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INVESTIGATION OF AREAS WHERE DOMESTIC SELF-SUPPLY WELLS ARE SENSITIVE TO WATER LEVEL DECLINE

INVESTIGATION OF AREAS WHERE DOMESTIC SELF-SUPPLY WELLS ARE SENSITIVE TO WATER LEVEL DECLINE

Contract SE410AA

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Submitted to:

St Johns River Water Management District

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Submitted by:

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EXECUTIVE SUMMARY

Self-supply well reduction in or loss of service (SSWRLS) in the St Johns River Water Management District (SJRWMD) predominantly occurs when the water level in a well declines such that the pumping system no longer functions properly. Pumping systems utilized in areas of free-flowing wells where water levels are above land surface (als) are particularly susceptible to SSWRLS. Rarely is SSWRLS associated with actual well construction such that the well "runs dry".

The widespread occurrence of SSWRLS in SJRWMD seems to be a recent phenomena. Many of the drillers interviewed have 20 years or more experience and many stated that SSWRLS has become much more common since about 1999. Prior to that time, the occurrence of SSWRLS in SJRWMD was relatively rare.

A few scattered instances of SSWRLS were reported during a period of low groundwater levels associated with a drought that occurred in the early 1980s. Historically, SSWRLS has occurred at self-supply systems in proximity to centers of agricultural irrigation and freeze protection in St Johns, Putnam and Volusia counties. In southern Putnam and northern Volusia counties, large groundwater withdrawals of short duration are required for fern freeze protection and the Upper Floridan aquifer potentiometric surface in the area declines significantly. SSWRLS has also historically occurred in portions of St Johns and Putnam counties as a result of Upper Floridan aquifer potentiometric surface declines in response to large volume withdrawals for potato irrigation and possibly other users.

Since 1999, the highest concentration and greatest number of documented occurrences of SSWRLS have been in the Mandarin/Fruit Cove area of southern Duval and northern St Johns counties. The water level of the Upper Floridan wells in this area has historically been above land surface (als), in some places as much as 30 ft als. Operation of the nearby Community Hall well field in recent years has resulted in lowering of the Upper Floridan aquifer potentiometric surface or water level; at times the potentiometric surface has dropped below land surface (bls) in some places. The operator, JEA, has agreed to mitigate SSWRLS in the vicinity of the well field in accordance with a provision of its Consumptive Use Permit. Mitigation has included adding or replacing pumps and/or drop pipes, sealing piping system air leaks, replacing wells, or connecting residences to public water supply.

Because SSWRLS predominantly occurs when the water level in a well declines such that the pumping system no longer functions properly, the most significant factor in the occurrence of SSWRLS is the class of pumping system utilized. Based on common well construction practices in SJRWMD, five classes of SSWRLS were identified. Each class is associated with a specific water level threshold and related pumping system(s). Three of the five classes occur in areas where water levels are above land surface. These systems rely on the aquifer pressure head to move water through the system to some degree.

Class 1 SSWRLS occurs when the water level in a well declines from about 35 ft als or more to less than 35 ft als. Affected systems are domestic self-supply systems without pumps that rely on hydraulic head to supply system pressure. In order to provide adequate pressure for domestic supply, these systems are typically restricted to areas where the water level was at least 35 ft als at the time of well construction. SSWRLS occurs if the water level declines to a point where the hydraulic head is no longer sufficient to adequately pressurize the system. These systems are relatively rare but are most common in portions of Duval, Clay and St Johns counties.

Class 2 SSWRLS occurs when the water level in a well declines from about 15 ft als or more to less than 15 ft als. Affected systems are domestic self-supply systems with a treatment unit that rely on hydraulic head to move water through the unit. The single pump in the system is located between the unit and the point of use. In order to provide adequate pressure to the treatment unit, these systems are typically restricted to areas where the water level was at least 15 ft als at the time of well construction. SSWRLS occurs if the water level declines to a point where hydraulic head is not sufficient to move water through the treatment unit. These systems typically utilize an aerator for treatment of hydrogen sulfide and are most prevalent in areas where the source water sulfate concentrations are elevated.

Class 3 SSWRLS occurs when the water level in a well declines from above land surface to below land surface. Affected systems are domestic and irrigation self-supply systems equipped with centrifugal or shallow-well jet pumps and irrigation self-supply systems without pumps. If the water level drops below land surface, the former may experience SSWRLS from loss of prime due to system air leaks and irrigation self-supply systems without pumps will not function. These systems are prevalent in areas where water levels have historically been above land surface, particularly in southeast and northeast SJRWMD and along the St Johns River.

Class 4 SSWRLS occurs when the water level in a well declines from less than 20 ft bls to greater than 20 ft bls. Affected systems are domestic and irrigation self-supply systems equipped with centrifugal or shallow-well jet pumps. If water levels decline to deeper than about 20 ft bls, the effective lift capacity of theses pumps is exceeded and these systems will experience SSWRLS.

Class 5 SSWRLS occurs when the water level in a well declines to below the intake of a submersible or deep-well jet pump. Common well construction practice in SJRWMD is to install submersible and deep-well jet pump intakes at least 15 to 20 ft below the water level at the time of well construction.

Correcting SSWRLS is typically accomplished by adding a pump, replacing the pump, installing additional drop pipe, and/or repairing air leaks in the pumping system. In rare cases, a new well is required to correct the problem. Costs to retrofit a well to avoid reoccurrence of SSWRLS generally ranges from $200 to $3,000.

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INTRODUCTION

The District Water Supply Plan (DWSP), published in 2000 by St. Johns River Water Management District (SJRWMD) as Special Publication SJ2000-SP1, addresses current and future water demands, sources, and improvements needed to meet 2020 water supply needs. Infrastructure improvements needed to meet future demand must accommodate water quality, wetland and aquatic systems, and existing legal uses. Identification of areas where self-supply wells that fall below SJRWMD's consumptive use permitting threshold and those exempt from permitting requirements are sensitive to water level fluctuation will assist the planning process.

Certain areas of SJRWMD have high densities of self-supply wells. A self-supply water system, for purposes of this report, is a water system (including well, pump, aerator, drop pipe, etc.) that derives its supply from a source other than a public water-supply utility and supplies water to an individual user. Users include individual households as well as commercial and agricultural entities.

As growth has continued and demands on the aquifers have increased, regional lowering of groundwater levels has occurred, resulting in self-supply well reduction in or loss of service (SSWRLS). SJRWMD project SE410AA: Investigation of Areas Where Domestic Self Supply Wells Are Sensitive to Water Level Fluctuation (the Project) was designed to identify areas where existing and projected hydrologic conditions through 2020 will affect groundwater levels such that self-supply water systems below SJRWMD's consumptive use permitting threshold and self-supply water systems that are exempt from permitting requirements may experience SSWRLS.

D. L. Smith & Associates implemented the Project on behalf of SJRWMD. The work performed was accomplished in accordance with a scope of services provided by SJRWMD. The investigation was conducted by completing a series of separate tasks. Separate reports have been completed detailing task results and the methodologies used. The primary tasks included the following:

- Description of Current and Historic Occurrences of SSWRLS to Self-Supply Water Systems
- Self-Supply Well Area Delineation
- Groundwater Conditions Delineation
- Well Construction and Pumping Equipment Description
- Identification of Areas Where Self-Supply Wells Will Experience Significant SSWRLS

METHODOLGY

The investigation was conducted by completing a series of separate tasks. The overall methodology utilized is described below with more detailed information provided in the appropriate sections of the document. The primary tasks included the following:

- Describe current and historic occurrences of SSWRLS
- Delineate geographic areas where self-supply wells are expected to be a significant means of water supply through 2020
- Delineate potentiometric surfaces and water tables through 2020
- Identify areas within which self-supply water systems are likely to experience SSWRLS through 2020 and to describe the extent and nature of the projected interference
- Assess the need for area-specific well construction and pumping equipment criteria that, if adhered to, would reasonably assure that self-supply systems would not experience SSWRLS during projected low potentiometric surface and water table conditions; and, if needed, to develop such area-specific criteria

Current and historic occurrences of SSWRLS information was provided by SJRWMD staff, public supply utilities, well construction contractors, local government offices, and State of Florida county health departments. Evaluation of this information identified five primary classes of SSWRLS. Each was related to the capacity of the self-supply well pumping system and associated with a specific water level threshold. When water levels decline below these threshold values, SSSWRLS occurs.

Geographic areas where self-supply wells are expected to be a significant means of supply were identified to determine where wells would exist that could be affected. Self-supply wells will obviously be a significant means of supply in areas where a public water supply is not available. Evaluation of self-supply well use within areas served by a public water supply was conducted. ArcGIS coverages of water supply public service areas (PSAs) were obtained from SJRWMD. Electronic records of self-supply wells were obtained from local governments, the Florida Department of Environmental Protection (FDEP), and local offices of the Florida Department of Health. A total of 109,514 records were obtained. The records were imported into ArcGIS. Address matching (geocoding) was used to assign spatial coordinates to the wells. The records that could be address-matched were plotted as points. Queries were developed to calculate the number of wells located within PSAs, outside of PSAs, and within each PSA.

Local government programs that restrict the use or regulate the construction of self-supply wells such as to protect against SSWRLS were identified. Local government programs were determined through review of published ordinances, land use regulations, building codes, and comprehensive plans. Municipal Code Corporation online database

of local government programs was a primary source of information (Municipal Code Corporation 2002). Information was also provided directly by individual local governments.

The projected 2020-groundwater conditions were evaluated to identify areas where projected decline in water levels will potentially result in SSWRLS. The evaluation was based on projections derived from groundwater flow modeling by SJRWMD and USGS. SSWRLS is related to the water level in the well and a primary focus was development of water level maps for the surficial and Upper Floridan aquifers. Insufficient data was available to prepare a baseline water level map for the Intermediate aquifer. Water levels are measured from land surface and may be above or below land surface. Three sets of maps were prepared for each aquifer: a map of baseline conditions, a map of projected 2020 conditions, and a map of maximum low water levels.

Well construction and pumping equipment practices were evaluated to determine the type and geographic distribution of well and pump installations susceptible to SSWRLS. Information was obtained from interviewing SJRWMD staff, local well drillers, and county health department staff. Applicable publications of SJRWMD, United States Geologic Survey (USGS) and Florida Geological Survey were reviewed.

Areas at risk of SSWRLS were identified based on baseline conditions, projected 2020 water levels, projected maximum low water levels, common well construction practices, and the water level threshold values associated with the five classes of SSWRLS. Areas where baseline water levels were greater than a threshold value but the projected 2020 conditions were lower than the threshold were identified as at risk for the related class of SSWRLS. Minimum well construction and pumping equipment criteria necessary to avoid interference with self-supply wells through 2020 were developed for geographic areas where baseline water levels were greater than a threshold value but the projected maximum low water levels were lower than the threshold.

SOURCES OF SELF-SUPPLY

Self-supply systems in SJRWMD utilize the Upper Floridan, intermediate, and surficial aquifer systems as sources of supply. The Upper Floridan aquifer is the most common source for self-supply wells in SJRWMD. The surficial aquifer is a common source for self-supply in the northern and southern portions of SJRWMD where the top of the Upper Floridan is relatively deep and in areas where the quality of water in the Upper Floridan is poor. The intermediate aquifer is used in areas where the quality of water in the surficial aquifer is poor or the surficial aquifer does not yield adequate quantities of water.

Surficial Aquifer System

The surficial aquifer system primarily consists of beds of unconsolidated sediments with various ratios of sand, silt and clay. It is generally less than 50 ft thick in the central portion of SJRWMD and about 100 ft thick in the north and south. In some areas it may be up to about 200 ft thick. The composition of the beds changes laterally and vertically and the surficial aquifer system is heterogeneous and anisotropic. Throughout most of SJRWMD, the upper portion of the surficial aquifer system is comprised predominantly of silty or clayey sand. In some areas of SJRWMD, a relatively persistent limestone is present at the base of the surficial aquifer. In these areas, the surficial aquifer system consists of two water bearing units, the water table unit and the limestone unit, separated by sediments of low permeability (Phelps 1994). In Duval, Nassau, Clay and St. John counties, the limestone is represented by the Charlton Limestone of the Hawthorn Group and is locally referred to as the rock aquifer. In Brevard and Indian River counties this limestone is represented by the Tamiami Formation and is locally referred to as the shallow-rock zone.

Intermediate Aquifer

The intermediate aquifer system is comprised of permeable layers and lenses within the Hawthorn Group. The Hawthorn Group consists of thick beds of clay-rich sediments interspersed with beds of limestone, shell and permeable sand. It is less than 50 ft thick in the central portion of SJRWMD, over 200 ft thick in the north and over 100 ft thick in the south. The low permeability sediments of the Hawthorn Group, referred to as the intermediate confining unit, act as a semi-confining unit for the underlying Upper Floridan aquifer. However, permeable sand and carbonate beds of the Hawthorn Group yield significant quantities of water in many parts of SJRWMD and are commonly used as a source for self-supply systems in those areas. The permeable sediments of the Hawthorn Group are collectively referred to as the intermediate aquifer system. The intermediate aquifer is confined throughout most of SJRWMD and its potentiometric surface is above land surface in some places.

Upper Floridan Aquifer

The Upper Floridan aquifer is the most common source for self-supply wells in SJRWMD. The Floridan aquifer system consists of a thick sequence of limestone and dolomite. In SJRWMD, the system has been divided into the Upper and Lower Floridan aquifers, separated by a less-permeable confining unit. The Upper Floridan aquifer is highly permeable in most places and well yields are sufficient for the large majority of self-supply users. Only a few, large volume, commercial or agricultural self-supply systems utilize the Lower Floridan aquifer.

The depth to the top of the Upper Floridan aquifer is less than 200 ft bls throughout the central portion of SJRWMD and less than 100 ft bls in much of Alachua, Lake, Marion, Polk, Seminole, and Volusia counties. In the northern part of SJRWMD, depth to the top of the Upper Floridan increases from about 100 ft bls in southern Flagler and Putnam counties to over 500 ft bls in Nassau County. In the southern part of SJRWMD, the depth increases from about 100 ft bls in northern Brevard and Orange counties to over 400 ft bls in Indian River County.

The Upper Floridan aquifer is confined except in a few areas in portions of Marion and Alachua counties where it outcrops. The potentiometric surface of the Upper Floridan is above land surface in areas along the coast and along the St. Johns River. It is greater than 20 ft bls throughout most of the western portion of SJRWMD.

Water Levels

The overall objective of this investigation is to evaluate SSWRLS due to a decline in water level. The water level under non-pumping conditions in a confined-aquifer well reflects the potentiometric surface of the aquifer at that point. In areas where the potentiometric surface is above land surface, the water level is above land surface and the well will free flow. The amount of flow from the well is proportional to the height of the water level above land surface.

Historically, water levels of Upper Floridan aquifer wells along the St Johns River and within areas in the northern and southern portions of SJRWMD have been above land surface (Figure 1). In these areas, Upper Floridan aquifer wells will free flow. The water level of Upper Floridan aquifer wells in most of the western portion of SJRWMD is deeper than 20 ft bls.

Depth to the water table within the surficial aquifer is generally a function of topography; it is deeper under areas of higher elevation. Throughout most of SJRWMD, depth to the water table is 5 to 10 ft bls. It is deepest along ridges and where the intermediate confining unit is thin or absent. Water table elevations fluctuate in response to changes in recharge. During periods of low rainfall, water levels may decline 10 ft or more. The decline is greatest in areas of higher elevation where the surficial sands are permeable.

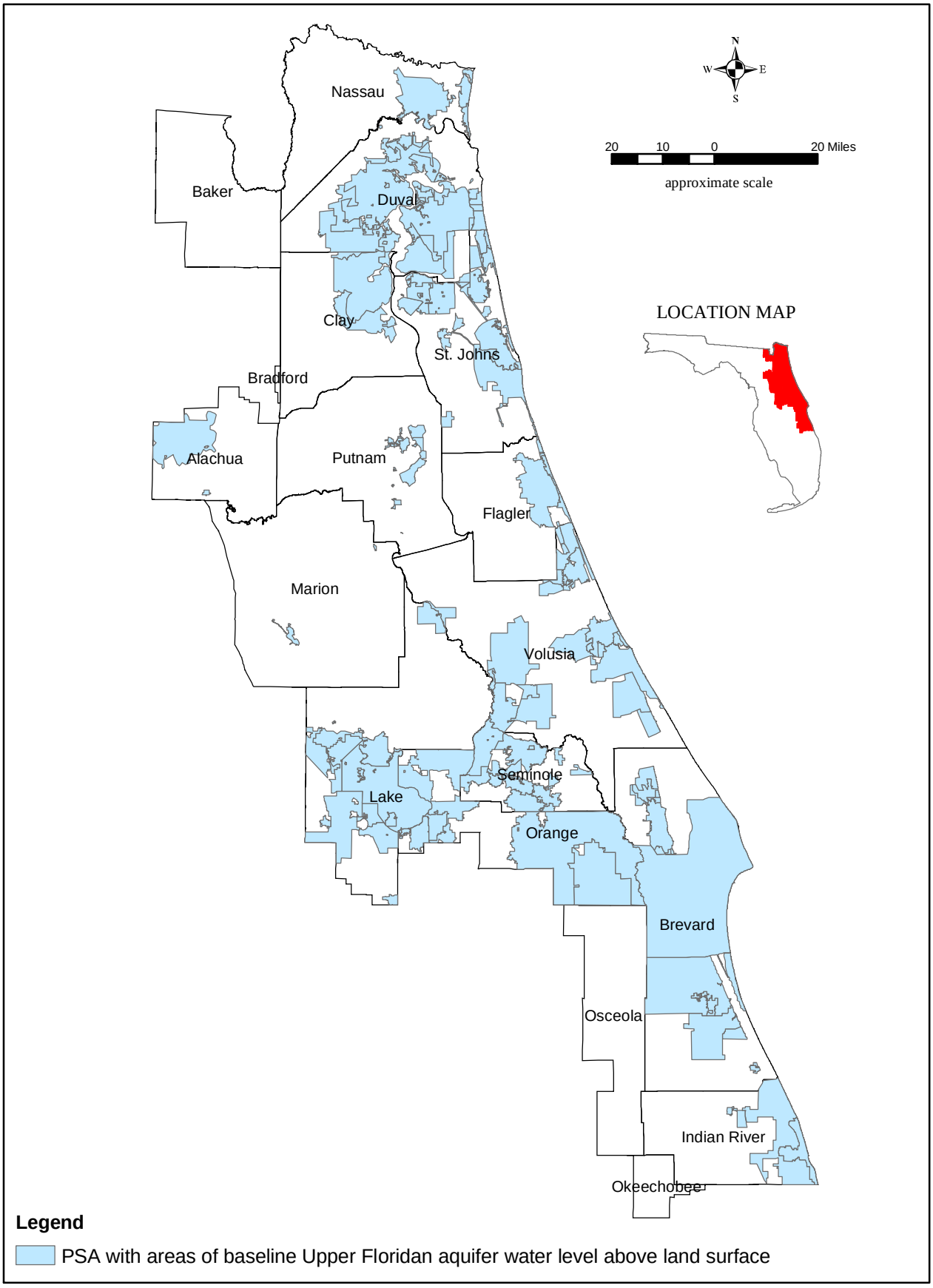

Figure 1: Public Service Areas (PSAs) with baseline Upper Floridan aquifer water levels above land surface

LOCAL GOVERNMENT PROGRAMS

D. L. Smith & Associates conducted a review of the local government programs and ordinances within SJRWMD related to self-supply wells. The methodology for the review and the text of the applicable programs and ordinances are presented in a separate document entitled *Local Government Well Ordinances in SJRWMD* (D. L. Smith & Associates 2002d). Only Putnam, St Johns, and Volusia counties have established local government programs specifically intended to limit SSWRLS. In each case, the program applies only to specific designated areas within each county

St Johns River Water Management District

No state regulations specifically address the occurrence or repair of SSWRLS. The construction of most self-supply wells is regulated through Chapters 40C-3 and 62-555, *Florida Administrative Code* (*F.A.C.)*. The water management districts administer chapter 40C-3, *F.A.C.* SJRWMD has delegated permitting of wells of less than 6-in diameter in some counties as detailed in Chapter 40C-3.032 *F.A.C.* Delegation. The counties where SJRWMD has delegated permitting are listed in Table 1.

County	Delegated Authority	Year
Brevard County	County Health Department	2002
Clay County	County Health Department	2001
Duval County	City of Jacksonville	1978
Flagler County	County Health Department	2001
Indian River County	County Health Department	1995
Lake County	County Health Department	1999
Nassau County	County Health Department	2001
Okeechobee County	County Health Department	2002
Osceola County	County Health Department	1999
Putnam County	County Health Department	2002
St Johns County	County Health Department	2001
Volusia County	Volusia County	1996

Table 1: Counties to which SJRWMD has delegated well permitting responsibility

Chapter 40C-3, *F.A.C.,* requires permitting of all wells unless exempted. A Consumptive Use Permit is required for large capacity self-supply wells, such as those for commercial, industrial or agricultural use. Self-supply wells less than 6-in diameter are exempted from permitting unless located within a "delineated area" as defined in Chapter 62-524, *F.A.C.,* or within counties where SJRWMD has delegated authority. A well completion report must be submitted for all wells, even those exempted from permitting.

Chapter 40C-3, *F.A.C.,* establishes minimum well construction criteria. All wells in SJRWMD are regulated by the requirements of Chapter 40C-3, *F.A.C.,* and all wells must be constructed in accordance with the standards established therein. However, the intent

of Chapter 40C-3, *F.A.C.*, is not to prevent or limit potential SSWRLS and it does not address pumping systems or other aspects of well construction related to SSWRLS.

Florida Building Code

Section 612 of the Florida Building Code (the Code) Plumbing Volume mandates minimum criteria for well pumps and tanks used for private potable water systems. The Code specifies minimum pump size and yield for private potable systems based on number of bathrooms as specified in table 612.1 of the Code. This requirement may serve to limit SSWRLS for private potable self-supply systems by establishing a minimum flow rate for the system and insuring that pumps will continue to operate under increased hydraulic head resultant from water level decline.

Local Government Programs

A discussion of the local government programs in each county is included in Appendix A: *County Descriptions*. Specific local government ordinances and regulations are presented in a separate document titled *Local Government Well Ordinances in SJRWMD* (D. L. Smith & Associates 2002d). In general, local government programs pertaining to self-supply wells fall into four broad categories:

- Requiring connection to a public water supply system
- Requiring a well permit from the local government
- Prohibiting one or more types of wells
- Regulating the construction of wells

Programs requiring a connection to the public water supply are by far the most common and most local governments with public supply systems have ordinances requiring connection to the system and disconnection from existing self-supply wells. However, it is common practice for these wells to be converted for irrigation use rather than abandoned. Most of the counties and many municipalities in SJRWMD require self-supply wells to be permitted, but do not regulate well construction. Twenty-four local governments prohibit potable self-supply wells and two prohibit irrigation self-supply wells.

Local government regulations that restrict or control the construction of wells and or pumping equipment are the least common. Only eleven local governments have regulations that address well construction. Most of these are not intended to limit or avoid SSWRLS.

Only Putnam, St Johns, and Volusia counties have established local government programs to limit SSWRLS. In each case, the program applies to specific areas within the county. The programs establish pump type and placement based on water level at the time of well construction. The specific regulations are presented in a separate document

titled *Local Government Well Ordinances in SJRWMD* (D. L. Smith & Associates 2002d).

Within specified areas of St Johns and Putnam counties, the regulations require that where the water level at the time of well construction is greater than 5 ft als, the pumping equipment must be able to lift water from a depth of at least 20 ft bls and that where the water level is less than 5 ft als, a submersible pump capable of pumping water from at least 40 ft below the water level is required. In St. Johns County the well owner has the option not to follow these requirements. However, if water levels fall below the pumping level of the installed equipment, it is the owner's responsibility to install pumping equipment in accordance with the requirements of the ordinance.

In Volusia County, the program specifies pump standards for an area of the county that has historically experienced SSWRLS. The program does not allow centrifugal pumps, requires that the pump intake be set to at least 84 ft bls, and requires multi-stage pumps for deep-well jet systems

GROUNDWATER CONDITIONS DELINEATION

The overall objective of this investigation is to evaluate SSWRLS through 2020 due to a decline in water levels in self-supply wells. Groundwater-flow-model predicted potentiometric surface for the Upper Floridan aquifer and 2020 surficial aquifer drawdown were used as the basis for the evaluation.

The USGS has recently published Water-Resources Investigations Report 02-4009, *Simulation of Ground-Water Flow in the intermediate and Floridan Aquifer Systems in Peninsular Florida* (Sepulveda 2002) that documents development of a groundwater-flow model (the Megamodel). The Megamodel encompasses the entire SJRWMD area and considers withdrawals from outside SJRWMD.

The Megamodel specified-head scenario simulation was used as the basis for the analysis of Upper Floridan aquifer SSWRLS. The grid size of the Megamodel is one mile between nodes, which limits the precision of the analysis. The attribute most sensitive to the coarseness of the grid is topography. Significant changes in topography occur with one grid node (one square mile) in some areas of SJRWMD. There is less variation in water table and potentiometric surface elevations within a grid node. The SSWRLS analysis will be more tentative in areas of high topographic relief.

Groundwater withdrawals used in the Megamodel represent average annual values. The 2020 specified-head scenario simulation represents steady-state conditions with long-term average annual withdrawals. The model assumes that the projected 2020 demands will be derived from the Floridan aquifer system. It is unlikely that all projected 2020 demand will be derived from the Floridan, especially in priority water resource caution areas. Actual 2020 Floridan aquifer withdrawals will likely be less than assumed in the Megamodel and resultant steady-state drawdown will also likely be less.

The Megamodel does not account for withdrawals from the surficial aquifer and the surficial aquifer layer is treated as a source-sink with specified water levels. Surficial aquifer water level decline projected by the following models was used as the basis for evaluation of surficial aquifer SSWRLS.

Durden, D.W. P.E., 2000, Estimates of Regional Drawdowns in the Potentiometric Surface of the Upper Floridan Aquifer of Northeast Florida Using a Numerical Drawdown Model, SJRWMD Technical Publication SJ2000-4

Toth, D. P.G., 1994, Projected Aquifer Drawdowns, Palm Bay Utility Corporation Wellfield, Brevard County, Florida, SJRWMD Professional Paper SJ294-PP7

Toth, D. P.G., 2001a, Projected 2020 Aquifer Drawdowns at the City of St. Augustine Wellfield, St. Johns County, Florida, SJRWMD Professional Paper SJ2001-PP1

Toth, D. P.G., 2001b, Projected 2020 Aquifer Drawdowns at the Tillman Wellfield, St. Johns County, Florida, SJRWMD Professional Paper SJ2001-PP2

Toth, D. P.G., 2001c, Projected 2020 Aquifer Drawdowns at the City of Vero Beach and Indian River County Wellfields, SJRWMD Professional Paper SJ2001-PP2

Huang, C. P., 1996, Projected Aquifer Drawdowns, Palm Coast Utility Corporation Wellfields, Flagler County, Florida, SJRWMD Professional Paper SJ96-PP1
PUB. NO.: SJ98-1

McGurk, B., 1998, Regional Simulation of Projected Groundwater Withdrawals from the Floridan Aquifer System in Western Volusia County and Southeastern Putnam County, Florida, SJRWMD Technical Publication SJ98-1

McGurk B. and Presley P.F., 2002, Simulation of the Effects of Groundwater Withdrawals on the Floridan Aquifer System in East-Central Florida: Model Expansion and Revision, SJRWMD Technical Publication SJ2002-3

Motz, Beddow, Caprara, Gay, and Sheaffer, 1995, North-Central Florida Regional Groundwater Investigation and Flow Model, SJRWMD Special Publication SJ95-SP7

Baseline Conditions

The widespread occurrence of SSWRLS was not generally observed in SJRWMD prior to 1999 as described in the Current and Historic Occurrence of SSWRLS section of this document. Prior to that time, SSWRLS was generally restricted to portions of Putnam, Volusia and St Johns counties in the vicinity of agricultural operations with high maximum-day withdrawals. The USGS Megamodel was calibrated to water level data from 1993 and 1994. The calibrated potentiometric surface of the Upper Floridan aquifer and the surficial aquifer water table were used as the baseline conditions for the analysis. These baseline conditions were used to establish depth-to-water distribution and to classify areas of the district by potential pumping system class. The change in depth-to-water from baseline conditions to 2020 was used to identify areas where self-supply wells could experience SSWRLS. This technique assumes that SSWRLS was not occurring prior to the designated baseline period. This approach may fail to identify of SSWRLS risk in areas where it had occurred prior to that time.

Surficial Aquifer

The water table elevations presented in the Megamodel were determined using a linear regression between measured values and the land surface altitudes. Detailed description of the technique is provided in the Megamodel documentation (Sepulveda 2002).

Calibrated water table elevations and topographic elevations included in the Megamodel were used to create a map of SJRWMD depicting the depth to the surficial aquifer water table at baseline conditions (Figure 2). The map was prepared using ArcMap GIS. Shape files of the Megamodel output were provided by SJRWMD. Each grid node had an assigned value for land surface elevation and water table elevation. A value for depth to

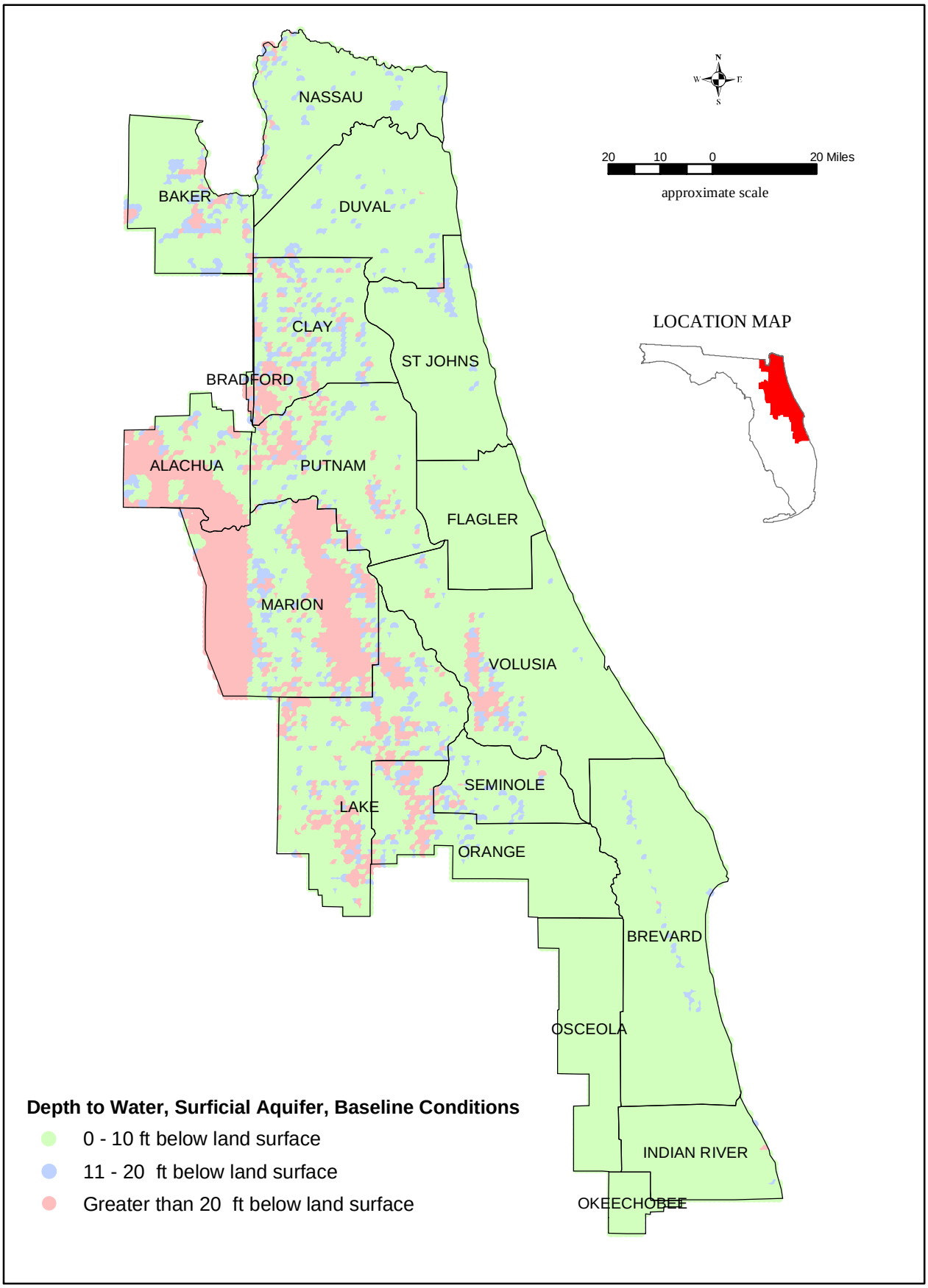

Figure 2: Baseline depth to water table (derived from Sepulveda 2002)

the water table was calculated for each node by subtracting the water table elevation value for each node from the land surface elevation value at that node. The resultant values represent the depth to water at each node.

Throughout most of SJRWMD, surficial aquifer water levels are less than 10 ft below land surface. They are greater than 20 ft below land surface beneath ridges in the central and western areas of SJRWMD.

Intermediate Aquifer

Very little data is available on the potentiometric surface of the intermediate aquifer system on a district wide basis. In the northern portion of SJRWMD, the intermediate aquifer system potentiometric surface responds in a manner similar to that of the Upper Floridan aquifer (Caroline Silvers, pers. com. 2002). Most of the existing models represent the intermediate aquifer as a leakance value for the bottom of surficial aquifer layer and not as a separate, active layer. The Megamodel designates the intermediate as an active layer but simulations were not performed for the intermediate within SJRWMD. Existing data is not sufficient to prepare a potentiometric surface or water level map of the intermediate aquifer.

Upper Floridan Aquifer

Calibrated Upper Floridan aquifer potentiometric surface elevation and topographic elevations included in the Megamodel were used to create a map of SJRWMD depicting baseline (1993-1994) depth-to-water for the Upper Floridan aquifer (Figure 3). The map was prepared using ArcMap GIS. Shape files of the Megamodel output were provided by SJRWMD. Each grid node had an assigned value for land surface elevation and potentiometric surface elevation. A value for depth to the water table was calculated for each node by subtracting the potentiometric surface elevation value of each node from the land surface elevation value at that node. The resultant values represent the depth-to-water, or water level, at each node. Negative values indicate that the potentiometric surface elevation is above land surface.

Projected 2020 Conditions

Projected 2020 conditions for the surficial and Upper Floridan aquifer systems were established based on the results of groundwater flow models prepared by SJRWMD and USGS.

Surficial Aquifer

The surficial aquifer is not an active layer in the USGS Megamodel; therefore the Megamodel does not predict surficial aquifer declines through 2020. The values of water table decline through 2020 predicted by the following groundwater flow models were used to prepare a composite map of water-table drawdown through 2020 (Figure 4).

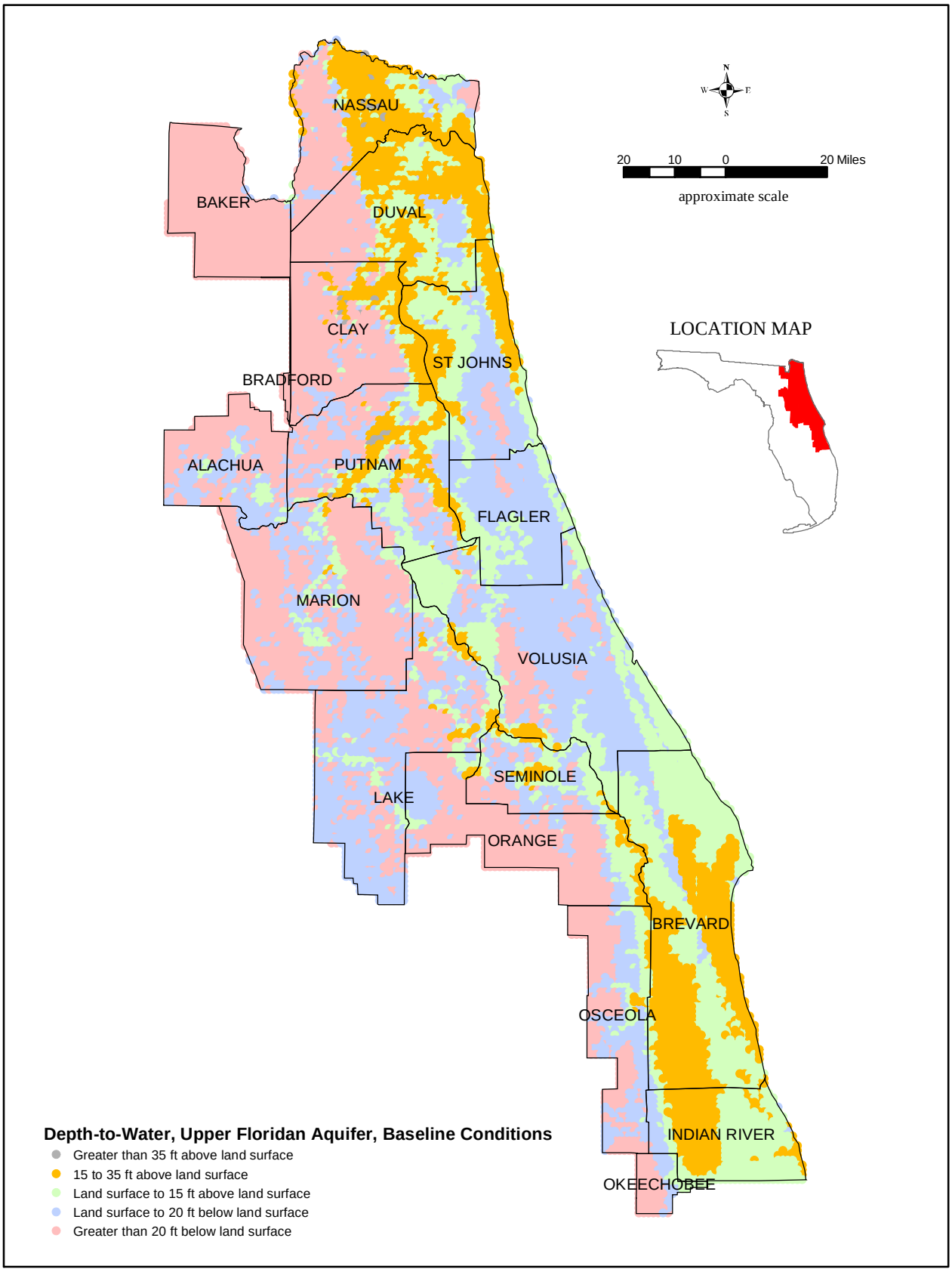

Figure 3: Baseline Upper Floridan aquifer depth-to-water

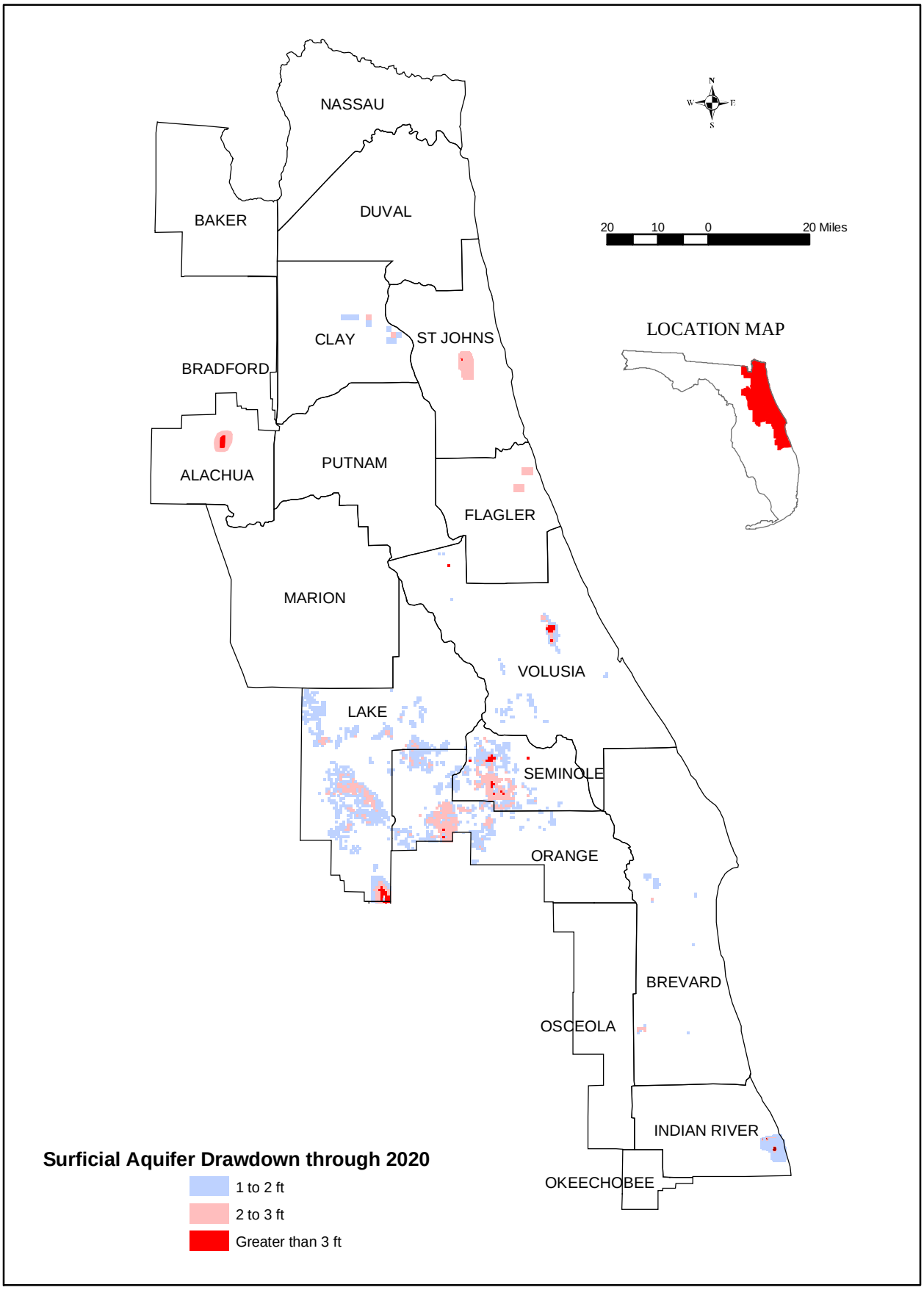

Figure 4: Predicted water-table decline through 2020

Durden, D.W. P.E., 2000, Estimates of Regional Drawdowns in the Potentiometric Surface of the Upper Floridan Aquifer of Northeast Florida Using a Numerical Drawdown Model, SJRWMD Technical Publication SJ2000-4

Toth, D. P.G., 1994, Projected Aquifer Drawdowns, Palm Bay Utility Corporation Wellfield, Brevard County, Florida, SJRWMD Professional Paper SJ294-PP7

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Motz, Beddow, Caprara, Gay, and Sheaffer, 1995, North-Central Florida Regional Groundwater Investigation and Flow Model, SJRWMD Special Publication SJ95-SP7

Intermediate Aquifer

Existing data is not sufficient to prepare a map of the change in intermediate aquifer system potentiometric surface elevation through 2020.

