REGIONAL WATER SUPPLY PLAN
FOR SANTA ROSA, OKALOOSA AND WALTON COUNTIES

Northwest Florida Water Management District

Water Resources Assessment 2000-1

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LIST OF ACRONYMS AND ABBREVIATIONS

ADR	AVERAGE DAILY RATE
AFB	AIR FORCE BASE
ASC	AREAS OF SPECIAL CONCERN
ASR	AQUIFER STORAGE AND RECHARGE
BEBR	BUREAU OF ECONOMIC & BUSINESS RESEARCH (UNIVERSITY OF FLORIDA)
CUP	CONSUMPTIVE USE PERMIT
DWU	DESTIN WATER UTILITIES
ECUA	ESCAMBIA COUNTY UTILITIES AUTHORITY
F.S.	FLORIDA STATUTES
FCSC	FLORIDA COMMUNITY SERVICE CORPORATION
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
FRUS	FAIRPOINT REGIONAL UTILITY SYSTEM
ft.	FEET
ft^2/d	FEET SQUARED PER DAY
ft^3/sec	CUBIC FEET PER SECOND
gal/d	GALLONS PER DAY
gal/min/ft	GALLONS PER MINUTE PER FOOT
in/yr	INCHES PER YEAR
mg/L	MILLIGRAMS PER LITER
Mgal/d	MILLION GALLONS PER DAY
mi^2	SQUARE MILES
MFL	MINIMUM FLOWS AND LEVELS
NWFWMD	NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
RO	REVERSE OSMOSIS
RUA	WALTON/OKALOOSA/SANTA ROSA REGIONAL UTILITY AUTHORITY
RWSP	REGIONAL WATER SUPPLY PLAN
SSRUS	SOUTH SANTA ROSA UTILITY SYSTEM
SWUC	SOUTH WALTON UTILITY COMPANY
USGS	UNITED STATES GEOLOGICAL SURVEY
WFRPC	WEST FLORIDA REGIONAL PLANNING COUNCIL
WMD	WATER MANAGEMENT DISTRICT
WRCA	WATER RESOURCE CAUTION AREA
WS	WATER SYSTEM
WSA	WATER SUPPLY ASSESSMENT
WWTP	WASTEWATER TREATMENT PLANT

Executive Summary

Pursuant to Section 373.0361, Florida Statutes, a Regional Water Supply Plan is required for Water Supply Planning Region II, which is comprised of Santa Rosa, Okaloosa and Walton counties. Water withdrawals from the Floridan Aquifer in the coastal area of Region II have formed a large cone of depression in the aquifer centered at Fort Walton Beach. According to the Water Supply Assessment completed by the District in 1998, existing and reasonably anticipated sources of water were not considered adequate to supply water for all existing legal users and reasonably anticipated future needs. Water demand in the Region is projected to increase by 34 million gallons per day (Mgal/d) (to 92.3 Mgal/d) by 2020. This change in demand is due largely to the Region's projected population increase from 292,213 in 1995 to 442,351 in 2020.

Dependence on the Floridan Aquifer along the coast to meet this additional future demand is expected to put the coastal region at risk for saltwater encroachment. As ground water is practically the coastal area's sole source of water, the District has identified several alternative water supply source options, including inland water wells tapping the Sand-and-Gravel Aquifer and inland Floridan Aquifer wells in the more central part of Region II. A considerable amount of cooperation and coordination between local governments, utilities, and the District will be needed to bring the use of sources such as these to fruition.

In order to meet future water supply demands, the development of alternative water supply sources is critical regarding the long-term sustainability of Region II. With this goal in mind, various traditional and alternative water supply source options were examined to determine whether, and to what extent, each potential source or demand reduction technique could be utilized to address the future water needs of the Region. The water source options examined include:

- Floridan Aquifer (Inland)
- Sand-and-Gravel Aquifer
    - Conservation
- Reclaimed Water (Reuse)
- Aquifer Storage and Recovery
    - Surface Water
    - Desalination

Analysis of potential future withdrawal scenarios from Floridan Aquifer sources was performed utilizing a numerical ground water flow model of Region II. This regional model is an analysis tool for estimating the cumulative effects of withdrawals on ground water levels and flow rates in the Floridan Aquifer. However, due to the threat of saltwater intrusion, uncertainty exists regarding the ability of the Floridan Aquifer to meet the 2020 demands in a sustainable manner. Efforts to estimate the sustainable portion of current withdrawals have only recently begun. This modeling, when complete, will be used to assess the severity of saltwater encroachment and determine the sustainability of current Floridan Aquifer sources and withdrawal patterns. It is estimated that the sustainability modeling will take two years to complete.

The potential use of the Sand-and-Gravel Aquifer as an alternative water supply source option in Region II was also considered. Two areas of interest were examined: the coastal portion of Region II south of Eglin AFB, and the area between the Blackwater and Yellow rivers. Average recharge rates, typical stream flow rates, and effects of drought were evaluated. Preliminary results indicate that a more detailed analysis is warranted to evaluate potential impacts by wellfield drawdown on water levels in the areas of interest and on base flow to the smaller, more sensitive tributaries within the area. This work will take approximately 18 months to complete.

A number of water conservation practices were also evaluated as an alternative supply option. Cost data and quantities of water generated from conservation practices were from local utilities' data. The analysis examined current practices within Region II and provided an estimate of additional water that could be conserved by implementing various procedures. The results of this evaluation indicated that a number of conservation practices are in place and are already having a significant effect. The District should continue to assist the utilities in their efforts of public education regarding the benefits associated with water conservation.

Treated reclaimed wastewater (reuse) was evaluated separately as a conservation measure. The analysis of reuse looked at current practices and availability of treated wastewater and suggested ways in which additional wastewater could be utilized to reduce Floridan Aquifer withdrawals. It was determined that detailed analysis of reuse facilities and distribution systems within Region II should continue in order to assist with the location and evaluation of reuse water for future applications.

Aquifer storage and recovery (ASR) was evaluated as an alternative supply source on the basis of available water sources (surface and ground water) and the suitability of the Floridan Aquifer for storing water. The feasibility analysis of ASR applicability within Region II is recommended pending the outcome of sustainability modeling of the Floridan Aquifer. Feasibility analyses should identify ASR's specific advantages and disadvantages in Region II and include more detailed cost estimates and financial analysis to implement such a program. In particular, it should be determined if ASR would be useful as a barrier to saltwater intrusion, as well as a future water supply alternative.

Surface water was considered as an alternative water supply option based on available statistical data related to flows from USGS databases, water quality data and analysis and preliminary cost data. Although considered to be one of the more costly options at this time, the feasibility of developing a regional surface water source should be examined more closely in the future. Surface water studies should be coordinated with sustainability modeling efforts and with future ASR feasibility analyses. More detailed surface water quality monitoring is needed to perform treatability analyses and will take approximately three years to complete.

Finally, desalination of sea water or brackish ground water was evaluated as an alternative supply option for Region II. This evaluation was based on a literature review of existing technology, literature-based unit cost estimates, source water quality, and a screening tool involving demand economics and water quality. It was concluded from this evaluation that desalination is not a feasible alternative supply option during the 20-year planning horizon.

The evaluation of alternative water supply source options also included a cost analysis for each water supply source. The purpose of performing an economic analysis for each feasible supply option was to determine how the public interest would best be served and how overall costs could be saved by preventing the loss of natural water resources or by minimizing expenditures. All of the cost estimates presented in this document are on an equivalent annual cost basis for preliminary planning level analysis. The alternative water supply options, which were evaluated for cost effectiveness, environmental impacts, implementation, reliability and economics, are summarized in the following table. The cost analysis considered all factors associated with the production, treatment and distribution of water except for the costs of the local distribution systems to utility customers.

Region II: Water Source Options Data

Water Source Options	*Estimated Water*	*Estimated Costs of*

	Available for Water Supply (Mgal/d)	*Water Supply ($/1,000 gal.)*[1]
Sand-and-Gravel	20.0	$0.98-2.15
Floridan Aquifer-Inland	20.0	$1.37-2.66
Conservation	<2.5	Up to $4.00
Reuse of Treated Water	5.0	$2.50-3.50
Aquifer Storage and Recovery	10.0	$2.56-2.85
Surface Water	>20.0	$1.92-3.42

[1]Does not include costs associated with local distribution systems to end users.

The need for additional water supply within Region II will require alternative water resource development in order to meet projected water demands while at the same time reducing current stresses on the Floridan Aquifer. This commonly shared goal can best be achieved through effective teamwork, coordination, and communication between the District, local governments, utilities, DEP, federal government agencies, and other interested parties. Alternate water source development that will best serve the public interest can be accomplished through careful planning and judicious stewardship of the Region's existing and future water supply sources.

With these goals in mind and in cooperation with various entities, the District is developing ground water models to investigate saltwater intrusion in the Floridan Aquifer. These models will be used to project future sustainable water withdrawal levels within Region II. The District is also working on a detailed Sand-and-Gravel Aquifer analysis to more accurately determine water availability from the development of this source. These efforts include continued evaluation and monitoring of the water resources in Region II. The development and research on the technical and economic feasibility of other water source options that may not be as economically competitive in the current 2020-planning horizon, but may be needed in the more distant future, will also continue.

Most notably, the District has worked with various entities in Region II to promote the development of sustainable water supply sources in the area. In Santa Rosa County, the coastal utilities comprising the Fairpoint Regional Utility System (FRUS) have committed to developing inland Sand-and-Gravel Aquifer wells, and in 1999 the District received a $328,000 grant from the Environmental Protection Agency to help implement this project. The District has received $2.85 million in additional federal funds to aid in the construction of the FRUS wellfield

and associated transmission facilities. The District has also permitted WRP, Inc. (now South Walton Utility Company) to pump water from inland Floridan Aquifer sources in south-central Walton County, and Okaloosa County has been permitted to withdraw Floridan Aquifer water from inland sources near the City of Crestview to augment coastal water demands. These efforts and the cooperation shown among the utilities, the local governments and the District are recognized in the plan, and are regarded as major steps toward resolution of water supply issues in Region II.

Chapter 1
INTRODUCTION

Overview

In 1997, the Florida Legislature amended the Florida Water Resources Act [Chapter 373, Florida Statutes (F.S.)], providing additional guidance to the state's five water management districts regarding water supply planning. The new process established by the Legislature involves dividing each water management district's jurisdiction into one or more "water supply planning regions"; assessing water supply needs and sources for each region; identifying regions that currently have, or are likely to develop future water supply problems; and developing "regional water supply plans" for those regions with identified or anticipated water supply problems.

The Northwest Florida Water Management District (NWFWMD or District) began this process by establishing seven water supply planning regions (Figure 1.1) and developing the "*District Water Supply Assessment*" or "WSA" (Ryan et al. 1998), which was completed in June 1998. Based on the WSA's findings, the District determined that existing sources of water were not adequate to meet projected future water needs in Region II (Santa Rosa, Okaloosa, and Walton counties). This determination required development of a "Regional Water Supply Plan" (RWSP) for Region II pursuant to Section 373.0361, Florida Statutes. This section of the statute states:

> *By October 1, 1998, the governing board shall initiate water supply planning for each water supply planning region identified in the district water management plan under s. 373.036, where it determines that sources of water are not adequate for the planning period to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems.* [§373.0361(1), F.S.]

The WSA determination was not unexpected for this region. The area has been the focus of numerous NWFWMD water supply planning activities over the past two decades, and the resource concerns in the coastal portion of the region are well documented. Over the years, the District has worked closely with the local governments and utilities in this region to monitor the water resources and develop solutions that will adequately provide for the future demands.

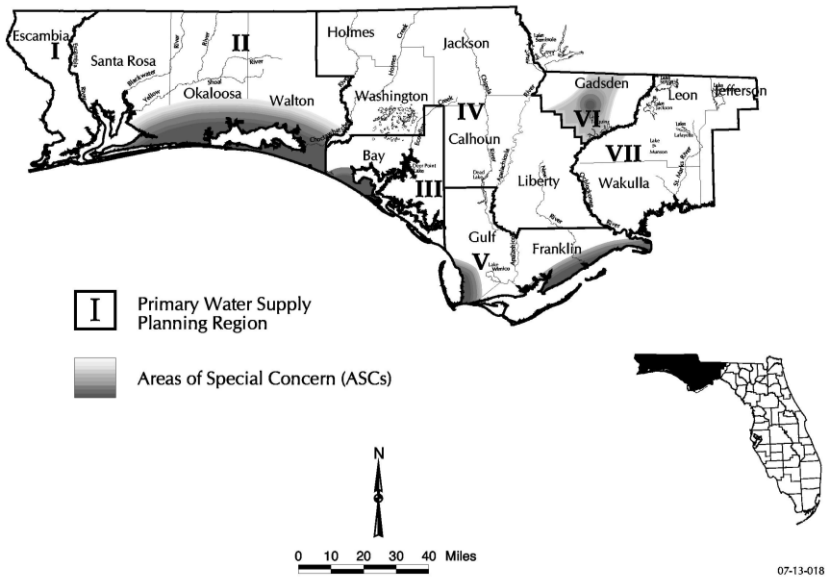
Virtually all of the water supply issues in the planning region are attributable to demands for potable water that is distributed by public supply water utilities in the coastal fringe of Santa Rosa, Okaloosa, and Walton counties. Public supply water use in the region is projected to increase by 24.5 million gallons per day (Mgal/d) from the 1995 amount of 37 Mgal/d to an estimated 61.5 Mgal/d in 2020. Almost two-thirds (15.9 Mgal/d) of this increased demand is projected to occur in the coastal areas of the region. Overall, the region is projected to grow 51 percent from 1995's population of 292,213 to 442351 in 2020 (Ryan et al. 1998).

Increases in pumping of local Floridan Aquifer wells to supply growing demands in the coastal fringe have resulted in formation of a substantial cone of depression in the aquifer. Although further study is required to accurately quantify the amounts and for how long potable water can be safely produced from the Floridan Aquifer, the current levels of water withdrawal may not be sustainable on a long-term basis. Additional modeling efforts are currently underway to define sustainable aquifer withdrawals, and the results of this work will be utilized in future steps of the regional water supply planning process.

The RWSP has been developed to address the regional water supply planning requirements of the Florida Water Resources Act, Chapter 373, F.S. Sections of the statute that are most relevant to regional water supply planning are included in Appendix A. The RWSP has a 20-year planning horizon, extending through the year 2020. It describes the water supply needs of the region, identifies existing and alternative water source options and analyzes the ability of these sources to meet future demands. The plan discusses water supply alternatives to address unmet demand and to sustain the water resources.

Figure 1.1

Northwest Florida Water Management District
Water Supply Planning Regions



Planning Area

For this RWSP, the study area includes only Santa Rosa, Okaloosa and Walton counties (Figure 1.1). Escambia County comprises the Region's western boundary. Alabama forms the study area's northern edge, the Gulf of Mexico forms the southern edge, and the eastern edge is formed by Walton County's border with Holmes, Washington and Bay counties.

The Region's southern portion lies in a physiographic region known as the Coastal Lowlands characterized by beach ridge plains, shorelines and marine terraces. These terrace complexes are predominately underlain by sand with local occurrences of clay, shell beds and peat. Elevations in these lowlands range from 0 to 100 ft. above mean sea level (MSL). The Region's northern section, generally beginning at the southern boundary of Eglin Air Force Base (AFB), lies in the Western Highlands, which are underlain by ancient delta deposits of clays, clayey sands and gravel. Elevation in this region ranges from 100 to 200 ft. above MSL (Barrett, Daffin and Carlan, Inc. 1982). The Region contains two major watersheds: the Choctawhatchee River and Bay System, and the Pensacola Bay System. The Pensacola Bay System includes the watersheds of the Escambia, Blackwater, Yellow, and Shoal rivers; the Pensacola, Escambia, East and Blackwater bays; and the Santa Rosa Sound.

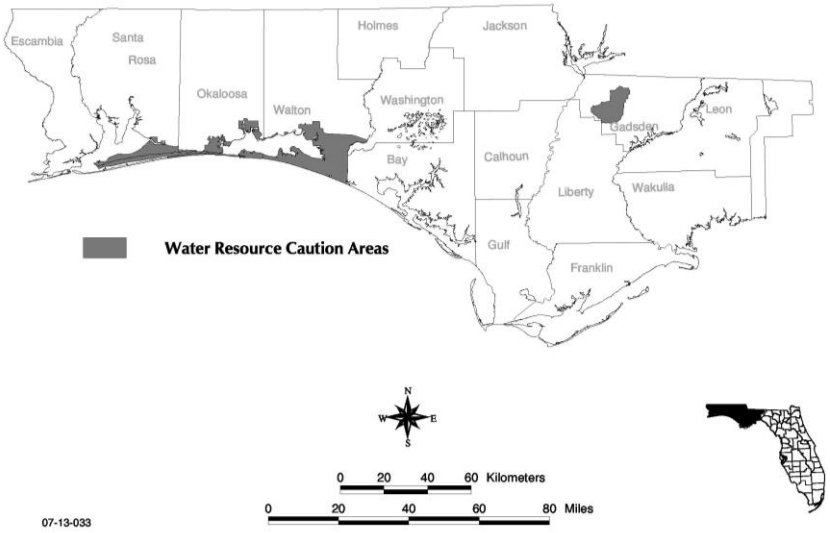
Water Resource Caution Area

In response to existing and anticipated water supply problems, the District has designated the coastal area of Santa Rosa, Okaloosa and Walton counties as a Water Resource Caution Area (WRCA) (Figure 1.2).

The WRCA designation subjects all non-exempt withdrawals to more rigorous scrutiny to ensure that the proposed withdrawal does not result in unacceptable impacts to the resource. Permittees within a WRCA also have increased water use reporting requirements, must implement water conservation measures, and must improve water use efficiencies. They are also required to perform an evaluation of the technical, environmental, and economic feasibility of providing reclaimed water for reuse. In Santa Rosa, Okaloosa, and Walton counties, use of the Floridan Aquifer for non-potable purposes is prohibited in the WRCA (Ryan et al. 1998).

Figure 1.2

Northwest Florida
Water Management District
Water Resource Caution Areas



Santa Rosa County

Santa Rosa County covers approximately 1,152 square miles (1,064 sq. mi. land area), and its elevations range between MSL and 290 ft. above MSL. The County is bounded on the west by the Escambia River, on the east by Okaloosa County, on the north by Alabama, and to the south by the Gulf of Mexico. Major watercourses in the County include the Yellow River, Sweetwater Creek, Big Juniper Creek, Big Coldwater Creek, Blackwater River, and Pond Creek, all of which drain into East Bay. Moore Creek is a tributary of the Escambia River. Bear Lake is the largest lake in the County at 109 acres. Garcon Point separates East Bay from Escambia Bay, and Santa Rosa Sound separates the peninsular mainland from Santa Rosa Island (NWFWMD 1994).

Santa Rosa County includes three incorporated cities: Milton, Jay, and Gulf Breeze. Milton, the county seat, is the largest city with an estimated 7,722 people; however, nearly 84 percent of the population live in the unincorporated portion of the County. The Bureau of Economic and Business Research (BEBR) estimates the County's 1999 population at 112,631, up 38 percent from the 1990 Census count of 81,608 (BEBR 1999). In 2010, BEBR projects the County's total population to be 142,620, an increase of 26 percent over the 1999 estimated population.

Okaloosa County

Okaloosa County covers approximately 998 square miles (936 sq.mi. land area), and its elevation ranges from MSL to 250 ft. above MSL. Major watercourses in the County include the Yellow, Shoal, and East Bay rivers, as well as Panther, Titi, Turtle and Trammel creeks, all draining into East Bay. Turkey and Rocky creeks empty into Choctawhatchee Bay. Santa Rosa Sound separates the mainland from Santa Rosa Island, a barrier island, and Moreno Point (a peninsula) separates Choctawhatchee Bay from the Gulf of Mexico (NWFWMD 1994).

Okaloosa County has nine municipalities: Cinco Bayou, Crestview (the county seat), Destin, Fort Walton Beach, Laurel Hill, Mary Esther, Niceville, Shalimar and Valparaiso. Fort Walton Beach is the largest city with an estimated 22,052 people. Over 58 percent of the population live in the unincorporated portion of the County. The Bureau of Economic and Business Research (BEBR) estimates the County's 1999 population at 179,589, up 25 percent from the 1990 Census count of 143,777 (BEBR 1999). In 2010, BEBR projects the County's total population to be 216,000, an increase of 20 percent over the 1999 estimated population.

Walton County

Walton County covers approximately 1,135 square miles (1,066 sq. mi. land area), and its elevations range between MSL and 345 ft. above MSL. The Choctawhatchee River forms the boundary on the east, Okaloosa County on the west, Alabama on the north, and the Gulf of Mexico on the south. The Titi, Turkey, Gum, Pine Log, and Long creeks feed the Shoal River. Juniper Lake (670 acres) is the largest of the County's 16 lakes and ponds (NWFWMD 1994).

Walton County includes three incorporated cities: Freeport, Paxton, and DeFuniak Springs, the county seat. More than 76 percent of the population live in the unincorporated portion of the County. The Bureau of Economic and Business Research (BEBR) estimates the County's 1999 population at 40,466, up 46 percent from the 1990 Census count of 27,759 (BEBR 1999). In 2010, BEBR projects the County's total population to be 50,902, an increase of 25 percent over the 1999 estimated population.

Previous Water Supply Planning Efforts

Region II, having always relied heavily on ground water for its fresh water needs, began pumping significant amounts of water from the Floridan Aquifer in the late 1930s and 1940s after the construction of Eglin AFB. In the following decades, the Region's population increased and pumping demands, especially to supply the Region's coastal area, rose dramatically. As a result of these withdrawals, potentiometric levels in several areas dropped substantially. In the vicinity of the City of Fort Walton Beach, for example, the Floridan Aquifer has lost 150-ft. of head over its pre-development level, while areas near the cities of Crestview and Milton have both lost around 70-ft. of pre-development head (Ryan et al. 1998).

To identify and evaluate alternatives for meeting the Region's future water supply needs, the District released the *Regional Water Supply Development Plan* in November 1982. The 1982 RWSDP, using U.S. Census data, Regional Planning Council reports as well as sociopolitical and geographical boundaries originally encompassed the currently designated Region II and parts of Escambia and Bay counties. The study area was then broken down into nine smaller planning zones to allow more detailed research. The 1982 RWSDP provided specific recommendations for water supply development in each of the nine planning zones. In several zones, the existing supply was deemed adequate, while in other areas demand was expected to outstrip supply by 2020. The District identified the region south of Eglin AFB in Santa Rosa, Okaloosa and Walton counties as the highest priority area for development of new water supply sources, and designated this subregion as a Water Resource Caution Area (WRCA) (Figure 1.2). The District also recommended alternative water supply sources, including: 1) pursuing the development of a regional wellfield on Eglin AFB to serve the western portion of the subregion; and 2) undertaking other inland wellfields in the eastern subregion.

The District subsequently worked with the West Florida Regional Planning Council (WFRPC), the Florida Department of Environmental Regulation (FDER), and the various local governments to develop an inter-local agreement establishing the Walton/Okaloosa/Santa Rosa Regional Utility Authority (RUA). The RUA, which was granted FDER approval in October 1986, includes Walton, Okaloosa and Santa Rosa counties and the cities of Destin, Fort Walton Beach, Gulf Breeze and Mary Esther.

In 1988, the District updated the portions of the RWSDP that were applicable to the RUA in the form of an addendum. The addendum's recommendations included: (1) designing and implementing an exploratory test well program for the Sand-and-Gravel Aquifer in southern Santa Rosa County; (2) evaluating the feasibility of a western subregional wellfield on Eglin AFB; (3) evaluating the feasibility of an eastern subregional inland water supply utilizing the upper part of the Floridan Aquifer; and (4) investigating desalination for south Walton County and southeast Okaloosa County (Destin area).

In the years since the addendum's preparation, significant work has been completed toward implementing alternative water supplies for coastal Santa Rosa, Okaloosa and Walton counties. Okaloosa County obtained a consumptive use permit (CUP) to expand its Mid-county wellfield with part of the water obtained from the wellfield to be sent to southern Okaloosa County. Private utilities completed exploration of the lower Floridan Aquifer as a source of reverse osmosis (RO) water in the Destin area (deemed impractical at this time). WRP, Inc. (Destin Water Users and South Walton Utility Co.) secured a permit for Floridan Aquifer withdrawals in south-central Walton County, on the north side of the Choctawhatchee Bay.

In 1994, the RUA designated Santa Rosa County as the lead agency to pursue development of the western regional wellfield. In the same year, negotiations with representatives of Eglin AFB revealed that the proposed construction of wells on the base would require preparation of an Environmental Impact Statement (EIS) costing upwards of $1 million and taking a year to complete with no assurance of a favorable outcome. Santa Rosa County subsequently contracted for a study of water supply alternatives for Navarre Beach that would not involve construction of wells on Eglin AFB. The study evaluated seven alternatives for supplying potable water to Navarre Beach, including construction of a wellfield north of Eglin AFB and the Yellow River and RO treatment of water from the Lower Floridan Aquifer (Fabre Engineering, Inc. 1994). As a result of this report, the County directed a more detailed study of the proposed Yellow River wellfield as a source of water for southern Santa Rosa County.

A "Preliminary Planning Report" for the Santa Rosa County Regional Water System was prepared to analyze the proposed wellfield north of the Yellow River (Carlan Consulting Group and Post Buckley Schuh and Jernigan 1995). It was initially based on use of the Floridan Aquifer and later changed to evaluate the use of water from the Sand-and-Gravel Aquifer at the encouragement of NWFWMD staff. The report evaluated supplying water to Holley-Navarre, Navarre Beach, Midway, and South Santa Rosa Utilities, but did not include the City of Gulf Breeze. Estimated costs of supplying water in the report ranged from $1.75 to $3.00 per 1,000 gal., depending on the volume of water sold to participants.

In 1998, development of the western regional well field north of the Yellow River in the Sand-and-Gravel Aquifer was recommended (Fabre Engineering and Baskerville-Donovan 1998). The proposed system would serve Holley-Navarre, Midway, the City of Gulf Breeze, South Santa Rosa Shores, and Navarre Beach.

Fairpoint Regional Utilities, Inc. was incorporated on July 22, 1999 by the City of Gulf Breeze, the Holley-Navarre Water System, Inc., and the Midway Water System, Inc. to construct the western regional well field and transmission system. The $19 million project is in the design phase with start-up projected for mid 2002.

Water Supply Problems

Within Region II ground water is, effectively, the sole source of water used. Historically, most of the demand has been met by wells tapping the Floridan Aquifer along the coast. Prior to 1940, water use from this Aquifer was less than 2 Mgal/d. Since that time, Floridan Aquifer ground water use has increased to approximately 27 Mgal/d. along the coast. In Santa Rosa County, the Sand-and-Gravel Aquifer provides about 75 percent of the ground water used with the remaining 25 percent coming from the Floridan Aquifer. In Okaloosa and Walton counties the situation is reversed, with the Floridan Aquifer providing the bulk of the ground water demand.

Prior to development, ground water in the Floridan Aquifer flowed in a generally north to south direction. Pre-development aquifer water levels were highest in the northernmost parts of Region II. In northern Walton County, water levels were about 200 ft. above MSL. In northern Santa Rosa water levels were lower, on the order of 130 ft. above MSL. Floridan Aquifer water flowed down the hydraulic gradient and discharged naturally into the Choctawhatchee River, Choctawhatchee Bay and Gulf of Mexico. Along the coastline,

pre-development heads ranged from about 20 ft. above MSL in Walton County, to 50 ft. above MSL in Okaloosa County and to 70 ft. above MSL in Santa Rosa County.

Water levels have steadily declined since water production began. Since pre-development times, water levels in the Floridan Aquifer have been lowered throughout all of Santa Rosa and Okaloosa counties and about half of Walton County. Heads are presently below MSL throughout much of coastal Santa Rosa, Okaloosa and Walton counties. At its lowest, the potentiometric surface is depressed as much as 150 ft. below MSL. This head reversal reflects a maximum loss of about 200 ft. The net result of water level declines is a regionally significant cone of depression.

Within the three counties, the cone of depression has grown in an asymmetrical fashion. Head declines are greatest (both areally and vertically) in the western half of the Region. The asymmetrical growth is driven by the relatively higher recharge in Walton County, as compared to Santa Rosa and Okaloosa counties. Heads in northern Walton County are virtually unaffected by current pumping elsewhere in the region.

The substantial depression of the potentiometric surface puts wells in coastal parts of the Region at risk for saltwater intrusion. Along the coastline, areas exist with naturally occurring ground waters that exceed drinking water standards. These areas include much of coastal Santa Rosa and Walton counties. For example, along Santa Rosa Island, sodium exceeds its standard from the vicinity of the Santa Rosa/Okaloosa county line west to Gulf Breeze and beyond. On the mainland, at Navarre, sodium is near its standard. In the Tiger Point area, both sodium and chloride have concentrations around 500 mg/L. In a large area of Walton County south of Choctawhatchee Bay, both sodium and chloride are at or above their respective water quality standards. In addition, at some unknown distance south of the Gulf shoreline, Floridan Aquifer ground water everywhere south of Okaloosa County exceeds sodium and chloride standards. As a result, the 250 mg/L isochlor may be conceptualized as a broad, shallow arc, onshore in coastal Santa Rosa County, offshore south of Okaloosa County, and onshore again in coastal Walton County.

All of these areas with poor quality water are hydraulically up-gradient of the center of the cone of depression. Ground water from these areas is presently flowing toward the cone of depression. To date, water produced from the Floridan Aquifer in coastal Region II has been little effected by the deterioration of water quality. Prior to the cessation of their use, water from Navarre Beach wells was regularly exceeding the sodium standard (160 mg/L) and experiencing increasing chloride concentrations. In coastal Walton County, selected wells owned by Florida Community Services Corp. have experienced increases in both sodium and chloride concentrations. Elsewhere, temporal concentration trends are relatively stable.

Continuation of the cone will eventually result in more widespread deterioration of water quality in supply wells and is, therefore, unsustainable. These factors lead to the current level of concern about the Region's ground water resources. As a consequence, long-term alternatives and options for new sources of water are needed to alleviate or prevent future problems anticipated with the continued use of the Floridan Aquifer in coastal areas. However, systems located in the transition zone very near to the non-potable portions of the Floridan Aquifer have already been impacted.

Chapter 2
METHODS

Overview

This Chapter describes the methodologies that were employed to develop and analyze information used in the preparation of the RWSP. For estimating future water needs, the project utilized previous estimates from the NWFWMD *District Water Supply Assessment* (Ryan et al. 1998). Examination of existing water sources and source options relied upon a number of information sources and techniques to estimate amounts of water potentially available within the 20-year planning horizon.

Water Demand Projection Methods

Future water demands through the year 2020 were prepared for six individual water use categories: public supply, domestic self-supplied and small public supply systems, commercial-industrial self-supplied, power generation, recreational irrigation and agricultural irrigation. This information was developed in 1997 and 1998, with the primary data collection and water demand projections being developed by the U.S. Geological Survey and the University of Florida in support of the NWFWMD *District Water Supply Assessment* (Ryan et al. 1998).

The methodologies used to project future average water demand for the various water users in northwest Florida are summarized below. Also included below are descriptions of the methods used to determine water needs during a 1-in-10 year drought to address the "level-of-certainty planning goal" of meeting the water supply needs of existing and future reasonable-beneficial uses during this type of drought condition. Additional details about specific methodologies used for the water demand projections can be found in the documents titled: *Water Use Trends and Demand Projections in the Northwest Florida Water Management District* (Marella et al. 1998); and *Projected Water Demand by Agriculture in the Northwest Florida Water Management District* (Moss and deBodisco 1998).

