made to determine the existing location of water use in agriculture, recreation, commercial/industrial, and domestic self-supply categories. Though public supply is a large water use in Marion County, cumulatively the amount of water use in other categories exceeded public supply use in 2005. However, the amount of public supply water use is projected to

[4] Member governments will generally have more detailed information than that provided here. For example, Marion County is preparing a utility masterplan which will provide more detailed information regarding their water supply. The City of Ocala adopted an Integrated Water Resources Plan that provides coordinated strategies and recommendations for their water supply.

increase more than the other categories from 2005 to 2030. The projected increase in water use for public supply and other use categories is discussed in Chapter 1.

3.3.2.1 Domestic Self-Supply

Domestic self-supply use is not measured by the SWFWMD or the SJRWMD, though well construction is tracked. The approximate locations of existing domestic self-supply use are identified using 2005 spatial information provided by Marion County (Figure 3-12). Areas with significant domestic self-supply use are generally present throughout Marion County, except for undeveloped areas in and around the Ocala National Forest and in southwestern Marion County.

3.3.2.2 Recreation, Agriculture, and Industrial/Commercial

General approximations of 2009 permitted use and location were made for readily available withdrawal points in SWFWMD according to use type, with withdrawals scaled according to their size (Figure 3-13A-C). Data was not readily available for withdrawal points in these use categories in the SJRWMD.

3.4 Environmental Considerations of Potential Groundwater Supply Development

3.4.1 Introduction

The purpose of this section is to identify the environmental considerations of groundwater supply development in Marion County, in conjunction with the groundwater modeling discussed in this Chapter. This environmental characterization is an essential part of the water supply planning process, since it identifies potential concerns that may affect the permittability and long-term viability of the supply source. Specific areas of concern include water quality impacts and contamination potential, impacts to springs, saline water intrusion, lake and wetland impacts, and potential impacts associated with drawdown cones of influence.

Water quality impacts can degrade the water source and limit its usage for water supply. Therefore, water quality impacts are evaluated with attention to degradation potential, effects of development, and water management activities. The Marion County Aquifer Vulnerability Assessment (MCAVA) was used in assessing the potential for water quality declines (Figure 3-14). MCAVA is Marion County's index of aquifer vulnerability to pollution based on FDEP's Florida Aquifer Vulnerability Assessment (FAVA) methodology (Arthur, 2008). It considers depth to water, aquifer recharge, confinement or overburden thickness, karst features/topographic depression, water quality data, and soil hydraulic conductivity (Advanced GeoSpatial, 2007).

Saltwater intrusion can have an extremely adverse effect on traditional groundwater supply by increasing the dissolved solids content of the source water. The SJRWMD and SWFWMD saltwater intrusion monitoring networks will identify if coastal saltwater intrusion is occurring, but the potential is assessed for local saline water upconing from lower portions of the aquifer.

Lakes, wetlands and springs can constrain water supply development, if development of the supply significantly affects (harms) water levels in nearby lakes, wetlands or springs. In evaluating the potential for lake and wetland impacts, analyses were focused on the identification of waterbodies vulnerable to pumpage, including waterbodies with MFL protection.

The groundwater withdrawal modeling detailed above is also used in this analysis. In assessing the potential for impacts to springs, potential water quality and quantity effects are noted.

Finally, contamination of sources can result in adverse health affects on consumers if not treated properly. In assessing potential cones of influence and contamination, potential contamination sources to the aquifer or wellfield are identified and discussed based on readily available database information. Figure 3-15 shows contaminated storage tank, solid waste, Superfund, and SUPER act sites (designated risks to drinking water) in Marion County. [5,6] The review of potential contamination sources is intended to be a general, reference identification based on readily available information. It does not ascertain whether contamination is present or whether potential contamination sources are actually releasing contaminants. For existing public supply wells, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

In this section, the various environmental considerations are identified, as applicable, to the Marion County groundwater source areas described above. Further rating and evaluation of the environmental considerations identified here is provided for the specific supply projects discussed in Chapter 4.

3.4.2 Water Quality Impacts

Source areas M1:

- This approximate existing source area is located within the City of Dunnellon in southwest Marion County (see Figure 3-11). It is located in a rural land use area that has few contaminated storage tanks, solid waste sites, or designated risks to drinking water. For existing public supply wells in this area, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

Source areas M2, M3, M4:

- These approximate existing source areas are located in the vicinity of the SR 200/I-75 area in central-southwest Marion County (see Figure 3-11), in the On Top of the World, Oak Run, and Marion Oak/Summerglen service areas. The geology in this area is rated most vulnerable by MCAVA, and contaminated storage tanks and designated risks are located along SR 200 the corridor, with density increasing at Ocala. Overall, there is a low density of contamination sources in this area, but due to aquifer vulnerability, water quality should be considered as development expands. For existing public supply wells in this area, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

Source area M5:

- This approximate existing source area is located in the North West Marion County service area where future development is projected (see Figure 3-11). The geology in this area is rated more vulnerable to most vulnerable by MCAVA. Few contaminated

[5] Potential contamination sources include Superfund sites, permitted solid waste facilities such as landfills and transfer stations, and underground storage tanks undergoing or planned for remediation.

[6] Designated risks are defined by the State Underground Petroleum Environmental Response (SUPER) Act. The SUPER Act program is responsible for identifying areas of the state having drinking water contaminated as a result of leaking underground storage tanks, surface spills, and other discharges to the environment (373.3071, F.S.).

storage tanks and designated risks are located in this immediate area, with density increasing at Ocala. Overall, there is a low density of contamination sources in this area, but due to aquifer vulnerability, water quality should be considered as development expands. For existing public supply wells in this area, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

Source areas M6, M7, M8:

- These approximate source areas are located in the Silver Springs Shores, Belleview, and along US 441 in south-central Marion County area where future development is projected (Figure 3-11). Currently, these source areas are bordered on their infrastructure corridors by a series of contaminated storage tanks, solid waste sites, and designated risks to drinking water. This region is considered to have a moderate-density of these contamination sites and is rated most to more vulnerable to aquifer contamination by MCAVA. Due to this area's location in a future water demand area, water quality should be monitored as development expands. For existing public supply wells in this area, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

Source areas M9:

- This approximate source area is located in southern Ocala. (Figure 3-11). Currently, this source area is in the vicinity of a series of contaminated storage tanks, solid waste sites, and designated risks to drinking water. This region is considered to have a high-density of these contamination sites and is rated more vulnerable to aquifer contamination by MCAVA. Due to this area's location in a future water demand area, water quality should be monitored as development expands. For existing public supply wells in this area, water quality monitoring required by FDEP will detect contamination should it occur at the wellhead.

Source areas M10, M11, M12, M13:

- These approximate potential future source areas are located near Eureka, near Reddick, in west-central Marion County and along SR 200 in the Ocala National Forest. They are located in rural land use areas that have few contaminated storage tanks and few designated risks to drinking water.

3.4.3 Springs Impacts

Large springs in Marion County are Rainbow Springs, Silver Springs, Salt Springs and Silver Glen Springs. WRA (2007-c) determined that the large springs and spring runs in Marion County are not viable water sources for direct withdrawals due to their socio-economic and environmental resource values. The modeling discussed above determined that excessive groundwater withdrawals within the associated springsheds have the potential to reduce spring flow beyond expected acceptable levels.

MFLs for springs, where adopted by the SJRWMD and the SWFWMD, will protect against significant water quantity or quality degradation from withdrawals. Water use permitting criteria in 40C-2 and 40D-2, Florida Administrative Code (F.A.C.) will also limit harms to springs due to reductions in flow due to groundwater withdrawals. Since the MFLs for many springs in Marion County have not been formally established, the NCF modeling discussed above assumed a "screening flow" as the maximum allowable impact for interim planning purposes. For the purposes of estimating the effects of withdrawals on the springs in Marion County, a 15 percent

reduction from average historic flow was used as the screening flow (SJRWMD and CH2M Hill, 2005).[7] The MFLs for Rainbow Springs, Silver Springs, and others may be less than 15 percent when adopted.[8] The 15 percent reduction in average spring discharge provides a benchmark for evaluation with the understanding that the constraint may be revised in the future.

The results of the NCF modeling were used to determine that Silver Springs is more sensitive to groundwater withdrawals than Rainbow Springs based on existing facilities and projected demand areas within the NCF Model domain. This conclusion is generally consistent with results of the SWFWMD ND Model discussed in Chapter 4 of Technical Memorandum No. 2. Silver Springs is located near the center of the County and its springshed extends through the center half of the County. The NCF modeling also determined that Juniper and Fern Hammock Springs may serve as constraints to groundwater development along SR 40 in the Ocala National Forest.

WRA (2007-c) did not evaluate potential impacts to Gum/Citrus Blue springs in Sumter County. The WRWSA has developed a proxy MFL for this spring, and the adoption of this MFL in 2010 may affect groundwater supply development since the springshed extends into Marion County. More discussion on Gum/Citrus Blue springs is provided in Phase II and Phase VII's Technical Memorandum #2.

3.4.4 Saline Water Intrusion

Declines to UFA levels from groundwater withdrawals are projected in Marion County, as discussed above. The US-27/301 corridor is a potential high growth area where significant alternative supplies are not yet available. Marion County is not a coastal county and the UFA is unconfined to the west, so potential impacts to water quality will tend to be restricted by environmental impacts to surface features before inducing regional saline water intrusion (by upconing of lower quality water from the LFA). Local upconing in confined areas in eastern Marion County is a possibility if large increases in withdrawals were to occur there.

Lower quality groundwater is withdrawn from the LFA in the vicinity of southwest Marion County at The Villages. The hydraulic characteristics and spatial extent of MCU 1 and the LFA are poorly understood in the region (WRA, 2008), which limits the assessment of potential saline water intrusion. Saline water has been observed at relatively shallow depths in southwestern Marion County.

Due to the limited understanding of the LFA and confining characteristics and their extent, sulfate upconing should be closely monitored to ensure protection of the groundwater quality in Marion County.

[7] The WRWSA's Phase VII proxy MFLs assume a 16.6% cumulative allowable flow reduction for a second magnitude freshwater spring (Gum/Citrus Blue Springs). However, the WRWSA's proxy MFL methodology is not directly applicable to Rainbow and Silver Springs, due to the lack of adopted MFL precedents for springs of this size.

[8] The SJRWMD will establish the MFL for Silver Springs in 2011, and the SWFWMD will establish the MFL for Rainbow Springs in 2010. The SJRWMD and the SWFWMD are developing a joint methodology to ensure consistent criteria are used for both systems.

3.4.5 Lake and Wetland Impacts

The amount of drawdown in the SAS and UFA was used to predict the amount of potential harm to native habitat, wetland and lake systems (WRA, 2007-c). The SJRWMD native wetland vegetation planning criteria (Kinser and Minno, 1995; Kinser et al, 2003) was utilized for evaluating these impacts.

Projected surface drawdown from 1995 to 2025 in southern Marion County ranges from 0.35 feet to 1.0 feet, which has the potential to harm lakes and wetlands under SJRWMD planning criteria by reducing their water levels. However, based on the groundwater modeling, impacts to lakes and wetlands were not expected to become limiting to groundwater supply development before the screening flow for Silver Springs is reached. The adoption of the Silver Springs MFL in 2011 may affect this conclusion by revising the spring flow reduction constraint used in this analysis. Regulatory criteria for lakes and wetlands will also protect these features from harm due to water withdrawals.

Projected drawdown in the UFA at Lake Weir is 1.0 to 1.2 feet as a result of withdrawals from 1995 to 2025, which has the potential to harm lakes under SJRWMD criteria. However, Lake Weir has an adopted SJRWMD MFL which will protect it from significant harm due to water withdrawals.

Located in southeastern and eastern Marion County, Lakes Charles, Weir, Halfmoon, Hopkins Prairie, Kerr, Nicotoon, and Smith are water bodies for which SJRWMD MFLs have been or will be adopted. Located in western Marion County, Lakes Bonable, Little Bonable, and Tiger are water bodies for which SWFWMD MFLs will be adopted. Their MFL adoption will protect these resources from significant environmental harm due to water withdrawals.

3.4.6 River Impacts

The Withlacoochee River and Ocklawaha River are potentially significant sources of alternative water supplies to Marion County (WRA, 2007-c). The potential water supply yield from the rivers is affected by groundwater flow (e.g., baseflow) and surface water flow reductions. This section discusses potential groundwater flow reductions to the rivers due to groundwater withdrawals.

The WRWSA ND groundwater modeling in Phase II and VII -- Technical Memorandum No. 2 considers potential groundwater impacts to the Withlacoochee River system. The WRWSA established proxy MFLs[9] for the Withlacoochee River and evaluated the potential impact of projected groundwater withdrawals on the proxy MFLs in the Technical Memorandum. The SWFWMD plans to adopt MFLs for the Withlacoochee River system beginning in 2010, which will be protective of both water quality and quantity.

The Silver River and the Lower Ocklawaha River below the confluence with the Silver River are MFL priority water bodies planned for adoption by the SJRWMD in 2011. The MFLs for these resources will be protective of both water quality and quantity effects due to water withdrawals. The Silver River is almost entirely spring discharge, so its MFL will consider groundwater withdrawal impacts and will be protective of baseflow to the Lower Ocklawaha River upstream of the confluence.

[9] See the WRWSA's Phase II and VII Technical Memorandum No. 1

The Lower Ocklawaha at SR 40 will be protected from significant impacts from withdrawals by its MFL, but no MFL is planned for the Upper Ocklawaha River in Marion County (the reaches upstream of the confluence with Silver River, including Moss Bluff). MFLs are scheduled for the Harris Chain of Lakes in Lake County in 2012. Significant public supply surface water withdrawals have been proposed from the Upper Ocklawaha River Basin (UORB) upstream of Marion County in Lake County.[10] Surface water withdrawals in Lake County could reduce flow to this reach of the upper river, and the reach is within an area of projected drawdown that could reduce existing groundwater baseflow. The Upper Ocklawaha River in Marion County will require monitoring to ensure it is not adversely impacted by water withdrawals.

3.5 Methodology Comparison between Water Management Districts

The SJRWMD has declared Lake County and the far southern extent of its jurisdiction in Marion County to be a priority water resource caution area (PWRCA), meaning that projected water needs in the 20-year planning horizon (2005 to 2025) can not be met by traditional groundwater sources without incurring unacceptable impact to natural resources (SJRWMD, 2006). Figure 3-16 shows the SJRWMD PWRCA and the jurisdictional boundary between the SJRWMD and SWFWMD.

The SWFWMD and SJRWMD jurisdictions and the SJRWMD PRWCA designation add jurisdictional complexity to WRWSA water supply planning efforts involving Marion County. The PWRCA designation indicates that it is important to understand the effect of groundwater withdrawals in both the SJRWMD and the SWFWMD and to maintain coordinated and consistent resource assessments and management strategies between the two agencies.

A preliminary methodological identification and comparison of key groundwater assessment tools between SJRWMD and SWFWMD was prepared to support coordination efforts between the two agencies. The comparison addresses the SJRWMD NCF Model and the SWFWMD ND Model which are in use in this region, and the planning application of the modeling results to determine projected harm to wetlands (as a constraint to groundwater development).

Both the SJRWMD and SWFWMD have a common understanding of resource conditions and consistent resource management strategies in the region. The purpose of the methodological identification and comparison is to document the groundwater assessment methodologies that are in use. The Phase II and VII update to this groundwater resource assessment will maintain this common understanding of resource conditions while applying assessment methodologies specific to each agency. The methodological identification and comparison is presented below.

3.5.1 Wetland Harm Constraint Applications

The SJRWMD and SWFWMD utilize model projections of drawdown in the SAS or unconfined UFA to estimate whether the hydrology and vegetation in wetlands in Marion County will be adversely impacted (harmed) by future groundwater demands. Adverse drawdown impacts are generally understood by both the SJRWMD and the SWFWMD to include drawdown-induced shifts in dominant wetland vegetation, soil subsidence, plant mortality, and other ecological effects.

[10] The City of Minneola has proposed a 20 mgd withdrawal from Lake Apopka. The proposal is being evaluated by the SJRWMD.

At the planning level, the wetland harm constraint is applied by both SJRWMD and SWFWMD to assess regional groundwater resources and to identify needs for additional reuse, alternative water supplies, or increased demand reduction. The SJRWMD uses model drawdown beginning from 1995 for the planning estimation. The SWFWMD uses modeled drawdown beginning from pre-development conditions for the planning estimation. The SJRWMD has used this constraint to help predict time periods when future groundwater withdrawals will not be allowed due to projected environmental impacts. The SWFWMD typically does not predict time periods when future groundwater withdrawals will not be allowed.

SJRWMD Kinser-Minno Method

The SJRWMD regional wetland harm constraint is known as the Kinser-Minno method. It was developed in Kinser and Minno (1995) and subsequently modified in Kinser et al (2003) and Dunn et al (2008). The Dunn et al (2008) modification was specific to unconfined areas located within the NCF model extents, including Marion County. The Kinser-Minno method uses a GIS model to define areas where wetland vegetation may be susceptible to harm. It incorporates GIS representations (layers) of soil permeability, plant communities, and projected water table drawdown.

The soil permeabilities are rated according to high, moderate, and low susceptibility to dewatering, based on the permeability of the most limiting soil horizon. The rating is assigned by soil survey map unit. The plant communities are rated according to high, moderate, or low sensitivity to dewatering based on the general vegetation type. The general vegetation type is determined by photointerpretation. Similarly, the projected water table drawdown is rated low if less than 0.35 feet, medium if between 0.35 feet and 1.2 feet, and high if greater than 1.2 feet. These values are based on typical hydrographs developed from scientific literature.

The soil and plant susceptibility layers to dewatering are overlain to generate an overall rated potential for harm based on the lowest susceptibility of each layer. For example, if soils in a given area are rated highly susceptible to dewatering, but the vegetation is rated low sensitivity to dewatering (such as in a xeric upland), the overall rated potential for harm to that area is shown as low.

The rated potential for harm layer is overlain with the rated water table drawdown layer to generate a final likelihood of harm layer. Areas with both high potential for harm and high projected declines in the water table are given final ratings of high, and other areas with a combination of high and medium ratings are rated based on the potential for harm layer. In unconfined areas, the final likelihood of harm layer is modified based on depth intervals from the ground surface to the UFA, so that only wetlands located within 15-feet of the UFA can be given a high likelihood of harm rating. Finally, wetland acreages are tabulated according to the final likelihood of harm results.

SWFWMD – Northern Tampa Bay Region

The SWFWMD's regional wetland harm constraint is based on work done in the Northern Tampa Bay region where it was observed that impacted wetlands (based on shifts in dominant vegetation) in the wellfield areas were more likely to be found in areas where the models predicted greater than 1.0 foot of drawdown in the SAS.

The planning level harm constraint is generally consistent with the SWFWMD's wetlands MFL methodology, developed using cypress wetlands in the flatwoods environment of the Northern Tampa Bay area, which presumes that significant harm will occur when the long-term median water level in a wetland is lowered by greater than 0.8 feet. To protect herbaceous wetland fringes of lakes in the WRWSA, the SWFWMD has adopted the 0.8 feet presumption for lake MFLs in its Northern District.

A comparison between the Northern Tampa Bay and Kinser-Minno methods is presented in Table 3-4 below.

Table 3-4. SJRWMD and SWFWMD Wetland Harm Planning Constraints.

	Water Management District	
Description	**SJRWMD**	**SWFWMD**
Range of Allowable Drawdown (feet)	0.35-1.2[(1)]	0.8-1.0
Constraint Development		
Technical basis	Water level data in unimpacted systems; literature review	Correlation between observed wetland impacts and model drawdown in Northern Tampa Bay region
Wetland types used	Bay swamp; river/lake swamp; cypress swamp; mixed forest; freshwater marsh; wet prairie; emergent aquatic; submergent aquatic; mixed scrub-shrub	Freshwater marshes; cypress swamps
Physiographic setting	Xeric uplands; mesic uplands; flatwoods; wetlands	Flatwoods
Hydrogeologic setting	Confined	Confined
Constraint Application in Water Supply Planning		
GIS-based wetland and soil coverages	Yes	No
Use of topography to identify perched wetlands in unconfined areas	Yes	Yes
Estimates of ranges of potential for harm	Yes	No
Use of wetland monitoring[(2)]	Yes	Yes
Application of constraint based on unadjusted demands	Yes	No
Application of constraint to predevelopment conditions	No	Yes

(1) Range is based on wetland types used. Generally, forested and wet prairie wetlands are more susceptible to dewatering (0.35-0.55 feet) than freshwater marsh and aquatic wetlands (0.55-1.20 feet).

(2) Wetland monitoring evaluates the predictive capabilities of modeling tools and monitors their results. Management decisions can be adjusted based on results of the resource monitoring.

Future Work Efforts

Work is ongoing at both the SJRWMD and the SWFWMD to evaluate the use of the wetland harm constraints in sandhill environments (WRA, 2007-d; CH2M Hill, 2003; Nkedi-Kizza and Richardson, 2007; Jones Edmunds, 2006). Sandhills are the most common physiography in south-central Marion County where the groundwater modeling projected adverse impacts to wetlands in the 2025 and 2055 time frames. Sandhills are characterized by highly permeable soils, rolling hills and wetlands with large seasonal water level fluctuations. The allowable drawdown to wetlands characterized by large seasonal water level fluctuations in this setting is not known, because vegetation in these wetlands may have different sensitivity to aquifer drawdown than wetlands in other regions. A sandhill overlay has been developed for the Kinser-Minno method. The actual sensitivity of these systems to withdrawals could strongly affect local groundwater supply development in south-central Marion County.

Vegetation and ecology in wetland systems is strongly linked to seasonal hydropatterns (see Epting, 2007). In the SJRWMD, wetland monitoring related to the possible impacts of projected increases in water use in based on natural areas that have experienced little hydrologic alteration (Epting, 2007). However, drawdown effects on wetland will vary by season. Drawdown and recharge in the regional models are determined on an annual average basis and are not estimated seasonally.

The planning application of wetland harm constraints using the regional groundwater model results does not consider seasonal water level fluctuations. Since the SWFWMD wetland harm constraint has been empirically correlated with regional modeling results, it does not require adjustment for seasonal fluctuations. The SJRWMD wetland harm constraint has not been empirically correlated and may not correlate with actual drawdown effects.

As previously mentioned, both the SJRWMD and SWFWMD have a common understanding of resource conditions and consistent resource management strategies in the region. The WRWSA Phase II and VII update to this groundwater resource assessment will maintain a common understanding of resource conditions while applying the wetland harm assessment methodologies specific to each agency.

3.5.2 NCF and ND Groundwater Models

The SWFWMD-Northern District (ND) Model (HydroGeoLogic, 2008) encompasses all of Pasco, Citrus, and Hernando Counties, as well as most of Levy, Marion, and Sumter Counties and portions of surrounding counties. This model is part of a long-term effort, the Northern District Water Resources Assessment Project (NDWRAP), to evaluate water resources in the northern part of the SWFWMD. The ND Model is currently being finalized, and is described in detail in HydroGeoLogic (2008) and in Phase II – Technical Memorandum #2.

Model Coverages

The ND and NCF models share areas of coverage in Alachua, Putnam, Levy, Marion, Citrus, Sumter, and Lake Counties. As with the NCF Model, the ND Model also incompletely encompasses Marion County. The ND model does not include far northeast Marion County, while the NCF model does not include far western Marion County. The regional grid of the ND model consists of 182 columns and 275 rows and has uniform model cell spacing of 2,500 by

2,500 feet. In the vertical direction, seven layers of finite-difference cells represent the primary hydrogeologic units (HydroGeoLogic, 2008).

Confinement and Transmissivity

The extent of the SAS in the NCF model is shown in Figure 3-4 (expressed in terms of leakance of the ICU). Differences in the SAS extents and distributions of leakance in the ICU with the ND model may be observed by comparing Figure 3-17 with Figure 3-4. One can see that the ND Model shows a less expansive unconfined area of the UFA in Marion County. However, the distributions of leakance in the ICU, where present, are qualitatively similar. The leakance distributions in both models in the MCU are qualitatively similar. A comparison between the ND and NCF UFA transmissivities indicates that the two distributions are qualitatively similar in terms of general pattern of high and low transmissivities. High transmissivity is present in Marion County in both models. The UFA transmissivity in the Marion County area in the NCF model, in general, tends to be slightly greater than that in the ND model. The LFA transmissivities in both models are relatively uniform in the Marion County area in both models, in terms of general pattern of high and low transmissivities. However, the LFA transmissivity in the NCF Model is greater than that in the ND model. The LFA transmissivity in the NCF Model varies from 100,000 to 500,000 ft^2/day, whereas the LFA transmissivity in the ND Model is between 20,000 to 50,000 ft^2/day.

Recharge

Recharge in the NCF Model is based on rainfall, irrigation, septic tank inflow, runoff, and evapotranspiration (Motz and Dogan, 2004). The resulting is net recharge which was applied to the NCF Model. Return flow from domestic waste facilities was not included. Recharge in the ND Model is based on rainfall, runoff, and evapotranspiration (HydroGeoLogic, 2008). Neither the septic tank inflow nor the return flow from domestic waste facilities is included in the current ND model.

Calibration Conditions and Simulation Capabilities

Both the NCF and ND models were calibrated to steady-state conditions approximated by average 1995 conditions in respective model areas. The NCF Model is developed for steady-state simulations only. In contrast, the ND Model is a transient model which can be used to simulate in both steady-state and transient modes. A transient modeling approach accounts for the water released from storage in the transmissive and confining layers during the period of drawdown. The ND Model was also calibrated using observed transient conditions between 1996 and 2002. In addition to the two calibration conditions, the ND Model calibration may be extended to include pre-development conditions in the future, according to the SWFWMD.

A comparison between the NCF and ND models is summarized in Table 3-5 below.

Table 3-5. Summary of Comparison between the Northern District Model and the North-Central Florida Model.

Attribute	North-Central Florida Model	Northern District Model
Grid spacing	2,500 ft, uniform	2,500 ft, uniform
Number of Layers	3 layers (1 for the SAS, 1 for the UFA, and 1 for the LFA). The ICU and MSCU are represented by leakances.	7 layers (1 for the SAS, 1 for the ICU, 3 for the UFA, 1 for the MCU, and 1 for the LFA)
Recharge application	Net recharge (total less evapotranspiration from the aquifer) is applied directly to the top layer of the model.	Net recharge (total less evapotranspiration from the aquifer) is applied directly to the top layer of the model
Simulation mode	Steady state only	Both steady state and transient
Calibration period*	1995 (Steady-State)	1995 (Steady-state); 1996-2002 (Transient)
Model Evaluation Period	1995 to Present	Pre-pumping to Present
Coverage of Marion County	Approximately 98 percent of the county except for a small north-south strip of the county west of Rainbow Springs.	Approximately 80 percent of the county except for the northeastern corner of the county
Extent of Unconfined Area	Less unconfined area	More unconfined area
Confinement of the ICU	Qualitatively similar, where present	Qualitatively similar, where present
Confinement of the MCU	Qualitatively similar	Qualitatively similar
Distribution of transmissivity in the UFA	Qualitatively similar	Qualitatively similar
Representation of the LFA	The LFA is excluded where chloride concentration exceeds 5,000 mg/L	The LFA is fully represented where present.

Note:

* According to SWFWMD, a pre-pumping calibration may be developed for the final version of the ND Model.

Future Work Efforts

The NCF model will undergo a post-verification process to provide a second calibration point (in addition to the original 1995 calibration). The second calibration will be to a period of time in the 2004-2006 range and will provide verification that the model remains accurate in the vicinity of the calibration. The post-verification should improve the predictive capabilities of the NCF model.

Future work associated with the ND model is discussed in Phase II and VII - Technical Memorandum No. 2.

Resource monitoring at both the SWFWMD and SJRWMD evaluates the predictive capabilities of modeling tools and monitors their results through comparison to observed data. Water resource management decisions can be adjusted based on results of the resource monitoring.

3.6 Domestic Self-Supply Modeling Evaluation

Domestic self-supply is a significant water use in Marion County, as discussed in Chapter 1. Estimates of the per capita rate of domestic self-supply use in Marion County vary widely among reporting agencies.

The SJRWMD and the SWFWMD are participating in a study to evaluate the potential impacts of projected increases in domestic self-supply water use in Marion County. The study's main components include estimating current and future demand of groundwater for domestic self supply DSS) use, using the NCF and ND regional groundwater flow models to simulate current and future DSS water use in Marion County, and determining the potential environmental impact on lakes, wetlands, and spring flow due to DSS withdrawals.

If DSS water use is determined to cause a significant impact to water resources, then SJRWMD and SWFWMD will develop a list of possible management strategies to address the issue. The possible strategies included on this list will be discussed with Marion County and the WRWSA, with final recommendations developed for further consideration.

3.7 Summary

The WRWSA RWSPU, completed in 2007, evaluated the projected 2025 impacts to groundwater resources in Hernando, Citrus, and Sumter Counties and the City of Ocala. This section updates the RWSPU to include current knowledge relative to the ability of the groundwater resources within Marion County to support future water supply development.

The projected impacts to groundwater resources in Marion County for the 2025 planning horizons are evaluated using groundwater modeling. The groundwater modeling was performed by the SJRWMD using the NCF groundwater flow model. Projected 2025 model scenarios were compared to calibrated average 1995 conditions. Unadjusted demands and SJRWMD planning criteria were used for the impact determination. Based on the projected impacts to spring flow, lakes and wetlands, the need for increased conservation, reuse, and/or alternative water supplies in Marion County was identified for the 2025 planning horizon. The adoption of the SJRWMD MFL for Silver Springs in 2011 and the SWFWMD MFL for Rainbow Springs in 2010 may affect estimates of groundwater supply in Marion County.

The SJRWMD uses the NCF Model to assess groundwater resources in Marion County. The SWFWMD uses the ND Model to assess groundwater resources in its Northern District. The ND and NCF groundwater flow models share areas of coverage in Marion, Citrus, and Sumter Counties. Both the NCF and ND models were calibrated to steady-state conditions approximated by average 1995 conditions in respective model areas. The NCF Model is restricted to steady-state simulations. In contrast, the ND Model is a transient model which was also calibrated with observed transient conditions between 1996 and 2002.

The SJRWMD and the SWFWMD use different groundwater models and criteria for allowable wetland drawdown (harm) due to groundwater withdrawals. However, both the SJRWMD and SWFWMD have a common understanding of resource conditions and consistent resource management strategies in the region. The WRWSA Phase II and VII update to this groundwater resource assessment will maintain a common understanding of resource conditions and consistent resource management strategies while applying methodologies specific to each agency.

Neither SJRWMD or SWFWMD has confidently determined a metric for wetland harm in the sandhill physiographic settings common in south-central Marion County and elsewhere in the WRWSA, where natural wetland water level fluctuations are greater than in other regions of the SJRWMD and SWFWMD. The projected impacts to lakes and wetlands were primarily located in south-central Marion County. Far southeastern Marion County and Lake County have been identified by the SJRWMD as a PRWCA, meaning that projected water needs in the 20-year planning horizon (2005 to 2025) can not be met by traditional groundwater sources without incurring unacceptable impact to natural resources.

The WRWSA will amend the water supply feasibility analyses and groundwater resource assessment in Phases II and VII of its MRWSP&IP to include Marion County in 2030. The groundwater resource assessment described in this section will be utilized to direct the development of the Phase II and VII amendment.

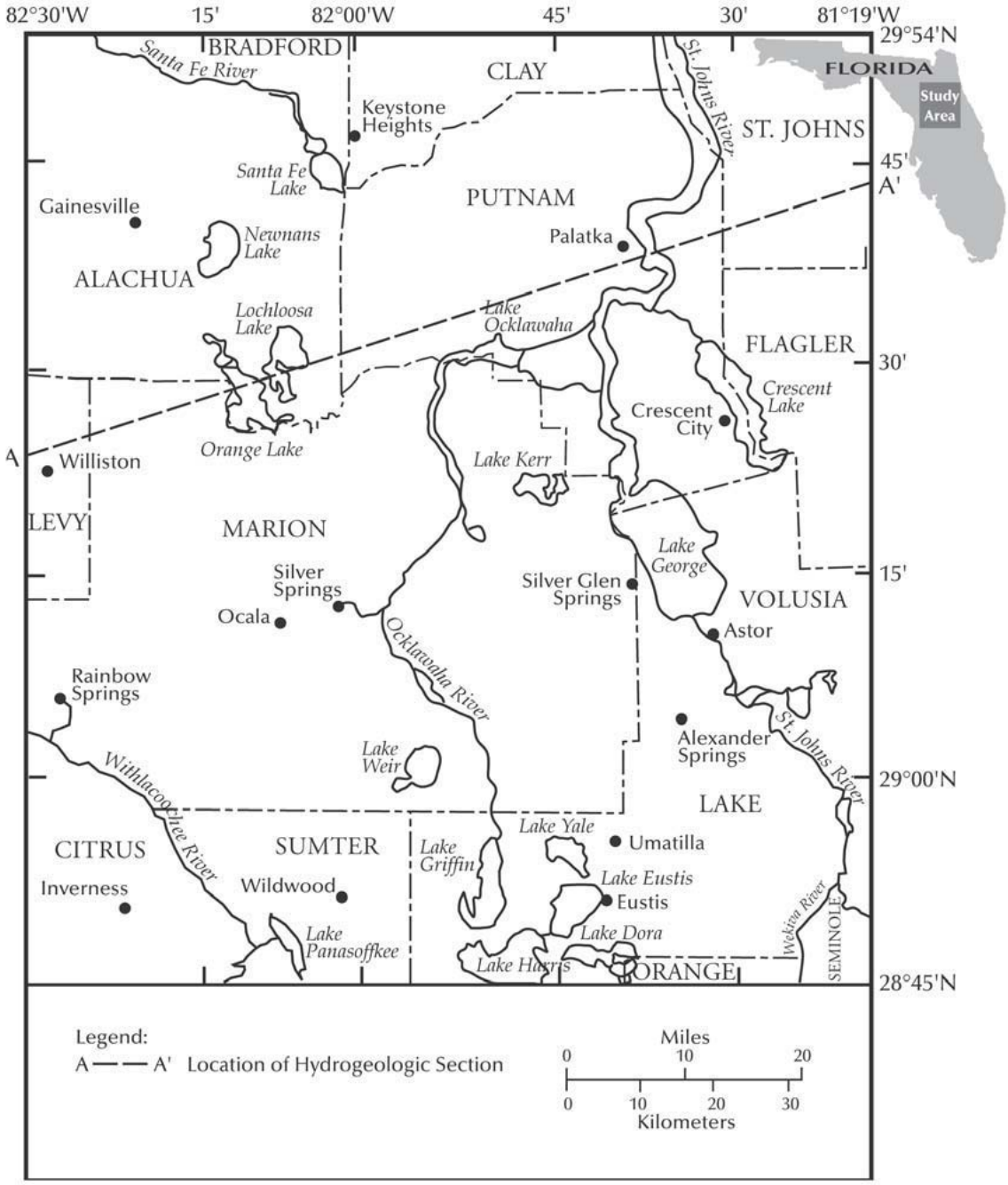


Figure 3-1 The North-Central Florida (NCF) Model Extent (Motz and Dogan, 2004).