Upper Floridan Aquifer

A map of projected Upper Floridan aquifer 2020 water levels was prepared. Projected 2020 Upper Floridan aquifer potentiometric surface elevations from the Megamodel were subtracted from land surface elevation. A negative value indicates that the calculated water level is above land surface. The resultant values were used to prepare a map of projected 2020 Upper Floridan aquifer water levels (Figure 5).

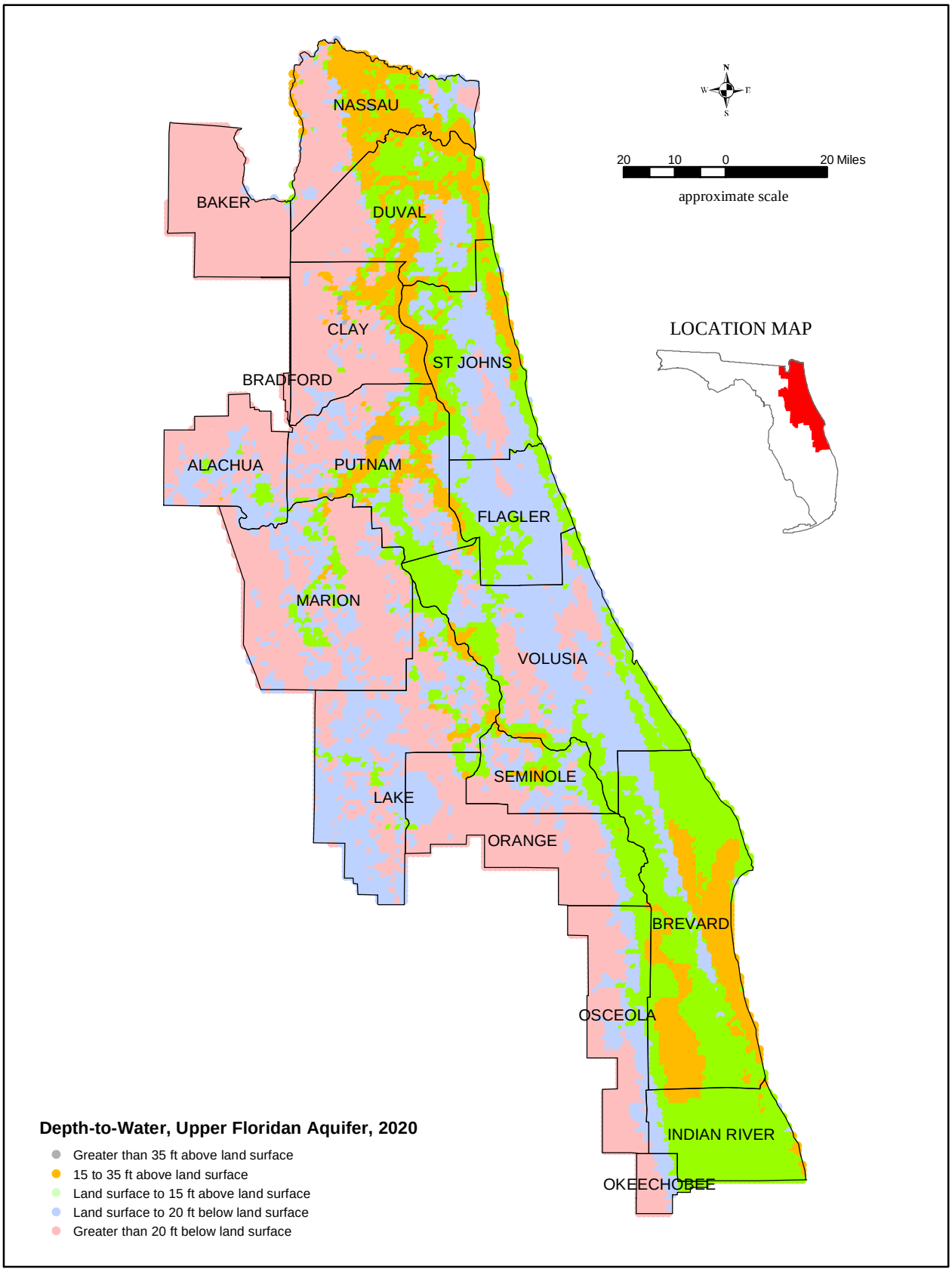

Figure 5: 2020 Upper Floridan aquifer depth-to-water (derived from Sepulveda 2002)

Water Level Response to Drought Conditions

Water levels in wells are typically lowest during drought conditions and most incidences of SSWRLS first occur after an extended period of low rainfall (D. L. Smith & Associates 2002a). The groundwater flow models used for the evaluation of SSWRLS do not take into account drought conditions. An evaluation of water level fluctuations and historic low water levels was accomplished to determine an appropriate technique to take into account drought conditions and historic low water levels for evaluation of potential SSWRLS in SJRWMD.

Historic water level information was obtained from USGS and SJRWMD. USGS has recorded water levels in a network of Floridan aquifer wells. The period of record for some wells extends from the 1930s to the present. Overall, water levels have declined in most of the wells monitored over the period of record as a result of groundwater resource development. The historic high water levels occur early in the period of record and the historic lows have generally occurred within the past several years.

Although the general trend shows a systematic decline in most wells, water levels also fluctuate seasonally. For example, the average annual range in water levels for 18 wells in north-central Florida in 2001 was about 5 ft (USGS 2002). Water levels are lowest during periods of low rainfall and minimum levels are generally observed in May and June each year. Seasonal maximum water levels are generally observed in September and October. The seasonal low Floridan aquifer water levels are primarily the result of increased water use and associated well discharge during periods of low precipitation. The Floridan aquifer is highly transmissive and, for the most part, is confined. Lower water levels during periods of drought are not the direct result of a reduction in recharge but result from higher rates of groundwater withdrawals.

The surficial aquifer is generally unconfined and is characterized by low transmissivity. Regionally, low water table elevations during drought are primarily the result of reduced recharge. Surficial aquifer water table declines on the order of 10 ft are common during periods of drought (Adamski and Knowles 2001). Observed water table decline is greatest in recharge areas. Locally, surficial aquifer water levels have a drawdown component related to groundwater withdrawals. In areas with a high density of surficial aquifer self-supply wells, cumulative withdrawals can create significant drawdown. Withdrawals from public supply surficial aquifer wells result in increased drawdown in the general vicinity of the pumping wells. However, the transmissivity of the surficial aquifer is relatively low and the cone of depression related to individual withdrawals is steep but localized.

Historic low water levels for the Floridan aquifer have in many cases been observed after the baseline period of 1993/1994 established for this evaluation of SSWRLS. Some of the decline is accounted for in the predicted drawdown from 1993/1994 through 2020. The groundwater flow models utilize average annual withdrawal rates for well discharge and the projected 2020 water levels do not reflect maximum low levels associated with periods of maximum groundwater withdrawals.

COMMON WELL CONSTRUCTION AND PUMPING EQUIPMENT PRACTICES

Self-supply well systems include wells, pumping systems, pressure tanks and storage components and, in some areas, aerators or other types of treatment units. Well construction and pumping equipment practices, predominantly the latter, are determinate factors in the occurrence of SSWRLS. In almost all cases, a well and pumping system can be constructed that will avoid SSWRLS due to projected water level decline through 2020.

The well construction and pumping equipment practices within SJRWMD Public Service Areas (PSAs) were reviewed to identify those that would be associated with a risk of SSWRLS. The evaluation was based on data compiled from a number of sources. Information was obtained from SJRWMD, USGS, local well drillers, Florida Department of Environmental Protection (FDEP), Florida Geologic Survey, municipal and county governments, county health departments, and utility operators (D. L. Smith & Associates 2002b).

Wells

Common well construction practices within SJRWMD generally do not contribute to the risk of SSWRLS. The total depth of the wells is typically far below existing and projected low water levels and the wells do not "go dry". Common well diameters are sufficient to accept pumps that could provide adequate supply under current or projected water level conditions. Two well construction practices were identified in SJRWMD that could result in SSWRLS, neither were common.

On the barrier island in Indian River County, poor water quality is present at shallow depth and surficial aquifer water supply wells must be very shallow. Self-supply wells are commonly only 8-to-12 feet deep to tap the thin, shallow lens of fresh water. In many cases, several shallow wells that only penetrated the top foot of the saturated zone are connected to a common header to provide sufficient yield (Whynot pers. com. 2002). SSWRLS is very common in these wells during drought and the problem has been ongoing for many years. This is one of the rare cases where SSWRLS is related to well construction as opposed to a pumping system failure.

In portions of the western part of SJRWMD, the Upper Floridan aquifer is unconfined and in some areas the water level is only slightly above the top of the aquifer. Upper Floridan aquifer wells in these areas are typically constructed with a surface casing set through the overlying unconsolidated materials and into the limestone at the top of the Upper Floridan aquifer. A smaller diameter boring is drilled into the limestone and left uncased. A submersible pump is set inside the surface casing. In some cases, water levels have dropped below the base of the surface casing and the pumps could not be lowered sufficiently because the diameter of the well below the surface casing was too small to accommodate the pump (Stuart pers. com. 2002).

Pumping Systems

SSWRLS in SJRWMD is predominantly associated with the class of system pumping equipment. Commonly used self-supply systems were identified that will experience SSWRLS if water levels drop below a specific required water level, or threshold value, associated with the pumping system. Five water level thresholds were identified for specific pumping systems that will experience SSWRLS if water levels drop below the threshold water level (Table 2).

System Class	Pumping System	Water Level Threshold	SSWRLS will occur if:
1	Domestic wells without a pump	35 ft above land surface	Water level falls below threshold value
2	Systems with treatment units and no pump between well and treatment unit	15 ft above land surface	Water level falls below threshold value
3	Centrifugal or shallow-well jet pump or no pump for low pressure irrigation systems	above land surface	Water level falls below threshold value
4	Centrifugal or shallow-well jet pump	Within the lift capacity of the pump (about 20 ft below land surface)	Water level falls below lift capacity of pump
5	Submersible or deep-well jet pump	none	Water level falls below pump intake

Table 2: Self-supply well pumping systems susceptible to SSWRLS

Domestic Self-Supply Systems Without Pumps

Domestic self-supply wells without a pumping system are used in the relatively few areas of SJRWMD where the water level is high enough above land surface (about 35 ft als) to provide sufficient pressure for domestic supply. They are common in limited areas of Clay, St Johns and Duval counties. These systems rely on the aquifer pressure-heads to push water through the system to the point of use. They generally provide low water pressure and may not supply the minimum yields now required by the Florida Unified Building Code. This class of pumping system is rarely used for a new well. It was more commonly used in the past and older systems of this type still exist. This class of pumping system will experience SSWRLS if water levels drop below about 35 ft als such that the aquifer pressure-head is not sufficient to provide adequate system pressure. SSWRLS is corrected for these systems by installing a pump.

Domestic Self-Supply Systems with Treatment Units and Single Pumps

Treatment units such as aerators are sometimes part of a domestic water supply system. These systems usually have two pumps: one between the wellhead and the treatment unit and a second between the treatment unit and the point of use. In areas where the potentiometric surface is about 15 ft als or more, many of these systems only have one pump between the treatment unit and the point of use and rely on aquifer pressure-head to move water from the well through the treatment unit. The pump moves water from the treatment unit to the point of use. These systems are most common in the eastern part of SJRWMD, particularly the northeast. These systems will experience SSWRLS if water levels drop below about 15 ft als and the aquifer pressure-head is not sufficient to move water through the treatment unit. SSWRLS is corrected for these systems by installing a pump between the wellhead and the treatment unit.

Self-Supply Systems Where Water Levels are Above Land Surface

Self-supply systems in areas where water levels are above land surface are particularly susceptible to SSWRLS if water levels drop below land surface. Three common pumping systems are at risk of SSWRLS under these conditions.

Self-supply irrigation systems in areas where water levels are above land surface are often not equipped with pumps. Landscape irrigation can be accomplished with a low-pressure system and some systems are not equipped with pumps in these areas. Some agricultural irrigation systems are not equipped with pumps in these areas; water flows from the well to a ditch system that distributes the water. These systems will cease to function if water levels decline to below land surface. Correcting SSWRLS for these systems requires adding a pump.

Centrifugal and shallow-well jet pumps are often attached directly to the wellhead without a check valve in areas where water levels are above land surface. The pumps are sometimes located away from the well, closer to the point of use. In order to function properly, these pumps must maintain prime (be full of water) at all times. In areas where water levels are above land surface, aquifer hydraulic head ensures the pumps are primed. These systems will lose prime and cease to function if water levels decline to below land surface. Correcting SSWRLS for these systems requires adding a drop pipe with check valve.

Self-supply systems are commonly equipped with shallow-well jet or centrifugal pumps with drop pipes installed inside the well casings. In order to function properly, these pumps must maintain prime. In areas where water levels are above land surface, aquifer hydraulic head ensures the pumps are primed. Air leaks at pipe joints or faulty check values will cause these systems to lose prime and cease to function if water levels decline below land surface. SSWRLS is easily corrected for these systems by ensuring airtight joints and/or installing or replacing check valves.

Self-Supply Systems with Centrifugal or Shallow-Well Jet Pumps

End suction centrifugal pumps and shallow-well jet pumps utilize atmospheric pressure to raise water into the pump. A shallow-well jet pump is an end suction centrifugal pump with a jet assembly on the front of the pump housing which boosts the pressure. The theoretical maximum lift capacity of these pumps is about 34 ft. The effective lift capacity of centrifugal pumps is about 20 ft and effective lift capacity of shallow-well jet pumps is about 25 ft. Use of centrifugal pumps is generally restricted to areas where depth to water in the well is less than about 10 to 15 ft bls. Shallow-well jet pumps are used in areas where the depth to water in the well is less than 15 to 20 ft bls. These systems will experience SSWRLS if water levels drop below the effective lift capacity of the pumping system. SSWRLS is corrected for these systems by installing deep-well jet or submersible pumps.

Self-Supply Systems with Submersible or Deep-Well Jet Pumps

In areas where the water level is greater than about 20 ft bls, most new self-supply systems in SJRWMD are equipped with a submersible pump. Submersible pumps with multiple stages can pump water from up to 1,000 ft bls. Although less common, deep-well jet pumps are sometimes used for low capacity water systems in areas where the depth-to-water is greater than about 20 ft bls. Deep-well jet pumps can produce water from as deep as 150 to 200 ft bls. Submersible and deep-well jet pumps experience SSWRLS if the water level drops below the pump intake. SSWRLS is corrected for these systems by lowering pump intakes.

CURRENT AND HISTORIC OCCURRENCE OF SSWRLS

Information Sources

The description of the current and historic occurrence of SSWRLS was prepared based on information provided by SJRWMD staff, public supply utilities, well construction contractors, local government offices, and the State of Florida Department of Health.

SJRWMD SSWRLS Records

Each SJRWMD service center was contacted for SSWRLS information. SJRWMD provided a list of 129 records of complaints concerning SSWRLS recorded by the Jacksonville Service Center. The information was provided in Microsoft Access database format and covered the period from April 1999 to June 2001. The Jacksonville Service Center office had no records of reports of SSWRLS prior to 1999. The majority of the records were for wells in Duval and St. Johns counties. There were SSWRLS records for eight wells in Clay County and one well in Nassau County.

Records of 19 SSWRLS complaints received by the Palatka Service Center from 2000 to 2001 were provided. Four of the records were for wells in Putnam County and fifteen were for wells in Volusia County. The complaints were related to SSWRLS from water level declines due to pumping for fern freeze-protection. SJRWMD had previously documented SSWRLS seasonally in portions of northeast Putnam County and southwest St. Johns County during periods of potato crop irrigation (Vergara 1998).

The Palm Bay Service Center had received a few complaints from owners of shallow wells with centrifugal pumps when the water table declined to depths of 15 to 20 feet bls (Berklew, pers. com. 2002). Written records are not available. The complaints were received during the typical dry season and periods of drought. Most of the complaints were from the Sebastian, Palm Bay and Mims areas.

SSWRLS complaints received by the Altamonte Springs Service Center are not recorded unless that they are related to interference associated with a specific permitted user (Joyce, pers. com. 2002). Most of the complaints received by Altamonte Springs Service Center are related to shallow surficial aquifer wells, which experienced SSWRLS during periods of drought.

Public Supply Utilities

A questionnaire was developed and sent to public supply utilities in SJRWMD requesting information on the occurrence of SSWRLS within the PSA(s) operated by the utility. Responses were received from many of the public supply utilities. Except for City of Maitland and Indian River County Utility Services, the utilities did not report the occurrence of SSWRLS within their service areas.

JEA operates the largest water supply utility in Duval County. JEA is conducting mitigation of SSWRLS in the vicinity of its Community Hall well field in accordance with a provision of the consumptive use permit for the well field. JEA has maintained a database of the incidences of SSWRLS in the area and provided copies to SJRWMD. At the time this work was preformed, these databases contained 594 records of individual wells that had experienced SSWRLS. Of the total, 440 were for wells located in the Mandarin area of southern Duval County and 152 were located in the Fruit Cove area of northwestern St. Johns County. Two of the records had no noted location data. All the records contained owner information and, except for two, physical addresses for the wells. Most contained a general description of the type of problem and some provided information about the wells, such as depth or diameter.

Well Construction Contractors

Well construction contractors working in each of the counties were interviewed to obtain SSWRLS information. Contact information is included in Appendix B. The information obtained is described in Appendix A: County Descriptions. Partridge Well Drilling provided 167 records of individual SSWRLS that it has repaired. Eighty-nine records were for wells in Duval County and 78 records were for wells in St Johns County.

Local Government Offices

Environmental protection and/or building departments of each of the 19 counties were contacted for information concerning SSWRLS. The information obtained is described in Appendix A: County Descriptions. Contact information is included in Appendix B.

Florida Department of Health

The local office of the Florida Department of Health was contacted in each county for information concerning SSWRLS. The information obtained is described in Appendix A: County Descriptions. Contact information is included in Appendix B.

Occurrence of SSWRLS in SJRWMD

Records of SSWRLS at 850 self-supply systems in SJRWMD were obtained and used to prepare a database. The database is detailed in a companion document titled *Task B: Description of Current and Historic Occurrences of Significant Reductions in the Level of Service or Complete Loss of Service to Self-Supply Systems* (D.L. Smith & Associates 2202a). Most of these systems were located in Mandarin/Fruit Cove area of southern Duval and northern St Johns counties. In addition, twenty-one discrete areas within SJRWMD that reportedly have experienced SSWRLS were identified based on interviews. Identified current and historic SSWRLS are shown on Figure 6 and summarized in Table 3. Descriptions of SSWRLS in each county are presented in Appendix A.

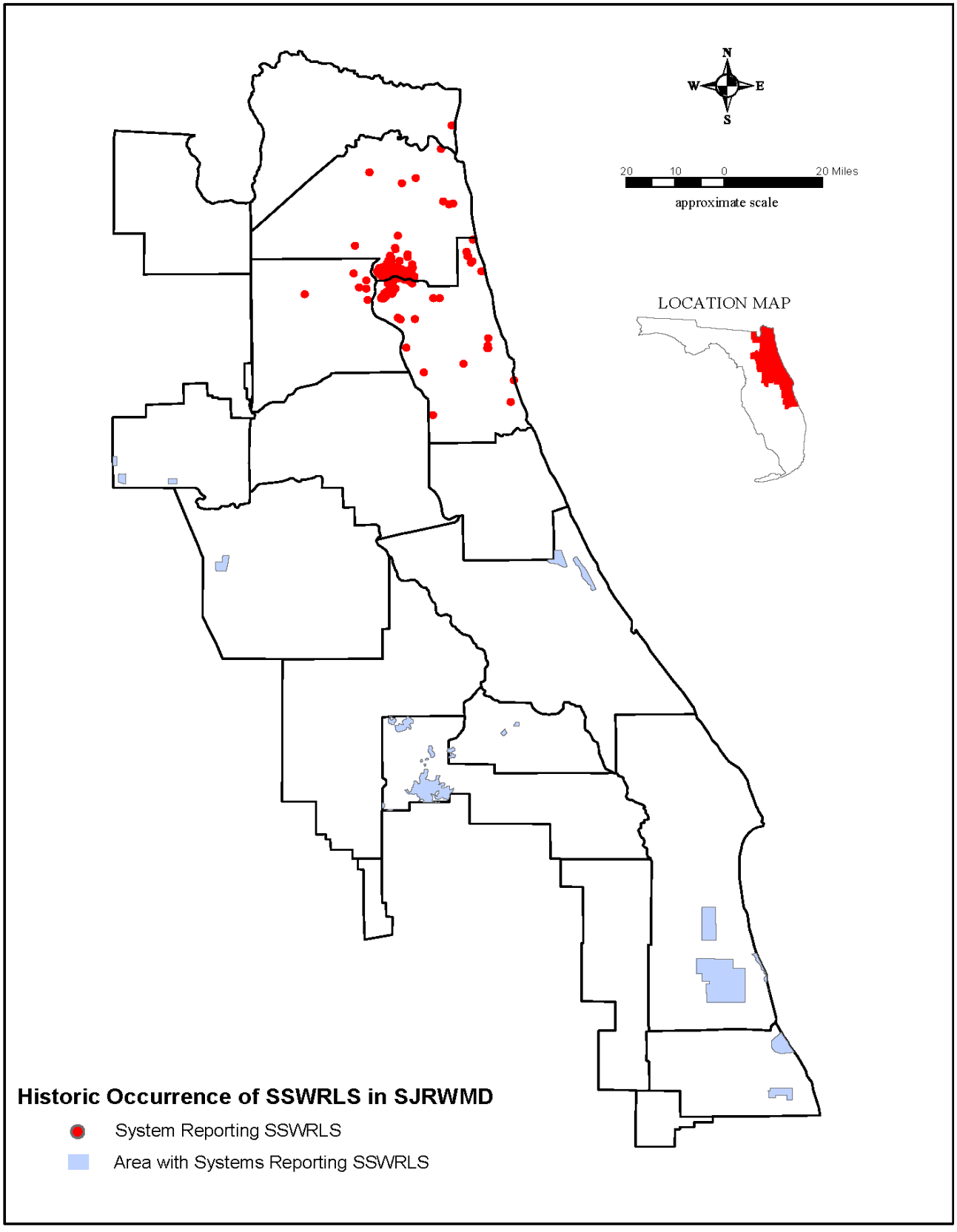

Figure 6: Historic occurrence of SSWRLS in SJRWMD
Note: Wells experiencing historic occurrence of SSWRLS in Putnam County are not included on this map.

County	Area Name	SSWRLS Class	Suspected Cause of SSWRLS
Alachua	Kanapaha	5	Drought, Self-Supply Well Withdrawals
Alachua	Micanopy	4	Drought
Alachua	Archer	4	Drought
Alachua	Grassy Lakes	4	Drought
Brevard	Palm Bay	4	Drought, Self-Supply Well Withdrawals
Brevard	West Melbourne	4	Drought, Self-Supply Well Withdrawals
Brevard	South Melbourne Beach	Well	Drought lowered water levels below bottom of wells
Duval	Mandarin	1,2,3	Public Water Supply Withdrawals
Indian River	Sebastian Highlands	4	Drought, Self-Supply Well Withdrawals
Indian River	Barrier Islands	Well	Drought lowered water levels below bottom of wells
Indian River	West Vero Artesian	3	Drought
Marion	Citra	4	Drought
Orange	Maitland	4,5	Public Water Supply Withdrawals
Orange	High Ridges	5	Public Water Supply Withdrawals
Putnam	Crescent City	4	Fern Freeze Protection
St Johns	Fruit Cove	1,2,3	Public Water Supply Withdrawals
St Johns	Palm Valley	2,3	Public Water Supply Withdrawals
Seminole	Elder Springs	4	Drought
Seminole	Lockport	4	Drought
Volusia	Seville/Pierson	4	Fern Freeze Protection
Volusia	Timber Creek Road	3	Drought
Volusia	Derbyshire Ridge	4	Drought

Table 3: Identified areas of SSWRLS in SJRWMD

The most significant factor in the occurrence of SSWRLS is the pumping system utilized. Rarely is SSWRLS associated with actual well construction such that the well “runs dry”. SSWRLS typically occurs when the water level declines such that the pumping system no longer functions properly. Self-supply water systems relying on free-flowing wells to supply a household are particularly susceptible to SSWRLS.

Based on common well construction practices in SJRWMD, five classes of SSWRLS were identified. Each class is associated with a specific water level threshold and related pumping system class. Three of the five classes rely on the aquifer pressure head in areas where water levels are above land surface to move water through the system to some degree.

Class 1 SSWRLS occurs when the water level in a well declines from about 35 ft als or more to less than 35 ft als. Affected systems are domestic supply self-supply systems without a pump that rely on the hydraulic head to supply system pressure (Class 1 Systems). In order to provide adequate pressure for domestic supply, these systems are typically restricted to areas where the water level was at least 35 ft als at the time of well

construction. SSWRLS occurs if the water level declines to a point where the hydraulic head is not sufficient to adequately pressurize the system. These systems are relatively rare but are most common in portions of Duval, Clay and St Johns counties.

Class 2 SSWRLS occurs when the water level in a well declines from about 15 ft als or more to less than 15 ft als. Affected systems are domestic self-supply systems with a treatment unit that relies on hydraulic head to move water through the unit (Class 2 Systems). The single pump in the system is located between the unit and the point of use. In order to provide adequate pressure to the treatment unit, these systems are typically restricted to areas where the water level was at least 15 ft als at the time of well construction. SSWRLS occurs if the water level declines to a point where hydraulic head is not sufficient to move water through the treatment unit. These systems typically utilize an aerator for treatment of hydrogen sulfide and are most prevalent in areas where the source water sulfate concentrations are generally elevated.

Class 3 SSWRLS occurs when the water level in a well declines from above land surface to below land surface. Affected systems are domestic and irrigation self-supply systems equipped with centrifugal or shallow-well jet pumps and irrigation self-supply systems without pumps (Class 3 Systems). If the water level drops below land surface, the former may experience SSWRLS from loss of prime due to system air leaks and irrigation self-supply systems without pumps will not function. These systems are prevalent in areas where water levels have historically been above land surface.

Class 4 SSWRLS occurs when the water level in a well declines from less than 20 ft bls to greater than 20 ft bls. Affected systems are domestic and irrigation self-supply systems equipped with centrifugal or shallow-well jet pumps (Class 4 Systems). If water levels decline to greater than about 20 ft bls, the effective lift capacity of theses pumps is exceeded and these systems will experience SSWRLS. These systems are prevalent in areas where water levels have historically less than 20 ft bls.

Class 5 SSWRLS occurs when the water level in a well declines to below the intake of a submersible or deep-well jet pump (Class 5 Systems). Common well construction practice in SJRWMD is to install submersible and deep-well jet pump intakes at least 15 to 20 ft below the water level at the time of well construction. These systems are prevalent in areas where water levels have historically been deeper than 20 ft bls.

2020 SELF-SUPPLY WELL USE

An evaluation was conducted to identify Water Supply Public Service Areas (PSAs) where self-supply wells are expected to be a significant means of water supply through 2020. SJRWMD provided geographic information system (GIS) coverage of current PSA boundaries (Figure 7). There is no single database of self-supply systems in SJRWMD. Self-supply well locations within SJRWMD were obtained from a number of sources.

Sources of Self -Supply Well Information

Information about locations of self-supply wells in SJRWMD was requested through written and verbal communication with SJRWMD staff, public supply utilities, local government offices, FDEP, and Florida Department of Health. The primary objective was to locate and obtain electronic record. A summary of the information resulting from these requests is presented in Table 4.

Source	Total Number of Database Records
DEP Superact Wells	5,973
DEP Water Supply Restoration Program Wells	8,613
Alachua County	0
Baker County	0
Bradford County	0
Brevard County	20,335
Clay County	4,640
Duval County	16,689
Flagler County	4,058
Indian River County	5,707
Lake County	2,944
Marion County	0
Nassau County	3,000
Okeechobee County	0
Orange County	4,458
Osceola County	1,700
Polk County	0
Putnam County	249
St. Johns County	11,233
Seminole County	1,503
Volusia County	18,412
TOTAL.	**109,514**

Table 1: Summary of self-supply well data acquisition

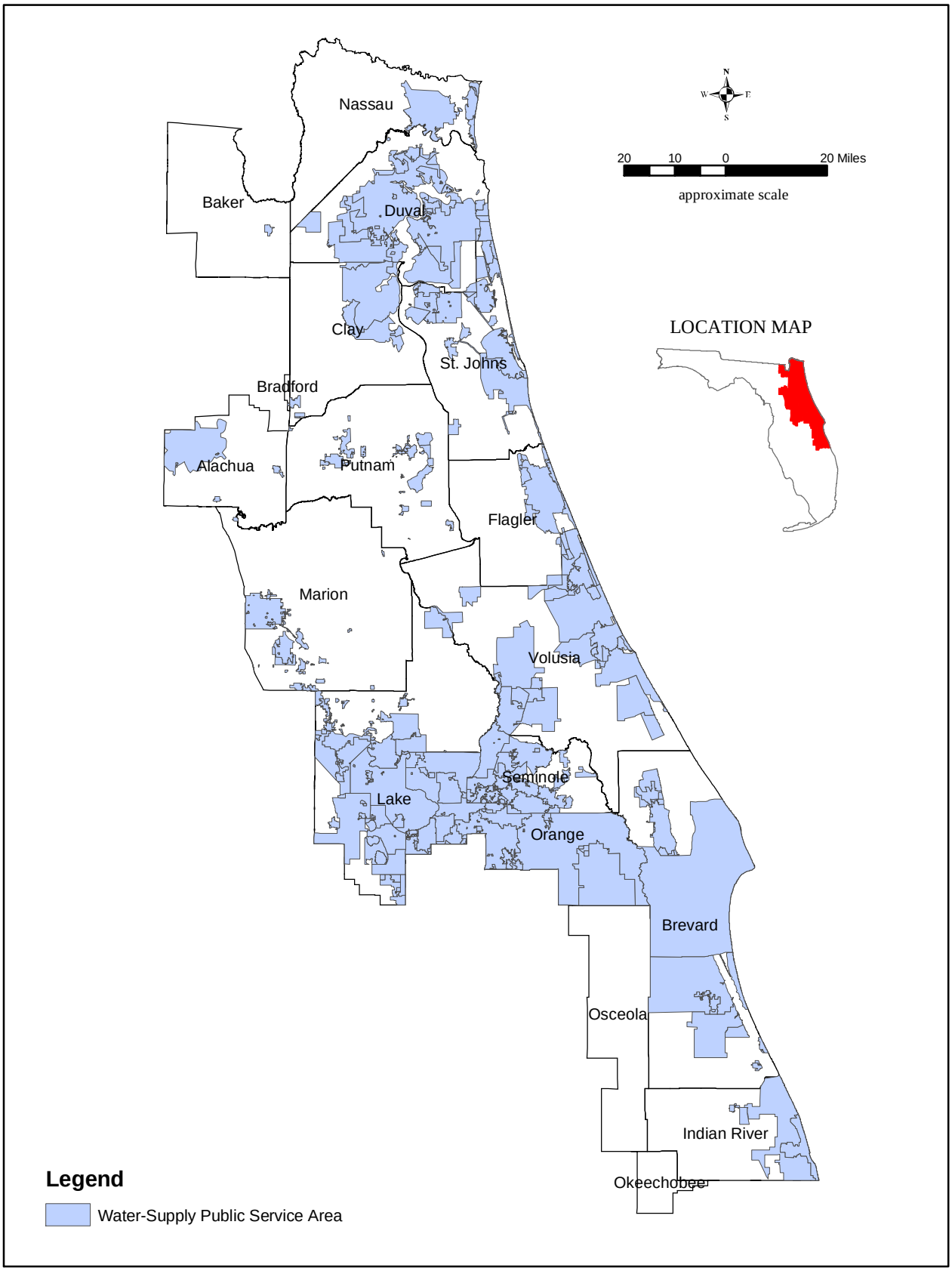

Figure 7: Water-Supply Public Service Areas

A description of the well information is provided below. Well information acquired from county offices of the Department of Health and local government is included in Appendix A.

FDEP Superact Well Database

The State Underground Petroleum Environmental Response (SUPER) Act was enacted by the Florida State Legislature in 1986 in order to conduct drinking water well sampling and investigation around known or suspected contaminated petroleum facilities, such as service stations, industrial facilities and fuel oil sites. These investigations include documentation of public-supply wells within a 1/2-mile radius of the sites and private wells within a 1/4-mile radius. The State of Florida recently expanded this program to include contaminated sites around known or suspected dry cleaning facilities.

The DEP maintains a database of self-supply wells within 1/4-mile of the suspected sources. FDEP provided ArcGIS shape files containing records for 5,973 self-supply wells identified within SJRWMD. The well locations are determined using GPS by the FDEP or subcontractors (commonly local health department staff).

FDEP Water Supply Restoration Program

The FDEP Water Supply Restoration Program maintains GIS coverages of the location of wells from which water samples are collected by county health departments. FDEP Water Supply Restoration Program staff provided ArcGIS shape files for a GIS coverage containing records for 8,613 self-supply wells identified in SJRWMD.

Department of Health Local Offices

The local Department of Health office in each county was contacted for self-supply well information. Well information acquired from county offices of the Department of Health is included Appendix A. Contact information is provided in Appendix B.

Local Governments

Each county government was contacted for self-supply well information. Well information acquired from local governments is included in Appendix A. Contact information is provided in Appendix B.

Areas Where Self-Supply Wells are Expected to Be a Significant Means of Water Supply through 2020

Self-supply wells will be the predominate source of water supply outside of PSAs. ArcGIS shape files of PSA boundaries and sample populations of self-supply well locations were used to create self-supply well distribution maps (D. L. Smith & Associates 2002b). The maps showed significant concentrations of self-supply wells in most PSAs.

Irrigation self-supply wells are expected to be a common source of supply within PSAs except where prohibited by local government regulation. Irrigation self-supply wells are generally not prohibited and in most cases are expressly allowed. The use of irrigation self-supply wells is only restricted in a few areas and only where reuse systems have been installed to provide water for lawn and landscape irrigation. As the cost of public water supply rises, the incentive increases to use self-supply wells for irrigation. This incentive is based on the common perception that self-supply wells can provide irrigation water less expensively than it can be provided by public supply systems. Irrigation self-supply wells are expected to be a common source of supply in all PSAs, except where prohibited by local government regulation.

Domestic self-supply wells are generally not used in areas where public water supply is available. Domestic self-supply wells will be a significant source of supply in some privately owned PSAs and PSAs where public water supply is not available throughout the entire PSA. Most local governments operating a public water supply system require connection to the system. Many local governments prohibit the use of wells for domestic self-supply. Private utilities do not have the ability to require connection to their system but must rely on local government to require connection. Public water supply is generally considered available to a property if a water line is within 100 ft of the property boundary. Typically, the longer public supply has been available in a PSA, the lower the number of wells used for domestic self-supply. In areas that have relied upon self-supply wells prior to the availability of public water supply, it is common for the owner to convert a potable well to irrigation use rather than abandoning the well.

RISK OF SSWRLS BASED ON 2020 CONDITIONS

Maps were created identifying areas at risk of SSWRLS based on projected groundwater level declines through 2020 for model-projected water level declines and for estimated maximum water level declines.