Public Supply

Projections for public supply water use were developed through the use of mathematical curve-fitting techniques. This method used historical water use and population data to develop growth curves, then extended the curves to arrive at future values. The results of six different projection curves were analyzed statistically to determine which projection is most appropriate for the given utility. These projections were calculated for all utilities that used more than 0.10 Mgal/d in 1995 or that were projected to reach 0.10 Mgal/d by 2020.

Domestic Self-supply and Small Public Supply Systems

Projections for Domestic Self-Supplied and Small Public Supply Systems populations were made by subtracting the estimated county population that obtains water from

public supply systems from the total county population. This assumes the remaining population to be self-supplied or served by small public supply systems that are below 0.10 Mgal/d (systems not accounted for under Public Supply). The water use for Domestic Self-Supplied and Small Public Supply Systems was then calculated by assuming that the population not on Public Supply used the same average amount of water (per capita) as the portion of the population on Public Supply in a county.

Commercial-Industrial Self-Supply

Projections for the major self-supplied commercial-industrial facilities were provided directly by the users. In this region, this water use category addresses five facilities: Air Products and Chemicals, Inc. and Sterling Fibers, Inc. in Santa Rosa County; Eglin Air Force Base and Hurlbert Field in Okaloosa County; and Perdue Farms, Inc. in Walton County.

Recreational Irrigation

Projections for golf course irrigation water use were made by applying an application rate of 30 inches per acre to the number of acres irrigated in each county. This rate was generated from the AFSIRS computer model (Smajstrla 1986) and is estimated to be for the average year.

Agricultural Irrigation

The University of Florida IFAS prepared future water demand projections for Agricultural Irrigation, based on econometric principles and historical agricultural water use trends. This work included development of historical estimates of agricultural water use in the NWFWMD from 1970 through 1995 and projection of future water needs through 2020. Historical water use was derived from data available from the Census of Agriculture, the Florida Agricultural Statistical Service and pumping records maintained by the District. There are very few acres of irrigated farmland in Santa Rosa, Okaloosa, and Walton counties.

Thermoelectric Power Generation

Projections for the five major power plants in northwest Florida were provided directly by the users. There are no power generation facilities in Santa Rosa, Okaloosa, or Walton counties.

Level-of-Certainty Analysis for Assessing Drought Condition Water Demands

With the passage of Chapter 97-100, Laws of Florida, during the 1997 Legislative Session, the Florida Legislature placed a series of new water supply planning requirements into Chapter 373, F.S., including a section stating:

> "*The level-of-certainty planning goal associated with identifying the water supply needs of existing and future reasonable-beneficial uses shall be based upon meeting those needs for a 1-in-10 year drought event*." (Section 373.0361(2)(a)1., F.S.)

During drought events, certain factors come into play when determinations must be made concerning availability of water to meet the needs of both permitted users and the natural systems. First, in drought conditions, demands will increase for certain water uses such as Agricultural Irrigation and outdoor water use (landscape irrigation). Indoor water uses, Commercial-Industrial and Thermoelectric Power Generation uses do not tend to increase as a result of drought conditions.

Second, in certain circumstances, drought conditions can reduce the amount of water that is available for withdrawal from a given source without causing harm to natural systems. This tends to be most applicable to surface water supply sources (rivers and lakes/reservoirs) and aquifers that, because of their geologic characteristics, tend to fluctuate widely in response to short-duration climatic events.
Estimating the increased water needs during drought conditions is relatively easy for the Agricultural Irrigation and Recreational Irrigation water use categories. However, increased outdoor water use demands, associated with the Public Supply and Domestic Self-Supplied and Small Public Supply Systems, are quite difficult to estimate, as appropriate data are not available. However, guidance on this issue was provided by the 1-in-10 year Drought Subcommittee of the statewide Water Planning Coordination Group. This subcommittee, composed of staff from the five water management districts and the FDEP, examined alternative methods for estimating drought related demand increases. The committee concluded for the public supply and domestic self supply and small public supply systems water use categories, that a factor of six percent above average yearly demand would suffice for the purposes of the WSA (Vergara 1998).

Screening and Methods of Water Source Options Analysis

Various traditional and alternative water supply source options were examined to determine whether and to what extent each potential source or demand reduction technique (e.g. conservation) could be utilized to address the future water needs of the region. The options examined include:

- Ground Water
- Reclaimed Water
- Conservation
- Surface Water
- Aquifer Storage and Recovery
- Desalination

The examination of options generally involved two steps: first, an initial screening-level analysis was performed to consider if an option would be technically and environmentally favorable, and if costs would be prohibitive. If an alternative appeared to be competitive and passed the first screening level, a second, more thorough analysis, developed planning-level cost estimates and estimates of the quantity of water potentially available through the option. As a basis of comparison, all cost estimates were expressed in equivalent annual cost terms in dollars per 1,000 gal. The individual options examined and the methods used to perform screening and/or detailed examination of each option are outlined below.

Coastal Floridan Aquifer Sources

As coastal populations have increased, so to has the demand for water. Historically, demand for Floridan Aquifer water has grown inside the coastal population footprint. Traditionally, water is produced not far from where it is consumed. As such, the coastal portion of the Floridan Aquifer is considered to be the traditional source of supply for the various coastal communities.

As a starting point for the analysis of water supply source options, it was assumed that, for the coastal area as a whole, no significant Floridan Aquifer withdrawal increases would be allowed, over and above current levels. Beyond this assumption, the only additional analysis necessary was to estimate the portion of current withdrawals that is sustainable from this traditional source. Unfortunately, efforts to more accurately assess the threat of saltwater intrusion and the sustainability of current coastal withdrawals are not complete and have only recently begun.

In the absence of having a completed solute transport model, the existing flow model was used to assess the impact of various utilization scenarios. These include steady state simulation of current (1998) conditions, an estimate of currently permitted withdrawals, and a projection of 2020 Floridan Aquifer demands. A series of simulations was also performed that entailed systematic reductions in coastal zone Floridan Aquifer pumping, thereby reducing total demand on the Floridan Aquifer. This series of simulations is intended to provide insight into the effect of developing alternatives to a portion of coastal Floridan Aquifer pumping, at such time as this strategy is required. As a part of the work effort, 1998 pumpage rates were assembled for all Region II Floridan Aquifer users with permitted average daily withdrawal rates of 50,000 gal/d or greater.

Inland Floridan Aquifer Sources

The Floridan Aquifer in the interior of Region II is both a traditional and an alternate source of water. It is a traditional source for inland utilities and an alternate source for coastal utilities. For inland utilities, withdrawals have historically taken place in close proximity to where water was needed. More recently, coastal utilities have sought permits to withdraw water in the interior and transport it to the coast. As the coastal Floridan Aquifer has limited capacity to provide additional water over current withdrawals, the inland portions of the aquifer are the only viable source of "new" water from this source.

Analyses of potential future withdrawal scenarios from inland Floridan Aquifer sources were performed using the Region II ground water flow model. A series of simulations was run to assess the impact of new inland Floridan Aquifer pumping on head and drawdown. Comparisons were made between new Floridan Aquifer withdrawals and the projected 2020 Floridan Aquifer demands. For these simulations, available water from the Floridan Aquifer was evaluated in 5 Mgal/d. increments (approximately 10 percent of the current Region II Floridan Aquifer withdrawals) up to 20 Mgal/d. Additional simulations involved relocating pumpage from the coastal zone to inland areas north of Eglin AFB. These simulations hold the Region II Floridan Aquifer pumpage constant, but

predict the effect of developing inland well fields to replace a portion of the coastal pumping. The primary screening-level constraints were water availability and costs.

Sand-and-Gravel Aquifer

The potential use of the Sand-and-Gravel Aquifer as an alternate supply option for Region II involved two areas of interest. One area is the coastal portion of the Region south of Eglin AFB and the other area lies between the Blackwater and Yellow rivers. For the area south of Eglin AFB, reasonable assumptions on the potential yield were made based on existing information regarding the hydrogeology of the Sand-and-Gravel Aquifer and the hydraulic capabilities of the Aquifer. For the area between the Blackwater and Yellow rivers, basic water budget techniques and existing hydrogeologic data were used to identify potential source areas in the inter-river region, where the Sand-and-Gravel Aquifer receives appreciable recharge. Withdrawals from the Sand-and-Gravel Aquifer were considered in 5 Mgal/d increments. A primary screening-level constraint was implemented by limiting withdrawals to amounts believed not to effect (1) base flows in adjacent rivers and (2) ongoing wellfield plans.

Conservation

Water conservation practices evaluated were based on utility data within Region II, as well as conservation practices in general. Post, Buckley, Schuh & Jernigan (PBS&J 2000c) estimated cost data and quantities of water saved from conservation practices. The analysis looked at current practices within the larger utilities in the region and provided an estimate of additional water that could be conserved by implementing various procedures. In most cases, individual utilities within the region have already implemented or plan to implement extensive conservation practices. As part of the analysis, the additional amount of water that could be provided from conservation on a regional basis, as well as the additional conservation costs, were estimated. The primary objective of this screening analysis was to determine if the amount of water saved from additional conservation would be a significant factor in replacing Floridan Aquifer sources, or meeting future demands. As previously discussed for other regional water supply source options, the analysis was constrained by considering increased production of water in 5 Mgal/d (approximately 10 percent of current regional withdrawals) increments. This same criteria was used for conservation as a cutoff to determine if more detailed analysis would be needed on a regional basis.

Reclaimed Water

Analysis of the use of reclaimed water (treated wastewater, also referred to as reuse) was based on data from the larger utilities within the coastal region of Santa Rosa, Okaloosa, and Walton counties. The analysis (PBS&J 2000d) looked at current practices and availability of treated wastewater and suggested ways additional wastewater could be utilized to further reduce Floridan Aquifer withdrawals. In some cases, individual utilities within the region have already implemented, or plan to implement, extensive reclaimed water practices. The screening level analysis was based on an estimate (5 Mgal/d) of the quantity of reuse water that could be used to replace Floridan Aquifer (potable water supply) sources. Reuse was examined further through development of planning level

cost data and cost comparisons with other water source options in Region II, as well as the costs of reuse in other parts of Florida.

Surface Water

The use of surface water was evaluated on the basis of available statistical data on flows from the USGS data bases, water quality data and analysis (PBS&J 2000e) and cost data (PBS&J 2000b, 2000e). Yield estimates were in 5 Mgal/d increments and developed on the basis of treating surface water from either the Choctawhatchee River or the Yellow River, assuming each was capable of a sustainable supply (up to 20 Mgal/d), and meeting minimum flow requirements. Historical flow records and chemical analysis data were available from both river systems to assess the physical and chemical constraints upon use of surface water from either of these sources. Surface water was also analyzed in conjunction with its use for ASR within Region II. The primary screening-level criteria were the costs of treatment and transport of water from the source. As an initial level analysis the preliminary cost data developed did not include reservoir requirements and added costs that would be required for reconfiguring local distribution (or possibly blending) systems to handle a single point source of water.

Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) was evaluated on the basis of: (1) surface water data and analysis sources PBS&J (2000a, 2000b), (2) data available for ground water sources (HGL, Inc., 2000 and PBS&J 2000c), and (3) data and analysis available for the use of the coastal Sand-and-Gravel Aquifer (Clabaugh 1999) as an ASR water source. A screening-level process for ASR projects developed by (CH2M HILL 1997) was utilized for preliminary screening analysis. ASR becomes economically less feasible on a cost per gallon basis as the amount of water needed to be stored or used declines. In general, ASR needs to be capable of supplying at least 5 Mgal/d. Thus, ASR was evaluated in conjunction with water sources that would have periods of excess supply to meet the minimum amount of water for effective diversion into ASR systems.

Desalination

Desalination of sea water or brackish ground water was evaluated on the basis of: (1) a literature search for existing reverse osmosis and membrane technology, (2) literature-based unit cost estimates for existing or planned desalination plants in Florida and elsewhere, (3) source water quality, and (4) a screening tool involving demand economics and water quality related resource constraints developed by the St. Johns River Water Management District (CH2M HILL 1998). Water quality data was acquired from testing of a Lower Floridan Aquifer brackish water source within Region II regarding the use of the Floridan for desalination (Baskerville-Donovan, Inc. and Camp Dresser & McKee, Inc. 1997).

Chapter 3
WATER SUPPLY DEVELOPMENT COMPONENT

Overview

According to Section 373.0361(2), F.S., each RWSP must include a "water supply development component" that includes:

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

2. *A list of water source options for water supply development, including traditional and alternative sources, from which local government, government-owned and privately-owned utilities, self-suppliers, and others may choose, which will exceed the needs identified in subparagraph 1.*

3. *For each option listed in subparagraph 2., the estimated amount of water available for use and the estimated costs of and potential sources of funding for water supply development.*

4. *A list of water supply development projects that meet the criteria in s. 373.0831(4).*

This chapter identifies the water supply needs of Region II and provides analysis of the source options for meeting future water needs, including both traditional and alternative water sources. Estimates of the amounts of water available from the various sources and costs of obtaining water from each source are provided.

Water Supply Needs

The following is a description of NWFWMD's water supply needs in Region II for the 20-year planning period.

Public Supply

Public supply is the largest water use category in Region II, accounting for an average of approximately 37.0 Mgal/d or 63 percent of total regional water use in 1995. Okaloosa County Water and Sewer is the Region's single largest public water supplier, with an average withdrawal of 6.8 Mgal/d in 1995. The majority of public supply water use is within the Region's coastal area, which is a popular tourist destination and is more heavily populated than the Region's northern, inland portions. Overall, the regional population is projected to increase by 49 percent from 1995's population of 292,213 to 442,351 in 2020 (Ryan et al. 1998). In 1995, the Region's southern portion, identified by the District as an Area of Special Concern (ASC), used an average of approximately 24.3 Mgal/d for public supply compared to approximately 12.8 Mgal/d used in the remainder of the Region.

Domestic Self-Supply and Small Public Supply Systems

Domestic self-supply and small public supply systems water use accounts for only a small percentage (five percent or 3.1 Mgal/d) of total water use within Region II. In 1995, an average of approximately 2.3 Mgal/d was used in the Region II ASC and another 0.9 Mgal/d was used in the remainder of the Region.

Commercial-Industrial Self-Supplied

In 1995, the commercial-industrial self-supplied water use category accounted for an average of approximately 11.8 Mgal/d or about 20 percent of the Region's total water use. The majority of this water was used within the non-ASC in Santa Rosa County. Major Commercial-Industrial users in Region II include Eglin Air Force Base (AFB) in Okaloosa County (predominately the Floridan Aquifer), Air Products and Sterling Fibers (Cytec) in Santa Rosa County (Sand-and-Gravel Aquifer), and Perdue Farms (Showell) in Walton County (Floridan Aquifer).

Recreational Irrigation

Recreational irrigation water use accounted for approximately 5.43 Mgal/d or nine percent of the Region's total water use in 1995. The majority of water used for recreational irrigation, an average of approximately 4.56 Mgal/d in 1995, was used by golf courses located in the southern portion of the Region. Some of the Region's golf courses use treated wastewater effluent (reuse water) for all or part of their irrigation demands.

Agricultural Irrigation

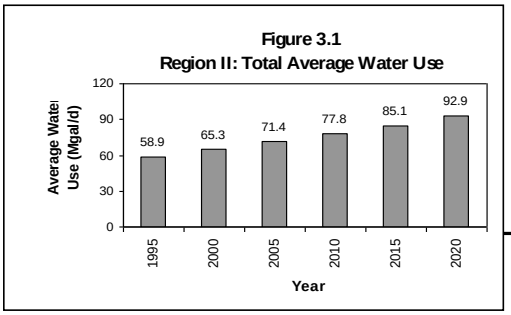
Agricultural irrigation in 1995 used approximately 1.5 Mgal/d, accounting for approximately three percent of the Region's total average water use. The vast majority of water use in this category took place in Okaloosa County (1.2 Mgal/d). Nurseries and corn crops were the Region's primary users of water for agricultural irrigation.

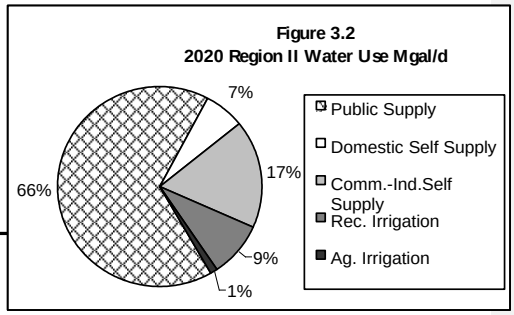
Power Generation

No water is used for Power Generation within Region II.

Reasonably-Anticipated Future Needs for Each Water Use Category Through 2020

Based on the WSA, the Region's average water use is projected to increase from approximately 58.9 Mgal/d in 1995 to 92.9 Mgal/d in the year 2020, an increase of approximately 58 percent (Figure 3.1). Public supply is expected to be the largest water use category in Region II through 2020 (Figure 3.2).



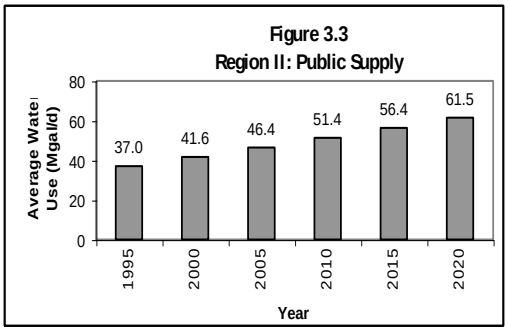


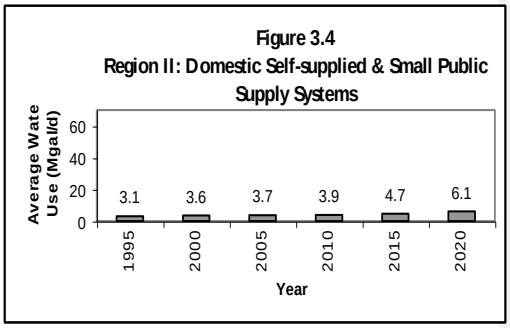
Public Supply

Water use projections indicate that public supply will continue to be the predominant water use category within Region II through the year 2020. Regional water use projections suggest that use will increase approximately 66 percent from an average 37.0 Mgal/d in 1995 to 61.5 Mgal/d in 2020 (Figure 3.3). The majority of public supply water use is projected to occur within the southern portion of Okaloosa and Santa Rosa counties.

Domestic Self-Supply and Small Public Supply Systems

The amount of water used in Region II for domestic self-supply and small public supply systems is expected to almost double between 1995 and 2020 from 3.1 to 6.1 Mgal/d (Figure 3.4). In addition, the percentage of the Region's population dependent upon this water use category is projected to increase from approximately eight percent in 1995 to almost nine percent in 2020.



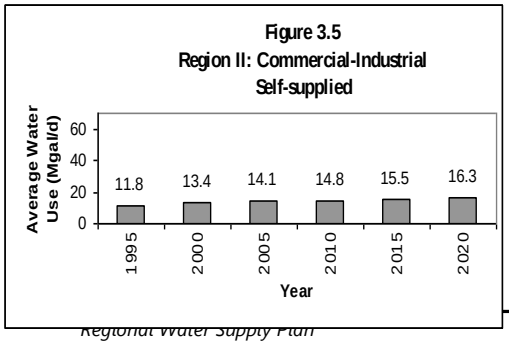


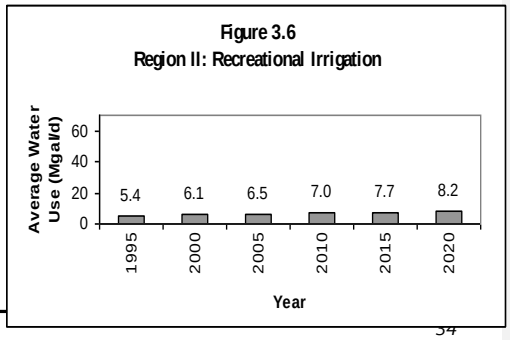
Commercial-Industrial Self-Supplied

The commercial-industrial water use category is projected to increase 38 percent from 11.8 Mgal/d in 1995 to 16.3 Mgal/d in 2020 (Figure 3.5). The majority of commercial-industrial water use will continue to occur in the non-ASC portion of Santa Rosa County (8.2 Mgal/d).

Recreational Irrigation

Water used for recreational irrigation is projected to increase by approximately 52 percent from 1995 (5.4 Mgal/d) to 2020 (8.2 Mgal/d) (Figure 3.6).





Agricultural Irrigation

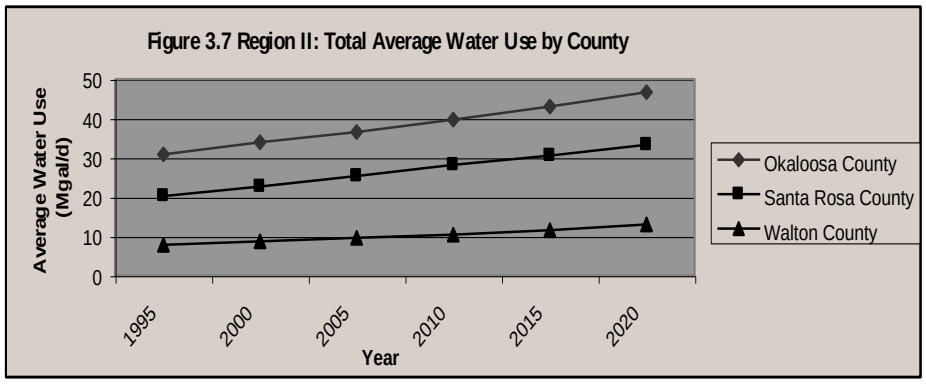
Projections indicate that agricultural irrigation will remain a small component of the Region's water use, accounting for one percent of total regional water use in 2020 (0.8 Mgal/d).

Power Generation

There is no water use projected for power generation within Region II.

Future Needs by County Through 2020

Figure 3.7 and Table 3.1 illustrate projected total average water use by county through 2020. Okaloosa County accounts for the majority of water use in Region II with an average total usage of approximately 30.9 Mgal/d in 1995 to 46.7 Mgal/d in 2020. Public supply is the County's largest water use category, accounting for approximately 21.9 Mgal/d in 1995 and increasing to 32.6 Mgal/d in 2020. Water use in Santa Rosa County is projected to increase by approximately 65 percent from an average usage of approximately 20.2 Mgal/d in 1995 to 33.3 Mgal/d in 2020. Public supply is Santa Rosa County's largest water use category, accounting for 11.5 Mgal/d in 1995 and 21.1 Mgal/d in 2020. Although accounting for only a small percentage of total regional water use, Walton County water use is projected to almost double between 1995 and 2020 from 7.8 Mgal/d to 13 Mgal/d. Walton County's largest water use is public supply, accounting for



4.4 Mgal/d in 1995 and increasing to 7.9 Mgal/d in 2020.

	Santa Rosa County		Okaloosa County		Walton County		Regional Total	
Water Use Category	1995	2020	1995	2020	1995	2020	1995 Total	2020 Total
Public Supply	11.5	21.1	21.2	32.6	4.4	7.9	37.0	61.5
Domestic/Small Public	0.8	0.9	1.9	3.8	0.5	1.4	3.1	6.1
Commercial-Industrial	6.2	8.2	4.0	6.3	1.6	1.7	11.8	16.3
Recreational Irrigation	1.5	2.6	2.6	3.7	1.3	1.9	5.4	8.2
Agricultural Irrigation	0.2	0.5	1.2	0.3	0.1	0.1	1.5	0.8
Power Generation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	20.2	33.3	30.9	46.7	7.8	13.0	58.9	92.9

As discussed previously, Chapter 373, F.S., has language that identifies a planning goal to ensure that adequate supplies of water are available during drought conditions. The statute states:

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

The Table below identifies the Region's estimated future water supply needs for a 1-in-10 year drought event. These estimates were developed utilizing the methodology outlined in Chapter 2.

Table 3.2 Region II: Estimated Water Demand During Drought Conditions (Mgal/d)

	2000	2005	2010	2015	2020
Water Use Category					
Public Supply	44.1	49.8	54.5	59.8	65.2
Domestic /Small Public	3.9	4.0	4.2	5.0	6.5
Commercial-Industrial	13.4	14.1	14.8	15.5	16.3
Recreational Irrigation	7.8	7.8	8.4	9.2	9.9
Agricultural Irrigation	1.7	1.8	2.0	2.1	2.3
Power Generation	0.0	0.0	0.0	0.0	0.0
Total	70.9	77.5	83.9	91.6	100.2
Increase Over Average Daily Demand	5.0	5.4	6.0	6.5	7.2

Current Sources and Future Needs For Public Supply Through 2020

The traditional sources of water supply in Santa Rosa, Okaloosa, and Walton counties are the Floridan and Sand-and-Gravel aquifers, with the majority of the water being withdrawn from the Floridan Aquifer. The Floridan Aquifer is the primary water supply source throughout Walton County, Okaloosa County and the southeastern coastal portion of Santa Rosa County. The Sand-and-Gravel Aquifer is the primary water supply source throughout the remainder of Santa Rosa County.

In Santa Rosa County where the Sand-and-Gravel Aquifer is the primary source for water supply, the aquifer is fully capable of providing a sustainable supply of water to meet the projected 2020 demands. However, under present pumping conditions, the Floridan Aquifer is susceptible to saltwater encroachment in the coastal part of Region II. To address this threat, the District is currently developing, in cooperation with the three counties and coastal utilities dependent on Floridan Aquifer withdrawals, a density-dependent, solute transport model. The model, when completed, will be used to assess the severity of the saltwater encroachment problem and determine the sustainability of current Floridan Aquifer withdrawal patterns.

Due to the threat of saltwater intrusion, utilities in the coastal area have begun to implement plans to procure water from other sources. All of the current efforts by larger utilities to develop non-traditional sources are focused on inland ground water sources. This strategy is consistent with the recommendations of previous NWFWMD water supply planning efforts. The utilities are now in various stages of developing ground water supplies from inland areas located outside of their respective coastal zone service areas. Development of alternate sources will help these utilities meet future water demands and will enable them to minimize future coastal zone pumping from the Floridan Aquifer.

Public supply is and will continue to be the dominant water use category through the year 2020. Basic water system information is provided with a more detailed discussion (including major water supply initiatives undertaken in recent years) for the coastal utilities reliant on the Floridan Aquifer. This discussion includes (1) the currently utilized sources, (2) the major water supply initiatives to develop alternative sources in recent years, and (3) a projection of 2020 Floridan Aquifer demands assuming current trends (see Appendix B).

Utilities in Santa Rosa County

Santa Rosa County has 13 water supply utilities that use more than 0.05 Mgal/d, as identified in Table 3.3 below. The "coastal" utilities are those located within the Water Resource Caution Area on Fair Point Peninsula and Santa Rosa Island south of Eglin AFB (Figure 3.8). Coastal utilities obtain water from a combination of sources including; purchases of Sand-and-Gravel Aquifer water from Escambia County Utilities Authority (ECUA), Sand-and-Gravel Aquifer water obtained within the utilities' service areas and the Floridan Aquifer. The dependence of the coastal utilities on the Floridan Aquifer has raised questions about the long-term sustainability of that portion of the water supply. In contrast, the "inland" utilities are primarily dependent on the Sand-and-Gravel Aquifer, which is capable of providing for the 2020 demands in a sustainable manner.

Table 3.3 Santa Rosa Co. Public Supply Demand Projections & Permitted Water U

Utilities	1995 Demand Average Daily Flow (Mgal/d)	Current CUP[1] (Mgal/d)	Projected 2020 Demand (Mgal/d)	Difference Between 2020 demand and CUP [surplus or (deficit)] (Mgal/d)	Projected 2020 Floridan Aquifer Demand[5] (Mgal/d)
Coastal					
Gulf Breeze[2]	0.79	N/A	1.11	N/A	0.00
Holley-Navarre	1.48	2.20	3.73	(1.53)	0.93
Midway	0.71	2.52	1.47	1.05	0.57
Navarre Beach[3]	0.27	0.35	0.43	(0.08)	0.00
S. Santa Rosa Utility System[4]	0.79	N/A	1.44	N/A	0.00
Sub-total	**4.04**	**5.07**	**8.18**		**1.50**
Inland					
Bagdad/Garcon	0.39	0.43	0.70	(0.27)	-
Berrydale	0.21	0.21	0.43	(0.22)	-
Chumuckla	0.27	0.44	0.43	0.01	-
East Milton	0.77	1.69	1.85	(0.16)	0.37
Jay	0.28	0.29	0.27	0.02	-
Milton	1.98	2.71	2.64	0.07	-
Moore Creek/Mt. Carmel	0.31	0.52	0.62	(0.10)	-
Pace	2.59	3.52	4.68	(1.16)	-
Sub-total	**6.80**	**9.81**	**11.62**		**0.37**
County Total	**10.84**	**14.88**	**19.80**		**1.87**

[1]CUP = Consumptive Use Permit

[2]Gulf Breeze purchases water from ECUA.

[3]Navarre Beach has an emergency allocation CUP but is currently purchasing water from Midway.

[4]South Santa Rosa Utility System purchases water from Midway.

[5]Assumes current trends (see Appendix B for Floridan Aquifer 2020 demand projections).