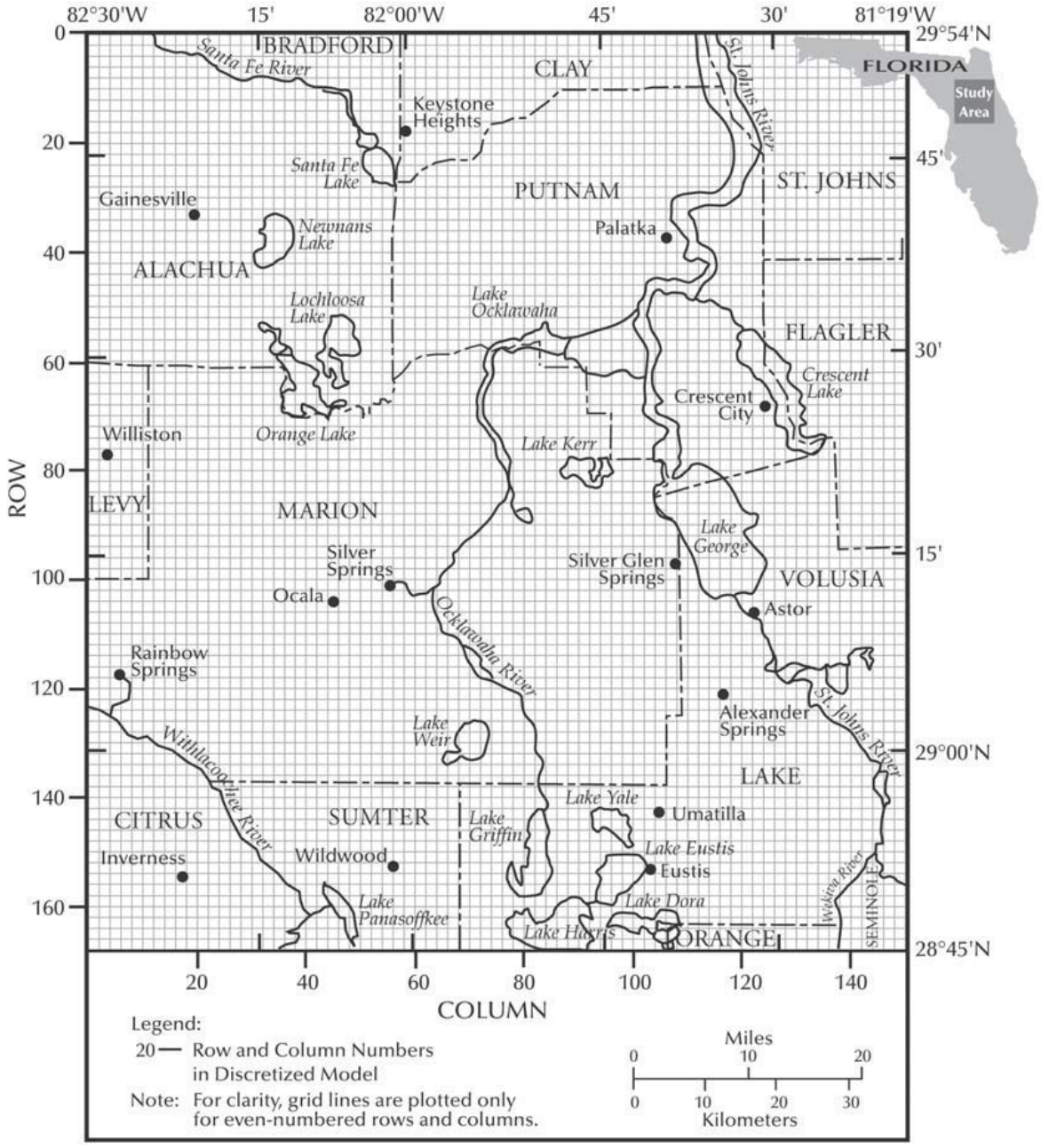


Figure 3-2 The NCF Model Grid (Motz and Dogan, 2004).

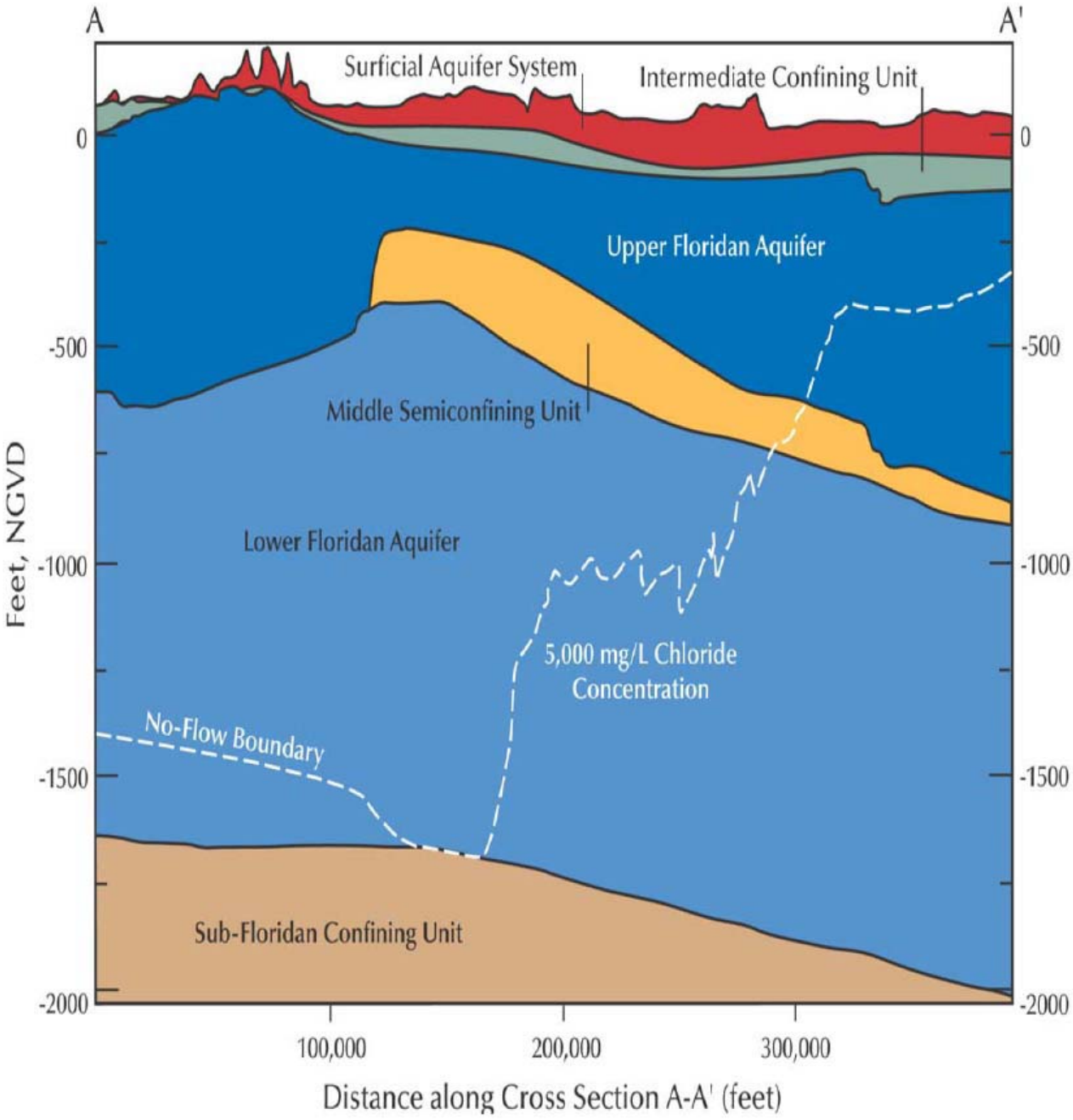


Figure 3-3 The Hydrogeologic units underlying the NCF Model (Section A-A' in Figure 3-1) (Motz and Dogan, 2004).

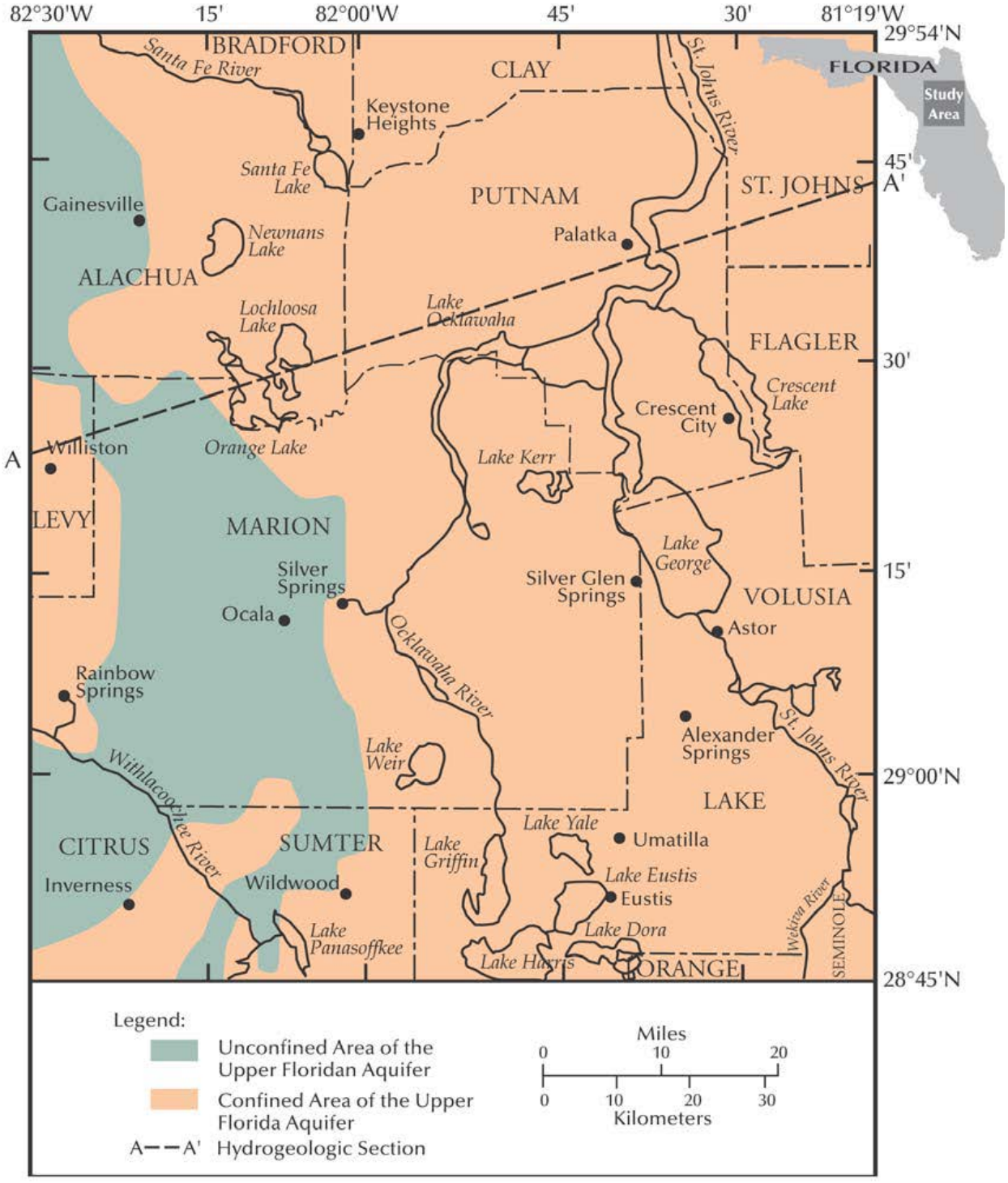


Figure 3-4 Unconfined/confined Areas in the Upper Floridan Aquifer (Motz and Dogan, 2004).

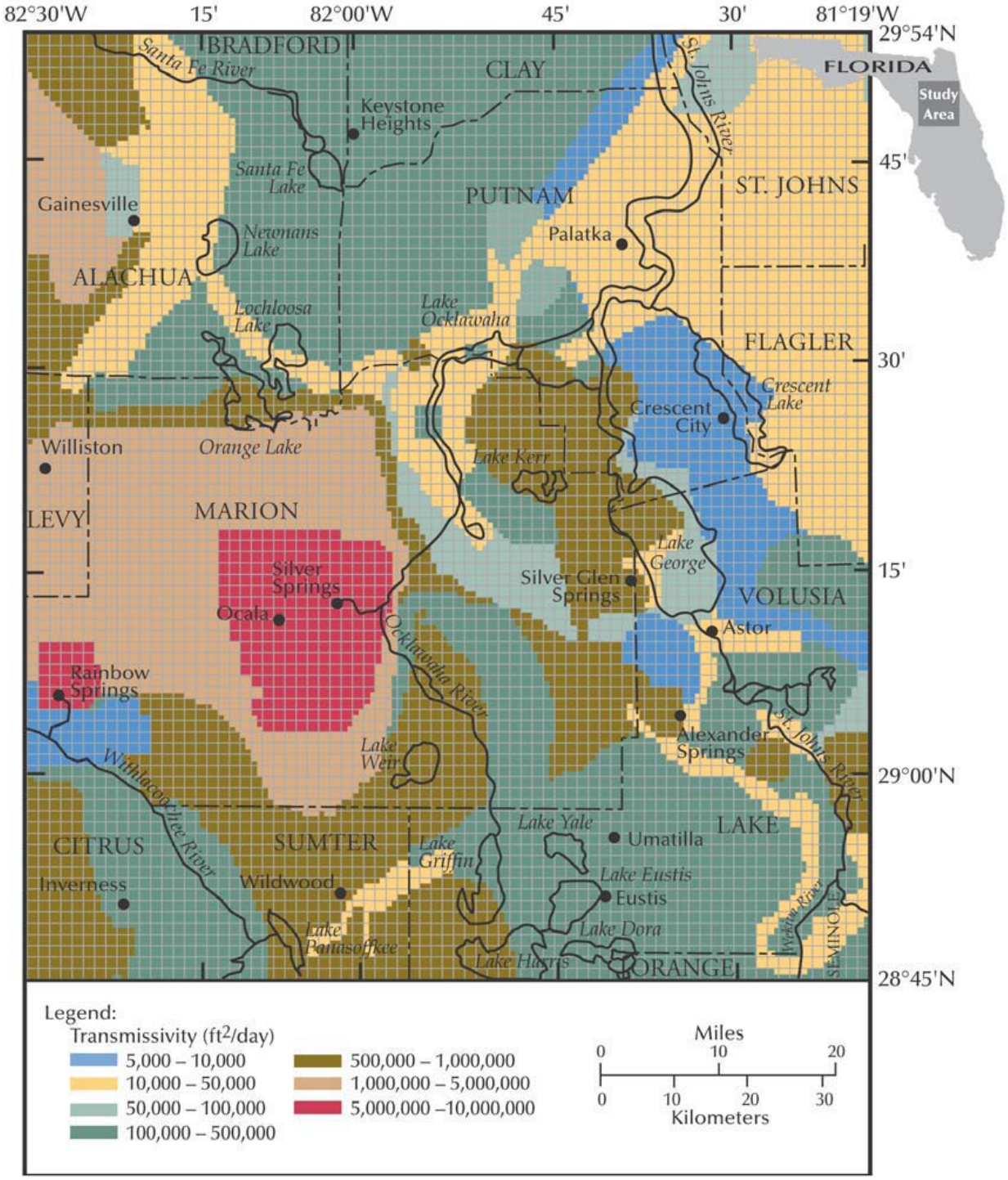


Figure 3-5 Transmissivity in the Upper Floridan Aquifer (Motz and Dogan, 2004).

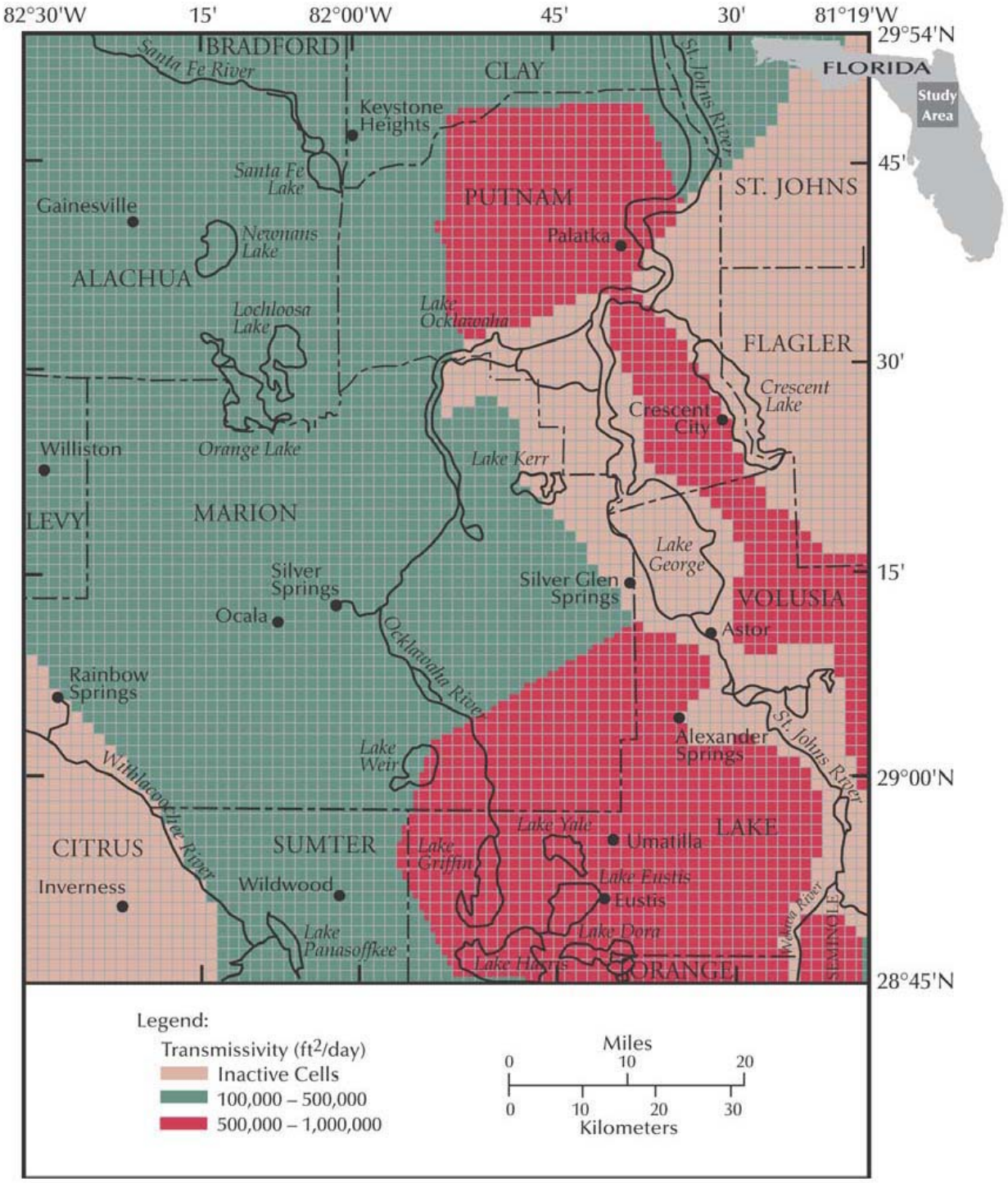


Figure 3-6 Transmissivity in the Lower Floridan Aquifer (Motz and Dogan, 2004).

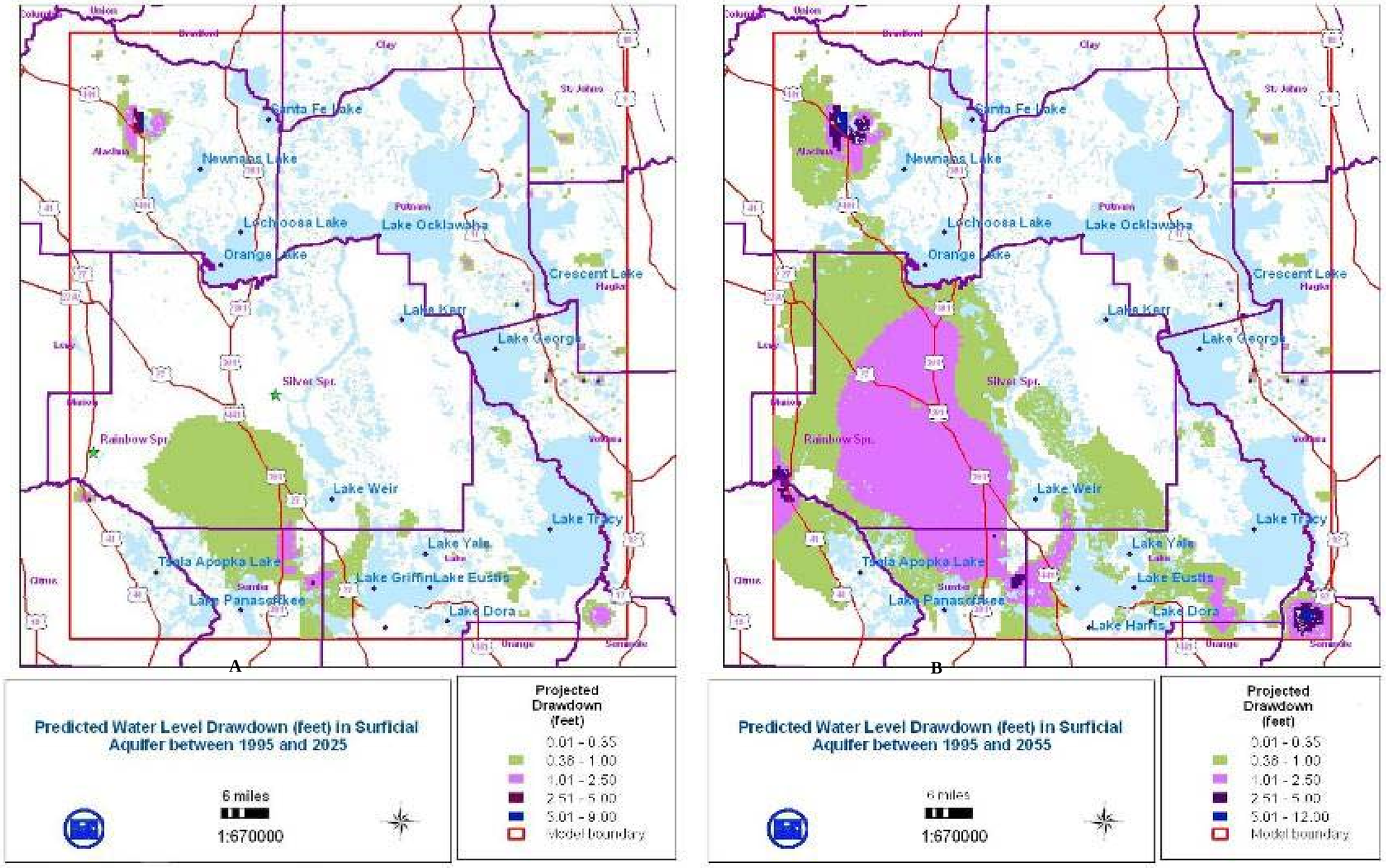


Figure 3-7 Projected Change in Water Levels in the Surficial Aquifer from 1995 to 2025 (A) and to 2055 (B)

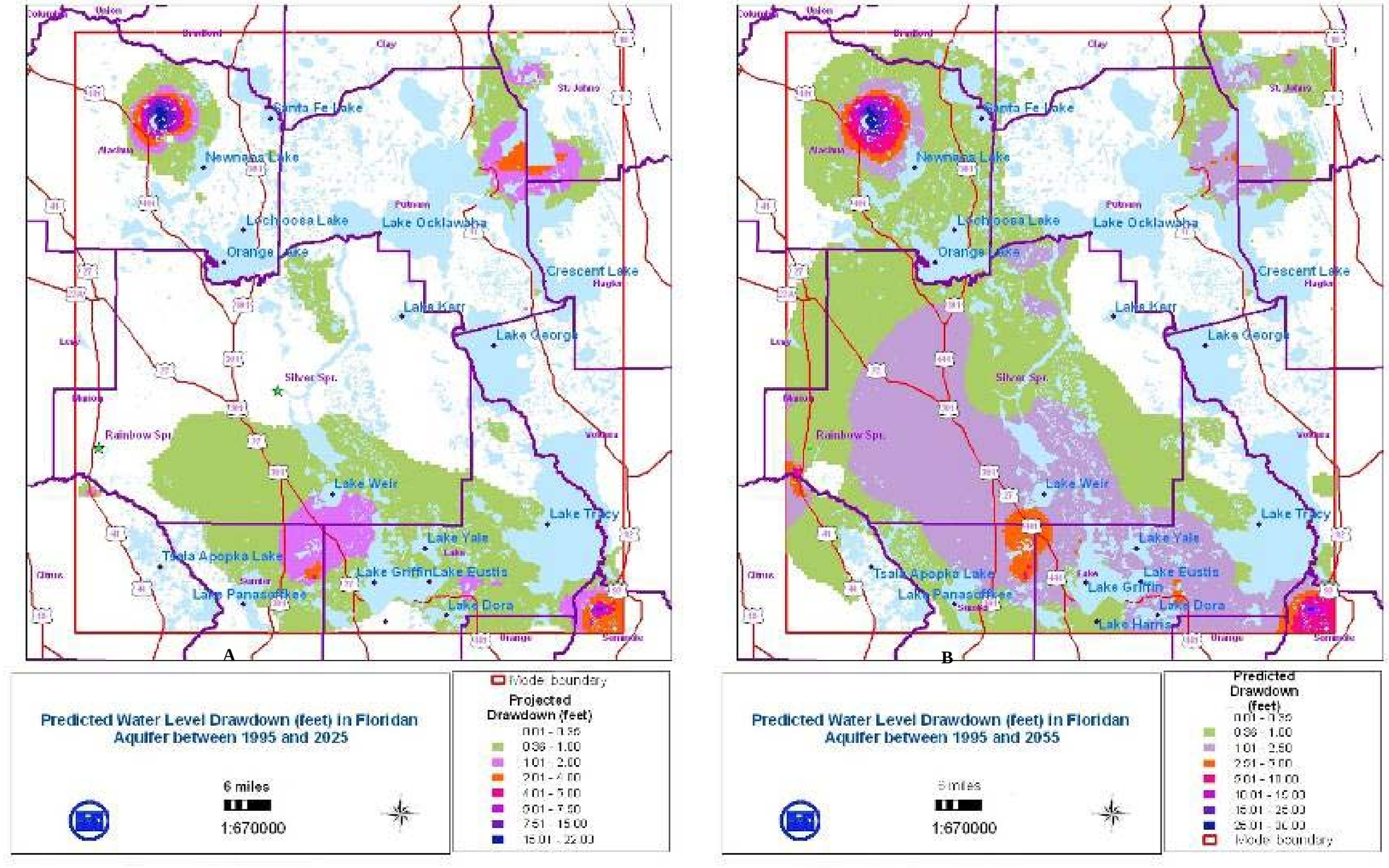
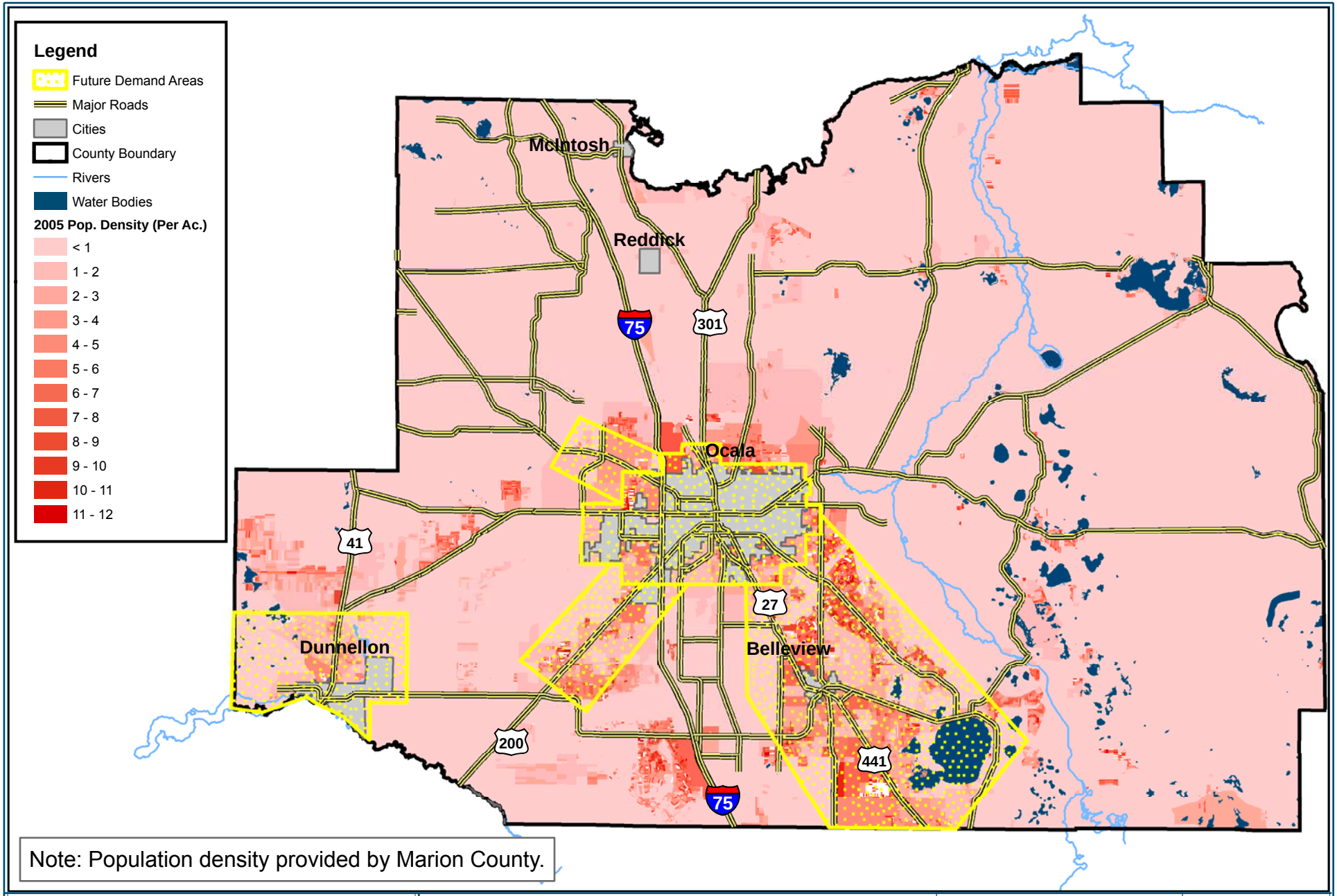


Figure 3-8 Projected Change in Water Levels in the Upper Floridan Aquifer from 1995 to 2025 (A) and to 2055 (B)



Note: Population density provided by Marion County.