Surficial Aquifer Self-Supply Systems

The surficial aquifer is unconfined and the water level of surficial aquifer wells is located below land surface. Surficial aquifer self-supply systems utilize Class 4 and Class 5 pumping systems. Class 4 systems with centrifugal or shallow-well jet pumps are used in areas where the water table is less than about 20 ft bls. If the water table drops below 20 ft, these systems will experience SSWRLS. If these systems are equipped with drop pipes shorter than 20 ft, they will experience SSWRLS when the water level drops below the bottom of the drop pipe. Class 5 systems with submersible or deep-well jet pumps will experience SSWRLS if the water level drops below the pump intake. Pump intakes are commonly set at least 15 ft below the water table.

Projected water table declines through 2020 are presented in Figure 4. The maximum predicted drawdown is about 10 ft in small portions of Alachua, Polk, Orange, Seminole and Volusia counties. Based on these results, Class 5 surficial aquifer systems are not at risk of SSWRLS through 2020.

Class 4 self-supply systems are used in areas where the depth to the water table is less than about 20 ft. The SSWRLS risk for Class 4 surficial self-supply systems was evaluated using GIS. Areas where depth to the water table was less than 20 ft in 1993-1994 were identified using the baseline depth to water table map data field. A 2020 depth to water table data field was created by adding the value of the predicted 2020 water table drawdown for each record to the baseline depth to water table value for that record. Queries were developed using the baseline and the 2020 depth to water table fields to select records where baseline water table was less than 20 ft bls but the 2020 water table is greater than 20 ft bls. Class 4 surficial aquifer self-supply systems in these areas are considered at risk of SSWRLS (Figure 8).

In order to estimate areas where surficial aquifer self-supply systems would be susceptible to SSWRLS following a 1 in 10 year drought, maximum low water levels were estimated. Existing groundwater flow models do not consider response to long-term drought (Hoenstine 1991). Water table declines as great as 10 ft have been reported during periods of drought for portions of SJRWMD. Areas susceptible to Class 4 SSWRLS if the water table declines 10 ft are shown in Figure 9. This map was prepared by identifying areas where baseline water tables are less than 20 ft bls but would be greater than 20 ft bls with a 10-ft water table decline.

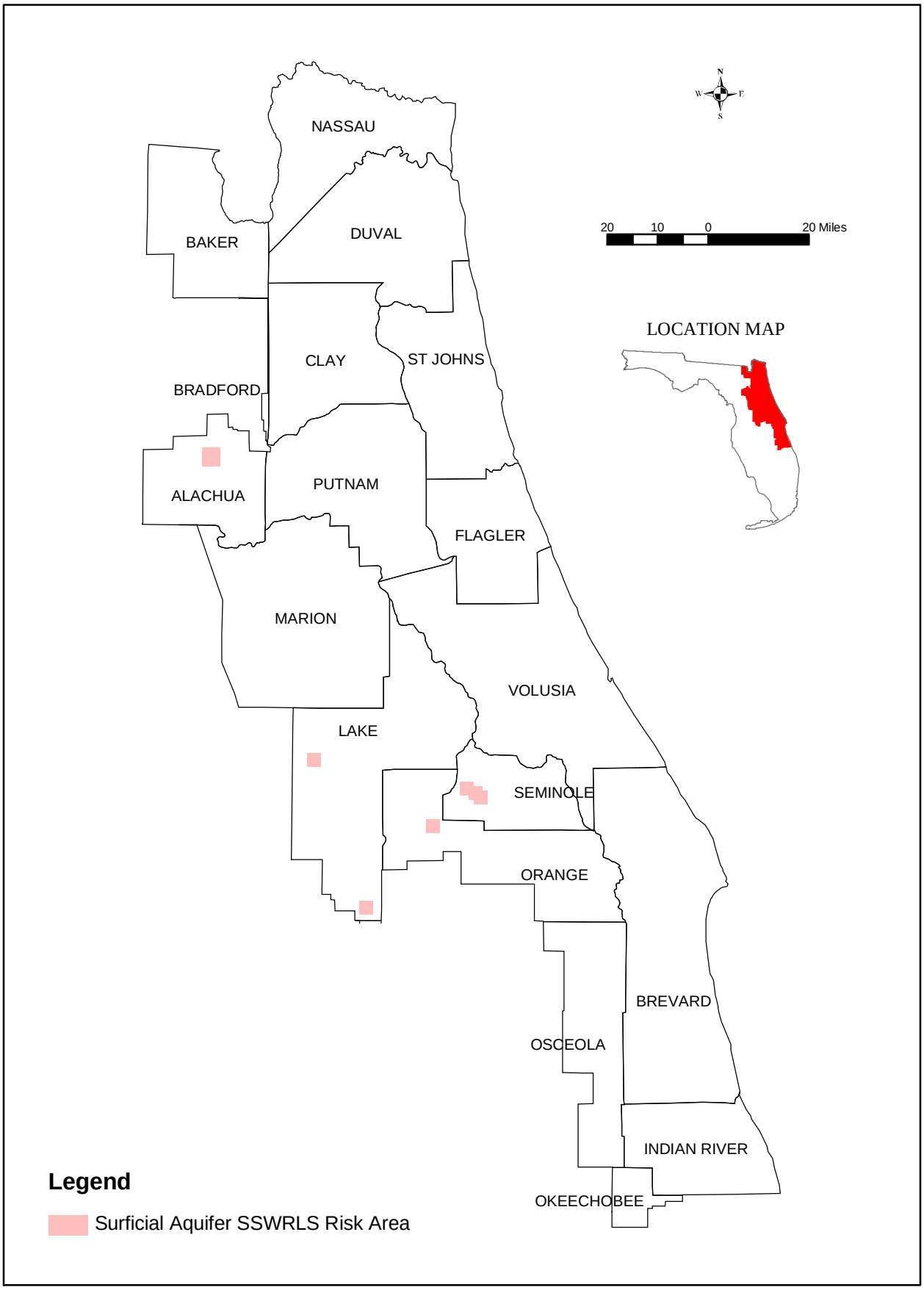

Figure 8: Surficial aquifer Class 4 system SSWRLS risk areas based on 2020 conditions

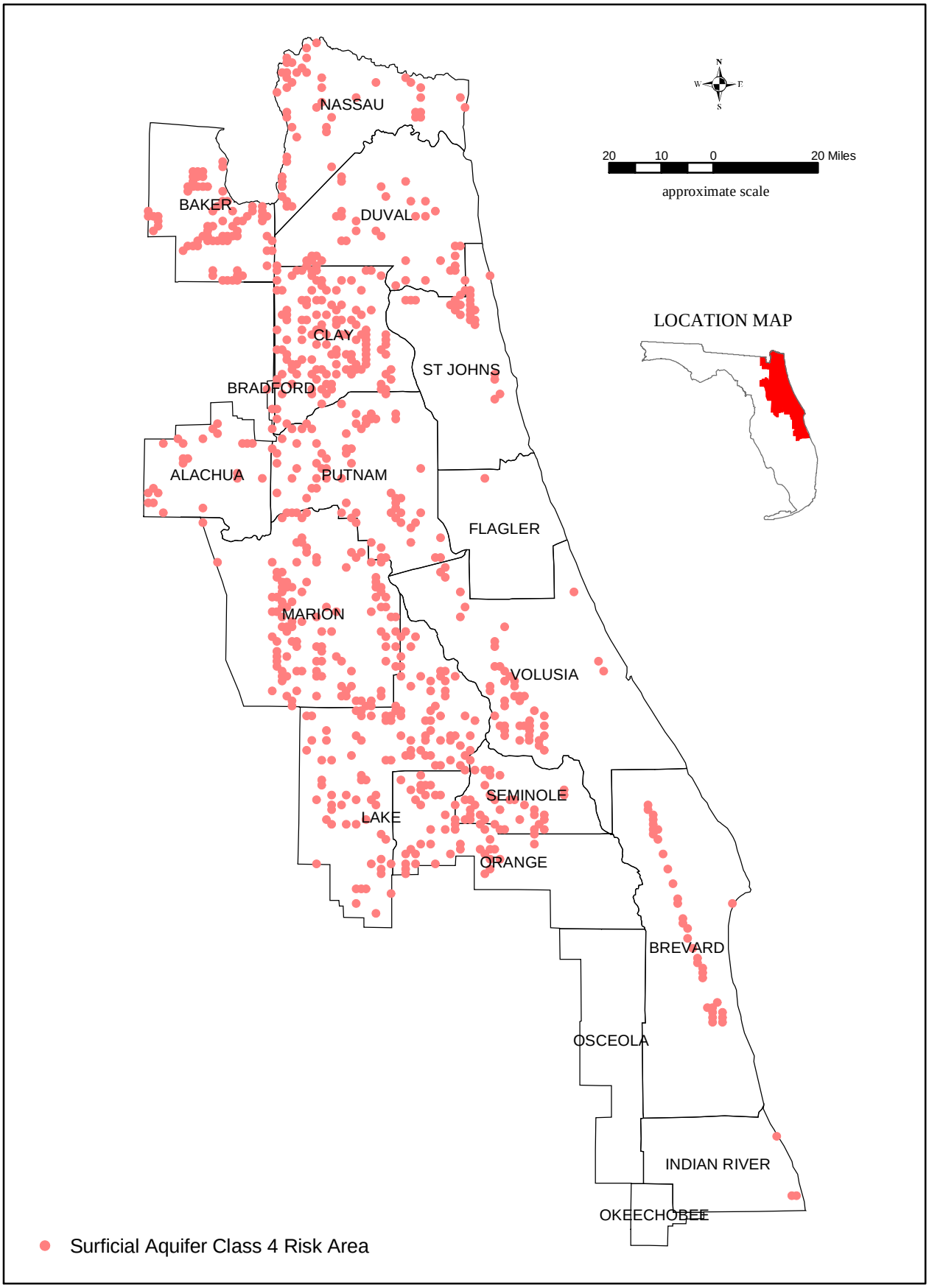

Figure 9: Surficial aquifer Class 4 System SSWRLS risk areas assuming 10-ft water table decline

Upper Floridan Aquifer Self-Supply Systems

SSWRLS risk areas for Upper Floridan aquifer systems were identified using ArcGIS by comparing baseline water levels to projected 2020 water levels. The 2020 water levels were calculated by adding the 2020 Megamodel specified-head scenario Upper Floridan aquifer drawdown values to the calculated baseline Upper Floridan aquifer depth-to-water values. SSWRLS risk was assigned to areas where the water level threshold for a SSWRLS class was met for baseline conditions but exceeded in 2020. For example, Class 4 self-supply systems are considered at risk of Class 4 SSWRLS in areas where baseline water levels are less than 20 ft bls and projected 2020 water levels are greater than 20 ft bls. The identified Upper Floridan aquifer risk areas for each SSWRLS class are shown on Figure 10.

The USGS Megamodel uses average annual withdrawals for aquifer discharge. During extended periods of drought, actual withdrawals may be significantly greater than the average annual values and resultant drawdown will be higher than predicted by the model. Maximum daily demand is commonly considered to be 1.5 to 2 times the average daily demand. Drawdown is directly proportional to discharge and model-simulated steady-state drawdown would be twice as large if maximum demand of twice the average was used. Because periods of maximum withdrawal are of short duration, steady state conditions are generally not achieved and actual drawdowns would be less. A map of Upper Floridan aquifer SSWRLS risk was prepared to evaluate potential SSWRLS resultant from high demand extended periods of drought which might reasonably represent the 1 in 10 year drought (Figure 11). Maximum low water levels in 2020 were estimated by adding twice the amount of the 2020 Megamodel drawdown to the baseline Upper Floridan aquifer water level. SSWRLS risk areas were identified for each system class as previously described.

The risk maps were used to identify PSAs that may experience the occurrence of SSWRLS by 2020. The identified PSAs are discussed in Appendix A.

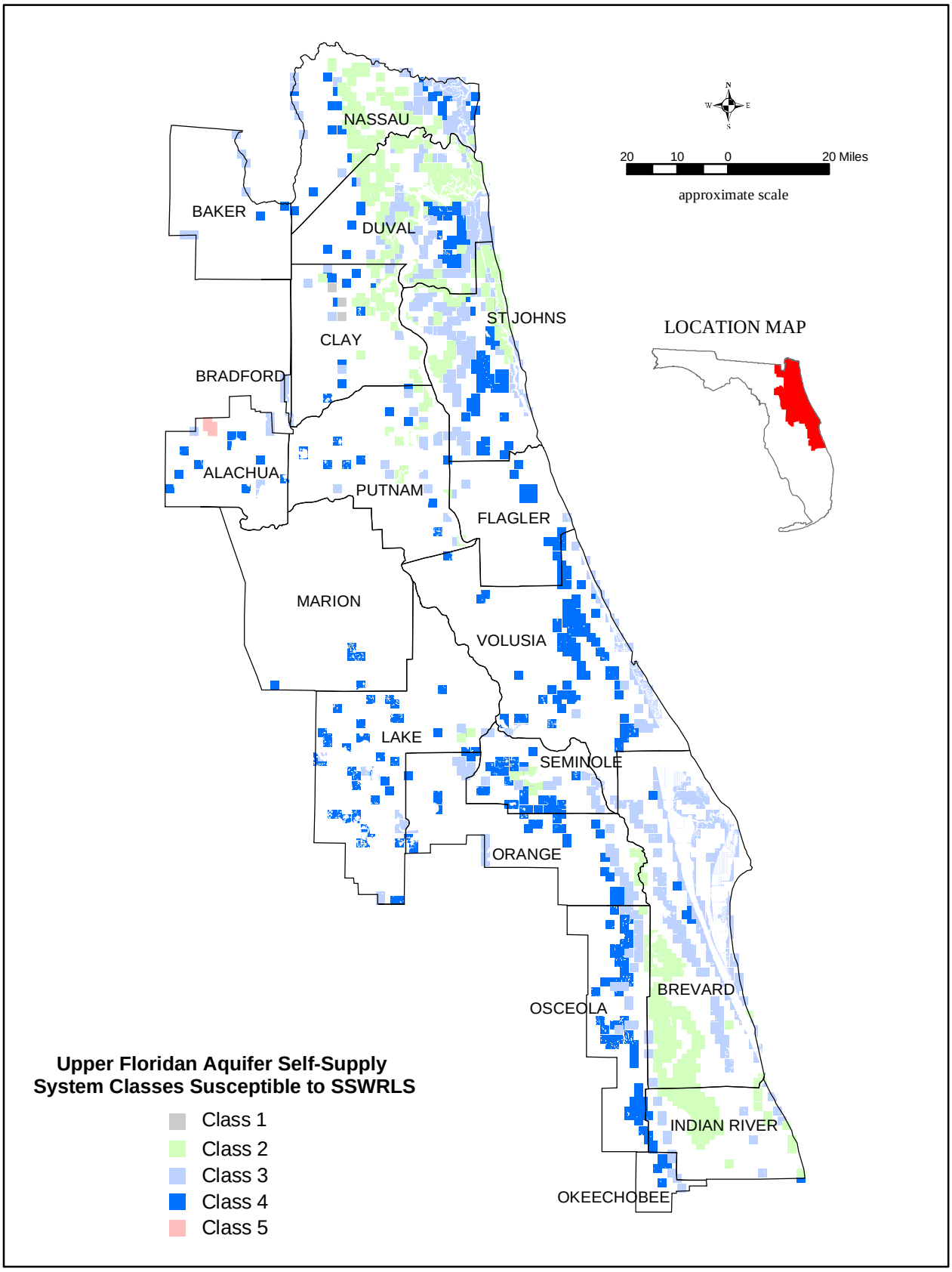

Figure 10: Upper Floridan aquifer SSWRLS risk areas based on average daily demand

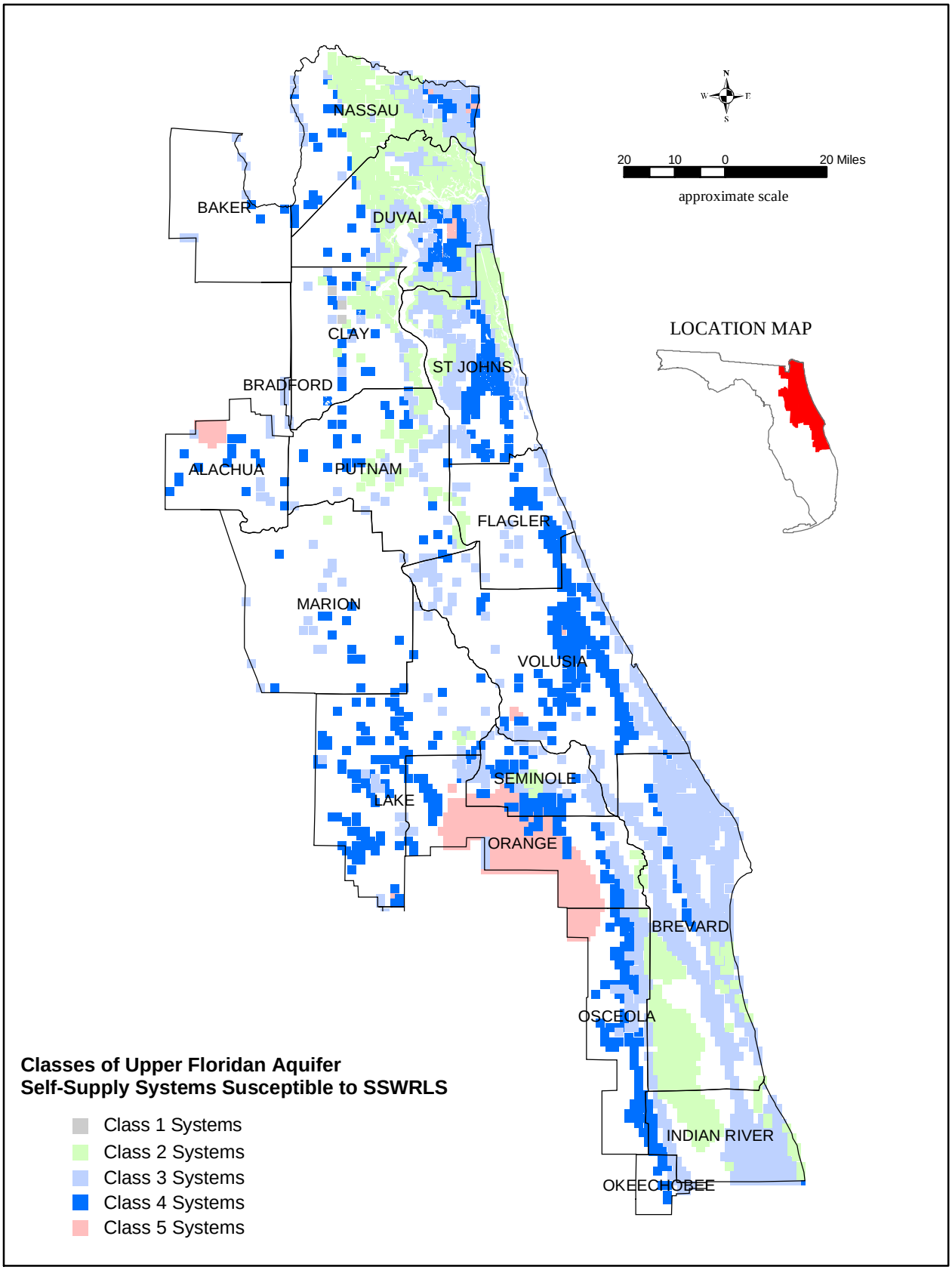

Figure 11: Areas where Upper Floridan aquifer systems are susceptible to SSWRLS based on 2020 maximum predicted drawdown

Minimum Well Construction and Pumping Equipment Criteria

Areas have been identified that may experience SSWRLS based on common well construction and pumping equipment practices and projected water level declines through 2020 (D. L. Smith & Associates 2003). SSWRLS associated with water level decline is primarily related to the reduced capacity of the well pump or to pump failure.

Changes to common pumping equipment practices within the identified areas can prevent potential reduction in or loss of service. The minimum pumping equipment criteria necessary to avoid well reduction in or loss of service has been determined for these areas. A description of how these criteria differ from current well construction and pumping equipment practices is provided.

Five classes of self-supply pumping systems that experience SSWRLS under certain circumstances have been identified (Table 5). Three of the five classes are related to Upper Floridan and/or intermediate aquifer systems in areas where water levels are above land surface. The other two classes apply to systems where water levels are below land surface.

Pumping System Class	Pump	Head Required	SSWRLS will occur if:	Applicable Aquifers
1	None	35 ft above land surface	head falls below 35 ft above land surface	Floridan
2	None between well and treatment unit. Pump used to transfer water from treatment unit to point-of-use	15 ft above land surface	head falls below 15 ft above land surface	Floridan
3	Centrifugal or shallow-well jet pump or no pump for low pressure (irrigation) systems	above land surface	head falls below land surface	Floridan
4	Centrifugal or shallow well jet pump	Within the lift capacity of the pump (about 20 ft below land surface)	head falls below lift capacity of pump	Surficial or Floridan
5	Submersible or deep-well jet pump	none	water level falls below pump intake	Surficial or Floridan

Table 5: Self-supply well pumping systems susceptible to SSWRLS

Each class of common pumping equipment is associated with a specific water level threshold. If water levels decline to below the threshold value for a specific class, that

class of pumping system will experience SSWRLS. Areas where projected 2020 water levels drop below these thresholds were identified as at risk of SSWRLS (D. L. Smith & Associates 2003). These areas were identified based on numerical groundwater flow model simulations (Sepulveda 2002). The groundwater flow modeling simulations represent best estimates based on certain assumptions regarding the groundwater flow system. The accuracy of the model simulations is dependent upon the accuracy of the assumptions.

Class 1 systems are domestic self-supply systems with an Upper Floridan well that do not utilize a pump but rely on hydraulic head to supply system pressure. In order to provide adequate pressure, these systems are typically restricted to areas where the water level is at least 35 ft als. SSWRLS occurs if the water level declines to a point where hydraulic head is not sufficient to provide adequate system pressure. Class 1 systems were considered at risk of SSWRLS in areas where 2020 water levels are projected to decline to less than 35 ft als.

Class 2 systems are domestic self-supply systems with an Upper Floridan well and a treatment unit (usually an aeration system) that rely on hydraulic head to move water through the unit. A single pump is located between the treatment unit and the point of use. These systems are typically restricted to areas where the water level is at least 15 ft als. SSWRLS occurs if the water level declines to a point where aquifer head is not sufficient to move water through the treatment unit. Class 2 systems were considered at risk of SSWRLS in areas where 2020 water levels are projected to decline to less than 15 ft als. Class 3 systems include domestic and irrigation self-supply systems that utilize an Upper Floridan well equipped with a centrifugal or shallow-well jet pump and irrigation self-supply systems in areas where the potentiometric surface is above land surface that utilize an Upper Floridan well without a pump. If the water level drops below land surface, the former may experience SSWRLS from loss of prime due to system air leaks and irrigation self-supply systems without pumps will not function. Class 3 systems were considered at risk of SSWRLS in areas where 2020 water levels are projected to decline to below land surface.

Class 4 systems are domestic and irrigation self-supply systems equipped with centrifugal or shallow-well jet pumps. If water levels drop below the effective lift capacity of the pumps (about 20 ft), the systems will experience SSWRLS. In some cases these systems are equipped with drop pipes shorter than the maximum lift capacity of the pumps. In these cases the system will experience SSWRLS when the water levels drop below the bottom of the drop pipes. Class 4 systems were considered at risk of SSWRLS in areas where 2020 water levels are projected to decline to greater than 20 ft bls.

Class 5 systems are domestic and irrigation self-supply systems equipped with submersible or deep-well jet pumps. These systems will experience SSWRLS if the water level drops below the pump intake. Class 5 systems were considered at risk of SSWRLS in areas where 2020 water levels are projected to drop by at least 15 ft.

PSAs where SSWRLS risk is predicted for one or more system classes in at least a portion of the PSA are listed in Table 6. In each case, the risk of SSWRLS is related to current pumping system practices, baseline water levels, and projected 2020 water levels determined by ground-water flow model simulation. The models are based on best estimates of ground water use and the locations of withdrawal points. Revisions of 2020 water use estimates and withdrawal points would change projected drawdown and the associated predicted risk of SSWRLS.

The recommended minimum pumping systems required to avoid SSWRLS is based on projected maximum low water levels. Maximum low water level is calculated based on twice the 2020 steady-state projected drawdown. Table 7 describes how the recommended minimum pumping equipment practices to avoid SSWRLS differ from current well construction and pumping equipment practices.

Figure 12 shows areas where risk of SSWRLS is predicted for Class 1 systems based upon projected water level declines from regional 2020 groundwater demands. Current pumping equipment practices in these areas include self-supply systems that do not utilize a pump but rely on aquifer hydraulic head to supply water system pressure. In areas of predicted Class 1 system risk, recommended pumping equipment practices to reduce SSWRLS risk is to utilize a centrifugal or shallow-well jet pump.

Figure 13 shows areas where risk of SSWRLS is predicted for Class 2 systems based upon projected water level declines from regional 2020 groundwater demands. Current pumping equipment practices in these areas include self-supply systems with water treatment units that rely on aquifer hydraulic head to move water through the unit. In areas of predicted Class 2 system risk, recommended pumping equipment practices to reduce SSWRLS risk is to utilize a centrifugal or shallow-well jet pump between the well and the treatment unit.

Figure 14 shows areas of where risk of SSWRLS is predicted for Class 3 systems based upon projected water level declines from regional 2020 groundwater demands. Current pumping equipment practices in these areas include domestic self-supply systems equipped with centrifugal or shallow-well jet pumps and irrigation self-supply systems without pumps. In areas of predicted Class 3 system risk, recommended pumping equipment practices to reduce SSWRLS risk through 2020 is to utilize a centrifugal or shallow-well jet pump and a 20 ft drop pipe.

Table 6: PSAs with identified risk of SSWRLS

		Self-Supply System Class				
UTILITY	PSA ID Number	Class 1	Class 2	Class 3	Class 4	Class 5
GAINESVILLE REGIONAL UTILITIES	114	No	No	No	Yes	Yes
BREVARD COUNTY UTILITIES	371	No	No	Yes	No	No
BREVARD COUNTY UTILITIES	393	No	No	Yes	No	No
COCOA	454	No	High	Yes	No	No
MELBOURNE	628	No	Yes	No	No	No
MELBOURNE	629	No	High	Yes	No	No
PALM BAY UTILITIES	636	No	Yes	Yes	No	No
TITUSVILLE	460	No	No	Yes	No	No
CLAY COUNTY UTILITY AUTHORITY	68	Yes	High	Yes	Yes	No
CLAY COUNTY UTILITY AUTHORITY	84	No	Yes	Yes	Yes	No
JEA	70	No	No	Yes	No	No
ATLANTIC BEACH UTILITY	31	No	High	No	No	No
ATLANTIC BEACH UTILITY	34	No	High	No	No	No
FLORIDA WATER SERVICES CORP	24	No	Yes	No	No	No
FLORIDA WATER SERVICES CORP	25	No	Yes	No	No	No
JEA (FORMERLY UNITED WATER of FLORIDA)	32	No	No	No	Yes	No
JEA (FORMERLY UNITED WATER of FLORIDA)	46	No	High	No	No	No
JEA (FORMERLY UNITED WATER of FLORIDA)	50	No	No	Yes	No	No
JEA (FORMERLY UNITED WATER of FLORIDA)	51	No	High	Yes	No	No
JEA (FORMERLY UNITED WATER of FLORIDA)	61	No	High	High	No	No
JACKSONVILLE BEACH	40	No	High	Yes	No	No
JEA	8	No	High	Yes	Yes	No
JEA	9	No	High	Yes	No	No
JEA	13	No	High	No	No	No
JEA	16	No	High	No	No	No
JEA	21	No	Yes	No	No	No
JEA	27	No	High	High	High	No
JEA	29	No	No	No	Yes	No
JEA	35	No	No	No	Yes	No
JEA	47	No	High	No	No	No
JEA	57	No	No	High	No	No
JEA	58	No	No	High	No	No
JEA	72	No	Yes	High	No	No
NEPTUNE BEACH	38	No	High	No	No	No
INDIAN RIVER COUNTY UTILITIES	645	No	High	No	No	No
VERO BEACH	649	No	High	No	No	No
CLERMONT	504	No	No	No	Yes	No
FLORIDA WATER SERVICES CORP	436	No	No	No	Yes	No
LAKE GROVES UTILITIES INC	590	No	No	No	Yes	No

No - Risk of SSWRLS Not Predicted for Self-Supply System Class
Yes - Risk of SSWRLS Predicted for Self-Supply System Class
High – High Risk of SSWRLS Predicted for Self-Supply System Class

Table 6 (continued): PSAs with identified risk of SSWRLS

		Self-Supply System Class				
UTILITY	PSA ID Number	Class 1	Class 2	Class 3	Class 4	Class 5
LAKE UTILITY SERVICES INC	555	No	No	No	Yes	No
LEESBURG	331	No	No	Yes	High	No
LEESBURG	338	No	No	Yes	No	No
MONTVERDE	491	No	No	Yes	No	No
MOUNT DORA	334	No	No	No	Yes	No
SOUTHLAKE UTILITIES INC	601	No	No	No	High	No
TAVARES	333	No	No	No	Yes	No
FLORIDA WATER SERVICES CORP	283	No	No	No	Yes	No
FERNANDINA BEACH	3	No	No	No	High	Yes
FLORIDA WATER SERVICES CORP	6	No	No	Yes	No	No
FORMERLY UNITED WATER OF FLORIDA INC	2	No	High	High	High	No
APOPKA	376	No	No	No	High	No
EAST CENTRAL FLA SERVICES INC	534	No	High	High	High	No
MAITLAND	469	No	No	No	High	No
ORANGE COUNTY PUBLIC UTILITIES	353	No	Yes	Yes	High	No
ORANGE COUNTY PUBLIC UTILITIES	486	No	High	Yes	High	No
TANGERINE TOWN OF	351	No	No	No	Yes	No
WINTER GARDEN	496	No	No	No	High	No
WINTER PARK	479	No	No	No	High	No
FLORIDA WATER SERVICES CORP	123	No	Yes	No	No	No
FLORIDA WATER SERVICES CORP	145	No	No	No	Yes	No
CASSELBERRY	398	No	No	No	High	No
CASSELBERRY	473	No	No	No	Yes	No
LAKE MARY	355	No	No	No	Yes	No
LONGWOOD	383	No	No	No	Yes	No
OVIEDO	405	No	No	High	Yes	No
SANFORD	336	No	Yes	Yes	Yes	No
SANLANDO UTILITIES CORP	369	No	No	High	Yes	No
SEMINOLE COUNTY PWD	319	No	Yes	Yes	Yes	No
SEMINOLE COUNTY PWD	361	No	No	Yes	Yes	No
SEMINOLE COUNTY PWD	382	No	No	Yes	No	No
SEMINOLE COUNTY PWD	425	No	No	High	High	No
UTILITIES INC OF FLORIDA	347	No	No	No	Yes	No
WINTER SPRINGS	384	No	High	Yes	High	No
FLORIDA WATER SERVICES CORP	62	No	Yes	No	No	No
FORMERLY UNITED WATER OF FLORIDA INC	56	No	High	No	No	No
FORMERLY UNITED WATER OF FLORIDA INC	81	No	No	Yes	No	No
FORMERLY UNITED WATER OF FLORIDA INC	82	No	Yes	Yes	No	No
INTERCOASTAL UTILITIES INC	65	No	High	No	No	No
INTERCOASTAL UTILITIES INC	66	No	High	High	No	No

No - Risk of SSWRLS Not Predicted for Self-Supply System Class
Yes - Risk of SSWRLS Predicted for Self-Supply System Class
High – High Risk of SSWRLS Predicted for Self-Supply System Class

Table 6 (continued): PSAs with identified risk of SSWRLS

		Self-Supply System Class				
UTILITY	PSA ID Number	Class 1	Class 2	Class 3	Class 4	Class 5
JEA	71	No	High	High	No	No
JEA	74	No	High	Yes	No	No
ST AUGUSTINE	97	No	Yes	Yes	No	No
ST JOE UTILITIES INC	90	No	Yes	Yes	No	No
ST JOHNS COUNTY UTILITIES	80	No	No	Yes	Yes	No
ST JOHNS COUNTY UTILITIES	95	No	No	High	No	No
ST JOHNS COUNTY UTILITIES	99	No	Yes	No	No	No
ST JOHNS COUNTY UTILITIES	100	No	Yes	No	High	No
ST JOHNS SERVICE CO INC	55	No	High	No	No	No
DAYTONA BEACH	181	No	No	Yes	High	No
DELAND	224	No	No	No	Yes	No
EDGEWATER	278	No	No	Yes	No	No
FLORIDA WATER SERVICES CORP	288	No	No	Yes	Yes	No
LAKE HELEN	279	No	No	No	Yes	No
NEW SMYRNA BEACH	245	No	No	Yes	Yes	No
ORMOND BEACH	172	No	No	Yes	Yes	No
ORMOND BEACH	176	No	No	No	Yes	No
PORT ORANGE	215	No	No	No	Yes	No
PORT ORANGE	239	No	No	Yes	High	No
VOLUSIA COUNTY UTILITIES	167	No	No	No	Yes	No
VOLUSIA COUNTY UTILITIES	247	No	No	Yes	No	No
VOLUSIA COUNTY UTILITIES	312	No	No	Yes	No	No

No - Risk of SSWRLS Not Predicted for Self-Supply System Class
Yes - Risk of SSWRLS Predicted for Self-Supply System Class
High – High Risk of SSWRLS Predicted for Self-Supply System Class

Figure 15 shows areas of SJRWMD where risk of SSWRLS is predicted for Class 4 systems based upon projected water level declines from regional 2020 groundwater demands. Current pumping equipment practices in these areas include self-supply systems with centrifugal or shallow-well jet pumps. In areas of Class 4 system risk, recommended pumping equipment practice to reduce SSWRLS risk through 2020 is to utilize submersible or deep-well jet pumps with pump intakes set 15 ft below the maximum low 2020 water level.

Figure 16 shows areas of SJRWMD (both within and without PSAs) where risk of SSWRLS is predicted for Class 5 systems. Current pumping equipment practices in these areas include self-supply systems with submersible or deep-well jet pumps set 15 ft below water level at the time of well installation. In areas of Class 5 system risk, recommended pumping equipment practice to reduce SSWRLS risk through 2020 is to set pump intakes 15 ft below the maximum low 2020 water level.