Figure 3.8

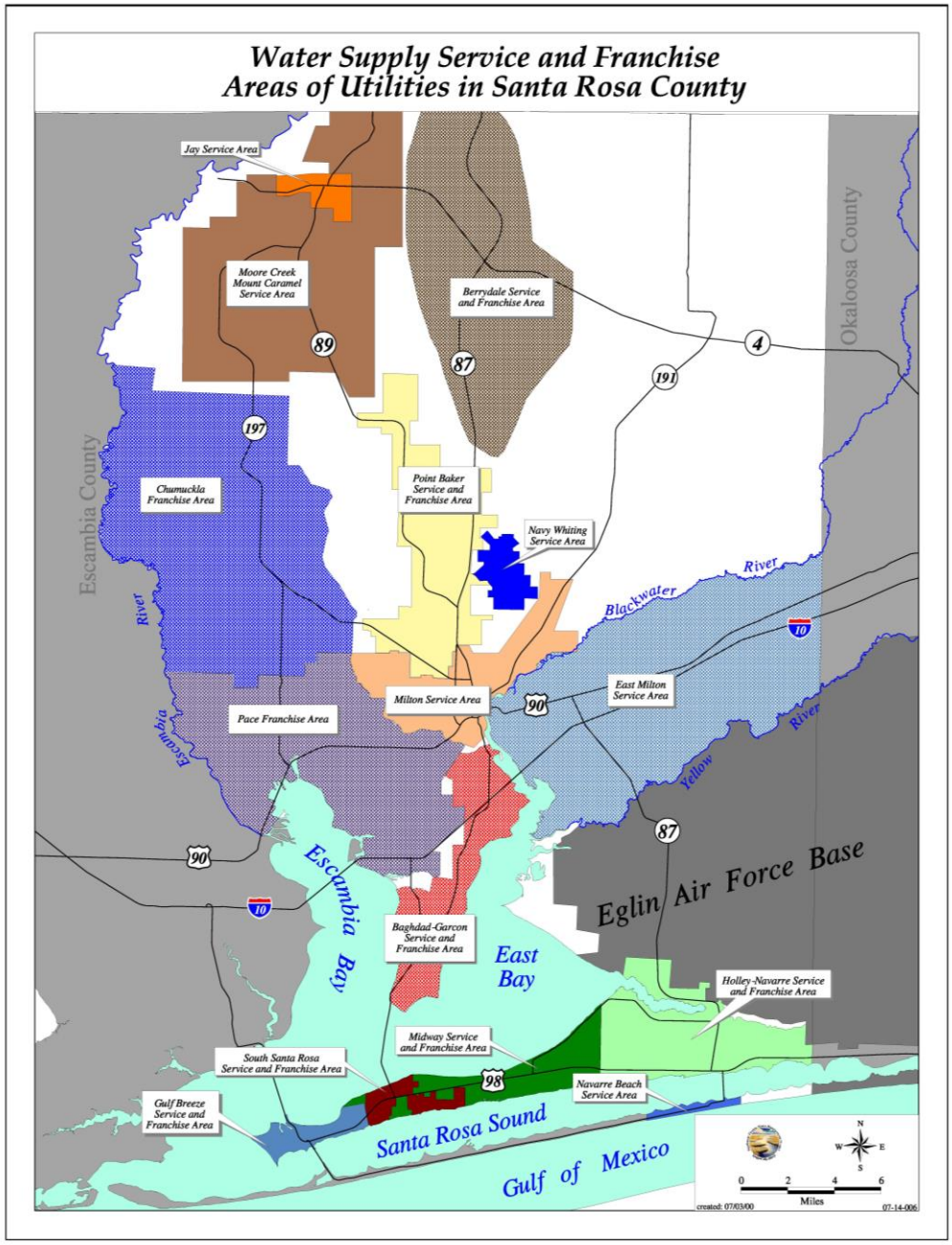
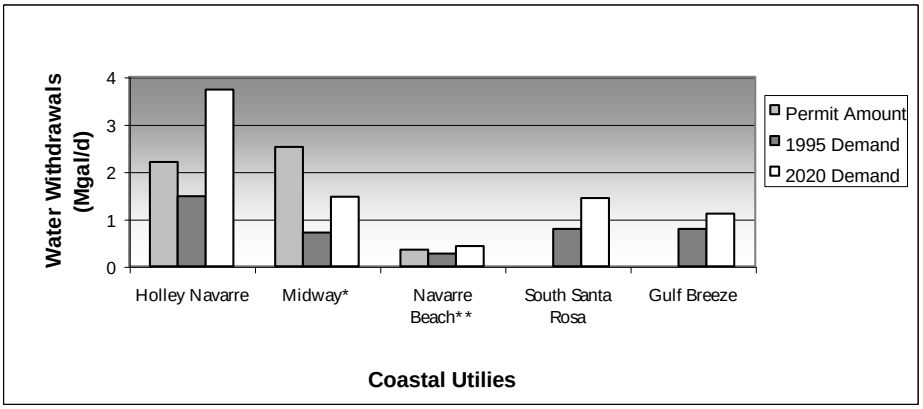

Water Supply Service and Franchise Areas of Utilities in Santa Rosa County
Jay Service Area
Moore Creek Mount Caramel Service Area
Berrydale Service and Franchise Area
Okaloosa County
Escambia County
Chumuckla Franchise Area
Point Baker Service and Franchise Area
Navy Whiting Service Area
Blackwater River
East Milton Service Area
Milton Service Area
Pace Franchise Area
Escambia River
Yellow River
Eglin Air Force Base
Escambia Bay
East Bay
Baghdad-Garcon Service and Franchise Area
Holley-Navarre Service and Franchise Area
Midway Service and Franchise Area
South Santa Rosa Service and Franchise Area
Navarre Beach Service Area
Gulf Breeze Service and Franchise Area
Santa Rosa Sound
Gulf of Mexico
89
87
4
191
197
90
10
98
N
W
E
S
0 2 4 6
Miles
created: 07/03/00
07-14-006

Figure 3.9 Santa Rosa County Coastal 1995 Water Demand, 2020 Projected Water Demand and Current Permit Amount



* The permit amount is also to meet the demands of Navarre Beach and South Santa Rosa Utility System.
** Permitted for emergency withdrawals.

Holley-Navarre

1995 Water Usage:	*1.48 Mgal/d*	**2000 CUP:**	*2.2 Mgal/d*
2020 Proj. Water Usage:	*3.73 Mgal/d*	**Permit Expires:**	*07/03*
Wells Operating:	*4 Floridan*	**Water Source:**	*Floridan/S&G*

Notes: *Modifying permit to allow 0.3 Mgal/d from Sand-&-Gravel Aquifer. Projected 2020 water deficit to be mitigated by participation in FRUS.*

The Holley-Navarre Water System, Inc. water franchise area extends from the western boundary of Holley-by-the-Sea to the Okaloosa County line. In 1997, it served 6,418 residential and 257 commercial connections. At 2.67 persons per residential connection, the population is estimated to be 17,136 (WFRPC 1999). The area is rapidly developing and water demands are projected to more than double by the year 2020. Holley-Navarre has joined with the City of Gulf Breeze and Midway to form the Fairpoint Regional Utility System (FRUS). The partnership is seeking to construct Sand-and-Gravel Aquifer wells on the east side of SR 87, south of Interstate 10 and north of the Yellow River. The inland wells would be used to meet the coastal area's future water needs and provide for reductions in coastal Floridan Aquifer water withdrawals.

In 1997, District staff discussed with Holley-Navarre's board the need to put an end to further withdrawals from the Floridan Aquifer, as well as the need to initiate development of Sand-and-Gravel Aquifer water resources. Based on these discussions, Holley-Navarre agreed to proceed with a test well and exploratory program to examine the feasibility of developing the Sand-and-Gravel Aquifer at a site within the Holley-Navarre service area (south of East Bay) and at a site north of East Bay. In 1999, the District performed a Sand-and-Gravel Aquifer test boring to evaluate the location of Holley-Navarre well #3 as a site for construction of a test well. Holley-Navarre constructed a test well at the site of Holley-Navarre well #4 to determine the capability

of the aquifer to support a production well. The District is in the process of modifying Holley-Navarre's Consumptive Use Permit (CUP) to authorize the withdrawal of 0.3 Mgal/d from the Sand-and-Gravel Aquifer.

Midway

1995 Water Usage:	*0.71 Mgal/d*	**2000 CUP:**	*2.52 Mgal/d*
2020 Proj. Water Usage:	*1.47 Mgal/d*	**Permit Expires:**	*01/04*
Wells Operating:	*2 Floridan/2 S&G*	**Water Source:**	*Floridan/S&G*

Notes: *2 Floridan wells (61 percent of production), 2 S&G wells (39 percent of production). Possible reactivation of one S&G well owned by South Santa Rosa Utility System.*

Midway Water System, Inc.'s service area extends 12 miles along SR 98 between the South Santa Rosa Utility System (SSRUS) service area and the western edge of Holley-by-the-Sea. Midway served 3,276 residential and 112 commercial connections in early 1998 (WFRPC 1999). It also provides approximately 75 percent of SSRUS's water supply. At 2.69 persons per residential connection, the estimated population for the service area is 8,812 (BEBR 1998). The large difference between Midway's permitted amount and demand is the result of Midway's arrangements to deliver water to both SSRUS and Navarre Beach. Midway's service area is growing rapidly and projected to double its water demands by 2020. To meet these future demands, Midway is in partnership with Gulf Breeze and Holley-Navarre (Fairpoint Regional Utility System).

Midway has hardware connections to all of its neighboring utility systems. Midway has four interconnections with SSRUS, a 12-inch interconnection with Gulf Breeze, and a recently opened connection with Navarre Beach. Two of the interconnections with SSRUS are used daily. Midway and Holley-Navarre are currently working on two proposed emergency water connections between the two utilities.

In 1997, Midway agreed to explore development of the Sand-and-Gravel Aquifer within its service area to meet the future needs of its service area and those of Navarre Beach. The District, at that time, informed Midway that future authorization for expanded use of the Floridan Aquifer should not be expected. In 1998, water started to flow from the Midway Water System to Navarre Beach through a recently completed 7,400 ft., $2 million pipeline across Santa Rosa Sound. This project resulted in the discontinued use of three coastal Floridan Aquifer wells, as required by the District. In 1999, Midway began considering reactivating a Sand-and-Gravel Aquifer well owned by SSRUS. This well has an estimated capacity of approximately 550 gal/min. Midway has also constructed a Sand-and-Gravel Aquifer test well in the vicinity of the Garcon Point Bridge and US 98. Initial tests indicated that the proposed production well could have a capacity of 500 gal/min. These wells are needed to meet Navarre Beach's peak demand, and the activation of these wells should result in the discontinuation of all normal use of the Navarre Beach coastal wells. In January 2000, the District approved Midway's use of a Sand-and-Gravel Aquifer production well (Midway well #4).

Navarre Beach

1995 Water Usage:	*0.27 Mgal/d*	**2000 CUP:**	*0.35 Mgal/d*
2020 Proj. Water Usage:	*0.43 Mgal/d*	**Permit Expires:**	*05/03*
Wells Operating:	*2 Floridan*	**Water Source:**	*Midway WS*

Notes: *Midway supplies all water, Floridan Aquifer wells are for emergency use only*

The Navarre Beach Utility System provides water service to four miles of Santa Rosa Island between Gulf Isles National Seashore and Eglin AFB properties. In 1997, Santa Rosa County officials informed the District of their intention to discontinue the regular use of Navarre Beach's Floridan Aquifer wells. The discontinuation of the Floridan Aquifer use was encouraged by a CUP issued by the District in 1994. A subsequent CUP modification called for only emergency withdrawals from the Floridan Aquifer, the construction of a pipeline to Santa Rosa Island and for Navarre Beach to obtain water from inland sources. Navarre Beach Utility System has a 12-inch interconnection with Midway, and will most likely remain a customer of a mainland utility system unless developing technology makes other options feasible.

Fairpoint Regional Utility

1995 Water Usage:	*NA*	**2000 CUP:**	*NA*
2020 Proj. Water Usage:	*6.3 Mgal/d*	**Permit Expires:**	*NA*
Wells Operating:	*None permitted*	**Water Source:**	*S&G Aquifer*

Notes: *No retail customers at present. Inland S&G wellfield (7 wells anticipated) and pipeline under design.*

Fairpoint Regional Utility System (FRUS) is comprised of the City of Gulf Breeze, Midway Water System and Holley-Navarre Water System. Although not a FRUS member, the Santa Rosa County Board of County Commissioners (Navarre Beach) will receive water from the utility and is currently upgrading its wastewater treatment facility with four additional sprayfields and expanding its reuse program. In 1998, Eglin AFB granted Holley-Navarre, Midway and South Santa Rosa Utility System preliminary approval to build a pipeline through the Eglin Reservation along SR 87. In 1998, FRUS filed a CUP application, now under review, to construct 7 Sand-and-Gravel Aquifer wells in Santa Rosa County north of Eglin AFB. The application proposes to withdraw an average of 6.68 Mgal/d (later revised to 6.3 Mgal/d), and to pipe water approximately 15 miles to the Fair Point Peninsula. In 1999, the District received a $328,000 grant from the Environmental Protection Agency to be used for the engineering and design of the inland Sand-and-Gravel wellfield and transmission pipeline for coastal Santa Rosa County. The estimated cost of the project is $19 million, and is projected to be online in

mid-2002. The District has already received $2.85 million in federal funds to aid in the construction of the wellfield and associated transmission facilities.

Utilities in Okaloosa County

Okaloosa County has 16 utilities that use more than 0.05 Mgal/d, as identified in Table 3.4 below. Fifteen of the 16 utilities use the Floridan Aquifer as their sole and traditional source of supply. Ft. Walton Beach primarily uses the Floridan Aquifer but also obtains some of its supply from the Sand-and-Gravel Aquifer. The Sand-and-Gravel supply is used for irrigation purposes only.

The "coastal" utilities are those within the Water Resource Caution Area located south of Eglin AFB (Figure 3.10). Inland utilities that utilize the Floridan Aquifer will be able to continue use of their traditional supply sources through the planning timeframe. The coastal utilities, however, will need to continue development of currently planned alternative sources while the ongoing study assessing the threat of saltwater intrusion and sustainability of coastal ground water withdrawals is completed.

Table 3.4 Okaloosa County Public Supply Demand Projections & Permitted Water Use

Utilities	1995 Demand Average Daily Flow (Mgal/d)	Current CUP[1] (Mgal/d)	Projected 2020 Demand (Mgal/d)	Difference between2020 demand and CUP [surplus or (deficit)] (Mgal/d)	Projected 2020 Floridan Aquifer Demand[3] (Mgal/d)
Coastal					
Destin Water Users	2.83	3.39	4.96	(1.57)[2]	2.01
Ft. Walton Beach	3.29	4.08	4.45	(0.37)	3.97
Niceville	2.80	3.03	4.82	(1.79)	4.82
Seminole Community	0.11	0.11	0.09	0.02	0.11
Valparaiso	0.62	0.86	0.64	0.22	0.86
Mary Esther	0.77	0.72	0.93	(0.21)	0.93
OCWS -- Garniers	5.19	6.25	7.21	(0.96)	4.50
OCWS -- Bluewater	1.03	1.56	1.52	(0.04)	1.52
OCWS -- West	0.56	0.81	0.93	(0.12)	0.81
Sub-total	**17.20**	**20.81**	**25.55**		**19.53**
Inland					
Auburn	1.11	1.40	2.03	(0.63)	2.03
Baker	0.16	0.25	0.26	(0.01)	0.26
Crestview	2.04	3.71	3.14	0.57	3.14
Holt	0.09	0.13	0.14	(0.01)	0.14
OCWS -- Mid-County	0.33	3.61	0.78	2.83	3.61
Milligan	0.14	0.16	0.45	(0.29)	0.45
Laurel Hill	0.13	0.17	0.19	(0.02)	0.19
Sub-total	**4.00**	**9.43**	**6.99**		**9.82**
County Total	**21.20**	**30.24**	**32.54**		**29.35**

[1]CUP = Consumptive Use Permit

[2]Deficit should be addressed by water provided by South Walton Utilities.

[3]Assumes current trends (see Appendix B for Floridan Aquifer 2020 demand projections).

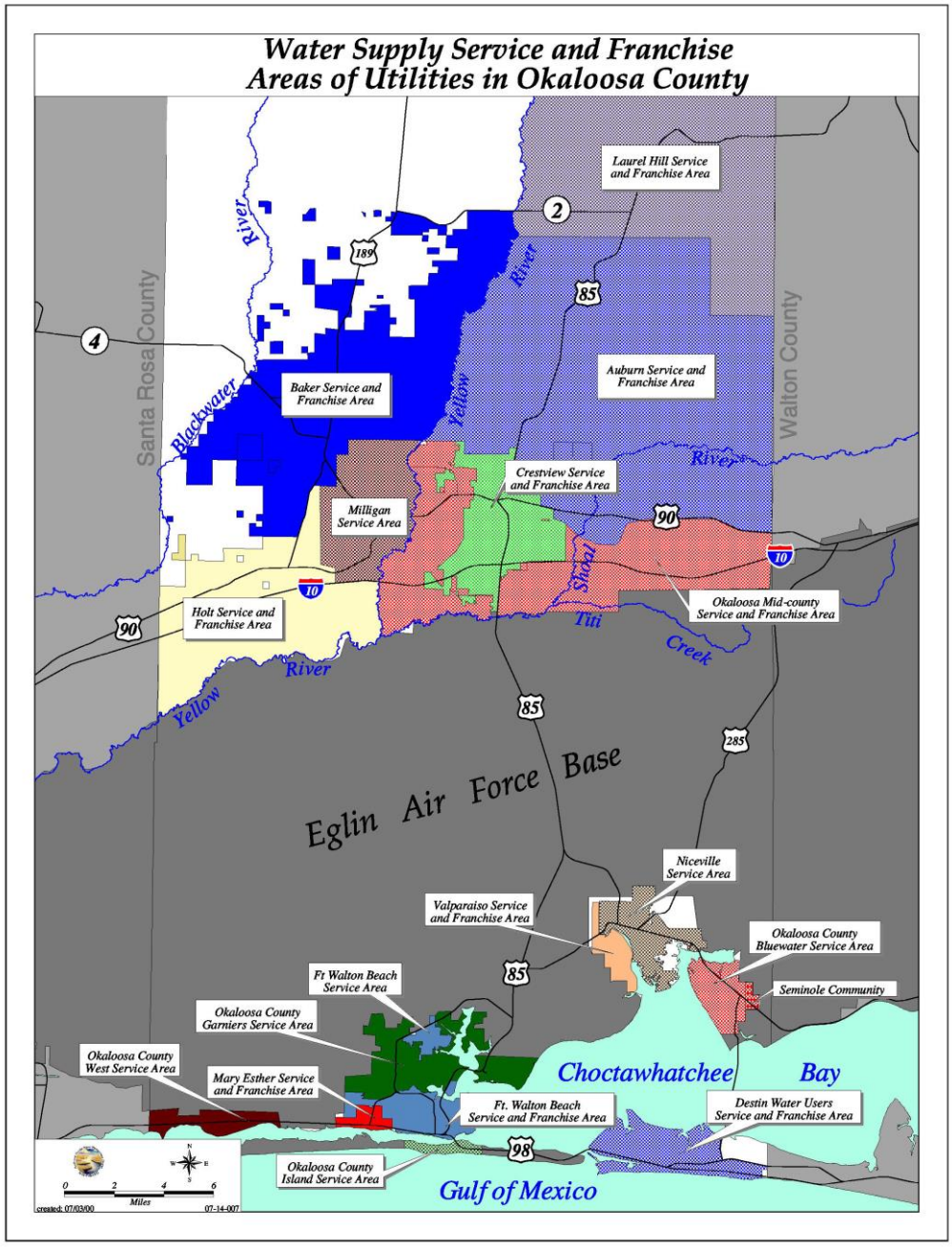
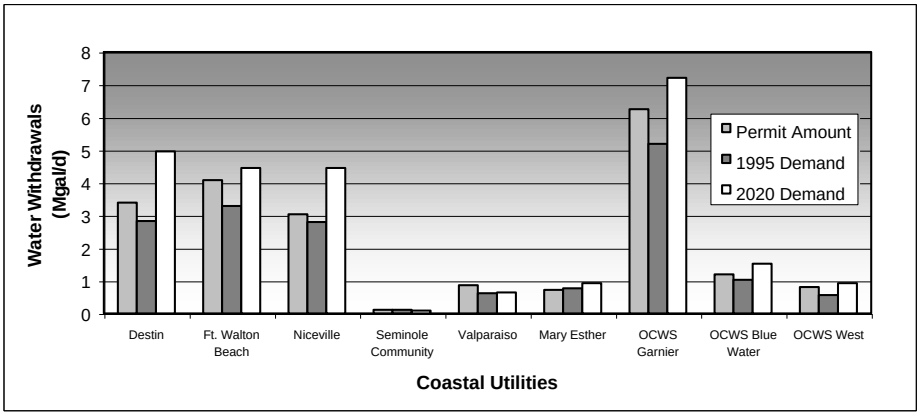

Water Supply Service and Franchise
Areas of Utilities in Okaloosa County
Laurel Hill Service and Franchise Area
Auburn Service and Franchise Area
Baker Service and Franchise Area
Crestview Service and Franchise Area
Milligan Service Area
Holt Service and Franchise Area
Okaloosa Mid-county Service and Franchise Area
Niceville Service Area
Valparaiso Service and Franchise Area
Okaloosa County Bluewater Service Area
Seminole Community
Ft Walton Beach Service Area
Okaloosa County Garniers Service Area
Okaloosa County West Service Area
Mary Esther Service and Franchise Area
Ft. Walton Beach Service and Franchise Area
Destin Water Users Service and Franchise Area
Okaloosa County Island Service Area
Eglin Air Force Base
Choctawhatchee Bay
Gulf of Mexico
Santa Rosa County
Walton County
Blackwater River
Yellow River
Shoal River
Titi Creek
0 2 4 6
Miles
created: 07/03/00
07-14-007

Figure 3.10

Figure 3.11 Okaloosa County Coastal 1995 Water Demand, 2020 Projected



Water Demand and Current Permit Amount

Destin Water Users, Inc.

1995 Water Usage:	*2.83 Mgal/d*	**2000 CUP:**	*3.39 Mgal/d*
2020 Proj. Water Usage:	*4.96 Mgal/d*	**Permit Expires:**	*06/02*
Wells Operating:	*7 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *2020 water deficit to be mitigated by water purchase from SWUC Rock Hill inland wellfield.*

Destin Water Users, Inc. (DWU) provides water service to the eastern end of Moreno Point except for two small areas north and south of Hwy 98. In 1998, DWU served 5,354 residential, 895 commercial, and 6,063 condominium and hotel connections (WFRPC 1999). Recent data estimate the City of Destin's population at 11,363 (BEBR 1999).

In 1997, the District issued a CUP to DWU requiring the implementation of extensive water efficiency and conservation measures. The District also expressed concern regarding continued withdrawals from the Floridan Aquifer and issued a permit to WRP, Inc. to provide for DWU's future water needs. DWU provides a growing percentage of the reclaimed water generated in the service area. In addition, DWU has developed a list of potential users waiting for reclaimed water and an implementation schedule for connecting them. DWU, along with South Walton Utility Company (SWUC), will pump water from Freeport through an existing Florida Community Service Corporation (FCSC) water main. The water will originate from the SWUC Floridan Aquifer wellfield located north of Freeport. DWU and SWUC will build the necessary water distribution system to connect their wells to FCSC's pipeline.

Ft. Walton Beach

1995 Water Usage:	*3.29 Mgal/d*	**2000 CUP:**	*4.08 Mgal/d*
2020 Proj. Water Usage:	*4.45 Mgal/d*	**Permit Expires:**	*11/02*
Wells Operating:	*14*	**Water Source:**	*Floridan/S&G*

Notes: *Investigating additional S&G Aquifer use for public supply needs. Wells: 9 Floridan Aquifer, 5 Sand-& Gravel Aquifer.*

The City of Ft. Walton Beach (est. pop. 22,000) is bordered by Mary Esther and Eglin AFB on the west, by Cinco Bayou on the north, by Choctawhatchee Bay on the east, and by Santa Rosa Sound on the south. Ft. Walton Beach serves its own municipality, the Town of Cinco Bayou and the Eglin Highway Subdivision. Ft. Walton Beach has interconnections with Okaloosa County and (for emergency service only) the City of Mary Esther. Ft. Walton Beach obtains its water from nine Floridan Aquifer and five Sand-and-Gravel Aquifer wells. The Floridan wells are used to meet public water use demands and to irrigate several public access areas, while the Sand-and-Gravel wells are used for backup irrigation purposes. Ft. Walton Beach proposed utilizing reclaimed water and the Sand-and-Gravel Aquifer to replace some of its present non-potable uses of the Floridan Aquifer. Ft. Walton Beach presently provides reclaimed water to a golf course and a sprayfield. Ft. Walton Beach is in the process of identifying alternate water supplies. Ft. Walton Beach has reduced water loss by refitting inaccurate and inoperative customer meters and, according to the utility, has reduced withdrawal from the Floridan by 16 percent over the last ten years through increased conservation efforts.

Niceville

1995 Water Usage:	*2.80 Mgal/d*	**2000 CUP:**	*3.03 Mgal/d*
2020 Proj. Water Usage:	*4.82 Mgal/d*	**Permit Expires:**	*04/04*
Wells Operating:	*9 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Developing plan to use Turkey Creek water for local irrigation.*

The City of Niceville (est. pop. 12,000) encompasses approximately 10 square miles south of Eglin AFB between Valparaiso and Boggy Bayou. In 1998, Niceville served 5,930 residential, 348 commercial and 53 public building connections (WFRPC 1999). Additionally, Niceville served 507 residential, 43 commercial and six schools/churches for irrigation purposes only (WFRPC 1999). To help relieve demand on the Floridan Aquifer, Niceville is developing a plan to draw water from Turkey Creek for irrigation of nearby medians and parks. Niceville has a water interconnection agreement with the City of Valparaiso, which includes four- and six-inch lines for emergency use.

Seminole Community

1995 Water Usage:	*0.11 Mgal/d*	**2000 CUP:**	*0.11 Mgal/d*
2020 Proj. Water Usage:	*0.09 Mgal/d*	**Permit Expires:**	*03/01*
Wells Operating:	*5 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Initiated water conservation measures.*

Seminole Community Center operates a public supply system in southern Okaloosa County. The system consists of five Floridan Aquifer wells serving approximately 315 residential connections and nine commercial connections. Seminole Community has also initiated water conservation measures such as increasing water rates to reduce indiscriminate use, and providing water conservation tips to customers.

Valparaiso

1995 Water Usage:	*0.62 Mgal/d*	**2000 CUP:**	*Under Review*
2020 Proj. Water Usage:	*0.64 Mgal/d*	**Permit Expires:**	*Under Review*
Wells Operating:	*4 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Initiated water conservation measures.*

The City of Valparaiso (est. pop. 7,000) operates a public water system in southern Okaloosa County consisting of four Floridan Aquifer wells. In 1998, Valparaiso served 1,675 residential and 121 commercial connections (WFRPC 1999). Valparaiso has implemented several water conservation measures, including an ordinance awarding developers density and intensity land use bonuses for using treated wastewater, or other low-water methods for irrigation, or for using low-water demand plants in their landscaping. Valparaiso has two interconnections with the City of Niceville for emergencies: one four-inch and one six-inch.

Mary Esther

1995 Water Usage:	*0.77 Mgal/d*	**2000 CUP:**	*0.72 Mgal/d*
2020 Proj. Water Usage:	*0.93 Mgal/d*	**Permit Expires:**	*05/05*
Wells Operating:	*4 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Initiated water conservation measures.*

The City of Mary Esther, located between Ft. Walton Beach and Hurlburt Field, encompasses approximately 2.5 square miles in southern Okaloosa County and has an estimated population of 4,400. Mary Esther's water system utilizes four Floridan Aquifer wells with three wells in use at any one time. In 1998, Mary Esther served 1,594 residential and 279 commercial connections (WFRPC 1999). Water conservation

measures include a three-step rate schedule, and evaluation of water losses. Mary Esther has an interconnection agreement and line connection with the City of Ft. Walton Beach, but the interconnection is for emergency use only. Another interconnection with Ft. Walton Beach exists at Santa Rosa Mall to ensure pressurization of the water sprinkler system. The interconnection at the mall could be used in an emergency.

Okaloosa County

1995 Water Usage:		**2000 CUP:**	
Garniers	*5.19 Mgal/d*	**Garniers**	*6.25 Mgal/d*
Bluewater	*1.03 Mgal/d*	**Bluewater**	*1.56 Mgal/d*
West	*0.56Mgal/d*	**West**	*0.81 Mgal/d*
2020 Proj. Water Usage:		**Permit Expires:**	
Garniers	*7.21 Mgal/d*	**Garniers**	*08/00*
Bluewater	*1.52 Mgal/d*	**Bluewater**	*04/05*
West	*0.93 Mgal/d*	**West**	*06/05*
Wells Operating:	*17 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Issued permit for six new inland wells to mitigate projected 2020 water deficit. Wells: 11 Garniers, 3 Bluewater, 3 County West.*

The Okaloosa County Water and Sewer System is comprised of four subregions: Garniers, County West, Bluewater and Mid-County. Garniers, the largest, includes the unincorporated areas between Eglin AFB and the cities of Ft. Walton Beach and Mary Esther as well as the Town of Shalimar. Garniers supplies water to Okaloosa Island via a pipeline across the sound, as Floridan Aquifer wells on Okaloosa Island have been shut down. The Bluewater service area includes unincorporated areas surrounding Niceville and along SR 20 and 293. Okaloosa West serves the unincorporated area along Hwy. 98 between the Santa Rosa County line and Mary Esther. Recent population estimates for the area, done by Florida State University (1997) and Polyengineering (1996), vary from 57,000 to 66,000, respectively. In 1998, Okaloosa County served 22,621 residential and 7,125 nonresidential connections (WFRPC 1999). Okaloosa County has six-inch water interconnections with the Auburn Water System and the cities of Crestview and Ft. Walton Beach to be used in the event of an emergency.

In 1997, District staff discussed with Okaloosa County officials the need to develop alternate water supplies for its future coastal water demands. Okaloosa County agreed to modify its Garniers and Mid-County CUP renewal applications (Mid-County renewed to 03/18) to provide for the development of inland wells and to discontinue the expansion of Floridan Aquifer withdrawals in its coastal system. The District also asked Okaloosa County to form water supply partnerships with other utilities. In 1997, the District issued Okaloosa County a CUP requiring the implementation of extensive water efficiency and conservation measures, as well as the development of alternative water supplies by August 1, 2000.

In 1998, the District issued a long-term CUP to Okaloosa County authorizing the construction of six inland Floridan Aquifer wells and the withdrawal of 3.61 Mgal/d. In

this area the Floridan Aquifer is considered a dependable source of supply due to it being hydraulically isolated from the overlying Sand-and-Gravel Aquifer and associated wetlands. Of the permitted amount, the CUP requires that approximately 60 percent (2.18 Mgal/d) be pumped from the inland wells for use in the coastal service areas. The authorized wells will be constructed north of the Eglin AFB near the City of Crestview. Okaloosa County will construct a pipeline across Eglin AFB along SR 85, a distance of approximately 30 miles, to bring water to its coastal water systems. The project's cost is estimated at over $12 million.

Utilities in Walton County

Walton County has 10 utilities that use more than 0.05 Mgal/d, as identified in Table 3.5 below. The "coastal" utilities are those within the Water Resource Caution Area located south of Eglin AFB (Figure 3.10). Nine of the ten utilities use the Floridan Aquifer as their sole and traditional source of supply. Inlet Beach has one Floridan Aquifer well and one Intermediate System well.

Inland utilities that utilize the Floridan Aquifer will be able to continue use of their traditional supply sources through the planning timeframe. The coastal utilities, however, will need to continue development of currently planned alternative sources while the ongoing study assessing the threat of saltwater intrusion and sustainability of coastal ground water withdrawals is completed.

Table 3.5 Walton County Public Supply Demand Projections & Permitted Water Use

Utilities	1995 Demand Average Daily Flow (Mgal/d)	Current CUP[1] (Mgal/d)	Projected 2020 Demand (Mgal/d)	Difference between2020 demand and CUP [surplus or (deficit)] (Mgal/d)	Projected 2020 Floridan Aquifer Demand (Mgal/d)[3]
Coastal					
Freeport	0.29	2.33	0.60	1.73	2.33
Inlet Beach	0.07	0.09	0.24	(0.15)	0.21
FCSC[2] (Regional Utilities)	0.72	0.30	2.16	(1.86)	0.30
North Bay Water Co.	0.13	0.08	0.17	(0.09)	0.17
S. Walton Utility Company	1.80	7.29	3.18	4.11	6.12
Sub-total	**3.01**	**5.25**	**6.35**		**9.13**
Inland					
Argyle	0.06	0.08	0.08	0.00	0.13
DeFuniak Springs	1.00	1.08	1.14	(0.06)	1.14
Mossy Head	0.08	0.17	0.15	0.02	0.15
Paxton	0.20	0.27	0.18	0.09	0.30
Sub-total	**1.34**	**1.60**	**1.55**		**1.72**
County Total	**4.35**	**6.85**	**7.90**		**10.85**

[1]CUP = Consumptive Use Permit

[2]Water deficit made up by water purchases from Freeport.

[3]Assumes current trends (see Appendix B for Floridan Aquifer 2020 demand projections).