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Figure 3-10
Approximate Future Demand Areas

ORIGINAL DATE: 09-22-08
REVISION DATE: 11-17-08
JOB NUMBER: 0576
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GIS OPERATOR: DR

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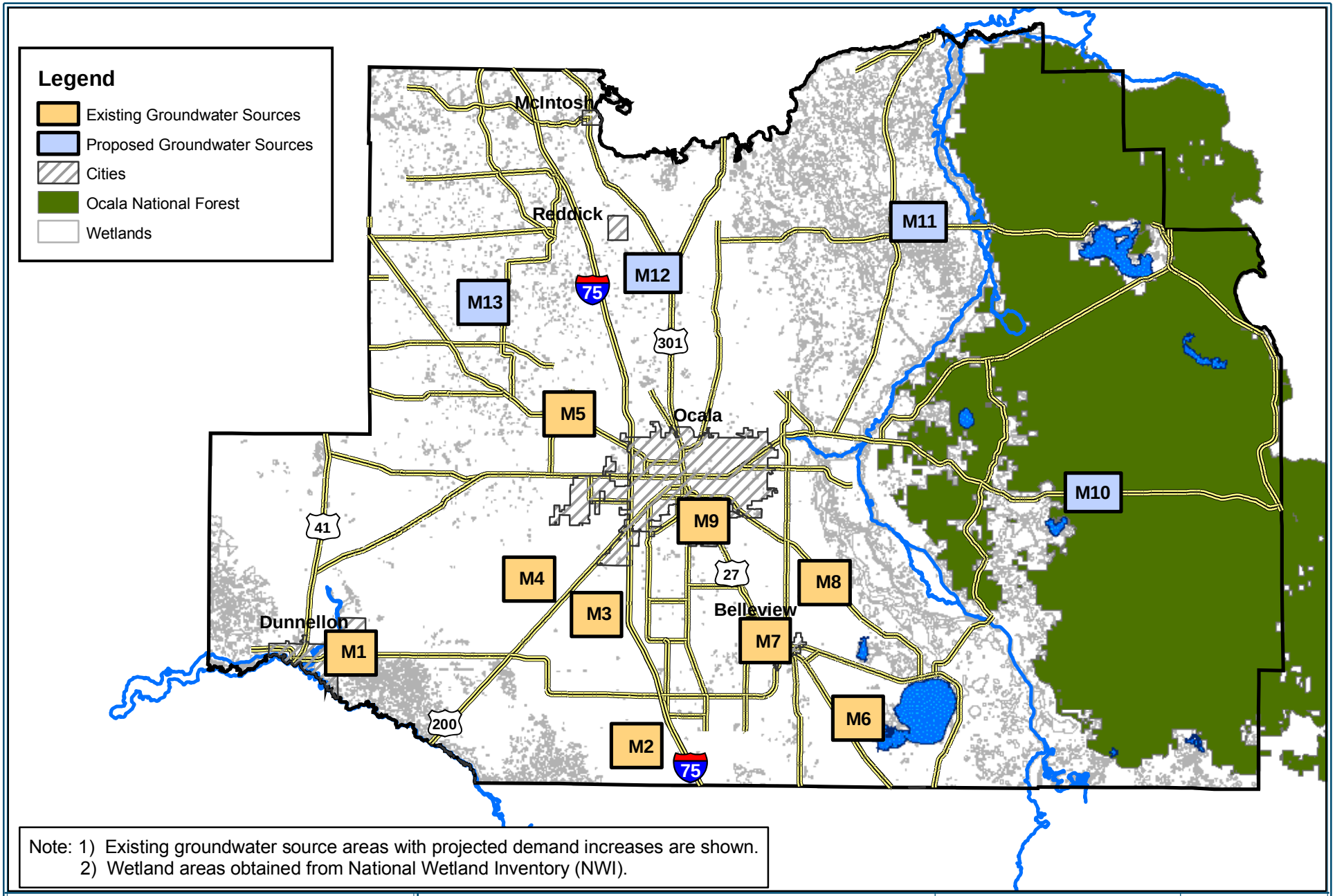
1 Inch = 35,000 Feet



Note: 1) Existing groundwater source areas with projected demand increases are shown.
2) Wetland areas obtained from National Wetland Inventory (NWI).

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Figure 3-11
Approximate Public Supply Groundwater Source Areas

ORIGINAL DATE: 09-22-08
REVISION DATE: 10-19-09
JOB NUMBER: 0576
FILE NAME: Figure 3-11.mxd
GIS OPERATOR: DR

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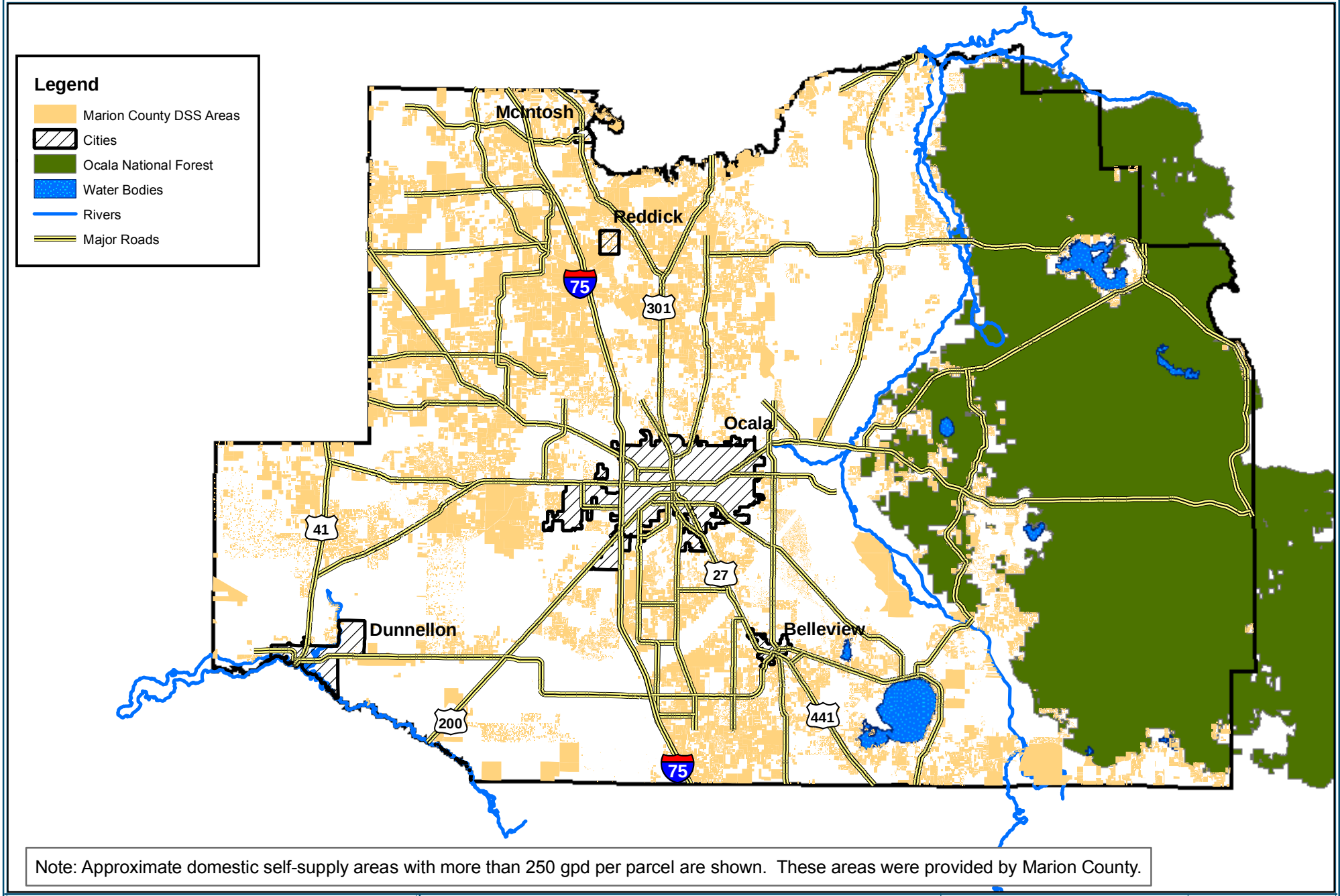

Note: Approximate domestic self-supply areas with more than 250 gpd per parcel are shown. These areas were provided by Marion County.

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Figure 3-12
Approximate Domestic Self-Supply Areas

ORIGINAL DATE: 09-23-08
REVISION DATE: 10-18-09
JOB NUMBER: 0576
FILE NAME: Figure 3-12.mxd
GIS OPERATOR: DR

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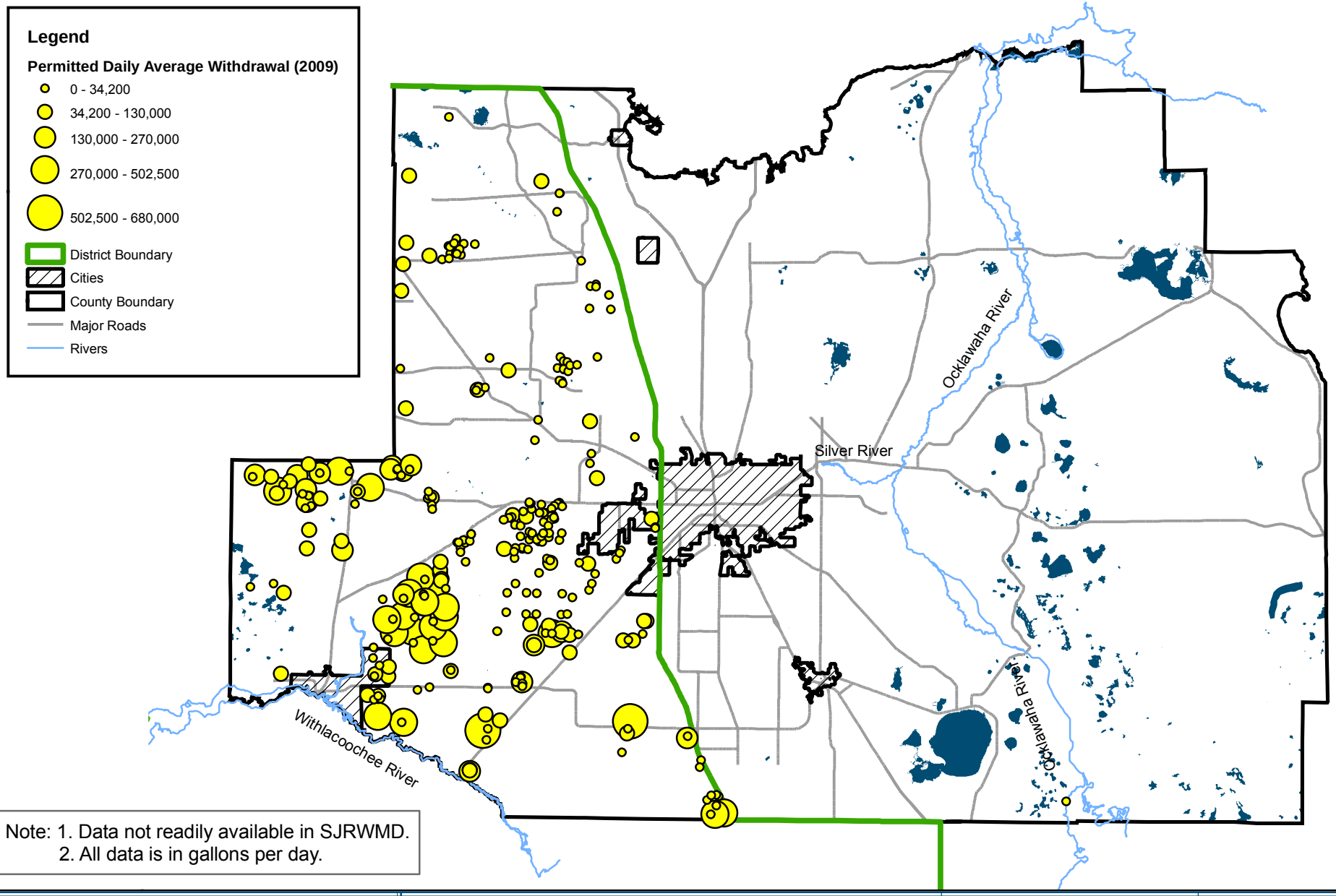
1 Inch = 35,000 Feet



Note: 1. Data not readily available in SJRWMD.
2. All data is in gallons per day.

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Figure 3-13A
SWFWMD Agricultural Groundwater Source Areas

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REVISION DATE: 10-18-09
JOB NUMBER: 0576
FILE NAME: Figure 3-13a.mxd
GIS OPERATOR: DR

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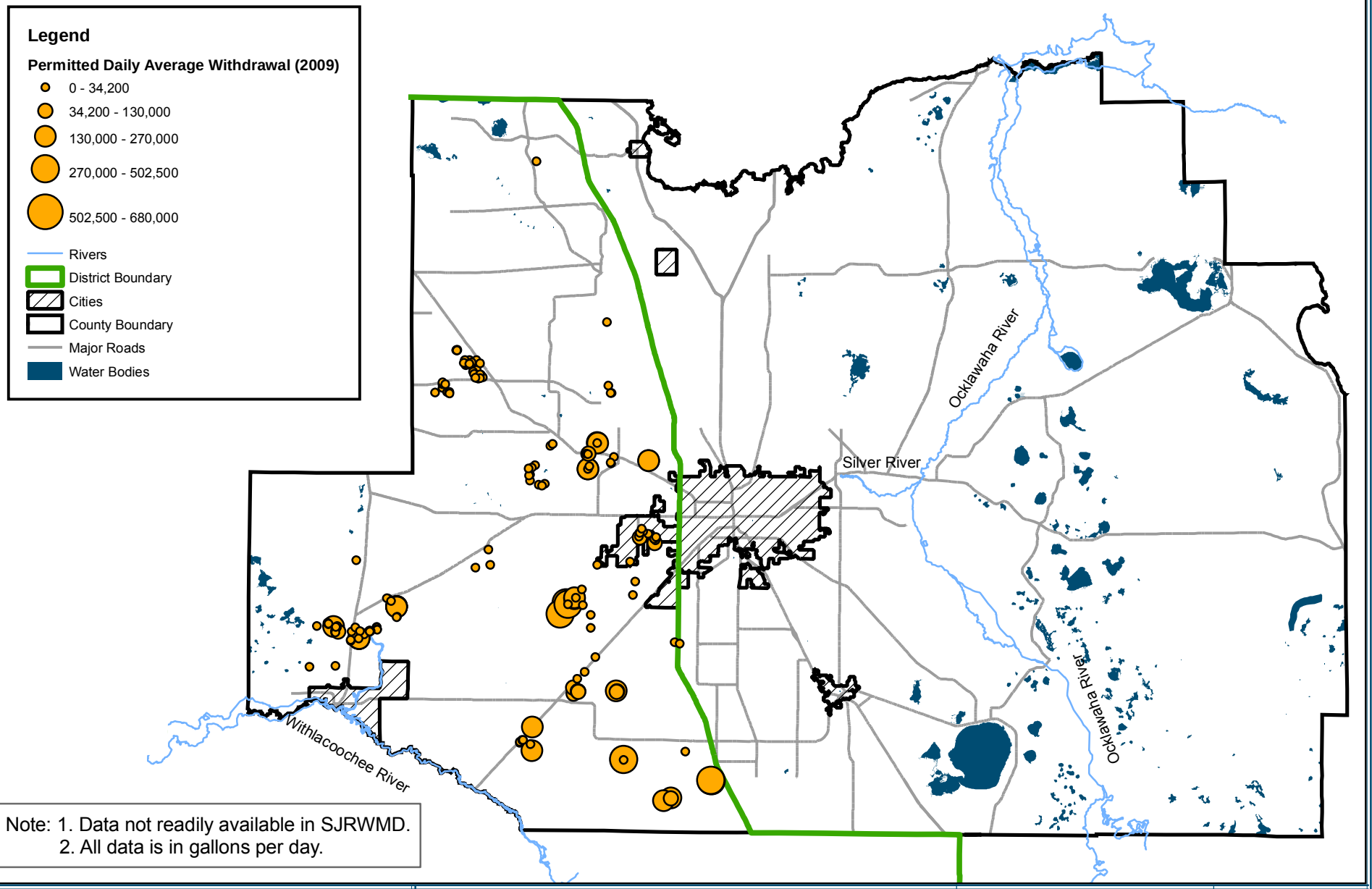
1 Inch = 35,000 Feet



Note: 1. Data not readily available in SJRWMD.
2. All data is in gallons per day.

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Figure 3-13B
SWFWMD Recreational Groundwater Source Areas

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REVISION DATE: 10-18-09
JOB NUMBER: 0576
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GIS OPERATOR: DR

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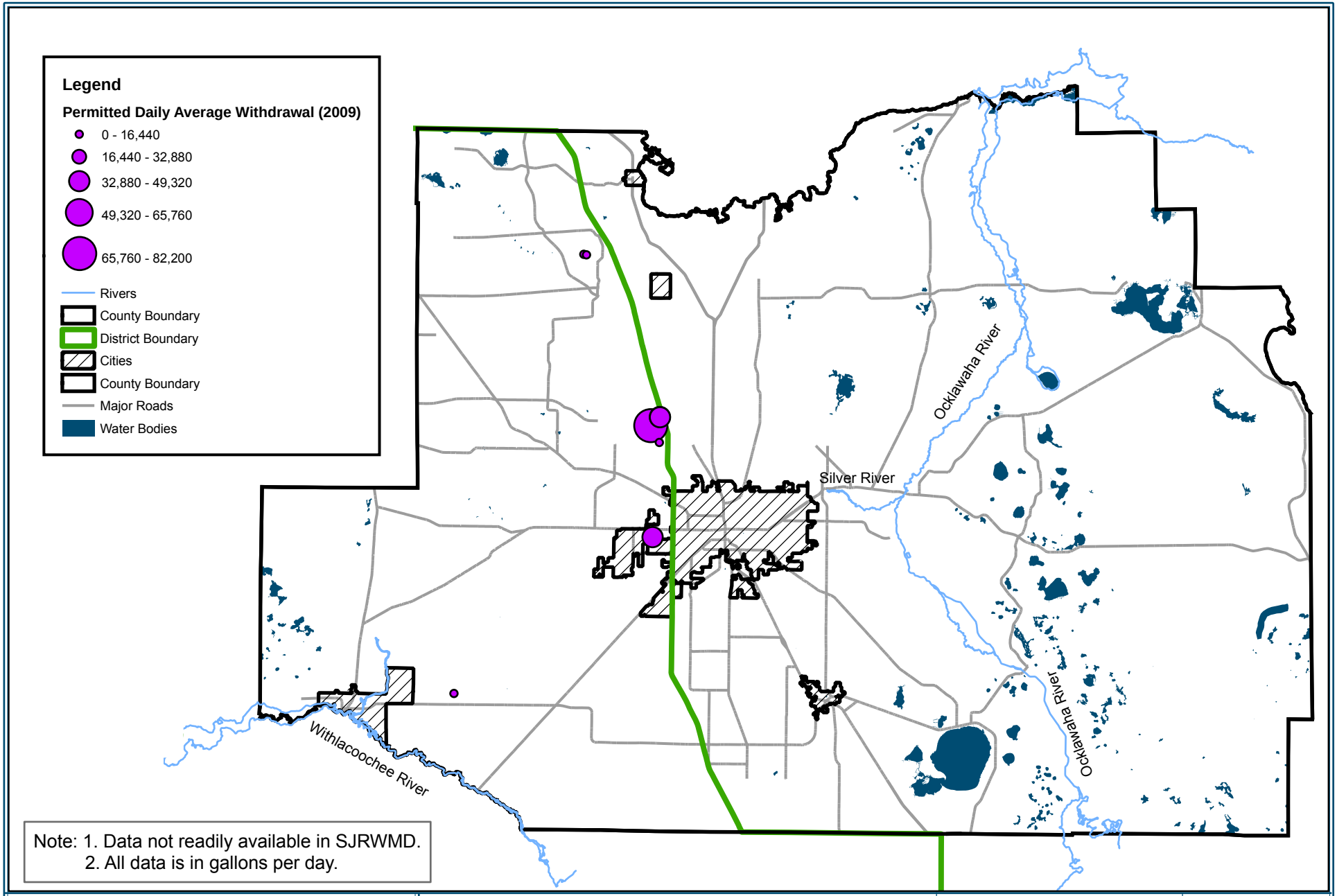

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Figure 3-13C
SWFWMD Industrial/Commercial Groundwater Source Areas

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REVISION DATE: 10-18-09
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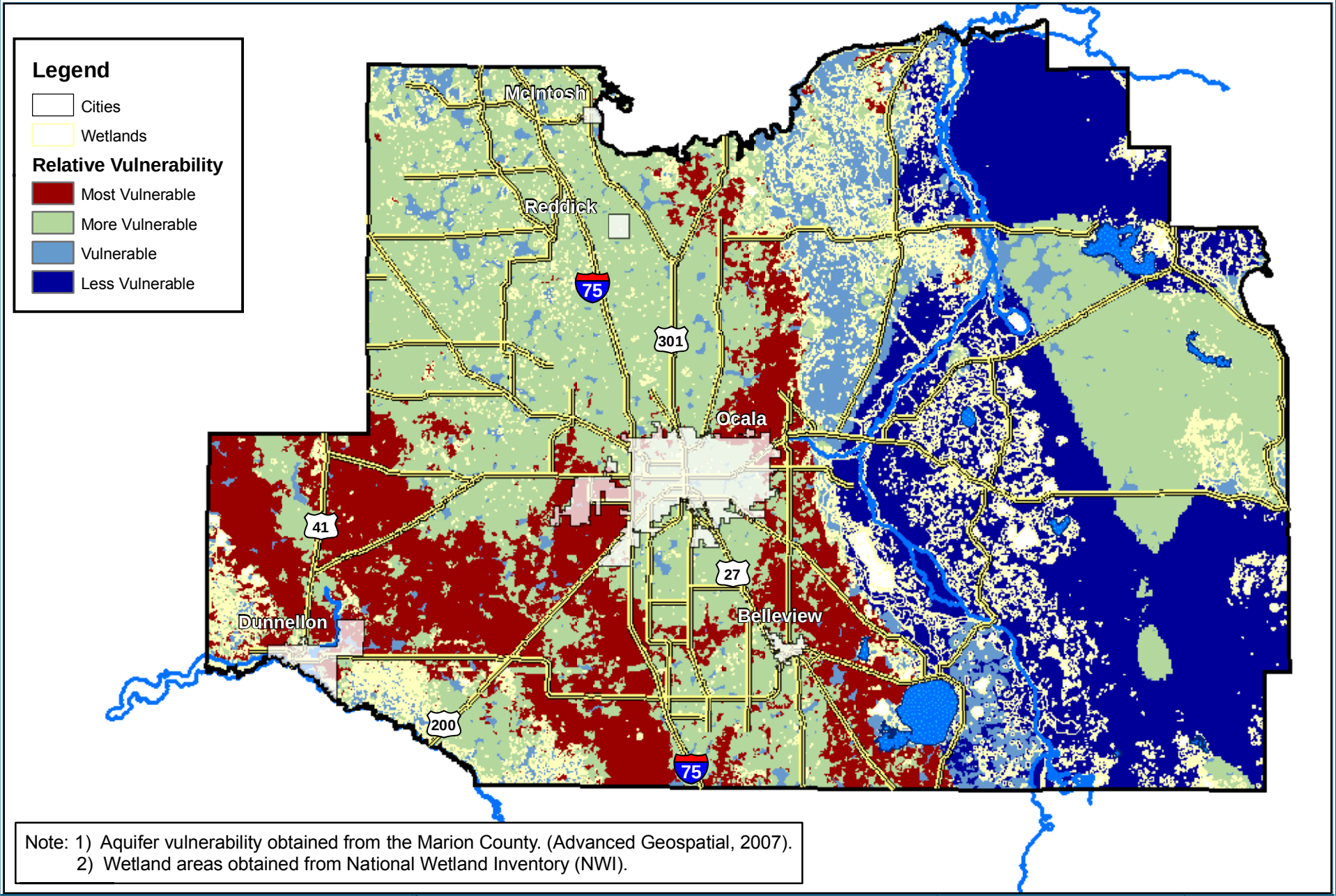

Note: 1) Aquifer vulnerability obtained from the Marion County. (Advanced Geospatial, 2007).
2) Wetland areas obtained from National Wetland Inventory (NWI).

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Figure 3-14
Marion County Aquifer Vulnerability Assessment

ORIGINAL DATE: 09-22-08
REVISION DATE: 10-19-09
JOB NUMBER: 0576
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GIS OPERATOR: DR

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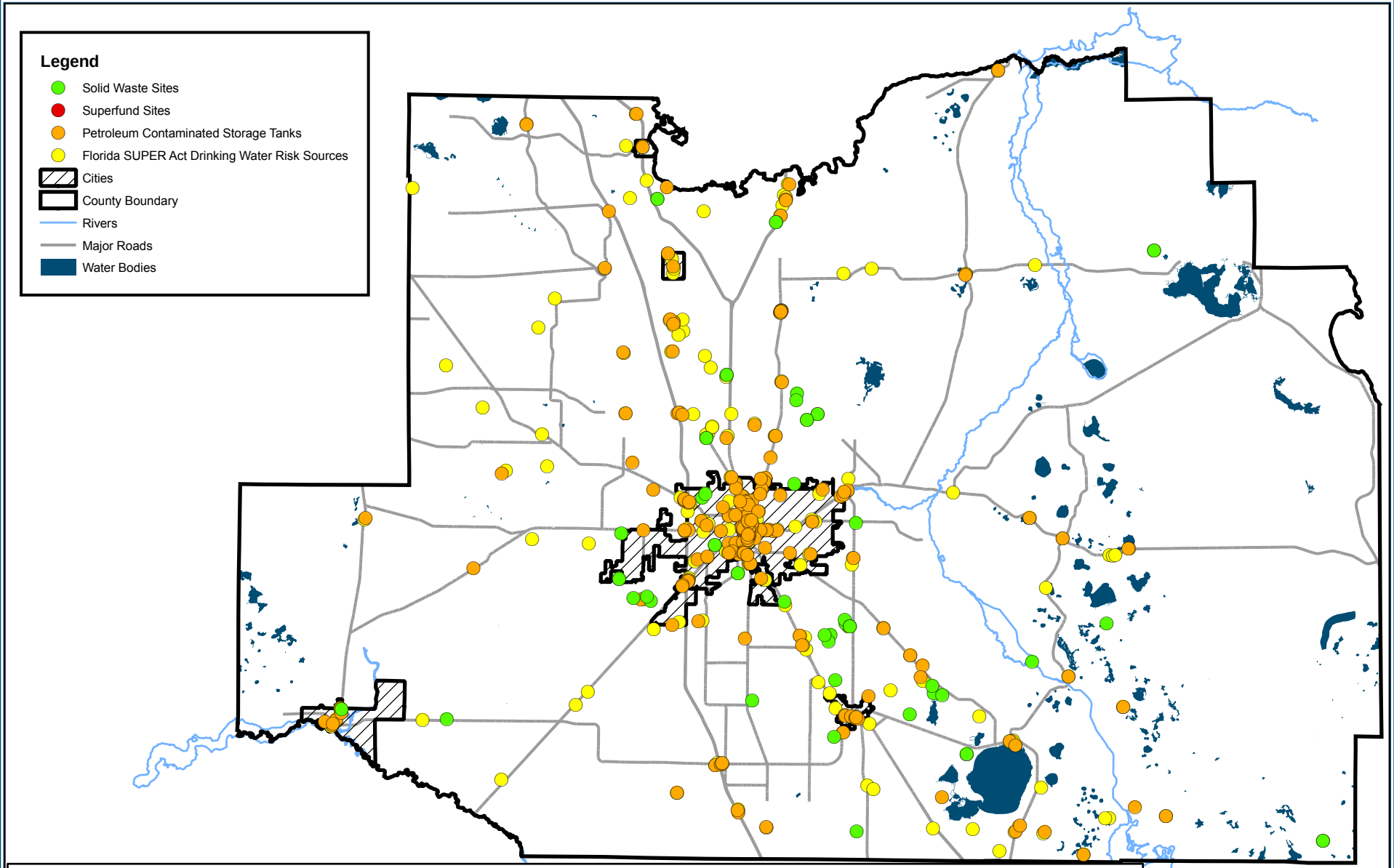

Note: 1) Data was obtained from the Florida Geographic Data Library (FGDL).
2) This figure does not include discharges that are not required for 62-770 or discharges that have already been cleaned up.

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Figure 3-15
Petroleum Contaminated Storage Tank, Solid Waste, and Superfund Sites

ORIGINAL DATE: 09-22-08
REVISION DATE: 10-18-09
JOB NUMBER: 0576
FILE NAME: Figure 3-15.mxd
GIS OPERATOR: DR

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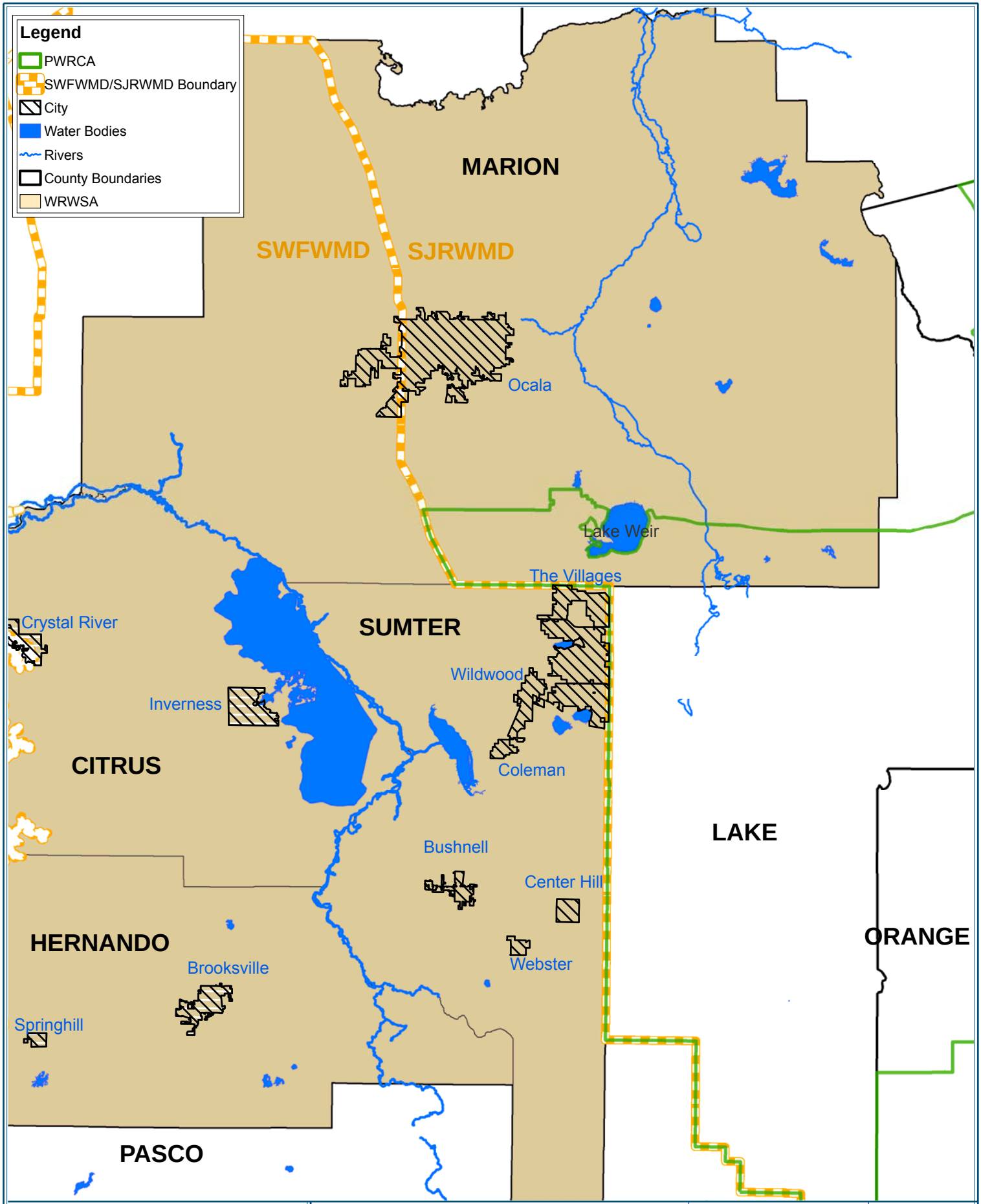
1 Inch = 35,000 Feet



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PROJECT: 0468 - Withlacoochee - Phase II

Figure 3-16
Water Management
District Designations

ORIGINAL DATE: 06-23-08
REVISION DATE: NA
JOB NUMBER: 0468
FILE NAME: Figure 3-16.mxd
GIS OPERATOR: DR

N W E S

1 Inch = 4.75 Miles

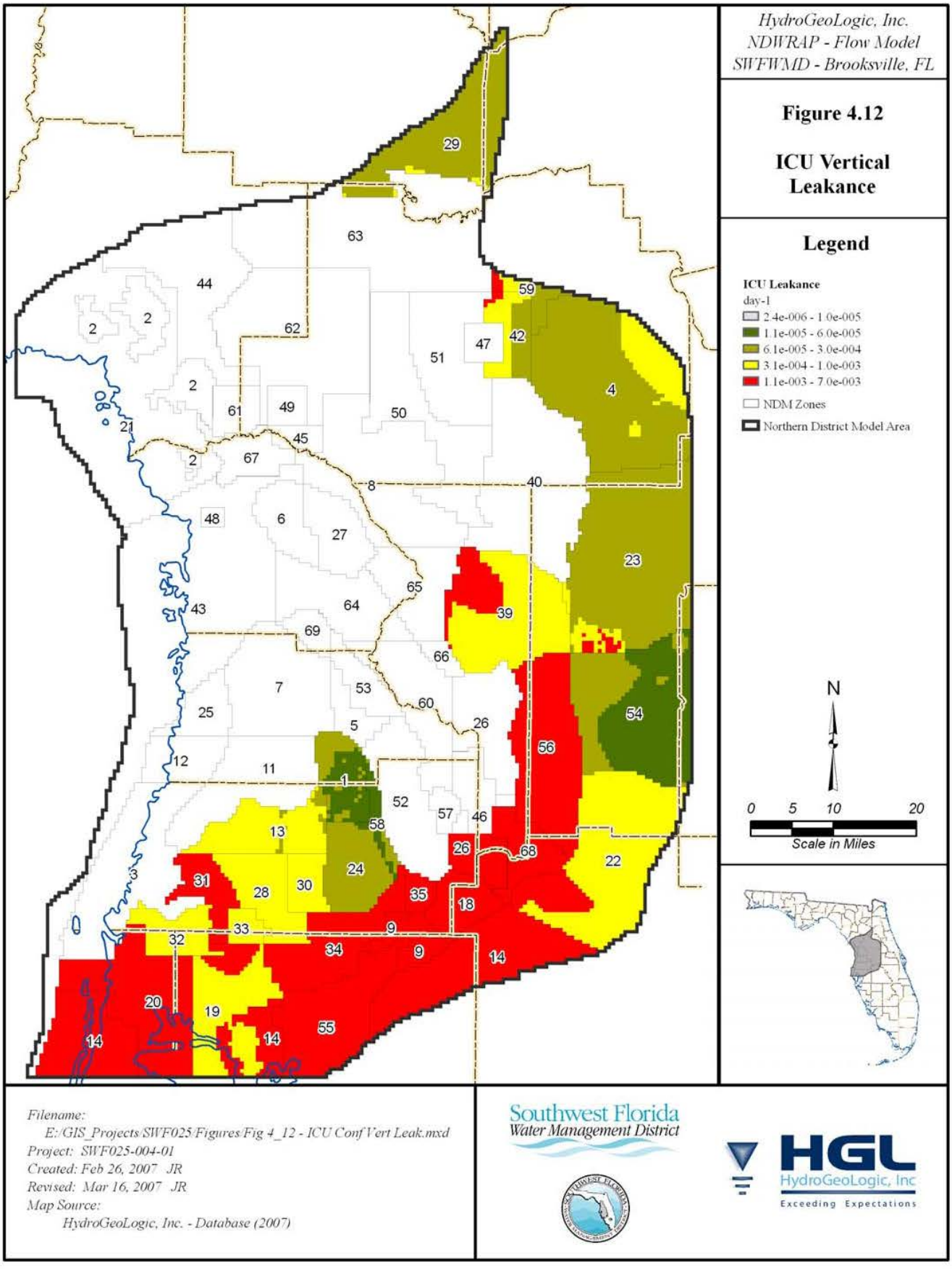


Figure 3-17 **Extent of the SAS in the Northern District Model and the Leakance Distribution in the Intermediate Confining Unit**

Chapter 4

4.0 Future Water Supply Projects

Key Points

- This chapter identifies and characterizes potential regional water supply development projects that could serve WRWSA members in Marion County. Current WRWSA and SJRWMD water supply development projects are identified.
- Potential WRWSA projects are evaluated for general feasibility to members in Marion County to prioritize and focus future water supply development. Selected projects are recommended for further feasibility evaluation. This chapter provides general direction for the potential projects, but does determine detailed project configurations or ultimate viability.
- Recommended groundwater supply projects for further feasibility evaluation include a dispersed wellfield in eastern Marion County in the SJRWMD, and a dispersed wellfield in northwestern Marion County in the SWFWMD.
- Recommended WRWSA alternative water supply projects for further feasibility evaluation include surface water development along the Withlacoochee River, and desalination supply at the Crystal River power plant.
- Recommended WRWSA water supply projects identified for further evaluation will be assessed in the future using resource methodologies specific to the WMD where the project is located. Since the SJRWMD and SWFWMD have a common understanding of resource conditions, the two agencies have a consistent identification of the sources that are viable for potential supply projects in this region.
- Beneficial reuse development opportunities in Marion County are identified.
- This chapter does not evaluate potential SJRWMD water supply development projects. The progress of these projects will be monitored and described in Phase II of the MRWSP&IP.