Table 7: Minimum well construction and pumping equipment criteria necessary to avoid SSWRLS compared to current practices in areas of identified risk of SSWRLS

Self-Supply Well System Class for Which Risk is Identified	Current Pumping Equipment Practices	Water Level Required to Avoid SSWRLS for System Class	Projected 2020 Recommended Minimum Pumping Equipment
1	Flowing Well with No Pump	At Least 35 ft als	Centrifugal or Shallow-Well Jet Pump
2	Self-Supply System with Water Treatment Unit and No Pump Between the Well and Treatment Unit. Pump Used to Transfer Water from Treatment Unit to Point-of-Use	At Least 15 ft als	Add Centrifugal Pump Between Well and Treatment Unit
3	Centrifugal or Shallow-Well Jet Pump or No Pump for Low-Pressure Irrigation Systems	als	Install Centrifugal Pump with 20-ft Drop Pipe
4	Centrifugal or Shallow-Well Jet Pump	Within the Lift Capacity of the Pump (Less Than About 20 ft bls)	Install Submersible or Deep-Well Jet Pump to 15 ft Below Maximum Low Predicted 2020 Water Level
5	Submersible or Deep-Well Jet Pump	Above Pump Intake	Set Pump Intake 15 ft Below Maximum Low Predicted 2020 Water Level

als = above land surface
bls = below land surface

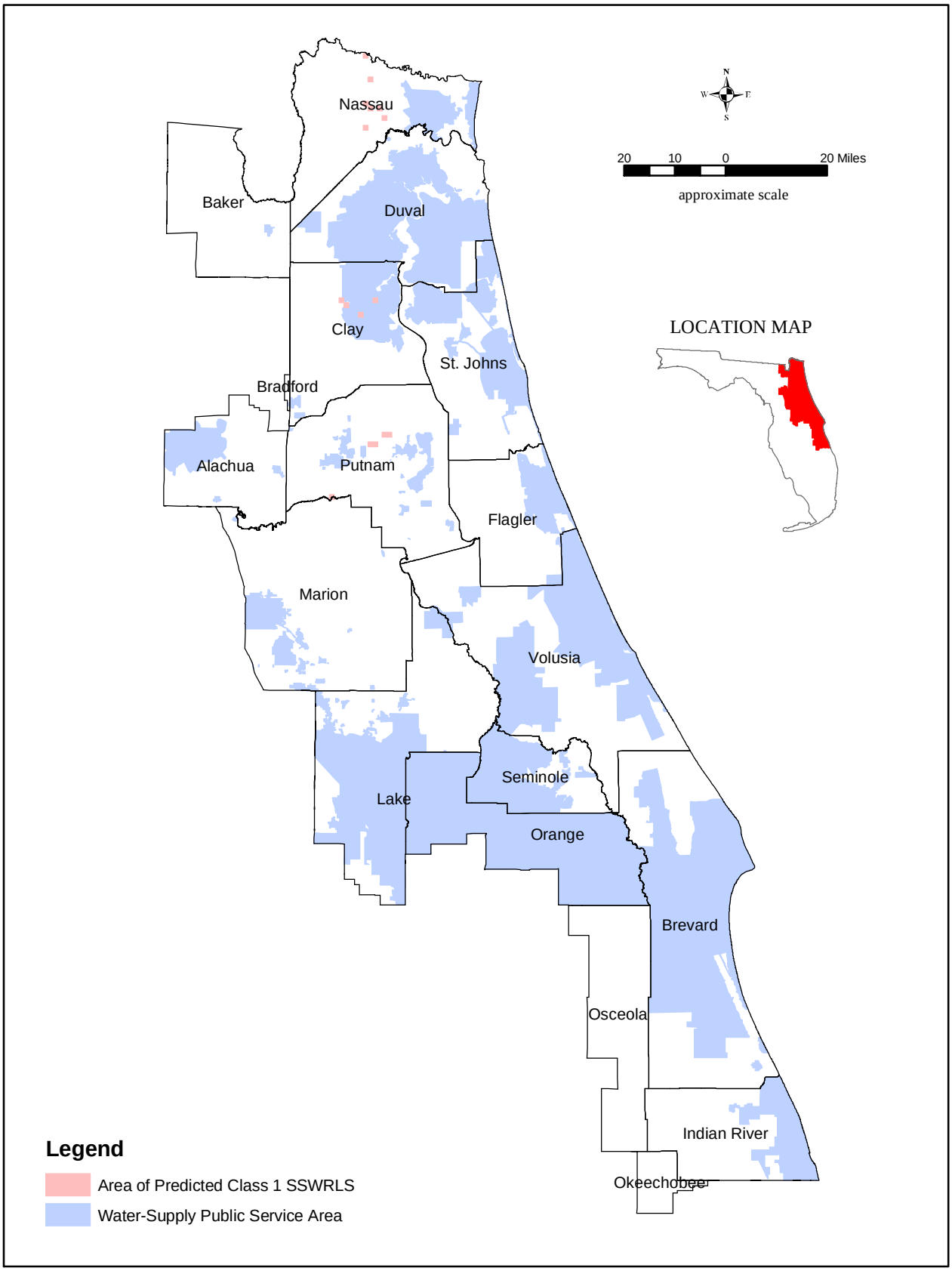

Figure 12: Areas where systems are recommended to utilize a pump based on maximum predicted 2020 drawdown and where current practice includes systems without pumps (Class 1 Systems)

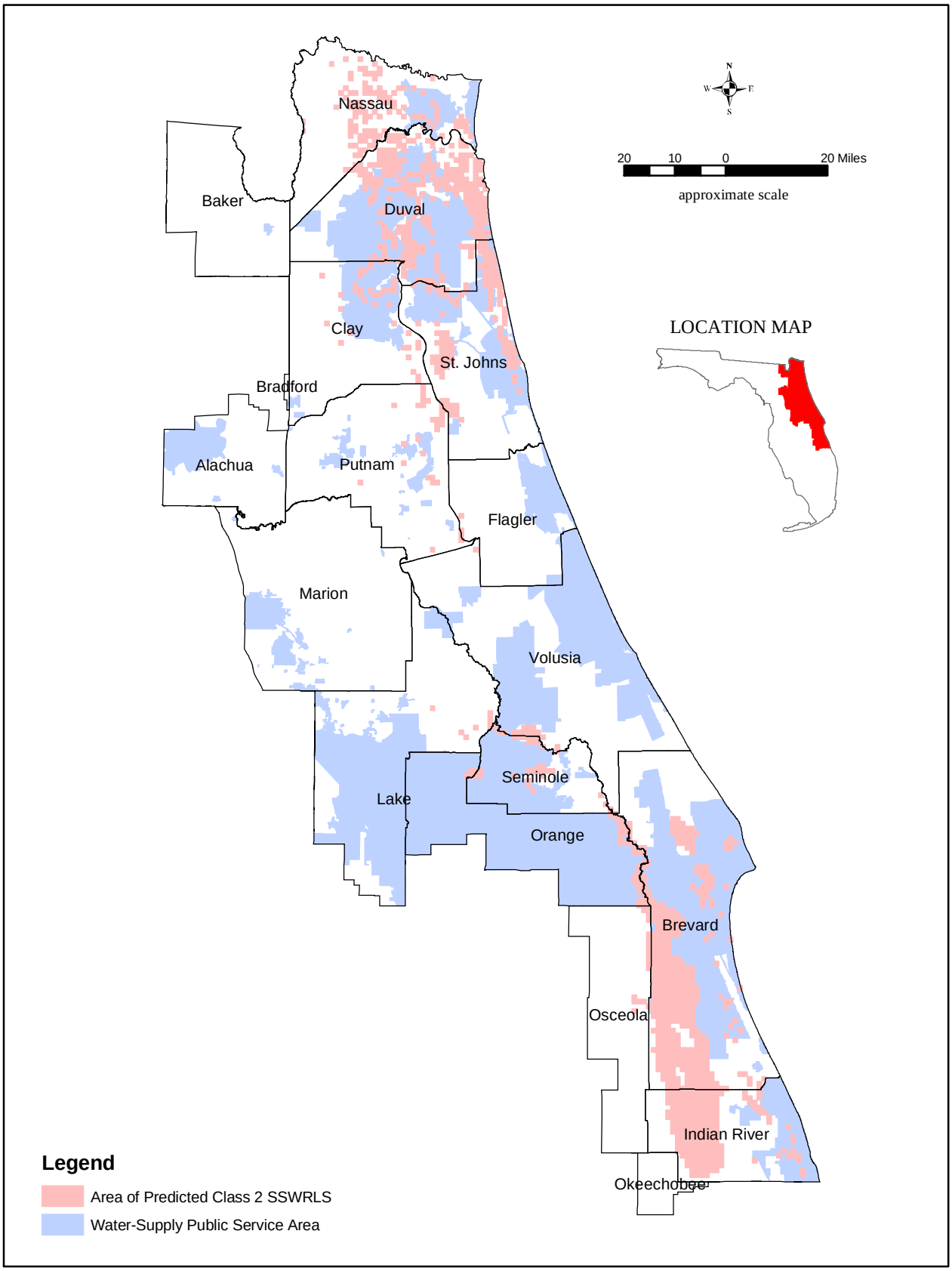

Figure 13: Areas where systems with treatment units are recommended to utilize a pump to move water through the treatment unit based on maximum predicted 2020 drawdown and where current practice includes systems with treatment units that rely on potentiometric head to move water through the unit (Class 2 Systems)

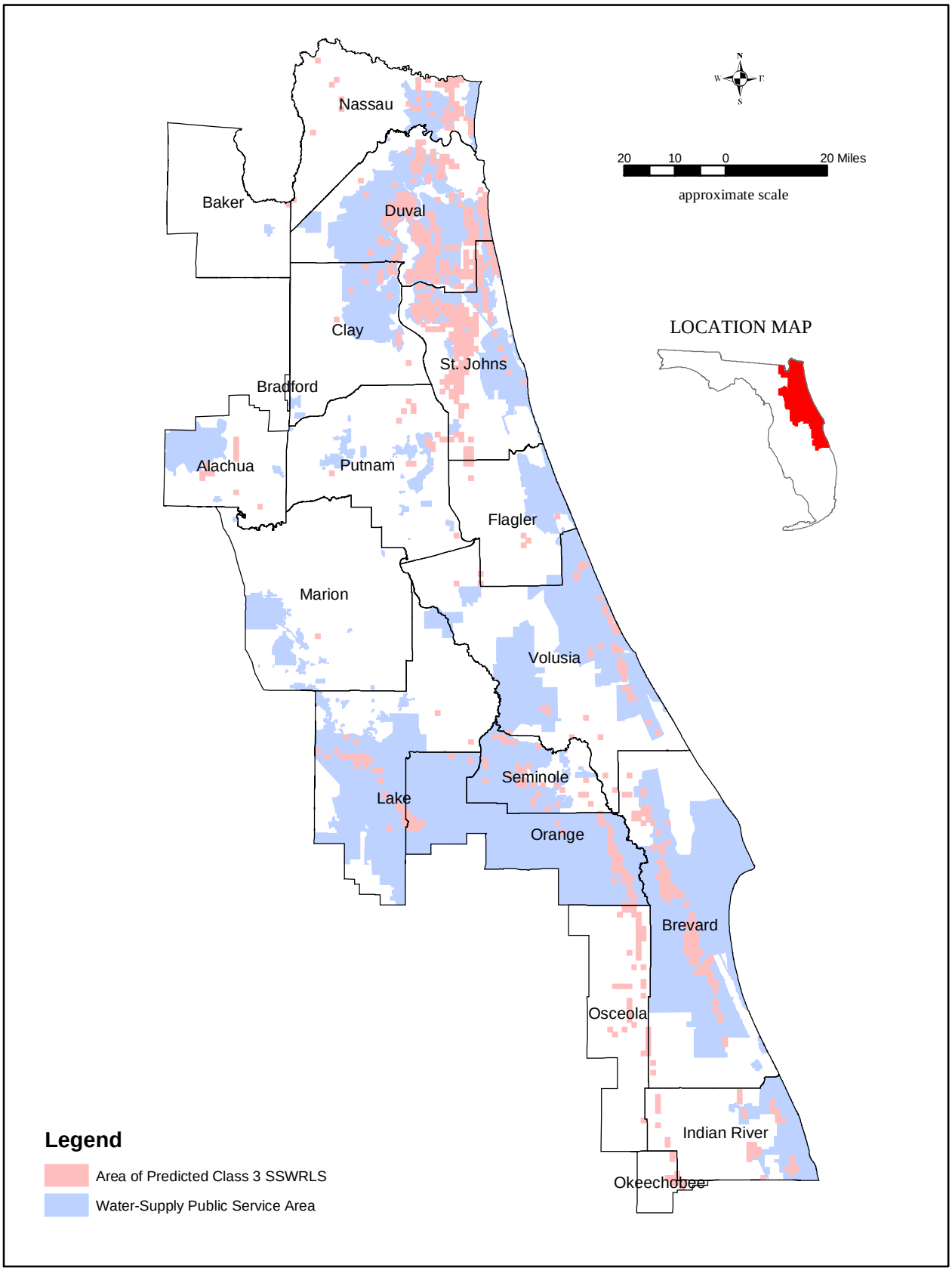

Figure 14: Areas where centrifugal or shallow-well jet pumps with drop pipes are recommended based on maximum predicted 2020 drawdown and where current practice includes systems with shallow-well jet and centrifugal pumps without drop pipes and irrigation systems without pumps (Class 3 Systems)

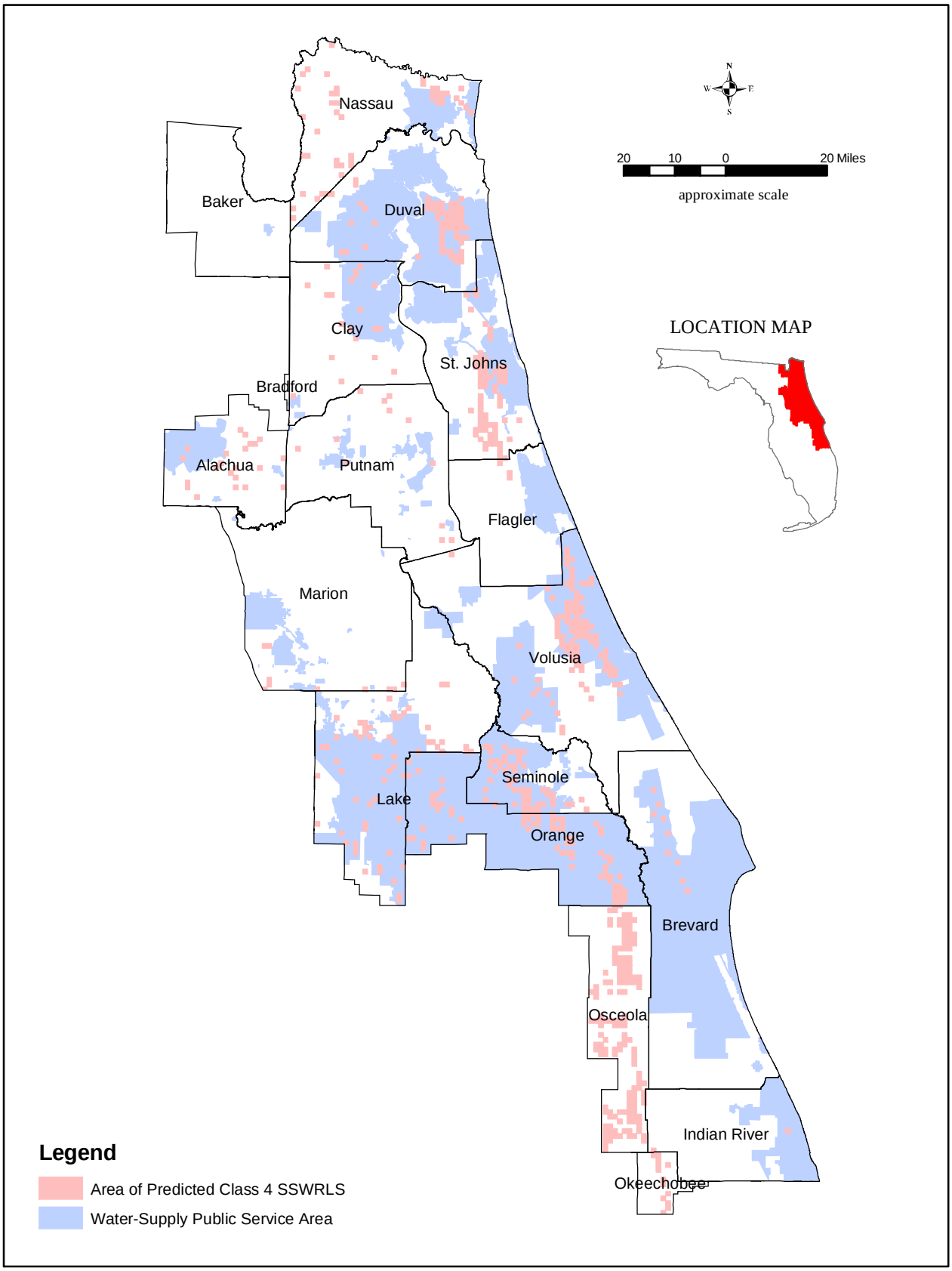

Figure 15: Areas where submersible or deep-well jet pumps are recommended based on maximum predicted 2020 drawdown and where current practice includes the use of shallow-well jet and centrifugal pumps (Class 4 Systems)

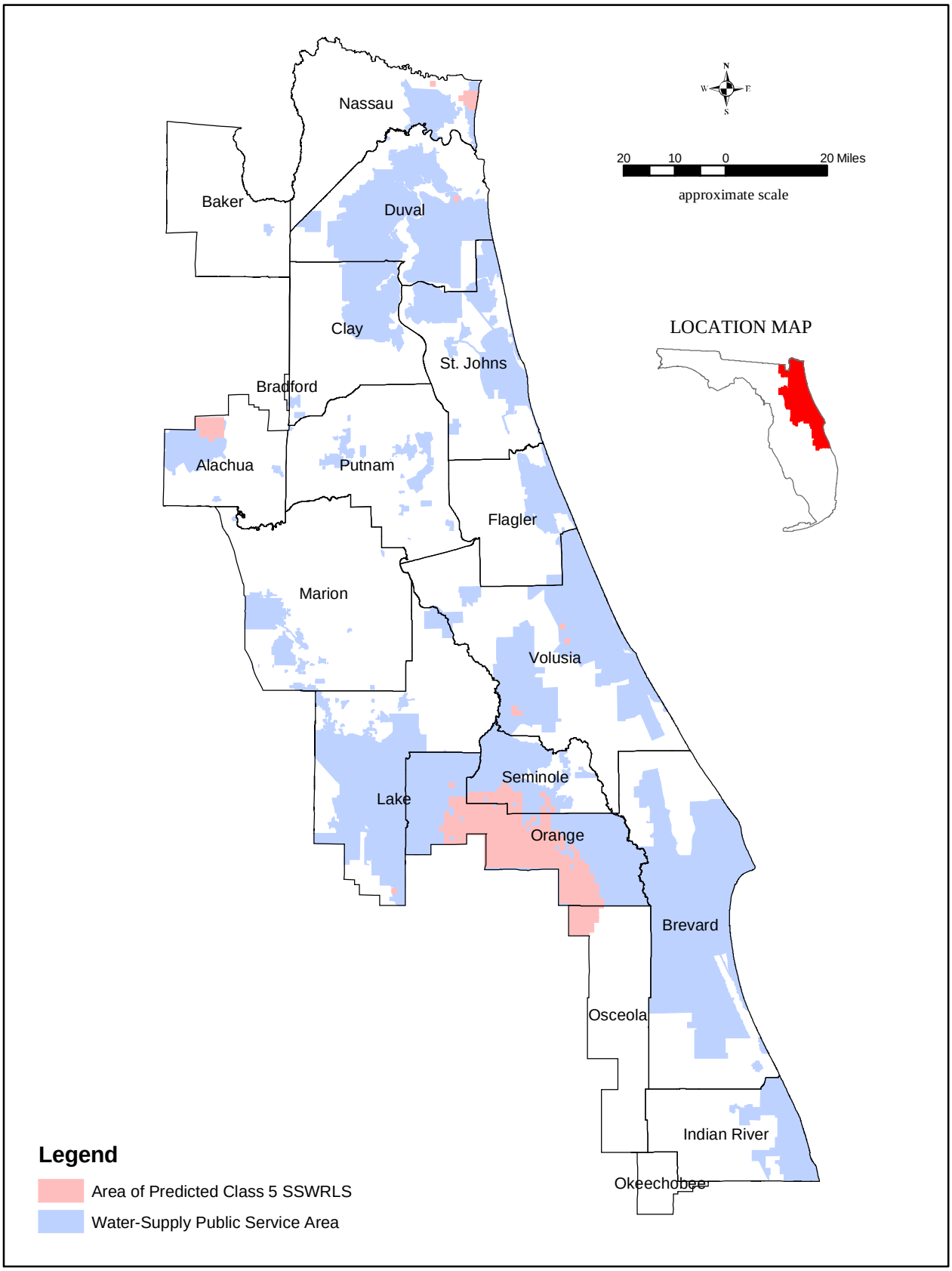

Figure 16: Areas where current well construction practice includes systems with submersible pumps (Class 5 Systems) and where recommended practice is to set the pump intake at least 40 ft below the static water level

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Appendix A: County Descriptions

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County Descriptions

Alachua County

Alachua County Self-Supply Sources

The top of the Upper Floridan ranges from about 0 to 200 ft bls. Sediments of the Hawthorn Group overlie the Floridan. The Hawthorn Group is a semi-confining unit but layers of permeable material within the Hawthorn yield sufficient volumes of water for domestic and private irrigation use. These permeable layers constitute the Intermediate aquifer which averages about 100 feet thick. It is absent in some areas and up to 200 ft thick in others. Surficial sands overlie the Hawthorn and comprise the surficial aquifer where saturated. The surficial sands are generally 20 to 30 ft thick in the area.

The major source of water for self-supply in the Alachua County is the Upper Floridan aquifer. These wells are commonly 4-in diameter and equipped with submersible pumps. The pumps are typically set 10 to 15 ft below the static water level in the well. Generally, the open-hole portion of the well is nominal 3 or 4-in diameter.
In areas where top of the Upper Floridan is relatively deep, on the order of 150-to-200 ft bls, shallow, 2-in diameter, Intermediate or surficial aquifer, self-supply wells with shallow-well jet pumps and short drop pipes are commonly utilized.

Alachua County Local Government Programs

Alachua County has not been delegated by SJRWMD to permit wells less than six inches in diameter on behalf of SJRWMD. Alachua County, Gainesville, Hawthorne, and Micanopy have ordinances governing use, permitting and/or construction of self-supply wells as detailed in the companion volume Local Government Self-Supply Well Programs (Table 1). None of these local government programs specifically regulates aspects of well construction that relate to the occurrence of SSWRLS.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Alachua County	Yes	Yes	No	Yes
Gainesville	Yes	No	No	No
Hawthorne	Yes	No	No	No
Micanopy	Yes	No	No	No

Table 1: Alachua County Local Government Programs

Alachua County Current and Historic SSWRLS

In Alachua County, SSWRLS was reported in the summer of 2000 (Ladner, 2002). Most occurrences were at systems with 35-to-40 year old, 2-in diameter, Intermediate aquifer wells. These wells are most common in areas where the top of the Upper Floridan

aquifer is relatively deep, 150-to-200 ft bls. About 50% of the problems were from the area of Micanopy south of Hawthorne, 25% from near Archer, and the remaining 25% scattered throughout the County.

Local drillers identified four areas in Alachua County where SSWRLS had occurred in spring of 2000 and, to a lesser extent, spring and early summer of 2001: Kanapaha, Micanopy, Archer and Grassy Lake (Myers, 2002). It is estimated that 40 to 50 wells experienced SSWRLS in the four areas.

SSWRLS in the Kanapaha area was reported for systems with 60-to-70 ft deep, Upper Floridan aquifer, domestic self-supply wells with submersible. These systems are located within a relatively new development of about 500 homes, each with a domestic self-supply well. The systems that experienced SSWRLS typically had the intake of the submersible pump set only 5 to 10 feet below the potentiometric surface level. As a result of drought and from the combined withdrawals of the 500 new wells in the area, the potentiometric dropped below the pump intakes in the wells that experienced SSWRLS (Myers, 2002).

Systems experiencing SSWRLS in the Micanopy, Archer and Grassy Lake areas were 2-in diameter, Intermediate aquifer, domestic-supply wells with shallow-well jet pumps and short drop pipes (Ladner, 2002; Myers, 2002). These wells were repaired by installing longer drop pipes or deep-well jet pumps.

Alachua County Well Database

Alachua County is currently developing a database of self-supply wells in the County.

Alachua County PSAs

Five utilities operate PSAs within SJRWMD portion of Alachua County (Table 2). The largest is the Gainesville Regional Water Authority that encompasses the City of Gainesville and surrounding areas. Kincaid Hills and Aquasource Utility Inc. operate small PSAs located inside Gainesville Regional Water Authority's PSAs. The Town of Micanopy and the City of Hawthorne operate PSAs in southern and western Alachua County respectively.

UTILITY	ACREAGE	SUBGROUP
AQUASOURCE UTILITY INC	175	ARREDONDO ESTATES AND FARMS
GAINESVILLE REGIONAL UTILITIES	55,606	AREA WITHIN SJRWMD
HAWTHORNE CITY OF	1,399	HAWTHORNE CITY OF
KINCAID HILLS	137	KINCAID HILLS
MICANOPY	706	MICANOPY

Table 2: Alachua County PSAs

Alachua County PSA Common Well Construction Practices

Gainesville Regional Water Authority PSA

The top of the Upper Floridan aquifer ranges from less than 10 ft to about 180 ft bls within this PSA. The top of the Upper Floridan is generally less than 50 ft bls within the southern portion of the PSA and generally more than 100 ft bls within the northeast portion. Hawthorn Group sediments overlie the Upper Floridan. The 1995 modeled potentiometric surface of the Upper Floridan ranges from about 50 to 80 ft msl.

Currently, most new self-supply systems within the Gainesville Regional Water Authority utilize Upper Floridan aquifer wells. The common well construction practice is to install casing to the top of Upper Floridan and drill an uncased boring (open hole) into the Upper Floridan. These wells are commonly 4-in diameter, 60 to 200 ft deep, constructed with PVC casing and screen, and equipped with submersible pumps. The pumps are typically set 10 to 15 ft below the static water level in the well. Generally, the open-hole portion of the well is nominal 3-in diameter.

In the northeast portion of the PSA where the top of the Upper Floridan is deep, shallow, 2-in diameter, Intermediate aquifer, domestic-supply wells with shallow-well jet pumps and short drop pipes are commonly utilized.

A total of 115 private-use wells from the Super Act database were identified within the Gainesville Regional Water Authority PSA. The Super Act database is described in the Task C report for this contract’s scope of work.

Thirty-six wells were 2-in diameter. Of these, 32 were constructed with galvanized steel, three with PVC, one with black steel, and one "other". These wells were equipped with 0.5 to 1.0 horsepower shallow-well jet pumps.

Seventy-five of the wells were constructed with 4-in diameter casing and five of the wells were constructed with a 6 in diameter casing. Most of these wells were equipped with 1-horsepower submersible pumps and some were equipped with jet pumps.

Kincaid Hills PSA

The top of the Upper Floridan aquifer ranges is about 100 ft bls within this PSA. The 1995 modeled potentiometric surface of the Upper Floridan is about 50 ft msl. Currently, most self-supply systems within the Kincaid Hills PSA utilize Upper Floridan aquifer wells that are cased to the top of aquifer and with are open hole into the Upper Floridan. These wells are commonly 4-in diameter, 100 ft deep, constructed with PVC casing and screen, and equipped with submersible pumps. The pumps are typically set 10 to 15 ft below the static water level in the well. Generally, the open-hole portion of the well is nominal 3 or 4-in diameter. Shallow, 2-in diameter, Intermediate or surficial aquifer, wells with shallow-well jet pumps and short drop pipes are also utilized.

Aquasource Utility Inc. PSA

The top of the Upper Floridan aquifer is about 20 ft bls within the Aquasource Utility Inc. PSA. Hawthorn Group sediments overlie the Upper Floridan. The 1995 modeled potentiometric surface of the Upper Floridan is about 50 ft msl. Currently, most self-supply systems within the Aquasource Utility Inc. PSA utilize Upper Floridan aquifer wells that are cased to the top of aquifer and with are open hole into the Upper Floridan. (Myers, 2002). These wells are commonly 4-in diameter, 30 to 50 ft deep, constructed with PVC and equipped with submersible pumps.

Town of Micanopy PSA

The top of the Upper Floridan aquifer is from about 50-to-80 ft bls within the Micanopy PSA (Macesich, 1998). Hawthorn Group sediments overlie the Upper Floridan. The 1995 modeled potentiometric surface of the Upper Floridan is about 50 ft msl. Currently, most self-supply systems within the Micanopy PSA utilize Upper Floridan aquifer wells that are cased to the top of aquifer and with are open hole into the Upper Floridan. (Myers, 2002). These wells are commonly 4-in diameter, 60 to 70 ft deep, constructed with PVC and equipped with submersible pumps.

City of Hawthorn PSA

The top of the Upper Floridan aquifer is about 130-to-180 ft bls within the Hawthorn PSA (Macesich, 1998). The 1995 modeled potentiometric surface of the Upper Floridan is from about 70 to 75 ft msl. Hawthorn Group sediments overlie the Upper Floridan. Self-supply systems in the Hawthorne PSA would typically utilize 2-in diameter, Intermediate aquifer wells with centrifugal or shallow-well jet pumps and short drop pipes (Myers, 2002).

Alachua County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water-level declines, SSWRLS may occur within the Gainesville Regional Water Authority PSA. Upper Floridan wells with submersible or deep-well jet pumps in an area within the northeast portion of the PSA may experience SSWRLS due to predicted water-level declines greater than 15 ft. Upper Floridan wells with centrifugal or shallow-well jet pumps in an area within the central portion of the PSA may experience SSWRLS due to predicted increase in depth-to-water to greater than 20 ft bls.

Baker County

Baker County Self-Supply Sources

The top of the Upper Floridan aquifer ranges from about 150 ft bls in the western portion of the County to more than 400 ft bls in the east (Leve, 1968). The Intermediate aquifer system is present above the Upper Floridan and ranges from about 120 to 350 ft thick. The surficial aquifer ranges from about 30 to 200 ft thick and overlies the Hawthorn.

Throughout most of the County, the primary source of water for self-supply wells is the lower surficial aquifer. Most of these wells are 2-in diameter and equipped with centrifugal or shallow-well pumps. In the southwest portion of the County where the depth to the top of the Floridan is less, Upper Floridan aquifer wells are more common.

Baker County Local Government Programs

Baker County does not have an ordinance governing construction of self-supply wells and self-supply wells are not permitted or inventoried. Baker County Health Department is not delegated by SJRWMD to permit wells in the County. Residents of Macclenny are required to connect to the city water system, if available (Table 3). The City of Macclenny requires wells to be permitted by the City and prohibits potable wells inside the city limits.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Baker County	No	No	No	No
Glen St. Mary	No	No	No	No
Macclenny	Yes	Yes	Yes (Potable)	No

Table 1: Baker County Local Government Programs

Baker County Current and Historic SSWRLS

SSWRLS caused by drought-related water level declines has occurred throughout Baker County during the summer of 2000 and spring of 2002(Sapp, 2002). The reported SSWRLS occurred primarily in shallow, 2-in diameter, surficial aquifer wells with centrifugal or shallow-well jet pumps. Service was typically restored to these wells by lowering the drop pipes or installing a deep-well jet pump. In a very few cases, the reported SSWRLS occurred in 4-in diameter surficial aquifer wells with a submersible pumps. Service was typically restored to these wells by lowering the pump intakes.

Baker County Well Database

Baker County has no database of self-supply wells in the County.

Baker County PSAs

The only public service area located within Baker County is located in the area surrounding Macclenny.

Baker County PSAs Well Construction

The only PSA located in the portion of Baker County within SJRWMD is that of the City of Macclenny. Self-supply wells used for irrigation are common in this PSA. Most of these wells are 2-in diameter and equipped with centrifugal or shallow-well jet pumps (Sanders, 2002). Most are constructed to the shallow rock zone the lower surficial but some produce from the shallow surficial aquifer sands.

Baker County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and modeled water-level declines through 2020, SSWRLS are not predicted within the City of Macclenny PSA. Historic SSWRLS has been documented in Baker County. Surficial aquifer wells with centrifugal or shallow-well jet pumps in portions of the County where surficial aquifer water levels are 10 to 20 ft bls have experienced SSWRLS during periods of extended drought (Sapp, 2002).

Bradford County

Bradford County Self-Supply Sources

Self-supply systems in the area utilize Upper Floridan, Intermediate, and surficial aquifer wells. The surficial aquifer wells are generally 2-in diameter, 50 to 75 ft deep and equipped with shallow-well jet pumps. Intermediate aquifer wells are generally 2- or 4-in diameter, over 100-ft deep, and equipped with jet or submersible pumps. Upper Floridan aquifer wells are generally 4-in diameter, over 150-ft deep, and equipped with submersible pumps.

The top of the Upper Floridan aquifer ranges from about 150 to 225 ft bls in SJRWMD portion of the County. The Intermediate aquifer system is present above the Upper Floridan and ranges from about 120 to 350 ft thick. The surficial aquifer ranges from about 10 to 75 ft thick and overlies the Hawthorn.

Bradford County Local Government Programs

Bradford County does not have an ordinance governing construction of self-supply wells and self-supply wells are not permitted or inventoried (Table 4).

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Bradford County	No	No	No	No

Table 1: Bradford County Local Government Programs

Bradford County Current and Historic SSWRLS

SSWRLS has been reported in portions of western Bradford County but not in the portion of the County in SJRWMD (Rensberger, 2002; Durrance, 2002).

Bradford County Well Database

Bradford County does not have a database of self-supply wells in the County.

Bradford County PSAs

Only two, small, PSAs are located within the portion of Bradford County located in SJRWMD (Table 5).

UTILITY	ACREAGE	SUBGROUP
FLORIDA WATER SERVICES CORP	142	KEYSTONE CLUB ESTATES
FLORIDA WATER SERVICES CORP	39	KEYSTONE CLUB ESTATES

Table 2: Bradford County PSAs

Keystone Club Estates PSAs

Two contiguous, Florida Water Services Corporation PSAs are located within SJRWMD portion of Bradford County in the vicinity of Keystone Heights. Self-supply wells in these PSAs include both Floridan aquifer and surficial aquifer wells. The surficial aquifer wells are generally 2-in diameter, 50 to 60 ft deep and equipped with jet pumps. Floridan aquifer wells are generally 4-in diameter, over 100 ft deep, and equipped with submersible pumps

.

Bradford County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and modeled water-level declines through 2020, SSWRLS are not predicted within SJRWMD portion of Bradford County.

Brevard County

Brevard County Self-Supply Sources

Most domestic and many household irrigation self-supply wells utilize the surficial aquifer. They are generally 2-in diameter and equipped with shallow-well jet pumps. The quality of water in the Upper Floridan is poor in much of the County and generally does not meet drinking water standards. Upper Floridan water quality is relatively good west of the St Johns River, in the southeastern corner of the County, and within small areas north and west of Titusville (Brown, et al, 1962). Domestic self-supply wells may utilize the Upper Floridan in the few areas of the County where the water quality is good.

The Upper Floridan aquifer is used as a source for irrigation in many areas of the County. Upper Floridan agricultural irrigation wells are commonly 4-in diameter and equipped with jet or submersible pumps. Some agricultural irrigation wells are not equipped with pumps and discharge to ditches designed to distribute the irrigation water. Household Upper Floridan aquifer irrigation wells are commonly 2-in diameter and equipped with jet pumps. In areas where the potentiometric surface of the Upper Floridan is significantly above land surface, some household irrigation systems are not equipped with pumps.

The top of the Upper Floridan aquifer ranges from about 100 to 150 ft bls in northern Brevard County to about 230 to 270 ft bls in southern Brevard County. The Intermediate aquifer system is present above the Upper Floridan and ranges from about 20 to 200 ft thick. The surficial aquifer ranges from about 10 to 130 ft thick.

Brevard County Local Government Programs

Brevard County is delegated by SJRWMD to permit wells less than six inches in diameter. Most of the local governments within Brevard County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 6.

Brevard County Well Database

SJRWMD Palm Bay Service Center has maintained a database of self-supply wells prepared from well completion reports for Brevard County that includes records for 20,335 wells permitted in Brevard County between November 1969 and February. The database contained data fields for the following information:

Last Name of Well Owner
Date Well Installed
Use of Well
Depth of Casing (feet)
Total Depth of Well (feet)
Casing Diameter (in inches)
Section
Township, Range

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Brevard County	No	Yes/Delegated	No	Yes
Cape Canaveral	Yes	No	No	No
Cocoa	Yes	No	No	No
Cocoa Beach	No	Yes	No	No
Indialantic	No	No	No	No
Indian Harbour Beach	No	No	No	No
Malabar	Yes	No	No	No
Melbourne	Yes	No	No	No
Melbourne Beach	No	No	No	No
Palm Bay	Yes	No	No	No
Palm Shores	No	No	No	No
Rockledge	No	No	No	No
Satellite Beach City	Yes	No	No	No
Titusville	Yes	No	Yes (Potable)	No
West Melbourne	Yes	Yes	No	Yes

Table 1: Brevard County Local Government Programs

Brevard County Current and Historic SSWRLS

SSWRLS was a significant problem in Brevard County from June to August 2001 as a result of drought (Schmidt, 2002). The main problems were observed in wells 40 to 70 feet deep. The primary areas where problems occurred were in Palm Bay, West Melbourne and, to a lesser extent, South Melbourne Beach.

Older, potable, surficial-aquifer, self-supply wells in Palm Bay experienced SSWRLS in late the spring and early summer of 2001 (Merrow, 2002). Potable self-supply wells in the Palm Bay area are generally 2-in diameter, about 65-ft deep and equipped with centrifugal or shallow-well jet pumps. The cause of SSWRLS in this area was reduced capacity or failure of the well pumps due to surficial aquifer water level declines resultant from drought and the combined withdrawals from the numerous self-supply wells in the area.

A few self-supply wells in the West Melbourne area within the City of Melbourne PSA experienced SSWRLS in late the spring and early summer of 2001 (Mock, 2002). Domestic self-supply wells commonly in the area are constructed to yield from shell and sand lenses within the surficial or Intermediate aquifers. Potable self-supply wells in the West Melbourne area are typically 2-in diameter, about 65-ft deep and equipped with centrifugal or shallow-well jet pumps. The cause of SSWRLS in this area was reduced capacity or failure of the well pumps due to surficial aquifer water level declines resultant from drought and the combined withdrawals from the numerous self-supply wells in the area.

Domestic self-supply wells in South Melbourne Beach are typically shallow and tap the fresh water lens at the top of the surficial aquifer. These wells are typically2-in diameter, less than 20 ft deep and equipped with centrifugal or shallow-well jet pumps. The cause

less than 20 ft deep and equipped with centrifugal or shallow-well jet pumps. The cause of SSWRLS in this area is lowered water levels during drought causing the pumps to fail. Lowered water levels also affect the quality of water from the wells and can cause the wells to be unsuitable for domestic supply.

Brevard County PSAs

Twenty-four PSAs operated by eight different utilities are located in Brevard County (Table 7).

UTILITY	ACREAGE	SUBGROUP
BREVARD COUNTY UTILITIES	8,386	MIMS
BREVARD COUNTY UTILITIES	6,360	MIMS
BREVARD COUNTY UTILITIES	2,431	MIMS
BREVARD COUNTY UTILITIES	690	MIMS
BREVARD COUNTY UTILITIES	272	CRYSTAL BAY
COCOA	288,424	CLAUDE H DYALS
FLORIDA CITIES WATER CORP	1,175	BAREFOOT BAY
MELBOURNE	7,623	MELBOURNE
MELBOURNE	104,358	MELBOURNE
PALM BAY UTILITIES	42,284	PALM BAY UTILITIES
BURKIN ENTERPRISES	23	SNUG HARBOR
BURKIN ENTERPRISES	40	SNUG HARBOR
BURKIN ENTERPRISES	38	SNUG HARBOR
SOUTH BREVARD COUNTY UTILITIES	1,613	SOUTH BREVARD COUNTY UTILITIES
SOUTH BREVARD COUNTY UTILITIES	116	SOUTH BREVARD COUNTY UTILITIES
TITUSVILLE	1,111	TITUSVILLE
TITUSVILLE	17	TITUSVILLE
TITUSVILLE	21,656	TITUSVILLE
TITUSVILLE	117	TITUSVILLE
TITUSVILLE	59	TITUSVILLE
TITUSVILLE	218	TITUSVILLE
TITUSVILLE	225	TITUSVILLE
TITUSVILLE	41	TITUSVILLE
TITUSVILLE	1,988	TITUSVILLE

Table 7: Brevard County Public Service Areas

Brevard County PSAs Common Well Construction Practices

Data provided by SJRWMD on self-supply wells in Brevard County were used to analyze self-supply well construction practices in Brevard County. Domestic and irrigation well construction summary data for Brevard County PSAs are presented in tables 8 and 9 respectively.

UTILITY	Number of Wells	Minimum Depth (ft)	Maximum Depth (ft)	Average Depth (ft)
BREVARD COUNTY UTILITIES	151	19	290	95
SNUG HARBOR (BURKIN ENTERPRISES)	1	103	103	103
CITY OF COCOA	77	15	240	66
CITY OF MELBOURNE	247	1	740	72
TOWN OF MALABAR	70	45	344	88
PALM BAY UTILITY COMMISSION	737	10	658	68
SOUTH BREVARD COUNTY UTILITIES	21	11	194	26
CITY OF TITUSVILLE	100	13	202	80

Table 8: Potable Self-Supply Well Data Summary, Brevard County PSAs

UTILITY	Number of Wells	Minimum Depth (ft)	Maximum Depth (ft)	Average Depth (ft)
BREVARD COUNTY UTILITIES	555	3	680	81
SNUG HARBOR (BURKIN ENTERPRISES)	14	23	375	90
CITY OF COCOA	4681	5	850	105
CITY OF MELBOURNE	4869	3	740	164
TOWN OF MALABAR	62	40	545	263
PALM BAY UTILITY COMMISSION	1805	6	652	114
SOUTH BREVARD COUNTY UTILITIES	113	8	370	205
CITY OF TITUSVILLE	3216	2	891	56

Table 9: Irrigation Self-Supply Well Data Summary, Brevard County PSAs

Brevard County Utilities Northern Service Areas

Brevard County Utilities has three existing and three proposed contiguous service areas located in the northern end of the County, east of the St. Johns River. In this portion of the County, the depth to the top of the Upper Floridan aquifer is about 100 ft bls and water quality is relatively good beneath the coastal ridge. Records for 149 domestic wells and 555 irrigation wells within these service areas were identified from records obtained from SJRWMD.

Domestic self-supply wells are predominantly 2-in diameter (143 of 149 wells) and are equipped with jet pumps. The average depth is 96 ft and the median depth is 113 ft. About half of the wells are Upper Floridan aquifer wells and half are surficial aquifer wells. The Hawthorn Group in the area is relatively thin, 5 to 10 feet thick. It is absent in some places and in these areas the surficial and Upper Floridan aquifers are hydraulically connected.

Irrigation self-supply wells are predominantly 2-in diameter (482 of 487 wells) and are equipped with jet pumps. Total depths ranged from 3 to 680 ft. Most wells are less than 100 ft deep, and about one-third (169 wells) are 25 ft deep or less. The average depth is 69 ft and the median depth is 30 ft. Average casing depth is 49 ft. About 80% of the wells are believed to be surficial aquifer wells typically producing from lenses of

coquina. About 20% of the wells are Upper Floridan aquifer wells producing from a fresh water lens within a shelly limestone.

Southern Service Areas

Brevard County Utilities has two existing contiguous service areas located in the southern end of the County, east of the St. Johns River in this area. The surficial aquifer is about 100 ft thick and underlain by about 120 ft of Hawthorn Group sediments. Surficial aquifer wells commonly yield from clayey, phosphatic, sand and shell lenses. The top of the Upper Floridan is at a depth of about 220 ft bls. Records for two domestic wells and 68 irrigation wells within these PSAs were identified.