Figure 3.12

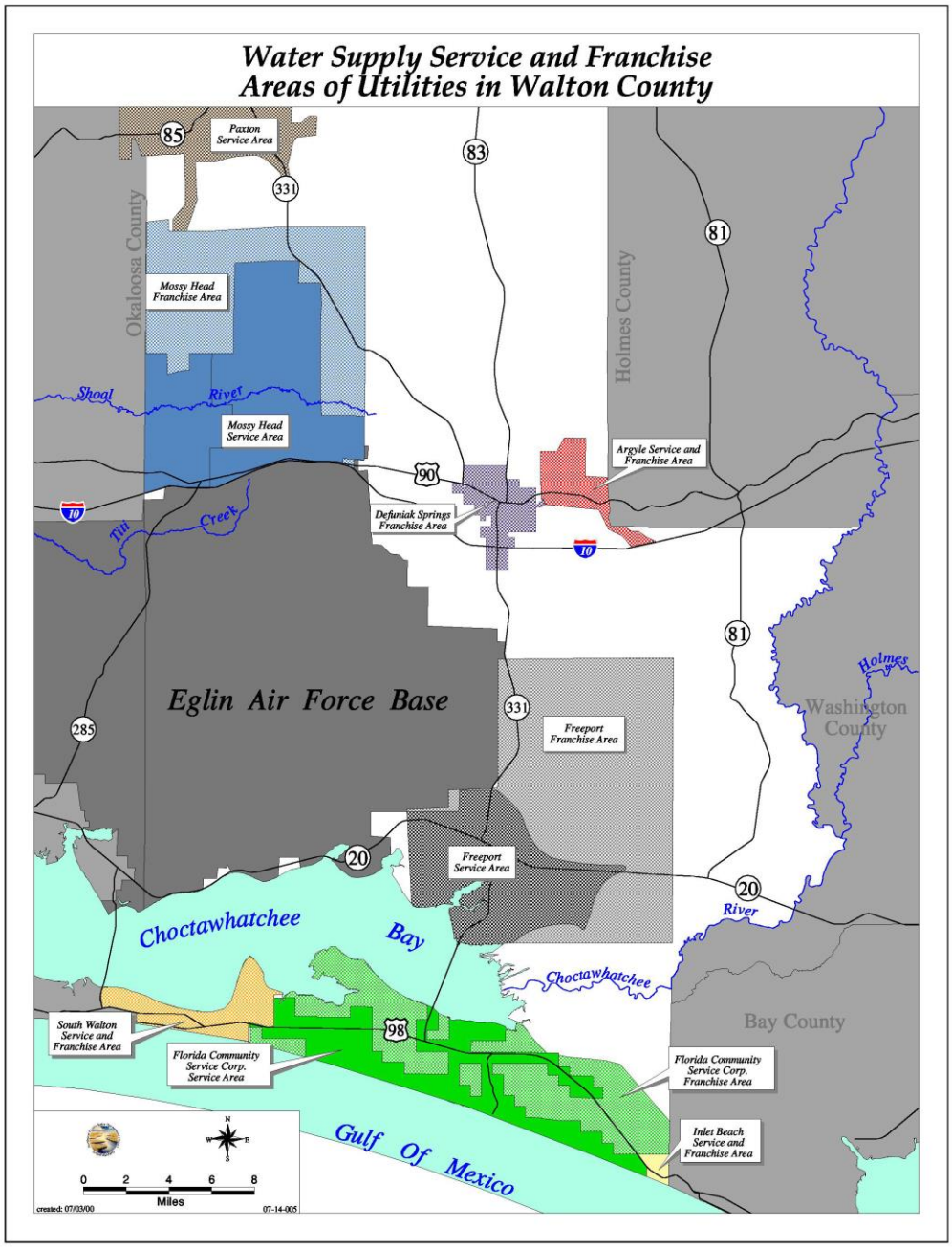
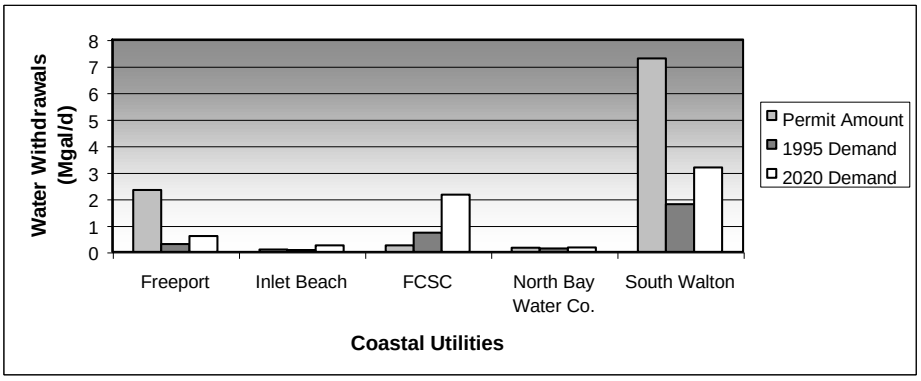

Water Supply Service and Franchise Areas of Utilities in Walton County
Paxton Service Area
Okaloosa County
Mossy Head Franchise Area
Shoal River
Mossy Head Service Area
Holmes County
Argyle Service and Franchise Area
Defuniak Springs Franchise Area
Till Creek
Eglin Air Force Base
Freeport Franchise Area
Freeport Service Area
Holmes
Washington County
Choctawhatchee Bay
Choctawhatchee River
Bay County
South Walton Service and Franchise Area
Florida Community Service Corp. Service Area
Florida Community Service Corp. Franchise Area
Inlet Beach Service and Franchise Area
Gulf Of Mexico
0 2 4 6 8
Miles
created: 07/03/00
07-14-005

Figure 3.13 Walton County Coastal 1995 Water Demand, 2020 Projected Water Demand and Current Permit Amount



FCSC (Regional Utilities)

1995 Water Usage:	*0.72 Mgal/d*	**2000 CUP:**	*0.30 Mgal/d*
2020 Proj. Water Usage:	*2.16 Mgal/d*	**Permit Expires:**	*06/18*
Wells Operating:	*11 Floridan*	**Water Source:**	*Floridan/Freeport*

Notes: *Water withdrawn from Rock Hill Rd. wellfield 15% by 2005. Three additional wells permitted, waiting on pipeline. Purchases water from Freeport.*

The Florida Community Services Corporation of Walton County, Inc. (FCSC) connects three separate water systems to serve an area that extends east of Sandestin Resort to the Walton/ Bay County line. Accurate population estimates are difficult because the area is unincorporated and much of the population is seasonal. A 1995 population estimate, using the *Regional Utilities Master Plan,* reported 4,665 permanent and 17,812 seasonal residents.

In response to water quality degradation in three wells in March 1998 and the subsequent loss of water production, the Walton County Commission adopted Resolution No. 98-15 declaring a temporary water supply emergency within the FCSC service area. The emergency was limited to the months of May through September of 1998. The resolution stipulated irrigation restrictions throughout the service area and required FCSC to undertake a public information campaign to promote water conservation and water use efficiency. The District also issued Emergency Order No. 98-1 authorizing the transfer of water from the City of Freeport and the South Walton Utility Company. The order also authorized FCSC to take remedial action on existing wells and the conditional construction of two new wells. The District subsequently issued FCSC a 20-year CUP allowing withdrawals up to 0.3 Mgal/d from the Rock Hill Rd. area, and

required FCSC to limit its coastal well withdrawals to emergency back-up use only by December 31, 2005.

South Walton Utility Company

1995 Water Usage:	*1.80 Mgal/d*	**2000 CUP:**	*7.29 Mgal/d*
2020 Proj. Water Usage:	*3.18 Mgal/d*	**Permit Expires:**	*04/01*
Wells Operating:	*7 Floridan*	**Water Source:**	*Inland/Coastal*

Notes: *SWUC has taken over the WRP CUP to develop inland Floridan source near Rock Hill Rd.*

The South Walton Utility Company, Inc. (SWUC) serves the Moreno Point area along Hwy. 98 from just past the eastern boundaries of sections 24 and 25, including Creekwater Bay, Hewitt Point, and Las Robles Grande subdivisions, to the Mid-Bay Bridge and slightly into Okaloosa County in the west. Due to the area's unincorporated status and high percentage of non-permanent residents, accurate population estimates are difficult to make; however in 1998 SWUC served 4,335 residential, 406 commercial, 68 condominium and 12 hotel/motel connections (WFRPC 1999). SWUC has initiated water conservation measures including customer education, more efficient landscaping irrigation and increasing block rates. SWUC also currently has a 100 percent reuse of reclaimed water and provides reclaimed water to developers at no monthly charge. The projected year 2020 water demand is to be met by inland wells and permitted capacity acquired from WRP. SWUC will also provide water to Destin from their inland source. Florida Community Services Corp. provides a water interconnection for emergency use.

Freeport

1995 Water Usage:	*0.29 Mgal/d*	**2000 CUP:**	*4.48 Mgal/d*
2020 Proj. Water Usage:	*0.60 Mgal/d*	**Permit Expires:**	*06/18*
Wells Operating:	*3 Floridan*	**Water Source:**	*Floridan (coastal)*

Notes: *Total of five wells, #1 is being plugged, #5 is being permitted.*

Located between Choctawhatchee Bay and Eglin AFB's southeast corner, the City of Freeport serves an estimated population of 5,600. In addition, Freeport entered into an agreement with Florida Community Services Corporation of Walton County, Inc. (FCSC) in 1996 to provide for the long-term water demands of FCSC's service area. Freeport has been granted a 20-year water use permit authorizing the transport of up to 1.70 Mgal/d to FCSC. This action reduces existing coastal withdrawals in south Walton County by approximately 1.0 Mgal/d.

WRP* (see South Walton Utility Company)

1995 Water Usage:	*NA*	**2000 CUP:**	*NA**
2020 Proj. Water Usage:	*NA*	**Permit Expires:**	*NA*
Wells Operating:	*None*	**Water Source:**	*NA*

Notes: ** WRP, Inc. no longer exists as a permitted utility; the WRP CUP has been transferred to South Walton Utility.*

In 1997 WRP, Inc., (members included Destin Water Users and South Walton Utility Company) completed a test well in the lower Floridan Aquifer to evaluate the feasibility of developing a desalination facility to meet the future water needs of its members. The District contributed $30,000 to this effort. The test results raised concerns about developing a desalination facility and WRP proceeded with the development of inland wells as its sole alternative source of water. Officials representing WRP communicated to the District their intention to explore the construction of wells east of Freeport. As a result of District concerns over WRP's proposed additional withdrawals in the Freeport area, WRP moved its proposed withdrawal site further north to an area at First American Farms near Rock Hill Road. In support of its CUP application, WRP, Inc. conducted an extensive field data collection and numerical modeling program. The modeling entailed development of both flow and solute transport models. This work was used to assess impacts to existing legal users and natural systems. Given the confinement of the Floridan Aquifer, minimal impacts to the Sand-and-Gravel Aquifer and associated wetlands were predicted. Impacts to existing legal users (i.e. drawdown of the potentiometric surface) were determined to be mitigable.

In 1998, the City of Freeport, the City of DeFuniak Springs, Walton County, and Florida Community Services Corporation of Walton County, Inc. (FCSC) filed a petition for an administrative hearing regarding WRP's Rock Hill Road area proposed CUP. The petition questioned whether the proposed WRP CUP was (1) reasonable and beneficial; (2) consistent with the public interest; or (3) interfered with existing uses. In 1999, an administrative hearing judge ruled in favor of the District and WRP, and the District issued WRP a permit (in June 1999) to withdraw 4.84 Mgal/d from the Rock Hill Road wellfield in central Walton County. As part of the permitted amount, up to 1.78 Mgal/d is allocated for coastal reduction of Floridan Aquifer withdrawals. In May 2000, WRP transferred its permit to South Walton Utility Company and WRP ceased to be a permitted entity. South Walton Utility Company (SWUC) will pump water from the Rock

Hill Road wells to an existing FCSC pipeline that traverses Choctawhatchee Bay. The water will originate at Rock Hill Rd. site owned by SWUC. SWUC will build the necessary water lines to connect their wells to FCSC's pipeline north of the bay, and to connect the water utility distribution system to the pipeline south of the bay.

Water Transportation Systems and Utility Interconnections

Although not a water source option, some of the water supply utilities along the coast have pipelines that are interconnected with one or more neighboring utilities. This allows water to be transferred from one utility to another, primarily on a temporary or emergency basis. The size of these interconnections ranges from 4- to 16-inches. Some interconnections allow two-way water flow, while others are only one-directional. The actual interconnections are in the form of valves that need to be turned manually; effecting a water transfer from a closed interconnection usually takes at least two hours. These interconnections have water flow capacities ranging from around 100,000 gal/d for a 4-inch pipe to over 1 Mgal/d for a 12- to 16-inch diameter pipe. Currently four areas have two or more utilities with interconnecting water lines. A series of Region II maps (Figures 3.14-18) shows major pipelines for both potable water and reuse water, and indicates the location of the public water supply wells and the wastewater treatment plants. Any interconnected pipelines between the utilities are also indicated. The interconnected utilities can be grouped as shown below.

Group 1	**Group 2**
Gulf Breeze	Fort Walton Beach
South Santa Rosa	Okaloosa County-Garniers
Midway	Mary Esther
Holley-Navarre	
Okaloosa County-West	

Group 3	**Group 4**
Destin Water Users	Valparaiso
South Walton	Niceville
Regional Utilities	
Freeport	

In addition to the above, Gulf Breeze is connected to and receives water from ECUA, a water supplier outside of Region II (in Escambia County). Okaloosa County Water and Sewer is planning to construct a pipeline within the next two years from Okaloosa County-Garniers to Okaloosa County-West, which would complete a connection between Group I and Group II utilities. This would allow 1 to 2 Mgal/d, at least potentially, from Gulf Breeze (actually Pensacola/Escambia County) to the Ft. Walton Beach area. Long-term possibilities could also include constructing a pipeline between Valparaiso and Okaloosa County-Garniers and building a pipeline connecting Niceville to Okaloosa County-Bluewater Bay. Although not without difficulty, these interconnections would make a physical pipeline connection from Gulf Breeze to just east of Niceville possible.

In practice, the movement of water between certain utilities is much more difficult than the pipeline layout would suggest. Obstacles that will need to be overcome to efficiently begin movement of water across the various utilities within the region on a mass scale include technical, economic, and political issues. Some of these obstacles are as follows:

- pipes and valves would need to be sized properly between each utility exchanging water
- consideration would need to be given to minimize potential negative chemical and physical interactions from mixing Floridan and Sand-and-Gravel Aquifer waters
- there may be considerable cost involved upgrading existing piping and valves to accommodate efficient and larger water transfers
- agreements would need to be established and obtained between various political entities that would benefit from the water sharing

Having such a regionally interconnected system could pose an advantage for future water supply planning efforts, providing, perhaps, a cost effective manner in which to move water to where it would be needed most. The concept of having a regional system of pipelines, incorporating the existing systems, to move water efficiently throughout the coastal area merits a more detailed analysis on both the technical and economic issues.

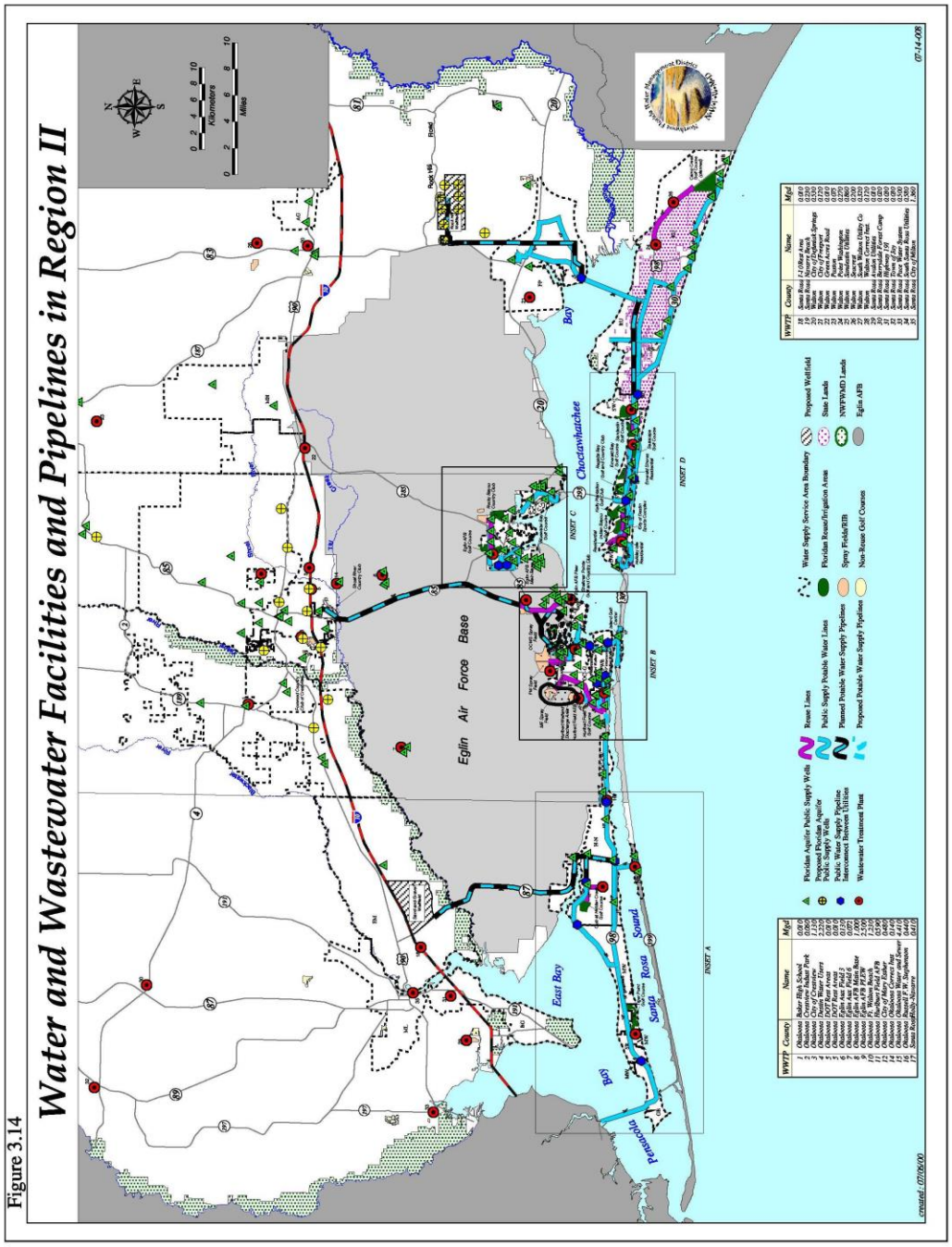
Reclaimed Wastewater Systems

Reuse of treated wastewater, also called reclaimed water, is an important element in the reduction of water used from the Floridan Aquifer within Region II. Most of the wastewater treatment plants within the Region are already treating at least some of their wastewater to levels that allow them to reuse the water for irrigation purposes. Demand for this water has seen a steady rise over the past few years. This demand comes in the form of residential areas, golf courses, parks, schools, and other public areas, that have been able to reap the benefit of having more water to use, with fewer restrictions on their ability to irrigate during dry periods. The single largest demand for using reclaimed water comes from golf courses that lie relatively close to wastewater treatment plants. Figure 3.14 indicates wastewater treatment plants in Region II, along with main distribution pipelines, and shows where reclaimed water is being applied (such as a residential area or a golf course). Golf courses currently not receiving reclaimed water also are shown on the map. The following table gives information on the wastewater plants within Region II, listing the amount of reclaimed wastewater currently being treated.

Table 3.6 Region II WWTP Reuse Summary

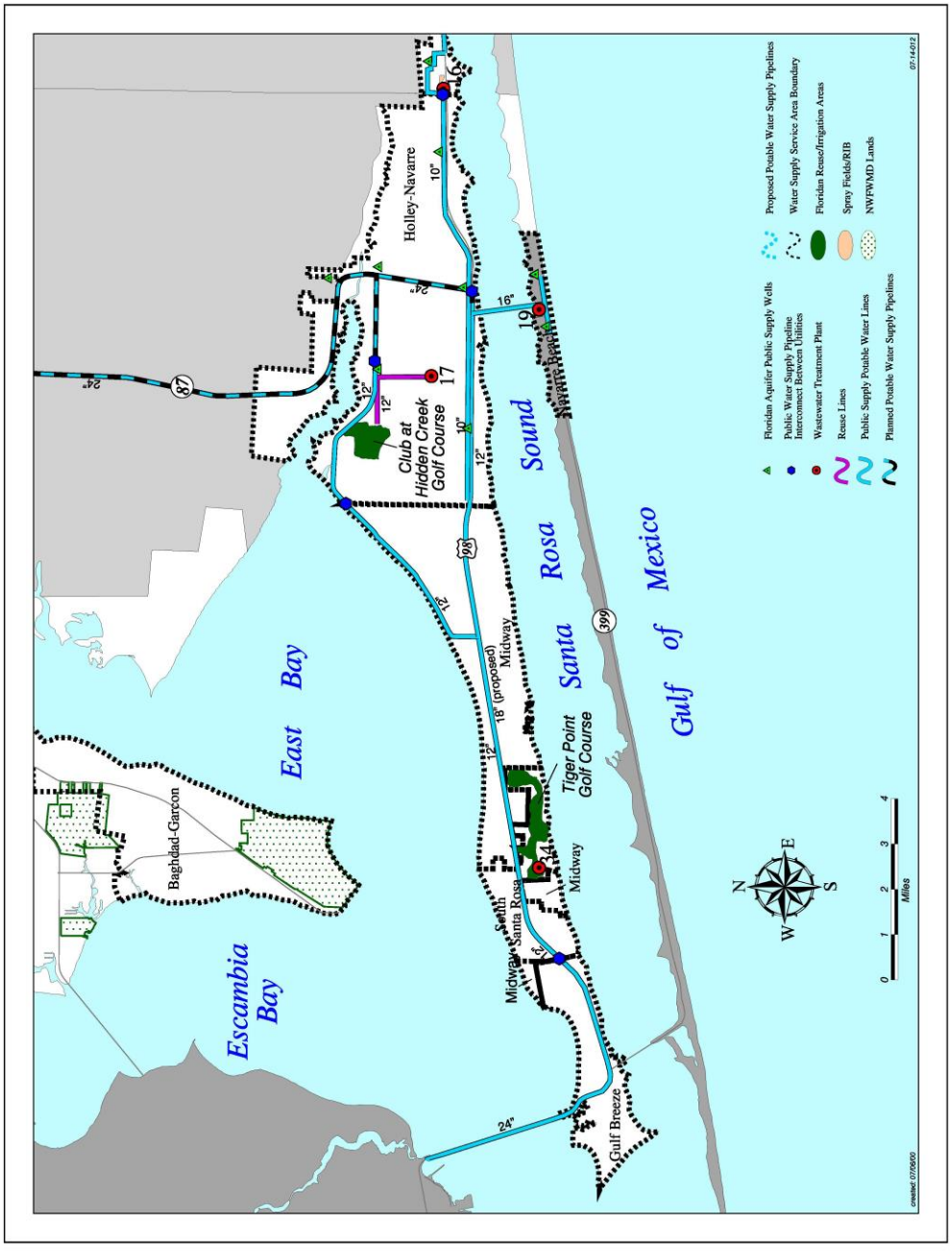
	1998 Flows, Mgal/d	
	Permitted	Actual
Santa Rosa County	7.71	3.79
Okaloosa County	30.42	16.63
Walton County	7.40	2.91
Region II Total	45.53	23.33

Figure 3.14


Water and Wastewater Facilities and Pipelines in Region II
Eglin Air Force Base
Choctawhatchee Bay
East Bay
Santa Rosa Sound
Pensacola Bay
INSET A
INSET B
INSET C
INSET D
Kilometers
Miles
Reuse Lines
Public Supply Potable Water Lines
Planned Potable Water Supply Pipelines
Proposed Potable Water Supply Pipelines
Water Supply Service Area Boundary
Floridan Reuse/Irrigation Areas
Spray Fields/EIFs
Non-Reuse Golf Courses
Proposed Wellfield
State Lands
NWFWMD Lands
Eglin AFB
created: 07/06/00
07-14-00

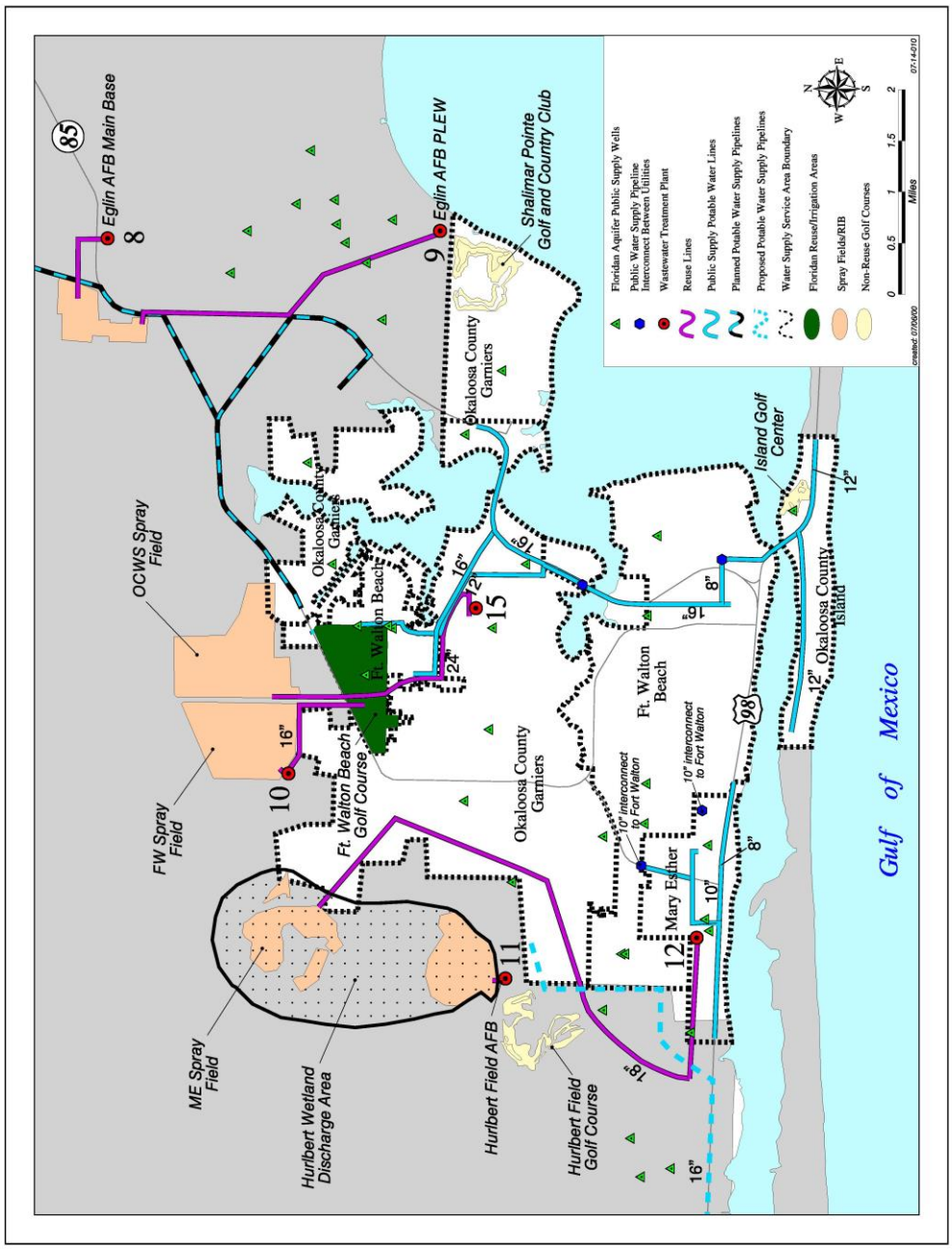
Inset-A

Figure 3.15 Facilities and Pipelines in South Santa Rosa County



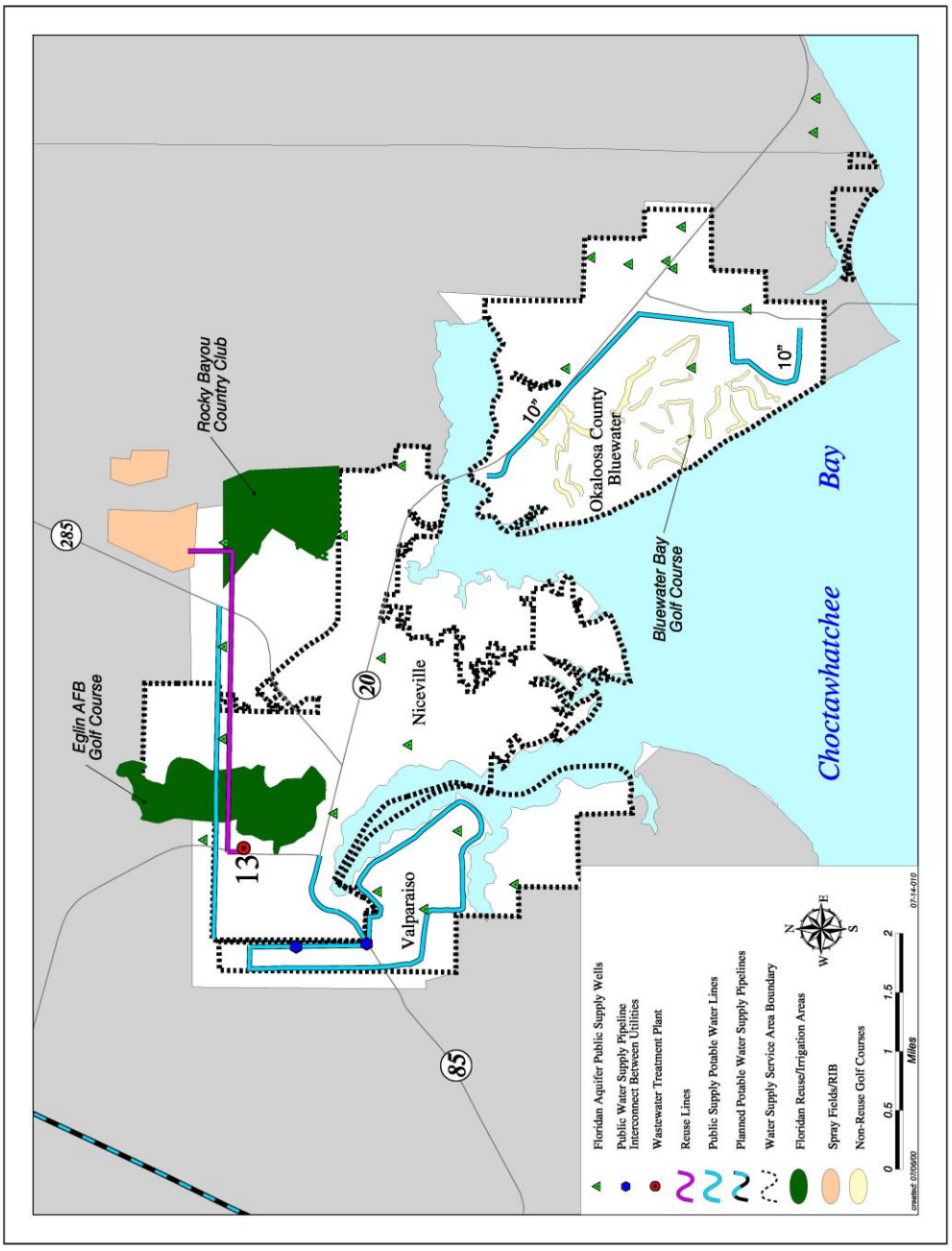
Inset-B

Figure 3.16 Facilities and Pipelines Fort Walton Beach Area



Inset – C

Figure 3.17 Facilities and Pipelines Niceville Area



Inset-D

Figure 3.18

Table 3.7 Region II Utilities with Water Use Projections

Utilities	1995 Demand	Current Consumptive Use Permit (Mgal/d)	Projected 2020 Demand (Mgal/d)	Difference between2020 demand and CUP [surplus or (deficit)] (Mgal/d)	Projected 2020 Floridan Aquifer Demand (Mgal/d)[5]
Santa Rosa County					
Coastal					
Gulf Breeze[1]	0.79	N/A	1.11	N/A	0.00
Holley Navarre	1.48	2.20	3.73	(1.53)	0.93
Midway	0.71	2.52	1.47	1.05	0.57
Navarre Beach	0.27	0.35	0.43	(0.08)	0.00
South Santa Rosa Util.System[2]	0.79	N/A	1.44	N/A	0.00
Sub-total	**4.04**	**5.07**	**8.18**		**1.50**
Inland					
Bagdad/Garcon	0.39	0.43	0.70	(0.27)	--
Berrydale	0.21	0.21	0.43	(0.22)	--
Chumuckla	0.27	0.44	0.43	0.01	--
East Milton	0.77	1.69	1.85	(0.16)	0.37
Jay	0.28	0.29	0.27	0.02	--
Milton	1.98	2.71	2.64	0.07	--
Moore Creek/Mt. Carmel	0.31	0.52	0.62	(0.10)	--
Pace	2.59	3.52	4.68	(1.16)	--
Sub-total	**6.80**	**9.81**	**11.62**		**0.37**
County Total	**10.84**	**14.88**	**19.80**		**1.87**
Okaloosa County					
Coastal					
Destin	2.83	3.39	4.96	(1.57)	2.01
Ft. Walton Beach	3.29	4.08	4.45	(0.37)	3.97
Niceville	2.80	3.03	4.82	(1.79)	4.82
Seminole Community	0.11	0.11	0.09	0.02	0.11
Valparaiso	0.62	0.86	0.64	0.22	0.86
Mary Esther	0.77	0.72	0.93	(0.21)	0.93
OCWS - Garniers	5.19	6.25	7.21	(0.96)	4.50
OCWS - Bluewater	1.03	1.56	1.52	(0.32)	1.52
OCWS - West	0.56	0.81	0.93	(0.12)	0.81
Sub-total	**17.20**	**20.45**	**25.55**		**19.53**
Inland					
Auburn	1.11	1.40	2.03	(0.63)	2.03
Baker	0.16	0.25	0.26	(0.01)	0.26
Crestview	2.04	3.71	3.14	0.57	3.14
Holt	0.09	0.13	0.14	(0.01)	0.14
OCWS - Mid-County	0.33	3.61	0.78	2.83	3.61
Milligan	0.14	0.16	0.45	(0.29)	0.45
Laurel Hill	0.13	0.17	0.19	(0.02)	0.19
Sub-total	**4.00**	**9.43**	**6.99**		**9.82**
County Total	**21.20**	**30.24**	**32.54**		**29.35**
Walton County					
Coastal					
Freeport	0.29	2.33	0.60	1.73	2.33
Inlet Beach	0.07	0.09	0.24	(0.15)	0.21
FCSC (Regional Utilities)[4]	0.72	0.30	2.16	(1.86)	0.30
North Bay Water Co.	0.13	0.08	0.17	(0.09)	0.17
S. Walton Utility Company	1.80	7.29	3.18	4.11	6.12
Sub-total	**3.01**	**5.25**	**6.35**		**9.13**
Inland					
Argyle	0.06	0.08	0.08	0.00	0.13
DeFuniak Springs	1.00	1.08	1.14	(0.06)	1.14
Mossy Head	0.08	0.17	0.15	0.02	0.15

Paxton	0.20	0.27	0.18	0.09	0.30
Sub-total	**1.34**	**1.60**	**1.55**		**1.72**
County Total	**4.35**	**6.85**	**7.90**		**10.85**

[1]Gulf Breeze purchases water from ECUA.
[2]South Santa Rosa Utility System purchases water from Midway.
[3]Deficit should be addressed by water provided by South Walton Utility Company.
[4]Purchases water from Freeport.
[5]Assumes current trends (see Appendix B for Floridan Aquifer 2020 demand projections).