4.1 Introduction

The RWSPU evaluated potential new supply sources in the WRWSA to prioritize and focus on water supply development. General source locations were refined and characterized into specific regional projects,[1] based on projected water demand, location relative to demand areas, results of groundwater modeling, surface water hydrologic analyses, and environmental resource data. The potential future water supply projects were evaluated and ranked, and the highest ranked projects were recommended for in-depth feasibility analysis in Phase II. Phase II conceptual designs are being prepared for the recommended groundwater, surface water and desalination projects in Phase II Technical Memorandum No. 1 and No. 2. Based on the conceptual designs, the Phase II projects will be evaluated, ranked and prioritized according to short-term, medium-term, and long-term planning horizons.

Chapter 4 uses the general source and water demand data presented in Chapters 1, 2 and 3 to identify potential new supply projects for members in Marion County. Since the WRWSA, Marion County and the SJRWMD have each previously identified regional projects that could be developed for Marion County, project information was compiled from the RWSPU, WRAMS, and the SJRWMD District Water Supply Plan (DWSP). The projects are categorized according to their water source as described below:

- Fresh Groundwater (e.g., potable);
- Surface Water;
- Seawater;
- Brackish Groundwater (including Offshore Springs);
- Stormwater; and
- Reclaimed Water.

This chapter is intended to encourage regional planning in water supply development and to provide general direction for the potential Phase II projects, but not to determine detailed project configurations or ultimate viability. The identified projects are screened and characterized to develop recommendations for detailed feasibility analysis and prioritization in Phase II. It is anticipated that project configurations will evolve and be refined in Phase II. The characterization and evaluation of potential new supply projects are presented below.

4.2 New Supply Capture Project Characterization

4.2.1 Groundwater Projects

4.2.1.1 Projects in Marion County

The objective of identifying potential regional groundwater supply projects is to screen areas based on technical criteria that could meet some of the projected future demands, and to encourage regional planning in water supply development. As a result, this section is intended to provide general direction for the potential Phase II projects, not to determine detailed project configurations or ultimate viability.

[1] Regional approaches for water supply development are strongly encouraged in State of Florida and SJRWMD and SWFWMD funding initiatives. The WRWSA considers opportunities for regional and multi-jurisdictional water supply development. More information and funding and water supply development is provided in the RWSPU.

Future areas of growth in Marion County are discussed in Chapters 1 and 3 (see Figure 3-10). They include the following areas.

- A corridor from Ocala south and east in the vicinity of I-75 to the region east of US 27 and US 441;
- A corridor from Ocala southwest in the vicinity of SR 200;
- A corridor from Ocala west in the vicinity of US 27; and
- The southwestern part of Marion County in the vicinity of Dunnellon.

Groundwater supply systems should ideally be located relatively close to the future demand areas and must consider the hydrogeological effects on springs, lakes, and the existing aquifer system. The existing and likely future public supply groundwater source areas are presented in Figure 3-11. This figure identifies four generalized areas for consideration of future groundwater withdrawal, including source areas from WRA (2007-c). The generalized project areas are summarized below:

- Eastern Marion County, along SR 40 in the Ocala National Forest (M9);
- Northeastern Marion County, near Eureka in the Ocala National Forest (M10);
- North-Central Marion County, east of I-75 near the Town of Reddick (M11); and
- Northwestern Marion County, west of I-75 and north of US 27 (M12).

Each of these areas is evaluated for feasibility in a section below as a potential groundwater withdrawal project.

4.2.1.2 Water Supply and Demand in Marion County – Regional Approaches

Regional approaches to water supply development have historically provided opportunities for efficiencies. These include economic, environmental, and water resource benefits that a collective approach to the planning, implementation, and operation of water facilities can provide.

Economic efficiencies can be realized when communities develop water supplies collectively. Economies of scale help to lower the cost of water including treatment and distribution when opportunities for sharing water supplies are present. Regional cooperation can also translate into benefits for both the environment and the water resource by lessening the impacts of water supply development. For example, rather than withdrawal points tapping a source of water near a sensitive resource, better located withdrawal points could lessen impacts to the environment and the water resource.

Regional approaches are also favored by the State of Florida, the SWFWMD, and the SJRWMD. This is reflected in the passage of the Water Protection and Sustainability Program by the Florida Legislature in 2005. This legislation promotes regionalizing water supply development and alternative water development.

A review of existing and future water demand in Marion County reveals Marion County Utilities, the City of Ocala, Dunnellon, and Belleview require new water quantities within the 2030 planning horizon. Table 4-1 shows existing and future water demand for these entities, based on the data provided in Chapter 1. Their cumulative increase in water demand by the year 2030 is projected at 17.89 MGD. Marion County Utilities and Ocala also have alternative water supply development conditions in their water use permits, as noted in Table 4-1.

Table 4-1. Water Use and Demand Summary in Marion County.

	Permit Expiration Date	Permitted Annual Average Quantity (MGD)	2005 Water Use (MGD)	Projected 2030 Demand (MGD)[1]
Marion County Utilities	Varies	8.50	2.78	10.30[2]
Ocala	08/07/2027	17.54	9.74	18.60[3]
Belleview	11/07/2016	1.27	0.79	1.38
Dunnellon	10/08/2014	0.45	0.35	1.27

[1] Projected demands do not take into account increases in reclaimed water supply or additional conservation.
[2] Marion County Utilities SWFWMD WUPs No. 6151 (State Road 200 service area) and No. 8165 (Quail Meadows service area) require completion of reuse feasibility studies prior to renewal of the permits. Marion County Utilities SJRWMD CUP No. 3054 (Silver Springs Shores service area) requires completion of a reuse feasibility study prior to renewal of the permit.
[3] Ocala's SJRWMD CUP No. 50324 requires the identification by 2014 of an alternative water supply project to meet projected water demands after 2027.

Since groundwater is the preferred water source for potable supply, the groundwater projects in this chapter are selected for evaluation with respect to projected regional water demands in Marion County. A specific demand for potential service from groundwater projects will be identified in Phase II.

4.2.1.3 Sumter and Citrus County Wellfields

Conceptual designs for the following groundwater projects were prepared in Phase II -- Technical Memorandum No. 2, using recommendations from the RWSPU.

- North Sumter County Regional Wellfield[2]
- Citrus County Regional Wellfield[3]

The North Sumter County project is an option for 10 MGD of potable supply to members in Sumter County. The SWFWMD will accept this project to address a condition in the Villages and City of Wildwood WUPs requiring the development of alternative water supplies (importation of groundwater from alternative locations can be used to meet the condition). Due to groundwater resource limitations and previously identified service, this project is not expected to provide sufficient regional supplies for additional members in Marion County. However, other groundwater projects will be evaluated in Marion County for Phase II. The North Sumter County project is not selected for evaluation for members in Marion County.

The Citrus County project is an option for 15 MGD of regional potable supply to WRWSA members in Citrus and Hernando Counties. The project would require lengthy transmission lines for service to Marion County members. However, other, closer groundwater projects will be evaluated in Marion County for Phase II. The Citrus County project is not selected for

[2] This project was identified in the RWSPU as a northeast Sumter County supply. It was modified in Phase II based on water resource constraints identified through groundwater modeling.
[3] This project was identified in the RWSPU as an eastern Citrus County supply. It was modified in Phase II to reduce transmission requirements.

conceptual design for members in Marion County.

4.2.2 Surface Water Project Characterization

The Withlacoochee River and Ocklawaha River were analyzed and discussed in Chapter 2 as having significant potential for water supply development in Marion County. Surface water projects utilizing these two rivers have the potential to serve as regional water supplies. Projects incorporating these river systems are described below.

4.2.2.1 Withlacoochee River Projects

Conceptual designs for the following Withlacoochee River surface water projects were prepared in Phase II -- Technical Memorandum No. 1, using recommendations from the RWSPU.

- Aquifer Recharge Facility (Withlacoochee River at Trilby);[4]
- North Sumter Surface Water Supply (Withlacoochee River at Wysong Dam);[5] and
- Regional Surface Water Supply (Withlacoochee River at Holder, or at Lake Rousseau).

The aquifer recharge facility provides aquifer recharge benefits to groundwater in Hernando County. Since the project does not provide aquifer recharge to groundwater basins within or benefiting Marion County, it is not selected for conceptual design for members in Marion County.

The North Sumter Surface Water project is an option for 15 MGD of potable supply to members in Sumter County. It is a conjunctive use project that provides surface water when river flows are sufficient. The surface water is used to supplement groundwater withdrawals and increase projected yields. Since the North Sumter Surface Water project does not provide sufficient regional supply for demands in both Sumter and Marion Counties, it is not selected for conceptual design for members in Marion County.

The Regional Surface Water Supply project, as currently configured, provides 40 MGD of regional potable supply to WRWSA members in Sumter, Hernando Counties and the City of Ocala. Two potential locations for the facility have been identified as part of an initial optimization process. Since this project is in close proximity to Marion County (at either location) and could provide a large regional supply, it is selected for conceptual design. The project will be amended as a part of Phase II to include service to Marion County members.

The RWSPU considered, but did not recommend, a surface water project withdrawing from the Rainbow River. This project was eliminated due to permitting / siting issues associated with its exceptional scenic and recreational value, and its distance from demand areas. The addition of Marion County members to the project is unlikely to improve the permitting / siting issues associated with the project. The Rainbow River project is not selected for evaluation.

[4] This project was identified in the RWSPU as a reclaimed water augmentation project. It was modified in Phase II to eliminate treatment and transmission requirements.
[5] This project was identified in the RWSPU as a potable supply from Lake Panasoffkee. It was included in Phase II after the SWFWMD accepted documented projections increasing demand from The Villages.

4.2.2.2 Lower Ocklawaha River Project

The Lower Ocklawaha River (LOR) project is one of several projects identified by the SJRWMD to provide significant regional alternative water supplies (SJRWMD, 2008). The LOR project involves treatment of surface water withdrawn downstream of the confluence of Silver River and the LOR. The SJRWMD has initiated water supply planning and facilitation efforts to develop this source for potable supply for a service area that includes Lake, Marion, and Putnam Counties.

The SJRWMD efforts have focused on establishing utility partnerships to develop the LOR. SJRWMD is preparing a cumulative impact analysis (CIA) of the effects of utilizing the LOR as a significant water supply. The CIA will incorporate hydrologic and hydrodynamic modeling of withdrawal scenarios, MFL's to be established in 2011, and environmental monitoring data, to evaluate the impact of potential withdrawals on the ecosystem. The SJRWMD has a two (2) phase program to complete the evaluation with a target completion date of December 2010.

The WRWSA will not develop a Phase II conceptual design for water supply from the Ocklawaha River system and the LOR project will not be evaluated because it is not currently a WRWSA project.

The current project design and cost estimate for the SJRWMD Lower Ocklawaha River project will be described in more detail in Phase II, since this project is located within the WRWSA jurisdiction and may serve WRWSA members.

4.2.3 Seawater Project Characterization

Seawater was discussed in Chapter 2 and has potential to serve supply water demands in Marion County. Seawater projects on the Gulf of Mexico and the Atlantic Ocean coasts have the potential to serve as regional water supplies to members in Marion County. These projects are described below.

4.2.3.1 WRWSA Seawater Projects – Crystal River Co-Location

A conceptual design for a co-located desalination supply project at the Progress Energy Crystal River Power Plant was prepared in Phase II Technical Memorandum No. 1, based on recommendations from the RWSPU. The Crystal River desalination project is an option for 25 MGD of regional potable supply to WRWSA members in Citrus and Hernando Counties, and the City of Ocala. Since this project provides a large regional supply, it is selected for further evaluation. The Crystal River desalination project will include service to Marion County members in Phase II.

The RWSPU considered, but did not recommend, a non co-located desalination project located along the Hernando County coastline. This project was eliminated due to high costs without the benefit of co-location for reject water disposal. The addition of Marion County to the project is unlikely to substantially affect the cost basis of a non co-located desalination project. Further, the desalination project co-located at Crystal River is located in closer proximity to Marion County, reducing transmission costs. For these reasons, non co-located desalination is not selected for evaluation.

4.2.3.2 SJRWMD Coquina Coast Seawater Desalination Project

The SJRWMD is partnering with several county and local governments to investigate and prepare preliminary design documents for a desalination facility in Flagler County. The SJRWMD will provide up to $2.5 million in cost-share funding and administrative services for the development of a detailed plan for a seawater desalination facility and up to $5 million for construction. An agreement was recently completed to accomplish the preliminary design and permitting work for the project. Under the approved agreement, the project has two phases: choosing between a land or ship-based facility, and then preparing the preliminary design.

The partners included in the agreement are the SJRWMD; the Water Authority of Volusia; Flagler, Marion and St. Johns counties; Dunes Community Development District and the cities of Palm Coast, DeLand, Mount Dora, Leesburg, Bunnell and Flagler Beach.

The Coquina Coast Seawater Desalination project is not located within the WRWSA jurisdiction, so the WRWSA will not evaluate the Coquina Coast project. The current project design and cost estimate for the SJRWMD Coquina Coast project will be described in more detail in Phase II, because this project conceivably could serve WRWSA members.

4.2.4 Brackish Groundwater and Offshore Springs Project Characterization

Brackish groundwater and offshore springs were discussed in Chapter 2 as sources that could be relevant to water supply in Marion County. Projects in these areas are described below, based on the RWSPU.

4.2.4.1 Brackish Groundwater Project Characterization

Brackish groundwater has been successfully developed elsewhere in Florida, but coastal zone brackish groundwater is unlikely to be viable due to the unconfined hydrogeology of the coastal regions of the WRWSA. Inland brackish groundwater in the Lower Floridan aquifer may have some water supply development potential, subject to further aquifer testing.[6] The WRWSA will continue to monitor ongoing aquifer testing in the amended Phase II, since this project area may have the potential to serve members in Marion County.

4.2.4.2 Offshore Springs Project Characterization

Offshore springs were eliminated from further consideration in the RWSPU, due to the potential reliability, cost and logistical constraints associated with capture, treatment, and transmission or water emanating from these features. The addition of Marion County is unlikely to substantially affect the cost basis of an offshore springs project. Offshore springs are not selected for evaluation in Phase II.

4.3 Feasibility Evaluation for Groundwater Projects in Marion County

The groundwater project areas identified in Marion County were not previously analyzed in the RWSPU. The qualitative evaluation matrix from the RWSPU is applied to the groundwater

[6] For example, the City of Ocala is currently evaluating the LFA as a potential water supply source. The SWFWMD and the SJRWMD are also conducting additional aquifer testing. See Chapter 4 of Phase II Technical Memorandum No. 2 for more information.

projects in this section to establish a common basis with the other projects from the RWSPU and Phase II. Additionally, this evaluation serves to narrow the potential groundwater source areas identified in WRA (2007-c) to the source areas that will receive further feasibility evaluation for potential wellfield development in Phase II.

The qualitative evaluation matrix contains eight (8) grading categories. The categories are described in detail in Table 4-2. They include:

- Resource Availability, Reliability, and Longevity;
- Raw Water Quality;
- Permittability;
- Environmental Compatibility;
- Cost;
- Funding;
- Compatibility with SWFWMD – District Water Management Plan (DWMP); and
- Location.

As previously noted, this section is intended to provide general direction for the potential Phase II projects, not to determine detailed project configurations or ultimate viability. Selected projects will evolve and be refined in Phase II. The evaluation of the groundwater projects is provided below.

4.3.1 Eastern Marion County Wellfield (M10)

An Eastern Marion County Regional Wellfield Project is conceptualized as a linear wellfield along State Route (SR) 40 east of Ocala and Mill Dam Lake in the Ocala National Forest (see M10 on Figure 3-11; also see WRA (2007-c)). Wells would be dispersed along the highway to minimize drawdown in surface water features and approximately 20-miles of pipeline would be located along the right-of-way to convey water to future demand areas in Marion County. The specific capacity of the wellfield to produce potable water supply will be dependent on future regional groundwater modeling and resource evaluations. If necessary, the wellfield can be extended north or further dispersed to limit environmental impacts. Table 4-3 details the grading for the project.

4.3.1.1 Resource Availability, Reliability, and Longevity

The region east of the Ocklawaha River and west of the St. Johns River may constitute a potential location for a regional wellfield providing that the confinement of the Floridan aquifer system is sufficient and withdrawals do not cause significant harm to local springs. The availability of groundwater supply may be curtailed not only by the establishment of MFLs, but normal water use permitting criteria such as impacts to wetlands and existing legal users.

Assuming a safe yield for the wellfield can be established which protects the springs, lakes, wetlands and other ecological elements within the area, the location of the wellfield in the Ocala National Forest would result in a protected, reliable, long-term source of potable water supply.

Grade: B(+)

4.3.1.2 Raw Water Quality

Groundwater quality in eastern Marion County is considered to be very good and generally meets primary and secondary drinking water standards (WRA, 2005). As shown on Figure 3-11, this area of the County is shown as "less vulnerable" when compared to other parts of the County based on the MCAVA. The project is located in the Ocala National Forest which will minimize future development and related environmental impacts for the area and provide long-term water quality protection of the source.

Grade: A

4.3.1.3 Permittability

Future groundwater development in eastern Marion County should be permittable, though quantities will likely be limited. The location, design and quantity of water developed would be critical in determining if impacts to the natural environment, and local lakes and springs, are minimized. Normal consumptive use permitting criteria would be reviewed to determine potential impacts. Siting within the Ocala National Forest will require coordination with the National Park Service (NPS).

Grade: B

4.3.1.4 Environmental Compatibility

Continued population growth in Marion County is likely to result in continued effects on groundwater resources. As the cone of influence of existing and future wellfields expand, drawdown impacts on the springs and lakes of this region may occur. The MFLs for rivers, springs, and lakes that are being considered focus on the potential impacts to environmental features in the area. Impacts to lake levels will be scrutinized closely, including levels in Lake Kerr in the Ocala National Forest which has an adopted MFL.

Grade: B

4.3.1.5 Cost

Economies of scale dictate that groundwater development approached collaboratively in a water stressed area could be a more cost-effective approach to water supply development than alternative water supplies. The high raw water quality of groundwater would limit the cost of treatment prior to use, while transmission costs will be comparable to that of alternative water supplies in this area.

Grade: A

4.3.1.6 Funding

Based on verbal discussions with the SJRWMD and the review of their Cooperative Funding Initiative, development of groundwater is not expected to be a project that will be funded through the SJRWMD. Even though this is a regional approach to water supply development, only alternative water supplies will be considered for funding.

Grade: C

4.3.1.7 Compatibility with District Water Management Plan

The regional aspects of water supply development are consistent with the DWMP; however, alternative water supply development is favored over groundwater supplies. There are no discernible water quality issues with this source. The primary natural systems threat is the impact of drawdown on springs, lakes, and wetlands in the eastern portion of Marion County, which is likely to be inconsistent with the DWMP. Additionally, a number of MFLs have been established in the vicinity of the Ocala National Forest which may significantly influence the compatibility with the DWMP.

Grade: C

4.3.1.8 Location

The location of the groundwater wellfield is approximately 20 miles east of Ocala and the identified future demand areas. Consideration must be given to the piping and transport of water from this regional system to the probable interconnection with existing water system infrastructure.

Grade: C

4.3.1.9 Project Summary

With assorted environmental concerns present and pending regarding spring flows, lake levels, and MFL limitations, long-term reliance on groundwater withdrawals is not the preferred environmental option. However, surface water and desalination supply sources in the WRWSA service area will be more costly to develop, treat and transmit to the Marion County demand areas. Regional cooperation could ensure that the least adverse near-term withdrawal framework is developed relative to other supply alternatives, such that a regional wellfield can be a partial supply solution to future demands.

Overall Grade: B(+)

4.3.2 Northeastern Marion County Wellfield (M11)

A Northeastern Marion County Wellfield Project is conceptualized as a dispersed wellfield north and south of County Route (CR) 316 near Eureka, in the vicinity of the Ocala National Forest and the Lower Ocklawaha River (see M11 on Figure 3-11; also see WRA (2007-c)). Pipeline access to the demand areas could be along CR 315 and 316. Wells would be dispersed along the highway to minimize drawdown impacts to surface water features and approximately 25-miles of pipeline would be located along the right-of-way to convey water to future demand areas in Marion County. The capacity of the wellfield to produce potable water supply will be dependent on future regional groundwater modeling and resource evaluations. If necessary, the wellfield can be extended north or further dispersed to limit environmental impacts.

A review of existing and future water supply demand in the area will be used to identify potential partners to the project in Marion County. Table 4-4 details the grading for the project.

4.3.2.1 Resource Availability, Reliability, and Longevity

The region east of the Ocklawaha River and west of the St. Johns River may constitute a potential location for a regional wellfield providing that the confinement of the Floridan aquifer system is sufficient and withdrawals do not cause significant harm to local springs, the Lower Ocklawaha River and the wetlands in this area. The availability of groundwater supply may be curtailed not only by the establishment of MFLs, but normal consumptive use permitting criteria such as impacts to wetlands and existing legal users.

Assuming a safe yield for the wellfield can be established which protects the springs, river, wetlands and other ecological elements within the area, the location of the wellfield in a moderately confined area would help protect the potable water supply.

Grade: B

4.3.2.2 Raw Water Quality

Groundwater quality in eastern Marion County is considered to be very good and generally meets primary and secondary drinking water standards (WRA, 2005). As shown on Figure 3-11, this area of the County is shown as "less vulnerable" to "vulnerable" when compared to other parts of the County based on the MCAVA. Although this area is moderately confined, the project is not located in the Ocala National Forest, so there is some potential for future development and related environmental impacts that could affect the long-term water quality of the source.

Grade: A(-)

4.3.2.3 Permittability

Future groundwater development in northeastern Marion County should be permittable. The location, design and quantity of water developed and local confinement would be critical in determining if impacts to the natural environment, and local lakes and springs, are minimized. There are extensive wetlands in the area along the LOR which will require lengthy review under normal permitting criteria to determine potential impacts.

Grade: B(-)

4.3.2.4 Environmental Compatibility

Continued population growth in Marion County is likely to result in continued effects on groundwater resources. As the cone of influence of existing and future wellfields expand, drawdown impacts on the springs and lakes of this region may occur. The MFLs for rivers, springs, and lakes that are being considered focus on the potential impacts to environmental features in the area. Impacts to lake levels will be scrutinized closely, including levels in Lake Kerr in the Ocala National Forest which has an adopted MFL. However, potentially significant quantities of unregulated domestic self-supply withdrawals are not present in this area, making environmental protection more certain.

Grade: B

4.3.2.5 Cost

Economies of scale would dictate that groundwater development that could be approached collaboratively in a water stressed area could be a more cost-effective approach to water supply development than alternative water supplies. The high raw water quality of groundwater would limit the cost of treatment prior to use, while transmission costs will be comparable to that of alternative water supplies in this area.

Grade: A

4.3.2.6 Funding

Based on verbal discussions with the SJRWMD and the review of their Cooperative Funding Initiative, development of groundwater is not expected to be a project that will be funded through the SJRWMD. Even though this is a regional approach to water supply development, only alternative water supplies will be considered for funding.

Grade: C

4.3.2.7 Compatibility with District Water Management Plan

The regional aspects of water supply development are consistent with the DWMP; however, alternative water supply development is favored over groundwater supplies. There are no discernible water quality issues with this source. The primary natural systems threat is the impact of drawdown on springs, lakes, and wetlands in northeastern portion of Marion County, which is likely to be inconsistent with the DWMP. Additionally, a number of MFLs have been established in the vicinity of the Ocala National Forest which may significantly influence the compatibility with the DWMP.

Grade: C

4.3.2.8 Location

The location of the groundwater wellfield is approximately 25 miles north and east of the identified future demand areas. Consideration must be given to the piping and transport of water from this regional system to the probable interconnection with existing water system infrastructure.

Grade: C

4.3.2.9 Project Summary

With assorted environmental concerns present and pending regarding spring flows, wetland impacts, and MFL limitations, long-term reliance on groundwater withdrawals is not the preferred environmental option. However, surface water and desalination supply sources in the WRWSA service area will be more costly to develop, treat and transmit to the Marion County demand areas. If a safe yield can be developed while protecting the extensive wetlands in this area, regional cooperation could ensure that the least adverse near-term withdrawal framework is developed relative to other supply alternatives, such that a regional wellfield can be a partial supply solution to future demands.

Overall Grade: B

4.3.3 North-Central Marion County Wellfield (M12)

A North-Central Marion County wellfield is conceptualized as a dispersed regional wellfield located west of US 441, east of I-75 near Reddick (see M12 on Figure 3-11). The location was selected because it is a sufficient distance north of Rainbow and Silver Springs (WRA, 2007-c).

A review of existing and future water supply demand in the area will be used to identify potential partners to the project in Marion County. Table 4-5 details the grading for the project.

4.3.3.1 Resource Availability, Reliability, and Longevity

The dispersed wellfield would require lengthy investigation to determine impacts to surface water features since the Floridan aquifer system is unconfined in this area. The area is also on the fringe of the Silver and Rainbow Springs springsheds, and consequently withdrawals may cause negative impacts to the springs. The availability of groundwater supply may be curtailed not only by the establishment of MFLs, but normal consumptive use permitting criteria such as impacts to wetlands and existing legal users.

Grade: B

4.3.3.2 Raw Water Quality

Groundwater quality in central and western Marion County is considered to be good and only requires limited treatment for potable use. It is susceptible to land development degradation from stormwater runoff as well as commercial/industrial discharges since the aquifer is unconfined. As shown on Figure 3-11, this area of the County is shown as “more vulnerable” when compared to other parts of the County based on the MCAVA. The area is slightly east of the I-75 corridor, which should limit the potential for declines in long-term water quality.

Grade: A(-)

4.3.3.3 Permittability

Future groundwater development in northwestern Marion County should be permittable, but investigation will be required to ascertain impacts to surface water features in an unconfined area and to Rainbow and Silver Springs. The quantities yielded may not be adequate to support a large regional wellfield. The location, design and quantity of water developed would

be critical in determining if impacts to the natural environment, and local lakes and springs, are minimized. Normal water use permitting criteria would be reviewed to determine potential impacts.

Grade: B

4.3.3.4 Environmental Compatibility

Continued population growth in Marion County is likely to result in continued effects on groundwater resources. Drawdown impacts on the springs and lakes of this region may occur as the cone of influence of withdrawals expands. The MFLs for rivers, springs, and lakes in the area should be protective of environmental resources, but potentially significant quantities of unregulated domestic self-supply withdrawals in this developed area of Marion County make environmental protection uncertain.

Grade: C

4.3.3.5 Cost

Economies of scale would dictate that groundwater development that could be approached collaboratively in a water stressed area could be a more cost-effective approach to water supply development. The high raw water quality of groundwater would limit the cost of treatment prior to use, while transmission costs will be comparable to that of alternative water supplies in this area.

Grade: A

4.3.3.6 Funding

Based on verbal discussions with the SJRWMD and the review of their Cooperative Funding Initiative, development of groundwater is not expected to be a project that will be funded through the SJRWMD. Even though this is a regional approach to water supply development, only alternative water supplies will be considered for funding.

Grade: C

4.3.3.7 Compatibility with District Water Management Plan

The regional aspects of water supply development are consistent with the DWMP, however, alternative water supply development is favored over groundwater supplies. There are no discernable water quality issues with this source. The primary natural systems threat is the impact of drawdown on springs, lakes, and wetlands in the eastern portion of Marion County, which is likely to be inconsistent with the DWMP.

Grade: C

4.3.3.8 Location

The location of the regional groundwater wellfield is approximately 15 miles north of Ocala and the identified future demand areas. Consideration must be given to the piping and transport of water from this regional system to the probable interconnection with existing water system infrastructure.

Grade: C

4.3.3.9 Project Summary

With assorted environmental concerns present and pending regarding spring flows, wetland impacts, and MFL limitations, long-term reliance on groundwater withdrawals is not the preferred environmental option. However, surface water and desalination supply sources in the WRWSA service area will be more costly to develop, treat and transmit to the Marion County demand areas. If resource protection can be assured given the potentially significant quantities of unregulated domestic self-supply withdrawals in this area, regional cooperation could ensure that the least adverse near-term withdrawal framework is developed relative to other supply alternatives, such that a regional wellfield can be a partial supply solution to future demands.

Overall Grade: B

4.3.4 Northwestern Marion County Wellfield (M13)

This wellfield is conceptualized as a dispersed regional wellfield located west of I-75 and west of US 441 (see M13 on Figure 3-11). The location was selected because it is a sufficient distance north of Rainbow Springs and well west of Silver Springs, but still in close proximity to the demands in Marion County.

A review of existing and future water supply demand in the area will be used to identify potential partners to the project in Marion County. Table 4-6 details the grading for the project.

4.3.4.1 Resource Availability, Reliability, and Longevity

The dispersed wellfield would require lengthy investigation to determine impacts to surface water features since the Floridan aquifer system is unconfined in this area. The area is also on the fringe of the Rainbow Spring springshed, and consequently withdrawals may cause negative impacts to the spring; however, Silver Springs should not be affected. The availability of groundwater supply may be curtailed not only by the establishment of MFLs, but normal water use permitting criteria such as impacts to wetlands and existing legal users.

Grade: B(+)

4.3.4.2 Raw Water Quality

Groundwater quality in central and western Marion County is considered to be good and only requires limited treatment for potable use. It is susceptible to land development degradation from stormwater runoff as well as commercial/industrial discharges since the aquifer is unconfined. As shown on Figure 3-11, this area of the County is shown as “more vulnerable”

when compared to other parts of the County based on the MCAVA. The area is slightly west of the I-75 corridor, which should limit the potential for declines in long-term water quality.

Grade: A(-)

4.3.4.3 Permittability

Future groundwater development in northwestern Marion County should be permittable, but significant investigation will be required to ascertain impacts to Rainbow Springs. The quantities may not be adequate to support a large regional wellfield, but Rainbow Springs is expected to allow more additional withdrawals in its springshed than Silver Springs. The location, design and quantity of water developed would be critical in determining if impacts to the natural environment, and local lakes and springs, are minimized. Normal water use permitting criteria would be reviewed to determine potential impacts.

Grade: B(+)

4.3.4.4 Environmental Compatibility

Continued population growth in Marion County is likely to result in continued effects on groundwater resources. Drawdown impacts on the springs and lakes of this region may occur as the cone of influence of withdrawals expands. The MFLs for rivers, springs, and lakes in the area should be protective of environmental resources, but potentially significant quantities of unregulated domestic self-supply withdrawals in this developed area of Marion County makes environmental protection uncertain.

Grade: C

4.3.4.5 Cost

Economies of scale would dictate that groundwater development that could be approached collaboratively in a water stressed area could be a more cost-effective approach to water supply development. The high raw water quality of groundwater would limit the cost of treatment prior to use, while transmission costs will be comparable to that of alternative water supplies in this area.