Both of the domestic wells are 2-in diameter, equipped with jet pumps and completed in the surficial aquifer. The depths are 65 and 69 ft.

All but one of the 68 irrigation wells are 2-in diameter and all are equipped with jet pumps. Total depths ranged from 25 to 360 ft. The average depth is 163 ft and the median depth is 100 ft. Average casing depth is 49 ft.

Thirty-six of the irrigation wells are classified as surficial aquifer wells, six are considered Hawthorn wells and 26 are classified as Upper Floridan aquifer wells. The surficial aquifer wells are all 2-in diameter. The average depth is 79 ft and the median depth is 83 ft. Average casing depth is 56 ft and typically the wells have 10-ft screens. The Upper Floridan aquifer wells average about 250 ft deep. They are cased through the Hawthorn with an open hole drilled into the Ocala limestone.

City of Titusville PSAs

City of Titusville operates six contiguous PSAs located immediately south of the Brevard County Utilities PSAs and east of the St. Johns River. Records for 100 domestic wells and 3,216 irrigation wells within these service areas were obtained from SJRWMD. These PSAs include the City of Titusville as well as areas outside the City. Titusville requires that residents within the city limits connect to the public water supply. The Hawthorn Group is absent in this area and the surficial and Upper Floridan aquifers are hydraulically connected.

The domestic wells are predominantly 2-in diameter (97 of 100 wells) and are equipped with jet pumps. The average depth is 80 ft and the median depth is 72 ft. About 60% of the wells are believed to be surficial aquifer wells and 40% Upper Floridan aquifer wells. The irrigation wells are predominantly 2-in diameter and are equipped with jet pumps. The average depth is 56 ft and the median depth is 26 ft. About 85% of the wells are believed to be surficial aquifer wells and 15% Upper Floridan aquifer wells.

City of Cocoa PSAs

One large City of Cocoa PSA is located immediately south of the City of Titusville PSAs and east of the St. Johns River. This PSA includes the City of Cocoa and unincorporated areas outside the City. Cocoa requires that residents within the city limits connect to the public water supply.

The groundwater quality in the PSA is generally poor and does not meet drinking water standards in much of the area. However, a lens of relatively good quality water is present in the surficial aquifer and, to a limited extent, Upper Floridan aquifer beneath the Atlantic Coastal Ridge. The water quality of the lens is variable and dependent upon recharge from precipitation and relative use.

Records for 77 domestic wells and 4,681 irrigation wells within this PSA were obtained from SJRWMD. All the domestic wells are 2-in diameter and are equipped with centrifugal or jet pumps. The average depth of the domestic wells is 66 ft and the median depth is 60 ft. About 90% of the domestic wells are believed to be surficial aquifer wells and 10% Upper Floridan aquifer wells.

The irrigation wells are predominantly 2-in diameter (4,600 of 4,681 wells) and are equipped with centrifugal or jet pumps. The average irrigation well depth is 105 ft and the median depth is 45 ft. About 70% of the wells are believed to be surficial aquifer wells and 30% Upper Floridan aquifer wells.

City of Melbourne PSAs

The City of Melbourne operates two PSAs totaling approximately 112,000 acres. The PSAs include the municipalities of Melbourne, West Melbourne, Melbourne Village, Melbourne Beach, Indialantic, Indian Harbour Beach, Satellite Beach, and Palm Shores. Domestic self-supply wells commonly are constructed to yield from shell and sand lenses within the surficial or Intermediate aquifers.

Irrigation wells are commonly constructed in the surficial, Intermediate, and Upper Floridan aquifers. Upper Floridan aquifer irrigation and water source heat pump wells are common along the Atlantic Coastal Ridge and on the barrier island. Upper Floridan wells on the barrier island and immediately west of the Intracoastal Waterway are generally free flowing and many irrigation wells in these areas are not equipped with pumps. Upper Floridan wells along the Atlantic Coastal Ridge are equipped with pumps.

A total of 268 domestic self-supply wells were identified within the City of Melbourne PSAs. Forty-nine of these wells were located within municipal boundaries. One hundred twenty-seven of the wells had a reported 5-ft screened or open interval. The average depth of the wells is 67 ft and the median depth is 55 ft. Only 14 wells were greater than 100 ft in depth. Seventy-one of the wells were less than 50 ft deep and 227 of the wells were 70 ft deep or less. Outside the municipal boundaries, wells are concentrated in two areas, one east and south of Lake Washington and the other west of West Melbourne. The wells east of Lake Washington (97) are generally more shallow and 55 are 60 ft deep or less. The wells west of West Melbourne (164) are slightly deeper.

A total of 4,869 irrigation self-supply wells were located in the City of Melbourne service area. The average depth is 164 ft and the median depth is 75 ft. In general, the depths of the irrigation wells can be divided into two broad categories. Wells less than 100 ft deep comprised over 50 percent of the wells present. There are relatively few wells with depths from 100 to 240 ft. A large number of wells are between 240 and about 350 ft deep. Most of the wells greater than 350 ft deep are located in the southern portion of the City of Melbourne. A total of 1,310 of the wells are located on the barrier island. On the barrier island, wells are generally either less than 40 ft deep (314 of 1,310) or greater than about 250 ft deep (784 of 1,310). The remaining wells are located on the mainland, almost exclusively within the eastern half of the PSA.

Town of Malabar PSA

The Town of Malabar PSA encompasses the Town of Malabar and comprises about 5,500 acres. Sixty-two irrigation wells were identified within the PSA. All but one well was 2-in diameter. The wells ranged from 40 to 545 ft deep. Twenty-three wells were between 40 and 130 ft deep and likely are surficial aquifer wells. These wells averaged 75 ft in depth and the median depth was 71 ft. The surficial aquifer irrigation wells greater than 130 ft deep typically had a producing interval of 10 ft.

The 39 remaining irrigation wells are likely Floridan aquifer wells. Thirty-seven of these wells were between 315 and 430 ft deep and the other two wells were 520 and 545 ft deep. The depth of the Upper Floridan irrigation wells averaged 375 ft and the median depth is 271 ft. The Floridan irrigation wells typically had an open interval of about 100 ft. The Floridan wells are generally constructed by driving the well casing to the middle Hawthorn marker bed (about 150 to 180 ft bls) and drilling an open hole into the Upper Floridan.

Burkin Enterprises PSAs

Burkin Enterprises operates the Snug Harbor Utility PSA consisting of three service areas comprising about 100 acres in southern Brevard County. One domestic supply well and 14 irrigation self-supply wells were identified within these PSAs. The domestic well is 2-in diameter and 103 ft deep and produces from the surficial aquifer.

Thirteen of the irrigation wells produce from the surficial aquifer and range from 23 to 102 ft in depth. The average depth is 69 ft and the median depth is 68 ft. All wells were 2-in diameter. Casing depths, where reported, were 10 to 17 ft less than the total well depths. One Upper Floridan aquifer irrigation well was identified in the PSA. The well was 375 ft deep with 290 ft of 2-in diameter casing.

Palm Bay Utility Commission PSAs

The Palm Bay Utility Commission operates a single PSA within the boundaries of the Town of Palm Bay. The locations of 737 domestic self-supply wells were identified within the Palm Bay PSA. Most of the wells are located in the Port Malabar area that, although within the PSA, is not currently served by public water supply. The average

depth of these domestic wells is 68 ft and the median well depth is 62 ft. Only 28 of the wells were greater than 100 ft deep. All but three were constructed with 2-in diameter casing.

The locations of 1,805 irrigation self-supply wells were identified within the Palm Bay PSA. The average depth was 114 ft and the median depth was 70 ft. Most of the wells (1,374) had a screen interval of 20 ft or less and 838 wells had a screen interval of 10 ft or less. Most of the wells (1,781) were 2-in diameter or less.

South Brevard County Utilities PSAs

South Brevard County Utilities PSA is located in Brevard County on the south end of the barrier island and includes the Town of Floridana Beach. Domestic wells in the PSA are typically shallow and tap the fresh water lens in the surficial aquifer. Because of the shallow depth, these wells are highly susceptible to reduction in or loss of service from drought and from withdrawals from the underlying Upper Floridan aquifer. Irrigation and water source heat pump wells in the PSA are commonly Upper Floridan aquifer wells and produce from the Sebastian fresh water lens.

The locations of 21 domestic self-supply wells were identified within the South Brevard County Utilities PSA. The average well depth is 26 ft and the median well depth is 18 ft. Only one of the wells was greater than 21 ft deep (194 ft). All were 2-in diameter.
The locations of 113 irrigation self-supply wells were identified within the South Brevard County Utilities PSA. The average depth is 205 ft and the median depth is 179 ft. All but two were 2-in diameter or less.

Brevard County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Brevard County, shallow surficial aquifer wells in areas with high densities of these wells are at risk of SSWRLS during periods of drought. Apparently, lowered recharge combined with increased drawdown from increased use result in large water level declines where the wells are close together and individual cones of depression intersect.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, certain Upper Floridan wells within seven Brevard County PSAs may experience SSWRLS (Table 10). Two classes of self-supply systems would be at risk: Type 2 and Type 3.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
BREVARD COUNTY UTILITIES	MIMS	371	No	No	Yes	No	No
BREVARD COUNTY UTILITIES	MIMS	393	No	No	Yes	No	No
COCOA	NA	454	No	High	Yes	No	No
MELBOURNE	MELBOURNE	628	No	Yes	No	No	No
MELBOURNE	MELBOURNE	629	No	High	Yes	No	No
PALM BAY UTILITIES	NA	636	No	Yes	Yes	No	No
TITUSVILLE	TITUSVILLE	460	No	No	Yes	No	No

Table 10: Brevard County PSAs with Risk of SSWRLS

Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in areas where the water levels are predicted to decline to less than 10 ft als by 2020.

Type 3 systems include Upper Floridan potable wells equipped with centrifugal or shallow-well jet pumps and Upper Floridan irrigation wells without pumps located on the coastal ridge where 1995 water levels were above land surface. Upper Floridan aquifer water levels along the ridge are predicted to drop below land surface by 2020. Type 3 domestic wells along the ridge may experience SSWRLS due to loss of prime from water level declines to below land surface. Type 3 irrigation wells will cease to flow when water levels drop below land surface.

Clay County

Clay County Self-Supply Sources

The shallow surficial, lower surficial, Intermediate, and Upper Floridan aquifers are used for self-supply in Clay County. The top of the Upper Floridan ranges from about 100 ft bls in southwestern Clay County to over 450 ft bls in northern Clay County. The potentiometric surface of the Upper Floridan is above land surface within eastern Clay County, along the St Johns River. In western Clay County, the Upper Floridan potentiometric surface is generally greater than 100 ft bls.

Sediments of the Hawthorn Group range from about 80 ft to 375 ft thick in the County and overlie the Upper Floridan. Permeable layers within the Hawthorn constitute the Intermediate aquifer. Sediments of the surficial aquifer overlie the Hawthorn. The surficial aquifer ranges from about 5 to 240-ft thick in the County and averages about 90-ft thick.

The major sources of water for domestic self-supply in the Clay County are the lower surficial aquifer and the Intermediate aquifer (Clark, et al, 1964). Associated wells are commonly 2-in diameter with shallow-well jet pumps or 4-in diameter with submersible pumps.

In most of the County, the top of the Upper Floridan is relatively deep and it is not as commonly used for self-supply as in other areas of SJRWMD. Shallow surficial aquifer irrigation wells are relatively common but because of low yield and high iron content, the shallow surficial is not frequently used for domestic self-supply.

Clay County Local Government Programs

Clay County is delegated by SJRWMD to permit wells less than six inches in diameter. Most of the local governments within Clay County have ordinances related to self-supply wells. The type of ordinance for each local government is summarized in Table 11.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Clay County	No	Yes/Delegated	No	Yes
Green Cove Springs	Yes	Yes	Yes (Potable)	No
Keystone Heights	No	No	No	No
Orange Park	Yes	Yes	Yes (Potable)	No
Penney Farms	Yes	Yes	No	No

Table 1: Clay County Local Government Programs

Clay County Well Database

Clay County maintains an electronic database of well permits issued since 1996. Clay County provided records for 4,640 wells permitted in the County between August 1996 and February 2002 in an Excel worksheet file. The database contained data fields for the following information:

Permit Date
Last Name of Applicant
First Name of Applicant
Applicant Street Address
Applicant Address City
Use of Well (A=Abandonment, I=Irrigation, M=Monitor Well, P=Domestic Self-Supply)
Permit Fee Amount ($)
Name of Well Drilling Company
Well Location (Section-Township-Range)
Owner's Phone Number

Clay County Current and Historic SSWRLS

In 1999 and 2000, a few instances of SSWRLS were reported in the Green Cove Springs, Orange Park, Fleming Island and Middleburg areas (Barnett, 2002). SJRWMD Jacksonville Service Center office database of SSWRLS complaints contained eight entries for Clay County: five in Orange Park, two in Fleming Island, and one in Middleburg. All eight complaints were related to flowing Upper Floridan wells without pumps or with treatment units that relied on aquifer head to move water through the unit. In each case, pumps were installed to correct the problems.

Clay County PSAs

Eight PSAs operated by four different owners are identified in Clay County as listed in Table 12.

UTILITY	ACREAGE	SUBGROUP
CLAY COUNTY UTILITY AUTHORITY	67,846	CLAY COUNTY UTILITY AUTHORITY
CLAY COUNTY UTILITY AUTHORITY	25,794	CLAY COUNTY UTILITY AUTHORITY
FLORIDA WATER SERVICES CORP	2,261	KEYSTONE HEIGHTS
FLORIDA WATER SERVICES CORP	926	POSTMASTER VILLAGE
FLORIDA WATER SERVICES CORP	176	POSTMASTER VILLAGE
GREEN COVE SPRINGS	1,755	GREEN COVE SPRINGS
JEA	3,382	JACKSONVILLE ELECTRIC AUTHORITY
ORANGE PARK	2,353	ORANGE PARK

Table 12: Clay County Public Service Areas

Clay County PSAs Common Well Construction Practices

The locations of 1,106 self-supply wells within Clay County PSAs were established from data provided by Clay County. A total of 117 Super Act wells and 19 WRW wells are located within PSAs in Clay County. None of this data included information concerning well depth, diameter or well construction details. Common well construction practice depends on the aquifer utilized and the relative depth to water.

Florida Water Services PSAs

At the three Florida Water Services PSAs in the southwest corner of the County, the depth to the Upper Floridan is 100 to 200 ft bls and Upper Floridan aquifer wells are common. The wells are typically 3- or 4- in diameter wells cased to the top of the Upper Floridan and open hole into the Upper Floridan. The 1995 depth-to-water in these wells ranges from less than 5 to more than 90 ft bls and is primarily a function of topography. Depth-to-water is generally less than 20 ft bls in wells near area lakes. These wells could be equipped with centrifugal or shallow-well jet pumps. Depth-to-water is generally more than 20 ft bls in wells where land surface elevations are greater than about 110 ft msl. These wells would be equipped with submersible or deep-well jet pumps.

Northeast Clay County PSAs

JEA, Orange Park, Clay County Utility, and Green Cove Springs PSAs are located in the northeast corner of the County. Depth to the top of the Upper Floridan is deep in this area, ranging from about 250 to more than 450 ft bls. Upper Floridan aquifer self-supply wells are 2- to 4- in diameter with casing installed to the top of the Upper Floridan and open hole into the Upper Floridan. The Upper Floridan potentiometric surface is above land surface throughout much of this area and higher than 15 als within a large portion of the largest Clay County Utility PSA. It is more higher 30 ft als in an area southwest and west of Doctors Lake. The Upper Floridan potentiometric surface is greater than 20 ft bls within the western and southwestern portions of the Clay Utilities PSAs.

In areas with land surface elevation less than about 40 ft msl, the Upper Floridan potentiometric surface is more than 15 ft als. Self-supply systems with the treatment units that rely on aquifer head to move water through the units are common in this area. Wells without pumps are present in areas west and south of Doctors Lake. Upper Floridan wells with submersible or deep-well pumps are common in the western and southwestern portions of the Clay Utilities PSAs.

Due to the depth to the top of the Upper Floridan, surficial and Intermediate aquifer wells are common in the northeast Clay County PSAs. Intermediate and lower surficial aquifer wells are constructed similar to Upper Floridan wells. In general, potentiometric head within the Intermediate and lower surficial aquifers would be less than that in the underlying Upper Floridan but the hydrogeology of these units are not well defined. These wells are most often equipped with centrifugal or shallow-well jet pumps. Shallow

surficial aquifer wells are typically 2-in diameter wells with screens and equipped with centrifugal or shallow-well jet pumps.

Clay County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Clay County, Upper Floridan aquifer systems without pumps or with treatment units that rely on aquifer head to move water through the unit are at risk of SSWRLS during periods of drought. Most of the wells with reported SSWRLS are located in the immediate vicinity and south of Doctors Lake.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, certain Upper Floridan wells within three Clay County PSAs may experience SSWRLS (Table 13). Four classes of self-supply systems would be at risk: Type 1, 2, 3, and 4.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
CLAY CO UTILITY	CLAY CO UTILITY	68	Yes	High	Yes	Yes	No
CLAY CO UTILITY	CLAY CO UTILITY	84	No	Yes	Yes	Yes	No
JEA	JEA	70	No	No	Yes	No	No

Table 13: Clay County PSAs with Risk of SSWRLS

For areas south of Doctors Lake in the northern Clay Utility PSA, predicted 2020 Upper Floridan depth to water is less than 10 ft als and the SSWRLS risk for Type 2 systems (self-supply systems with the treatment units that rely on aquifer head to move water through the system) is considered high.

Type 1 systems do not have pumps but rely on aquifer head to supply system pressure. SSWRLS occurs when water levels decline to a point (assumed to be less than 35 ft als) where aquifer pressure is insufficient to provide system pressure. The Upper Floridan potentiometric surface is predicted to decline from higher than 35 ft als to less than 35 ft als by 2020 in areas southwest of Doctors Lake in the northern Clay Utility PSA.

Type 2 systems have treatment units and rely on aquifer head to move water through the units. These systems may experience SSWRLS due to insufficient aquifer head to move water through the units in areas where predicted Upper Floridan water level will be less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in areas where the water levels are predicted to decline to less than 10 ft als by 2020. Areas south of Doctors Lake in the northern Clay Utility PSA have predicted 2020 Upper Floridan water levels less than 10 ft als.

Type 3 systems have wells equipped with centrifugal or shallow-well jet pumps in areas where the potentiometric surface is above land surface. These wells may experience SSWRLS if the potentiometric surface drops below land surface caused by loss of prime from system air leaks.

Type 4 systems are equipped with centrifugal or shallow-well jet pumps and water levels are less than 20 ft bls. These systems may experience SSWRLS where predicted Upper Floridan water level will be greater than 20 ft bls by 2020.

Duval County

Duval County Self-Supply Sources

In Duval County, the shallow surficial aquifer, lower surficial aquifer, Intermediate aquifer, and Upper Floridan aquifer self-supply wells are common. The aquifer utilized in each case is dependent upon desired yield, desired water quality, local hydrostratigraphy, and economics. Upper Floridan aquifer wells produce the highest yields and generally good quality water. Shallow surficial aquifer wells completed in the upper sand unit generally produce low yields and water of poorer quality. Wells completed in both the shallow rock zone of the lower surficial aquifer and the Intermediate aquifer will produce good quality water with yields sufficient for domestic and private irrigation use.

Most domestic self-supply wells in Duval County are lower surficial aquifer wells. A limestone unit is present at the base of the surficial aquifer, locally referred to as the "Rock" aquifer, which yields moderate quantities of good quality water. These wells are typically about 100 ft deep and constructed with 2- or 3-in diameter casing. They are generally installed without a well screen and are open hole through the production interval. Water levels within the Rock aquifer wells are typically 5 to 10 ft bls. Most often, these wells are equipped with centrifugal or shallow-well jet pumps.

In certain areas of the County, the Rock aquifer is absent and Intermediate and Upper Floridan self-supply wells predominate. Upper Floridan domestic self-supply wells are also common in areas where overlying aquifers contain water with high iron concentrations or when a large quantity of water is required. In Duval County, the top of the Upper Floridan ranges from about 280 to over 600 ft bls. The potentiometric surface of the Upper Floridan is above land surface throughout most of the eastern county. It is higher than 15 ft als along the coast and the St Johns River and in the northern county.

Shallow surficial aquifer wells are often used as a source for household irrigation self-supply. They are generally 2-in diameter, 30 to 60 ft deep, and equipped with centrifugal or shallow-well jet pumps. Water levels within the shallow surficial aquifer wells are typically 5 to 10 ft bls.

Duval County Local Government Programs

Some of the local governments within Duval County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 14.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Duval County (Jacksonville)	Yes	Yes	Yes (Potable)	Yes
Atlantic Beach	Yes	Yes	Yes (Potable)	No
Baldwin	No	No	No	No
Jacksonville Beach	Yes	No	No	No
Neptune Beach	No	Yes	No	No

Table 14: Duval County Local Government Programs

Duval County requires a permit for construction, repair or abandonment of certain wells under Chapter 366 of the City Ordinance Code and EPB Rule 8. Permits are required for the following types of wells.

1. All Floridan aquifer wells less than 6 inches in diameter (permits are required for wells with depth to within 75 feet vertically of this aquifer, they are generally deeper than 250 feet)

2. All other public supply wells as defined in Ch.10D-4 Florida Administrative Code (FAC).

3. All wells within 500 feet of a hazardous waste or groundwater contamination site.

4. Exploration or foundation holes constructed to within 75 feet vertically of or through the Floridan Aquifer.

5. Any injection or drainage well provided by a variance from the Environmental Protection Board (EPB).

6. Industrial or commercial process water supply wells.

7. Air sparging wells.

8. Recovery wells.

Duval County Well Database

City of Jacksonville's Ground Water Well Inventory database was constructed to satisfy the requirements of City Ordinance Code Title X, Chapter 366, and Section 305 (Winter, 2002). The database is an inventory of ground water wells installed within Duval County. These include wells that have been permitted by the City of Jacksonville and/or the St. Johns River Water Management District. The Air and Water Quality Division's Ground Water Section currently maintains the database. City of Jacksonville developed GIS coverage from the database containing records for 13,176 wells installed in the County from as early as 1900 to 1998. City of Jacksonville also prepared an Excel worksheet file containing 16,689 records of wells in Duval County. The GIS attribute table contains the following data fields:

City – well owner's mailing address
City of Jacksonville Well Inspector
City of Jacksonville, Property Appraiser's Panel Number
City of Jacksonville, Property Appraiser's Real Estate Number for the parcel on which the well is located.
Construction material of upper well casing (see below)
Construction of lower well casing (see below)
Date the well data was entered into the Well Inventory database
Does the well have a pit casing? – Yes or No
Does well serve a heat pump? – Yes or No
Duval County Health Department well number
F.A.C. 62-555 public supply well? – Yes or No
First name of well owner
Florida DEP construction permit number
Florida Department of Transportation well identification number
Former site use (if changed from previous owner
Former water use (if changed from previous owner)
General comments regarding well and/or well permit
Geophysical log for well on file? – Yes or No
GIS number
Has a pump test been performed on the well - Yes or No
Has the well been abandoned or plugged? – Yes or No
Is the well free flowing - Yes or No
JEA Well Number (if applicable)
Latitude of well determined utilizing GPS unit in decimal degrees
Latitude of well in Degrees, Minutes, Seconds. Coordinate system is NAD 83 State Plane Florida East
Letter for CUP number on file? Yes or No
Longitude of well determined utilizing GPS unit in decimal degrees
Longitude of well in Degrees, Minutes, Seconds. Coordinate system is NAD 83 State Plane Florida East
Lower Casing Depth (feet)
Lower Casing Diameter (inches)
Lower casing starting depth (feet)
Method well data was determined
Mid Zone casing depth (feet)
Mid Zone casing diameter (inches)
Mid Zone casing material (see page 3)
Mid Zone casing starting depth (feet)
Most recent date the well record was updated
Original inspection date
Phone number – well owner's phone number
Previous well owner, first name
Previous well owner, last name
Primary contact person for well owner

St Johns River Water Management District's Consumptive Use Permit Number for well
St. Johns River Water Management District's "D" number for well
State – well owner's mailing address
Subdivision lot number
Subdivision name of well location
Subdivision unit number
The City of Jacksonville's unique well identification number
Total number of wells per well site
Type of outpost monitoring well
Upper Casing Depth (feet)
Upper Casing Diameter (inches)
Upper casing started above land surface? – Yes or No
Upper casing starting depth (feet)
USGS Water-Use Code
USGS 7.5 minute quadrangle name
USGS range number of well location
USGS section number of well location
USGS township number of well location
Was the well grouted with a bentonite slip? – Yes or No
Was the well grouted with bentonite slurry? – Yes or No
Was the well grouted with cement? – Yes or No
Well completion report submitted to the City? – Yes or No
Well identified for enforcement action? – Yes or No
Well location city
Well location street name
Well location street number
Well location zip code
Well owner also known as
Well owner's mailing address street name
Well owner's mailing address street number
Well owner's station identification number
Well owner's well identification number
Zip Code – well owner's mailing address

Duval County Current and Historic SSWRLS

Groundwater-level declines have been reported throughout most of Duval County due to drought and public water supply well withdrawals (Winter, 2002). A database of 544 instances of individual SSWRLS in Duval County has been developed from information provided by SJRWMD, JEA, and local well drillers.

The vast majority of documented SSWRLS in Duval County (97%) has occurred in the Mandarin area of southern Duval County. Historically, the potentiometric surface of the Upper Floridan in the area has been above land surface, in some places as much as 30 ft als. The potentiometric surface of the Upper Floridan in the area has been lowered by

operation of the nearby Community Hall Well Field. At times, the potentiometric surface has dropped below land surface. The operator, JEA, has agreed to mitigate SSWRLS in the vicinity of well field in accordance with a provision of a Consumptive Use Permit. Mitigation has included installing new pumps and drop pipes, replacing wells, or connecting residences to the public water supply system.

The wells that have experienced SSWRLS in Mandarin were predominantly Upper Floridan aquifer wells. A few Intermediate aquifer wells in the area have also experienced SSWRLS.

Two primary types of water-supply systems experienced SSWRLS, systems with water treatment units supplied by aquifer pressure head and systems with centrifugal or shallow well jet pumps where water levels dropped below land surface. Many of the impacted systems have water treatment units without a pump between the well and the unit. These systems rely on aquifer head to move water through the unit. A single pump is located between the unit and the point of use to pressurize the system. These systems experience SSWRLS when water levels decline to a point where potentiometric head is no longer sufficient to move water through the treatment unit. SSWRLS is corrected by adding a second pump between the well and the treatment unit.

SSWRLS also was common for systems with an Intermediateaquifer or UpperFloridanaquifer well and a centrifugal or shallow-well jet pump attached directly to the wellhead. Historically, the potentiometric surface of the Intermediate and Upper Floridan aquifers in the Mandarin area has been above land surface. Many of these systems experienced SSWRLS when the potentiometric surface dropped below land surface and the pumps lost prime due to air leaks in the system piping. These systems are modified to avoid SSWRLS by sealing all leaks or by connecting the pump to a drop pipe with check valve installed in the well to below the low water level.

In a few cases, older self-supply systems did not have pumps but relied on potentiometric head to pressurize the system. These systems experienced SSWRLS when the potentiometric head declined to the point where water no longer moved through the system. These systems are modified to avoid SSWRLS by adding a pump. In other cases, wells with centrifugal or shallow-well jet pumps and short drop pipes experienced SSWRLS when water levels in the well dropped below the bottom of the pipe. These systems are modified to avoid SSWRLS by extending the drop pipe. In some cases, wells with centrifugal pumps experienced SSWRLS when the water level dropped below the effective maximum lift capacity of the system. These systems are modified to avoid SSWRLS by replacing the pump.

Scattered occurrences of SSWRLS have been reported in other areas of Duval County. Most were located near the St Johns River in East Arlington, Dames Point, Garden City and Ortega Hills areas. Most of these systems have water treatment units without a pump between the well and the unit.

Duval County PSAs

Eleven utilities operate 40 PSAs as identified by an Arcview shape file provided by SJRWMD. Table 15 provides a summary of PSAs in Duval County.

UTILITY	NUMBER OF PSAs	TOTAL ACRES
ATLANTIC BEACH UTILITY	2	4,636
BALDWIN	1	8,710
CLAY COUNTY UTILITY AUTHORITY	1	74
FLORIDA WATER SERVICES CORP	2	3,539
JACKSONVILLE BEACH	1	204
JEA	10	213,956
NEIGHBORHOOD UTILITY CO	1	200
NEPTUNE BEACH	1	1,667
NORMANDY VILLAGES UTILITIES	1	405
UNITED STATES NAVY	1	1,833
UNITED WATER FLORIDA INC	19	20,109

Table 15: Duval County Public Service Areas

Based on listed well use, a total of 5,346 self-supply wells were identified within PSAs in Duval County. An additional 4,019 wells identified in the PSAs did not have a use listed but it is assumed most of these are self-supply wells.

Duval County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, the risk of SSWRLS was identified in portions of 23 Duval County PSAs (Table 16). Three classes of systems would be at risk: Type 2, 3, and 4. Where the threshold criteria are exceeded by more than 5 ft, the risk is considered high.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
ATLANTIC BEACH	BUCCANEER	31	No	High	No	No	No
ATLANTIC BEACH	ATLANTIC BEACH	34	No	High	No	No	No
FLORIDA WATER SERVICES		24	No	Yes	No	No	No
FLORIDA WATER SERVICES		25	No	Yes	No	No	No
UWF (FORMERLY)	SOUTH GRID/HOLLY OAKS	32	No	No	No	Yes	No
UWF (FORMERLY)	SOUTH GRID/SAN PABLO	46	No	High	No	No	No
UWF (FORMERLY)	NORTH GRID/JAX HEIGHTS	50	No	No	Yes	No	No
UWF (FORMERLY)	SOUTH GRID/SAN JOSE	51	No	High	Yes	No	No
UWF (FORMERLY)	SOUTH GRID/ROYAL LAKES	61	No	High	High	No	No
JACKSONVILLE BEACH	JACKSONVILLE BEACH	40	No	High	Yes	No	No
JEA	NORTH GRID	8	No	High	Yes	Yes	No
JEA	NORTH GRID	9	No	High	Yes	No	No
JEA	NORTH GRID	13	No	High	No	No	No
JEA	NORTH GRID	29	No	No	No	Yes	No
JEA	NORTH GRID	47	No	High	No	No	No
JEA	NORTH GRID	58	No	No	High	No	No
JEA	NORTH GRID/BLOUNT ISLAND	16	No	High	No	No	No
JEA	NORTH GRID/WHITESHELL	21	No	Yes	No	No	No
JEA	SOUTH GRID	27	No	High	High	High	No
JEA	SOUTH GRID	35	No	No	No	Yes	No
JEA	SOUTH GRID	57	No	No	High	No	No
JEA	SOUTH GRID/NOCATEE	72	No	Yes	High	No	No
NEPTUNE BEACH	NEPTUNE BEACH	38	No	High	No	No	No

Table 16: Duval County PSAs with Risk of SSWRLS

Flagler County

Flagler County Self-Supply Sources

The top of the Upper Floridan is from about 100 to 150 ft bls in northern Flagler County and 50 to 100 ft bls in southern Flagler County. In the northeast corner and west central area of the County, the top of the Upper Floridan 150 to 180 ft bls. The potentiometric surface of the Upper Floridan is above land surface along the coast and within the western portion of the County near the St Johns River.

The Intermediate aquifer system is present above the Upper Floridan and ranges from about 40 to 100 ft thick. The surficial aquifer ranges from about 10- to 130-ft thick and overlies the Hawthorn.

About 15% of the residences of Flagler County utilize self-supply wells for domestic supply (Cholmondeley, 2002). The surficial aquifer is the most common source for self-supply wells. Domestic self-supply wells are most common in the western portion of the County with some located along the beach. They are typically 80-ft deep and equipped with a submersible pump. Most self-supply wells in Flagler County are used for irrigation. Of the 990 new wells permitted in Flagler County during 2001, 910 were irrigation wells. The typical irrigation self-supply well is about 40-ft deep, equipped with a shallow-well jet pump.

Flagler County Local Government Programs

Flagler County is delegated by SJRWMD to permit wells less than six inches in diameter. Most of the local governments within Flagler County do not have ordinances related to self-supply wells. None of the local government programs regulate the construction of self-supply wells to avoid SSWRLS. The type of ordinance for each local government is listed in Table 17.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Flagler County	No	Yes/Delegated	No	No
Beverly Beach	Yes	No	Yes	No
Bunnell	No	No	No	No
Flagler Beach	Yes	No	No	No
Marineland	No	No	No	No
Palm Coast	No	No	No	No

Table 1: Flagler County Local Government Programs

Flagler County Well Database

Flagler County maintains a database of well permits issued since 1997. Flagler County provided records for 4,058 wells permitted in the County between March 1997 and December 2001 in an Excel worksheet file. The database contained data fields for the following information:

Permit Date
Well Owners Name
Well Location City Street Address Number
Well Location City Street Address Name
Well Location City
Name of Well Drilling Company
Flagler County Permit Number
Type of Well
Comments concerning the permit including name of driller who installed well
Completion Report Received (Yes, No, or Date Received)
Inspection Completed by Health Department (Yes, No)

Flagler County Current and Historic SSWRLS

Incidences of SSWRLS have not been documented in Flagler County (Cholmondeley, 2002; Beasley, 2002).

Flagler County PSAs

Seven PSAs are identified in Flagler County (Table 18). Five PSAs are entirely within the County and two, Plantation Bay and the proposed Ormond Beach PSA, straddle Flagler and Volusia Counties.

UTILITY	ACREAGE	SUBGROUP
BUNNELL	3,409	
DUNES COMMUNITY DEVELOPMENT DISTRICT	2,537	
FLAGER BEACH	2,521	FLAGER BEACH
FLORIDA WATER SERVICES CORP	45,830	PALM COAST
MARINELAND	107	MARINELAND INC
PLANTATION BAY	1,975	
ORMOND BEACH	7,776	ORMOND BEACH

Table 18: Flagler County PSAs

Flagler County PSAs Common Well Construction Practices

A total of 2,995 self-supply wells from the Flagler County Health Department records were located within Flagler County PSAs. The permitted wells were almost exclusively irrigation wells, only twenty were for domestic supply. The records do not include well construction information.

Table 19 lists the size of each service area and the number of domestic and irrigation self-supply wells located in each.

			Well Use	
Utility	Status	Acreage	Domestic	Irrigation
BUNNELL	EXISTING	3,556	1	25
DUNES COMMUNITY DEVELOPMENT SJRWMD	EXISTING	2,399	0	0
FLAGER BEACH	EXISTING	2,428	1	23
FLORIDA WATER SERVICES CORP (Palm Coast)	EXISTING	45,554	13	2,913
MARINELAND	EXISTING	107	0	0
ORMOND BEACH	PROPOSED	7,776	0	0
PLANTATION BAY	EXISTING	1,975	5	8

Table 19: Flagler County PSA Well Summary

Irrigation self-supply wells are by far the most common type in Flagler County. Irrigation wells most commonly are 2-in diameter, about 40-ft deep with a 5-to-10 ft screen, and equipped with a shallow-well jet pump (Cholmondeley, 2002; Beasley, 2002). Water levels in the surficial aquifer in Flagler County are generally 5 to 10 ft bls. Domestic self-supply systems are rare but typically include lower surficial aquifer wells 80-ft deep and equipped with a submersible pump.

Flagler County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS is not predicted within Flagler County PSAs. However, the methodology used does not consider water table decline from withdrawals for the individual irrigation wells. Additional model simulations would be required to predict water table declines resultant from self-supply use from the surficial. Surficial aquifer irrigation self-supply wells would be at risk of SSWRLS if water levels decline below about 20 ft msl.

Indian River County

Indian River County Self-Supply Sources

The top of the Upper Floridan is from about 100 to 150 ft bls in northern Indian River County and 50 to 100 ft bls in southern Indian River County. In the northeast corner and west central area of the County, the top of the Upper Floridan 150 to 180 ft bls. The potentiometric surface of the Upper Floridan is above land surface along the coast and within the western portion of the County near the St Johns River.

The Intermediate aquifer system is present above the Upper Floridan and ranges from about 40 to 100 ft thick. The surficial aquifer ranges from about 10 to 130-ft thick and overlies the Hawthorn.

West of the barrier island, domestic self-supply wells are commonly 60 to 100 ft deep and equipped with centrifugal or shallow-well jet pumps (Galanis, 2002). Domestic self-supply wells on the barrier island are either very shallow or very deep due to the presence of poor water quality. Self-supply wells on the barrier island are commonly installed only eight to twelve ft deep to tap the thin, fresh water lens.

Indian River County Local Government Programs

Indian River County is delegated by SJRWMD to permit wells less than six inches in. Most of the local governments within Flagler County have ordinances related to self-supply wells. None of the local government programs regulate the construction of self-supply wells to avoid SSWRLS. The type of ordinance for each local government is listed in Table 20.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Indian River County	Yes	Yes/Delegated	No	Yes
Fellsmere	Yes	Yes	Yes (Potable)	No
Indian River Shores	No	No	No	No
Sebastian	Yes	No	Yes (Potable)	No
Vero Beach	Yes	No	No	No

Table 20: Indian River County Local Government Programs

Indian River County Well Database

Indian River County maintains a database of well permits issued since 1996. Indian River County provided records for 5,707 wells permitted in the County between 1996 and December 2001 in an Excel worksheet file. The database contained data fields for the following information:

Indian River County Permit Number
Permit Purpose
Well Location Street Address Number
Well Location Street Address Name
Well Location City
Well Location Indian River County Tax Appraiser Parcel Number
Number of Wells
Primary Use of Well
Secondary Use of Well

Indian River County Current and Historic SSWRLS

Surficial aquifer SSWRLS was common in the Sebastian Highlands area from 1998 to 2001 (Galanis, 2002; Whynot, 2002). At least 40 to 50 incidences of SSWRLS occurred in the spring and early summer of 2000 (Whynot, 2002). The Sebastian Highlands area is located in northeastern Indian River County and consists of five different subdivisions with over 10,000 lots. The subdivisions rely on individual self-supply systems for domestic water supply. The systems commonly use surficial aquifer wells 60 to 100 ft deep that are equipped with shallow-well jet pumps. SSWRLS in the area is attributed to drawdown in the area caused by pumping from the numerous, individual self-supply wells during drought (Galanis, 2002). SSWRLS is generally corrected by installing longer drop pipes in the wells.

Shallow surficial aquifer SSWRLS is common on the barrier island in the eastern portion of the County (Galanis, 2002). On the barrier island, poor water quality is present at shallow depth and surficial aquifer water supply wells must be very shallow. Self-supply wells are commonly only 8-to-12 feet deep to tap the thin, shallow lens of fresh water. In many cases, several shallow wells that only penetrated the top foot of the saturated zone are connected to a common header to provide enough yield (Whynot, 2002). SSWRLS is very common in these wells during drought and the problem has been ongoing for many years. This is one of the rare cases where SSWRLS is related to well construction as opposed to a pumping system failure.