Water Supply Source Options Evaluation

The objective of this plan and the discussion which follows is to provide an evaluation of all possible water supply source alternatives with respect to the individual water source features and water use. The water source options identified are as follows:

- Floridan Aquifer coastal (traditional sources)
- Floridan Aquifer inland
- Sand-and-Gravel Aquifer
- Reuse of Treated Water

- Aquifer Storage and Recovery
- Surface Water
- Desalination
- Conservation

The planning analysis of these water source options is at the first phase or reconnaissance level of study and, hence, designed to identify water resources development activities that deserve further study. As a regional-scale water supply plan, the analysis is also intended to provide sufficient data that describes each water source option listed. This planning phase is not at the detailed project level or feasibility stage that would have to follow for development of desirable water source options.

For the water source options listed it was also necessary to determine if the amount of water available from traditional and alternative sources would exceed the projected regional demands. Analyses of source options include the development of hydrologic data and estimates of the amounts of water that can be withdrawn from traditional and alternative ground and surface water sources in a sustainable manner. The analysis of each source option also considers environmental and economic constraints on delivery of source water to water suppliers.

Floridan Aquifer

The southeast coastal portion of Santa Rosa County and all of Okaloosa and Walton counties utilize the Floridan Aquifer as their primary water source. Withdrawals in the coastal portions of these counties have lowered the potentiometric surface well below MSL over much of the coastal area raising concerns regarding saltwater intrusion. Due to the threat of saltwater intrusion in the coastal area, uncertainty exists regarding the ability of the Floridan Aquifer to meet the 2020 demands in a sustainable manner.

A regional ground water flow model was developed to aid in the determination of the sustainable yield of the Floridan Aquifer. The District's Region II ground water flow model was used to evaluate the impacts of current withdrawals (1998) from the Floridan Aquifer and to predict the response of the aquifer to proposed Floridan Aquifer utilization scenarios. The model was developed using MODFLOW-96 (Harbaugh and McDonald 1996) and was calibrated to steady state, 1990 conditions. The model is capable of predicting water levels for a given pumpage distribution and change in water levels (drawdown or recovery) which result from alteration of pumpage patterns. All simulations were run to steady state conditions. Specifications regarding boundary conditions and calibration are documented in the report *Modeling of Ground Water Flow in Walton, Okaloosa and Santa Rosa Counties, Florida*, (HydroGeoLogic, Inc. 2000).

To assess the hydrologic effect of current use and future utilization scenarios, a projection of expected 2020 Floridan Aquifer demand was prepared for all users with consumptive use permits greater than 50,000 gal/d ADR (Appendix B). These Region II water supply systems which utilize the Floridan Aquifer were assigned to either the "inland" subregion or the "coastal" subregion. The subregional demands were identified in order to assess the effect of employing alternate utilization scenarios to meet the demand of the coastal subregion. Typically, systems north of Eglin AFB were assigned to the inland subregion and those south of Eglin to the coastal subregion. The SWUC Rock Hill (WRP), Freeport and FCSC Rock Hill water production facilities located in Walton County are assigned to the inland subregion while the SWUC and FCSC demands were assigned to the coastal subregion. Flow model simulations were run for actual 1998 average daily pumping rates, the projected 2020 Floridan Aquifer demand and the 'current adjusted ADR' scenario (Appendix B). In addition, a series of model simulations was run to investigate the effect of reducing pumpage in the coastal subregion. Model simulations were also executed to assess the potential for using the Floridan Aquifer (via additional inland pumping) as an alternate supply source for the coastal subregion. Although a variety of simulations were prepared, only a limited number of simulations are presented in this document. All simulations were performed to examine, in a gross manner, the impact of altered pumping patterns on water levels. They should not be interpreted to represent specific District recommendations regarding water use

quantities (current or future) or recommended pumping distributions. Rather, they are intended to give perspective on how changes in the distribution of pumping will potentially influence water levels in the Floridan Aquifer, and to perform preliminary planning level economic analyses of this water supply source.

The USGS program ZONEBUDGET (Harbaugh 1990) is used to calculate the rate at which ground water flows into the coastal zone (center of the cone of depression) of the Floridan Aquifer. The coastal zone of the Floridan Aquifer consists of the entire thickness of the Floridan Aquifer (including the undifferentiated Floridan Aquifer, upper and lower Floridan Aquifer) and includes all Floridan Aquifer system demands designated 'coastal' in the Appendix, with the exception of Inlet Beach, which is located to the east of the cone of depression. As configured, ZONEBUDGET identifies the rate of the ground water flow into the cone of depression in terms of lateral flow from offshore areas, lateral flow from inland areas and vertical flow (leakage) from above. The relative importance of these different source areas can then be assessed for a variety of Floridan Aquifer utilization scenarios.

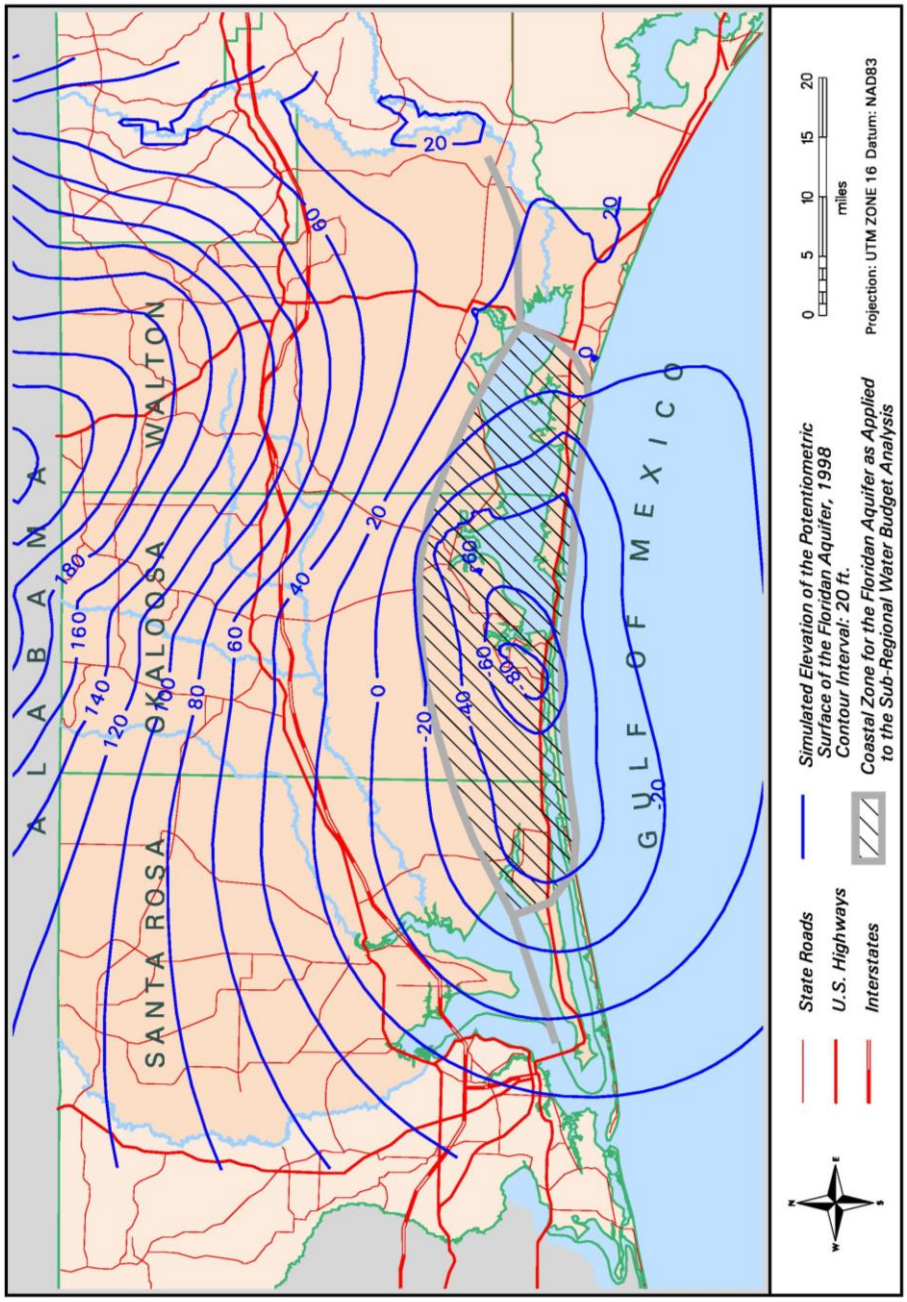
The sustainability of Floridan Aquifer utilization scenarios will be determined by the rate of movement of saltwater towards the coastal wells. MODFLOW-96 is not capable of performing density dependent solute transport analysis generally needed for assessing the threat of saltwater intrusion. The calibrated regional flow model is, however, required prior to development of the saltwater intrusion model. The existing flow model provides a regionally calibrated distribution of hydraulic properties, which is required for the saltwater intrusion model. The District's flow model will also interface directly with the saltwater intrusion model and provide boundary conditions for various saltwater intrusion simulations. A model capable of this type of analysis is currently in development, hence, the sustainability of current or projected pumpage scenarios detailed below should not be inferred.

The following flow model simulations are provided to give insight regarding the effect of various utilization scenarios on water levels and flow rates within the Floridan Aquifer.

1998 Reported Average Daily Rate (ADR) Simulation (35.7 Mgal/d Region II)

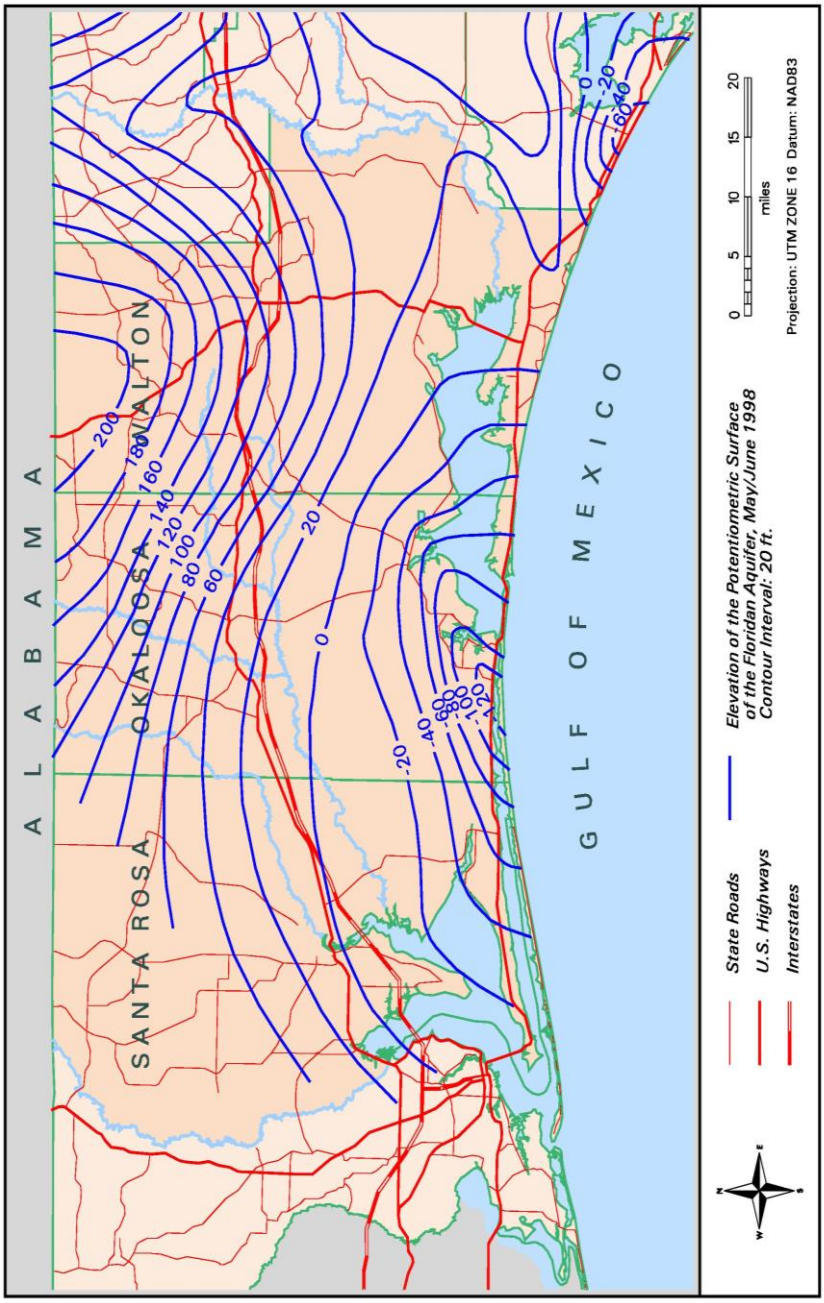
The 1998 Reported ADR simulation was run to establish a benchmark case representing current conditions against which other predictive simulations could be compared. In this model simulation, utility reported 1998 ADR withdrawals are simulated for systems shown in Appendix B. The simulated Floridan Aquifer heads are given in Figure 3.19. For comparison, the observed 1998 Floridan Aquifer potentiometric surface is given in Figure 3.20. Changes, either drawdown or recovery, from current 1998 conditions are calculated by comparing alternate or proposed Floridan Aquifer utilization scenarios to the results of this simulation. By comparing the flow rate from offshore areas using ZONEBUDGET, the relative threat of saltwater intrusion, as compared to current conditions, can be assessed for a variety of Floridan Aquifer utilization scenarios. When completed, the saltwater intrusion model will be used to assess the sustainability of the 1998 Floridan Aquifer utilization pattern (current conditions).

Figure 3.19 Simulated Potentiometric Surface of the Floridan Aquifer,



Steady State Conditions, 1998.

Figure 3.20 Observed Potentiometric Surface of the Floridan Aquifer, May / June 1998.



'Current Adjusted ADR' Scenario Simulation (45.7 Mgal/d Region II)

Pumpage used in the 'current adjusted ADR' simulation is included in Table B.1 (Appendix B). For this simulation, individual systems were not allowed to exceed their permitted withdrawal rates. For systems with both Floridan and Sand-and-Gravel aquifer source water, the currently permitted ADR is allocated to specific aquifers in the same manner as was the 2020 demand (Appendix B). The current adjusted ADR simulation also assumes that individual systems will not require withdrawals from the Floridan Aquifer greater than their projected 2020 Floridan Aquifer demand. Results of this simulation represent the cumulative effect of anticipated Floridan Aquifer utilization based on currently permitted withdrawals and 2020 demand projections prepared by the USGS. This utilization scenario provides 45.7 Mgal/d of the projected 50.8 Mgal/d 2020 Floridan Aquifer demand resulting in a 5.1 Mgal/d shortfall. The simulation includes well locations for which a well has been permitted, but not yet constructed.

Simulation results are presented as change in water levels relative to the 1998 ADR simulation. Figure 3.21 is an estimate of the change (drawdown or recovery) expected to occur as a result of permits issued but not presently implemented or fully utilized. These include significant permit modifications recently issued to OCWS Mid-County, Crestview, SWUC and Freeport. This simulation also incorporates the expected development of a 6 Mgal/d Sand-and-Gravel Aquifer wellfield for use in coastal Santa Rosa County. This expected wellfield would provide for both reductions in Floridan Aquifer pumpage and growth in coastal Santa Rosa County.

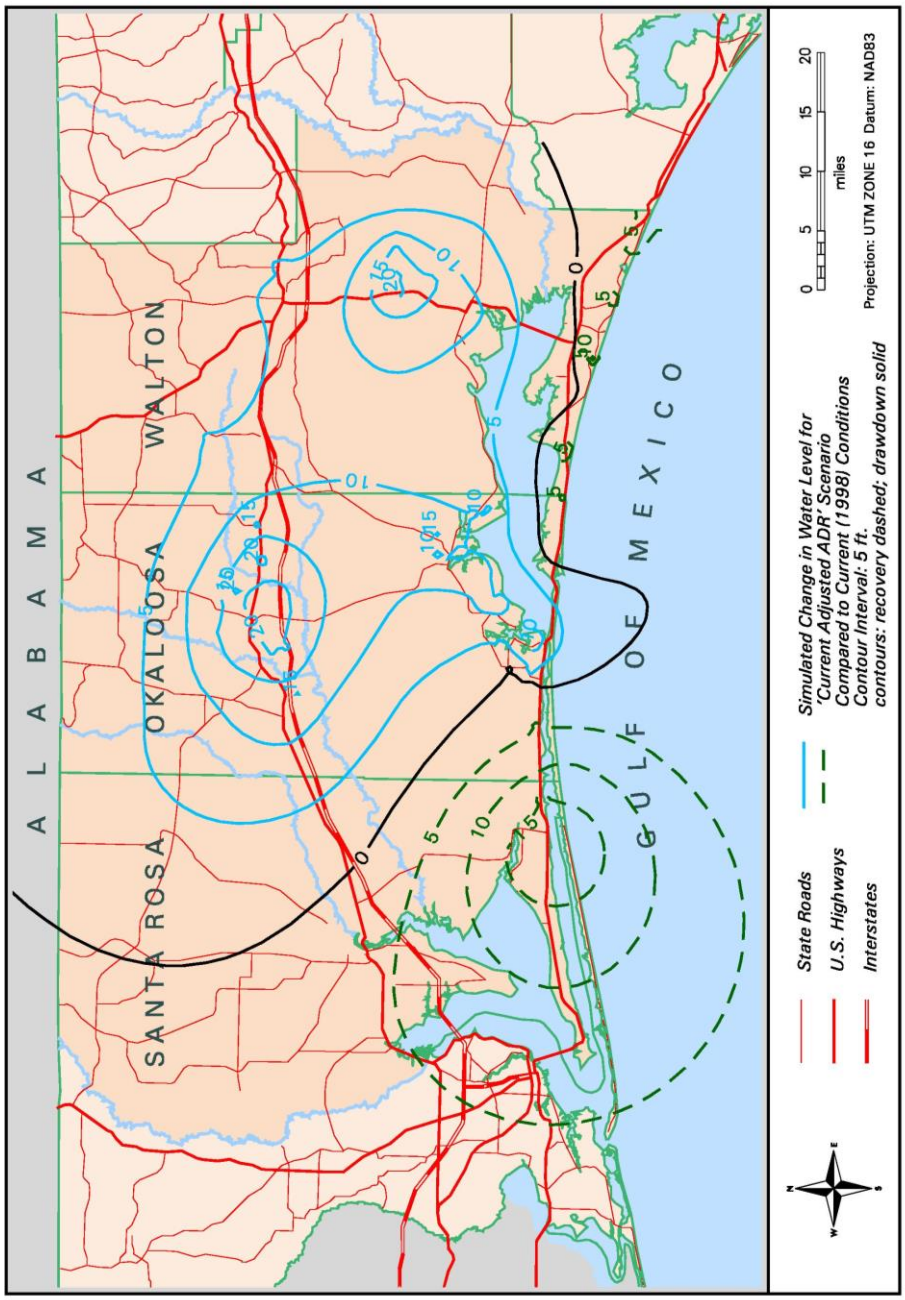
Under this modeling scenario, Floridan Aquifer water levels recover over much of southern Escambia and Santa Rosa counties. This recovery is due to a 2.2 Mgal/d reduction in Floridan Aquifer pumping by Midway, Holley-Navarre and Navarre Beach. This reduction is due to and assumes completion of their current initiative to develop an inland, Sand-and-Gravel Aquifer wellfield and continued use of Sand-and-Gravel Aquifer wells located within their service areas. The maximum recovery of 20 ft. is centered on Navarre.

In contrast, additional drawdown occurs over much of Okaloosa County. Under this scenario, Okaloosa County pumping, compared to the 1998 ADR simulation, increases by 5.8 Mgal/d. In the coastal subregion of Okaloosa County, (south of and including Eglin AFB), net pumpage increased by 1.3 Mgal/d and drawdown of 10 to 12 ft. is predicted in the Ft. Walton Beach, Eglin and Niceville areas. In the central part of the county drawdown averages 20 ft. and is centered on Crestview. The simulated drawdown around Crestview is largely due to a 3.1 Mgal/d increase in OCWS Mid-County withdrawals, and 1.0 Mgal/d increase by Crestview. Of the 3.1 Mgal/d increase for OCWS Mid-County (inland) system, 2.8 Mgal/d is supplied to OCWS's Garniers (coastal) system. The 2.8 Mgal/d provides for the increased demand of the Garniers system and for reductions in their coastal withdrawals. Recovery is predicted in southwest Okaloosa County due to reduced pumpage in southeast Santa Rosa County. Slight recovery of water levels is predicted in the Destin area due to a reduction in coastal pumpage by Destin and South Walton brought about by their (WRP) initiative to develop an inland, Floridan Aquifer wellfield at Rock Hill.

In Walton County, predicted drawdowns ranging between 10 and 20 ft. occur around the Freeport, SWUC Rock Hill and FCSC Rock Hill wells. The associated pumping increase over 1998 conditions for these systems is 6.8 Mgal/d. Most of this production will provide for increased demand in the coastal area and a reduction in coastal withdrawals. Drawdowns of 4 to 8 ft. are noted in central Walton County, while little change is

indicated in the northern portion of the county. This scenario predicts modest recovery in water levels along the Walton County coastline, reflecting the reduction in coastal pumpage.

Figure 3.21 Simulated Floridan Aquifer Water Level Change Caused by 'Current Adjusted ADR' Scenario Pumping.



Projected 2020 Floridan Aquifer Demand Simulation (50.8 Mgal/d Region II)

This scenario simulates the projected 2020 Floridan Aquifer demands found in Table B.1. The simulation provides for 100 percent of the projected 2020 demand and approximates the expected distribution of pumpage anticipated if no new major initiatives are pursued. Region-wide pumping from the Floridan Aquifer under this scenario is increased to 50.8 Mgal/d. This simulation assumes current major initiatives (OCWS--Mid-County, South Walton Rock Hill and FRUS) will be fully implemented. It also assumes additional withdrawals necessary for individual users to meet their projected 2020 Floridan Aquifer demand will occur locally, within the existing footprint of their current production.

In the current adjusted ADR simulation previously discussed, individual system withdrawals were not allowed to exceed the Floridan Aquifer portion of their permitted ADR resulting in a 5.1 Mgal/d shortfall in meeting the projected 2020 Floridan Aquifer demand. In this simulation, permittees are not capped by their permits. Instead, the permittees are allowed to increase withdrawals to meet their projected 2020 Floridan Aquifer demand. Accordingly, the drawdown is somewhat greater as compared to the current adjusted ADR simulation, and less head recovery occurs in coastal Santa Rosa County.

Drawdown distribution, which results from the projected Floridan Aquifer 2020-demand simulation, was calculated as head change from current (1998) conditions. The simulated drawdown is shown in Figure 3.22. Drawdowns ranging from 20 to 30 ft. occur over much of central and southern Okaloosa County with lesser amounts of drawdown over most of the remaining area. Recovery of water levels of up to 10 ft. are noted in southeast Santa Rosa County due to the projected development of a 6.0 Mgal/d inland Sand-and-Gravel Aquifer wellfield.

Coastal Pumping Reduction Simulations

One series of simulations was run to assess the effect of reducing the projected 2020 Floridan Aquifer withdrawals for all coastal pumping within Region II. In these simulations, the projected 2020 Floridan Aquifer coastal demand of 28.7 Mgal/d was reduced in 2.87 Mgal/d (10 percent) increments. A total of 10 simulations were performed representing coastal withdrawals ranging from zero to 90 percent of the projected 2020 Floridan Aquifer demand. Inland pumping was consistently maintained at the projected 2020 Floridan Aquifer demand level (22.1 Mgal/d). The reduction in coastal pumping was evenly proportioned to all coastal systems. Implicit with these simulations was the assumption that Floridan Aquifer pumping removed from the coast would be replaced with non-traditional sources, i.e., sources other than the Floridan Aquifer. The coastal demand reduction was not placed back into the Floridan Aquifer elsewhere in the model domain.

These simulations were performed to give perspective on the impact of altering pumping patterns on water levels. They do not represent specific District recommendations regarding water use quantities (current or future) or recommended pumping distributions. Rather, they are intended to give perspective on how changes in the distribution of pumping will potentially influence water levels in the Floridan Aquifer. Questions regarding the sustainability of long-term Floridan Aquifer withdrawals are deferred, pending completion of ongoing solute transport modeling.

Simulation results are given as drawdown (or recovery) contours relative to the 1998 ADR scenario and as contoured head distributions. Results for the 30 percent reduction scenario are given in Figures 3.23 and 3.24. Results for the 70 percent reduction scenario are given in Figures 3.25 and 3.26. The 30 percent reduction scenario has a coastal pumping of 20.1 Mgal/d. This represents a decline in pumping of 8.6 Mgal/d, compared

to 2020 demand conditions. The 70 percent reduction scenario has a coastal pumping of 8.6 Mgal/d. This represents a decline in coastal pumping of 20.1 Mgal/d, compared to 2020 demand conditions.

Figure 3.22 Simulated Floridan Aquifer Water Level Change Caused by Projected 2020 Floridan Aquifer Pumping.

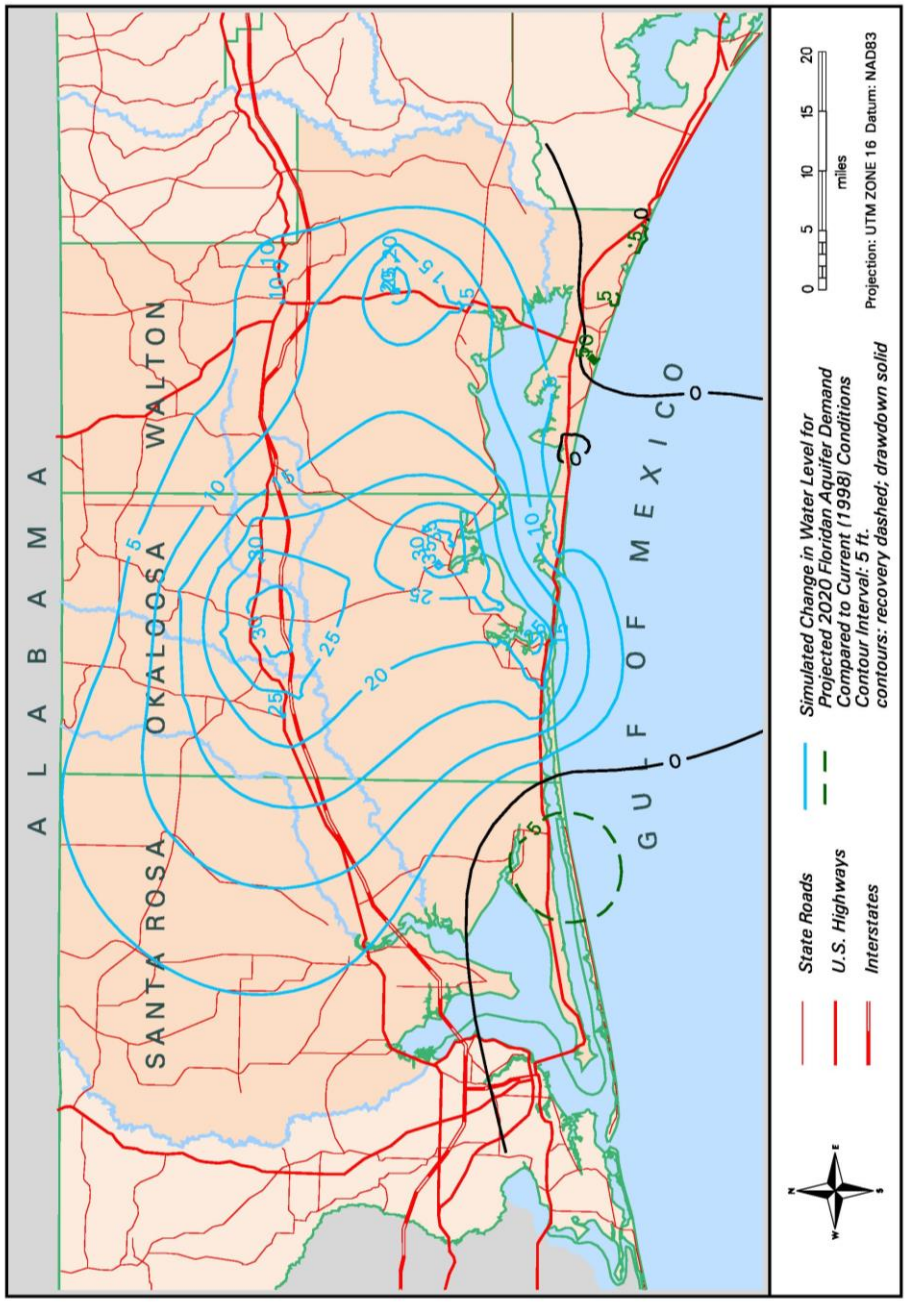
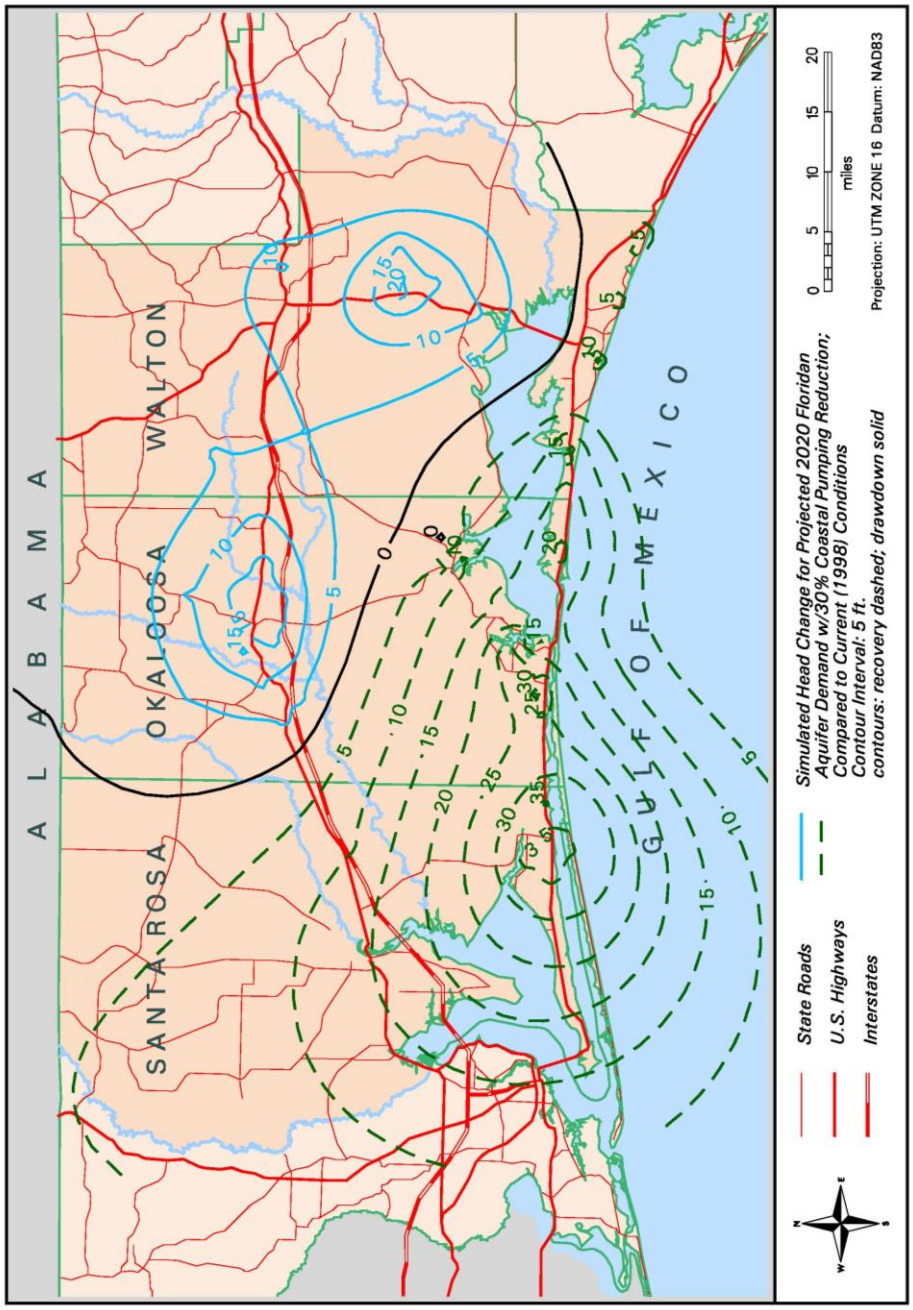


Figure 3.23 Simulated Floridan Aquifer Water Level Change Caused by Projected 2020 Floridan Aquifer Pumping With 30% Reduction in Coastal Subregion



Pumping.