Grade: A

4.3.4.6 Funding

Based on verbal discussions with the SWFWMD and the review of their Cooperative Funding Initiative, development of groundwater is not expected to be a project that will be funded through the SWFWMD. Even though this is a regional approach to water supply development, only alternative water supplies will be considered for funding.

Grade: C

4.3.4.7 Compatibility with District Water Management Plan

The regional aspects of water supply development are consistent with the DWMP, however, alternative water supply development is favored over groundwater supplies. There are no discernable water quality issues with this source. The primary natural systems threat is the impact of drawdown on springs, lakes, and wetlands in the eastern portion of Marion County, which is likely to be inconsistent with the DWMP.

Grade: C

4.3.4.8 Location

The location of the regional groundwater wellfield is approximately 10 miles northwest of Ocala and the identified future demand areas. Consideration must be given to the piping and transport of water from this regional system to the probable interconnection with existing water system infrastructure.

Grade: C

4.3.4.9 Project Summary

With assorted environmental concerns present and pending regarding spring flows, lake levels, and MFL limitations, long-term reliance on groundwater withdrawals is not the preferred environmental option. However, surface water and desalination supply sources in the WRWSA service area will be more costly to develop, treat and transmit to the Marion County demand areas. Regional cooperation could ensure that the least adverse near-term withdrawal framework is developed relative to other supply alternatives, such that a regional wellfield can be a partial supply solution to future demands.

Overall Grade: B(+)

4.3.5 Groundwater Evaluation Summary

Table 4-7 below summarizes the results of the evaluation matrix application to the Eastern Marion County and Northwestern Marion County groundwater projects. All projects received grades of “B” or higher. All recommended projects in the RWSPU received grades of “B” or higher.

Two potential groundwater projects are selected for conceptual design with service to Marion County members as part of Phase II. The selection of two project locations reflects a possible opportunity for groundwater to be developed dispersed either to the east or to the west of the Ocala population center.

The Eastern Marion County Wellfield and the Northwestern Marion County Wellfield grade the highest of the four projects. The higher summary grade for the Eastern wellfield reflects its location in a confined, protected setting outside of the Silver and Rainbow Springsheds, with a lower density of nearby wetlands than other alternatives. The higher summary grade for the Northwestern wellfield project reflects its shorter transmission distance to demand areas than the other alternatives, and its location closer to Rainbow Springs rather than Silver Springs

(Rainbow Springs is expected to allow more additional withdrawals in its springshed than Silver Springs). As previously noted, this section is intended to provide general direction for the potential Phase II projects, not to determine final project configurations or ultimate viability.

Table 4-7. Groundwater Projects Evaluation Summary.

Criteria Categories	Project Areas			
	Groundwater			
	Eastern Marion Wellfield	Northeastern Marion Wellfield	North-Central Marion Wellfield	Northwestern Marion Wellfield
1. Resource Availability, Reliability, and Longevity	B(+)	B	B	B(+)
2. Raw Water Quality	A	A(-)	A(-)	A(-)
3. Permittability	B	B(-)	B	B(+)
4. Environmental Compatibility	B	B	C	C
5. Cost	A	A	A	A
6. Funding	C	C	C	C
7. Compatibility with SWFWMD and SJRWMD Water Management Plan (DWMP)	C	C	C	C
8. Location	C	C	C	C
OVERALL GRADE:	**B(+)**	**B**	**B**	**B(+)**

Note:
No brackish groundwater projects are recommended, but withdrawal feasibility from the Lower Floridan aquifer should be monitored in conjunction with the ongoing hydrogeologic explorations underway within the SWFWMD and the City of Ocala.

4.4 St. Johns River Water Management District and Southwest Florida Water Management District Jurisdictional Considerations to Water Supply Projects

Alternative water supply (AWS) development for many utilities in the WRWSA will be driven by conditions in their water use permits that require consideration of alternative water supplies. Utilities currently facing these conditions include:

- Hernando County Utilities Department;
- Wildwood;
- The Villages;
- Marion County Utilities Department;
- City of Ocala; and
- Progress Energy Crystal River Power Plant.

In specific cases, the SWFWMD regulatory department will accept traditional groundwater supplies imported from outside the utility (i.e., regional dispersed groundwater supplies) to meet an AWS condition.[7] This regulatory determination is made on a case-by-case basis. This practice will enable the WRWSA and its member governments to develop either alternative or traditional supplies, based on regional water resource constraints rather than local constraints. However, traditional groundwater supplies are not be eligible for cooperative funding as an alternative supply.

Recommended WRWSA water supply projects identified for further evaluation will be assessed in the future using resource methodologies specific to the WMD where the project is located. Since the SJRWMD and SWFWMD have a common understanding of resource conditions, the two agencies have a consistent identification of the sources that are viable for potential supply projects in this region. The feasibility evaluation in Phase II will consider projected resource constraints for regional wellfields in the applicable WMD.

4.5 Reclaimed Water Project Evaluation

For water supply purposes, beneficial reuse is that which replaces traditional groundwater or surface water uses, including golf course irrigation, public access area irrigation, or industrial uses. Non-beneficial reuse refers to disposal methods that do not replace a traditional use, including rapid infiltration, absorption fields, and sprayfield irrigation (see the RWSPU for more information).

Opportunities for potential beneficial reuse projects were identified by determining projected 2030 flow rates for individual wastewater facilities. The intent is to develop a general estimate of the potential reuse sources for the WRWSA planning process. [8] Potential reuse opportunities are presented in the following section.

The projected 2030 wastewater flow rates were determined by adjusting 2007 flows by the percentage increase in public supply population within Marion County. Projected 2030 beneficial

[7] See SWFWMD WUP No. 2983.009.

[8] Member governments will generally have more detailed information than that provided here. For example, Marion County is preparing a utility masterplan which will provide more detailed information regarding their water supply. The City of Ocala adopted an Integrated Water Resources Plan that provides coordinated strategies and recommendations for their water supply.

reuse flows were calculated by assuming a 75% utilization of 2030 wastewater flows by facility. Utilities are normally limited to a beneficial reclaimed water utilization rate of 50% of wastewater flow due to seasonal supply and demand constraints, so this method assumes that utilities will develop storage and distribution infrastructure sufficient to achieve this utilization. Factors such as distance from the treatment facilities to service areas, tie-ins to existing reuse lines, and associated costs will affect actual project development. Wastewater facilities that are planned for decommissioning were not included.

Reuse water can be a cost effective means to offset groundwater reliance, and presents cost sharing opportunities with the SWFWMD and SJRWMD. Therefore, consideration of all identified reclaimed water projects is recommended to maximize this water source. Per capita rates should be evaluated at the time projects are initiated; if per capita rates are higher than the SWFWMD requirement and the SJRWMD target of 150 gallons per capita per day (gpcd) in the vicinity of the wastewater treatment plants, it is recommended that residential use of reclaimed water be implemented, where feasible, to aid in driving down these rates.

A brief summary of the reuse type and capacity of the facilities is provided. Table 4-8 summarizes the reclaimed water projects.

4.5.1 City of Belleview

The City of Belleview has a wastewater treatment facility with a capacity of 0.76 mgd and a 2007 average daily flow of 0.37 mgd. It provides beneficial reuse of 0.35 mgd for golf course irrigation (CUP No. 3137-4) and 0.12 mgd of reuse for agricultural spray-field irrigation (FDEP, 2008). The wastewater treatment facility is planned for expansion.

4.5.2 City of Dunnellon

The City of Dunnellon has a WWTP with a capacity of 0.25 mgd and a 2007 average daily flow of 0.15 mgd. The daily flow can increase by 0.1 mgd during storm events. The WWTP discharges to spray-field irrigation; no beneficial reuse is utilized.

4.5.3 Lowell (Marion) Correctional Institution

The Lowell Correctional Institution has on-site wastewater facilities with a capacity of 0.61 mgd and a 2007 average flow of 0.36 mgd (FDEP, 2008). The discharge is to spray-field irrigation; no beneficial reuse is utilized.

4.5.4 Marion Landings

Marion Landings is a private WWTP with a capacity of 0.11 mgd and a 2007 average flow of 0.05 mgd. The discharge is to a rapid infiltration basin; no beneficial reuse is utilized.

4.5.5 Marion Oaks

Marion Oaks is a Marion County Utilities WWTF with a capacity of 0.26 mgd and average flow of 0.23 mgd. The discharge is to a rapid infiltration basin; no beneficial reuse is utilized. This facility is planned to be decommissioned and flow diverted to a new facility at the same location.

4.5.6 Marion Oak Run

Marion Oak Run is a Marion County Utilities WWTF with a capacity of 0.8 mgd and a 2007 average flow of 0.41 mgd. The facility provides beneficial reuse of 0.17 mgd for golf course irrigation and 0.24 mgd of disposal to a rapid infiltration basin (Marion County, 2009). Oak Run is planned to provide treatment of Marion Oaks flows during the construction of the new facility.

4.5.7 On Top of the World/Bay Laurel

On Top of the World/Bay Laurel is a private WWTF with a capacity of 0.75 mgd and a 2007 average daily flow of 0.39 mgd. The facility discharges to spray-field irrigation (FDEP, 2008); no beneficial reuse is utilized.

4.5.8 Rainbow Springs

Rainbow Springs is a private WWTF with a capacity of 0.23 mgd and a 2007 average daily flow of 0.15 mgd. The facility discharges to spray-field irrigation (FDEP, 2008); no beneficial reuse is utilized.

4.5.9 Silver Springs Regional

Silver Springs Regional is a Marion County Utilities WWTF with a capacity of 0.45 mgd and a 2007 average flow of 0.15 mgd. The facility discharges to a rapid infiltration basin (Marion County, 2008); no beneficial reuse is utilized.

4.5.10 Silver Springs Shores

Silver Springs Shores is a Marion County Utilities WWTF with a capacity of 1.5 mgd and a 2007 average daily flow of 0.95 mgd. The facility discharges to spray-field irrigation and a rapid infiltration basin (Marion County, 2009); no beneficial reuse is utilized.

4.5.11 Spruce Creek South

Spruce Creek South is a Marion County Utilities WWTF with a capacity of 0.45 mgd and a 2007 average daily flow of 0.12 mgd. The facility discharges to a rapid infiltration basin (Marion County, 2009). This facility is planned to be decommissioned with flows diverted to the Villages.

4.5.12 Stonecrest

Stonecrest is a Marion County Utilities WWTF with a capacity of 0.23 mgd and a 2007 average daily flow of 0.17 mgd (Marion County, 2009). The facility discharges to a rapid infiltration basin (FDEP, 2008). A new facility is currently under construction. It will have beneficial reuse capacity to provide irrigation to the Stonecrest Golf Club.

4.5.13 Summerglen

Summerglen is a Marion County Utilities WWTF with a capacity of 0.2 mgd and a 2007 average flow of 0.09 mgd. The facility provides beneficial reuse for golf course irrigation (Marion County, 2009). This facility is planned to be decommissioned with flow diverted to the new facility at the Marion Oaks location.

4.5.14 Northwest Regional WWTF (Golden Ocala)

Northwest Regional is a Marion County Utilities WWTF with a capacity of 0.2 mgd and a 2007 average daily flow of 0.008 mgd. The facility discharges to spray-field irrigation (Marion County, 2009); current flows are not sufficient to be utilized beneficially. However, the facility is planned to provide beneficial reuse when flows increase.

4.5.15 Marion Oaks Regional Water Reuse Facility

The Marion Oaks Regional WRF is a Marion County Utilities facility planned for the Marion Oaks site. The planned facility will accept flows from the current facility and Summerglen. It will have the capacity to produce reclaimed water for beneficial reuse at Marion Oaks Golf Course.

4.5.16 Ocala No. 1 WWTP

Ocala No. 1 is a City of Ocala facility with a capacity of 2.5 mgd and a 2007 average daily flow of 1.09 mgd (FDEP, 2008). The facility provides beneficial reuse for public access areas and golf course irrigation (Black and Veatch, 2009). This facility is planned to be decommissioned with flow diverted to the Ocala No. 2 WRF and the Ocala No. 3 WWTP.

4.5.17 Ocala No. 2 WRF

Ocala No. 2 WRF is a City of Ocala facility with a capacity of 6.5 mgd and a 2007 average daily flow of 2.52 mgd (FDEP, 2007). The facility provides beneficial reuse for golf course and public access area irrigation. It also discharges to rapid infiltration and spray-field irrigation. The facility is planned for expansion and will receive flows diverted from the Ocala No. 1 WWTP after it is decommissioned (Black and Veatch, 2009).

4.5.18 Ocala No. 3 WWTP

Ocala No. 3 WWTP is a City of Ocala facility with a capacity of 4.0 mgd and a 2007 average daily flow of 2.05 mgd (FDEP, 2007). It provides beneficial reuse for public access area irrigation. The facility is planned for expansion and will receive flows diverted from the Ocala No. 1 WWTP after it is decommissioned (Black and Veatch, 2009).

4.6 Stormwater

Stormwater was discussed in Chapter 1 as a potential non-potable water supply option. Stormwater use involves capture of runoff created by development and use of the stored water for irrigation. In comparison to large regional water supplies, it is a smaller, local-scale source. For new construction, stormwater use must be built into the design of the development to be an effective alternative water supply. Storage of runoff until the dry months when demand is high is a challenge.

Stormwater was evaluated in the RWSPU and in WRA (2007-c) as a general project area. It was recommended for irrigation purposes since it is a desirable lower quality source that can be applied in a broad array of applications (when feasible). Therefore, stormwater supply remains recommended for irrigation purposes.

4.7 New Supply Project Summary

Table 4-9 below summarizes the recommended new supply WRWSA projects and sources for which conceptual designs will be prepared or amended for Phase II. SJRWMD new supply projects that will be described in more detail in Phase II are also shown.

The WRWSA groundwater projects are regional wellfields located in the Eastern Marion County in the SJRWMD and Northwestern Marion County in the SWFWMD. The WRWSA surface water projects are the Withlacoochee River at Holder and Lake Rousseau. The WRWSA seawater project is co-located desalination with the Crystal River Power Plant.

The SJRWMD surface water project is the Lower Ocklawaha River. The SJRWMD seawater project is the ship or land-based Coquina Coast desalination supply.

Table 4-9. New Supply Capture Projects Summary.

Sponsor Entity	WRWSA					SJRWMD	
Source[1]	Surface water		Seawater	Groundwater		Surface water	Seawater
Current Design Quantity	40 MGD	40 MGD	25 MGD	TBD[2]	TBD[2]	TBD[3]	TBD[3]
Project	Withlacoochee River at Lake Rousseau	Withlacoochee River at Holder	Co-Located Desalination at Crystal River	Eastern Marion Wellfield	Northwestern Marion Wellfield	Lower Ocklawaha River	Coquina Coast Desalination

[1] No brackish groundwater projects are recommended, but withdrawal feasibility from the Lower Floridan aquifer should be monitored in conjunction with the ongoing hydrogeologic explorations underway at the SWFWMD and the City of Ocala.
[2] Quantities for these projects will be identified in Phase II based on member demands and potential yield.
[3] Quantities for these projects will be identified in Phase II using SJRWMD data.

4.8 Estimated Costs

Unit cost estimates ($ per thousand gallons) to develop water have been developed for the WRWSA surface water, groundwater, seawater desalination, and reclaimed water projects in Phase II – Technical Memorandum No. 1 and No. 2. The RWSPU also reviewed unit costs by source type as applicable in the WRWSA region. Generally, potable supply costs increase along the following source progression: groundwater, brackish groundwater, surface water, and seawater. Generally, non-potable supply costs increase along a non-potable source progression from reclaimed water to various blends of multiple sources.

The cost estimates for the surface water and seawater desalination projects will be amended in Phase II to reflect service to Marion County members. Cost estimates will also be prepared in Phase II for the new groundwater and reclaimed water projects located in Marion County.

Table 4-2
Project Evaluation Criteria

Project Name:			
		County:	
Type of Project:	*Groundwater:*	*Surface Water:*	*Other:*
Project Description:			

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal termination. It considers the characteristics of the hydrogeology and/or surface water resources.		**C** - Significant negative water quantity or supply variability issues **B** - Few negative water quantity or supply variability issues **A** - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long-term degradation of source water quality.		**D** - Intensive treatment via saltwater demineralization likely **C** - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation **B** - Conventional-type treatment likely (e.g. complete filtration, membrane softening) **A** - Limited treatment likely (e.g. lime softening)
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with other existing legal users of water, and compatibility with minimum flows and levels.		**C** - Difficult to permit due to various regulatory reasons or local government opinion **B** - Permitting will follow normal permitting course with few issues **A** - Permitting will follow normal permitting course and likely will be supported by local governments and the District
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the environment, groundwater, surface water flows, and downstream resources. Minimum flows and levels and stressed lakes will be considered. This criterion does not include environmental impacts from a specific construction footprint.		**C** - Reasonable likelihood of significant adverse environmental impacts **B** - Low likelihood of significant adverse environmental impacts **A** - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations and maintenance. It is relative to other new supply alternatives under consideration.		**D** - Very high anticipated costs from alternative treatment technologies (e.g., seawater desalination) and transmission needs **C** - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs **B** - Moderate anticipated costs resulting from conventional treatment or transmission needs **A** - Low anticipated costs due to good source quality and limited transmission needs

Table 4-2
Project Evaluation Criteria

Project Name:			
		County:	
Type of Project:	*Groundwater:*	*Surface Water:*	*Other:*
Project Description:			

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
6. Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the WRWSA or its members (primarily the Florida Water Protection and Sustainability Program).		**C** - Low chance of gaining outside funding **B** - Reasonable chance of gaining outside funding **A** - High chance of gaining outside funding
7. Compatibility with SWFWMD and SJRWMD - District Water Management Plan (DWMP) - This criterion includes an evaluation of the project relative to DWMP long-range goals, as illustrated by the following program areas: a) Water Supply, b) Flood Protection, c) Water Quality, and d) Natural Systems		**C** - Generally uncompatible with the DWMP due to a number of factors, or uncompatible with a significant DWMP criterion **B** - Somewhat compatible with the DWMP, due to one or a few factors **A** - Generally compatible with the DWMP, and not incompatible with significant criteria.
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).		**C** - Project area is significantly distant from WRWSA demand areas (greater than 5 miles) **B** - Project area is reasonably proximate to demand areas, but not ideally located (between 1 and 5 miles) **A** - Project area is in close proximity to demand areas (less than 1 mile)
OVERALL GRADE:		**C** - Project is not recommended for further consideration **B** - Project is recommended for further consideration with qualifications **A** - Project is recommended for further consideration

Table 4-3
Project Evaluation: Eastern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in eastern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal termination. It considers the characteristics of the hydrogeology and/or surface water resources.	**B(+)**	**C** - Significant negative water quantity or supply variability issues **B** - Few negative water quantity or supply variability issues **A** - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long-term degradation of source water quality.	**A**	**D** - Intensive treatment via saltwater demineralization likely **C** - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation **B** - Conventional-type treatment likely (e.g. complete filtration, membrane softening) **A** - Limited treatment likely (e.g. lime softening)
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with other existing legal users of water, and compatibility with minimum flows and levels.	**B**	**C** - Difficult to permit due to various regulatory reasons or local government opinion **B** - Permitting will follow normal permitting course with few issues **A** - Permitting will follow normal permitting course and likely will be supported by local governments and the District
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the environment, groundwater, surface water flows, and downstream resources. Minimum flows and levels and stressed lakes will be considered. This criterion does not include environmental impacts from a specific construction footprint.	**B**	**C** - Reasonable likelihood of significant adverse environmental impacts **B** - Low likelihood of significant adverse environmental impacts **A** - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations and maintenance. It is relative to other new supply alternatives under consideration.	**A**	**D** - Very high anticipated costs from alternative treatment technologies (e.g., seawater desalination) and transmission needs **C** - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs **B** - Moderate anticipated costs resulting from conventional treatment or transmission needs **A** - Low anticipated costs due to good source quality and limited transmission needs

Table 4-3
Project Evaluation: Eastern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in eastern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
6. Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the WRWSA or its members (primarily the Florida Water Protection and Sustainability Program).	**C**	**C** - Low chance of gaining outside funding **B** - Reasonable chance of gaining outside funding **A** - High chance of gaining outside funding
7. Compatibility with SWFWMD and SJRWMD - District Water Management Plan (DWMP) - This criterion includes an evaluation of the project relative to DWMP long-range goals, as illustrated by the following program areas: a) Water Supply, b) Flood Protection, c) Water Quality, and d) Natural Systems	**C**	**C** - Generally uncompatible with the DWMP due to a number of factors, or uncompatible with a significant DWMP criterion **B** - Somewhat compatible with the DWMP, due to one or a few factors **A** - Generally compatible with the DWMP, and not incompatible with significant criteria.
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	**C**	**C** - Project area is significantly distant from WRWSA demand areas (greater than 5 miles) **B** - Project area is reasonably proximate to demand areas, but not ideally located (between 1 and 5 miles) **A** - Project area is in close proximity to demand areas (less than 1 mile)
OVERALL GRADE:	**B(+)**	**C** - Project is not recommended for further consideration **B** - Project is recommended for further consideration with qualifications **A** - Project is recommended for further consideration

Table 4-4
Project Evaluation: Northeastern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in northeastern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal	**B**	**C** - Significant negative water quantity or supply variability issues **B** - Few negative water quantity or supply variability issues **A** - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long	**A(-)**	**D** - Intensive treatment via saltwater demineralization likely **C** - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation **B** - Conventional-type treatme
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with	**B(-)**	**C** - Difficult to permit due to various regulatory reasons or local government opinion **B** - Permitting will follow normal permitting course with few issues **A** - Permitting will follow normal permitting course and likely will be supported by local governments
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the envir	**B**	**C** - Reasonable likelihood of significant adverse environmental impacts **B** - Low likelihood of significant adverse environmental impacts **A** - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations an	**A**	**D** - Very high anticipated costs from alternative treatment technologies (e.g., seawater desalination) and transmission needs **C** - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and tra

Table 4-4
Project Evaluation: Northeastern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater:* ***X***	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in northeastern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
6. Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the WRWSA or its members (primarily the Florida Water Protection and Sustainability Program).	**C**	**C** - Low chance of gaining outside funding **B** - Reasonable chance of gaining outside funding **A** - High chance of gaining outside funding
7. Compatibility with SWFWMD and SJRWMD - District Water Management Plan (DWMP) - This criterion includes an evaluation of the project relative to DWMP long-range goals, as illustrated by the following program areas: a) Water Supply, b) Flood Protection, c) Water Quality, and d) Natural Systems	**C**	**C** - Generally uncompatible with the DWMP due to a number of factors, or uncompatible with a significant DWMP criterion **B** - Somewhat compatible with the DWMP, due to one or a few factors **A** - Generally compatible with the DWMP, and not incompatible with sig
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	**C**	**C** - Project area is significantly distant from WRWSA demand areas (greater than 5 miles) **B** - Project area is reasonably proximate to demand areas, but not ideally located (between 1 and 5 miles) **A** - Project area is in close proximity to demand areas (less
OVERALL GRADE:	**B**	**C** - Project is not recommended for further consideration **B** - Project is recommended for further consideration with qualifications **A** - Project is recommended for further consideration

Table 4-5
Project Evaluation: North-Central Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in North-Central Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal	**B**	**C** - Significant negative water quantity or supply variability issues **B** - Few negative water quantity or supply variability issues **A** - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long	**A(-)**	**D** - Intensive treatment via saltwater demineralization likely **C** - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation **B** - Conventional-type treatm
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with	**B**	**C** - Difficult to permit due to various regulatory reasons or local government opinion **B** - Permitting will follow normal permitting course with few issues **A** - Permitting will follow normal permitting course and likely will be supported by local governments
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the envir	**C**	**C** - Reasonable likelihood of significant adverse environmental impacts **B** - Low likelihood of significant adverse environmental impacts **A** - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations an	**A**	**D** - Very high anticipated costs from alternative treatment technologies (e.g., seawater desalination) and transmission needs **C** - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and tr

Table 4-5
Project Evaluation: North-Central Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in North-Central Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
6. Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the WRWSA or its members (primarily the Florida Water Protection and Sustainability Program).	**C**	**C** - Low chance of gaining outside funding **B** - Reasonable chance of gaining outside funding **A** - High chance of gaining outside funding
7. Compatibility with SWFWMD and SJRWMD - District Water Management Plan (DWMP) - This criterion includes an evaluation of the project relative to DWMP long-range goals, as illustrated by the following program areas: a) Water Supply, b) Flood Protection, c) Water Quality, and d) Natural Systems	**C**	**C** - Generally uncompatible with the DWMP due to a number of factors, or uncompatible with a significant DWMP criterion **B** - Somewhat compatible with the DWMP, due to one or a few factors **A** - Generally compatible with the DWMP, and not incompatible with sig
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	**C**	**C** - Project area is significantly distant from WRWSA demand areas (greater than 5 miles) **B** - Project area is reasonably proximate to demand areas, but not ideally located (between 1 and 5 miles) **A** - Project area is in close proximity to demand areas (less
OVERALL GRADE:	**B**	**C** - Project is not recommended for further consideration **B** - Project is recommended for further consideration with qualifications **A** - Project is recommended for further consideration

Table 4-6
Project Evaluation: Northwestern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in Northwestern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal termination. It considers the characteristics of the hydrogeology and/or surface water resources.	**B(+)**	**C** - Significant negative water quantity or supply variability issues **B** - Few negative water quantity or supply variability issues **A** - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long-term degradation of source water quality.	**A(-)**	**D** - Intensive treatment via saltwater demineralization likely **C** - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation **B** - Conventional-type treatment likely (e.g. complete filtration, membrane softening) **A** - Limited treatment likely (e.g. lime softening)
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with other existing legal users of water, and compatibility with minimum flows and levels.	**B(+)**	**C** - Difficult to permit due to various regulatory reasons or local government opinion **B** - Permitting will follow normal permitting course with few issues **A** - Permitting will follow normal permitting course and likely will be supported by local governments and the District
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the environment, groundwater, surface water flows, and downstream resources. Minimum flows and levels and stressed lakes will be considered. This criterion does not include environmental impacts from a specific construction footprint.	**C**	**C** - Reasonable likelihood of significant adverse environmental impacts **B** - Low likelihood of significant adverse environmental impacts **A** - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations and maintenance. It is relative to other new supply alternatives under consideration.	**A**	**D** - Very high anticipated costs from alternative treatment technologies (e.g., seawater desalination) and transmission needs **C** - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs **B** - Moderate anticipated costs resulting from conventional treatment or transmission needs **A** - Low anticipated costs due to good source quality and limited transmission needs

Table 4-6
Project Evaluation: Northwestern Marion Wellfield

		County: MARION	
Type of Project:	*Groundwater: X*	*Surface Water:*	*Other:*

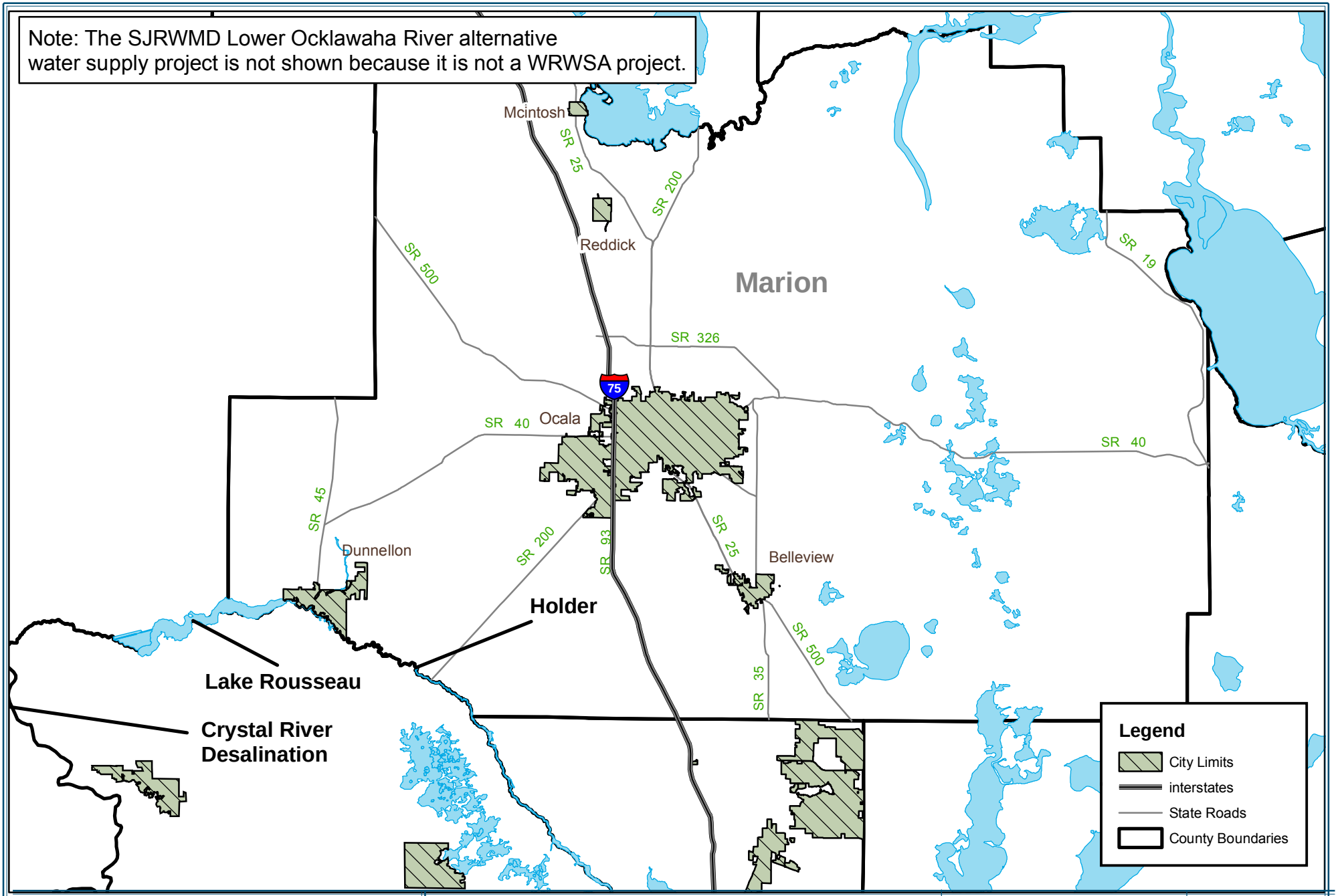
Project Description: This project involves the cooperation of WRWSA members in Marion County to develop a regional groundwater supply system in Northwestern Marion County.