Upper Floridan aquifer irrigation well SSWRLS was reported in an area west of Vero Beach in the spring and early summer of 2001(Herndon, 2002). The top of the Upper Floridan is 350 to 400 ft bls in the area and 1995 potentiometric surface of the Upper Floridan aquifer was 6 to 18 ft als. Domestic self-supply wells in the area are predominately surficial aquifer wells. Free-flowing irrigation wells are present but are not common. These wells are commonly used without pumps or have centrifugal or shallow-well jet pumps connected directly to the wellhead.

Indian River County PSAs

Three utilities operate three PSAs in Indian River County. Table 21 provides a summary of Indian River County PSAs.

UTILITY	ACREAGE	SUBGROUP
FELLSMERE	1,133	FELLSMERE
FELLSMERE	3,518	FELLSMERE
FELLSMERE	22	FELLSMERE
INDIAN RIVER COUNTY UTILITIES	71,617	INDIAN RIVER COUNTY UTILITIES
VERO BEACH	16,644	VERO BEACH

Table 21: Indian River County Public Service Areas

Indian River County PSAs Common Well Construction Practices

Indian River County Utilities PSA

A total of 3,491 self-supply wells were identified in the Indian River County Utilities PSA from County Health Department Records: 1,320 domestic wells and 2,171 irrigation wells. These records catalog type of use but do not contain construction information. Forty-two WSRP wells with construction information were located within Indian River County Utilities PSA. The wells were all surficial aquifer wells. The depths ranged from 60 to 125 ft and most (83%) were between 60 and 80 ft deep. All but two of the wells were 2-in diameter. Reported screened or open intervals ranged from 3 to 20 ft. A total of 141 Super Act wells were located in the PSA. One hundred twenty-six were 2-in diameter wells with galvanized casings. The records with pump information indicate that pumps were predominantly 1- or 2-horsepower shallow-well jet pumps.

City of Fellsmere PSA

Twenty self-supply wells were identified within the City or Fellsmere PSA from County Health Department Records, three domestic wells and 17 irrigation wells. Three WSRP wells with construction information were located within the PSA. One of the wells was a 40-ft deep, 2-in diameter, surficial aquifer well. The other two were Floridan wells, a 2-in diameter well 365 ft deep and 10-inch diameter well 400 ft deep. The Super Act well database did not contain any records for self-supply wells in Fellsmere.

City of Vero PSA

A total of 661 self-supply wells were identified within the City of Vero PSA from County Health Department Records, 37 domestic supply and 644 irrigation wells. Forty-two community Super Act wells were located in the PSA but no self-supply wells. Seven WSRP wells were located within Vero Beach Utilities PSA. The record for only one well contained depth information, listing the well as 75 ft deep. Irrigation wells in the Vero Beach area are commonly surficial aquifer wells with 2-in diameter casings and shallow-well jet pumps.

Indian River County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Indian River County, surficial aquifer wells in areas with high densities of these wells are at risk of SSWRLS during

periods of drought. Apparently, lowered recharge combined with increased drawdown from increased use result in large water level declines where the wells are close together and individual cones of depression intersect.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk was determined for Type 2 Upper Floridan wells within portions of two Indian River County PSAs (Table 22). The risk is considered high in both cases because the risk identification criterion was exceeded by more than 5 ft.

UTILITY	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
INDIAN RIVER COUNTY UTILITIES	645	No	High	No	No	No
VERO BEACH	649	No	High	No	No	No

Table 22: Indian River County PSAs with Risk of SSWRLS

Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in areas where the water levels are predicted to decline to less than 10 ft als by 2020. Upper Floridan irrigation systems without pumps may also experience SSWRLS in these PSAs.

Lake County

Lake County Self-Supply Sources

Most self-supply systems in Lake County utilize Floridan aquifer wells equipped with submersible pumps (Ball, 2002). The top of the Upper Floridan is from about 30 to 200 ft bls in Lake County and averages about 100 ft bls. In the central portion of the County beneath the Lake Wales Ridge, Mount Dora Ridge and within the Central Valley, the top of the Upper Floridan is generally greater than to 100 ft bls (Adamski and Knowles, 2001). It is less than 100 ft bls in the eastern and southwestern portions of the County within the Lake and Marion Uplands.

The potentiometric surface of the Upper Floridan is above land surface within portions of the northeastern part of the County and in the vicinity of Lake Harris. It is greater than 20 ft bls beneath the Lake Wales and Mount Dora Ridges and the Sumter Upland (Adamski and Knowles, 2001).

The Intermediate confining unit is present above the Upper Floridan and ranges from about 5 to 100 ft thick. It is not generally used as a source of supply because of the absence of suitable production horizons. It is thickest beneath an area extending northwestward from the Mount Dora Ridge and becomes thinner to the southwest and northeast.

The surficial aquifer ranges from about 10 ft to more than 200-ft thick and overlies the Hawthorn. The surficial aquifer is less than 50 ft thick beneath the Lake and Marion Uplands and greater than 100 ft thick beneath the ridges and Central Valley. The elevation of the water table in the surficial aquifer system ranges from near sea level along the St. Johns River to more than 165 ft above sea level in areas underlying the Mount Dora Ridge (Adamski and Knowles, 2001). The water table elevation is highly susceptible to changes in recharge and short term high amplitude fluctuations have been recorded (Adamski and Knowles, 2001). The surficial is sometimes used as a source of self-supply, particularly in the areas where it is thickest.

Lake County Local Government Programs

Lake County is delegated by SJRWMD to permit wells less than six inches in diameter on behalf of SJRWMD. Most of the local governments within Flagler County have ordinances related to self-supply wells. None of the local government programs regulate the construction of self-supply wells to avoid SSWRLS. The type of ordinance for each local government is listed in Table 23.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Lake County	Yes	Yes/Delegated	No	No
Astatula	No	No	No	No
Clermont	Yes	Yes	Yes (Potable)	No
Eustis	Yes	No	No	No
Fruitland Park	Yes	No	No	No
Groveland	Yes	Yes	No	No
Howey-in-the-Hills	Yes	Yes	Yes (Potable)	Yes
Lady Lake	No	No	No	No
Leesburg	Yes	No	All	No
Mascotte	Yes	Yes	No	No
Minneola	Yes	No	No	No
Montverde	Yes	No	Yes (Potable)	No
Mount Dora	Yes\4	No	No	No
Tavares	No	No	No	No
Umatilla	No	No	Yes (Potable)	No

Table 23: Lake County Local Government Programs

Lake County Well Database

Lake County maintains a database of well permits issued since 1999. Lake County provided records for 2,944 wells permitted between October 1999 and December 2001 in an Excel worksheet file. The database contained data fields for the following information:

Lake County Permit Number
Well Owner Name
Well Location Street Address
Well Location City
Well Location State
Permit Issue Date
Report Completion Date
Date Well Tagged
Source Theme

Lake County Current and Historic SSWRLS

No occurrences of SSWRLS were identified in Lake (Ball, 2002; Brown, 2002)

Lake County PSAs

Nineteen utilities operate PSAs in Lake County (Table 24). The PSAs are grouped in three areas of the County.

UTILITY	ACREAGE	SUBGROUP
AQUASOURCE UTILITY INC	141	KINGS COVE
ASTOR - ASTOR PARK WATER ASSOC INC	11,792	ASTOR PARK WATER ASSOC
CLERBROOK GOLF & RV RESORT	233	
CLERMONT	16,324	CLERMONT EAST AND WEST
EUSTIS	17,869	EUSTIS
FLORIDA WATER SERVICES CORP	83	HOLIDAY HAVEN
FLORIDA WATER SERVICES CORP	4	HOLIDAY HAVEN
FLORIDA WATER SERVICES CORP	2	HOLIDAY HAVEN
FLORIDA WATER SERVICES CORP	236	CARLTON VILLAGE
FLORIDA WATER SERVICES CORP	48	QUAIL RIDGE
FLORIDA WATER SERVICES CORP	11	
FLORIDA WATER SERVICES CORP	10	
FLORIDA WATER SERVICES CORP	55	HOBBY HILLS
FLORIDA WATER SERVICES CORP	95	SKYCREST
FLORIDA WATER SERVICES CORP	196	PINEY WOODS / SPRING LAKE
FLORIDA WATER SERVICES CORP	44	GRAND TERRACE
FLORIDA WATER SERVICES CORP	83	SILVER LAKES/WESTERN SHORES
FLORIDA WATER SERVICES CORP	976	SILVER LAKES/WESTERN SHORES
FLORIDA WATER SERVICES CORP	90	VALENCIA TERRACE
FLORIDA WATER SERVICES CORP	205	PICCIOLA ISLAND
FLORIDA WATER SERVICES CORP	87	FERN TERRACE
FLORIDA WATER SERVICES CORP	10	IMPERIAL MOBILE TERRACE
FLORIDA WATER SERVICES CORP	63	IMPERIAL MOBILE TERRACE
FLORIDA WATER SERVICES CORP	23	MORNING VIEW
FLORIDA WATER SERVICES CORP	136	VENETIAN VILLAGE
FLORIDA WATER SERVICES CORP	41	STONE MOUNTAIN
FLORIDA WATER SERVICES CORP	76	
FLORIDA WATER SERVICES CORP	10	FRIENDLY CENTER
FLORIDA WATER SERVICES CORP	18	PALMS MOBILE HOME PARK
FLORIDA WATER SERVICES CORP	4,831	SUNSHINE PARKWAY
FLORIDA WATER SERVICES CORP	323	SUNSHINE PARKWAY
FLORIDA WATER SERVICES CORP	908	PALISADES COUNTRY CLUB
FLORIDA WATER SERVICES CORP	183	PALISADES COUNTRY CLUB
FRUITLAND PARK	2,195	FRUITLAND PARK
FRUITLAND PARK	297	FRUITLAND PARK
FRUITLAND PARK	8	FRUITLAND PARK
FRUITLAND PARK	4	FRUITLAND PARK
GROVELAND	657	GROVELAND/SUMMIT
GROVELAND	1,837	GROVELAND
GROVELAND	11,136	GROVELAND
HARBOR HILLS UTILITIES LP	677	
HARBOR HILLS UTILITIES LP	80	
HAWTHORNE AT LEESBURG	296	
HERCULES INC AND INDIAN RIVER COUNTY UTILITIES	142	
HOWEY IN THE HILLS	1,197	HOWEY IN THE HILLS

Table 24: Lake County PSAs

UTILITY	ACREAGE	SUBGROUP
LADY LAKE	1,973	LADY LAKE
LAKE GRIFFIN ISLES	96	
LAKE GROVES UTILITIES INC	679	LAKE GROVES UTILITIES INC
LAKE GROVES UTILITIES INC	4,391	LAKE GROVES UTILITIES INC
LAKE GROVES UTILITIES INC	1,678	LAKE GROVES UTILITIES INC
LAKE GROVES UTILITIES INC	431	LAKE GROVES UTILITIES INC
LAKE UTILITY SERVICES INC	7,985	LAKE UTILITY SERVICES
LAKE UTILITY SERVICES INC	14,315	LAKE UTILITY SERVICES
LEESBURG	14,838	LEESBURG
LEESBURG	13,011	LEESBURG
LEESBURG	292	LEESBURG
LEESBURG	19,509	LEESBURG
LEESBURG	868	ROYAL HIGHLANDS
MASCOTTE	1,829	MASCOTTE
MID FLORIDA LAKES MHP	224	MID FLORIDA LAKES MHP
MINNEOLA	7,172	MINNEOLA
MONTVERDE	2,844	MONTVERDE
MONTVERDE MOBILE HOME ASSOC	103	MONTVERDE MOBILE HOME ASSOC
MOUNT DORA	11,480	MOUNT DORA
OAK SPRINGS MHP	71	
ORANGE LAKE MHP	39	
PALM SHORES RESORT	27	PALM SHORES RESORT
PENNBROOKE UTILITIES INC	522	
PLANTATION AT LEESBURG	1,385	
SOUTHLAKE UTILITIES INC	2,680	
SPRINGS PARK AREA INC	89	
SUNLAKE ESTATES	162	
TAVARES	17,931	TAVARES
UMATILLA	2,006	UMATILLA
VILLAGE CENTER COMMUNITY DEVELOPMENT DISTRICT	2,039	VILLAGES OF LAKE
WATER OAK COUNTRY CLUB ESTATES	510	WATER OAK ESTATES
WEDGEWOOD HOMEOWNERS ASSOC INC	187	

Table 24 (continued): Lake County PSAs

Lake County PSAs Well Construction

Most self-supply systems in Lake County include Floridan aquifer wells equipped with submersible pumps (Ball, 2002). Records for 645 wells constructed within Lake County PSAs were identified in the well database (Table 25). The records did not contain well construction data.

The WSRP database lists records for 630 domestic self-supply wells within Lake County PSAs. Of these, 461 were 4-in diameter, 160 were 2-in diameter, six were 6-in diameter, and three were 3-in diameter.

There are 293 WSRP wells in 13 PSAs and the average, minimum and maximum well depth in each PSA are summarized in Table 26.

UTILITY	Number of Private Wells
ASTOR - ASTOR PARK WATER	10
CLERMONT CITY OF	48
EUSTIS CITY OF	95
FLORIDA WATER SERVICES CORP	44
FRUITLAND PARK CITY OF	21
GROVELAND CITY OF	44
HOWEY IN THE HILLS TOWN	19
LADY LAKE TOWN OF	22
UTILITIES INC OF FLORIDA	19
LEESBURG CITY OF	129
MASCOTTE CITY OF	13
LARRY A KNIGHT	1
MINNEOLA CITY OF	15
MONTVERDE TOWN OF	4
MOUNT DORA CITY OF	46
SPRINGS PARK AREA INC	1
TAVARES CITY OF	100
UMATILLA CITY OF	12
WATER OAK COUNTRY CLUB ESTATES	2

Table 25: Private Wells in Lake County PSAs from Lake County Well Database

UTILITY	Count	Average Depth	Min Depth	Max Depth
CLERMONT	92	205	82	535
EUSTIS	18	177	115	340
FLORIDA WATER	9	184	103	270
FRUITLAND	3	146	94	180
GROVELAND	23	167	92	295
LADY LAKE	3	124	82	202
LAKE UTILITY	63	166	63	311
LEESBURG	20	155	50	260
MINNEOLA	40	215	85	600
MONTVERDE	3	165	140	215
MOUNT DORA	4	286	147	396
ORANGE	1	90	90	90
TAVARES	14	216	120	280

Table 26: Lake County PSA Well Construction Data Summary

Lake County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk was determined for Type 3 and/or Type 4 self-supply systems within portions of ten Lake County PSAs (Table 27). Type 3 systems include all systems with Upper Floridan self-supply wells, except those equipped with submersible pumps, in areas where Floridan potentiometric surface is predicted to drop to below land surface by 2020. Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS is considered high for Type 4 systems in areas where the water levels are predicted to decline to greater than 25 ft bls by 2020. Upper Floridan irrigation systems without pumps may also experience SSWRLS in these PSAs.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
CLERMONT	CLERMONT EAST AND WEST	504	No	No	No	Yes	No
FLORIDA WATER SERVICES	SUNSHINE PARKWAY	436	No	No	No	Yes	No
LAKE GROVES UTILITIES INC	LAKE GROVES UTILITIES INC	590	No	No	No	Yes	No
LAKE UTILITY SERVICES INC	LAKE UTILITY SERVICES	555	No	No	No	Yes	No
LEESBURG	LEESBURG	331	No	No	Yes	High	No
LEESBURG	LEESBURG	338	No	No	Yes	No	No
MONTVERDE	MONTVERDE	491	No	No	Yes	No	No
MOUNT DORA	MOUNT DORA	334	No	No	No	Yes	No
SOUTHLAKE		601	No	No	No	High	No
TAVARES	TAVARES	333	No	No	No	Yes	No

Table 27: Lake County PSAs with Risk of SSWRLS

Marion County

Marion County Self-Supply Sources

Most are 80 to 100 feet deep and produce from the Floridan aquifer (Young, 2002). Currently, these wells typically are constructed with submersible pumps and drillers are setting the pumps deep enough to avoid loss of service during times of low water levels.
Marion County Local Government Programs
Marion County does not have an ordinance governing construction of self-supply wells and self-supply wells are not permitted or inventoried. The only local government programs relating to self-supply wells are those requiring connection to the public system, if available (Table 28).

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Marion County	Yes	No	No	No
Belleview	Yes	Yes	No	No
McIntosh	No	No	No	No
Ocala	Fee Charged	No	No	No
Reddick	No	No	No	No

Table 28: Marion County Local Government Programs

Marion County Well Database

Marion County Health Department does not maintain a database of self-supply wells.

Marion County Current and Historic SSWRLS

Scattered incidences of SSWRLS were reported in Marion County in 1998 for Upper Floridan aquifer systems equipped with shallow-well jet pumps (Young, 2002). SSWRLS reportedly occurred in several areas: near the community of Friendship, near Citra, and just outside of Williston (McNeill, 2002). Williston and Friendship are not located within SJRWMD portion of Marion County. In the vicinity of Citra, the top of the Upper Floridan is less than 30 ft bls and the Upper Floridan is unconfined. The depth-to-water in Upper Floridan wells is 25 to 45 ft bls. SSWRLS will occur in Floridan Aquifer wells with centrifugal or shallow-well jet pumps if water levels drop to greater than 20 ft bls.

Marion County PSAs

Fourteen utility companies operate PSAs in Marion County within SJRWMD boundaries (Table 29). All but three of the PSAs are located within a corridor extending from Ocala southeastward to the County line. Three PSAs are located outside of the Ocala area: the PSA for the Town of McIntosh, a Florida Water Services PSA near Salt Springs, and a Sunshine Utilities PSA near Half Moon Lake.

UTILITY	ACRES	SUBGROUP
A P UTILITIES	36	
AQUASOURCE UTILITY INC	53	49TH STREET
AQUASOURCE UTILITY INC	343	OCALA OAKS 1 & 2
AQUASOURCE UTILITY INC	95	BELAIRE
AQUASOURCE UTILITY INC	68	HAWKS POINT
AQUASOURCE UTILITY INC	146	BELLVIEW HILLS ESTATES
BELLEVIEW	9,143	
BELLEVIEW	620	
BELLEVIEW	506	
BELLEVIEW	31	
BELLEVIEW	1,505	
BELLEVIEW	1,291	
DAYCO PRODUCTS INC	43	DAYCO PRODUCTS INC
EDGEWATER UTILITIES INC	151	EDGEWATER ESTATES
FLORIDA WATER SERVICES CORP	267	SALT SPRINGS
FLORIDA WATER SERVICES CORP	92	SOUTH FORTY
FLORIDA WATER SERVICES CORP	130	CITRUS PARK
FLORIDA WATER SERVICES CORP	3	SAMIRA VILLAS
FLORIDA WATER SERVICES CORP	1,571	SPRUCE CREEK GOLF AND COUNTRY CLUB
FLORIDA WATER SERVICES CORP	32,418	MARION OAKS
FLORIDA WATER SERVICES CORP	414	SPRUCE CREEK PRESERVE
FLORIDA WATER SERVICES CORP	839	STONECREST
FLORIDA WATER SERVICES CORP	669	SPRUCE CREEK SOUTH
LINADALE WATER SYSTEM	353	LINADALE
LITTLE SUMTER UTILITY COMPANY	1,744	VILLAGES OF MARION
MARION COUNTY UTILITIES	3	MAPCO TRAVEL CENTER AND MCDONALDS
MARION COUNTY UTILITIES	37	THE FOUNTAINS
MARION COUNTY UTILITIES	234	GOLDEN OCALA
MARION COUNTY UTILITIES	68	FOMERLY A P UTILITIES
MARION COUNTY UTILITIES	107	DEERPATH
MARION COUNTY UTILITIES	36	FOMERLY A P UTILITIES
MARION COUNTY UTILITIES	27	FOMERLY A P UTILITIES
MARION COUNTY UTILITIES	2,796	SILVER SPRING SHORES
MARION COUNTY UTILITIES	12	SOUTH OCALA INDUSTRIAL PARK
MARION COUNTY UTILITIES	3	HERITAGE HOMES
MARION COUNTY UTILITIES	88	CHERRYWOOD UNITS 5 6 AND 7
MARION COUNTY UTILITIES	1,515	DUNNELLON AIRPORT
MARION COUNTY UTILITIES	354	PINE RUN
MARION COUNTY UTILITIES	53	CHERRYWOOD UNITS 9 AND 10
MARION COUNTY UTILITIES	1,300	OAKRUN
MARION COUNTY UTILITIES	4	OAKRUN
MARION COUNTY UTILITIES	5	GARLITS/SONNYS BBQ/EXXON
MARION COUNTY UTILITIES	586	SUMMERGLEN
MARION COUNTY UTILITIES	828	WEIRSDALE

Table 29: Marion County Public Service Area Utilities in SJRWMD

UTILITY	ACRES	SUBGROUP
MARION COUNTY UTILITIES/FORMERLY AP UTILITIE	164	RAVEN HILL SUBDIVISION
MARION COUNTY UTILITIES/FORMERLY AP UTILITIE	177	SOUTH OAK SUBDIVISION
MARION UTILITIES INC	231	FORE ACRES
MARION UTILITIES INC	21	WINDGATE ESTATES
MARION UTILITIES INC	54	WINDGATE ESTATES
MARION UTILITIES INC	34	SUGAR HILL QUADRAVILLAS
MARION UTILITIES INC	29	MARION UTILITIES
MARION UTILITIES INC	60	MARION UTILITIES
MARION UTILITIES INC	196	MARION UTILITIES
MARION UTILITIES INC	40	MARION UTILITIES
MARION UTILITIES INC	21	MARION UTILITIES
MARION UTILITIES INC	160	GREENFIELDS/INDIAN PINES
MARION UTILITIES INC	207	CEDAR HILLS/DOUBLEGATE/HAWKS LANDING
MARION UTILITIES INC	15	MARION UTILITIES
MARION UTILITIES INC	79	MARION UTILITIES
MARION UTILITIES INC	39	TURNING POINTE
MCINTOSH	445	MCINTOSH
OCALA	28,000	OCALA
OCALA	11,921	OCALA
OCALA EAST VILLAS	76	
SUNSHINE UTILITIES	44	FORE OAKS
SUNSHINE UTILITIES	15	OAK HAVEN
SUNSHINE UTILITIES	19	FLOYD CLARKE
SUNSHINE UTILITIES	44	SUN RAY ESTATES
SUNSHINE UTILITIES	44	OCALA HEIGHTS
SUNSHINE UTILITIES	42	OAKHURST
SUNSHINE UTILITIES	47	WHISPERING SANDS
SUNSHINE UTILITIES	200	WINDING WATERS
SUNSHINE UTILITIES	117	FLORIDA HEIGHTS
SUNSHINE UTILITIES	40	BELLEVIEW OAKS ESTATES
SUNSHINE UTILITIES	717	OKLAWAHA
SUNSHINE UTILITIES	141	HILLTOP AT LAKE WEIR
SUNSHINE UTILITIES	39	LAKE WEIR MOBIL HOME PARK
SUNSHINE UTILITIES	13	LAKE WEIR PINES
SUNSHINE UTILITIES	61	LAKEVIEW HILLS
SUNSHINE UTILITIES	41	SUNLIGHT ACRES
SUNSHINE UTILITIES	212	LITTLE LAKE WEIR
TRADEWINDS UTILITY INC	184	TRADEWINDS/COUNTRYSIDE/GEORGE MAYO

Table 29 (Continued): Marion County Public Service Area Utilities in SJRWMD

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Marion County PSAs Common Well Construction Practices

Most of the Marion County PSAs are located in an area extending from Ocala southeastward to the County line. Three other PSAs are located in Marion County outside the Ocala area. The Town of McIntosh operates a 445-acre PSA associated with the Town. Florida Water Services operates a 267-acre PSA in the area of Salt Springs on the east end of Lake Kerr. Sunshine Utilities is the operator of a 200-acre PSA south of Half Moon Lake. A summary of the well construction data for these wells is provided in Table 30.

The average well depths for the PSAs ranged from 99 to 180 ft bls, well into the Upper Floridan. New wells in the area are generally constructed with submersible pumps. Older wells in the area may be equipped with centrifugal or shallow well jet pumps.

UTILITY	Number Of Wells	Minimum Depth (ft bls)	Maximum Depth (ft bls)	Average Depth (ft bls)
BELLEVIEW	9	85	400	138
EDGEWATER	1	180	180	180
MARION COUNTY	15	75	300	163
OCALA	4	30	155	99
SUNSHINE UTILITIES	2	90	135	113
TOWN OF MCINTOSH	0	NA	NA	NA
SALT SPRINGS	0	NA	NA	NA
SUNSHINE UTILITIES	0	NA	NA	NA

Table 30: Ocala Area Public Service Area Well Construction Summary

Marion County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Marion County, Upper Floridan aquifer wells with centrifugal or shallow-well jet pumps in areas where the Upper Floridan is unconfined are at risk of SSWRLS during periods of drought.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk for Type 4 systems is predicted for the Florida Water Services Stonecrest PSA (Table 31).

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
FLORIDA WATER SERVICES CORP	STONECREST	283	No	No	No	Yes	No

Table 31: Marion County PSAs with Risk of SSWRLS

Florida Water Services Stonecrest PSA is located along the southern boundary of Marion County southeast of Ocala. Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020.

Nassau County

Nassau County Self-Supply Sources

In Nassau County, shallow surficial aquifer, lower surficial aquifer, Intermediate aquifer, and Upper Floridan aquifer self-supply wells are common. The aquifer utilized in each case is dependent upon desired yield, desired water quality, local hydrostratigraphy, and economics. Floridan aquifer wells produce the highest yields and generally, good quality water. Shallow surficial aquifer wells completed in the upper sand unit generally produce low yields and water of poorer quality. Wells completed in both the shallow rock zone of the lower surficial aquifer and the Intermediate aquifer will produce good quality water with yields sufficient for domestic and private irrigation use.

The lower surficial aquifer is the most common source for self-supply systems in Nassau County. A limestone unit is present at the base of the surficial aquifer, locally referred to as the "Rock aquifer", which yields moderate quantities of good quality water. The surficial aquifer is about 100 ft thick throughout much of the County. It is up to 200 ft thick in the northwest portion of the County west and south of Hillard.

Lower surficial aquifer wells are typically about 100 ft deep and constructed with 2- or 3-in diameter casing. They are generally installed without a well screen and are open hole through the production interval. Water levels within the Rock aquifer wells are typically 5 to 10 ft bls. Most often, these wells are equipped with centrifugal or shallow-well jet pumps.

In Fernandina Beach near the St Marys River, chloride concentrations in water from the shallow rock zone are elevated and self-supply wells are typically constructed to the Upper Floridan aquifer. Upper Floridan domestic self-supply wells are also common in areas where overlying aquifers contain water with high iron concentrations or when a large quantity of water is required. In Nassau County, the top of the Upper Floridan ranges from about 350 ft to over 550 ft bls, deeper in the northeast and northwest portions of the County. The potentiometric surface of the Upper Floridan is more than 15 ft als throughout most of the central portion of the County and above land suface within most of the eastern County except at Fernandina Beach. The potentiometric surface of the Upper Floridan is generally more than 20 ft bls within the western portion of the County.

Shallow surficial aquifer wells are often used as a source for household irrigation self-supply. They are generally 2-in diameter, 30 to 60 ft deep, and equipped with centrifugal or shallow-well jet pumps. Water levels within the shallow surficial aquifer wells are typically 5 to 10 ft bls.

Nassau County Local Government Programs

Nassau County is delegated by SJRWMD to permit wells less than six inches in diameter. Most of the local governments within Nassau County have ordinances related to self-supply wells. None of the local government programs regulate the construction of self-

supply wells to avoid SSWRLS. The type of ordinance for each local government is listed in Table 32.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Nassau County	Yes	Yes/Delegated	No	No
Callahan	Yes	No	No	No
Fernandina Beach	Yes	No	No	No
Hilliard	Yes	No	Yes (Potable)	No

Table 32: Nassau County Local Government Programs

Nassau County Well Database

Nassau County maintains a written list of well permits issued since 1996 but not an electronic database. Nassau County provided a copy of the written list containing records for about 3,000 wells permitted between July 1996 and February 2002. The list contained data fields for the following information:

Nassau County Permit Number
Well Owner Name
Well Location Address
Well Diameter
Well Type
Permit Issue Date

Nassau County Current and Historic SSWRLS

SSWRLS has not been common in Nassau County (Freeman, 2002; Foreman, 2002; Scholen, 2002). A local driller remembered one or two incidences of SSWRLS during 2001 but believed that these were related to problems with the well pumps and not water level declines. The Jacksonville Service Center office database of SSWRLS complaints contained one entry for Nassau County, a flowing well that experienced SSWRLS due to inadequate flow to the aerator.

Nassau County PSAs

Three utilities operate PSAs in Nassau County: United Water Florida Inc., Fernandina Beach, and Florida Water Services Corp (Table 33).

UTILITY	ACREAGE	SUBGROUP
FERNANDINA BEACH	8,792	FERNANDINA BEACH
FLORIDA WATER SERVICES	3,022	AMELIA ISLAND
JEA	43,981	LOFTEN OAKS/NASSAU COUNTY JAIL/YULEE

Table 33: Nassau County PSAs

Nassau County PSAs Well Construction

JEA PSA

JEA operates a PSA (formerly United Water of Florida) in the vicinity of Yulee totaling about 44,000 acres. In this area, the top of the Floridan aquifer is between 400 and 500 ft bls. The Upper Floridan potentiometric surface is above land surface in the southern and western portions of the PSA and below land surface in the central and northeastern portions of the PSA.

According to local well drillers, most self-supply wells in the area are shallow rock zone wells 50 to 80 ft deep. Few self-supply wells utilize the Intermediate aquifer or Upper Floridan aquifer because of depth to these units. Sixteen self-supply wells within the United Water Florida PSAs were identified in the Super Act database. Twelve of the wells were constructed with 2-in diameter galvanized casing and equipped with 1/2- to 1-horsepower centrifugal pumps. Two of the wells were 4-in diameter PVC cased wells equipped with 1-horsepower centrifugal pumps. One well was constructed with black steel casing and equipped with a submersible pump and the other did not have casing or pump information. Records for eight wells within the PSAs were identified within the WSRP database but the records did not contain well depth or other construction information.

Fernandina Beach PSAs

Fernandina Beach operates a PSA totaling approximately 8,800 acres. According to local well drillers, self-supply wells in the area include both lower surficial aquifer wells and Upper Floridan aquifer wells. In areas close to the St Marys River, water from the shallow rock zone contains elevated chloride concentrations and Upper Floridan aquifer self-supply wells are common. The quality of water from the shallow rock zone improves South of the river and State Road 200 and lower surficial aquifer water quality improves and lower surficial aquifer wells are more common.

Twenty-two Super Act database wells were located within the Fernandina PSAs. Clusters of 2-in diameter wells were located in an area south of the City of Fernandina Beach north of the airport and in the Amelia City area. These wells typically are equipped with one-half horsepower centrifugal pumps. A second set of wells was identified in the Amelia City area. These wells are 4-in diameter PVC wells installed to the Upper Floridan aquifer. Nine WSRP wells were located within the Fernandina Beach PSAs. No well construction data was associated with these records.

Florida Water Services PSA

Florida Water Services operates a 3,000-acre PSA on the southern end of Amelia Island. Three WSRP wells were identified within the PSA but no well construction information was associated with these records. According to local drillers, self-supply wells in the

area are both shallow 2-in diameter surficial aquifer wells constructed with galvanized casing and equipped with 1/2 hp centrifugal pumps and deep Upper Floridan aquifer wells typically 4-in diameter and equipped with either centrifugal, jet or submersible pumps.

Nassau County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk for Type 2, 3, 4 and/or 5 systems is predicted for the three Nassau County PSAs (Table 34).

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
FERNANDINA BEACH	FERNANDINA BEACH	3	No	No	No	High	Yes
FLORIDA WATER SERVICES	AMELIA ISLAND	6	No	No	Yes	No	No
JEA	LOFTEN OAKS/ COUNTY JAIL/ YULEE	2	No	High	High	High	No

Table 34: Nassau County PSAs with Risk of SSWRLS

Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in areas where the water levels are predicted to decline to less than 10 ft als by 2020.

Type 3 systems include all systems with Upper Floridan self-supply wells, except those equipped with submersible pumps, in areas where Floridan potentiometric surface is predicted to drop to below land surface by 2020. The risk of SSWRLS is considered high for Type 3 systems in areas where the water levels are predicted to decline to greater than 5 ft bls by 2020.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS is considered high for Type 4 systems in areas where the water levels are predicted to decline to greater than 25 ft bls by 2020.

Type 5 systems are those with Floridan aquifer wells with deep-well jet or submersible pumps where Upper Floridan potentiometric surface is predicted to drop 15 ft or more from 1995 to 2020.

Okeechobee County

Okeechobee County Self-Supply Sources

The top of the Upper Floridan is from about 350 to 450 ft bls in the portion of Okeechobee County in SJRWMD. The potentiometric surface of the Upper Floridan is above land surface within the eastern part of the area near the St Johns River. It is greater than 20 ft bls along the western part of the area.

The Intermediate aquifer system is present above the Upper Floridan and ranges from about 80 to 280 ft thick. The surficial aquifer ranges from about 100 to 250 ft thick.
Self-supply wells in Okeechobee County are commonly constructed to yield from the "blue shell" or "gray sand" zone of the surficial aquifer. In southern Okeechobee County, Floridan aquifer water quality is better and Floridan aquifer wells are more common (Frazee, 2002).

Okeechobee County Local Government Programs

Okeechobee County has recently been delegated by SJRWMD to permit wells less than six inches in diameter on behalf of SJRWMD in accordance with Florida Statutes (F.S.) Chapter 373, Part III and enforce the Well Construction Standards set forth in Florida Administrative Code (F.A.C) Chapter 40C-3 (Table 35).

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Okeechobee County	No	Yes/Delegated	No	No

Table 35: Okeechobee County Local Government Programs

Okeechobee County Well Database

Okeechobee County has no database of self-supply wells in the County.

Okeechobee County Current and Historic SSWRLS

The occurrence of SSWRLS has not been documented in the portion of Okeechobee County within SJRWMD. The portion of the County within SJRWMD is sparsely populated and the area had not experienced significant groundwater level declines (Barton, 2002).

Okeechobee County PSAs

No PSAs are located in the portion of Okeechobee County in SJRWMD.

Okeechobee County Areas of Potential SSWRLS

No PSAs are located within SJRWMD portion of Okeechobee County. Based on predicted Upper Floridan aquifer water level declines, SSWRLS is not predicted in the portion of the County in SJRWMD.

Orange County

Orange County Self-Supply Sources

In Orange County, the shallow surficial aquifer, the Intermediate aquifer, and the Upper Floridan aquifer are commonly used as a source for self-supply (Fuchts, 2002). Most new domestic self-supply wells in the County are 4-in diameter Upper Floridan wells with submersible pumps (Joyce, 2002). Surficial aquifer wells, typically 2-in diameter with jet pumps, are commonly utilized in the southeastern part of the County where the top of the Upper Floridan is deeper (Fuchts, 2002).

The top of the Upper Floridan aquifer throughout most of Orange County ranges from about 50 to 150 ft bls in the western part of the County and 150 to over 250 ft bls in the eastern part. The potentiometric surface of the Upper Floridan is below land surface throughout most of the County. It is above land surface within the eastern-most portion County except close to the St Johns River. The potentiometric surface of the Upper Floridan is generally more than 20 ft bls within the central portion of the County and less than 20 ft bls in the western portion.

The Hawthorn Group is about 50 ft thick throughout most of the central portion of the County. It is about 100 ft thick in western Orange County and over 150 ft thick in eastern Orange County. The Intermediate aquifer of the Hawthorn Group is most commonly utilized as a source of self-supply in areas east and south of Orlando where the top of the Hawthorn Group is 100 to 150 ft bls.

The surficial aquifer extends over most of the County and is composed primarily of unconsolidated sand. It is commonly utilized for irrigation and water source heat pump self-supply (Joyce, 2002). The surficial aquifer thickness ranges from less than about 40 ft in the west to more than 150 ft in the east. Surficial aquifer wells are typically small diameter, sand point or screened wells 20- to 30-ft deep.

Orange County Local Government Programs

Most of the local governments within Orange County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 36.

None of the local government programs specifically regulate the construction of self-supply wells to avoid SSWRLS. Orange County regulates well location and certain aspects of well construction. The County requires surficial aquifer wells to be at least 20 ft deep but none of the County construction regulations pertain to avoidance of SSWRLS. Oakland and Winter Garden prohibit domestic self-supply wells. Winter Park requires the annular space of Intermediate or Upper Floridan irrigation wells be grouted through the surficial aquifer.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Orange County	Yes	Yes	No	Yes
Apopka	Yes	No	No	No
Belle Isle	No	No	No	No
Eatonville	No	No	No	No
Edgewood	No	No	No	No
Maitland	Yes\4	No	No	No
Oakland	Yes	Yes	Yes (Potable)	No
Ocoee	No	No	No	No
Orlando	No	No	No	No
Winter Garden	Yes	Yes	Yes (Potable)	No
Winter Park	No	No	No	Yes

Table 36: Orange County Local Government Programs

Orange County Well Database

Orange County maintains a database of well permits issued since 1991. A few records for older wells are also included. Orange County provided records for 4,458 wells permitted between January 1991 and January 2002 in an Excel worksheet file. The database contains data fields for the following information:

Name of Well Drilling Company
Well Drilling Company License Number
Well Location Street Address Number
Well Location Street Address Name
Well Location City
Section
Township
Range
Use of Well
Type of Permit
Casing Material
Casing Diameter (inches)
Casing Depth (feet)
Water Management District
Well Location Street Address Number and Name

Orange County Current and Historic SSWRLS

Prior to 2001, the occurrence of SSWRLS in Orange County was rare (Fuchts, 2002; Joyce, 2002; Stuart, 2002). A few occurrences of SSWRLS were reported in the Sadler Road area during drought in about 1980 (Crego, 2002). Most of the reports were for systems with submersible-pumps where water levels dropped below the pump intakes. The problems were corrected by lowering the pumps.

SSWRLS was reported in the County during the spring and early summer of 2001(Fuchts, 2002). Systems experiencing SSWRLS had Upper Floridan aquifer wells and submersible pumps. They were located on high ridges where depth to groundwater is typically greater than 20 ft bls (Joyce, 2002; Stuart, 2002). The Upper Floridan potentiometric surface dropped below the intakes of some of these wells and resulted in loss of service. The problems were generally corrected by lowering the pumps. In a few cases, the pumps could not be lowered sufficiently because diameter of the well was too small below the surface casing and these wells had to be replaced (Stuart, 2002).

Orange County PSAs

Thirty utilities operate 108 separate PSAs totaling about 615,000 acres in Orange County (Table 37).

Orange County PSAs Well Construction

Orange County provided records for 4,458 permitted wells in an Excel worksheet. Most of the records are for wells installed between January 1991 and January 2002. Locations for 3,873 wells within the County (3,321 within SJRWMD portion) were determined by geocoding addresses in ArcMap. Of these, 3,779 wells were located within PSAs (2,736 in PSAs within SJRWMD) but only 965 of the associated records (683 within SJRWMD) contained use and construction information.

Four hundred and forty-five domestic self-supply wells were identified within 12 Orange County PSAs (Table 38). These wells are predominately constructed with 4-inch-diameter, galvanized or black iron or steel casing set 85 to 110 ft deep. Because the well records do not include total well depth, only casing depth, it is not possible to precisely determine the aquifer in which the wells are completed. However, according to local drillers, most are Upper Floridan wells.