Figure 3.24 Simulated Potentiometric Surface of the Floridan Aquifer, Projected 2020 Floridan Aquifer Pumping With 30% Reduction in Coastal Subregion Pumping.

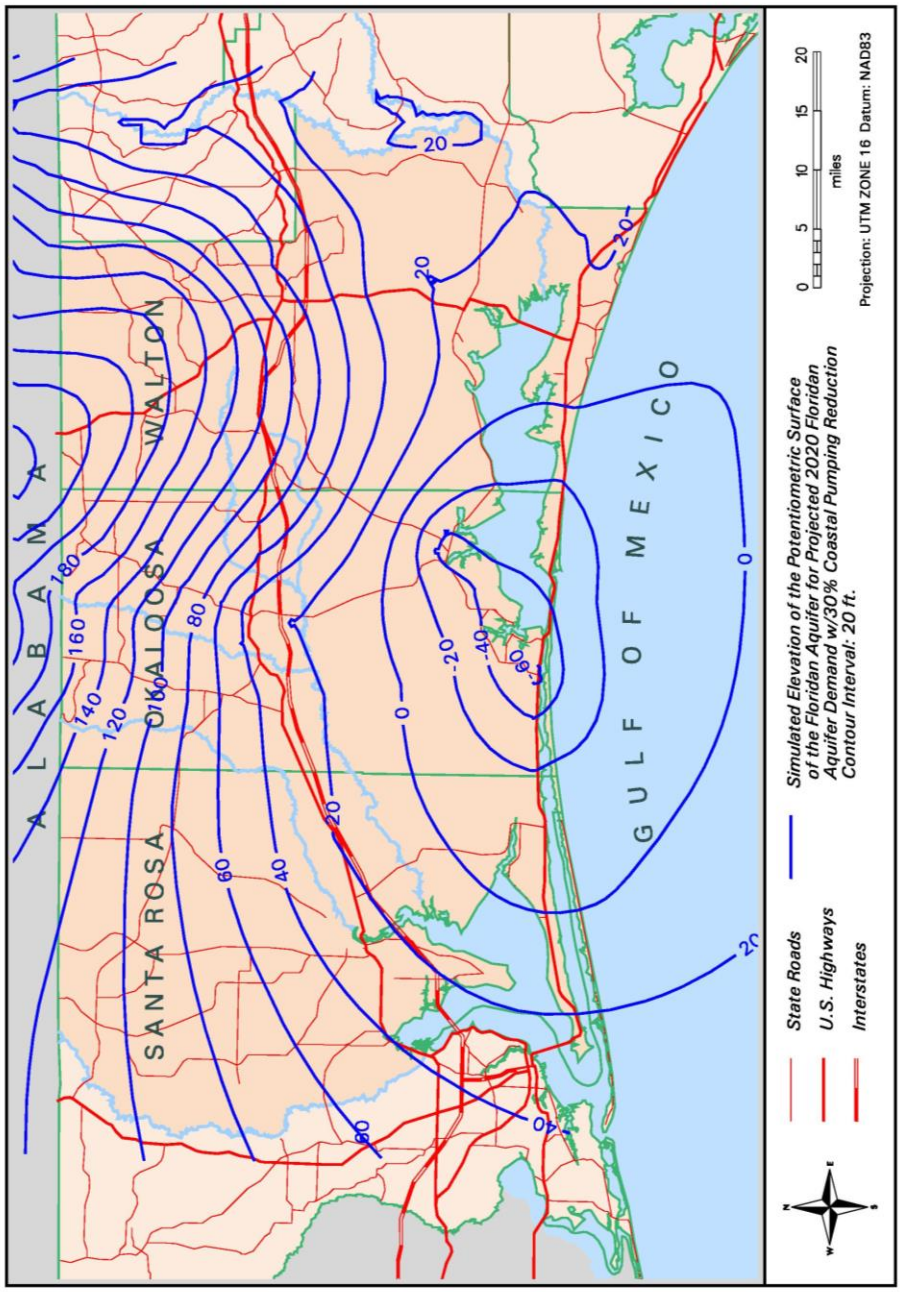


Figure 3.25 Simulated Floridan Aquifer Water Level Change Caused by Projected 2020 Floridan Aquifer Pumping With 70% Reduction in Coastal Subregion Pumping.

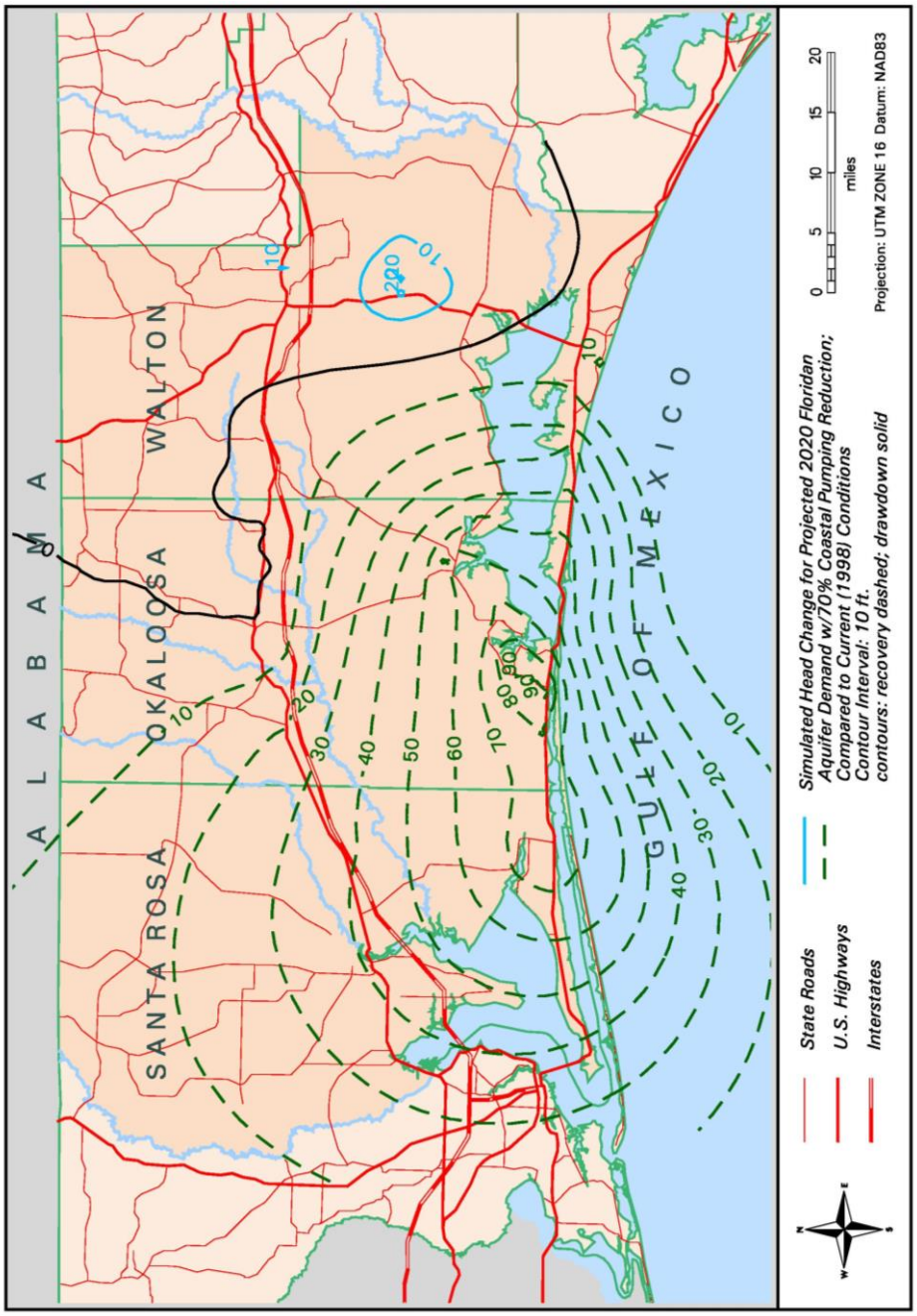
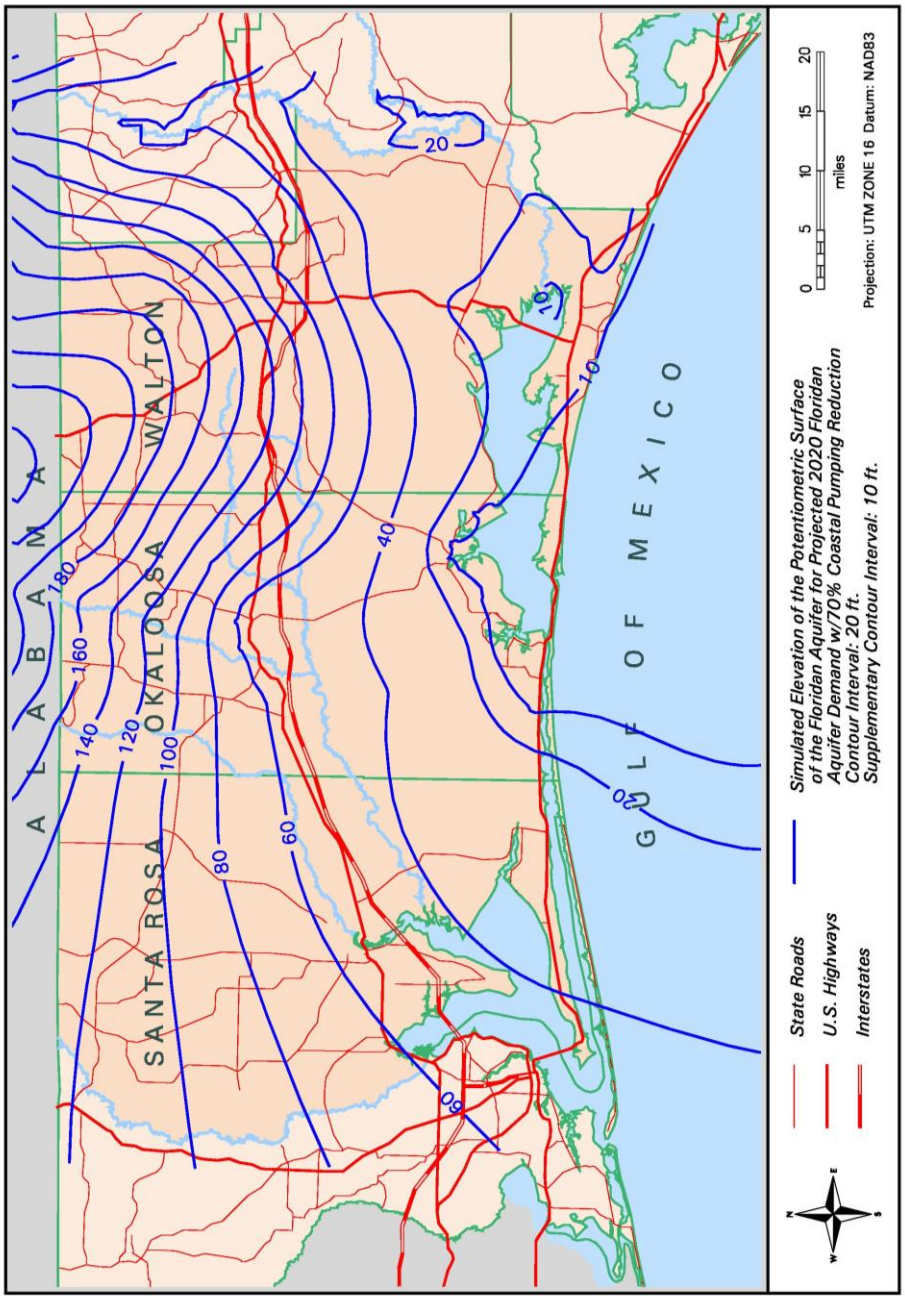


Figure 3.26 Simulated Potentiometric Surface of the Floridan Aquifer, Projected 2020 Floridan Aquifer Pumping With 70% Reduction in Coastal Subregion



Pumping.

Under the 30 percent reduction scenario, water levels recover over all of Santa Rosa County and over about half of Okaloosa County. Water level recoveries are greatest in coastal Santa Rosa and Okaloosa counties, where they recover from 20 to 30 ft. In the Crestview vicinity, water levels decline about 10 ft., reflecting the increase in pumping between 1998 conditions and the projected 2020 demand. Water levels also decline between 10 and 20 ft. in the vicinity of Rock Hill and Freeport for the same reason. Wellfields in both the Crestview and Rock Hill areas have been permitted to provide significant water supplies for projected growth in coastal demand and for reduction of coastal pumping. Withdrawals were held constant at these wellfields as they are situated in 'inland areas.'

Under the 70 percent reduction scenario, water levels recover over all of Santa Rosa County and most of Okaloosa County. As was the case with the 30 percent scenario, the water level recovery is greatest along the coastline, where recoveries range from 10 to 90 ft. (Figure 3.25). The greatest recovery (90 ft.) is centered on Mary Esther and Fort Walton Beach. Water level recoveries of this magnitude are sufficient to bring the potentiometric surface back to MSL. In southeast Santa Rosa County, water levels recover to 30 ft. above MSL. Water levels in Crestview recover about 10 ft. This is in spite of a simulated pumping increase (5.3 Mgal/d) in the vicinity of Crestview. Water level decline of up to 20 ft. occurs in the Rock Hill area of Walton County with declines of approximately 5 ft. present in the Freeport and DeFuniak Springs areas.

Simulation results were also evaluated by examining the impact of pumping reductions on the flux of ground water from under the Gulf of Mexico. This was accomplished using the USGS computer program ZONEBUDGET (Harbaugh 1990). Model layers representing the full thickness of the Floridan were divided into three zones; the center of the cone of depression, the portion of the aquifer seaward of the cone of depression, and the portion of the aquifer landward of the cone of depression (Figure 3.19). The model layer representing the overlying Intermediate System confining unit was also designated as a zone.

ZONEBUDGET was used to calculate the transfer of water among the zones. The results for the ten coastal pumping reduction simulations and the projected 2020 Floridan Aquifer demand simulations are given in Figure 3.27. For comparison purposes, the flux rate between these zones is also included for the simulation representing the current conditions (1998 ADR simulation). Simulated fluxes given in this figure represent the sum of all model layers used to characterize the Floridan Aquifer that includes the undifferentiated Floridan Aquifer, the upper Floridan Aquifer and the lower Floridan Aquifer. For all simulations, the sum of the fluxes from the offshore area, the inland area and the above layer (recharge) equal the total pumpage occurring within the cone of depression zone.

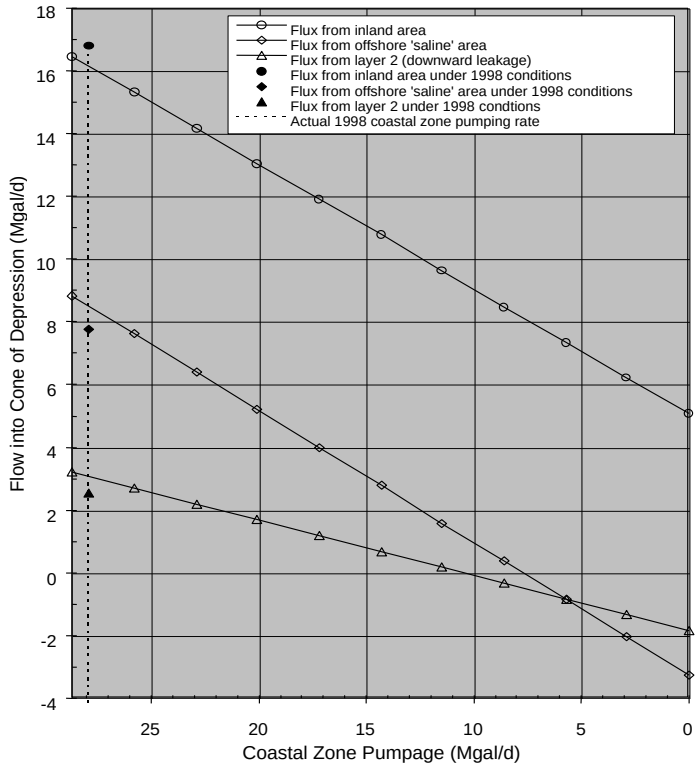
Under 1998 conditions about 17 Mgal/d flows into the center of the cone of depression from its landward side. Given its landward source, this water is fresh. Under 1998 conditions about 8 Mgal/d flows into the cone of depression from offshore areas. Finally, about 2.5 Mgal/d leaks downward into the Floridan Aquifer from the overlying confining unit. These three sources of water account for the 27.9 Mgal/d pumped out of the center of the cone of depression during 1998. They constitute the water budget for the Region II coastal production wells.

Under predevelopment conditions, the natural north-to-south flow of ground water carried freshwater across the shoreline and out under the Gulf of Mexico where it mixed with sea water in the aquifer, becoming progressively more salty. Eventually, the diluted

sea water, being less dense than sea water, flows up and out of the flow system and is discharged into the Gulf of Mexico. As a consequence of this mixing and dilution there is a concentration gradient beneath the Gulf. Progressively more saline water is found in the Floridan Aquifer the further one goes from shore. At some unknown distance from the shore the aquifer is filled, bottom to top, with sea water. The previous seaward flow is of significance in that it carried freshwater out an unknown distance under the Gulf, resulting in a "reservoir" of freshwater beneath the Gulf.

With the imposition of significant pumping along the shoreline, the flow direction in the immediate vicinity of the shoreline has reversed. Water from under the Gulf is now flowing landward into the center of the cone of depression. The substantial volume of freshwater that previously flowed under the Gulf is sustaining the current high quality of ground water being discharged from coastal wells.

Figure 3.27 Simulated Ground Water Flows into the Potentiometric Surface Depression



Inland Wellfield Simulations (50.8 Mgal/d Region II)

Another series of simulations involved running various hypothetical inland wellfield scenarios. This included the simulation of one (or more) new inland Floridan Aquifer wellfields, demonstrating the impact a new wellfield would have on Floridan Aquifer heads. The general area considered for inland wellfields is north of Eglin AFB in the vicinity of the I-10 corridor. New inland wellfields would be one means to implement a coastal aquifer recovery strategy, should one be required. Completion of ongoing work

in the area of Floridan Aquifer sustainability modeling and the adoption of minimum aquifer levels will determine if a coastal aquifer recovery strategy is required.

All inland wellfield simulations provided for 100 percent of the projected 2020 Floridan Aquifer demand. Drawdown and recovery is calculated as change from the projected 2020 Floridan Aquifer demand simulation. Wellfield simulations consisted of relocating withdrawals in increments of either 5 Mgal/d or 10 Mgal/d. The simulated wellfield pumpage in each scenario was matched by an equivalent reduction in coastal Floridan Aquifer pumpage. For example, if pumping from an inland wellfield was simulated at 5 Mgal/d, then Floridan Aquifer coastal pumping was reduced by 5 Mgal/d.

All simulated, inland wellfield locations were located immediately north of Eglin AFB in either Santa Rosa, Okaloosa or Walton counties but away from existing or recently permitted public supply wells. Sites selected were primarily based on distance from existing and/or permitted public supply wells to avoid wellfield interference. Furthermore, sites were selected where the presence of nearby existing roads and right-of-ways would reduce water transport cost. The distance between individual 1 Mgal/d wells ranged from 1 to 1.5 miles.

Results of this simulation indicated that relocating 5 Mgal/d of Floridan Aquifer production from the coastal area to an inland wellfield would result in drawdowns ranging from 5 to 25 ft. for nearby permitted users and recovery of approximately 25 ft. in the Ft. Walton Beach vicinity. ZONEBUDGET indicated a reduction in flux from offshore areas into the coastal zone potentiometric depression of approximately 19 percent or 1.7 Mgal/d. Relocating 10 Mgal/d of production results in maximum drawdowns of 10 to 50 ft. for nearby permitted users and results in recovery of approximately 50 ft. in the Ft. Walton Beach vicinity. This results in a 3.4 Mgal/d reduction in flux from offshore areas, equivalent to a 38 percent reduction.

The analysis indicated water level drawdowns at inland well sites can be reduced by designing a more distributed wellfield, however, the total costs of the project will likely increase as distance between the wells is increased. Recovery of water levels along the coast and the change in flux rate from offshore areas would essentially remain unchanged by altering the well spacing of an inland wellfield.

Simultaneous Coastal Reduction and Inland Wellfield Simulation (40.8 Mgal/d)

One simulation was run which involved a variation of the inland wellfield scenario described above. This simulation included a 20 Mgal/d reduction in the projected 2020 Floridan Aquifer coastal pumping, along with a 10 Mgal/d inland wellfield. The net simulated Floridan Aquifer pumping is 40.8 Mgal/d. Under this scenario, the assumption is made that the 10 Mgal/d shortfall would come from an alternative, non-traditional source (i.e. a source other than the Floridan Aquifer).

Changes in water levels and flux rate are calculated as change from the projected 2020 Floridan Aquifer demand simulation. Up to 100 ft. of recovery occurs in the vicinity of Ft. Walton Beach while drawdowns up to 30 ft. are predicted for nearby permitted users. Flux from offshore areas was reduced to 1.1 Mgal/d, which represents an 87 percent reduction.

Cost of Inland Floridan Aquifer Sources

The costs of developing additional inland Floridan Aquifer wellfields as an alternate water supply source is estimated to range from $1.37 to $2.66 per 1,000 gal. of finished

water produced from areas north of Eglin AFB, in the vicinity of the I-10 corridor. Several wells would be needed to supply the required amount of water to be transported south to the coast. These wells would need to be spaced about a mile apart and connected to a header pipe for treatment prior to being put into the main transmission line. Because the transmission lines cannot cut directly across Eglin AFB, they must follow existing right-of-ways, such as along highways 85 and 285. Costs reflect the required number of wells, the necessary pipes to interconnect all the supply wells to the main transmission line, a treatment plant at the head of the main transmission line, the transmission line, all costs associated with land purchase, and the added cost of environmental issues related to wetlands and endangered species concerns (PBS&J 2000a, PBS&J 2000b). These costs reflect the total capital and operating costs to develop new Floridan Aquifer wellfields for the production and transmission of bulk water to a local distribution system. Actual costs will depend upon wellfield location and the length of pipeline needed to deliver the water. These costs assume right-of-ways are already in hand or could be obtained at little or no expense.

Sand-and-Gravel Aquifer

The Sand-and-Gravel Aquifer is the source of the vast majority of water used in Santa Rosa County. The Sand-and-Gravel Aquifer is fully capable of providing for the future 2020 demands of the water supply systems that currently utilize this aquifer as their primary source. These systems can depend on the Sand-and-Gravel Aquifer to meet their future 2020 demand of 31.7 Mgal/d in a sustainable manner. Furthermore, the Sand-and-Gravel Aquifer has additional withdrawal capacity beyond the 2020 demand projections.

The Sand-and-Gravel Aquifer is, for portions of Region II, a potential alternative to continued or expanded use of the Floridan Aquifer. The aquifer is currently being used to supply water in areas where it is sufficiently thick and productive to do so. This includes all of Santa Rosa County and the coastal portion of Okaloosa County. In these areas the aquifer has potential for additional water resource development for public water supply. Elsewhere, in Okaloosa and Walton counties, the potential to develop water from the aquifer for public supply is more limited. Although a more detailed analysis is required to determine the long-term available yield from this resource throughout Region II, estimates of ground water availability were prepared based on existing information.

Two areas of interest were defined, the coastal fringe south of Eglin AFB and the corridor between the Blackwater and Yellow rivers in Santa Rosa and Okaloosa counties. The area south of Eglin AFB includes portions of Fair Point Peninsula, unincorporated Okaloosa County, Hurlburt Field, Mary Ester, Niceville, Valparaiso, and portions of Moreno Point. At present, widespread use of the Sand-and-Gravel Aquifer is made in these areas for lawn irrigation. Additional use of the aquifer is also made for golf course irrigation. For example, the City of Ft. Walton Beach uses several Sand-and-Gravel Aquifer wells at the golf course for irrigation purposes when reuse water levels are insufficient to meet needs. These wells, all about 100 ft. deep and cased about 60 ft., have a yield of about 300 gal/min per well. Two wells have measured specific capacities, 12 and 15 gal/min/ft, respectively. Further, two multi-well aquifer tests conducted on the Sand-and-Gravel Aquifer in the vicinity of Ft. Walton Beach yielded transmissivity values of 6,200 ft^2/d and 1,500 ft^2/d, respectively.

Assuming a well yield of 300 gal/min and an operation time of 1,000 minutes per day, a single Sand-and-Gravel Aquifer well would produce about 300,000 gal/d. By extension, 10 wells distributed around the Region's coastal fringe would yield a combined 3 Mgal/d. Fifteen such wells would yield 4.5 Mgal/d. Obviously, such water production

would be sensitive to ground water contamination and adverse land use impacts on water quality. Informed well siting and wellhead protection activities would assist in minimizing the potential for wells to yield contaminated water. Widespread utilization of the aquifer for water supply would require some analysis of potential sources of contamination and the potential aquifer yield.

An area along the Blackwater and Yellow rivers was delineated where the surface topography and hydrology suggest that the Sand-and-Gravel Aquifer receives appreciable recharge and adjacent rivers could support potential reductions in base flow. The area is located in Santa Rosa County and extends northeast into Okaloosa County (Figure 3.28). The aquifer ranges in thickness up to 300 ft. in the area. The study area was initially defined along the topographic break between the stream-valley floodplains of the Blackwater and Yellow rivers and the elevated surroundings. The low-lying stream-valleys adjacent to the rivers are considered to have little to no recharge potential and were excluded from the area of interest. Also excluded were a number of internal tributaries feeding the Blackwater and Yellow rivers. These minor tributaries are of concern in that they may be impacted by localized drawdown in the Sand-and-Gravel Aquifer. A 1,000-ft. buffer zone was added around these tributaries in order to delete a portion of the Sand-and-Gravel Aquifer zone of contribution for these streams. The remaining area is approximately 73.8 mi^2 and is believed to be subject to relatively high recharge rates.