Evaluation Information

Criteria Categories	Criteria Grade	Grading Explanation
6. Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the WRWSA or its members (primarily the Florida Water Protection and Sustainability Program).	**C**	**C** - Low chance of gaining outside funding **B** - Reasonable chance of gaining outside funding **A** - High chance of gaining outside funding
7. Compatibility with SWFWMD and SJRWMD - District Water Management Plan (DWMP) - This criterion includes an evaluation of the project relative to DWMP long-range goals, as illustrated by the following program areas: a) Water Supply, b) Flood Protection, c) Water Quality, and d) Natural Systems	**C**	**C** - Generally uncompatible with the DWMP due to a number of factors, or uncompatible with a significant DWMP criterion **B** - Somewhat compatible with the DWMP, due to one or a few factors **A** - Generally compatible with the DWMP, and not incompatible with significant criteria.
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	**C**	**C** - Project area is significantly distant from WRWSA demand areas (greater than 5 miles) **B** - Project area is reasonably proximate to demand areas, but not ideally located (between 1 and 5 miles) **A** - Project area is in close proximity to demand areas (less than 1 mile)
OVERALL GRADE:	**B(+)**	**C** - Project is not recommended for further consideration **B** - Project is recommended for further consideration with qualifications **A** - Project is recommended for further consideration

Facility	2030 Reuse		
	Projected Reuse Flow	Projected Flow For Beneficial Reuse	Possible Beneficial Reuse Projects
	(mgd)	(mgd)	
Marion County			
Belleview	1.09	0.82	Golf Course/Residential/Public Access Areas
Dunnellon	0.20	0.15	Residential/Public Access Areas
Lowell (Marion) Correctional Institution	0.61	0.46	Public Access Areas
Oak Run	0.70	0.53	Golf Course/Residential/Public Access Areas
Northwest Regional	0.01	0.01	Golf Course/Residential/Public Access Areas
Ocala No. 2 WRF	5.12	3.84	Golf Course/Residential/Public Access Areas. Planned to accept flows from Ocala No. 1 after decommissioning.
Ocala No. 3 WWTP	4.32	3.24	Golf Course/Residential/Public Access Areas. Planned to accept flows from Ocala No. 1 after decommissioning.
On Top of The World/Bay Laurel	0.67	0.50	Golf Course/Residential/Public Access Areas
Rainbow Springs	0.26	0.19	Golf Course/Residential/Public Access Areas
Silver Springs Regional	0.25	0.19	Golf Course/Residential/Public Access Areas
Silver Springs Shores	1.62	1.21	Golf Course/Residential/Public Access Areas
Stonecrest	0.29	0.22	Golf Course/Residential/Public Access Areas
Marion Oaks Regional Water Reuse Facility	0.73	0.55	Golf Course/Residential/Public Access Areas. New Facility planned to accept flows from current Marion Oaks and Summerglen

Table 4-8. Reclaimed Water Projects Summary



Water Resource Associates, Inc.
Engineering ~ Planning ~ Environmental Science
4260 West Linebaugh Avenue
Phone: 813-265-3130
Fax: 813-265-6610
www.wraconsultants.com

PROJECT: 0576 - Withlacoochee RWSA - Marion County Modification

Figure 4-1
Recommended WRWSA Alternative Water Supply Projects

ORIGINAL DATE: 10-30-2008
REVISION DATE: 10-26-09
JOB NUMBER: 0576
FILE NAME: Figure 4-1.mxd
GIS OPERATOR: DR

N
W E
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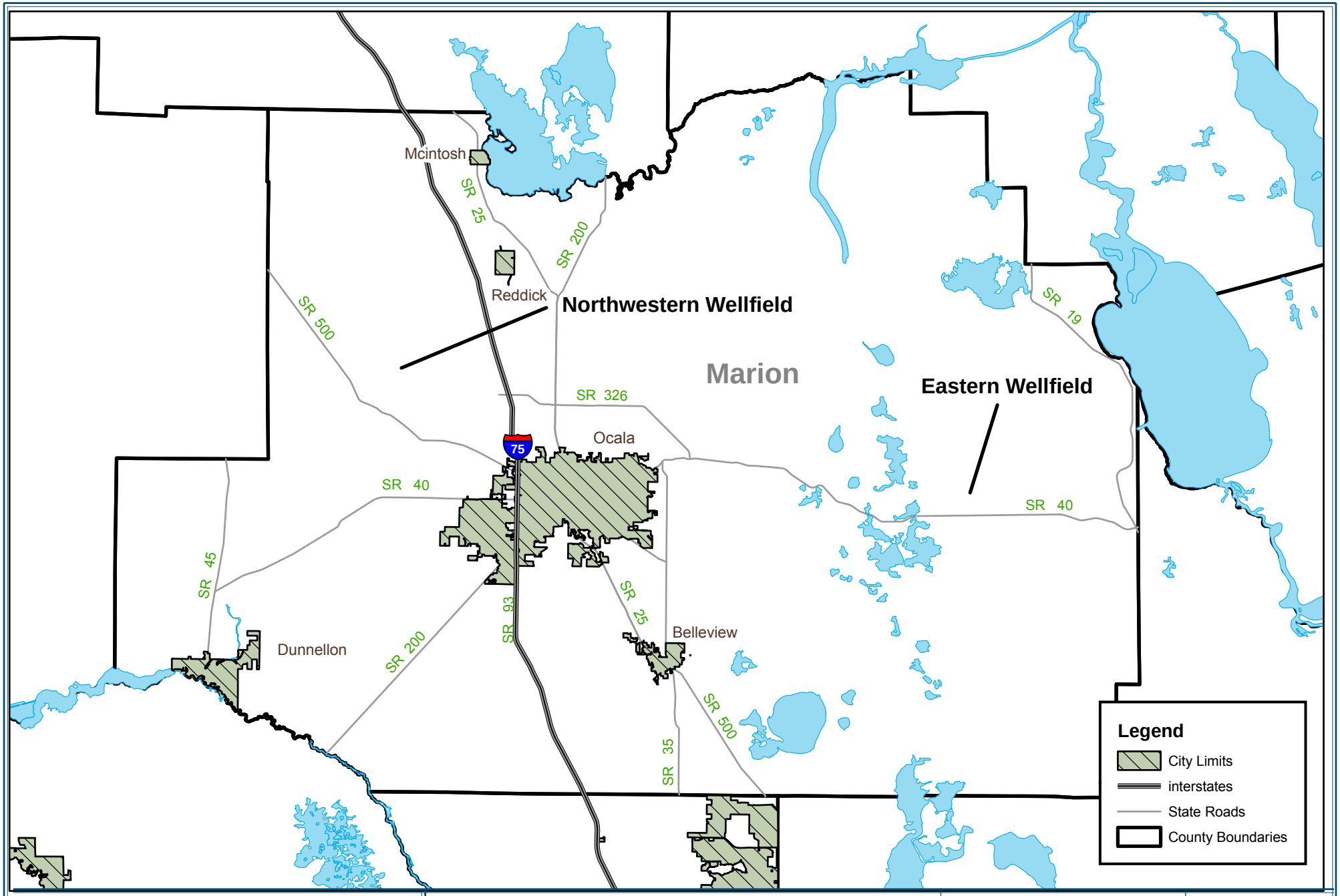
1 inch equals 7 miles



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PROJECT: 0576 - Withlacoochee RWSA - Marion County Modification

Figure 4-2
Recommended WRWSA Groundwater Projects

ORIGINAL DATE: 10-30-2008
REVISION DATE: 10-26-2009
JOB NUMBER: 0576
FILE NAME: Figure 4-2.mxd
GIS OPERATOR: DR

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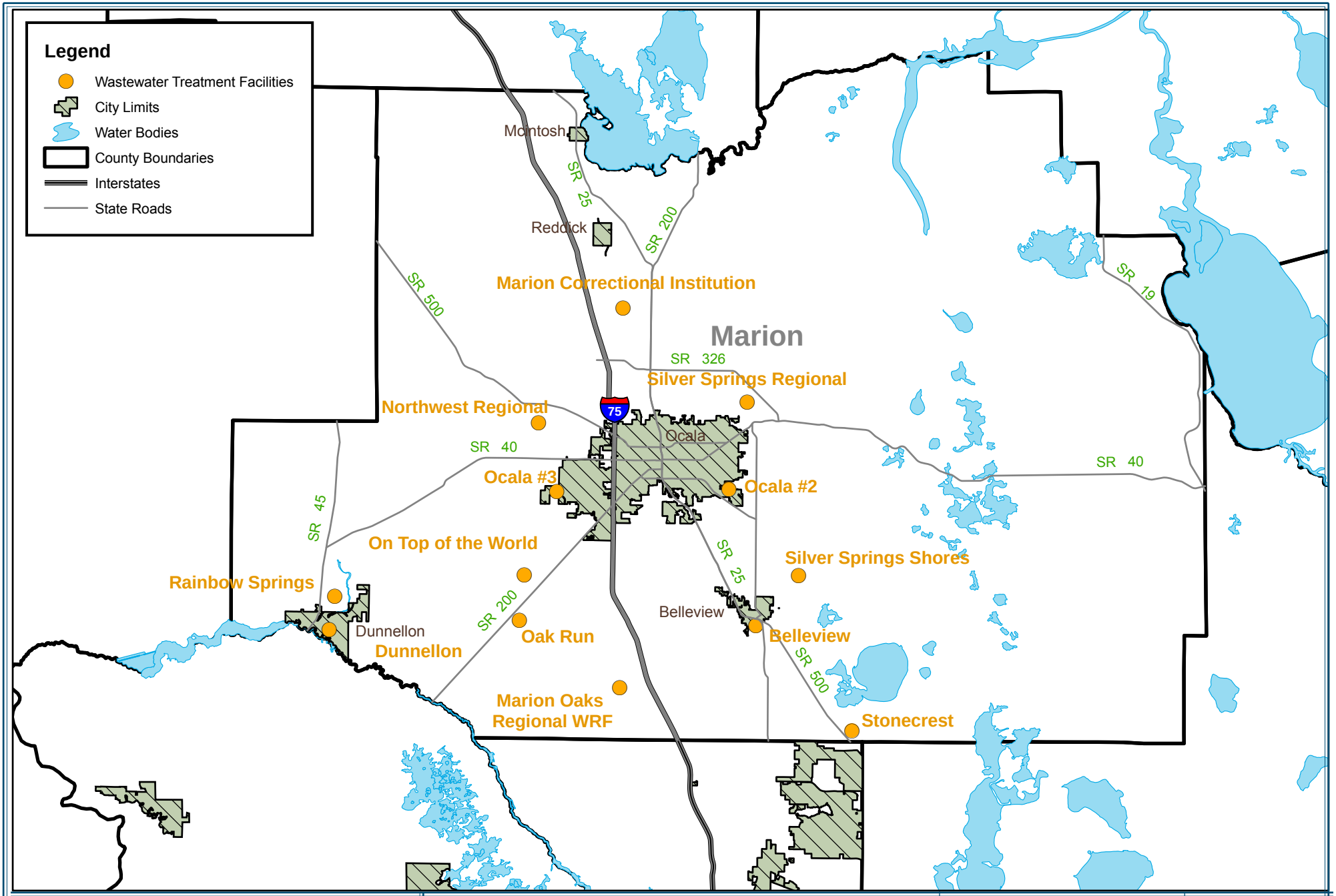
1 inch equals 7 miles



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PROJECT: 0576 - Marion County Compendium

Figure 4-3
Reclaimed Water Project Locations

ORIGINAL DATE: 11/03/2008
REVISION DATE: 11/09/2009
JOB NUMBER: 0576
FILE NAME: Reclaimed Projects.mxd
GIS OPERATOR: DR

N
W E
S
1 inch equals 7 miles

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LITERATURE REFERENCED

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APPENDIX A

MEMBER GOVERNMENT WATER CONSERVATION DATA

CITY OF BELLEVIEW

WATER CONSERVATION SURVEY

Education, Regulation, and Incentives

Do you enforce Water Management District watering restrictions that determine the time and days for outdoor watering? Y / N **Yes**

If yes, what are the penalties for violations? Describe **No penalties**

Do you have a landscape ordinance that requires Florida Friendly landscaping? Y/N **Yes**

Do you have staff dedicated to water conservation? Y / N **No**

Do you participate in any other educational and outreach activities related to water conservation? Describe **St John's Water Conservation Campaign**

Do you provide water efficient plumbing retrofit kits? These can include low-flow shower heads, low-volume toilets, low-flow faucets, etc Y / N **No**

Do you provide rain sensors for retrofit of irrigation systems? Y / N **No**

Do you regulate construction of wells smaller than 6" in casing diameter? Y / N **No**

Drinking Water

Do you have a utility that provide drinking water to residents? Y / N **Yes**

If yes, please provide the rates and fees that you charge for the water.
Attached

If yes, do you perform periodic audits of the distribution system to measure leakage? Y / N **Yes**

If yes, do you conduct systematic searches for leaks in your distribution system?
Yes

If yes, are developments that hook up to your water required to use Florida Friendly landscaping practices? **Yes**

If yes, do you send educational materials regarding water conservation to your accounts? Y / N **Posted on City Web Site**

If yes, do you notify high volume water users that they may be able to reduce their consumption? Y / N **Yes** **Posted on City Web Site**

If yes, do you monitor and detect plumbing leaks through meter readings? Y / N
Yes

If yes, do you maintain pressure in your distribution system such that leaks and high flow rates are avoided? Y / N
Yes

If yes, do you know what your rate of water use is per person? Describe **100 gpcd Customer historical stats used in our 2008 rate study**

If yes, do you have projections of your rate of water use per person in the future? Describe **We are in the process of CUP modification and will have this information available upon completion**

Please provide any readily available maps of existing potable water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format) **Not available**

Reuse Water

Do you have a centralized wastewater treatment facility? Y / N **Yes**

If yes, what are its current flows? **.360 gpd**

If yes, do you have future flow projections? Describe **In process of CUP modification, based on percentage of water consumption**

If yes, does it provide reclaimed water? Y / N **Yes**

If yes, do you have plans to upgrade this facility? Describe **Recently (2008) expanded to a 1.2 mgd facility**

Do you require dual lines for new development, so that these areas can receive reclaimed water for irrigation when it becomes available? Y / N **No**

Do you have a recent water/wastewater masterplan? Y / N **No**

If yes, please provide a copy (CD format is fine). **In process of updating master plan**

Do you have decentralized wastewater treatment facilities (other than septic tanks), such as package plants? **No**

If yes, please describe_____

If yes, does it provide reclaimed water?

Do you have any future plans with respect to reclaimed water? Describe **In the process of stormwater augmentation to subsidize reuse availability**

Please provide any readily available maps of existing reuse water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format) **Not available**

RESOLUTION 08-08

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF BELLEVIEW, FLORIDA AMENDING THE FEE SCHEDULE FOR WATER/SEWER RATES; ESTABLISING AN EFFECTIVE DATE TO COMMENCE WITH THE OCTOBER 2008 BILLING.

WHEREAS, the City Commission of Belleview, Florida, is authorized to establish water and sewer rates; and

WHEREAS, Ordinance 03-23 provides that water and sewer rates may be amended by Resolution duly adopted by the City Commission of Belleview, Florida, and

WHEREAS, the City Commission of Belleview, Florida, desires to increase said rates.

NOW, THEREFORE, BE IT RESOLVED that the City Commission of the City of Belleview, Florida hereby amends Appendix B. Table 3.H. Water and Sewer Service Rates as follows:

	Inside City Limits	Outside City Limits
Water Residential & Commercial		
Water Base Rate	$9.41	$14.12
Water 0 – 7000	$2.08	$ 3.12
Water 8000-20000	$2.50	$ 3.75
Water 21000-30000	$3.24	$ 4.86
Water 30000 and up/1000 gallons	$4.22	$ 6.33
Irrigation Water		
Water Base Rate	$9.41	$14.12
Water 0 – 7000	$2.50	$ 3.75
Water 8000-20000	$3.00	$ 4.50
Water 21000-30000	$3.89	$ 5.84
Water 30000 and up/1000 gallons	$5.06	$ 7.59
Sewer Residential & Commercial		
Sewer Base Rate	$18.00	$27.00
Sewer 0 – 7000	$ 2.77	$ 4.16
Sewer 7000 and up/1000 gallons	$ 3.38	$ 5.07
Construction Water		
Water Base Rate	$12.09	$12.09
Water per/1000 gallons	$ 5.06	$ 5.06

ORDINANCE 2007-31

AN ORDINANCE OF THE CITY OF BELLEVIEW, FLORIDA; RELATING TO AN AMENDMENT TO THE CITY OF BELLEVIEW CODE OF ORDINANCES REGARDING VEGETATION AND LANDSCAPING; AMENDING CHAPTER 90 VEGETATION AND CHAPTER 114 LANDSCAPING; COMBINING SAID CHAPTERS; ESTABLISHING CHAPTER 114: LANDSCAPING AND TREES; PROVIDING FOR SEVERABILITY; REPEALING ALL ORDINANCES IN CONFLICT; AND PROVIDING FOR AN EFFECTIVE DATE

WHEREAS, the Planning and Zoning Board of the City of Belleview did on August 7, 2007, recommend approval of said amendment, as described below; and

WHEREAS, the City Commission did on October 2, 2007 and on October 16, 2007 hold public hearings, with public notice, and the City Commission reviewed and considered all comments received during the public hearing, including the recommendation of the Planning and Zoning Board, serving also as the Local Planning Agency and staff, concerning said application for amendment, as described below, to the City Code of Ordinances; and

WHEREAS, the City Commission recognizes that trees and landscaping provide important aesthetic, environmental, and ecological benefits to the citizens of Belleview, property owners, and the general public;

WHEREAS, the City Commission recognizes the importance of providing flexibility in design for landscaping and trees while promoting the preservation of those types of trees that the City Commission has determined to be beneficial;

WHEREAS, the City Commission has determined and found this amendment, as described below, to be compatible with the goals, objectives and policies, of the City's Comprehensive Plan and Code of Ordinances including the Land Development Regulations; and

WHEREAS, the City Commission has determined and found that approval of said amendment, as described below, to the Code of Ordinances and Land Development Regulations would promote the public health, safety, morals, order, comfort, convenience, appearance, prosperity or general welfare; and

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COMMISSION OF THE CITY OF BELLEVIEW, FLORIDA, AS FOLLOWS:

Section 1. Pursuant to Ordinance 2007-31 Chapter 90 Vegetation and Chapter 114 Landscaping of the City Code of Ordinances are hereby amended, combined, and restated in Chapter 114: Landscaping and Trees; Chapter 114 being hereby established to read as follows:

CHAPTER 114: LANDSCAPING AND TREES

Article I. In General

Article II. Tree Preservation

Article III. Landscaping

Article IV. Buffering

Article V. Appeals and Conflicts

ARTICLE I. IN GENERAL

Sec. 114-10. Basis for Chapter Provisions

The intent of this chapter is to provide standards for protecting and enhancing the quality and quantity of trees within the City of Belleview and to provide development guidelines and requirements for landscaping and buffering in accordance with the goals, objectives, and policies of the City's Comprehensive Plan. It is also the intent of this chapter to provide flexibility to encourage innovative and unique approaches to landscape design to improve the overall aesthetic appearance of the City while preserving the environmental and ecological benefits that trees and landscaping provide.

Sec. 114-11. Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them, except where the context clearly indicates a different meaning:

Automatic controller - means a mechanical or electronic timer, capable of operating valve stations to set the days and length of time of a water application.

Buffer - means a strip of land of a specific width containing such natural and manmade barriers to lessen or minimize the negative effects of noise, light, odor or other objectionable visual, auditory or olfactory stimuli to adjacent properties (see Article IV).

Clear visibility triangle - means the triangular area formed by the intersection of ingress/egress, street or right-of-way lines and a straight line intersecting those two ingress/egress, street or right-of-way lines at points a minimum of 45 feet from their intersection.

Diameter breast height - means the diameter, in inches, of a tree measured at 4 1/2 feet above the existing grade.

DBH – is the abbreviation for "diameter breast height" as defined above.

Drip line - means an imaginary, perpendicular line that extends downward from the outermost tips of the tree branches to the ground.

Grade – means the normal ground height at the base of the subject tree.

Ground cover - means plants, other than turfgrass, normally reaching an average maximum height of not more than 24 inches at maturity.

Hydrozones – means grouping of vegetation with similar watering needs to minimize over irrigation and water consumption.

Irrigation system - means a permanent watering system designed to transport and distribute water to vegetation.

Landscape plan - means a landscape plan/open space plan showing the existing and proposed vegetation which shall include the type, size, and location of vegetation as well as any irrigation system and construction protection measures to be utilized for the developed site which shall be submitted with the required site plan for development.

Landscaping - means any designated area containing a combination of vegetation (such as shrubs, vines, hedges, trees, and/or other decorative plants) and nonliving landscape material (such as rocks, pebbles, sand, mulch, walls, fences or decorative paving materials). This landscaped area may include xeriscape, as defined in Florida Statutes, currently F.S. § 373.185(1)(b).

Micro irrigation - means the frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams or miniature sprays through emitters, placed along the water delivery pipes (laterals). Micro irrigation encompasses a number of methods or concepts including drip, subsurface, bubbler and spray irrigation, previously referred to as trickle irrigation, low volume or low flow irrigation.

Mulch - means nonliving, organic or synthetic materials customarily used in landscape design to retard erosion and retain moisture.

Nuisance tree – A list of recommended ornamental trees can be found in Section 114-26, Table 2(c) of this chapter.

Ornamental tree - A list of recommended ornamental trees can be found in Section 114-26, Table 2(a) of this chapter.

Perimeter line - means a line which clearly delineates the area surrounding a tree or tree group which is to be protected during any type of construction activity.

Plant communities - means a natural association of plants that is dominated by one or more prominent species or characteristic physical attribute(s).

Protected Tree – means any tree of a species listed in Table 2(b) of this chapter that is 24 inches DBH or larger.

Protective marker - means a highly visible, temporary fence limiting access to a protected area which ensures compliance with the intent of this Code, such as 36" orange, plastic web fencing.

Rain sensor device - means a low voltage electrical or mechanical component placed in the circuitry of an automatic lawn irrigation system which is designed to turn off a sprinkler controller when precipitation has reached a preset quantity.

Runoff - means water which is not absorbed by the soil or landscape to which it is applied and flows from the area.

Shade tree - means any tree which shall have a mature crown in the ratio of two feet for every inch of its DBH. Shade trees will attain a combination height and crown spread sufficient to shade large areas. A list of recommended shade trees can be found in Section 114-26, Table 2(b) of this chapter.

Site plan - means a plan for site development as described in chapter 22 of this Code.

Site specific vegetation - means a selection of vegetation that is particularly well suited to withstand the physical growing conditions that are normal for a specific location.

Tree Professional – means a certified arborist, horticulturist, or equally trained professional with experience in the evaluation and appraisal of trees (training documentation shall be submitted to the City for verification and filing).

Tree Plan – means a plan showing the existing and proposed size, type, location and category of trees included as part of the site plan.

Turf and turfgrass - mean continuous plant coverage consisting of grass species suited to growth in the county.

Vegetation - means any living plant including grass, trees, shrubs, etc.

Water use zone - means a grouping of sprays, sprinklers or microirrigation emitters into separate zones, which can be operated simultaneously according to the water requirements of the plants located therein.

Xeriscaping – means landscaping utilizing drought tolerant vegetation typically native to the area which is self sustaining without the need for irrigation.

(Sections 114-12 through 114-19 reserved).

ARTICLE II. TREE PRESERVATION

Sec. 114-20. Applicability of Article.

This article may be known as the City of Belleview Tree Ordinance. The provisions of this article shall apply to all development including: multi-family development, all non-residential development, residential subdivisions (at the time of platting/development), and planned developments. A tree removal permit is required for the removal of trees 6 inches or larger DBH (a permit is not required for the removal of trees of the type shown in table 2c or as otherwise exempted in this ordinance) for any development subject to this chapter. The following are exempt from the requirements of this Article:

1. Except when otherwise required through a planned development or subdivision process, all single family homes shall be exempt from the requirements of this article.

2. Existing development with a valid development permit/order. However, the requirements of this article shall be applicable where there is a proposed change of use, redevelopment, or change to existing development that involves the removal of trees 6 inches or larger.

3. All state-licensed, governmental and commercial plant or tree nurseries and botanical gardens where trees are grown for the purpose of being sold or for other public purposes.

4. All groves of trees in active commercial operation for *bona fide* agricultural purposes only.

5. Trees presenting an eminent danger to the public health or safety, as determined by the City Planner or Public Works Director.

In a declared emergency, the City Commission may waive the requirements of this article to ensure the protection of the health, safety, and welfare of the City and residents.

Sec. 114-21. Minimum Tree Requirements.

At a minimum, the City of Belleview shall require that existing or replacement trees for each property subject to this article provide for and maintain a minimum total tree DBH of 50 inches per acre (20 inches per acre for subdivision and residential planned developments located in common areas) of those species listed in Table 2(a) and 2(b) of this Article. A minimum of sixty percent (60%) of trees must be of tree species listed in Table 2(b) (shade trees) and up to forty percent (40%) may be of those listed in Table 2(a) (ornamental trees). The City recognizes that larger trees provide a more immediate benefit to the overall

quality of trees within the City. As such replacement trees 6 inches DBH or larger shall provide additional 50% credit toward meeting the required number of tree inches for the property. For example, an 8 inch live oak replacement tree would count as 12 inches toward meeting the required number of inches per acre.

Sec. 114-22. Existing Tree Plan.

As part of the landscape plan submitted for all site plan approvals or for subdivisions, a Tree Professional shall review the subject property and submit a proposed tree preservation plan in conjunction with the required existing tree plan. Properties that have no existing trees 6 inches DBH or larger may submit a request to the site plan committee to waive the requirement of the preservation plan. The tree preservation plan may be a separate site plan sheet or document or may be included as part of the landscape Plan. The Existing Tree Plan shall:

1. Identify the size, type, category (shade tree, ornamental tree, or prohibited tree), and location of all existing trees 24" DBH or greater.

2. Identify the size, type, category and location of all existing shade trees (Table 2b) 6" DBH or greater.

3. All protected trees shall be assessed by the Tree Professional based upon type, age, and condition. The assessment shall provide a written recommendation as to which trees should be retained and which trees may be removed based upon their overall replacement value. The assessment shall include the following:

a. Trees determined by the Tree Professional to be of low replacement value may be removed. All other trees shall be retained unless preservation of the tree(s) will significantly inhibit development of the site. In such cases, a written request with supporting documentation from the Tree Professional shall be submitted to the City requesting removal of the protected trees.

b. The site plan committee shall make a determination on the request as part of the site plan review process.

4. The Applicable site plan requirements of Sections 127-31 and 127-32 of this Code shall also be required for the tree plan.

Sec. 114-23. Restrictions.

Trees shall be prohibited from placement within a public or private right-of-way, utility easement, or maintenance easement which inhibit the clear visibility triangle or have the potential to disrupt utilities such as power lines, drainage

facilities (unless designed to include trees) and similar public utilities. Trees and landscaping approved through the site plan review process to be placed within these areas shall be located such to have minimal impact to underground and overhead utilities and the replacement (as a result of maintenance of the right-of-way or easement) of trees and landscaping shall run with the land and shall be the responsibility of any subsequent owners and tenants of the property in accordance with the approved site plan. All efforts shall be made to remove, prune, or top any trees which inhibit clear visibility or disrupt utility lines.

Sec. 114-24. Tree Protection.

The Tree Plan shall identify trees to be retained and protected during construction. Emphasis should be given to preservation of tree groups to maximize survivability during construction. The following tree protection measures shall be used:

1. A protective marker shall be placed around all shade trees with DBH greater than 24" and all protected trees, prior to any land preparation or other development activities. The protective fencing shall be located no closer than one-half the radius of the drip line or ten feet, whichever is more.

2. Required protective markers shall remain in place until all construction activity, except landscaping within the protected area, is finished.

3. Trees destroyed or receiving damage to the extent that survival is reasonably questionable must be replaced at the developer's/property owner's expense as provided in this article before a certificate of occupancy is issued.

3. The decision of the City of Belleview Development Services Director regarding damage to trees or replacement of damaged trees shall be final.

Sec. 114-25. Off-street parking reduction for tree preservation.

Off-street parking may be reduced to preserve existing trees. The amount of off-street parking that may be reduced shall be determined by the site plan committee in accordance with the intent of this chapter, the provisions of Chapter 106 of the City Code and of the City of Belleview Land Development Regulations.

Sec. 114-26. Tree Lists (groups).

The following trees (shade, ornamental or nuisance) are listed as recommended or prohibited species. All planting types shall be determined in accordance with the following tables (lists). The site plan committee may allow exceptions for species not listed on the following tables but which are included on the species lists of Waterwise Florida Landscapes published by the St. Johns River Water Management District (www.sjr.state.fl.us/). All planting allowed, as Waterwise

Florida Landscape list exceptions, must be otherwise consistent in size, type and category, to the requirements of this chapter. All proposed shrubs and ground cover species shall also be listed on the Waterwise Florida Landscape lists published by the St. Johns River Water Management District.

Table 2(a) - List of Ornamental Trees (Recommended):

Common Name	Botanical Name
Bradford Pear	*Pyrus calleryana*
Crape Myrtle	*Lagerstroemia indica*
Flowering Dogwood	*Cornus florida*
Fringetree	*Chionanthus virginicus*
Holly, American	*Ilex opaca*
Holly, Dahoon	*Ilex cassine*
Holly, East Palatka	*Ilex x attenuate "E. Palat."*
Holly, Savannah	*Ilex x attenuate varieties*
Holly, Yaupon	*Ilex vomitoria*
Ligustrum Tree	*Ligustrum japonicum tree-type*
Maple, Japanese	*Acer palmatum*
Palm, Date	*Phoenix spp.*
Palm, Pindo	*Butia capitalta*
Palm, Sabal	*Sabal palmetto*
Palm, Washingtonian	*Washingtonian filifera*
Pine, Black	*Pinus rigida serotina*
Pine, Loblolly	*Pinus taeda*
Pine, Longleaf	*Pinus palustris*
Pine, Slash	*Pinus elliot*
Red Bud	*Cercis spp.*
Red Cedar	*Juniperus spp.*
Willow, Weeping	*Salix babylonica*

Table 2(b) - List of and Shade Trees (Recommended):

Common Name	Botanical Name
Bald Cypress	*Taxodium distichum*
Elm, Drake	*Ulmus parvifolia*
Elm, Florida	*Ulmus americal floridana*
Elm, Winged	*Ulmus alata*
Hickory	*Carya*
Loblolly Bay	*Gordonia lasianthus*
Magnolia, Southern	*Magnolia grandiflora*
Magnolia, Sweetbay	*Magnolia virginiana*
Maple, Florida	*Acer barbatum (floridanum)*
Maple, Red	*Acer rubrum*
Maple, Silver	*Acer saccharinum*
Oak, Live	*Quercus virginiana*
Oak, Laurel	*Quercus laurifolia*
Oak, Shumard	*Quercus shumardi*
Oak, Southern Red	*Quercus falcate*
Oak, White	*Quercus alba*
Oak, Willow	*Quercus phellos*
Pecan	*Carya illinoinensis*
River Birch	*Betula nigra*
Sweetgum	*Liquidambar styraciflua*
Sycamore	*Platanus occidentalis*
Tulip Tree	*Liriodendron tulipifera*

Table 2(c) - List of Nuisance trees (Prohibited):

Common Name	Botanical Name
Australian Pine	*Casuarina spp.*
Black Locust	*Robinnia pseudoacacia*
Chinaberry	*Melia azedarach*
Chinese Privet	*Ligustrum lucidum*
Chinese Tallow Tree	*Sapium sebiferum*
Honeylocust, common	*Gleditsia triancanthes*
Mulberry	*Broussonetia spp.*
Camphor	*Cinnamonum camphora*

(Sections 114-27 through 114-29 reserved).

ARTICLE III. LANDSCAPING

Sec. 114-30. Applicability of Article.

This article may be known as the City of Belleview Landscaping ordinance. The provisions of this article shall apply to all non-residential (commercial) and multi-family development, and all development subject to Article 2 (Existing Tree Plan) of this chapter.

Sec. 114-31 Exemptions.

The following are exempted from this article:

1. *Bona fide* agricultural activities.

2. Landscaping for a single-family home or duplex.

3. Any development which is governed by a valid site development plan or a valid building permit prior to the effective date of Ordinance No. 2007-31. However, the requirements of this article shall be applicable where there is a proposed change of use, redevelopment, or change to existing

development that constitutes the need for additional landscaping or changes to existing landscaping.

Sec. 114-32. Landscape plan.

Landscape plans shall include existing and proposed vegetation which shall include the type, size, and location of vegetation as well as any irrigation system and construction protection measures to be utilized for the developed site which shall be submitted with the required site plan for development. A landscape plan serves to provide the specific location, size, type, and area for existing and proposed landscaping including buffers as part of the site plan process. For all development subject to this Article the following landscape plan requirements shall be met:

1. Identify the size, type, category and location (shade tree or ornamental tree) of all replacement and existing trees required to maintain the minimum number of tree inches as required by Section 114-21 of this chapter. All replacement trees shall be a minimum of 3 inches DBH and of Florida Grade #1 or better quality.

2. The landscaped plan shall identify the size, type, and category (shade tree or ornamental tree) proposed to be planted and the size, type and location of all shrubs and ground cover to be installed. All proposed shrubs and ground cover species shall also be listed on the Waterwise Florida Landscape lists published by the St. Johns River Water Management District.

3. A minimum landscaped area equal to 10% of the total area allocated for parking, access, loading, dumpster pad, and traffic circulation shall be landscaped through a combination of landscaped islands and perimeter landscaped areas. The landscape plan shall included calculations for these areas and calculations for the amount of required landscaped areas.

4. All designated landscaped areas shall be a minimum of 140 square feet in size. Where adjacent to parking or traffic circulation, curbing or other protective barriers shall be required to prevent encroachment and damage by vehicles.

5. All shrubs to be installed shall be a minimum size of 24 inches from grade. Shrubs installed within the clear visibility triangle and for other areas where safety may be an issue shrubs shall not exceed a height of 30 inches in parking and traffic circulation areas or where deemed to be a safety hazard.

6. The landscaped plan shall include calculations for preservation of existing and proposed trees to meet the minimum tree requirements as indicated in section 114-31 of this Article.

7. The construction protection measures to be utilized for the developed site, including location and type of protective markers.

8. Irrigation systems are not required by the City. However, if provided the system(s) shall be detailed on the landscape plan showing the type(s) of system(s) to be installed.

Sec. 114-33. Landscape plan water conservation and soil protection requirements.

The City recognizes the importance of providing irrigation systems to maintain trees and landscaping. However, there is also a growing need to protect diminishing water resources for both water quality and quantity and to minimize soil erosion during and after site development. The following protection measures shall be addressed on all landscaping plans.

1. A plan notation addressing the type of drought tolerant ground cover (grass) to be placed after construction to cover all areas disturbed during construction. There should be no bare soil areas unless part of the approved plans. Seeding and mulching is not permissible as a replacement ground cover.

2. A plan notation detailing the irrigation system(s) (if provided) that utilizes water use zones, rain sensor devices, and low volume drip irrigation to coincide with the selected planting types. The plans shall specify the spray zones, required watering frequency (based upon the planting types).

3. A plan notation summarizing the extent that Xeriscape species and/or low volume micro irrigation is utilized to minimize the overall water consumption needs of the landscape design.

4. A plan notation addressing re-use water for irrigation purposes if available and a commitment to provide connection to re-use water if it becomes available to the site. The determination on availability shall be when facilities are within 100 feet from the subject property.

5. A plan notation listing the allowable watering days and times as specified by City Regulations and a notation that the irrigation system(s) will only be used during those times.

(Sec 114-34 through 114-39 reserved)

ARTICLE IV. BUFFERING

Sec. 114-40. Applicability of Article.

This article may be known as the City of Belleview Buffering Ordinance. The provisions of this article shall apply to all non-residential (commercial) and multi-family development. The following are exempted from this article:

1. *Bona fide* agricultural activities in existence at the time of annexation.

2. Single family homes.

3. Any development which is governed by a valid site development plan or a valid building permit prior to the effective date of this Ordinance No. 2007-31. However, the requirements of this article shall be applicable where there is a proposed change of use, redevelopment, or change to existing development that constitutes the need for buffering or additional landscaping or changes to existing landscaping.

Sec. 114-41. Buffer requirements.

Landscape buffers mitigate conflict between potentially incompatible land uses, strategically separate vehicular and non-vehicular use areas, define vehicular access and circulation and screen vehicular movement, noise and glare from public view and adjacent properties.

A buffer shall be provided along property lines or along an abutting street right-of-way lines for parking areas and shall not be located on any portion of an existing, dedicated or proposed right-of-way, easement (unless an allowable use within the easement) or private street. No structures or buildings may be located within a required landscaped buffer.

The following buffer types are established for this Article:

Buffer Type A - Minimum Five (5) foot wide buffer with 2 trees and 10 shrubs per 100 linear feet.