UTILITY	ACRES	SUBGROUP
APOPKA	15,424	APOPKA
CASSELBERRY	183	
CASSELBERRY	30	MAITLAND AND CASSELBERRY
CYPRESS WALK	23	CYPRESS WALK
EAST CENTRAL FLA SERVICES INC	68,705	EAST CENTRAL FLA SERVICES INC
EATONVILLE	830	EATONVILLE
HIDDEN SPRINGS	296	HIDDEN SPRINGS
HIDDEN SPRINGS	5,158	HIDDEN SPRINGS
HIDDEN VALLEY MHP	51	HIDDEN SPRINGS
KISSIMMEE CITY OF	2,182	KISSIMMEE CITY OF
MAITLAND	3,401	MAITLAND
MOUNT DORA	973	MOUNT DORA
OAKLAND	547	OAKLAND
OAKLAND	97	OAKLAND
OAKLAND	1,189	OAKLAND
OAKLAND	211	OAKLAND
OAKLAND	30	OAKLAND
OCOEE	9,795	OCOEE
ORANGE COUNTY PUBLIC UTILITIES	74,912	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	646	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	162,938	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	705	PARK MANOR ESTATES
ORANGE COUNTY PUBLIC UTILITIES	5,790	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	75	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	261	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	62,446	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	2,508	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY PUBLIC UTILITIES	15,613	ORANGE COUNTY PUBLIC UTILITIES
ORANGE COUNTY RES & DEV	988	ORANGE COUNTY RES & DEV
ORLANDO UTILITIES COMMISSION	41,339	
ORLANDO UTILITIES COMMISSION	41	
ORLANDO UTILITIES COMMISSION	7	
ORLANDO UTILITIES COMMISSION	13	
ORLANDO UTILITIES COMMISSION	83	
ORLANDO UTILITIES COMMISSION	51	
ORLANDO UTILITIES COMMISSION	22	
ORLANDO UTILITIES COMMISSION	48	
ORLANDO UTILITIES COMMISSION	589	
ORLANDO UTILITIES COMMISSION	20	
ORLANDO UTILITIES COMMISSION	27	
ORLANDO UTILITIES COMMISSION	39	

Table 37: Orange County PSAs

UTILITY	ACRES	SUBGROUP
ORLANDO UTILITIES COMMISSION	63	
ORLANDO UTILITIES COMMISSION	27	
ORLANDO UTILITIES COMMISSION	43,560	
ORLANDO UTILITIES COMMISSION	615	
ORLANDO UTILITIES COMMISSION	15	
ORLANDO UTILITIES COMMISSION	8	
ORLANDO UTILITIES COMMISSION	63	
ORLANDO UTILITIES COMMISSION	59	
ORLANDO UTILITIES COMMISSION	9	
ORLANDO UTILITIES COMMISSION	616	
ORLANDO UTILITIES COMMISSION	52	
ORLANDO UTILITIES COMMISSION	26	
ORLANDO UTILITIES COMMISSION	15	
ORLANDO UTILITIES COMMISSION	219	
ORLANDO UTILITIES COMMISSION	81	
ORLANDO UTILITIES COMMISSION	29	
ORLANDO UTILITIES COMMISSION	55	
ORLANDO UTILITIES COMMISSION	65	
ORLANDO UTILITIES COMMISSION	527	
ORLANDO UTILITIES COMMISSION	39	
ORLANDO UTILITIES COMMISSION	41	
ORLANDO UTILITIES COMMISSION	85	
ORLANDO UTILITIES COMMISSION	97	
ORLANDO UTILITIES COMMISSION	56	
ORLANDO UTILITIES COMMISSION	142	
ORLANDO UTILITIES COMMISSION	1,539	
ORLANDO UTILITIES COMMISSION	1,088	
ORLANDO UTILITIES COMMISSION	23	
ORLANDO UTILITIES COMMISSION	17	
ORLANDO UTILITIES COMMISSION	12	
ORLANDO UTILITIES COMMISSION	506	
ORLANDO UTILITIES COMMISSION	388	
ORLANDO UTILITIES COMMISSION	64	
ORLANDO UTILITIES COMMISSION	26,446	
ORLANDO UTILITIES COMMISSION	222	
ORLANDO UTILITIES COMMISSION	2,148	
ORLANDO UTILITIES COMMISSION	34	
ORLANDO UTILITIES COMMISSION	51	
ORLANDO UTILITIES COMMISSION	160	
ORLANDO UTILITIES COMMISSION	100	
ORLANDO UTILITIES COMMISSION	2,060	LAKE NONA CORP
ORLANDO UTILITIES COMMISSION	55	

Table 37 (continued): Orange County PSAs

UTILITY	ACRES	SUBGROUP
ORLANDO UTILITIES COMMISSION	107	
ORLANDO UTILITIES COMMISSION	44	
ORLANDO UTILITIES COMMISSION	272	
ORLANDO UTILITIES COMMISSION	1,081	
REEDY CREEK	18,976	REEDY CREEK
REEDY CREEK	15	REEDY CREEK
ROCK SPRINGS MHP	149	
SHADOW HILLS MHP	53	
SHADOW HILLS MHP	41	
SOUTHLAKE UTILITIES INC	82	
STARLIGHT RANCH MHP	153	
TAFT WATER ASSOC	645	TAFT WATER ASSOC
TANGERINE TOWN OF	3,868	TANGERINE
TURKEY LAKE	349	TURKEY LAKE
UNIVERSITY OF CENTRAL FLORIDA	1,189	UNIVERSITY OF CENTRAL FLORIDA
UTILITIES INC OF FLORIDA	415	CRESCENT HEIGHTS
WEDGEFIELD UTILITIES INC	983	WEDGEFIELD
WEDGEFIELD UTILITIES INC	674	WEDGEFIELD
WINTER GARDEN	11,155	WINTER GARDEN
WINTER GARDEN	49	WINTER GARDEN
WINTER GARDEN	513	WINTER GARDEN
WINTER GARDEN	153	WINTER GARDEN
WINTER PARK	12,858	WINTER PARK
ZELLWOOD STATION UTILITIES	780	
ZELLWOOD WATER ASSOC	1,053	ZELLWOOD WATER ASSOC

Table 37 (continued): Orange County PSAs

UTILITY	Count	Average Casing Depth (ft)	Minimum Casing Depth (ft)	Maximum Casing Depth (ft)	Minimum Casing Diameter (in)	Maximum Casing Diameter (in)
APOPKA	20	103	50	175	4	4
EAST CENTRAL	25	85	4	160	0	4
HIDDEN SPRINGS	24	108	80	200	2	4
OAKLAND	8	92	80	100	4	4
OCOEE	26	97	68	126	4	6
ORANGE COUNTY	283	112	20	350	0	4
ORLANDO	26	143	80	300	0	4
PARK MANOR	3	91	84	105	4	4
WEDGEFIELD	6	79	42	100	0	4
WINTER GARDEN	6	114	90	185	4	4
WINTER PARK	3	100	100	100	4	4
ZELLWOOD	1	90	90	90	4	4

Table 38: Orange County Domestic Self-Supply Well Summary

Three hundred thirty-three self-supply irrigation wells were identified within Orange County PSAs in SJRWMD (Table 39). These wells are predominantly constructed with 4-in diameter casings set 50 to 120 ft deep. According to local drillers, irrigation wells utilize the surficial, Intermediate and Upper Floridan aquifers as a source of supply.

UTILITY	Count	Average Casing Depth (ft)	Minimum Casing Depth (ft)	Maximum Casing Depth (ft)	Minimum Casing Diameter (in)	Maximum Casing Diameter (in)
APOPKA	10	76	0	100	4	4
EAST CENTRAL FLA SERVICES	1	50	50	50	2	2
EATONVILLE AND MAITLAND	2	50	0	100	4	4
HIDDEN SPRINGS	64	107	0	180	0	4
KISSIMMEE CITY OF	2	120	120	120	4	4
MAITLAND	22	93	0	120	0	4
OAKLAND	22	85	0	200	0	4
OCOEE	3	111	84	150	4	4
ORANGE COUNTY PUBLIC	147	93	0	210	0	5
ORLANDO UTILITIES	63	99	0	225	0	5
TURKEY LAKE	1	100	100	100	4	4
WINTER GARDEN	22	91	0	200	4	4
WINTER PARK	14	89	0	140	0	4
ZELLWOOD WATER ASSOC	1	100	100	100	4	4

Table 39: Orange County Irrigation Self-Supply Well Summary

Orange County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk for Type 2, 3, and/or 4 systems is predicted for the eight Orange County PSAs (Table 40).

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
APOPKA	APOPKA	376	No	No	No	High	No
EAST CENTRAL FLA SERVICES INC	EAST CENTRAL FLA SERVICES INC	534	No	High	High	High	No
MAITLAND	MAITLAND	469	No	No	No	High	No
ORANGE COUNTY PUBLIC UTILITIES	ORANGE COUNTY PUBLIC UTILITIES	353	No	Yes	Yes	High	No
ORANGE COUNTY PUBLIC UTILITIES	ORANGE COUNTY PUBLIC UTILITIES	486	No	High	Yes	High	No
TANGERINE	TANGERINE	351	No	No	No	Yes	No
WINTER GARDEN	WINTER GARDEN	496	No	No	No	High	No
WINTER PARK	WINTER PARK	479	No	No	No	High	No

Table 40: Orange County PSAs with Risk of SSWRLS

Type 2 systems include Upper Floridan self-supply wells with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in parts of two Orange County PSAs where the water levels are predicted to decline to less than 10 ft als by 2020.

Type 3 systems include all systems with Upper Floridan self-supply wells, except those equipped with submersible pumps, in areas where Floridan potentiometric surface is predicted to drop to below land surface by 2020. The risk of SSWRLS is considered high for Type 3 systems in a portion of one Orange County PSA where the water levels are predicted to decline to greater than 5 ft bls by 2020.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS is considered high for Type 4 systems in portions of seven Orange County PSAs where the water levels are predicted to decline to greater than 25 ft bls by 2020.

Osceola County

Osceola County Self-Supply Sources

The majority of self-supply wells in the County produce water from the Floridan aquifer (Lamb, 2002). However in the eastern part of the County where the depth to the Floridan is greater, some self-supply wells produce water from shell lenses within the surficial aquifer. Centrifugal pumps and shallow-well jet pumps are utilized in a few small areas of the County where artesian conditions still exist. However most wells utilize deep-well jet or submersible (Lamb, 2002).

In SJRWMD portion of Osceola County, the top of the Upper Floridan is from about 150 to 350 ft bls. The potentiometric surface of the Upper Floridan is above land surface near the St Johns River. It is greater than 20 ft bls along the western and southern portions of the area. The Intermediate aquifer system is present above the Upper Floridan and ranges from about 60 to 300 ft thick. The surficial aquifer ranges from about 30 ft thick in the northern portion of the area to over 250-ft thick in the south.

Osceola County Local Government Programs

Osceola County has been delegated by SJRWMD to permit wells less than six inches in diameter (Table 41).

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Osceola County	No	Yes/Delegated	No	No

Table 1: Osceola County Local Government Programs

Osceola County Well Database

Osceola County maintains a written list of well permits issued since 1999. Osceola County provided a copy of the written list containing records for about 1,700 wells permitted between May 1999 and February 2002. Only six of these wells were located within the portion of the County in SJRWMD. The list contained data fields for the following information:

Permit Number
Well Owner Name
Well Location Address
Well Diameter
Permit Type
Permit Issue Date
Report Completion Date
Date Well Tagged

Osceola County Current and Historic SSWRLS

SSWRLS has not historically been a problem in Osceola County (Wolf, 2002). Reports of SSWRLS in Osceola County were reported for the first time in the late spring and early summer of 2001. SSWRLS was reported within three areas of the County: the Pleasant Hill Road area, the Carroll Street area and the Campbell Station area (Lamb, 2002). All three areas are within a part of Osceola County outside of the SJWMD. The effected self-supply wells in each of these areas were Floridan aquifer wells about 100 feet deep with shallow-well jet pumps (Lamb, 2002) The wells were repaired by lowering drop pipes and/or installing deep-well jet pumps.

Osceola County PSAs

No PSAs are located in the portion of Osceola County in SJRWMD.

Osceola County PSAs Common Well Construction Practices

No PSAs are located in the portion of Osceola County in SJRWMD. The portion of the County within SJRWMD is largely rural and undeveloped and there are large tracts of publicly owned land. The majority of self-supply wells in this area produce water from the Floridan aquifer. In the southern part of this area depth to the Floridan is greater and some self-supply wells produce water from shell lenses within the surficial aquifer. Centrifugal pumps and shallow-well jet pumps may be utilized in a areas close to the St Johns River where artesian conditions still exist. However most wells in the area are equipped with deep-well jet or submersible pumps.

Osceola County Areas of Potential SSWRLS

No PSAs are located within SJRWMD portion of Osceola County. Based on predicted Upper Floridan aquifer water level declines, Floridan aquifer Type 2, 3, and/or 4 systems may be at risk of SSWRLS in the portion of the County in SJRWMD.

Type 2 systems are predicted to be at risk of SSWRLS within the northeastern portion of the County. Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in small areas of the County where the water levels are predicted to decline to less than 10 ft als by 2020. Upper Floridan self-supply systems are not common in this area.

Type 3 systems are predicted to be at risk of SSWRLS within the central part of SJRWMD portion of the County. Type 3 systems include all systems with Upper Floridan self-supply wells, except those equipped with submersible pumps, in areas where Floridan potentiometric surface is predicted to drop to below land surface by 2020. The risk of SSWRLS is considered high for Type 3 systems in small areas of the County where the water levels are predicted to decline to greater than 5 ft bls by 2020.

Type 4 systems are predicted to be at risk of SSWRLS within the central and southern parts of SJRWMD portion of the County. Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS is considered high for Type 4 systems in some areas of the County where the water levels are predicted to decline to greater than 25 ft bls by 2020.

Polk County

Polk County Self-Supply Sources

The portion of SJRWMD in Polk County is part of the Green Swamp basin. The area is sparsely populated and self-supply wells are not common. Some agricultural self-supply wells and scattered domestic wells are present. The agricultural wells are Upper Floridan wells, 4-diameter and equipped with submersible pumps. The domestic self-supply wells are usually Upper Floridan wells, but surficial aquifer wells may also be present.

The top of the Upper Floridan is from about 50 to 150 ft bls in this part of Polk County. The potentiometric surface of the Upper Floridan is at about land surface within the swamp and as deep as 100 ft bls on top of the ridges.

Polk County Local Government Programs

Polk County does not have an ordinance governing construction of self-supply wells and self-supply wells are not permitted or inventoried. Davenport requires connection to the public water supply if available (Table 42).

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Polk County	No	No	No	No
Davenport	Yes	No	No	No
Haines City	No	No	No	No

Table 42: Polk County Local Government Programs

Polk County Well Database

Polk County has no database of self-supply wells in the County.

Polk County Current and Historic SSWRLS

The occurrence of SSWRLS has not been documented in the portion of Polk County within SJRWMD (Griffin, 2002).

Polk County PSAs

Two PSAs operated by Polk County Utilities are located in the portion of Polk County in SJRWMD (Table 43).

UTILITY	ACREAGE	SUBGROUP

POLK COUNTY UTILITIES	19,258	POLK COUNTY
POLK COUNTY UTILITIES	3,639	POLK COUNTY

Table 43: Polk County Public Service Area Utilities in SJRWMD

Polk County PSAs Well Construction

Most self-supply systems in SJRWMD portion of Polk County utilize Upper Floridan aquifer wells equipped with submersible pumps.

Polk County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and modeled water-level declines through 2020, SSWRLS are not predicted within SJRWMD portion of Polk County.

Putnam County

Putnam County Self-Supply Sources

Most new self-supply systems in Putnam County utilize Upper Floridan aquifer wells and submersible pumps (Winkleman, 2002). They are typically constructed with 4-in diameter casing to the top of the limestone and open hole through the limestone. Historically, Upper Floridan self-supply systems were equipped with centrifugal or shallow-well jet pumps, especially in areas near the St Johns River.

The top of the Upper Floridan ranges from about 50 ft bls in southern Putnam County and to 200 to 300 ft bls in the northern county. Throughout most of Putnam County the top of the Upper Floridan is 100 to 150 ft bls.

The potentiometric surface of the Upper Floridan is above land surface near the St Johns River and in an area north and west of Palatka. It is greater than 20 ft bls in the northwest portion of the County and in an area near Welaka and Pomona Park. It is between land surface and 20 ft bls in the southern end of the County.

In the vicinity of Palatka, wells that produce water from shell horizons in the surficial and Intermediate aquifers are commonly utilized. Older self-supply systems in the northeastern part of the County have shallow, surficial aquifer wells with centrifugal or shallow-well jet pumps. The wells are commonly sand points with 2-in diameter galvanized casing driven in place or installed in drilled boreholes (Bermes, et. al., 1963). Newer self-supply systems in the northeastern part of the County have surficial or Intermediate aquifer wells with submersible pumps.

The surficial aquifer is from 50 to 100 ft thick throughout most of Putnam County. It is thinner near Palatka and areas north and west of Palatka. It is thicker beneath topographic high areas northwest of Interlachen. The thickness of the Hawthorn increases from less than 50 ft in the south near Crescent City to about 200 ft at the north end of the County.

Putnam County Local Government Programs

Putnam County is delegated by SJRWMD to permit wells less than six inches in diameter. Most of the local governments within Putnam County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 44.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type	Construction Regulated
Putnam County	No	Yes/Delegated	No	Yes
Crescent City	Yes	Yes	Yes (Potable)	No
Interlachen	No	No	No	No
Palatka	Yes	No	No	No
Welaka	Yes	No	Yes	No

Table 44: Putnam County Local Government Programs

Putnam County has one of the few local government programs that regulate the construction of self-supply wells to avoid SSWRLS. The program specifies pump standards for three areas of the County that had experienced SSWRLS. The program requires that the pumping system be able to operate with up to as much as 45 ft of additional drawdown depending on the relative location of the Upper Floridan potentiometric surface (static water level) at the time of well installation. The ordinance authorizing the program is as follows:

(1) In the unincorporated area of Putnam County bounded on the west by the westerly section lines of sections 3, 10, 15, 22, 27, and 34 of Township 12 South, Range 27 East; and sections 3, 10, 15 and 22 of Township 13 South, Range 27 East; on the south by the Putnam/Volusia County line; on the east by the Putnam the Volusia County line and on the north by the northern section line of sections 2 and 3, Township 12 South, Range 27 East extended due east to the Putnam/Flagler County line as indicated by the area labeled 87-2.51 (1) on Appendix A of this ordinance, minimum well construction standards shall be as follows:

(a) Well casing shall be seated to the top of the Floridian aquifer.

(b) When the static water level measured in the well at the time of completion of well construction is greater than 5 ft above land surface than the wells shall be equipped with pumping equipment installed such that the pump can lift water from a depth of at least 20 ft below land surface.

(c) When the static water level measured in the well at the time of well completion is 5 ft. or less above land surface then the well should be equipped with a submersible or multi stage jet pump with a minimal one horsepower motor installed such that the pump can lift water from a depth of at least 40 ft. below the wells static water level measured at the time of completion of well construction.

(2) In the unincorporated area of Putnam County bounded on the west by County Road 309 from the Putnam/Volusia County line northward to its intersection with U.S. Highway 17 and U.S. Highway 17 from its intersection with County Road 309 northward to Dunn's Creek, on the east side by the Putnam/Flagler County line, on the north by Dunns Creek and on the south by the Putnam/Volusia County line except for the area described in 87-2.51 (1) as indicated by the area labeled 87-2.51 (2) on Appendix A of this ordinance, minimum well construction standards shall be as follows:

(a) Well casing shall be seated to the top of the Floridian aquifer.

(b) Wells shall be equipped with submersible or multistage jet pumps with a minimum one horsepower motor installed such that the pump can lift water from a depth of at least 40 ft. below the wells static water level measured at the time of completion of well construction.

(3) In the unincorporated area of Putnam County bounded on the west by U.S. Highway 17 from Dunns Creek northward to the St. Johns River and by the St. Johns River from its intersection with U.S. Highway 17 northward to the Putnam/St. Johns County line on the east, and on the north by the Putnam/St. Johns County line, and on the south by Dunns Creek, as indicated by the area labeled 87-2.51 (3) on Appendix A of this ordinance, the minimum well construction standards shall be as follows:

(a) Well casing and shall be seated to the top of the Floridian aquifer.

(b) When the static water level measured in the well at the time of completion of well construction is greater than 5 ft above land surface the wells should be equipped with pumping equipment installed such that the pump can lift water from a depth of at least 20 ft below land surface.

(c) When the static water level measured in the well at the time of well completion is 5 ft. or less above land surface, the well should be equipped with a submersible or multistage jet pump with a minimum one horsepower motor installed such that the pump can lift water from a depth of that least 40 ft. below the wells static water level measured at the time of completion of well construction.

Putnam County Well Database

Putnam County maintains a database of well permits issued since 2001. Putnam County provided records for 249 wells permitted between April 2001 and January 2002 in an Excel worksheet file. The database contained data fields for the following information:

Last Name of Applicant
First Name of Applicant
Middle Initial of Applicant
Applicant Address Line 1
Applicant Address Line 2
Applicant Address City
Applicant Address State
Applicant Address Zip
Applicant Home Phone
Applicant Work Phone
Well Location Street Address Number
Well Location Street Address Name
Well Location Subdivision
Putnam County Permit Number
Permit Date
Date Well Completed
Section
Township
Range
Well Drilling Company License Number

Putnam County Current and Historic SSWRLS

SSWRLS has been a long-term, reoccurring problem in Putnam County. SSWRLS generally occurs at systems with 2-in diameter, Floridan aquifer wells and centrifugal or shallow-well jet pumps. Most SSWRLS in Putnam County has been directly related to freeze protection by ferneries in the Crescent City area (Winkleman, 2002). To a more limited extent, SSWRLS has been reported in areas of the County east of the St Johns River near Hastings related to agricultural irrigation (Gauch, 2002). Occasionally, SSWRLS occurs in older, shallow, surficial aquifer wells in the northeastern part of the County during periods of drought (Winkleman, 2002).

New wells in the County are constructed in accordance with county well construction standards and are generally not affected. SSWRLS has been generally restricted to older wells and as these older wells are repaired, fewer incidences of SSWRLS are reported each year (Gauch, 2002).

Four SSWRLS complaints were recorded for wells in the Crescent City area of Putnam County by the Palatka Service Center from the period 2000 to 2001. All of the complaints were related to SSWRLS resultant from water level declines due to pumping for fern freeze-protection. The wells were all equipped with shallow-well jet pumps and the recorded depths ranged from 100 to 200 ft. Three of the wells were repaired by installing longer drop pipes. One of the wells was repaired by restoring prime to the pump.

Putnam County PSAs.

A total of 21 PSAs operated by three utilities and totaling about 16,000 acres were listed in GIS coverages for Putnam County provided by SJRWMD (Table 45). The PSAs are concentrated in three areas of the County: the Interlachen area, the Palatka area, and Crescent City area.

UTILITY	ACRES	SUBGROUP
CRESCENT CITY	1,152	CRESENT CITY
CRESCENT CITY	1	CRESENT CITY
FLORIDA WATER SERVICES CORP	297	
FLORIDA WATER SERVICES CORP	5,205	
FLORIDA WATER SERVICES CORP	297	
FLORIDA WATER SERVICES CORP	37	
FLORIDA WATER SERVICES CORP	64	PALM PORT
FLORIDA WATER SERVICES CORP	1,238	
FLORIDA WATER SERVICES CORP	47	RIVER GROVE
FLORIDA WATER SERVICES CORP	247	INTERLACHEN LAKE ESTATES
FLORIDA WATER SERVICES CORP	80	
FLORIDA WATER SERVICES CORP	9	PARK MANOR
FLORIDA WATER SERVICES CORP	659	
FLORIDA WATER SERVICES CORP	11	SILVER LAKE OAKS
FLORIDA WATER SERVICES CORP	929	
FLORIDA WATER SERVICES CORP	145	
FLORIDA WATER SERVICES CORP	70	HERMITS COVE
FLORIDA WATER SERVICES CORP	85	ST JOHNS HIGHLANDS
FLORIDA WATER SERVICES CORP	70	SARATOGA HARBOUR/WELAKA
FLORIDA WATER SERVICES CORP	90	SARATOGA HARBOUR/WELAKA
FLORIDA WATER SERVICES CORP	1,282	POMONA PARK
FLORIDA WATER SERVICES CORP	224	BEECHERS POINT
FLORIDA WATER SERVICES CORP	28	WOOTENS
INTERLACHEN	4,151	INTERLACHEN
MELROSE	264	MELROSE
MELROSE	310	MELROSE
PALATKA	4,291	PALATKA
PALATKA	12	PALATKA
WELAKA	925	WELAKA

Table 45: Putnam County PSAs

Putnam County PSAs Well Construction

Forty self-supply wells from a well database provided by Putnam County Health Department were located within Putnam County PSAs. However, the database did not include construction information for these wells. Six wells in the WSRP database were located in these PSAs but no construction information was available.

Florida Water Services Corporation PSAs

Florida Water Services Corporation owns 10 PSAs (some contiguous and some noncontiguous) in the vicinity of Interlachen. No PSA was listed for the Town of Interlachen and the PSAs are located outside the Town.

Land surface elevations range from about 100 to 150 ft above mean sea level in the area. The surficial sands are about 60 ft thick in the area and underlain by the Hawthorn Group

sediments associated with the Intermediate aquifer. The surficial sands are highly permeable and the depth to the water table is relatively deep. The top of the Upper Floridan is present at about -50 to -75 ft mean sea level in the area or about 150 to 225 ft bls. Self-supply wells in the area are constructed to the Intermediate or Upper Floridan aquifers. They are commonly 4-in diameter and equipped with submersible pumps. Depth-to-water in the Upper Floridan wells is generally deep, about 30 to 50 ft bls.

City of Palatka PSAs

The City of Palatka operates two contiguous PSAs totaling about 4,300 acres in and around Palatka. Florida Water Services Corporation operates a small PSA on the east side of the St Johns River, in East Palatka.

Land surface elevations range from about 10 to 80 ft above mean sea level in the area. The surficial sands are about 50 to 150 ft thick and underlain by the Hawthorn Group sediments associated with the Intermediate aquifer. The top of the Upper Floridan is present at about -150 ft mean sea level in the area or about 160 to 230 ft bls. Self-supply wells in the area are constructed to the Surficial, Intermediate or Upper Floridan aquifers. They are commonly 4-in diameter and equipped with submersible pumps. Floridan aquifer water levels are above land surface in areas of lower land surface elevation.

Florida Water Services Corporation PSAs

Florida Water Services Corporation owns six PSAs at five different locations in southern Putnam County. Four of the locations are on the east side of the St. Johns River, proximate to the river. The fifth location is comprised of about 1,300 acres and located in the vicinity of Pomona Park.

The hydrogeologic setting at the PSAs along the river is similar. The elevation of the top of the Upper Floridan aquifer in these areas ranges from 50 to 75 ft bls. Land surface elevations at these four locations are typically 5 to 30 ft above mean sea level. Self-supply wells within the service areas would typically be 2 or 4-in diameter and installed to the Intermediate or Upper Floridan aquifer with depths ranging from 60 to 100 ft bls. Water levels in Upper Floridan aquifer wells would generally be near or slightly above land surface. Centrifugal, jet or submersible pumps are utilized. Aerators are commonly used to oxidize hydrogen sulfide.

In the vicinity of the Florida Water Services Corp. PSA near Pomona Park, the elevation of the top of the Upper Floridan aquifer is at about -50 ft bls. Land surface elevations at these four locations are typically 40 to 100 ft above mean sea level. Self-supply wells within the service areas would typically be 4-in diameter and installed to the Floridan aquifer with depths ranging from 90 to 150 ft bls. Water levels in Floridan aquifer wells would generally be 10 to 40 ft bls. Pumps utilized for new wells would generally be submersible but older wells would have deep-well jet pumps.

Crescent City PSA

In the vicinity of the Crescent City PSA , the elevation of the top of the Upper Floridan aquifer is at about 25 to 50 below land surface. Land surface elevations are typically 20 to 50 ft above mean sea level. Self-supply wells within the service area would typically be 4-in diameter and installed to the Floridan aquifer with depths ranging from 50 to 100 ft bls. Water levels in Floridan aquifer wells would generally be 5 to 20 ft bls. Submersible pumps would generally be utilized for new wells but older wells would typically be equipped with deep-well jet pumps.

Putnam County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, SSWRLS risk for Type 2 systems is predicted for Florida Water Service's Palm Port PSA north of Palatka and risk for Type 4 systems is predicted for Florida Water Service PSA east of Interlachen (Table 46).

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
FLORIDA WATER SERVICES CORP	PALM PORT	123	No	Yes	No	No	No
FLORIDA WATER SERVICES CORP		145	No	No	No	Yes	No

Table 46: Putnam County PSAs with SSWRLS Risk

Type 2 systems include Upper Floridan self-supply wells with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020.

St Johns County

St Johns County Self-Supply Well Sources

The top of the Upper Floridan aquifer ranges from about 100 ft bls in southern St Johns County to 400 to 450 ft bls in northern St Johns County. The Intermediate aquifer system is present above the Upper Floridan and ranges from about 50 to 450 ft thick. The surficial aquifer ranges from about 10 to 150 ft thick and overlies the Hawthorn.

Self-supply wells in St. Johns County utilize the surficial, Intermediate, and Upper Floridan aquifers as sources of supply. The aquifer utilized depends primarily upon yield and water quality requirements.

In the northern portion of the County, where Upper Floridan aquifer water quality is good, many domestic self-supply wells utilize the Upper Floridan aquifer as a source of supply. Surficial and Intermediate aquifer domestic self-supply wells are also common in this area. And the surficial and Intermediate aquifers are the primary source for irrigation self-supply wells.

In the southern portion of the County, most domestic self-supply wells utilize the surficial and Intermediate aquifers. Upper Floridan aquifer wells are commonly used for irrigation.

St Johns County Local Government Programs

St Johns County is delegated by SJRWMD to permit wells less than six inches in diameter on behalf of SJRWMD. Most of the local governments within St. Johns County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 47.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
St. Johns County	Yes	Yes/Delegation	No	Yes
Hastings	No	No	No	No
St Augustine	Yes	No	No	No
St. Augustine Beach	Yes	No	No	No

Table 47: St Johns County Local Government Programs

St Johns County has one of the few local government programs that regulate the construction of self-supply wells to avoid SSWRLS. The program specifies pump standards for a large portion of the unincorporated area of the County. The program requires that the pumping system be able to operate with up to as much as 45 ft of additional drawdown depending on the relative location of the Upper Floridan potentiometric surface (static water level) at the time of well installation. It specifies the

use of submersible pumps under certain circumstances. The ordinance authorizing the program is as follows:

(a) In the unincorporated area of the County, minimum well construction standards shall be those established pursuant to the agreement.

(b) In the portion of the unincorporated area of St. Johns County; bounded on the west by the St. Johns County boundary line; bounded on the north by State Road 16 from the County boundary line east to State Road 13, State Road 13 north to County Road 210, and County Road 210 east to Interstate 95; bounded on the east by Interstate 95; and bounded on the south by the St. Johns County boundary line (see map delineating well construction ordinance area, section 61-305(b)), minimum well construction standards, in addition to the provisions of section 61-305(a), shall be as follows:

(1) Well casing shall be seated to the top of the Floridan aquifer.

(2) When the static water level measured in the well at the time of completion of well construction is greater than five (5) feet above land surface then the well shall be equipped with pumping equipment installed such that the pump can lift water from a depth of at least twenty (20) feet below land surface.

(3) When the static water level measured in the well at the time of well completion is five (5) feet or less above land surface then the well shall be equipped with a submersible or multi-stage jet pump with a minimum one (1) horsepower motor installed such that the pump can lift water from a depth of at least forty (40) feet below the well's static water level measured at the time of completion of well construction.

(c) In the case of free-flowing wells, the well owner may opt not to install pumping equipment on the well at the time of well construction. However, should the static water level fall below ground surface, causing free-flow to cease, it is the owner's responsibility to install pumping equipment in accordance with section 61-305(b)(2) or section 61-305(b)(3). The type of equipment required is determined by the static water level measured in the well at the time of well completion, as specified in subsections (2) and (3) above.

(d) In the case of non-free-flowing wells, the well owner may opt to install pumping equipment that does not meet the standards of section 61-305(b)(3) at the time of well construction. However, should the static water level fall below the pumping level of the installed equipment, causing flow to cease, it is the owner's responsibility to install pumping equipment in accordance with section 61-305(b)(3).

(Ord. No. 99-71, § 5, 12-21-99)

St Johns County Well Database

St Johns County maintains a database of well permits issued since 1977. St. Johns County provided records for 11,233 wells permitted between 1977 and December 2001 in an Access database. The database is one of the most comprehensive available in SJRWMD and contained data fields for the following information:

St Johns County Permit Number
Name of Well Owner
Well Location Street Address Number
Well Location Street Address Name
Well Location Subdivision
Section
Township
Range
Permit Issue Date
Name of Well Drilling Company
Name of Driller Who Installed Well
Well Drilling Company License Number
Date Well Completed
Total Depth (feet)
Use of Well
Lithologic Log of Well
Casing Diameter (inches)
Water Level at Time of Well Installation
Second Casing Diameter, if Present (inches)

St Johns County Current and Historic SSWRLS

SSWRLS has been reported in the northeastern, northwestern, and southern portions of the St Johns County for both the surficial and Upper Floridan aquifer self-supply systems (Rogers, 2002). Scattered instances of SSWRLS have historically occurred in the southern part of the County in proximity to large agricultural users. The first time a large number of self-supply systems in the northern part of the County experienced SSWRLS was in April 1999.

Most of the affected surficial aquifer wells are located in the southern portion of the County. These wells not only experience SSWRLS but changes in water quality resulting from water level declines.

SSWRLS has been reported for a number of Upper Floridan self-supply systems located in the Fruit Cove area. The SSWRLS in this area is attributed to lowering of the Upper Floridan potentiometric surface in response to operation of the JEA Community Hall well field in adjoining Duval County. JEA is conducting mitigation of SSWRLS in the Fruit Cove area in accordance with a provision of the Consumptive Use Permit for the well field. The JEA has maintained a database of the incidences of SSWRLS in the area and provided copies to SJRWMD. The database contained 594 records of individual wells that had experienced SSWRLS in Duval and St Johns Counties. Of the total, 152 records

were for systems located in the Fruit Cove area. Partridge Well Drilling has repaired many of the systems experiencing SSWRLS in the area. They provided 167 records of individual SSWRLS that they had repaired. Seventy-eight of these records were for self-supply systems in the Fruit Cove area.

The wells that have experienced SSWRLS in the Mandarin were predominantly Type 2 and 3 systems with Upper Floridan aquifer wells. Some Type 1 and 4 Upper Floridan systems were also impacted. A few systems with Intermediate aquifer wells in the area have also experienced SSWRLS.

The two primary types of self-supply systems have experienced SSWRLS in the Fruit Cave area, systems with water treatment units supplied by aquifer pressure head (Type 2 systems) and systems with centrifugal or shallow well jet pumps where water levels dropped below land surface (Type 3 systems). Type 2 systems have water treatment units without a pump between the well and the unit. These systems rely on aquifer head to move water through the unit. A single pump is located between the unit and the point of use to pressurize the system. These systems experience SSWRLS when water levels decline to a point where potentiometric head is no longer sufficient to move water through the treatment unit. SSWRLS is corrected by adding a second pump between the well and the treatment unit.

Type 3 systems have an Intermediate-aquifer or Upper-Floridan-aquifer well and a centrifugal or shallow-well jet pump attached directly to the wellhead. Historically, the potentiometric surface of the Intermediate and Upper Floridan aquifers in the Fruit Cove area has been above land surface. Many of these systems experienced SSWRLS when the potentiometric surface dropped below land surface and the pumps lost prime due to air leaks in the system piping. These systems are modified to avoid SSWRLS by sealing all leaks or by installing a drop pipe with check valve in the well to below the low water level.

In a few cases, older self-supply systems in Fruit Cove did not have pumps but relied on potentiometric head to pressurize the system (Type 1 systems). Type 1 systems experienced SSWRLS when the potentiometric head declined to the point where water no longer moved through the system. These systems are modified to avoid SSWRLS by adding a pump.

In other cases, systems with centrifugal or shallow-well jet pumps (Type 4 systems) and short drop pipes experienced SSWRLS when water levels in the well dropped below the bottom of the pipe. These systems are modified to avoid SSWRLS by extending the drop pipe. In some cases, wells with centrifugal pumps experienced SSWRLS when the water level dropped below the effective maximum lift capacity of the system. These systems are modified to avoid SSWRLS by replacing the pump.

St Johns County PSAs

Sixteen utilities operate a total of 29 PSAs in St Johns County totaling about 150,000 acres (Table 48).

UTILITY	ACRES	SUBGROUP
CRESCENT COVE ENTERPRISES	78	CRESCENT COVE
FLORIDA WATER SERVICES CORP	1,042	
FORMERLY UNITED WATER OF FLORIDA INC	1,504	PONTE VEDRA/PONTE VEDRA NORTH/CORONA ROAD
FORMERLY UNITED WATER OF FLORIDA INC	18	THE FOUNTAINS
FORMERLY UNITED WATER OF FLORIDA INC	10,767	ST JOHNS NORTH
FORMERLY UNITED WATER OF FLORIDA INC	17,556	ST JOHNS FOREST
FORMERLY UNITED WATER OF FLORIDA INC	1,035	PONCE DE LEON/A1A NORTH/A1A SOUTH
FRUIT COVE PROPERTIES INC	82	FRUIT COVE PROPERTIES
HASTINGS	3,338	HASTINGS
HOMEOWNERS UTILITIES	70	PORPOISE POINT
INTERCOASTAL UTILITIES INC	5,529	INTERCOASTAL UTILITIES INC
INTERCOASTAL UTILITIES INC	4,598	INTERCOASTAL UTILITIES INC
JEA	12,992	NOCATEE
JEA	4,692	JULINGTON CREEK PLANTATION
JEA	1,047	JULINGTON CREEK PLANTATION
NORTH BEACH UTILITIES INC	1,033	NORTH BEACH UTILITIES INC
QUARTEL CORP	106	CAMACHEE COVE
REMINGTON FOREST UTILITY	57	REMINGTON FOREST UTILITY
ST AUGUSTINE	26,604	ST AUGUSTINE
ST JOE UTILITIES INC	6,382	ST JOE UTILITIES
ST JOHNS COUNTY UTILITIES	128	MARSH HARBOR
ST JOHNS COUNTY UTILITIES	10	HARMONY VILLAGE
ST JOHNS COUNTY UTILITIES	4,131	WALDEN CHASE / MARSHALL CREEK
ST JOHNS COUNTY UTILITIES	2,326	NORTHWEST/WORLD GOLF VILLAGE
ST JOHNS COUNTY UTILITIES	80	EAGLE CREEK
ST JOHNS COUNTY UTILITIES	3,895	SIX MILE CREEK
ST JOHNS COUNTY UTILITIES	40,347	MAINLAND AND ST AUGUSTINE BEACH TO MARINELAND
ST JOHNS SERVICE CO INC	4,605	ST JOHNS SERVICE CO INC
WILDWOOD WATER COMPANY	344	WILDWOOD

Table 48: St Johns County PSAs

St Johns County PSAs Well Construction

The St Johns County Health Department well database was utilized to analyze well construction practices within St Johns County PSAs. A total of 4,870 self-supply wells were located within PSAs including 2,143 domestic, 2,694 irrigation, 6 heat pump wells, and the rest designated “other” or not designated. Tables 49 and 50 summarize the construction information for domestic and irrigation self-supply wells located in the PSAs, respectively. Wells in the database without construction information were excluded from the analysis.