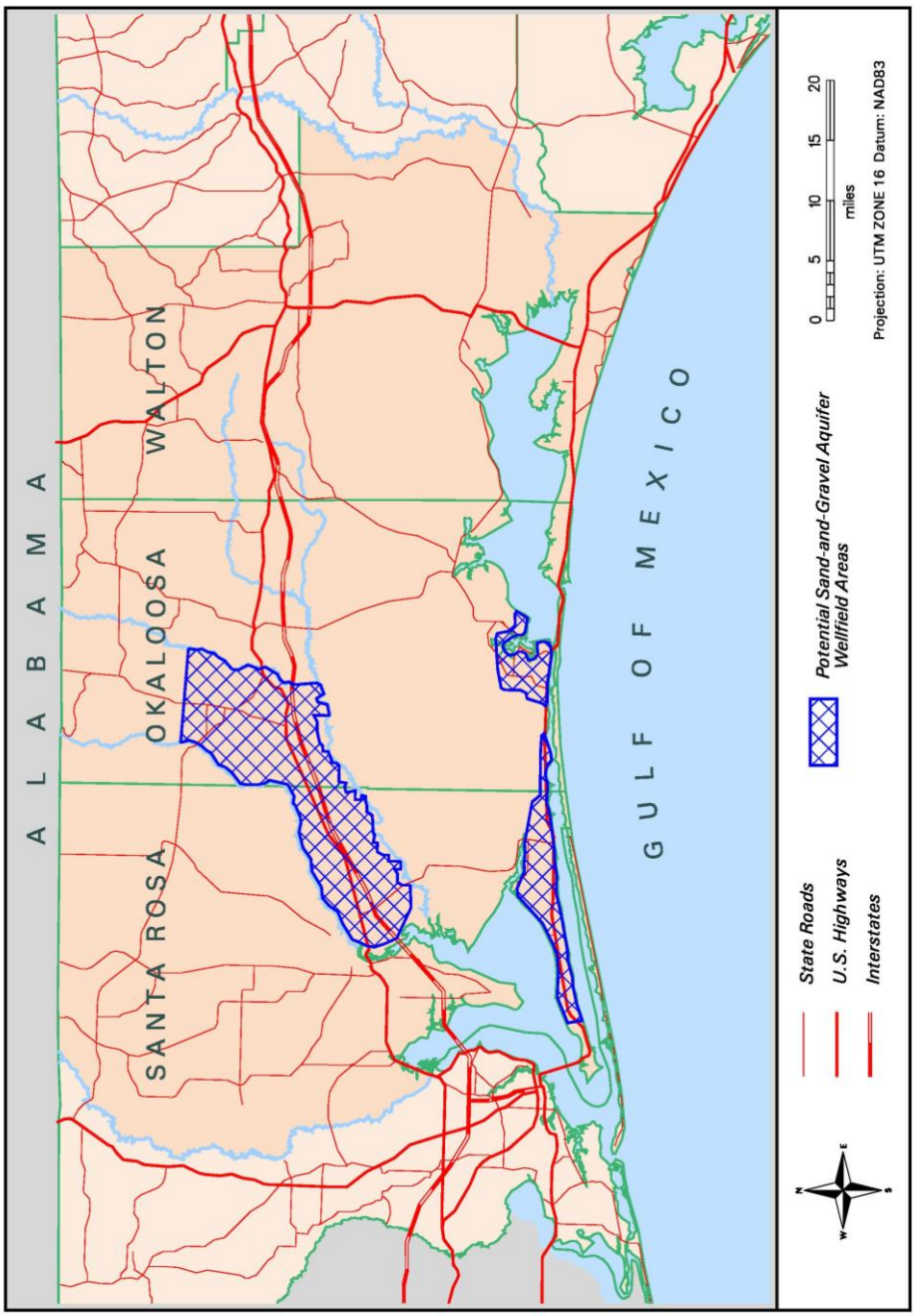
Previous works by the USGS (Vecchioli et al. 1990 and Grubbs 1995) suggest that, due to the favorable recharge characteristics of the Region, and the presumed lack of sufficient surface or ground water storage, ground water discharge (base flow) is equal to ground water recharge. These studies used historical stream discharge records at regional gaging stations and hydrograph separation techniques to estimate stream base flow. Based on the previous assumption that base flow is equal to basin recharge, basin-wide estimates of recharge were made. Results from these studies (for gaging stations adjacent to or in the vicinity of the area of interest) were used to calculate a long-term, average recharge rate to the Sand-and-Gravel Aquifer. The area-weighted, average recharge estimate is 18 in/yr. This equates to a base flow contribution of 97.9 ft^3/sec (63.2 Mgal/d) from the 73.8 mi^2 study area. This value is the long-term, average ground water flux through the area of recharge into the Blackwater and Yellow rivers and constitutes only a fraction of the annual average stream flow in these waterbodies.

The Florida portions of the Blackwater River and the Yellow River drainage basins cover approximately 603 and 856 mi^2, respectively. By applying the estimated average recharge rate of 18 in/yr to these areas, average base flows near the river mouths are estimated to be at least 800 ft^3/sec (516 Mgal/d) in the Blackwater River and 1,135 ft^3/sec (733 Mgal/d) in the Yellow River. Projected future demands on the Sand-and-Gravel Aquifer within the area of interest are approximately 7.5 Mgal/d (East Milton--1.5 Mgal/d, FRUS--6 Mgal/d). An additional 10 Mgal/d, at a minimum, is anticipated from the study area as an alternative water supply option. A total 2020 demand of 18 Mgal/d from the Sand-and-Gravel Aquifer within the area of interest represents only 1.5 percent of the average base flow for the two rivers and, thus, represents an unquantifiably small impact on these streams. The impact on streamflow is even smaller, as base flow is but a fraction of total streamflow. A more detailed analysis would be necessary to evaluate potential impacts on wells due to water level drawdowns and on base flow to the smaller, more sensitive tributaries, as well as the major rivers, within the area.

Although the long-term, average recharge rates and streamflows represent typical conditions, the effect of short-term drought was also evaluated. Historic low-flow conditions for six gaging stations (adjacent to or in the vicinity of the study area) were

used to estimate a minimum recharge rate of 7 in/yr for the Florida portion of the Blackwater/ Yellow River drainage basins. At this reduced rate, recharge to the study area should contribute an estimated 38.4 ft^3/sec (24.8 Mgal/d) of base flow to the adjacent rivers. Based on 7 in/yr applied to the entire Florida portion of the respective watersheds, low-flow conditions near the river mouth are expected to be 310 ft^3/sec (200 Mgal/d) and 441 ft^3/sec (285 Mgal/d) for the Blackwater and Yellow rivers, respectively. Impacts of low recharge conditions will be further mitigated by the fact that drought must persist for a considerable period of time before reduced recharge translates to significantly reduced base flow.

Figure 3.28 Potential Sand-and-Gravel Aquifer Wellfield Area.



Prior to that, reduced recharge equates, primarily, to a reduction in ground water storage. Under these drought-like conditions, reduced base flow from the area may amplify as of yet unknown impacts of wellfield withdrawals on discharge to the internal tributaries. However, these impacts (if any) should last only as long as the short-term drought. More significantly, an estimated demand of 18 Mgal/d still represents only 2.4 percent of the streamflow in the Blackwater and Yellow rivers under these reduced recharge conditions.

The range of estimated unit costs for production of Sand-and-Gravel Aquifer sources to supply water to local distribution systems in southeast Santa Rosa County and within Ft. Walton Beach is $0.98 to $2.15 per 1,000 gal. These costs reflect the total capital and operating costs to develop new Sand-and-Gravel Aquifer wellfields and depend upon the wellfield location and the length of pipeline needed to deliver the water. The lower end of the cost range is for local Sand-and-Gravel Aquifer sources that are near the coast. The higher end reflects the costs of Sand-and-Gravel Aquifer sources further inland. The costs of buying or leasing pipeline right-of-ways or easements are not included, as in some cases the easement or right-of-ways are already in hand or could be obtained at little or no cost.

Conservation

A large majority of utilities within Region II have implemented some form of conservation measure within their individual service areas. Many of these utilities have implemented, or have plans to implement, several different, additional, conservation measures. Water is used for many different purposes within Region II, but the single largest use within public supply is for some form of irrigation. It is in the reduction of water use for irrigation purposes that conservation efforts have their biggest impact. Irrigation can also be augmented with other sources such as the Sand-and-Gravel Aquifer, stormwater and reclaimed water.

Data compiled to consider conservation as a regional alternative include information gathered from individual utilities for the Water Supply Assessment, information from the West Florida Regional Planning Council report (February 1999), and information and data from the other water management districts. These data were compiled to provide an estimate (PBS&J 2000c) regarding the impact conservation efforts could have over the 20-year planning period within Region II. Conservation practices and programs that are being used, or could be implemented, within Region II to reduce the amount of water required from the Floridan Aquifer are discussed by PBS&J (2000c). There are primarily six conservation practices that have been or could be implemented within Region II. Reuse of treated wastewater is also commonly considered a form of water conservation, however, it is important enough that it has been addressed in a separate section (PBS&J 2000e). The six conservation practices addressed here are listed below.

- Residential Conservation Rate Structure
- Leak Detection Programs by the Utilities
- Water Conservation Public Information
- Landscape Irrigation Restrictions
- Low Volume Plumbing Building Codes
- Xeriscape Landscape Ordinances

According to the analyses (PBS&J 2000c), if each of the utilities were to implement all conservation measures applicable to their service areas, the additional amount of water that could be saved by the year 2020 was estimated to range from zero to 2.57 Mgal/d. The range in these estimates is due to the uncertainty and difficulty with precisely

calculating conservation estimates, as there are many economic and demographic variables involved. The additional water to be saved is not considered to be a regionally significant amount based on these estimates. However, these results suggest that a number of these practices are already in place and are having a significant effect. The District should, therefore continue to encourage utilities within Region II in their efforts to promote the benefits arising from water conservation.

The range of unit costs is estimated to be from $0.04 to $4.25 per 1,000 gal. of water saved (PBS&J 2000c). These costs reflect the total capital and operating costs to produce and implement conservation measures or new water saving technology. Some conservation measures, such as public education, may not have any significant material (capital) or O&M costs associated with them.

Reuse of Treated Wastewater

Most of the utilities within Region II have implemented some form of reuse of treated wastewater, also called reclaimed water, within their individual service areas. Many of these utilities have plans to expand upon existing reuse systems. Those wastewater utilities that are currently not providing reuse water are planning to provide it within the early part of the 20-year planning horizon. The reuse of reclaimed wastewater from treatment plants for beneficial purposes, primarily irrigation, has been strongly advocated by the FDEP for several years, and is an important part of their wastewater permitting program. As more utilities have implemented reuse of treated wastewater within the coastal area of Region II, a consumer demand for it has begun to appear, especially for areas of new development which require a steady supply of water for landscape irrigation.

Reuse water can be used for various purposes within Region II, depending upon the level of treatment and disinfection, but by far the single largest use is for some form of irrigation. It is in the water use for irrigation purposes that reuse efforts have their biggest impact. The maximum benefit from use of treated wastewater is derived when the reuse water directly replaces water that was being, or would have been, withdrawn from the Floridan Aquifer.

The current production and use of reclaimed wastewater in the coastal area was analyzed (PBS&J 2000d) and a projection made for available reclaimed water in the year 2020. According to the analysis, if each of the coastal utilities were to fully implement reuse of treated wastewater within their service area, enough reclaimed water would be available by 2020 to replace about 5 Mgal/d of Floridan Aquifer water. This is the amount of water that would have been obtained from the Floridan Aquifer, as opposed to other sources. A constraint to the use of this entire amount is that it is being produced in relatively small quantities from wastewater treatment plants spread throughout the coastal area, a length of approximately 90 miles, and not from one single source area.

The estimated range of unit costs for reclaimed water is from $2.50 to $3.50 per 1,000 gal. (PBS&J 2000d) produced from the Region's wastewater treatment plants. These costs reflect the total capital and operating costs to develop the additional treatment and pipelines necessary to deliver the treated wastewater, and depend upon the treatment plant location and the length of pipeline needed to deliver the water. The costs of buying or leasing right-of-ways or easements for the pipeline are not included, as in some cases the easement or right-of-ways are already in hand or could be obtained at little or no cost.

To provide treated wastewater for reuse in public access areas, such as residential lawns, common areas (e.g. parks, median strips) or golf courses, the typical wastewater treatment plant is required by the FDEP to meet more stringent secondary cleanup standards. These more stringent standards are frequently met using additional filtration of the secondary treated water coupled with high level disinfection of the filtered water. After this has been accomplished, storage, transport, and distribution system components must be installed to deliver the treated water to the end user.

The cost to produce and deliver treated wastewater to an end user for reuse purposes is highly dependent upon the distance from the treatment plant to the user. Another factor is whether or not the reuse distribution will be placed in a new development at the time of construction or will be retrofitted into an existing developed area. Retrofitting into existing development is generally more expensive than installing distribution lines at the time of development, however, if a new development is significantly distant, and a retrofit site is reasonably close to the plant it can be more cost effective to consider a retrofit. Costs for upgrading an existing or planned wastewater treatment plant from secondary treatment to the more stringent standards necessary for public access reuse depends on how the system is to be implemented, as mentioned earlier. As an example, however, for planning purposes, costs for the additional treatment, storage, and distribution of a 1 Mgal/d wastewater flow have been prepared (PBS&J 2000d). This example assumes the treated water is transported a distance of one mile to its user. Total capital costs for construction of this system are estimated to be about $5.6 million, in addition to the cost of building the secondary treatment plant. Annual operation and maintenance costs are estimated to be approximately $181,000. The equivalent annual cost based on these figures, and assuming a 20-year time span, is just over $1 million per year. This equates to a unit cost of about $2.97/1,000 gal. of reclaimed water produced.

Although the cost of this reuse water is expensive, there are significant environmental benefits associated with its use, particularly along the more densely populated coastal area. In addition, the benefits of using this water to replace the use of water obtained from the Floridan Aquifer along the coast to avoid the problem of saltwater intrusion and to sustain potable supplies remaining in the Floridan Aquifer could be significant. More detailed analysis of reuse facilities and distribution systems within Region II is currently ongoing to assist with the location and evaluation of reuse water for future applications whenever possible. The primary focus of this ongoing effort is to help operating and permitted wastewater treatment plants with associated pipelines leading to public access reuse areas. Planning for future service delivery of reuse water to existing or planned developments, and possible interconnections among wastewater utilities to optimize distribution of reuse water are two important components of this ongoing program.

Reuse is a way that utilities in the Region can help meet water supply and wastewater management needs in the face of the growing population. The State of Florida promotes reuse of reclaimed water and water conservation as major state objectives, as established in Sections 403.064 and 373.250, F.S. The Florida Department of Environmental Protection (FDEP) has developed a comprehensive set of rules, Chapter 62-610 F.A.C., governing the reuse of reclaimed water to ensure that communities and utilities that practice reuse provide enough treatment and disinfection, and that continuous and reliable supplies of high-quality reclaimed water are produced.

Surface Water

Two general sources of surface water within Region II could be used for potential future water supplies: the saltwater bodies of Choctawhatchee Bay and the Gulf of Mexico; and

the fresh waters in the Region's rivers. At present, no freshwater lakes or reservoirs of sufficient size exist from which water could be extracted for public supply. Utilization of the saltwater sources would necessitate the use of some form of desalination (which is discussed separately below). For reasonably large freshwater uses, the only viable sources are the rivers that flow through or border Region II. The RWSDP, published by the District in 1982, and the Addendum to that plan published in 1988, presented several possible sources of fresh surface water within the Region II planning area. All except the Choctawhatchee River were relatively small stream sources located south of Eglin AFB, having most of their drainage originating within the borders of Eglin AFB.

Several concerns regarding potential surface water sources were discussed in the 1982 and 1988 Water Supply Plan documents, which previously resulted in the elimination of all of them for consideration as water supply sources. For the smaller streams, there was the concern that water in the Sand-and-Gravel Aquifer supports the stream flow, and that aquifer's development would significantly reduce the available stream water. By 1988, Eglin AFB had become reluctant to allow any development of water resources within the base boundary, eliminating Turkey Creek from consideration as a water supply source. The location of the proposed surface water plant on the Choctawhatchee River led to its elimination as an alternative based on its proximity to the Choctawhatchee Bay, about five miles downstream, which might cause problems due to saltwater influx. Another problem with the Choctawhatchee River was stated in the 1988 Addendum as being the unknown influence of upstream agricultural activities that might contribute unacceptable chemical contaminant levels in the water supply. Two additional stream locations have been identified for possible development in the future: the Yellow River, at or upstream from CR 87 in Santa Rosa County; and the Choctawhatchee River, 20 miles upstream from its mouth near the SR 20 bridge in Walton County.

Preliminary analysis of flow data and water quality data from both of these river systems (PBS&J 2000e) indicates it may be feasible to capture a significant amount of freshwater, which potentially could be used directly for public water supply, or as a source of water for ASR. A flow record for the Yellow River at CR 87 is not available, however, flow stations just upstream from the confluence of the Yellow and Shoal rivers give a combined, and conservative, value for expected flows in the Yellow River at CR 87. Table 3.8 presents a summary of flows for both the Choctawhatchee River at SR 20 and the combined Yellow/Shoal rivers. As can be seen, even the low flow of record at both locations far exceeds the 2020 demand requirements for Region II. Preliminary analysis of the available water quality data for the new locations on these rivers did not indicate a need for water treatment beyond conventional methods in order to meet potable drinking water standards. Occasional sampling during the 1970s through early 1990s tested the waters of the Yellow and Choctawhatchee rivers for heavy metals and agricultural chemicals (herbicides and pesticides), but no levels above current drinking water standards were reported.

Table 3.8 Flow Statistics of Yellow/Shoal and Choctawhatchee Rivers

Statistical Flow Rate	*CFS*	*Flow Mgal/d*	*% of Flow Rate at 20 Mgal/d Withdrawal Rate*
Yellow/Shoal Rivers at Milligan & Shoal Rd. (upstream of their confluence)			
Exceeded 10%	4,328	2,797	0.72 %
Exceeded 50%	1,598	1,033	1.94 %
Exceeded 90%	749	484	4.13 %
Lowest Recorded	312	198	10.1 %
Choctawhatchee River Near Bruce (SR 20 Bridge)			

Exceeded 10%	14,200	9,177	0.22 %
Exceeded 50%	5,049	3,263	0.61 %
Exceeded 90%	2,319	1,499	1.33 %
Lowest Recorded	1,103	713	2.81 %

Development of either of these water sources, however, would necessitate additional construction of water infrastructure, including a water treatment plant and pipelines of 25 miles or greater to transport the treated water to where it would likely be needed the most, (i.e. along the coast). Offline and/or inline reservoir storage would likely be needed for periods when stream flows are low or quantity and quality considerations make the treatment plant inoperable. Avoiding withdrawals of very turbid surface water during high river flow periods may also necessitate reservoir storage.

Based on a facility with a capacity to treat 10 Mgal/d, preliminary studies (PBS&J 2000e) estimated capital costs for surface water treatment alone would be approximately $30 million, with additional operation and maintenance costs of $1.3 million annually (approximately $1.09/1,000 gal. of water produced). In addition, total capital costs to construct a 36-inch pipeline a nominal distance of 25 miles, assuming pipeline easements or right-of-ways have already been obtained, would be estimated to be approximately $29 million with annual O&M costs of approximately $500,000, for an equivalent annual cost of approximately $2.7 million, or an estimated additional $0.73/1,000 gal.

To develop a sustainable and dependable source of surface water, it may also be necessary to develop an off-stream or in-stream reservoir. Site-specific conditions may vary significantly when considering the costs of a reservoir, and the amount of storage needed would depend to some extent on what backup supplies are available during periods of drought. Off-stream reservoirs, with a very limited amount of storage (five-day supply), would add an estimated $0.10/1000 gal. to the cost of surface water supply (CH2M HILL 1997). This may be considered a low-end number merely to support water treatment plant operations. There are also likely to be additional costs for ancillary infrastructure to support connections and intakes between the reservoir source and the treatment plant. High end cost estimates for reservoirs are for those to construct new in-stream reservoirs that provide reliable long-term storage capacities. These types of reservoirs add an estimated additional $1.00/1000 gal. to surface water supply costs primarily due to wetland impacts and environmental and permitting costs (PBSJ 2000b).

The estimated range of unit costs for finished bulk water produced from the Yellow or Choctawhatchee rivers is from $1.92 to $3.42 per 1,000 gal. (PBS&J 2000e). These costs reflect the total capital and operating costs required to develop new treatment plants along these rivers, water transport costs, and surface water supply reservoir costs (either off-stream or in-stream) but do not include the costs of local distribution to the water customer. The costs depend highly on the treatment plant's location and the length of pipeline needed to deliver the water. The costs of buying or leasing right-of-ways or easements for the pipeline are not included, as in some cases the easement or right-of-ways are already in hand or could be obtained at little or no cost.

There are several additional factors that will require careful consideration regarding surface water source options. Important factors are the analysis of environmental impacts to the surface waterbody and its surrounding ecosystem, obtaining necessary state and federal permits and the establishment of minimum flows and levels for proposed withdrawal site(s). Design and construction of a surface water withdrawal system will also need to be included. All of the above would add considerably to the

project's total cost. Due to these costs, plus additional expenses for new distribution systems or blending systems (surface water and ground water), no single supplier of water would likely be able to market all of this water without some joint arrangements and changes in infrastructure. While costs presently may seem prohibitive, the feasibility of developing these sources of water should be examined more closely in the future, because they may be considered an important source beyond the current 20-year planning horizon.

Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is the process of injecting excess water from a source of supply into an aquifer for the purpose of temporarily storing it for removal and use at a later date. This water is generally injected into the subsurface at times when water from the source is available in sufficient quantity and quality. When water supplies subsequently become low or when demand increases on a temporary or seasonal basis, the previously injected or "banked" water is withdrawn. This is usually done on a cyclic (typically seasonal) basis where it is possible to reasonably predict periods of wet and dry conditions.

There are a number of potential advantages of using ASR including: (1) water may be stored and then withdrawn to meet peak or seasonal demands; (2) it may be used as a salinity barrier to protect existing ground water supplies: and (3) costs may be reduced if existing wells can be used for withdrawal and/or injection.

When surface water is the source for ASR other possible advantages include: (1) water supply reservoir costs would likely be minimal or unnecessary; (2) land requirements are minimal and environmental impacts associated with surface water reservoirs are avoided; (3) stored water may be used as a source of supply during droughts when the availability of water from riverine or other sources is low; (4) surface water treatment plant capacity may be held to a minimum; and (5) treatment plant costs may be minimized by avoiding withdrawals at times when the quality of the surface water source is poor or very turbid.

The primary purposes of ASR within Region II would be to replenish the Floridan Aquifer and/or to act as a salinity barrier. As part of a screening level analysis, three possible sources of water within Region II for potential ASR use have been identified (Clabaugh 1999). One potential source is the Sand-and-Gravel. The other two potential sources are from the surface waters of either the Yellow River to the west, in Santa Rosa County, or the Choctawhatchee River to the east, along the eastern boundary of Walton County. Of the three potential sources, the Sand-and-Gravel Aquifer may itself become a major source of water supply, requiring only the construction of additional wells and/or development of additional wellfields. This could limit the availability of Sand-and-Gravel Aquifer water for ASR. Thus the most plausible alternative for utilization of ASR within Region II is in conjunction with the development of surface water sources. The surface water data (PBS&J 2000e) indicate that from 5 to 20 Mgal/d of water would be available for use in an ASR operation from either of the potential surface water sources.

The unit costs for ASR using surface water sources are estimated to be from $2.56 to $2.85 per 1,000 gal. of finished water produced from the Yellow or Choctawhatchee rivers and injected into the Floridan Aquifer near Ft. Walton Beach, and assume all new wells at the points of injection. These costs reflect the total capital and operating costs to develop surface water treatment plants and small off-stream raw water storage reservoirs along these rivers, a new injection wellfield near Ft. Walton Beach, and depend upon the treatment plant location and the length of pipeline needed to deliver the water. The costs of buying or leasing right-of-ways or easements for the pipeline are not

included, as in some cases the easement or right-of-ways are already in hand or could be obtained at little or no cost.

Although the costs of ASR are relatively high, a comprehensive feasibility study of ASR applicability within Region II would be needed to clearly identify the specific advantages and disadvantages of ASR in the Region. In particular, the application and the benefits of ASR as a barrier to saltwater intrusion should be addressed.

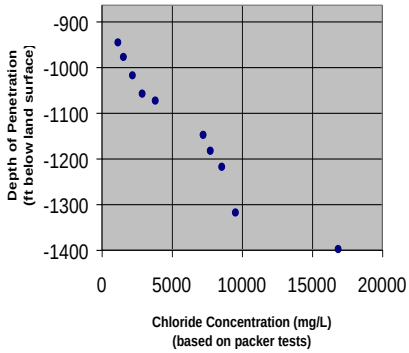
Desalination

Desalination is a process by which impurities, particularly soluble salts, are removed from water, usually in order to make it fit for human consumption. Desalination is primarily performed by one of two methods, either distillation or reverse osmosis (also known as membrane filtration). Distillation is an energy intensive method and much more costly than reverse osmosis per gal. of water produced. Therefore distillation is not considered to be a viable option for desalination during the plan's 20-year timeframe. As an example, distillation of 10 Mgal/d of brackish water would cost, in 1996 dollars, between $4 and $12/1,000 gal. of water produced. Assuming a slightly saline source, reverse osmosis (RO) costs are reported at approximately $1.59/1,000 gal. of water produced (PBS&J/SJRWMD 1996). Adjusting for inflation at approximately three percent per year, the cost of RO becomes about $1.90/1,000 gal. produced. These costs reflect the total capital and operating costs to develop new treatment plants to desalinate the water, with concentrations in the range of 2,000 mg/L to 3,000 mg/L, from either surface or subsurface sources.

Reverse osmosis is a process whereby water is forced through a semi-permeable membrane to remove dissolved solids. The resulting water is then usually of sufficient purity to be chlorinated and put into the public drinking water system. In a typical RO system only a portion of the raw water is forced, under high pressure, through the membrane. Eventually the remaining water becomes more concentrated with dissolved solids and is disposed of as a waste product. For proper disposal, a naturally salty environment is required (sea water) for surface disposal or brine aquifers for subsurface disposal.

Although RO can be used for raw water containing very high levels of dissolved solids, such as sea water, it becomes more effective and less expensive per gal. of potable water produced as concentrations of dissolved solids in the raw water source decrease. For this reason, the lower portions of the Floridan Aquifer, containing saline water, are a possible source of raw water for reverse osmosis in Region II. However, water within the lower Floridan Aquifer in this area can be expected to contain water with chloride concentration above 2,000 milligrams per liter (mg/L) and well above current federal and state drinking water standards, (Baskerville-Donovan & CDM 1997). These concentrations have been found to increase steadily as depth increases (Figure 3.29), indicating that during sustained pumping of the aquifer, salinity would steadily increase over time from upconing of the deeper water (Baskerville-Donovan & CDM 1997).

Figure 3.29
WRP Lower Floridan Test Well
Observed Chloride Concentrations



Other recent studies and planning efforts (Baskerville-Donovan 1999) have also considered the lower Floridan Aquifer for its potential as a brackish water source for use in desalination by reverse osmosis. These technical and economic analyses were for the area of south Walton and southeast Okaloosa counties, and concluded that desalination was not a feasible option for water supply for this area within the next 20 years. Disposal of residual brine, which may be one-half the raw water volume input and twice as concentrated, may also be a serious constraint that could significantly increase costs. Research by water management districts and others (PBS&J/SJRWMD 1996; CH2M HILL/SJRWMD 1998) also indicated that desalination of brackish aquifer water would not be a feasible alternative when salt content is high (e.g. 5,000 mg/L), and there is significant uncertainty associated with increasing salt concentrations in the aquifer utilized as water is pumped. Further, while it is technically possible to produce small quantities of potable water by desalination, the analysis indicates that a much higher demand must exist (30 to 35 Mgal/d) than is found within Region II in order for desalination to be pursued as a regional water supply. Even at higher demands, the high energy requirements for desalinization would generally be considered only when no other source is available.

Summary of Water Supply Source Options Analysis

Analysis of the water supply source options included the preparation of planning level cost estimates and water availability for the most likely (i.e. least cost) alternatives. Water availability estimates indicate 2020 water demands can be met through judicious use of alternative and existing sources. The cost estimates and analysis looked at a range of various withdrawal amounts from the coastal Floridan Aquifer, the inland Floridan Aquifer, and other source options. In order to consider the relative economy and make a rational choice among future alternatives, cost data for nontraditional alternative source options are presented below (Table 3.9).

Table 3.9 Summary of Water Supply Source Options Alternatives

Estimate of Withdrawal from Coastal Floridan Aquifer (Mgal/d)	Estimate of Withdrawal from Inland Floridan Aquifer (Mgal/d)	Estimate of Withdrawal from Other Source Options (Mgal/d)	Estimate of Inland Wells Costs $/1,000 gal.[3]	Estimate of Non-Floridan Source Options $/1,000 gal.[1]
30[2]	0	0	$0	$0
25	5	0	$1.57-$2.66	$0
20	5	5	$1.57-$2.66	$0.98-$2.15
20	10	0	$1.37-$2.01	$0
15	10	5	$1.37-$2.01	$0.98-$2.15
10	10	10	$1.37-$2.01	$1.43-$2.52

[1]Includes only the costs for most likely (least cost) alternative source option

[2]"no action" alternative

[3]Does not include costs associated with local distribution systems to end user.

In addition to water availability and costs, there are other project benefits that cannot be measured in monetary terms. Environmental and social costs and benefits are also discussed, which could have a significant influence over the economic costs and benefits. For this reason the final choice of "plan" for regional water supply sources will need to be closely coordinated with all water supply interests in Region II.

Chapter 4
WATER SUPPLY DEVELOPMENT PROJECTS

Overview

Subparagraph 373.0361, F.S., requires that this RWSP include a list of water supply development projects that meet the criteria in Subsection 373.0831(4), F.S. Based on the provisions of Subsection 373.0831(4), F.S., water supply development projects that are consistent with the relevant regional water supply plans and that meet one or more of the following criteria shall receive priority consideration for state or water management district funding assistance:

(a) Water supply development projects which are consistent with the relevant regional water supply plans and which meet one or more of the following criteria shall receive priority consideration for state or water management district funding assistance:

1. The project supports establishment of a dependable, sustainable supply of water, which is not otherwise financially feasible;

2. The project provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options; or

3. The project significantly implements reuse, storage, recharge, or conservation of water in a manner that contributes to the sustainability of regional water sources.

(b) Water supply development projects that meet the criteria in paragraph (a) and also bring about replacement of existing sources in order to help implement a minimum flow or level shall be given first consideration for state or water management district funding assistance.

Fair Point Peninsula Water Supply Development

This project provides financial assistance through a federal EPA grant obtained by the District for the design and development of the Sand-and-Gravel Aquifer inland wells for the Fair Point Peninsula. The District is providing $328,000 in financial assistance for the development of this water project in the form of a grant-in-aid. The District has secured federal assistance for the construction phase of this project as an alternative water supply. The project supports establishment of a dependable, sustainable supply of water, which is not otherwise financially feasible. The project also provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options. The project will include the development of an estimated 6.3 Mgal/d and will alleviate pumping from the Floridan Aquifer along the coast in southern Santa Rosa County.

Estimated construction costs are $19 million. The project funding is primarily by the public utilities.

Water Reuse Facilities Development

As part of the implementation of water resource development component of the RWSP the District may develop or assist with the development of more detailed plans for the use of reclaimed water. The reclaimed water would be used as replacement water for coastal public water supply sources. The project provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options. The project also significantly implements conservation of water in a manner that contributes to the sustainability of regional water sources. The estimated cost to provide financial support for new reclaimed water facilities would be determined as part of the development of the detailed plans. Eligibility of the reclaimed water projects for funding assistance would also be identified. Funding for implementation of project plans would include utilities, Florida Forever, and the federal government.

Sand-and-Gravel Aquifer Water Supply Protection Program

Long-term successful use of the Sand-and-Gravel Aquifer as an alternate water supply depends on measures to protect the aquifer from non-point impacts associated with overlying land uses. The proposed project is intended to examine non-point source susceptibility of the Sand-and-Gravel Aquifer in east-central Santa Rosa County, west-central Okaloosa County and southern Okaloosa County. These areas have been, or are currently being, examined as water supply source options. Much of the current interest focuses on the area between the Blackwater and Yellow rivers, which are tributaries to the Pensacola Bay System. The Pensacola Bay System is a District-designated Surface Water Improvement and Management (SWIM) waterbody and, as such, is one of the state's priority non-point source waterbodies. Urbanized areas south of Eglin AFB are also of interest.

Development of a program to protect the Sand-and-Gravel Aquifer is required due to its high susceptibility to contamination from surface spills or other non-point impacts and land uses. In urban areas such as nearby Escambia County, anthropogenic sources of pollution have contaminated the Sand-and-Gravel Aquifer over a significant fraction of the southern half of the county. About one-third of the principal public supply wells in the southern half of the county have documented solvent, hydrocarbon, and/or pesticide contamination. Water from these wells must be treated prior to being introduced into the water distribution system, often at great expense.

The susceptibility of the Sand-and-Gravel Aquifer to non-point impacts dictates that great care be taken in efforts to develop new, regionally significant sources of water. While land use in much of the Blackwater/Yellow River corridor is currently rural in nature, Santa Rosa County is one of the state's fastest growing counties. A major regional transportation route runs along the length of the corridor, along which development is presently taking place. Land use conversions from silviculture and agriculture to low-density residential are underway. It is reasonable to anticipate that

such development will continue, increasing the likelihood of adverse impacts to ground water quality.