Buffer Type B - Minimum Ten (10) foot wide buffer with 4 trees and 15 shrubs per 100 linear feet.

Buffer Type C - Minimum Fifteen (15) foot wide buffer with 6 trees and 20 shrubs per 100 linear feet.

Buffer Type D - Minimum 20 (twenty) foot wide buffer with 8 trees and 25 shrubs per 100 linear feet.

All required trees in a landscaped buffer shall be Shade trees (Table 2(b)) and Ornamental trees (Table 2(a)). Ornamental trees shall not exceed 50%

of the required number of trees in a landscaped buffer as specified by the buffer type listed above. Trees and shrubs shall be located such to provide a continuous landscaped buffer.

Buffering requirements shall be established during the site plan process or building permit process, should no site plan be required. Buffering shall be required based upon the zoning classification of the adjacent property, in accordance with Table 4 below. The Site Plan Committee may require additional buffering in unique instances where the proposed development or use will significantly affect the use and enjoyment of neighboring property or public safety.

TABLE 4:

Buffer Matrix

Existing Use / Zoning	AG	R-1	R-2	R-3	R-4	RMH	RO	B-1	B-2	B-4	B-5	M-1	M-2	GU	PD
AG	-	B	C	C	C	C	C	C	C	D	D	D	D	D	*
R1	B	-	A	A	A	A	B	B	B	C	D	D	D	B	*
R2	C	A	-	A	A	A	A	A	B	C	C	D	D	B	*
R3	C	A	A	-	A	A	B	A	B	C	C	D	D	B	*
R4	C	A	A	A	-	A	B	A	B	C	C	D	D	B	*
RMH	C	A	A	A	A	-	B	A	B	C	C	D	D	B	*
RO	C	B	A	B	B	B	-	A	B	B	B	D	D	B	*
B-1	C	B	A	A	A	A	A	-	A	A	B	C	D	B	*
B-2	C	B	B	B	B	B	B	A	-	-	A	C	D	B	*
B-3	D	C	B	B	B	B	B	B	-	-	-	C	D	B	*
B-4	D	C	C	C	C	C	B	A	-	-	-	B	D	B	*
B-5	D	D	C	C	C	C	B	B	A	-	-	A	C	B	*
M-1	D	D	D	D	D	D	D	C	C	B	A	-	A	B	*
M-2	D	D	D	D	D	D	D	D	D	D	C	A	-	B	*
GU	D	B	B	B	B	B	B	B	B	B	B	B	B	-	*
PD	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* Type "A" buffers, according to the above schedule, are required where parking is proposed along any road right-of-way or is situated so that lights (including vehicle headlights, driving lights and the like) from parked vehicles may project or shine into the adjacent roadway.

* * Where decorative walls or berms are proposed that will provide additional mitigation for impact to adjacent properties, the number of required plantings may be reduced by 50%. When a combination of a wall and plantings is proposed,

the wall shall be located so as to provide room between the wall and the property line to permit the remainder of the required plantings.

Sections 114-43 through 114-49 reserved.

ARTICLE V. APPEALS AND CONFLICTS.

Sec. 114-50. Maintenance.

The property owner and tenant shall be jointly and severally responsible for maintenance of all required landscape, irrigation, and landscape buffering improvements as originally approved for the site. This maintenance requirement shall run with the land and shall be the responsibility of any subsequent owners and tenants of the property. It is the responsibility of the owner to notify any subsequent owners of the property of this responsibility.

Landscape areas and site improvements shall be maintained in good condition, with a neat and orderly appearance, free from weeds and debris. All plant materials shall be maintained in a healthy and vigorous condition through proper irrigation, fertilization, pruning, weeding, mowing, and other standard horticultural practices, so as to grow to their normal shape, color, and height. It is the specific intent of this chapter that such plantings be maintained so as to provide aesthetic appeal and the required functions of screening, shading, buffering, established by the City. All dead plants shall be replaced with the same type of planting as approved by the City. All damaged plants including lawn grass shall be replaced or restored. Mulch shall be at the proper coverage and depth. Upon request in writing to the Planning Director, planting types may be changed, provided the required number of plantings, aesthetic appeal and function is not altered.

Sec. 114-51. Compliance; inspection; approval; revision; fee.

(a) The development of any improvements made pursuant to an approved site plan or drainage plan shall be inspected by the City, or such other agency as it may from time to time contract with for providing of this service.

(b) No site improvements shall be developed without the submission and approval of the required site plan and permits.

(c) No site improvements other than those indicated on the approved site plan shall be permitted, unless a revised site plan is submitted and approved.

(d) The City hereby establishes a fee for filing and review of landscape plans, such fees to be in the amount provided for by resolution of the City Commission. Such fee may be amended from time to time by resolution of the City Commission.

Sec. 114-52. Enforcement and Appeals.

The enforcement and appeal process of this chapter shall comply with the provisions of Article V. Code Enforcement, Chapter 2 of the City Code of Ordinances.

Sec. 114-53. Conflicts.

Whenever regulations or restrictions imposed by this article conflict with other ordinances or regulations, or are either more or less restrictive than regulations or restrictions imposed by any governmental authority through legislation, rule or regulation, the regulations, rules or restrictions which are more restrictive or which impose the highest standards or requirements shall govern. Regardless of any other provision of this article, no land shall be used and no structure erected or maintained in violation of any state or federal pollution control or environmental protection law or regulation.

Sec. 114-54. Environmental Protection.

Nothing contained in this chapter shall be construed to relieve any person or entity from compliance with the provisions of Chapter 106 for the protection of environmentally sensitive lands, freshwater marshes, or endangered or pristine habitat identified by a state or federal agency."

Section 2. Severability.

If any provision or portion of this Ordinance is declared by any court of competent jurisdiction to be void, unconstitutional, or unenforceable, then all remaining provisions and portions of this Ordinance shall remain in full force and effect.

Section 3. Conflicts Repealed.

All ordinances or parts of ordinances in conflict with this Ordinance shall be repealed to the extent of such conflict. If any portion of this Ordinance is found to be invalid, then only that portion of this Ordinance shall be stricken.

Section 4. Effective Date.

This Ordinance shall become effective immediately upon adoption.

CERTIFICATE OF ADOPTION AND APPROVAL

The above and foregoing ordinance was duly read and approved upon First Reading by a 5-0 vote of the City Commission of the City of Belleview, Florida, at a Regular Meeting held on October 2, 2007. Said ordinance was duly read, passed, and adopted upon Final Reading by a 5-0 vote of the City Commission of the City of Belleview, Florida at a Regular Meeting held on October 16, 2007.

Tammy C Moore

TAMMY C. MOORE
Mayor/Commissioner

Attest:

Sandi McKamey

SANDI McKAMEY, MMC, CPM
City Clerk/Administrator

APPROVED AS TO FORM AND LEGALITY:

FREDERICK E. LANDT, III
City Attorney

CERTIFICATE OF POSTING

I HEREBY CERTIFY that copies of the foregoing Ordinance were posted at City Hall, the Chamber of Commerce, and the Belleview Library, in the City of Belleview, Florida, on the 24th day of October, 2007.

Margaret DeGennaro

Margaret DeGennaro, CMC, CPS
Deputy City Clerk

CITY OF OCALA

WATER CONSERVATION SURVEY

Education, Regulation, and Incentives

Do you enforce Water Management District watering restrictions that determine the time and days for outdoor watering? (YES)

If yes, what are the penalties for violations? Describe -knock on customer door and talk with them about conservation.

Do you have a landscape ordinance that requires Florida Friendly landscaping? It is in draft form plan to bring to council before year is over

Do you have staff dedicated to water conservation? Yes The City has combined Water and Electrical conversation together in one program

Do you participate in any other educational and outreach activities related to water conservation? Describe - Yes, the WAV program through the St. John's water management district

Do you provide water efficient plumbing retrofit kits? These can include low-flow shower heads, low-volume toilets. NO; Due to funding issues the city does not provide the low flow fixtures on a routine basis.

Do you provide rain sensors for retrofit of irrigation systems? No the city does not currently provide irrigation equipment

Do you regulate construction of wells smaller than 6" in casing diameter? Yes if the well is in an area where city water service is already provided as per ordinance.

Drinking Water

Do you have a utility that provide drinking water to residents? Yes

If yes, please provide the rates and fees that you charge for the water. (Please see attached)

If yes, do you perform periodic audits of the distribution system to measure leakage? Not currently, a plan is being developed to better account for water loss

If yes, do you conduct systematic searches for leaks in your distribution system? Not on a consistent basis

If yes, are developments that hook up to your water required to use Florida Friendly landscaping practices? Not currently, a plan is being developed

If yes, do you send educational materials regarding water conservation to your accounts? NO not on a mass scale, typically use the water conservation coordinator to "get the message out"

If yes, do you notify high volume water users that they may be able to reduce their consumption? Yes we do talk with heavy water users, typically we find that the high water use is from not properly maintaining their irrigation system correctly, or they have a leak.

If yes, do you monitor and detect plumbing leaks through meter readings? Not currently, however the city is implementing and will be on-line by the first of the year an automatic meter reading program that can detect leaks.

If yes, do you maintain pressure in your distribution system such that leaks and high flow rates are avoided? NO

If yes, do you know what your rate of water use is per person? Describe ___The average residential use is 114 gpcd ____

If yes, do you have projections of your rate of water use per person in the future? Describe ___Per our CUP we do use an average projection of 100 gpcd_____

Please provide any readily available maps of existing potable water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format) Not able to that at this time

Reuse Water

Do you have a centralized wastewater treatment facility? YES

If yes, what are its current flows? _approximately 5.6 MGD_____

If yes, do you have future flow projections? Describe ____As part of our master plan we did develop future flow projections, and for 2028 the projection is 9.60 MGD_____

If yes, does it provide reclaimed water? YES

If yes, do you have plans to upgrade this facility? Describe ___Yes there are conceptional plans to upgrade systems to enhance treatment and provide for additional growth if necessary _____

Do you require dual lines for new development, so that these areas can receive reclaimed water for irrigation when it becomes available? Yes but currently only in areas within range of existing reuse lines

Do you have a recent water/wastewater masterplan? YES (Josh Schmitz should already have a copy if not we will send another)

Do you have decentralized wastewater treatment facilities (other than septic tanks), such as package plants? NO

If yes, please describe_____

If yes, does it provide reclaimed water?

Do you have any future plans with respect to reclaimed water? Describe - YES We plan on constructing more reuse lines to get reuse water to various parts of the city, so that there will be more options for new growth to use reclaimed water. _____

Please provide any readily available maps of existing reuse water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format) Not possible at this time.

CITY OF OCALA: Changes in Fee Schedule

WATER AND SEWER RATES

DESCRIPTION	CURRENT FY 2008-2009	PROPOSED CHANGES - FY 2009-2010
Sewer Charges		
Sewer Base Rate - Residential:		
5/8 inch meter	$22.32	
1 inch meter	$22.32	
1 1/2 inch meter	$22.32	
2 inch meter	$22.32	
Sewer Base Rate - Commercial:		
5/8 inch meter	$32.23	
1 inch meter	$114.76	
1 1/2 inch meter	$181.44	
2 inch meter	$368.37	
3 inch meter	$546.95	
4 inch meter	$1,186.50	
6 inch meter	$1,536.32	
8 inch meter	$2,879.73	
Residential & Commercial Sewer		
Consumption Rates		
Volume Charger per 100 cubic ft	$2.18	
No charge over 1,300 cubic feet for residential customers only.		
Flat Rate Sewer Charge	$37.73	
Sewer Front Foot Connection Fee	$40.00 per front foot	
Reclaimed Water Service Charges		
Monthly Base Rate per Unit	$4.60	
Consumption Rate per 100 CF:		
0-2,500	$0.36	
2,500 and above	$0.56	
Large Volume Users (3 inch meter		
or greater)		
Consumption Rate per 100 CF	$0.07	
City Installed		
5/8 inch meter	$1,200.00	
1 inch meter	$1,260.00	
1 1/2 inch meter	$2,000.00	
2 inch meter	$2,350.00	
Developer Installed		
5/8 inch meter	$292.00	
1 inch meter	$350.00	
1 1/2 inch meter	$531.00	
2 inch meter	$558.00	
Service Charge	$40.00	
Water Charges		
Water Meter Installation Charges		
City Installed		
5/8 inch meter	$1,200.00	
1 inch meter	$1,260.00	
1 1/2 inch meter	$2,000.00	
2 inch meter	$2,350.00	
3 inch and up	Actual cost plus overhead	

CITY OF OCALA: Changes in Fee Schedule

WATER AND SEWER RATES

DESCRIPTION	CURRENT FY 2008-2009	PROPOSED CHANGES - FY 2009-2010
Developer Installed		
5/8 inch meter	$292.00	
1 inch meter	$350.00	
1 1/2 inch meter	$531.00	
2 inch meter	$558.00	
3 inch and up	Actual cost plus overhead	
Service Charge	$40.00	
Hydrant or Jumper Service Deposit		
5/8 inch meter	$125.00	
3 inch meter	$750.00	
Hydrant or Jumper Monthly Flat Rate	$30.00 plus consumption	
Water Meter Test Fee	$50.00	
Water Base Rates		
5/8 inch meter	$9.20	
1 inch meter	$28.68	
1 1/2 inch meter	$52.15	
2 inch meter	$116.79	
3 inch meter	$220.15	
4 inch meter	$265.57	
6 inch meter	$408.56	
8 inch meter	$598.53	
Water Consumption Rates		
Residential & Commericial Irrigation		
Volume Charge per 100 cubic feet:		
0 - 1,400 cubic feet	$0.72	
1,401 - 2,000 cubic feet	$1.12	
2,001 - 5,000	$1.81	
5,001 - 10,000	$3.63	
10,001 and above	$7.25	
Water Consumption Rates		
Commercial/Industrial Non-Irrigation		
Volume Charge per 100 cubic feet:	$0.92	
Commercial/Residential Monthly		
Base Charge (Master Meter)	$8.28	

CITY OF DUNNELLON

WATER CONSERVATION SURVEY

Education, Regulation, and Incentives

Do you enforce Water Management District watering restrictions that determine the time and days for outdoor watering? Y / (N)

If yes, what are the penalties for violations? Describe _____

Do you have a landscape ordinance that requires Florida Friendly landscaping? Y/(N)

Do you have staff dedicated to water conservation? Y /(N)

Do you participate in any other educational and outreach activities related to water conservation? Describe NO

Do you provide water efficient plumbing retrofit kits? These can include low-flow shower heads, low-volume toilets, low-flow faucets, etc Y /(N)

Do you provide rain sensors for retrofit of irrigation systems? Y (N)

Do you regulate construction of wells smaller than 6" in casing diameter? Y /(N)

Drinking Water

Do you have a utility that provide drinking water to residents? (Y)/ N

If yes, please provide the rates and fees that you charge for the water.
Resolution 2008-13 attached

If yes, do you perform periodic audits of the distribution system to measure leakage? (Y) / N

If yes, do you conduct systematic searches for leaks in your distribution system? yes

If yes, are developments that hook up to your water required to use Florida Friendly landscaping practices? No

If yes, do you send educational materials regarding water conservation to your accounts? Y (N)

If yes, do you notify high volume water users that they may be able to reduce their consumption? Y (N)

If yes, do you monitor and detect plumbing leaks through meter readings? (Y)* / N
*If #'s are extraordinary

If yes, do you maintain pressure in your distribution system such that leaks and high flow rates are avoided? Y / N

If yes, do you know what your rate of water use is per person? Describe 111.6 gpd avg per capita
AS REPORTED SWFWMD 2007 WUS

If yes, do you have projections of your rate of water use per person in the future? Describe NO

Please provide any readily available maps of existing potable water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format) attached

Reuse Water

Do you have a centralized wastewater treatment facility? (Y) / N

If yes, what are its current flows? 150,000 GPD

If yes, do you have future flow projections? Describe No

If yes, does it provide reclaimed water? Y / (N)

If yes, do you have plans to upgrade this facility? Describe _____

Do you require dual lines for new development, so that these areas can receive reclaimed water for irrigation when it becomes available? Y / (N)

Do you have a recent water/wastewater masterplan? Y / N

If yes, please provide a copy (CD format is fine). WW Comp Plan attached

Do you have decentralized wastewater treatment facilities (other than septic tanks), such as package plants? N/A

If yes, please describe_____

If yes, does it provide reclaimed water?

Do you have any future plans with respect to reclaimed water? Describe No

Please provide any readily available maps of existing reuse water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format)

RESOLUTION NO. 2008-13

RESOLUTION OF THE CITY OF DUNNELLON REVISING THE WATER "BASE RATE" (AVAILABILITY) CHARGE, REVISING THE WATER UTILITY RATES, REVISING THE MONTHLY SEWER RATES AND CHARGES FOR RESIDENTIAL, COMMERCIAL/RESIDENTIAL, COMMERCIAL AND INDUSTRIAL ACCOUNTS; REVISING THE MONTHLY AVAILABILITY CHARGE FOR UNMETERED FIRE LINES AND FIRE HYDRANTS; PROVIDING FOR CONFLICTS, SEVERABILITY AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the City of Dunnellon, Florida provides water and/or sewer service to certain areas within and without the City Limits; and

WHEREAS, the City's utility systems require routine maintenance; and

WHEREAS, the City of Dunnellon has the responsibility to operate its public utilities in a fiscally sound manner; and

WHEREAS, the City finds that the water utility can be operated in a fiscally sound manner and encourage water conservation by utilizing a tiered water rate structure; and

WHEREAS, the charges enumerated below have been found by the City Council to be fair and reasonable, and to be sufficient for the immediate operating needs of the water utility

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Dunnellon that the owner, tenant or occupant of premises shall pay monthly water and sewer service charges for the use of the services and facilities of the water and sewer system as follows;

Section 1: Monthly sewer rates and charges shall be the aggregate of the following:

A. Residential Customers:

1. Establishing the Base Rate Charge for all residential customers providing usage up to the established "Minimum Monthly Gallons", of 4000 gallons.

BASE RATE:

MINIMUM MONTHLY GALLONS

UP TO 4,000 gallons $30.72

2. $7.04 per 800 gallons, or portion thereof, of sewage discharge for usage greater than the "Minimum Monthly Gallons".

B. Commercial-Residential Customers:

1. The "Minimum Monthly Availability Charge" for usage up to the established "Minimum Monthly Gallons".

METER SIZE -	MINIMUM MONTHLY GALLONS	MIMIMUM MONTHLY MONTHLY AVAILABILITY CHARGE
¾ inch -	3,000 gal	$ 35.66
1 inch -	5,000 gal	$ 50.49
1¼ inch -	7,500 gal	$ 65.76
1½ inch -	10,000 gal	$ 85.90
2 inch -	16,000 gal	$ 145.22
2½ inch -	20,000 gal	$ 178.16
3 inch -	30,000 gal	$ 235.82
4 inch -	50,000 gal	$ 375.85

2. $7.04 per 800 gallons, or portion thereof, of sewage discharge for usage amounts greater than the "Minimum Monthly Gallons".

C. Commercial Customers:

1. The "Minimum Monthly Availability Charge" for usage up to the established "Minimum Monthly Gallons".

METER SIZE - MINIMUM MONTHLY GALLONS		MIMIMUM MONTHLY AVAILABILITY CHARGE	
¾	inch - 3,000 gal	$	38.14
1	inch - 6,250 gal	$	60.82
1¼	inch – 9,370 gal	$	81.19
1½	inch – 12,500 gal	$	106.51
2	inch – 20,000 gal	$	178.16
2½	inch – 25,000 gal	$	219.35
3	inch – 37,500 gal	$	297.60
4	inch – 62,500 gal	$	478.81
6	inch –125,000 gal	$	952.42
8	inch -200,000 gal	$	1,487.81

2. $7.04 per 800 gallons, or portion thereof, of sewage discharge for usage amounts greater than the "Minimum Monthly Gallons".

D. Industrial Customers:

1. The "Minimum Monthly Availability Charge" for usage up to the established "Minimum Monthly Gallons".

METER SIZE - MINIMUM MONTHLY GALLONS		MIMIMUM MONTHLY AVAILABILITY CHARGE	
¾	inch - 75,000 gal	$	345.18
1	inch - 75,000 gal	$	351.51
1¼	inch - 150,000 gal	$	680.69
1½	inch – 150,000 gal	$	689.80
2	inch - 150,000 gal	$	721.05
2½	inch - 250,000 gal	$	1,060.90

3	inch - 250,000 gal	$	1,077.58
4	inch - 300,000 gal	$	1,456.13
6	inch - 300,000 gal	$	1,610.28
8	inch - 300,000 gal	$	1,766.97

2. $7.04 per 800 gallons, or portion thereof, of sewage discharge for usage amounts greater than the "Minimum Monthly Gallons".

Section 2: Monthly water rates and charges for customers shall be based upon the meter size as specified herein:

A. Residential Customers:

METER SIZE - MINIMUM MONTHLY GALLONS		MONTHLY SURCHARGE FEE	MIMIMUM MONTHLY AVAILABILITY CHARGE (PER THOUSAND GAL)
¾ inch	0-4,000	$ 7.08	$ 1.94
	4,001-8,000	$ 7.08	$ 2.28
	8,001-12,000	$ 7.08	$ 4.28
	12,001-20,000	$ 7.08	$ 7.48
	Greater than 20,000	$ 7.08	$ 9.63
1 inch	0-4,000	$ 7.08	$ 1.94
	4,001-8,000	$ 7.08	$ 2.28
	8,001-12,000	$ 7.08	$ 4.28
	12,001-20,000	$ 7.08	$ 7.48
	Greater than 20,000	$ 7.08	$ 9.63
1¼ inch	0-4,000	$ 7.08	$ 1.94
	4,001-8,000	$ 7.08	$ 2.28

	8,001-12,000	$	7.08	$	4.28
	12,001-20,000	$	7.08	$	7.48
	Greater than 20,000	$	7.08	$	9.63
1½ inch	0-4,000	$	7.08	$	1.94
	4,001-8,000	$	7.08	$	2.28
	8,001-12,000	$	7.08	$	4.28
	12,001-20,000	$	7.08	$	7.48
	Greater than 20,000	$	7.08	$	9.63

B. Commercial-Residential, Commercial and Industrial Customers:

METER SIZE - MINIMUM MONTHLY GALLONS		MONTHLY SURCHARGE FEE		MIMIMUM MONTHLY AVAILABILITY CHARGE (PER THOUSAND GAL)	
¾ inch	0-4,000	$	7.08	$	1.94
	4,001-8,000	$	7.08	$	2.28
	8,001-12,000	$	7.08	$	2.86
	12,001-20,000	$	7.08	$	4.27
	Greater than 20,000	$	7.08	$	6.42
1 inch	0-10,000	$	17.68	$	1.94
	10,001-20,000	$	17.68	$	2.28
	20,001-30,000	$	17.68	$	2.86
	30,001-50,000	$	17.68	$	4.27
	Greater than 50,000	$	17.68	$	6.42
1¼ inch	0-12,000	$	21.22	$	1.94

	12,001-24,000	$	21.22	$	2.28
	24,001-36,000	$	21.22	$	2.86
	36,001-60,000	$	21.22	$	4.27
	Greater than 60,000	$	21.22	$	6.42
1½ inch	0-20,000	$	35.36	$	1.94
	20,001-40,000	$	35.36	$	2.28
	40,001-60,000	$	35.36	$	2.86
	60,001-100,000	$	35.36	$	4.27
	Greater than 100,000	$	35.36	$	6.42
2 inch	0-32,000	$	56.58	$	1.94
	32,001-64,000	$	56.58	$	2.28
	64,001-96,000	$	56.58	$	2.86
	96,001-160,000	$	56.58	$	4.27
	Greater than 160,000	$	56.58	$	6.42
2½ inch	0-48,000	$	84.87	$	1.94
	48,001-96,000	$	84.87	$	2.28
	96,001-144,000	$	84.87	$	2.86
	144,001-240,000	$	84.87	$	4.27
	Greater than 240,000	$	84.87	$	6.42
3 inch	0-64,000	$	113.16	$	1.94
	64,001-128,000	$	113.16	$	2.28
	128,001-192,000	$	113.16	$	2.86
	192,001-320,000	$	113.16	$	4.27
	Greater than 320,000	$	113.16	$	6.42
4 inch	0-100,000	$	176.81	$	1.94

	100,001-200,000	$	176.81	$	2.28
	200,001-300,000	$	176.81	$	2.86
	300,001-500,000	$	176.81	$	4.27
	Greater than 500,000	$	176.81	$	6.42
6 inch	0-200,000	$	353.63	$	1.94
	200,001-400,000	$	353.63	$	2.28
	400,001-600,000	$	353.63	$	2.86
	600,001-1,000,000	$	353.63	$	4.27
	Greater than 1,000,000	$	353.63	$	6.42
8 inch	0-320,000	$	565.80	$	1.94
	320,001-640,000	$	565.80	$	2.28
	640,001-960,000	$	565.80	$	2.86
	960,001-1,600,000	$	565.80	$	4.27
	Greater than 1,600,000	$	565.80	$	6.42

Section 3: Monthly rates and charges for each unmetered fire line or fire hydrant on private property available to be utilized for private fire protection shall be the "Monthly Availability Charge" as specified herein.

WATER LINE SIZE		MONTHLY AVAILABILITY CHARGE
2	inch	$ 11.32
3	inch	$ 22.63
4	inch	$ 35.36
6	inch (or Hydrant)	$ 70.73
8	inch	$ 113.16

Section 4: Bulk Water Purchases. Purchases of bulk water utilizing a hydrant meter shall be subject to an initial set-up charge of $100, a deposit consistent with the commercial deposit rate and terms in effect at that time, and a monthly base (availability) charge in addition to the water rates enumerated in Section 2. One-time bulk water purchases will be subject to a one-time set up charge of $100 and the water rates enumerated in Section 2.

If a bulk water purchase requires a tap into a main, then the water hookup

fees for new service which are in effect at the time of the tap will apply in lieu of the initial set-up charge. All other charges (deposit, availability and water rates) will apply as outlined in the preceding paragraph.

Section 5: Conflicts. That all resolutions and parts of resolution in conflict with this resolution are hereby repealed.

Section 6: Severability. If any portion of the Resolution shall be declared unconstitutional or if the applicability of this Resolution or any portion thereof to any person or circumstances shall be held invalid, the validity of the remainder of this Resolution and the applicability of this Resolution, or any portion thereof to other persons or circumstances, shall not be affected thereby.

Section 7: Effective Date. This Resolution shall become effective November 1, 2008.

Upon motion duly made and carried, the foregoing Resolution was accepted by the City Council of the City of Dunnellon this 13th day of October, 2008.

ATTEST: Signed Copy on File @ City Hall

DAWN M. BOWNE, CMC FRED WARD, MAYOR

Approved as to form:

Approved as to Form and Legality
for use and reliance by the City
of Dunnellon, Florida:

City Attorney
James A. Fowler
Fowler & O'Quinn, P.A.
28 W. Central Blvd. 4th Floor
Orlando, FL. 32801

City of Dunnellon

Comprehensive Plan

Infrastructure Element - Wastewater Treatment

TABLE OF CONTENTS

identification of the infiltration problem could not be identified. The I & I problems occur mainly in the low-lying areas along Palmetto Way, located along the Rainbow River (due to joint failures and hammer taps) and along the eastern portion of The Granada. I & I problems also occur along the lower portions (south end) of Magnolia Street and Myrtle Street. The sewer along Pennsylvania Avenue has open laterals that allow infiltration and dirt and debris to enter the sewer. In addition, the old manholes in this section of the City have frames and covers that were originally designed to allow the inflow of storm water.

When too much excess water enters our sewers as Infiltration or Inflow, the following problems may occur:

- Sewage may backup into residents homes creating a health hazard and an expensive cleanup of their property;
- Sewage may overflow from manholes or bypass treatment facilities contaminating properties as well as rivers;
- Sewer systems will require upgrades sooner than designed resulting in increased utility bills to residents;
- Infiltration and inflow will use up existing hydraulic capacity in our sewers which will restrict the opportunity for growth;
- Excessive water in our sewers will decrease the efficiency of wastewater treatment plants and will result in higher operating costs of these plants as well as increased utility bills to residents.

Description of Existing Facilities

Prior to 1960, the City discharged sanitary sewerage flows directly to the Rainbow River. In the 1960's, the City pumped those sanitary sewerage flows to a conventional trickling filter WWTP, which provided up to 0.250 MGD of secondary treatment capacity and discharged treated, disinfected effluent to the Rainbow River.

In 1993, the City replaced that WWTP with the current WWTP that does not discharge to the Rainbow River. Treated effluent is pumped from the WWTP to a spray field irrigation site located approximately one mile southeast of the Dunnellon WWTP.

As of 2002, there were 11 miles of traditional gravity sewers and eight lift stations pumping sanitary sewerage to the City of Dunnellon Wastewater Treatment Plant (WWTP) located in the southeast portion of the City. The City currently has 1,030 water connections. Approximately 21 percent of the connections are for commercial users. The average water use per connection (combined residential and commercial) is 358 gallons per day (GPD) per connection. (Source: Wastewater Collection System and Facilities Planning Study – City of Dunnellon, Florida, 2002)

The sanitary sewer service area, as depicted on the Sanitary Sewer Service Area map borders Rolling Hills Road to the west, Powell Road to the north, the Rainbow River to the east, and the Withlacoochee River to the south. Some existing sewer service connections are located along US 41, and an apartment complex is located to the north. Limited sewer service is also available around the southeast portion of Blue Cove Lake.

year. Urban land is more than 70 percent covered with shopping centers, parking lots, large buildings, streets, sidewalks, and other structures. Urban land is primarily located in the commercial areas near the intersection of U.S. 41 (Williams Street) and CR 484 (Pennsylvania Avenue). Although it is impossible to observe Urban Land, it is suitable soil for development but lacks the qualities that would make this soil series ideal for septic systems. The Tavares soil series is well drained, but due to its fluctuations with the water table and saturation levels during the wet season, it is not the most ideal soil for septic systems. With some modifications, this soil would be suitable for septic systems due to low to middle erosion levels and its moderate to high suitability for development. Please refer to Map 2 for more information regarding which areas of the City of Dunnellon are ideal for septic systems.

Sanitary Sewer: Facility Capacity Analysis

Performance Assessment:

The City's existing sewage treatment system was constructed in various stages beginning in 1908. The treatment plant was constructed in 1965. The existing plant facilities were initially constructed as part of the 1964-65 construction program and later upgraded with filters in 1979.

The plant has a design capacity of 0.250 mgd average daily flow, based on previous design reports and facility permitting. Historically, trickling filter facilities average approximately eighty (80) percent treatment capability; additional filtration strives to achieve secondary treatment levels with ninety (90) percent removal of Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS). The tickling filter process is a nitrification process and does not remove nitrogen largely from the influent concentration. Consequently, nitrate nitrogen is present in the plant effluent.

The WWTP is producing a high quality effluent, with annual averages for carbonaceous biochemical oxygen demand (CBOD) and total suspended solids (TSS) in 2001 at 6 mg/l and 1 mg/l, respectively, which are well below the permitted annual average discharge limits for these two parameters of 20 mg/l. The annual average nitrate concentrations in the WWTP effluent to the spray field are 2 mg/l, and the maximum month concentration is 3 mg/l. The nitrate levels have not exceeded the discharge permit limit of 12 mg/l (single sample) during the past 2.5 years, indicating that the plant is being operated properly to achieve nitrification and denitrification of wastewater.

It is estimated that a portion of the collection system is antiquated and needs upgrading or maintenance. The City has a chemical treatment maintenance program for the mains, but mechanical maintenance occurs on as-needed basis. Some of the mains are over 70 years old, and perhaps are clogged. Preliminary evaluation of certain mains by the City found some partially clogged mains. It is estimated that an assessment of the maintenance needs of all the mains may be necessary in order to provide for future demands. While upgrading of the mains has not been determined to be an immediate health of safety need, funding for upgrading of sewer mains has been allocated in the Capital Improvement 5-year schedule of improvements.

located north of the City limits, will be added to the central sewer system. The wastewater system upgrades is divided into four phases

Phase 1 (2003 to 2004)

- Includes four separate collection system projects designed to upgrade existing transmission systems (including five of the eight pump stations), reduction of infiltration and inflow (I & I).

Phase 1 increased capacity of the sewer system for connection of existing residential areas and future growth and development.

Phase 2 (Current Phase – 2005 to 2006)
Provides sewer collection systems to five of the eight residential areas currently on failing septic systems including:

- Blue Cove
- Hendrix Drive
- Riverview
- Vogt Springs/Nine Island Cove
- Indian Cove

Connection of these five residential areas will provide an additional 160 new connections, and increase the wastewater flow by approximately 35,000 gpd, not including projected residential and commercial connections from in-fill growth and development with the City.

Phase 3 (2007 to 2009)
Includes the expansion of the wastewater treatment facilities and associated spray field land application system to accommodate the additional flows and loads from existing residential areas and related growth and development within the service and planning areas. The proposed 30-year design flow for the WWTP is 0.420 MGD. Phase 3 also includes expansion of the SR 41 transmission system to handle future wastewater flows from the remaining residential areas on the north portion of the City to receive sanitary sewers in Phase 4.

Phase 4 (2010 to 2011)
Provides sewer collection systems to three of the eight remaining residential areas currently on failing septic systems. The three remaining residential areas include:

- Dunnellon Heights
- Hillsdale/Powell Road
- Chatmire (Chatmire is located north of the City limits)

206 new residences will be connected and increase the wastewater flow by approximately 45,000 gpd.

Under the growth alternative selected by the City Council, an additional 420 new residential connections (21 residential connections per year) are projected over the next 20-years, in addition to the 366 residential connections that will occur following construction of sanitary sewer collection systems for the eight existing residential areas.