UTILITY	Number of Wells	Minimum Depth (ft)	Maximum Depth (ft)	Average Depth (ft)	Minimum Casing Diameter (in)	Maximum Casing Diameter (in)	Average Casing Diameter (in)
CRESCENT COVE ENTERPRISES	4	70	90	78	2	2	2
FLORIDA WATER SERVICES.	25	27	480	272	1	4	3
HOMEOWNERS UTILITIES	13	18	260	159	1	3	3
INTERCOASTAL UTILITIES	79	23	1,523	182	1	4	2
JEA	106	20	550	163	1	8	2
NOCATEE	3	315	480	378	3	4	4
NORTH BEACH UTILITIES	24	28	280	184	1	6	3
QUARTEL CORP.	2	225	230	228	4	4	4
REMINGTON FOREST UTILITY	1	30	30	30	2	2	2
ST AUGUSTINE	190	17	2,421	156	1	21	3
ST JOE UTILITIES	2	60	340	200	2	4	3
ST JOHNS COUNTY UTILITIES	1,100	13	420	98	1	15	2
ST JOHNS SERVICE CO INC.	72	29	525	192	1	6	2
UNITED WATER FLORIDA INC.	205	20	540	126	1	6	2
WILDWOOD WATER COMPANY	28	35	147	73	1	4	2

Table 49: St Johns County Irrigation Self-Supply Wells in PSAs

UTILITY	Number of Wells	Minimum Depth (ft)	Maximum Depth (ft)	Average Depth (ft)	Minimum Casing Diameter (in)	Maximum Casing Diameter (in)	Average Casing Diameter (in)
CRESCENT COVE ENTERPRISES	1	40	40	40	-	-	-
FLORIDA WATER SERVICES.	63	118	420	340	2	4	3
FRUIT COVE PROPERTIES INC.	2	470	500	485	3	3	3
HASTINGS	5	5	180	86	2	3	3
HOMEOWNERS UTILITIES	4	220	250	238	3	3	3
INTERCOASTAL UTILITIES	55	131	480	365	2	30	4
JEA	102	54	530	377	2	4	3
NOCATEE	10	90	504	333	3	4	4
NORTH BEACH UTILITIES	9	80	245	180	2	3	3
ST AUGUSTINE	267	11	420	106	1	4	2
ST JOE UTILITIES	24	60	462	368	2	4	3
ST JOHNS COUNTY UTILITIES	412	30	948	114	1	4	2
ST JOHNS SERVICE CO INC.	13	124	510	281	2	4	3
UNITED WATER FLORIDA INC.	126	30	525	345	1	4	3
WILDWOOD WATER COMPANY	3	65	83	74	2	2	2

Table 50: St Johns County Domestic Self-Supply Wells in PSAs

Self-supply wells in St. Johns County utilize the surficial, Intermediate, and Upper Floridan aquifers as sources of supply. The aquifer utilized depends primarily upon yield and water quality requirements. In the northern portion of the County, where Upper Floridan aquifer water quality is good, domestic self-supply wells commonly utilize the

Upper Floridan aquifer as a source of supply. Surficial and Intermediate aquifer domestic self-supply wells are also present in this area but are not predominant.

Most domestic self-supply wells in the central and southern portions of the County utilize the surficial aquifer due to poorer water quality of the Upper Floridan in these areas. However, irrigation self-supply wells commonly utilize the Upper Floridan because of less concern about quality.

Upper Floridan wells throughout St Johns County are constructed similarly except that Upper Floridan wells in the northern portion of the County are deeper because the depth to the top of the Floridan is greater there. Most Floridan wells are constructed with 3-in diameter casing set into the top of the Floridan and a 2-in diameter open hole in the Floridan. Of a population of 676 artesian Floridan aquifer wells in the County, 376 were constructed with 3-in diameter casing, 112 with 2-inch, 113 with 4-inch, and the rest with greater than 4-in diameter casings.

In areas where the potentiometric surface of the Upper Floridan is above land surface, a few Floridan wells are not equipped with pumps but rely on artesian pressure to move water through the system. Other Floridan wells in these areas are constructed with centrifugal pumps, in some cases located away from the well or with shallow-well jet pumps. New Floridan wells in the northwestern portion of the County must be constructed with deep-well jet or submersible pumps and designed to operate under extreme low water conditions.

Surficial aquifer domestic self-supply wells are commonly constructed with 2-in diameter casing and a well screen across from the production zone. Of 477 records of surficial aquifer wells in St Johns County PSAs with well construction data, 448 were constructed with 2-in diameter well casing, 10 with 1-inch, 3 with 3-in, and the remaining with 4-in diameter casings. Depth-to-water in these wells was less than 10 ft in 70% of the wells, between 10 and 20 ft in 26% of these wells and greater than 20 ft in 4% of the wells. These wells are commonly constructed with centrifugal or shallow-well jet pumps. Surficial aquifer irrigation self-supply wells are constructed similarly but 1-inch diameter, driven wells make up about 10% of the total population.

St Johns County Areas of Potential SSWRLS

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, certain Upper Floridan wells within fifteen St Johns County PSAs may experience SSWRLS (Table 51). Three classes of wells would be at risk: Type 2, Type 3 and Type 4.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
FLORIDA WATER SERVICES CORP		62	No	Yes	No	No	No
FORMERLY UNITED WATER OF FLORIDA IN	PONTE VEDRA/PONTE VEDRA NORTH/CORONA ROAD	56	No	High	No	No	No
FORMERLY UNITED WATER OF FLORIDA IN	ST JOHNS NORTH	81	No	No	Yes	No	No
FORMERLY UNITED WATER OF FLORIDA IN	ST JOHNS FOREST	82	No	Yes	Yes	No	No
INTERCOASTAL UTILITIES	INTERCOASTAL UTILITIES INC	65	No	High	No	No	No
INTERCOASTAL UTILITIES	INTERCOASTAL UTILITIES INC	66	No	High	High	No	No
JEA	NOCATEE	71	No	High	High	No	No
JEA	JULINGTON CREEK PLANTATION	74	No	High	Yes	No	No
ST AUGUSTINE	ST AUGUSTINE	97	No	Yes	Yes	No	No
ST JOE UTILITIES INC	ST JOE UTILITIES	90	No	Yes	Yes	No	No
ST JOHNS COUNTY UTILITIES	WALDEN CHASE / MARSHALL CREEK	80	No	No	Yes	Yes	No
ST JOHNS COUNTY UTILITIES	NORTHWEST/WORLD GOLF VILLAGE	95	No	No	High	No	No
ST JOHNS COUNTY UTILITIES	SIX MILE CREEK	99	No	Yes	No	No	No
ST JOHNS COUNTY UTILITIES	MAINLAND AND ST AUGUSTINE BEACH TO MARINELAND	100	No	Yes	No	High	No
ST JOHNS SERVICE CO INC	ST JOHNS SERVICE CO INC	55	No	High	No	No	No

Table 51: St Johns County PSAs with Risk of SSWRLS

Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS is considered high for Type 2 systems in six PSAs where the water levels are predicted to decline to less than 10 ft als by 2020.

Type 3 systems include Upper Floridan potable wells equipped with centrifugal or shallow-well jet pumps and Upper Floridan irrigation wells without pumps located on the coastal ridge where 1995 water levels were above land surface. Floridan aquifer water levels along the ridge are predicted to drop below land surface by 2020. Type 3 domestic wells along the ridge may experience SSWRLS due to loss of prime from water level declines to below land surface. Type 3 system irrigation wells will cease to flow when water levels drop below land surface. The risk of SSWRLS is considered high for Type 3 systems in three PSAs where the 2020 Upper Floridan potentiometric surface is projected to drop to greater than 5 ft bls.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS is considered high for Type 4 systems in one

PSA where the 2020 Upper Floridan potentiometric surface is projected to drop to greater than 25 ft bls.

Seminole County

Seminole County Self-Supply Sources

The Upper Floridan aquifer is the primary source of water for self-supply wells in Seminole County (Cochran, 2002). Floridan aquifer water quality in some of these areas is poor and the surficial aquifer is often used as a source of supply.

Historically, Floridan wells in the County were commonly constructed with 2-in diameter casing. Older Floridan wells or wells installed within the areas where wells would free flow may be equipped with centrifugal or shallow-well jet pumps. Most new Floridan wells are constructed with 4-in diameter casing and submersible pumps (Joyce, 2002).

The top of the Upper Floridan aquifer ranges from about 50 to 150 ft bls in Seminole County. The Hawthorn Group is above the Upper Floridan and ranges from about 30 to 100 ft thick. The surficial aquifer overlies the Hawthorn and ranges from about 10 to 100 ft thick, averaging about 25 ft thick.

Seminole County Local Government Programs

Seminole County has not been delegated by SJRWMD to permit wells. However, Seminole County requires all wells to be permitted by the County and has established well construction standards. Most of the local governments within Seminole County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 52.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Seminole County	Yes	Yes	No	Yes
Altamonte Springs	Yes	No	No	No
Casselberry	No	Yes\3	Yes (Potable)	No
Lake Mary	Yes	No	No	No
Longwood	No	No	No	No
Oviedo	Yes	No	No	No
Sanford	Yes	No	No	No

Table 52: Seminole County Local Government Programs

None of the local government programs specifically address SSWRLS. However, Seminole County requires minimum well size and pumping capabilities for self-supply systems. The ordinance states:

"All wells shall be a minimum of four inches (4") I.D. in size, design and development to obtain a minimum of sixteen (16) gpm at forty (40) psi, and constructed in such a manner as to maintain the existing material protection against pollution of the groundwater unless a variance is granted."

Compliance with these standards would reduce the potential of SSWRLS in some instances.

Seminole County Well Database

Seminole County maintains a database of well permits issued since 1985. Seminole County provided GIS coverages containing spatial coordinates for records of 1,503 wells permitted between 1985 and January 2002. The attribute table associated with these records contained data fields for the following information:

Seminole County Permit Number
Permit Issue Date
Seminole County Property Appraiser Tax ID Number
Well Location Street Address Number
Well Location Street Address Direction
Well Location Street Address Name
Well Location Street Address Suffix
Related Parcel ID Number
Name of Well Owner
Seminole County GIS Parcel ID
Well Location Street Address

Seminole County Current and Historic SSWRLS

Significant occurrence of SSWRLS in Seminole County was reported for the first time in about September 2000 (Cochran, 2002). SSWRLS occurred at the Lockport subdivision and the Elder Springs Mobile Home Park.

Several wells in the Lockport Subdivision reported SSWRLS. The area is located east of Airport Rd, north of SR 46A, and south of SR 46. The systems are relatively old with 2-in diameter Upper Floridan aquifer wells and centrifugal pumps.

SSWRLS was also reported at the Elder Springs Mobile Home Park on CR 427 just south of Sanford during February, March, and April of 2001. The systems are relatively old with 2-in diameter Upper Floridan aquifer wells and centrifugal pumps.

Seminole County PSAs

Twenty utilities operate 60 PSAs in Seminole County totaling about 138,000 acres. Table 53 summarizes the PSAs by utility.

UTILITY	ACRES	SUBGROUP
ALTAMONTE SPRINGS	7,406	ALTAMONTE SPRINGS
CASSELBERRY	7,622	
CASSELBERRY	12	
CASSELBERRY	22	
CASSELBERRY	8	
CASSELBERRY	43	
CASSELBERRY	17	
CASSELBERRY	31	
CASSELBERRY	23	
CASSELBERRY	28	
CASSELBERRY	61	
FLORIDA WATER SERVICES CORP	308	MEREDITH MANOR
FLORIDA WATER SERVICES CORP	38	LAKE BRANTLEY
FLORIDA WATER SERVICES CORP	882	APPLE VALLEY
FLORIDA WATER SERVICES CORP	11	HARMONY HOMES
FLORIDA WATER SERVICES CORP	146	LAKE HARRIET
FLORIDA WATER SERVICES CORP	17	DOL-RAY MANOR
FLORIDA WATER SERVICES CORP	1,752	CHULUOTA
FLORIDA WATER SERVICES CORP	57	FERN PARK
FLORIDA WATER SERVICES CORP	145	DRUID HILLS/HIDDEN HILLS/BRETTON WOODS
LAKE HARNEY WATER ASSOC INC	2,897	LAKE HARNEY WATER ASSOC INC
LAKE MARY	6,100	LAKE MARY
LONGWOOD	3,576	LONGWOOD
MIDWAY	505	MIDWAY
MULLET LAKE	2,550	MULLET LAKE
OVIEDO	9,123	OVIEDO
PALM VALLEY MHP	27	
PALM VALLEY MHP	187	
SANFORD	24,362	
SANFORD	200	
SANLANDO UTILITIES CORP	8,839	
SEMINOLE COUNTY PWD	23,387	NW GROUP/MONROE/HANOVER/HEATHROW PLNTS 10 5 AND 7
SEMINOLE COUNTY PWD	484	CHASE GROVE / PLANT 42
SEMINOLE COUNTY PWD	7,504	NE GROUP/COUNTRY CLUB/GREENWOOD PLNTS 3 AND 4
SEMINOLE COUNTY PWD	2,146	BLACK HAMMOCK
SEMINOLE COUNTY PWD	60	SUN SHADOW
SEMINOLE COUNTY PWD	2,123	LYNWOOD
SEMINOLE COUNTY PWD	15,365	SE GROUP/CONSUMER/HAYES
SEMINOLE COUNTY PWD	655	SE GROUP/INDIAN HILLS
SEMINOLE COUNTY PWD	35	CONSUMER/HAYES SOUTHEAST GROUP PLANT 6
SEMINOLE WOODS ASSOC	1,824	
SPRING HAMMOCK	2	
TOWN AND COUNTRY	30	
TUSKAWILLA TRAILS MHP	59	

Table 53: Seminole County PSAs

UTILITY	ACRES	SUBGROUP
TWELVE OAKS	23	TWELVE OAKS
UTILITIES INC OF FLORIDA	126	RAVENNA PARK
UTILITIES INC OF FLORIDA	223	CRYSTAL LAKE/PHILLIPS
UTILITIES INC OF FLORIDA	67	PARK RIDGE
TWELVE OAKS	23	TWELVE OAKS
UTILITIES INC OF FLORIDA	126	RAVENNA PARK
UTILITIES INC OF FLORIDA	223	CRYSTAL LAKE/PHILLIPS
UTILITIES INC OF FLORIDA	67	PARK RIDGE
TWELVE OAKS	23	TWELVE OAKS
UTILITIES INC OF FLORIDA	32	LITTLE WEKIVA
UTILITIES INC OF FLORIDA	26	WEATHERSFIELD
UTILITIES INC OF FLORIDA	87	BEAR LAKE
UTILITIES INC OF FLORIDA	287	WEATHERSFIELD
UTILITIES INC OF FLORIDA	166	JANSEN
UTILITIES INC OF FLORIDA	55	OAKLAND SHORES
WINTER SPRINGS	8,798	

Table 53 (continued): Seminole County PSAs

Seminole County PSAs Well Construction

Most self-supply systems in Seminole County utilize Upper Floridan aquifer wells. A total of 1,319 wells from the well database provided by Seminole County Building Department were located within Seminole County PSA boundaries. Table 54 summarizes the number of wells identified in each PSA. The well database did not provide information on well use or well construction and it is likely that some of the wells identified are not self-supply wells but may be monitor wells or public-supply wells.

UTILITY	Number of Wells
ALTAMONTE SPRINGS	2
CASSELBERRY	33
FLORIDA WATER SERVICES CORP	45
LAKE HARNEY WATER ASSOCIATION INC.	15
LAKE MARY	4
LONGWOOD	13
MIDWAY	1
MULLET LAKE	4
OVIEDO	2
PALM VALLEY MHP	2
SANFORD	110
SANLANDO UTILITIES CORP	123
SEMINOLE COUNTY PWD	757
SEMINOLE WOODS ASSOCIATION	56
TWELVE OAKS	2
UTILITIES INC. OF FLORIDA	27
WINTER SPRINGS	1

Table 54: Wells in Seminole County PSAs

The Super Act well database contained records for 318 wells in Seminole County PSAs of which 222 contained pump information. Centrifugal pumps were utilized on 87 of the wells, 78 were equipped with submersible pumps, and 57 were equipped with jet pumps. Well diameter was identified in 316 records; 142 wells were 2-in diameter, 136 were 4-in diameter, 6 were 6-inch diameter and the rest greater than 6-inch diameter. Black steel casing was used for construction of 167 of the wells, galvanized steel for 103 wells, and PVC for 45 wells. Depth information was available for 103 wells. Reported depths ranged from 26 to 1,355 ft deep, 60% of the wells were between 60 and 200 ft deep.

Seminole County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Seminole County, older self-supply systems with Upper Floridan aquifer wells and centrifugal or shallow-well jet pumps are at risk of SSWRLS during periods of drought.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, certain Upper Floridan wells within seven Brevard County PSAs may experience SSWRLS (Table 55). Three classes of wells would be at risk: Type 2, Type 3 and Type 4.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
CASSELBERRY		398	No	No	No	High	No
CASSELBERRY		473	No	No	No	Yes	No
LAKE MARY	LAKE MARY	355	No	No	No	Yes	No
LONGWOOD	LONGWOOD	383	No	No	No	Yes	No
OVIEDO	OVIEDO	405	No	No	High	Yes	No
SANFORD		336	No	Yes	Yes	Yes	No
SANLANDO UTILITIES CORP		369	No	No	High	Yes	No
SEMINOLE COUNTY PWD	NW GROUP	319	No	Yes	Yes	Yes	No
SEMINOLE COUNTY PWD	NE GROUP	361	No	No	Yes	Yes	No
SEMINOLE COUNTY PWD	BLACK HAMMOCK	382	No	No	Yes	No	No
SEMINOLE COUNTY PWD	SE GROUP	425	No	No	High	High	No
UTILITIES INC OF FLORIDA	RAVENNA PARK	347	No	No	No	Yes	No
WINTER SPRINGS		384	No	High	Yes	High	No

Table 55: Seminole County PSAs with Risk of SSWRLS

Type 2 systems are Upper Floridan self-supply systems with treatment units that rely on aquifer head to move water through the units. These wells may experience SSWRLS due to insufficient aquifer head to move water through the units when water level declines to less than 15 ft als by 2020. The risk of SSWRLS for Type 2 systems is predicted in portions of three Seminole County PSAs. The risk is considered high for Type 2 systems in one PSA where the water levels are predicted to decline to less than 10 ft als by 2020.

Type 3 systems include Upper Floridan potable wells equipped with centrifugal or shallow-well jet pumps and Upper Floridan irrigation wells without pumps. Type 3 systems may experience SSWRLS due to loss of prime from water level declines to below land surface. Type 3 system irrigation wells without pumps will cease to flow when water levels drop below land surface. The risk of SSWRLS for Type 3 systems is predicted in portions of eight Seminole County PSAs. The risk is considered high for Type 3 systems in three PSAs in areas where the 2020 Upper Floridan potentiometric surface is projected to drop to greater than 5 ft bls.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS for Type 4 systems is predicted in portions of twelve Seminole County PSAs. The risk of SSWRLS is considered high for Type 4 systems in portions of three PSAs in areas where the 2020 Upper Floridan potentiometric surface is projected to drop to greater than 25 ft bls.

Volusia County

Volusia County PSAs Self-Supply Sources

Most of the domestic self-supply systems in Volusia County utilize Upper Floridan aquifer wells (Carey, 2002). Surficial aquifer wells are commonly used for domestic self-supply on the eastern side of the County. Irrigation self-supply systems commonly utilize surficial aquifer wells but a large number also utilize Upper Floridan wells.

The top of the Upper Floridan aquifer ranges from about 50 to 100 ft bls in most of Volusia County. The Intermediate aquifer system is present above the Upper Floridan and ranges from about 25 to 60 ft thick. The surficial aquifer ranges from about 5 to 130 ft thick and overlies the Hawthorn.

Volusia County Local Government Regulations

Volusia County is delegated by SJRWMD to permit wells less than six inches in diameter on behalf of SJRWMD. Most of the local governments within Volusia County have ordinances related to self-supply wells. The type of ordinance for each local government is listed in Table 56.

Local Government	Connection Required	Well Permit Required	Wells Prohibited (Type)	Construction Regulated
Volusia County	Yes	Yes	No	Yes
Daytona Beach	No	No	No	No
Daytona Beach Shores	No	No	No	No
Debary	No	No	No	No
Deland	No	No	Yes (Potable)	No
Deltona	No	No	No	No
Edgewater	Yes	No	No	No
Holly Hill	Yes	Yes	Yes (Potable)	Yes
Lake Helen	Yes	Yes	No	No
New Smyrna Beach	Yes	Yes	Yes	No
Orange City	Yes	No	No	No
Ormond Beach	Yes	No	Yes (All)	No
Pierson	Yes	No	No	No
Ponce Inlet	Yes	No	No	No
Port Orange	Yes	No	Yes (Potable)	No
South Daytona	Yes	No	No	No

Table 56: Volusia County Local Government Programs

Volusia County has one of the few local government programs that regulate the construction of self-supply wells to avoid SSWRLS. The program specifies pump standards for an area of the County that had experienced SSWRLS. The program does

not allow centrifugal pumps and requires that the pump intake be set to at least 84 ft bls. The ordinance authorizing the program is as follows:

(g) Because of the proliferation of numerous large high capacity wells with resultant rapid drawdown of the Floridan aquifer during certain periods of time, the following additional requirement shall apply to all pumps installed for use in the Floridan aquifer in that part of the County, bounded on the east by State Road 11 and its intersection with U.S. 17 and U.S. 92 continuing south on U.S. 17-92 to its intersection with Beresford Avenue, Deland, Florida, bounded on the south by Beresford Avenue and an imaginary line extending west from Beresford Avenue, Deland, Florida, to the St. Johns River, bounded on the west by the St. Johns River and bounded on the north by the Volusia County line.

(1) No pump except a single pipe jet, double pipe jet, submersible or turbine shall be installed.

(2) The minimum depth of pump intake setting shall be 84 feet.

(3) A multi-stage pump is required for deep well jet systems.

(Ord. No. 95-4, § XI, 4-20-95)

Volusia County Well Database

Volusia County maintains a database of well permits issued since 1989. Volusia County provided GIS shapefiles containing spatial coordinates for records of 18,412 wells permitted between July 1989 and July 2001. The attribute table associated with these records contained data fields for the following information:

Volusia County Parcel Identification Number
Parcel Area (feet squared)
Volusia County ID Number
Volusia County Well Permit Number
Well Owner Name
Volusia County Property Appraiser Parcel Number
Use of Well
Casing Diameter (inches)
Casing Depth (feet below land surface)
Total Well Depth (feet below land surface)
Depth to Water at Time of Well Installation
Well Capacity (gallons per minute)
City Code
Street Name
Street Name Type (i.e., St, Ave, Rd, etc.)
Street Name Direction (i.e., N, S, E, W)
Volusia County Property Appraiser Block Number
Address Suite (if applicable)
Pump Horsepower
Latitude
Longitude

Volusia County Current and Historic SSWRLS

Historically, SSWRLS in Volusia County has been associated water level declines due to pumping for fern freeze-protection in the northwestern part of the County (Thompson, 2002). Fifteen SSWRLS complaints were recorded for self-supply systems in western Volusia County by SJRWMD Palatka Service Center from the period 2000 to 2001. All of the complaints were related to SSWRLS resultant from water level declines due to pumping for fern freeze-protection. Most of the systems had 2-in diameter Upper Floridan wells with recorded depths ranged from 100 to 180 ft and equipped with shallow-well jet pumps. The systems were repaired by installing longer drop pipes and/or by repairing or replacing the pumps.

During the spring and summer of 2001, a few self-supply systems in the eastern part of the County had experienced reduction in service resultant from drought (Carey, 2002) SSWRLS occurred at a few, scattered systems with Upper Floridan wells located west of Interstate 95, in the vicinity of Timber Creek Road (Beasley, 2002). The Upper Floridan potentiometric surface is above or slightly below land surface in this area. Some of the systems were constructed without a drop pipe or with very short drop pipes. SSWRLS in this area reportedly was a result of water levels in the wells dropping below the drop pipe. The systems were repaired by installing longer drop pipes.

During the spring and summer of 2001, SSWRLS was a significant problem at systems with shallow, surficial aquifer wells and shallow-well jet pumps located along the ridge parallel to Derbyshire Rd. in Daytona Beach (Beasley, 2002). This is an area with a high density of shallow surficial aquifer wells. An estimated 25 systems experienced SSWRLS due to water level declines below the lift capacity of the pumps. The systems were repaired by installing deep-well jet pumps.

Volusia County PSAs

Sixteen utilities operate 31 PSAs in Volusia County totaling about 344,000 acres. Table 57 summarizes the PSAs by utility.

UtTILITY	ACRES	SUBGROUP
ASTOR PARK WATER ASSOC INC	5,414	ASTOR PARK WATER ASSOC
DAYTONA BEACH	56,387	DAYTONA BEACH
DAYTONA BEACH	5,937	DAYTONA BEACH
DELAND	53,145	DELAND
EDGEWATER	26,414	EDGEWATER
FLORIDA WATER SERVICES CORP	27,162	DELTONA
HOLLY HILL	2,997	HOLLY HILL
LAKE BERESFORD WATER ASSOC INC	2,194	LAKE BERESFORD WATER ASSOC INC
LAKE HELEN	2,678	LAKE HELEN
LAKE HELEN	166	LAKE HELEN
NEW SMYRNA BEACH	35,984	NEW SMYRNA BEACH
ORANGE CITY	6,498	ORANGE CITY
ORMOND BEACH	2,823	ORMOND BEACH
ORMOND BEACH	16,546	ORMOND BEACH
ORMOND BEACH	7,776	ORMOND BEACH
PIERSON	7,901	PIERSON
PORT ORANGE	17,449	PORT ORANGE
PORT ORANGE	18,998	PORT ORANGE
PORT ORANGE	2,202	PORT ORANGE
PORT ORANGE	2,061	PORT ORANGE
PORT ORANGE CITY OF	1,234	TOWN OF PONCE INLET
TYMBER CREEK UTILITIES	2,088	TYMBER CREEK UTILITIES
VOLUSIA COUNTY UTILITIES	16,525	NORTHEAST SERVICE AREA
VOLUSIA COUNTY UTILITIES	1,037	SPRUCE CREEK PUD UTILITY SERVICE AREA
VOLUSIA COUNTY UTILITIES	20,822	LK MARIE ESTATES/GLEN ABBEY/TERRA ALTA
VOLUSIA COUNTY UTILITIES	4,832	DELTONA NORTH/CASSADEGGA
VOLUSIA COUNTY UTILITIES	7,920	SE AREA/LIGHTHOUSE COVE/INDIAN HARBOR/SOUTH WATERFRONT PARK/HACIENDA DEL RIO

Table 1: Volusia PSA Summary

Volusia County PSAs Common Well Construction Practices

Volusia County provided a database of self-supply wells installed in the County from 1989 to 2001. A total of 16,441 wells listed in the database were located within the Volusia County PSAs: 4,999 domestic wells, 11,381 irrigation wells and 31 heat pump wells. Table 61 summarizes the number of irrigation, domestic and heat pump wells in each PSA and average, minimum, and maximum well depth for each use category.

The majority of domestic wells (about 60%) were constructed with 4-in diameter casing. These wells are commonly equipped with submersible pumps. Most of the remaining domestic wells were constructed with 2-in diameter casing. These wells are commonly equipped with centrifugal or shallow-well jet pumps. In western Volusia County where flowing wells are common, wells may be equipped with centrifugal pumps.

Static water levels are generally about 10 ft bls within PSAs on the east side of the County and above land surface near the St Johns River. Static water levels are deeper, 30 to 80 ft deep, along the Deland Ridge on the western side of the County.

About 70% of the irrigation wells identified were 2-in diameter or less. The remaining wells were 4-in diameter or greater. These wells are commonly equipped with centrifugal or shallow-well jet pumps. Depth-to-water was 10 ft or less in about half of the irrigation wells and 20 ft or less in about 80 percent of the wells.

UTILITY	USE	NUMBER OF WELLS	AVERAGE DEPTH	MINMUM DEPTH	MAXIMUM DEPTH
ASTOR - ASTOR PARK	Domestic	17	157	91	260
	Irrigation	9	146	100	250
DAYTONA BEACH	Domestic	204	124	19	180
	Heat Pump	5	136	110	170
	Irrigation	1,677	73	10	420
DELAND	Domestic	1,669	158	2	395
	Heat Pump	3	203	180	235
	Irrigation	517	180	10	360
EDGEWATER	Domestic	252	64	15	200
	Heat Pump	2	32	24	40
	Irrigation	1,217	52	2	480
FLORIDA WATER SERVICES CORP	Domestic	228	149	22	240
	Irrigation	487	139	0	270
HOLLY HILL	Domestic	15	93	24	135
	Irrigation	222	47	16	220
LAKE BERESFORD WATER ASSOCIATION INC.	Domestic	1	15	15	15
	Irrigation	8	126	19	217
LAKE HELEN	Domestic	12	181	140	220
	Irrigation	38	178	100	315
NEW SMYRNA BEACH	Domestic	244	84	10	200
	Heat Pump	4	49	24	120
	Irrigation	824	42	10	205
ORANGE CITY	Domestic	128	161	80	300
	Irrigation	141	178	84	265
ORMOND BEACH	Domestic	149	132	24	620
	Heat Pump	1	60	60	60
	Irrigation	27	63	15	140
PIERSON	Domestic	13	167	120	225
	Irrigation	48	215	120	325
PLANTATION BAY	Irrigation	186	129	25	165
PORT ORANGE	Domestic	234	111	16	255
	Heat Pump	2	140	130	150
	Irrigation	2,178	84	5	430
CITY OF PORT ORANGE	Domestic	1	25	25	25
	Irrigation	186	25	17	110
TYMBER CREEK UTILITIES	Domestic	55	120	100	150
	Irrigation	84	125	35	180
VOLUSIA COUNTY UTILITIES	Domestic	1,729	135	16	480
	Heat Pump	13	101	25	180
	Irrigation	1,695	138	4	950

Table 58: Volusia County Self-supply Well Summary

Depth-to-water in about 10% of the wells was 50 ft or more. A large number of irrigation wells within the PSAs in eastern Volusia County utilize the surficial aquifer as a source of supply.

The surficial aquifer is not commonly used as a source for domestic supply wells because of high iron concentrations. Most of the domestic surficial aquifer wells are located on the east side of the County, especially within the New Smyrna Beach PSA, City of Edgewater PSA, and the Volusia County Utilities PSA south of the City of Edgewater.

The Upper Floridan aquifer is a common source of water for irrigation wells in Volusia County. About 50% of the irrigation wells within Volusia County PSAs utilize the Upper Floridan.

The Upper Floridan aquifer is the primary source of water for domestic self-supply wells in Volusia County. Domestic self-supply wells commonly utilize the Upper Floridan because of high iron concentrations in water from the surficial aquifer and higher, more dependable yields from the Floridan.

Volusia County Areas of Potential SSWRLS

Based on the historical occurrence of SSWRLS areas in Volusia County, older self-supply systems near ferneries that have Upper Floridan aquifer wells and centrifugal or shallow-well jet pumps are at risk of SSWRLS. Systems with shallow, surficial aquifer wells and shallow-well jet pumps located in areas with a high density of shallow surficial aquifer wells at where the water table is deep are at risk of SSWRLS during drought.

Based on evaluation of common well construction practices and predicted Upper Floridan aquifer water level declines, certain Upper Floridan wells within 14 Volusia County PSAs may experience SSWRLS (Table 62). Two classes of wells would be at risk: Type 3 and Type 4.

UTILITY	SUBGROUP	PSA ID	Type 1	Type 2	Type 3	Type 4	Type 5
DAYTONA BEACH	DAYTONA BEACH	181	No	No	Yes	High	No
DELAND		224	No	No	No	Yes	No
EDGEWATER	EDGEWATER	278	No	No	Yes	No	No
FLORIDA WATER SERVICES	DELTONA	288	No	No	Yes	Yes	No
LAKE HELEN	LAKE HELEN	279	No	No	No	Yes	No
NEW SMYRNA BEACH	NEW SMYRNA BEACH	245	No	No	Yes	Yes	No
ORMOND BEACH	ORMOND BEACH	172	No	No	Yes	Yes	No
ORMOND BEACH	ORMOND BEACH	176	No	No	No	Yes	No
PORT ORANGE	PORT ORANGE	215	No	No	No	Yes	No
PORT ORANGE	PORT ORANGE	239	No	No	Yes	High	No
VOLUSIA COUNTY UTILITIES	NORTHEAST	167	No	No	No	Yes	No
VOLUSIA COUNTY UTILITIES	SPRUCE CREEK	247	No	No	Yes	No	No
VOLUSIA COUNTY UTILITIES	SOUTHEAST	312	No	No	Yes	No	No

Table 59: Volusia County PSAs with Risk of SSWRLS

Type 3 systems include Upper Floridan potable wells equipped with centrifugal or shallow-well jet pumps and Upper Floridan irrigation wells without pumps. Type 3 systems may experience SSWRLS due to loss of prime from water level declines to below land surface. Type 3 system irrigation wells without pumps will cease to flow when water levels drop below land surface. The risk of SSWRLS for Type 3 systems is predicted in portions of eight Volusia County PSAs.

Type 4 systems are those with Floridan aquifer wells and centrifugal or shallow well jet pumps where Upper Floridan potentiometric surface is predicted to drop to greater than 20 ft bls by 2020. The risk of SSWRLS for Type 4 systems is predicted in portions of ten Volusia County PSAs. The risk of SSWRLS is considered high for Type 4 systems in portions of two PSAs in areas where the 2020 Upper Floridan potentiometric surface is projected to drop to greater than 25 ft bls.

Appendix B: Interview Contacts

Alachua County

Alachua County Health Department
224 Southeast 24th Street
Gainesville, FL 32641
(352) 334-7900

Myers Well Drilling
224 NE 16th Ave
Gainesville, FL 32601
352-378-2375

Baker County

Baker County Health Department
480 West Lowder Street
Macclenny, FL 32063-2607
(904) 259-3569

Sapp Well Drilling & Pump Service
60 N Lowder St
Macclenny, FL 32063
(904) 259-6934

Bradford County

Bradford County Health Department
1801 N. Temple Avenue
Starke, FL 32091
(904) 964-7732

Durrance Pump & Supply
864 N Temple Ave
Starke, FL 32091-2135
(904) 964-7061

Brevard County

Brevard County Health Department
2575 N. Courtney Parkway
Merritt Island, FL 32953-4147
(321) 454-7111

Florida Drilling
1191 Sandusky St SE
Palm Bay, Fl 32909
(321) 725-1809

Johns Well Drilling
3020 Harlock Rd
Melbourne, FL 32934-0000
(321) 254-9668

Clay County

Clay County Health Department
Post Office Box 578
1305 Idlewild Avenue
Green Cove Springs, FL 32043-0578
(904) 529-2280

Partridge Well Drilling Inc.
4744 Collins Rd
Jacksonville, FL 32207
(904) 355-3323

Duval County

City of Jacksonville, RESD
Air & Water Quality Division
Technical Services Branch
117 W. Duval St. Suite 225
Jacksonville, Florida 32202
(904) 630-4900, ext. 3156

JEA
21 W. Church St.
Jacksonville, FL 32202
(800) 683-5542

Partridge Well Drilling Inc.
4744 Collins Rd
Jacksonville, FL 32207
(904) 355-3323

Flagler County

Flagler County Health Department
Post Office Box 847
301 South Lemon Street
Bunnell, FL 32110-0847
(904) 437-7350

All-Florida Plumbing and Electrical Supply
1670 North Nova Road
Daytona Beach, FL 32117
(386) 252-4695

Indian River County

Indian River County Health Department
1900 27th Street
Vero Beach, FL 32960-3383
(561) 794-7400

Walter Herndon Well Drilling, Inc.
14075 113th St
Fellsmere, FL 32948
(561) 571-0324

Heidekruger Shallow Wells
8205 Babcock St
Palm Bay, FL 32909

Lake County

Lake County Health Department
16140 US Hwy 441
Eustis, FL 32726
(352) 253-6130

Lake Well & Pump
310 W Magnolia St
Leesburg, FL 34748
(352) 323-0822

Marion County

Marion County Health Department
1801 S.E. 32nd Avenue
P.O. Box 2408
Ocala, FL 34478
(352) 629-0137

Smokey's Pump Service & Well
4605 NE 36th Ave
Ocala, FL 34479
(352) 732-5570

Nassau County

Nassau County Health Department
P.O. Box 517
30 South 4th Street
Fernandina Beach, FL 32035-0517
(904) 277-7287

Freeman Well Drilling Inc.
606 South 6th Street
Fernandina Beach, FL 32034
(904) 261-5216

Okeechobee County

Okeechobee County Health Department
1728 NW 9th Avenue
Okeechobee, FL 34972
(941) 462-5760

Orange County

Orange County Health Department
832 West Central Boulevard
Orlando, FL 32802-3187
(407) 623-1180

ALSO (Crego, 2002).

Dick Joyce Well Drilling, Inc.
2709 Country Club Rd
Sanford, FL 32771
.
3720 N Orange Blossom Trail
Orlando, FL 32804
(407) 293-7381

Osceola County

Osceola County Health Department
P.O. Box 450309
1875 Boggy Creek Road
Kissimmee, FL 34745-0309
(407) 343-2024

Garry Lamb Well Drilling
Kissimmee, FL 34746
(407) 847-7873

Polk County

Polk County Health Department
1290 Golfview Avenue, 4th Floor
Bartow, FL 33830-6740
(863) 519-7900

Putnam County

Putnam County Health Department
2801 Kennedy Street
Palatka, FL 32177-4100
(904) 326-3200

Putnam Well Drilling
661 3rd Ave
Welaka, FL 32193
(386) 467-9247

St. Johns County

St. Johns County Health Department
180 Marine Street
St. Augustine, FL 32084
(904) 823-2514

JEA
21 W. Church St.
Jacksonville, FL 32202
(800) 683-5542

Partridge Well Drilling Inc.
4744 Collins Rd
Jacksonville, FL 32207
(904) 355-3323

Seminole County

Seminole County Health Department
400 West Airport Boulevard
Sanford, FL 32773
(407) 665-3200

Dick Joyce Well Drilling Inc.
2709 Country Club Rd
Sanford, FL 32771
(407) 322-4610

Volusia County

Volusia County Environmental Management
501 South Clyde Morris Boulevard
Daytona Beach, FL 32114-3997
(386) 736- 5927 x 2073

All-Florida Plumbing and Electrical Supply
1670 North Nova Road
Daytona Beach, FL 32117
(386) 252-4695

Jerry Thompson Well and Pump
1685 Compark Dr
DeLand, FL 32720
(386) 740-0180