Goals, Objectives, and Policies

The goals, objectives, and policies of the infrastructure element are amended to adopt the following Wastewater Treatment goals, objectives, and policies. The adopted goals, objectives, and policies are retained to the extent that such goals, objectives, and policies address potable water, solid waste, and stormwater drainage.

Goal: The City of Dunnellon will secure adequate capacity for treatment and disposal of wastewater, install and maintain adequate wastewater collection and transmission facilities, take steps to conserve water, protect aquifers and ground water resources, provide greater environmental protection, and maintain sufficient services for the sanitary sewer customers.

Objective 1.1:
Maximize the use of existing facilities, through the implantation of programs and adoption of land development regulations which reduce urban sprawl.

Policy 1.1.1: Replacement, improvement or expansion of facilities shall be coordinated with adopted level of service standards, and shall incorporate peak demand coefficients when determining capacity and demand. [*Former policy 1.1.5*]

~~**Policy 1.1.2:** Continue or strengthen existing maintenance programs for City maintained water, sewer and drainage facilities. [Former policy 1.1.6]~~

Policy 1.1.3: The City of Dunnellon supports the use of reuse effluent for spray irrigation.

Objective 2.1:
The City of Dunnellon will eliminate existing deficiencies and hazards identified in the wastewater treatment facilities and add additional facilities and services to serve the future needs of the customers so that adopted LOS standards are maintained.

Policy 2.1.1: The City of Dunnellon hereby adopts an existing level of service standard of 87 gallons per day per person. Peak flow is assumed to equal 1.5 times average daily flow. Projected flows have been rounded to the nearest tenth.

Policy 2.1.2: The City shall implement provisions through the Land Development Regulations, which ensure that development orders are not issued which lower level of service standards below adopted standards. [*Former policy 1.2.2*]

Policy 2.1.3: For development where the Future Land Use Map of the comprehensive plan allows the use of septic tanks, development orders shall not be issued prior to demonstration that appropriate permits for on-site wastewater treatment systems have been obtained from the Marion County Health Department in accordance with DHRS Chapter 10D-6, F.A.C., and other federal, state and local agencies. [*Former policy 1.2.5*]

Funded with a state grant and a low interest loan, the City of Dunnellon will expand, replace, and rehabilitate the central sanitary sewer system through four phases between the years 2003 and 2012.

Policy 5.1.1: The sanitary sewer system will be operated as an independent enterprise, such that utility customers will bear all costs, and revenues will be used for the benefit of those customers. The rate schedule for sanitary sewer services will be based on public utility cost-of-service principles in Florida Statute 180.30.

Policy 5.1.2: The City shall continue the ongoing application to the Farmer's Home Administration for wastewater disposal loans and grants. Other options for funding shall also be researched and implemented if feasible, including:

- Feasibility of using CDBG program monies for infrastructure improvements during the next grant cycle;
- Application to Farmer's Home Administration and the ~~DER~~ DEP State revolving loan fund to assist in funding of sewer or water extension;
- ~~Technical and financial assistance from the Southwest Florida Water Management District under the Surface Water Improvement and Management program or Basin District under the Surface Water Improvement and Management program or Basin Board funding to correct the direct discharge of untreated stormwater into the Rainbow River at Palmetto Way; and~~
- ~~Establishment of the Dunnellon Heights Water Assessment District to provide water services to the Dunnellon Heights subdivision.~~ [*Former policy 1.3.3*]

Objective 6.1:
Establish priorities for the replacement of existing facility deficiencies, the correction of existing facility deficiencies, and providing for future facility needs.

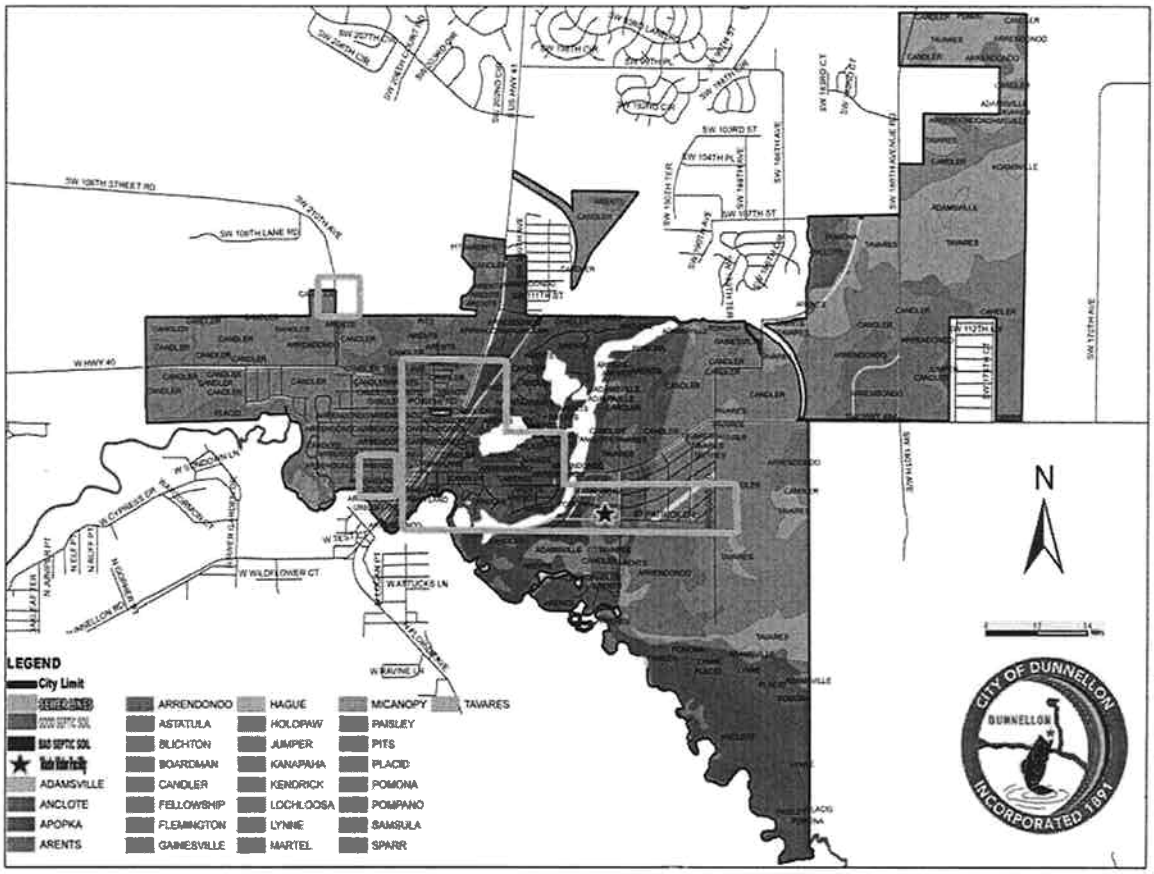
Policy 6.1.1:
Sanitary sewer capital improvements shall be implemented each year in order of priority. Improvements required for public health shall receive the highest priority; improvements related to providing the level of service standard shall receive the second highest priority; and operational, convenience, and other improvements shall receive the third highest priority.

Table 1: Wastewater Treatment Plants

Plant/Location	Operating Responsibility	Design Capacity gal/day	Demand gal/day	Number of Hookups
City of Dunnellon – Edgar Ave/San Jose Blvd	City of Dunnellon	250,000	150,000	725
Dunnellon High School – SW 180th Ave.	Marion County School Board	24,000	3,000	N/A

Source: City of Dunnellon, 2007 and Wastewater Collection System and Facilities Planning Study – City of Dunnellon, Florida, 2002

2026	1293	21	1314	284	5	289	1603	353,000
2027	1314	21	1335	289	5	294	1629	359,000
2028	1335	21	1356	294	5	299	1655	365,000
2029	1356	21	1377	299	5	304	1681	371,000
2030	1377	21	1398	304	5	309	1707	376,000
2031	1398	21	1419	309	5	314	1733	382,000
2032	1419	21	1440	314	5	319	1759	388,000
Totals (Year 2022)	1209	786	1230	264	96	269	1499	330,000
Totals (Year 2032)	1419	986	1440	314	146	319	1759	388,000


City of Dunnellon Waste Water Treatment Project
LEGEND
City Limit
ADAMSVILLE
ANCLOTE
APOPKA
ARENTS
ARRENDONDO
ASTATULA
BLICHTON
BOARDMAN
CANDLER
FELLOWSHIP
FLEMINGTON
GAINESVILLE
HAGUE
HOLOPAW
JUMPER
KANAPAHA
KENDRICK
LOCHLOOSA
LYNNE
MARTEL
MICANOPY
PAISLEY
PITS
PLACID
POMONA
POMPANO
SAMSULA
SPARR
TAVARES
N
CITY OF DUNNELLON
DUNNELLON
INCORPORATED 1891
Source: USDA, UF FDGL
NOV 2007
J.Hackley

TOWN OF MCINTOSH

Withlacoochee Regional Water Supply Authority – Regional Water Supply Plan Update for the Inclusion of Marion County

WATER CONSERVATION SURVEY

Education, Regulation, and Incentives

Do you enforce Water Management District watering restrictions that determine the time and days for outdoor watering? Y / (N)

If yes, what are the penalties for violations? Describe _____

Do you have a landscape ordinance that requires Florida Friendly landscaping? Y (N)

Do you have staff dedicated to water conservation? Y (N)

Do you participate in any other educational and outreach activities related to water conservation? Describe WEBSITE

Do you provide water efficient plumbing retrofit kits? These can include low-flow shower heads, low-volume toilets, low-flow faucets, etc Y / (N)

Do you provide rain sensors for retrofit of irrigation systems? Y / (N)

Do you regulate construction of wells smaller than 6" in casing diameter? Y / (N)

Drinking Water

Do you have a utility that provide drinking water to residents? (Y) N

If yes, please provide the rates and fees that you charge for the water.

If yes, do you perform periodic audits of the distribution system to measure leakage? (Y) N

If yes, do you conduct systematic searches for leaks in your distribution system? (Y)

If yes, are developments that hook up to your water required to use Florida Friendly landscaping practices? N/A

If yes, do you send educational materials regarding water conservation to your accounts? Y / (N)

If yes, do you notify high volume water users that they may be able to reduce their consumption? Y / (N)

If yes, do you monitor and detect plumbing leaks through meter readings? (Y) N

If yes, do you maintain pressure in your distribution system such that leaks and high flow rates are avoided? (Y) N

If yes, do you know what your rate of water use is per person? Describe 350 gal/day/person

If yes, do you have projections of your rate of water use per person in the future? Describe SAME - POPULATION UNCHANGED

Please provide any readily available maps of existing potable water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format)

Reuse Water

Do you have a centralized wastewater treatment facility? Y / (N)

If yes, what are its current flows? _____

If yes, do you have future flow projections? Describe _____

If yes, does it provide reclaimed water? Y / N

If yes, do you have plans to upgrade this facility? Describe _____

Do you require dual lines for new development, so that these areas can receive reclaimed water for irrigation when it becomes available? Y / N

Do you have a recent water/wastewater masterplan? Y / N
If yes, please provide a copy (CD format is fine).

Do you have decentralized wastewater treatment facilities (other than septic tanks), such as package plants?

If yes, please describe N/A

If yes, does it provide reclaimed water?

Do you have any future plans with respect to reclaimed water? Describe NO

Please provide any readily available maps of existing reuse water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format)

RESOLUTION NO. 2009-03

A RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF McINTOSH ESTABLISHING GARBAGE RATES, WATER RATES, WATER DEPOSIT, WATER INITIAL CONNECTION FEE, SERVICE CHARGE FOR RECONNECTION OF WATER AND A FEE FOR LATE PAYMENT; REPEALING RESOLUTION NO.: 2007-06; AND ESTABLISHING AN EFFECTIVE DATE.

WHEREAS, the Town of McIntosh, Florida operates and maintains a water utility system;

WHEREAS, the Town provides for garbage collection service; and

WHEREAS, at the Town Council meeting of August 9, 2007, the Town Council adopted Resolution No.: 2007-06, establishing garbage rates and water rates for residential and commercial customers;

WHEREAS, at the Town Council meeting of August 13, 2009, the Town Council adopted Ordinance No.: 2009-173, to provide for the establishment of water rates to be set by the Town Council by resolution, billing procedures, payment of fees and bills, service charge for reconnection, initial connection fee and to repeal Resolution No.: 2007-06; and

WHEREAS, the Town Council, after due study and consideration has determined that it is in the best interests of the citizens of the Town of McIntosh to establish the following rates for garbage, water, water reconnection fee, service charge for reconnection of water and a fee for late payment.

NOW, THEREFORE, BE IT RESOLVED BY THE PEOPLE OF THE TOWN OF McINTOSH that the following is hereby adopted:

1. Garbage rates shall be $15.13 per month for residential customer curbside pickup. Garbage rates shall be $17.00 for residential customers for back door pickup. Commercial rates shall be established per the Town's agreement with the appropriate subcontractor.

2. Monthly water rates shall be as follows for all residential and commercial customers, with the exception of Mobile Home Parks:

GALLONS	RATE
0 – 5,000	$9.00
5,001 – 10,000	$9.00 for the first 5,000 gallons, plus $0.75 for each additional 1,000 gallons (or fraction thereof)
10,001 and over	$12.75 for the first 10,000 gallons, plus $1.00 for each additional 1,000 gallons (or fraction thereof)

3. Monthly water rates for Mobile Homes Parks shall be $9.00 minimum per unit, plus $0.75 for each additional 1,000 gallons (or fraction thereof) used up to 10,000 gallons, and $1.00 for each additional 1,000 gallons (or fraction thereof) over 10,001 gallons.

4. Initial connection fee of $400.00 or actual cost of the meter for a water line which exceeds the standard diameter.

5. Deposits for new customers shall be $60.00.

6. Service fee of $10.00 for establishing a new account.

7. Service charge for reconnection shall be $10.00.

8. Late payment fee shall be $5.00.

9. Resolution No.: 2007-06 and all resolutions in conflict with this resolution are hereby repealed to the extent of conflict with this resolution.

10. This resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED by the Town of McIntosh, this 13th day of August, 2009.

ATTEST:

Debbie Miller
Town Clerk

TOWN COUNCIL OF THE TOWN OF McINTOSH, FLORIDA:

Frank Ciotti, President
Town Council

Approved by me as Mayor of the Town of McIntosh, Florida this 13th day of August 2009.

Cary McCollum
Mayor

APPROVED AS TO FORM AND CORRECTNESS:

Brent E. Baris, Esq.
Town Attorney

MARION COUNTY

WATER CONSERVATION SURVEY

Education, Regulation, and Incentives

Do you enforce Water Management District watering restrictions that determine the time and days for outdoor watering? Y / N

If yes, what are the penalties for violations? Describe. Upon receipt of complaints or reported violations, residents are sent a warning letter that describes the ordinance. If there is a repeat offense, it is $50 for the 2nd violation, $100 for the 3rd, and $250 for the 4th and subsequent violations.

Do you have a landscape ordinance that requires Florida Friendly landscaping? Y/N

We have a Landscape Ordinance supports the use of Florida Friendly Landscaping but it does not require it.

Do you have staff dedicated to water conservation? Y / N

Nia Haynes was hired to serve as the County Water Conservation Coordinator and is working on a number of public education programs to support water conservation.

Do you participate in any other educational and outreach activities related to water conservation? Describe We conduct workshops targeted to high use housing developments, workshops for general public, and participate in public events (festivals etc). We also maintain an educational page on the utility website. We have also hired a landscape irrigation consultant to provide irrigation and landscape evaluation and education program to 150 residents that we have targeted as high water users.

Do you provide water efficient plumbing retrofit kits? These can include low-flow shower heads, low-volume toilets, low-flow faucets, etc Y / N

We have identified these type programs for implementation. We are starting with low flow faucet aerators. As cooperative funding becomes available from the Water Management Districts, we would like to expand the programs.

Do you provide rain sensors for retrofit of irrigation systems? Y / N

As part of the landscape and irrigation evaluation and education program, meters are installed on participating irrigation systems, rain sensors are verified to be working and replaced if need be, and participants are required to report irrigation consumption for 12 months.

Do you regulate construction of wells smaller than 6" in casing diameter? Y /N

We have requested that the Water Management Districts review the need to regulate these wells more closely. When we implemented water conservation rate structures across our service area, many residents simply went to DOH and requested irrigation wells and DOH permitted all of them. We have now witnessed customers cross connecting their irrigation well to their potable water supply.

Drinking Water

Do you have a utility that provides drinking water to residents? Y / N

If yes, please provide the rates and fees that you charge for the water.

If yes, do you perform periodic audits of the distribution system to measure leakage? Y / N

If yes, do you conduct systematic searches for leaks in your distribution system?

Yes, we have a system wide audit underway right now.

If yes, are developments that hook up to your water required to use Florida Friendly landscaping practices?

Our Landscape Ordinance promotes the use of Florida Friendly Landscaping and prevents Homeowner's Associations and Developers from preventing its use.

If yes, do you send educational materials regarding water conservation to your accounts? Y / N

If yes, do you notify high volume water users that they may be able to reduce their consumption? Y / N Yes, send out letters to notify customers with unusually high water use to review our water conservation website and/or to have their irrigation system checked.

If yes, do you monitor and detect plumbing leaks through meter readings? Y / N

We do not currently have full capability to conduct this monitoring. Where we have automated meter reading, we do pull leak reports and check for leaks. We are moving toward a full automated meter reading system that will allow us to better monitor small leaks.

If yes, do you maintain pressure in your distribution system such that leaks and high flow rates are avoided? Y / N

If yes, do you know what your rate of water use is per person? Describe

Yes, we have several different Public Water Systems and the consumption use varies among them. We are targeting high use systems with Public Education and awareness training, direct mail notices, and monitoring to reduce over consumption.

If yes, do you have projections of your rate of water use per person in the future? Yes, we have aligned our water conservation program to comply with the water management districts per capita use of 150 gpd.

Please provide any readily available maps of existing potable water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format)

Reuse Water

Do you have a centralized wastewater treatment facility? Y / N

If yes, what are its current flows? We have 11 separate wastewater treatment facilities, with 2 currently producing reuse water West of I-75. The Oak Run WWTF which has a 3 month average flow of .458 MGD and supplies an average of 170,000 gallons of reuse water to the Oak Run Executive Golf Course. The SummerGlen WWTF which has a 3 month average daily flow of .109 MGD and provides an average of 92,000 gallons of reuse to the SummerGlen Golf Course. Other future Capital Improvement Projects include: additional reuse lines from the Oak Run WWTF to Spruce Creek Preserve, a second Oak Run Golf Course, and to common areas at JB Ranch.

If yes, do you have future flow projections? We are in the process of completing our Utility Master Plan and future flow projections will defined in that plan.

If yes, does it provide reclaimed water? See response above. Y / N

If yes, do you have plans to upgrade this facility? We have plans to upgrade a number of facilities in the Capital Improvement Plan and all will include adding reuse effluent. The Northwest Sub-regional WWTF (Golden Ocala) is also a reuse facility but its flows are currently too low for quality reuse. Future flows, above 15,000 gpd will be used as reuse. Future plans are also to redevelop the Marion Oaks WWTF to a reuse facility.

Do you require dual lines for new development, so that these areas can receive reclaimed water for irrigation when it becomes available? Y / N

We have begun to encourage developers to install dual line systems within new development but the Land Development Code has not yet been revised to make it a requirement.

Do you have a recent water/wastewater masterplan? Y / N

We have only recently been provided a draft copy of the Master Plan for review. The master plan should be completed and adopted by the end of November 2009.

If yes, please provide a copy (CD format is fine).

Do you have decentralized wastewater treatment facilities (other than septic tanks), such as package plants?

If yes, please describe. We have some small package plants that we intend to remove from service as part of our regionalization program.

If yes, does it provide reclaimed water? None of the package plants will provide reuse water.

Do you have any future plans with respect to reclaimed water? See responses above.

Please provide any readily available maps of existing reuse water lines, sizes and interconnect locations. (GIS, CAD, or hard copy format)

MARION COUNTY UTILITIES

SCHEDULE OF SERVICE RATES AND CHARGES

Effective 04/03/09

Business Hours
Monday - Friday
8:30AM to 4:30PM

MARION COUNTY UTILITIES

1219 S. Pine Ave.
Ocala, FL 34471

OFFICE AND EMERGENCIES
Phone: 352.671.8510
Fax: 352.671.8511
E-mail: Utilities@marioncountyfl.org

Tel: 352.671.8510

COUNTYWIDE SYSTEMS

Water Rates per Service

Meter Size	Base Facility Charge
3/4"	$ 11.94
1"	$ 29.85
1.5"	$ 59.70
2"	$ 95.52
3"	$ 191.05
4"	$ 298.50
6"	$ 597.01
8"	$ 955.23

Water Gallonage Rate per Service

Residential Use	Rate/1,000 gallons
1– 6,000	$ 1.12
6,001– 12,000	$ 1.50
12,001– 20,000	$ 2.63
20,001– or more	$ 5.26

Non Residential Use	Rate/1,000 gallons
ALL USE	$ 1.50

Irrigation Use	Rate/1,000 gallons
1– 20,000	$ 2.63
20,001– or more	$ 5.26

Wastewater Rates per Service

Meter Size	Base Facility Charge
3/4"	$ 19.06
1"	$ 47.66
1.5"	$ 95.34
2"	$ 152.53
3"	$ 305.07
4"	$ 476.67
6"	$ 953.34
8"	$1525.33

Residential Use	Rate/1,000 gallons
1– 6,000	$ 4.86

Non Residential Use	Rate/1,000 gallons
ALL USE	$ 4.86

Wastewater Service Only

Monthly Charge	$ 48.19

SILVER SPRINGS REGIONAL

Water Rates per Service

Meter Size	Base Facility Charge
3/4"	$ 8.65
1"	$ 19.42
1.5"	$ 35.31
2"	$ 82.22
3"	$ 160.38
4"	$ 226.99
6"	$ 417.06
8"	$ 691.70

Water Gallonage Rate per Service

Residential Use	Rate/1,000 gallons
1– 6,000	$ 1.16
6,001– 10,000	$ 1.56
10,001– 13,000	$ 1.77
13,001– or more	$ 2.04

Non Residential Use	Rate/1,000 gallons
1– 6,000	$ 1.16
6,001– 10,000	$ 1.56
10,001– 13,000	$ 1.77
13,001– or more	$ 1.77

Wastewater Rates per Service

Meter Size	Base Facility Charge
3/4"	$ 15.88
1"	$ 42.14
1.5"	$ 83.50
2"	$ 149.37
3"	$ 260.43
4"	$ 473.97
6"	$ 778.84
8"	$1270.02

Residential Use	Rate/1,000 gallons
ALL USE	$ 3.50

Non Residential Use	Rate/1,000 gallons
ALL USE	$ 3.50

Wastewater Service Only

Monthly Charge	$ 36.86

WATER AND WASTEWATER RATE SCHEDULES

DEPOSIT REQUIREMENTS

Water
Residential Accounts
(can be waived with a credit check)

5/8 x 3/4 meter service	$ 50.00

Commercial Accounts

5/8 x 3/4 meter service	$ 60.00
1" meter service	$105.00
1.5" meter service	$210.00
2" meter service	$340.00

*Over 2"(estimated two months billing) determined case by case

Wastewater
Residential Accounts

5/8 x 3/4 meter service	$100.00

Commercial Accounts

5/8 x 3/4 meter service	$120.00
1" meter service	$215.00
1.5" meter service	$435.00
2" meter service	$680.00

*Over 2"(estimated two months billing) determined case by case

TERMS OF PAYMENT

Bills are due and payable when rendered and become delinquent if not paid by the due date stated on your bill. Service may be discontinued for non payment after five(5) working days written notice. A separate late notice will not be sent. Delinquency will be noted on the following months bill. To avoid a late charge, payments must be received in our office. Failure to receive a bill does not prevent service interruption or additional service charges. ***Accounts that have been disconnected due to non payment must pay the delinquent amount plus a reconnection fee before service will be restored.*

PAYMENT OPTIONS

Payments can be made at our billing office located at 1219 S. Pine Ave; at any of our drop box locations, by signing up for EFT, or by going online at www.marioncountyfl.org. Payments can also be mailed to Marion County Utilities, P.O. Box 31596, Tampa, FL 33631-3596. Be sure to include your payment coupon to ensure proper credit of your payment. MasterCard and Visa cards are accepted, as is cash, check or money order. Checks are processed through Tele-Check and identification must be shown.

DROP BOX LOCATIONS

Freedom Library—5870 SW 95th St
Palm Cay Guard House—SW 106th Pl
Marion Oaks Comm Ctr— 294 Marion Oaks Ln
Silver Springs Shores
Community Center—590 Silver Road
Marion County Utilities—1219 S. Pine Ave

Payments are collected on Monday evenings and Wednesday evenings. NO LATE or CASH PAYMENTS PLEASE

MISCELLANEOUS CHARGES

New Service Charges

Initial connection fee	$ 55.00
Same day service	$ 85.00
New service after hours	$ 100.00
Credit check fee	$ 5.00

Transfer Fee $ 55.00

Reconnection Charges

Regular working hours	$ 55.00
After working hours (up to 10PM)	$ 100.00
Holidays (County observed)	$ 150.00
Seasonal (3 day advance notice)	$ 25.00

Meter Tampering/theft of service $ 250.00

Reinstalling Meter
pulled for tampering $ 125.00

Service Leaks $ 30.00
After hours $ 120.00

Relocation of meter service $ 200.00

Water Meter Testing Charges $ 60.00
2" meter & over actual cost plus overhead

Removal of Irrigation Service $ 40.00

Late Payment Fees 5% of the unpaid balance or $5.00 whichever is greater

Return Check Charges

Check value up to $ 50.00	$ 25.00
$50.01 to $300.00	$ 30.00
Greater than $300.00	$ 40.00 or 5% of face, which ever is greater

MISCELLANEOUS CHARGES

Water Meter Installation Charges

5/8 x 3/4 meter	$ 360.00
1" meter	$ 470.00
1.5" positive displacement meter	$ 665.00
2" turbine meter	$ 835.00
2" compound meter	$1555.00
Above 2" meter	actual cost plus overhead

Service Tap Fees

Short tap	$ 480.00
Long tap	$ 610.00
Sewer lateral	$1160.00
Service line ext.-Dbl taps	2 times the single

New Construction Capital Charges
Please call for fees

HELPFUL TIPS

Check your irrigation system for leaks. Be sure sprinkler heads are seating properly and not wasting water. Consider having a separate turn off valve for your irrigation system in case you have a leak and need to make repairs.

Take a reading of the meter before you irrigate and when you finish, to calculate how much water you use each time you irrigate.

Repair faucet leaks and install low-flow aerators

Run only full loads when using your dishwasher or washing machine

As a precaution, when going away for an extended period, consider turning off your outside house valve to prevent damage in case of a leak.

Don't forget when going on vacation you will still have usage from your irrigation system running, if you have not turned it off.

Check toilets for leaks by adding food coloring to the water in the tank. If color appears in the bowl without flushing, there is a leak.

Water your lawn only when it needs it. Grass needs watering if it stays flat and doesn't spring back up after you step on it.

Plant drought tolerant trees and plants. They require far less watering than other species.

Put mulch around trees and plants. Mulch slows evaporation of moisture and will discourage weed growth.

CHECKING FOR LEAKS

You can check for a leak by looking at the water meter located on you property line. Most meters have a leak indicator on them.

Step 1 Make sure you are not using any water

Step 2 Look at the leak indicator on the face of the meter. If the indicator is turning you have a leak.

Step 3 Determine whether the leak is in your house or outside by turning off your outside house valve, if you have one. Go back to the meter and look at the indicator once again. If the indicator is still turning (or the leak signal on electronic meters) then your leak is outside between your house and the meter. If it is no longer turning then your leak is in your home.

Step 4 If your leak is in your home, check for drips in faucets, toilets, and outside hoses. Toilet leaks can use up to 200 gallons per day. Small drips in a faucet can waste 20 gallons a day. Larger leaks can waste hundreds.

OTHER COUNTY OFFICES

ANIMAL CENTER	352-671-8700
BUILDING DEPT	352-438-2400
CODE ENFORCEMENT	352-671-8900
COMMISSIONERS	352-438-2323
COMMUNITY SERVICES	352-671-8770
COUNTY EXTENSION	352-671-8400
FIRE RESCUE	352-291-8000
LIBRARY	352-368-4500
MSTU	352-438-2650
9-1-1 MANAGEMENT	352-671-8460
PARKS	352-671-8560
PLANNING	352-438-2600
PUBLIC WORKS	352-671-8350
RISK MANAGEMENT	352-629-8359
SOLID WASTE	352-671-8465
TRANSPORTATION	352-671-8686
VETERAN SERVICES	352-671-8422
ZONING	352-438-2675

APPENDIX B

SWFWMD WATER SHORTAGE ORDER NO. 07-08

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

IN RE:
RELEASING UNICORPORATED MARION COUNTY AND THE CITY OF OCALA FROM DECLARATION OF WATER SHORTAGE

SEVENTH BOARD ORDER
MODIFYING WATER SHORTAGE ORDER NO. SWF 07-02

The Governing Board of the Southwest Florida Water Management District (District), during a public hearing held on April 28, 2009, in Brooksville, Florida, received information and recommendations from District staff, and makes the following Findings of Fact and Conclusions of Law.

FINDINGS OF FACT

1. Based on a consideration of factors set forth in the District's Water Shortage Plan, on January 9, 2007, the Executive Director, upon authority delegated by the Governing Board, declared a District-wide modified Phase II Severe Water Shortage. The Governing Board concurred with the Executive Director's decision to issue Water Shortage Order No. SWF 07-02 during its meeting on January 30, 2007. The Order, as modified from time to time, is in effect through June 30, 2009. Water Shortage Order No. SWF 07-02, as modified, is hereinafter referred to as "Order No. SWF 07-02".

2. The boundaries of Marion County and the City of Ocala cross the boundaries of this District and the St. Johns River Water Management District ("SJR").

3. The boundaries of The Villages of Marion, a Florida Quality Development ("The Villages of Marion"), cross the boundaries of this District and the SJR. The Villages of Marion is located within Marion County; however, water supply for The Villages of Marion is withdrawn in Sumter County pursuant to a water use permit issued by this District.

3. Pursuant to Section 373.046, F.S., in February 2008, this District and the SJR entered into an interagency agreement to provide that this District is the agency with the authority to declare water shortages and water shortage emergencies within all of unincorporated Marion County. The agreement expired April 28, 2009.

4. In April 2009, pursuant to Section 373.046, F.S., this District and the SJR replaced the February 2008 interagency agreement with an agreement titled "Interagency Agreement Between The St. Johns River Water Management District and The Southwest Florida Water Management District Regarding Landscape Irrigation and Water Shortages Within The City of Ocala and The Unincorporated Areas of Marion

County, Florida" (the "Interagency Agreement"). The Interagency Agreement provides that the SJR is the agency with the authority to declare water shortages and water shortage emergencies within the City of Ocala and all of unincorporated Marion County, except that unincorporated area lying within The Villages of Marion, FQD.

CONCLUSIONS OF LAW

5. Water management districts are duly authorized by Sections 373.175 and 373.246, F.S., to declare water shortages and water shortage emergencies and to adopt by regulation a plan for implementation during periods of water shortage.

6. Pursuant to Section 373.046(6), F.S., when a geographic area of a local government crosses district boundaries, the affected districts may designate, by interagency agreement, a single affected district to implement in that area under the rules of the designated district, all or part of the applicable regulatory responsibilities.

ORDERED

THEREFORE, based upon the foregoing Findings of Fact and Conclusions of Law, it is hereby Ordered:

7. The portion of the City of Ocala and the portion of unincorporated Marion County, except that unincorporated area lying within The Villages of Marion, FQD, located in the Southwest Florida Water Management District are hereby released from Order No. SWF 07-02 and shall be subject to the water shortage regulations, responsibilities and authorities of the SJR pursuant to the Interagency Agreement. The Villages of Marion, FQD, shall remain subject to Order No. SWF 07-02.

8. Except as modified herein, all other terms and conditions of Order No. SWF 07-02 shall remain in full force and effect.

DONE AND ORDERED in Hernando County, Florida, on this 28th day of April, 2009.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

By: _____
C. A. "Neil" Combee
Governing Board Chair

Approved as to Legal Form and Content

_____
Attorney

Filed this 28th day of April, 2009.

_____
Agency Clerk

Attest:

By: _____
Jennifer E. Closshey
Governing Board Secretary

NOTICE OF RIGHTS

Persons to whom this Order is directed, or whose substantial interests are affected, may petition for an administrative hearing in accordance with Sections 120.569 and 120.57, F.S., and Chapter 28-106, Florida Administrative Code (F.A.C.). A request for a hearing must: 1) explain how the petitioner's or other person's substantial interests will be affected by the District's action; 2) state all material facts disputed by the petitioner or other person, or state that there are no disputed facts; and 3) otherwise comply with Chapter 28-106, F.A.C.

A request for hearing must be filed with and received by the Agency Clerk of the District at District Headquarters, 2379 Broad Street, Brooksville, Florida 34604-6899 within twenty-one (21) days of receipt of this notice. Receipt is deemed to be the fifth day after the date on which this notice is deposited in the United States mail. Failure to file a request for hearing within this time period shall constitute a waiver of any right you or any other person may have to request a hearing under Sections 120.569 and 120.57, F.S.

Mediation pursuant to Section 120.573, F.S., and Rule 28-106.111, F.A.C., to settle an administrative dispute regarding the District's action in this matter is not available prior to the filing of a request for hearing.

In accordance with subsection 120.569(1), F.S., the following additional administrative or judicial review may be available.

A party who is adversely affected by final agency action may seek review of the action in the appropriate District Court of Appeal pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, within thirty (30) days after the rendering of the final action by the District.