On the positive side, much of this area is already in or surrounded by public ownership. A significant fraction of the land currently in private ownership, approximately 10,500 acres, was previously designated as the Conservation and Recreation Lands (CARL) Program Yellow River Ravines project. Presently, the Yellow River Ravines Tract is not a designated CARL project. Expanded public ownership of land within the study area could directly benefit the goal of developing sustainable water supplies for the Region.

Careful development of additional Sand-and-Gravel Aquifer water within Region II provides the opportunity to avoid adverse impacts to wells such as has occurred in southern Escambia County. Taking optimal advantage of this opportunity will require identification of wellhead protection areas surrounding new wells and implementation of policies and practices to protect the identified wellheads. Protection activities would minimally include development and implementation of wellhead protection ordinances. Optimally, acquisition of development rights and/or fee simple acquisition of wellhead protection areas and adjacent lands would completely and permanently protect the quality of water produced from the Sand-and-Gravel Aquifer. Implementation of such a program in the context of developing "new" sources of water will ensure that adverse non-point impacts, such as have occurred in southern Escambia County, are not repeated here.

Additional data collection and analysis is required to establish wellhead protection areas and other means (as necessary) to protect the quality of Sand-and-Gravel Aquifer water into the foreseeable future. Work will include inventories of potential sources of contamination (i.e. underground storage tanks, dry cleaning facilities, landfills, etc.). It will also include evaluating potential well sites against the context of existing sources of contamination. Consideration will also be given to protecting wetlands and other water resources in the area from non-point impacts. The project supports establishment of a dependable, sustainable supply of water, which is not otherwise financially feasible. The project also provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options. Funding sources for recommended projects such as land acquisition for water supply would include Florida Forever, federal funds, and state revenues for restoration and mitigation funding. The actual costs of acquiring land for water supply protection will depend on the results of the water resource development project and resource protection needs identified as this program develops. Up to 15 Mgal/d of water is estimated to be available through this project. Initial costs for performing aquifer protection analysis and establishment of areas for protection is $150,000.

Funding for Water Supply Development

Section 373.0361(2)(a) 3, F.S. requires that for each water supply development option listed, the RWSP include "*potential sources of funding for water supply development.*"

The water industry in Region II is made up of mostly publicly- or privately-owned water utilities within the corporate limits of a municipality or county. Each utility generally has a well-defined service area and customer base (please see Water Supply Sources section for details on the location of service areas). Production wells, main transmission lines and service lines to the customers are largely financed by the individual utilities. Infrastructure such as transmission lines are very costly relative to market conditions, and the customer base almost never supports competition or the duplication in the construction of water utility facilities. Utility customers also regard water as an entitlement or a necessity, and a basic service that should be subsidized by government and provided at a very low cost. This makes it extremely difficult for the industry to fund large capital projects or expansions unless there is an adequate new customer base or specific need to support these improvements. There are, however, a number of funding sources and circumstances under which to consider other sources of funds rather than revenues supported by customer fees.

The following is a list of potential sources of funding which may be applicable to the water supply development projects discussed in this plan:

- Water Utilities (investments, bonds, increased customer fees, and cooperatives)
- Local Government *ad valorem* taxes
- Local option sales taxes
- Franchise fees
- Regional Water Supply Authorities
- NWFWMD *ad valorem* taxes
- State of Florida general revenues
- State Revolving Loan Program
- Federal revenues
- Private/Public investments

Utility Revenues

Utility revenues obtained through customer fees are the traditional and most common approach for funding water supply projects, and this source of revenue is expected to continue to be the primary source of funding. As a whole, the basic economic principles of supply and demand (of water) apply. As the customer base grows, individual utility investments will also grow as long as sources of water are available at reasonable expense. Almost all of the water supply development options covered in this RWSP will continue to be funded through utility generated revenues. However, as water resource limits are reached, an individual utility may not be able to afford all the costs of importing water from outside its service area. Funding becomes particularly more problematic when the limit on water supply sources is due to the cumulative impacts of all the utilities in the Region and not just a problem singular to one water supplier.

In some instances, utilities may be able to pay for new sources of water simply by requiring a slight increase or adding a surcharge to customer fees to cover its expenses for expansion. Under more acute circumstances, it may be economically advantageous for a collective of utilities to take a regional or cooperative approach toward funding the development of alternative water supply sources and to more fairly distribute the costs of acquiring and transporting the additional water. Another possibility is that individual utilities requiring new sources of water may invest more than needed to help defray the costs of expansion. For example, they may decide to construct larger diameter pipes than needed and charge a fee to other utilities that may want to use them. The initial costs of the expansion may be through bond money, especially if the utility making the investment has a good bond rating and a good revenue stream to repay the debt. In general, the retail costs of water range from $2.00 - $4.00/1,000 gal. with an estimated average retail cost of $2.50/1,000 gal. Depending on what customers are accustomed to paying, a $0.25 to $0.50/1,000 gal. increase may be acceptable. However, the wholesale cost of new water from alternative water supply sources is estimated to be as much as $2.00 /1,000 gal.

Local Option Sales Tax

A local option sales tax is another source of revenue if there are a number of utilities involved and it is recognized that there is a significant public benefit toward solving water supply problems at the county level of government. This type of tax is likely to be useful in the coastal areas where the annual increase of population due to tourism could help defray the costs of increased water demands. This type of tax is also very useful when a revenue source cannot be paid back directly through utility fees or utility customer fees, but there are significant water supply problems of a regional nature such as saltwater intrusion that can be solved cooperatively through infrastructure improvements. Establishment of a local option sales tax can be used to pay for any number of fixed capital expenditures for public water facilities, including land acquisition, construction, facilities improvements, and engineering design costs. However, this type of tax requires voter approval by many voters who may not recognize the need for or benefits of the increased tax. It also requires cooperation between all the utilities and municipalities within the county(s) levying the tax. Thus, it may be difficult to obtain the

support of voters who may not understand the benefits of the tax, which include protection of existing water supply sources, indirect benefits to the local economy, and the need for increased water supplies to prevent water shortages and to meet growth demands.

Franchise and Service Area Fees

Although unlikely as a source of funding in northwest Florida, franchise fees are of possible value when there is an interest in further developing an alternative water supply system. According to Chapter 180, F.S., a municipality may create a zone or area by ordinance and prescribe reasonable regulations requiring all persons or corporations living or doing business in the area to connect to an available alternative water supply system. The alternative water supply system may include, but is not limited to reclaimed water, aquifer storage and recovery, and desalination systems. The franchise zone or area, which may extend up to five miles outside the corporate limits of a municipality as long as it does not include the limits of any other municipality, may help to protect investments made to develop alternative water supplies. For example, it is common for single utilities in southern Florida to secure a franchise or service area where a water system finds it feasible to import new water it needs for ASR. This helps insure a required connection to the newly developed water and protect the financial investment made. Assuming the area is large enough, it would also prevent some other entity from utilizing the new source of water and not paying for its development.

A municipal government owning a franchise or utility in a franchise area may also have an interest in developing new water and use it to supply areas outside of the franchise area. This is particularly useful when additional water is needed within the franchise area but expanding the customer base outside the franchise area can reduce development costs. Under these circumstances, some agreement may be reached to establish a fee at a rate that helps to defray the costs of developing the new water supply source. The initial expense or indebtedness for developing the new source would then be returned via new customers and utilities paying the franchise fee. This type of revenue generating source requires careful financial planning and willingness by the franchise to make a long-term investment.

Regional Water Supply Authorities

According to section 373.1962, F.S. local governments may create a regional water supply authority with the approval of the Secretary of the Department of Environmental Protection when the regional water supply authority is in the public interest. The authority must be created for the purpose of developing, recovering, storing, and supplying water for county or municipal purposes and in such a manner that it will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas. Within Region II, there is a regional water supply authority called the Regional Utility Authority (RUA), which was granted approval pursuant to 373.1962.

Among other powers, a regional water supply authority may levy *ad valorem* taxes, not to exceed 0.5 mills, and issue revenue bonds. No tax may be levied by the authority in

any county or municipality without an affirmative vote of the electors residing in that county or municipality. The revenues may be used by the authority to acquire land and facilities for the production and transmission of water to any county or municipality.

A RUA may also join with one or more public corporations for the purpose of carrying out any of its powers and contract with other public corporations for the purpose of financing the acquisition, construction, and operation of water supply facilities. As such, a regional water supply authority is authorized to develop, construct, operate, maintain, or contract for alternative sources of potable water, including desalinated water, and pipelines to interconnect authority sources and facilities, either by itself or jointly with a water management district. Alternative water sources, facilities, and pipelines may also be privately developed, constructed, owned, operated, and maintained, in which event an authority and a water management district are authorized to pledge and contribute their funds to reduce the wholesale cost of water.

Local Government Ad Valorem Tax Revenues

Local government *ad valorem* tax revenues are not expected to be a significant source of revenue to fund future water supply development projects. However, in some instances, local governments may contribute from their general fund to help initiate or participate in a project that can later be repaid through customer fees. This is generally thought of as seed money that is used with other sources of funding to move a water supply project forward.

NWFWMD Ad Valorem Tax Revenues

Unlike other water management districts in the State of Florida, the NWFWMD *ad valorem* tax rate is statutorily capped at 0.05 mills. This source of revenue is currently not sufficient to support the District's entire ongoing programs and is not available as a significant source of revenue for water supply projects.

Florida Forever Act and Preservation 2000

Section 259.101(3)(b), F.S. currently authorizes the District to use Preservation 2000 Trust Fund monies for the acquisition of lands for water supply development. However, the Florida Forever Act, Section 259.105, F.S., will replace Preservation 2000, Section 259.105, F.S. The goals for Florida Forever funding specifically include 35 percent of the funding to be spent to implement water management district work plans (S. 373.199, F.S.). These include the implementation of practices that provide sufficient quantities of water available to meet current and future needs of the natural systems and residents of the state, as measured by execution of water-resource-development components of the districts' water management plans. However, funds provided for capital improvements such as construction of treatment, transmission, or distribution facilities are not allowable.

Although the Florida Forever Act does not specifically authorize the use of funds for acquisition of lands for water supply development, the District's Governing Board is empowered to acquire land for water storage, conservation and protection of water resources, as well as aquifer recharge, and water resource and water supply

development. Florida Forever funds may also be used for construction of aquifer storage and recovery facilities, surface water reservoirs, and other capital improvements for water resource and water supply development. These activities should meet the needs of natural systems and citizens of the state by enhancing or restoring aquifer recharge, facilitating capture and storage of excess surface water flows, or promoting reuse.

Projects that are funded through Florida Forever funding should be within (or at least clearly consistent with) the Regional Water Supply Plan and the water resource development component of the District Water Management Plan. Minimum flows and levels must also be established for any waterbody that might reasonably be expected to be impacted by the funded project.

State of Florida General Revenues

State of Florida general revenues have occasionally been used to fund relatively small projects at the local government level. However, this source of funding has not typically been appropriated for significant water supply development projects. This practice is not expected to change.

Drinking Water State Revolving Loan Fund

Under Chapter 403 F.S., FDEP is authorized to make loans, terms generally limited to 30 years, to community water systems to assist in the planning, design, and construction of these systems. One of the difficulties with any type of loan is that local water utilities may already have significant debt, and may not be willing to incur any new debt to a public (or private) lender until old debts are repaid, or new debts can be repaid by new users. However, government-supported lending may be helpful if a utility is unable to obtain a loan from private sources.

Federal Revenues

The District, in cooperation with FDEP and other water management districts, has successfully pursued federal funding for water resources development and water supply development projects. In 1998, Congress appropriated $328,000 for a water supply planning project in southern Santa Rosa County. Following the development of this planning level initiative, an additional $2.85 million has been appropriated for water supply development in northwest Florida and is being sought to transport water from the inland Sand-and-Gravel Aquifer wellfield being developed as an alternative source of water supply. These funds are administered by the EPA.

Private Investments

Numerous opportunities exist for private enterprises or private and public partnerships to invest in water supply projects. Because these options are too numerous to list, only the concept for private funding opportunities is discussed here. In most cases, the financial arrangements, which may include public and private partnerships, will have to be custom-designed. For large investments (several million dollars), the expertise of a financial adviser is recommended. In some instances, a corporate entity may be set up that is run by a group of public utilities with a common need. In other instances, it may be possible to have the private sector involved with investments in the water supply

industry. Private sector involvement can include full ownership to a range of discrete service contracts involving construction, maintenance or operation of the water supply system. In all cases, there must be a revenue stream from government or the beneficiary who uses the water to support the private sector involvement. This may involve a take or pay agreement or other arrangement to ensure the private entity will be able to pay for any indebtedness or water produced. Competition among private corporations could also result in reduced project costs and lowered customer charges. For this reason, a fair and competitive bidding process is required when choosing an outside private contractor. Corporate entities competing for water projects should also have good access to accurate information relevant to the water supply project including technical data, financial statements, permits, property data, and the customers being served.

The approach taken will frequently depend on the willingness by the public to allow the private sector to participate in the water industry or outright own the utility or service. In some cases, contractual arrangements may allow the transfer of some water project assets back to the public once the contract term has been long enough for the private operator to recover its costs for the initial capital improvements made. The private operator may finance water supply projects through a number of means, including using internal assets, borrowing from commercial banks against its own assets, or contracting debt with an outside entity. In instances where small utility providers can consolidate or pool their project needs, or where a project by a single utility is just too small to consider, there may be a greater interest and need for corporate financing. Where privatization is not favored, public authorities may still want to take advantage of private sector expertise while retaining ownership. Under this circumstance, the private sector assumes little risk but is able to make a profit through good performance and fixed cost contracts.

Chapter 5
WATER RESOURCE DEVELOPMENT COMPONENT

Overview

The NWFWMD water resources development program for Region II is based on section 373.0361(2)(b), F.S. This requires that the regional water supply plan have a water resource development component that includes:

1. A listing of those water resource development projects that support water supply development.
2. For each water resource development project listed:
   a) An estimate of the amount of water to become available through the project.
   b) The timetable for implementing or constructing the project and the estimated costs for implementing, operating, and maintaining the project.
   c) Sources of funding and funding needs.
   d) Who will implement the project and how it will be implemented.

Based on the definition of water resource development included in Subsection 373.019(19), F.S., a water resource development project is a project that contributes to the formulation and implementation of regional water resource management strategies and includes:

- The collection and evaluation of surface water and ground water data
- Structural and nonstructural programs to protect and manage water resources
- The development of regional water resource implementation programs
- The construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and ground water recharge augmentation
- Related technical assistance to local governments and to government-owned and privately-owned water utilities

Water Resource Development Projects

The following is a description of NWFWMD's water resource development projects that are currently underway or will be implemented to support water supply development.

Floridan Aquifer Sustainability Model Analysis

The District, in cooperation with Region II local utilities, is currently engaged in the development of numerical ground water models to investigate saltwater intrusion, upconing and leakage in the underlying Floridan Aquifer system. The salinity transport models will be developed to examine the sustainability of withdrawals from the Floridan Aquifer in the coastal areas of Region II and to examine the potential for saltwater intrusion under current and future conditions. More specifically, the models will be useful to estimate how long Floridan Aquifer coastal sources will last at various rates of water withdrawals before they become too saline. In pursuit of this objective, the District has obtained the services of HydroGeoLogic, Inc. to provide solute transport models, which will simulate saltwater intrusion. The first solute transport model being developed will cover the center of the Region II Water Supply Planning Area. The model will consist of a three-dimensional mesh generated over the system for density-dependent flow and solute transport analysis. Once calibrated, the model will be used to investigate the impacts of various ground water demand scenarios on saltwater intrusion. The first salinity model is expected to be completed within one year.

As part of the sustainability analysis, HydroGeoLogic, Inc. and the District will conduct a number of model simulations of ground water flow and solute transport. The period of time simulated will include the 2020-planning horizon and be extended at least through the year 2050. Model simulations will cover current pumping conditions as well as proposed future pumping rates. The model results will be very useful for evaluating ground water withdrawals proposed as part of this RWSP to alleviate future problems, and further, to define future water resource constraints due to increased demands. The model will also be useful for more detailed water supply planning, wellfield development analyses and ongoing cumulative impact analyses. Results of the model forecast will include aerial and cross-sectional plots of chloride distribution, head distribution,

boundary flux distribution, velocity vector plots depicting magnitude and direction of flow, and mass balance calculations. These results will be reported for future conditions at various time intervals needed for future planning. Pending the outcome of the initial model in the central part of the region, two additional models covering the eastern and western flanks of Region II are also planned.

The entire Floridan Aquifer model sustainability analysis is expected to take two years to complete and will be utilized for the ongoing implementation of the RWSP, development of water management strategies and consumptive use permitting decisions. During the development stage, District staff will oversee the efforts of the ground water-modeling consultant. In addition, staff will participate in research, monitoring, test drilling, and related data collection activities that leads to the further development of salinity transport and ground water flow modeling capabilities of the District in Region II. The total estimated cost of this effort is $750,000. Funding sources for this project will be from the Water Management Lands Trust Fund, local governments, and general revenues of the District. An estimated sustainable withdrawal of water from the Floridan Aquifer that should be identified as a result of this analysis is 20 to 30 Mgal/d.

Inland Sand-and-Gravel Aquifer Water Resources Development Project

The uses of inland sources of the Sand-and-Gravel Aquifer as an alternate source of supply for Region II are currently being developed and under further study. This source of water supply supports the establishment of a dependable, sustainable supply of water that is not otherwise financially feasible under the provisions of section 373.0831 F.S. The main area being considered for development is the portion of the Sand-and-Gravel Aquifer that lies between the Blackwater and Yellow rivers in Santa Rosa and Okaloosa counties.

The Sand-and-Gravel Aquifer consists of unconsolidated quartz sand, gravel, silt, and clay. Sand, along with some gravel, is the dominant lithology, while silt and clay form discontinuous layers within the aquifer. Ground water within the aquifer exists under unconfined to semi-confined conditions. The water table marks the top of the Sand-and-Gravel Aquifer. The discontinuous layers of silt and clay typically provide for semi-confined conditions in the lower portions of the aquifer. In the Santa Rosa/Okaloosa County area, the thickness of the Sand-and-Gravel Aquifer increases from east to west, ranging from approximately 100 ft. in eastern Okaloosa County to more than 350 ft. in Santa Rosa County. Considerable local variation in the thickness of the aquifer occurs due to local topography and the somewhat irregular surface of the Intermediate System. Although poorly documented by hydraulic testing, the yield potential of the aquifer is believed to be highest in Santa Rosa County and lower in Okaloosa County. The Sand-and-Gravel Aquifer is the principal source of water for all uses in Santa Rosa County.

With increased problems associated with using the Floridan Aquifer, there has been increased reliance on the Sand-and-Gravel Aquifer. Most of the water used in Santa Rosa County is presently withdrawn from the Sand-and-Gravel Aquifer with little noticeable impact to the resource. The Sand-and-Gravel Aquifer in Santa Rosa County is extremely productive due to its high rate of recharge which for water supply

development purposes has been estimated up to 20 in/yr, or 40 times the estimated Floridan Aquifer recharge rate. The aquifer is believed to be capable of providing regionally significant quantities of water. Sand-and-Gravel Aquifer wells in Santa Rosa County yield as much as 1,440 gallons per minute (gal/min). Specific capacities of the major supply wells range up to 83 gallons per minute per foot of drawdown (gal/min/ft), with typical values ranging between 20 and 40 gal/min/ft. Presently, the largest user of Sand-and-Gravel Aquifer water in the Blackwater/Yellow River corridor is the East Milton Water System. East Milton has three wells in the area and produces about 0.77 Mgal/d from the aquifer. The Fairpoint Regional Utility System (FRUS) is currently in the process of obtaining a permit to withdraw an estimated average of 6 Mgal/d from an estimated total of 12 wells located on the western end of the area. East of Santa Rosa County, as the Sand-and-Gravel Aquifer thins, it becomes less productive and is generally utilized for non-potable purposes.

Quantifying additional ground water availability from the Sand-and-Gravel Aquifer will require more technical information than is presently available. This requires characterization of the principal components of the hydrogeologic framework (unit thicknesses, etc.) and quantification of the hydraulic properties of the Sand-and-Gravel Aquifer. The high degree of hydraulic communication between the Sand-and-Gravel Aquifer and local streams and wetlands also requires careful planning and analysis of proposed withdrawals in order to avoid significant impacts to these features. Surface water features that could potentially be impacted include riverine wetlands adjacent to the Yellow and Blackwater rivers, seepage wetlands and streamside wetlands lying along streams. This water resource development project will inventory and monitor all sensitive resources that may be impacted by wellfield withdrawals including, protection of water resources through CUP and evaluation of possible locations for MFL establishment.

The project's principal objectives will be to develop a detailed numerical model of the Sand-and-Gravel Aquifer's flow system in the study area capable of providing all the information necessary to develop the aquifer as an alternative supply source, and to evaluate impacts to surface waters and wetlands that derive from using this source. Work to be accomplished includes the following: inventory of existing wells; development of a potentiometric surface map of the Sand-and-Gravel Aquifer; test drilling and geophysical logging to define the hydrostratigraphic framework; hydraulic head monitor well construction; construction of multi-well aquifer test sites; performance and interpretation of a multi-well aquifer test; inventorying wetlands that could potentially be impacted by pumping, and measuring flows on surface streams that drain the Sand-and-Gravel Aquifer. Existing hydraulic and water quality data will be reviewed. All existing data available to the District will be utilized in the assessment. Other ongoing activities regarding the Sand-and-Gravel Aquifer within the study area will be incorporated into this assessment. Maximum use will be made of available data and information to allow for a more thorough assessment. Due to available data and other investigations being performed by the FRUS in the western portion of the study area, test wells and monitoring sites are expected to be spread over the central and eastern portions of the study area. Information developed through this initial phase will be used

to define the hydrogeologic framework of the aquifer and lay the foundation for subsequent detailed numerical modeling and analysis.

The model results will be used to determine the amount of additional ground water that can be safely withdrawn from this area and meet substantial regional water supply needs. In addition, the model will evaluate ground water and surface water stream interactions. Surface water monitoring sites will be specifically established for this purpose along the lower reaches of the local drainage features. Flow measurements will be recorded commensurate with water level surveys and will provide additional information regarding the water budget and aid in developing the ground water model to predict streamflow and ground water interactions. Stream flow data collected by recent studies and surface water modeling will also be compiled to quantitatively assess impact on streams, wetlands and other surface waterbodies.

The estimated cost of this project is $160,000 and will take 18 months to complete. As much as 10 Mgal/d of additional water is estimated to be available from this source.

Coastal Sand-and-Gravel Aquifer Sources

Based on preliminary estimates by Clabaugh (1999), there are 5 Mgal/d of water still available from the Sand-and-Gravel Aquifer in the coastal area of Region II. While this source of water may not be great, it is estimated to be a relatively inexpensive source of water that utilities may be interested in acquiring. The District will continue to evaluate this local source of water as part of the solution to alleviate coastal pumping from the Floridan Aquifer and work cooperatively with utilities interested in the further development of this water resource. It estimated that the initial evaluation and detailed mapping of where water would be available from this resource, without any additional tests for well yield, would cost $50,000.

Aquifer Storage and Recovery (ASR) Viability

While large-scale ASR operations by the District may not be economically feasible at the present time, some larger individual utilities or collectives of utilities may find ASR to be useful and wish to explore this technology further. Where opportunities exist to develop ASR with individual utilities as a means to protect the Floridan Aquifer from saltwater encroachment, while meeting local water supply demands, the District may work cooperatively with interested utilities to explore this technology further. These efforts would include technical, financial and educational assistance to any utility or groups of utilities interested in pursuing ASR as an option for their water supply systems. The District will also explore in more detail the use of ASR as a salinity barrier to protect existing potable water supplies. This project would need to be coordinated closely with ongoing aquifer sustainability efforts, surface water monitoring and supply feasibility analyses, and likely start after the Floridan Aquifer Sustainability Model analysis tool is developed. Possible funding sources for future ASR testing and development include Florida Forever, Water Management Lands Trust Fund, federal funds and public utilities.

Water Reuse Coordination Program

Reuse of wastewater is a significant water conservation measure with an estimated potential to reduce water withdrawals from the Floridan Aquifer's coastal area by 5 Mgal/d. Compared to the production costs of raw water, the cost of developing and distributing reclaimed water for reuse in Region II is expensive. However, the use of this water also has substantial environmental benefits when properly applied for irrigation purposes as it avoids direct discharges into surface waterbodies. The District's primary roles for reuse will be as coordinator and facilitator for any water supply plan reuse efforts amongst the various utilities in Region II. This project will include the ongoing mapping and updating of reuse sources, supply lines to demand centers, and potential areas with reuse demand. This will help interested utilities see where ongoing reuse activities are taking place throughout Region II and present opportunities to optimize flow of reuse water to future development in the area. Coordination with FDEP on wastewater regulatory and NWFWMD Consumptive Use Permitting decision-making, as well as opportunities to participate in rule- making activities that further the beneficial use of reuse water, will also continue.

In addition to coordination and facilitation activities by the District under the water resources development component of this plan, the District may also consider providing or seeking federal financial assistance to encourage reuse as a water supply development project. There are several considerations and further analyses that are necessary prior to the commitment of District or federal funds in Region II for this purpose. These include:

- A logistics analysis concerning the location of wastewater treatment plants and reuse transmission lines in relation to supply and demands centers
- Reuse reliability and the potential for augmenting or mixing reuse with ground water and stormwater sources may need to be examined
- The need to improve reuse quality so it may be used in public access areas instead of for farm irrigation or non-public access sites
- Potential of reuse for aquifer recharge and aquifer storage and recovery
- Economic and environmental feasibility
- Funding and ownership considerations for the continued operation of reuse facilities

As opportunities arise, the District will work with interested parties to develop reuse projects through the water resource development component of the RWSP. This will include continuation of closely coordinated efforts to facilitate reuse with local utilities and water users. An estimated cost of this program is $30,000 in the fiscal year 2000-2001. Funding would be provided through the Water Management Lands Trust Fund and NWFWMD general funds.

The initial component of this project will be to develop a detailed project plan that identifies the specific steps to be carried out by the District in working toward the goal of 5 Mgal/d of Floridan Aquifer water savings through reuse efforts by 2020. The project plan will include schedules for reuse activities and will identify the parties responsible for

implementation of each plan task. Development of the project plan will be closely coordinated with the DEP reuse coordinator and the District's regulatory programs.

Water Conservation Program

The District has actively pursued water conservation efforts through its consumptive use permitting and public education programs. This program will be enhanced through the development of a specific project to insure that successful conservation practices will continue in the future. Initial development of this project will entail identification of the specific steps the District currently undertakes and those that may potentially be undertaken to further water conservation in Santa Rosa, Okaloosa and Walton counties. Continuing and increased implementation of water conservation through both regulatory and non-regulatory strategies will be the focus of this project. Current regulatory strategies involve implementation of criteria stipulated in the District's Consumptive Uses of Water permitting rule, Chapter 40A-2, F.A.C. The rule requires utilities within the WRCA to submit water conservation plans, programs, and measures that are evaluated on their effectiveness to reduce water use demand and promote the efficient use of the area's water supplies. The utility conservation measures are reviewed specifically for standards and implementation schedules intended to reduce annual average per capita water consumption to 110 gallons per day, or lower, through such actions as adopting water conservation-based rate structures, reducing leaks to 10 percent or less of the water withdrawn, implementing water conservation public education programs, etc. Water conservation plans, programs and measures developed by local governments operating water supply utilities are also reviewed to determine if a Xeriscape ordinance meeting the requirements of paragraphs 373.185(2)(a)-(f), F. S., and an ordinance requiring the installation of a rain/moisture sensor cutoff device on automatic irrigation systems pursuant to Section 373.62, F. S., have been adopted.

Non-regulatory programs include coordination with planning agencies involved in the review of developments of regional impact and the dissemination of information that assists with the implementation of conservation programs by utilities and local governments and information that encourages conservation by end users. The District will also continue to conduct research to determine the water savings that may be realized through additional conservation efforts such as plumbing fixture and appliance rebate and retrofit programs, water use audits, and alternative metering strategies.

Surface Water Monitoring for Surface Water Supply Feasibility

The primary efforts directed at surface water will be to provide adequate hydrologic and water quality data for any surface water sources being developed or under consideration for future development. Surface water flow monitoring, modeling, and related data analyses activities would also be undertaken where the use of ground water sources would be expected to have an interaction effect on streamflow or other surface waterbodies. This includes continued monitoring of surface water flows on the Blackwater, Shoal, Yellow, and Choctawhatchee rivers. Monitoring of the tributaries to these rivers and local streams and creeks in the coastal area may also be included under this activity. Funding for this activity includes the traditional sources of the federal

government and general revenues of the District. Where necessary, the District would augment this funding through the Water Management Lands Trust Fund.

Surface waters from the Choctawhatchee, Yellow and Shoal rivers are possible alternative water supply sources in Region II. In fact, these larger river systems normally have flows that are far greater than the public utilities withdraw, and could easily provide a quantity of water that meets all the water needs of the area. However, there are several limitations that would have to be overcome before surface water use would be widely supported. To determine that these limitations could be overcome, additional research and data collection would need to be performed. This would include better characterization of the surface water flows from these sources, which tend to be highly variable in both quantity and quality and an evaluation of the treatability of surface water sources. The focus for water quality sampling should be on primary and secondary public drinking water standards.

Quantity analyses would primarily be used to determine a reliable amount of water available, and would also entail minimum flows and levels considerations that limit the availability of surface water sources during periods of low flow. Minimum flows would likely be established at or near historical minimum flows and protect the flow regime of natural systems based on climatic variability. Further feasibility analyses are needed to consider the storage requirements of the surface water supply system to supply water during the low flow periods when withdrawals would not be allowable. These storage requirements are likely to require large reservoir systems, which may also be associated with significant environmental impacts.

In addition to quality and quantity determinations, economic feasibility and public acceptance would also need to be considered. Surface water supply would generally require a large treatment plant and water transport mains to local suppliers willing to take this water. Preliminary estimates indicate that a single supplier of 10 Mgal/d of surface water would cost an estimated $60 million, not including the costs of reservoir storage. Also, the current infrastructure established along the coast is made up of numerous utilities with water distribution systems that supply ground water. These utilities may not desire, or be completely compatible with a surface water supplier. The need for surface water should also be closely coordinated with sustainability modeling efforts and future ASR feasibility analyses.

To begin the research to further explore surface water sources, the District will initially conduct additional streamflow monitoring on the Yellow and Choctawhatchee rivers. Additional flow monitoring data needed for the Yellow River may also be used for ground water yield analyses of the Sand-and-Gravel Aquifer sources which are connected to these surface waters. Other smaller streams in the coastal area and tributaries to the larger rivers may also be explored. Water quality monitoring will be primarily focused on additional data needed for treatability analyses. This monitoring work will take the next three years to complete. This monitoring work may also be useful in the examination of ASR alternatives and is also likely to be critical to the needs of Region II beyond the 2020-planning horizon. The District estimated the cost of the initial

monitoring work to be $50,000 per year, through the Water Management Lands Trust Fund. Possible funding sources for regional surface water supply facilities should these facilities become feasible or necessary would include public supply utilities, Florida Forever, and the federal government.

Development of Regional Water Management Strategies and RWSP Updates

The District is undertaking a number of activities to fully implement water resource and water supply development programs under the RWSP. This includes administration of funding and project management, coordination with FDEP and other WMDs as necessary, grant writing for implementation funding, reporting on the status of the plan to decision- makers, coordination with local governments and utilities, and technical assistance to local utilities. The total estimated annual cost of these activities in fiscal year 2000/2001 is $48,800. Primarily, funding will be from the Water Management Lands Trust Fund.

Specific requirements for reporting include an annual report by November 15th of each year to the Office of the Governor and Legislature by the FDEP on the status of the regional water supply plan. The information for this report is compiled by the District and prepared by the Department to describe each district's progress toward achieving water resource development objectives. The annual report should include a compilation of the estimated costs and potential sources of funding for water resource development and water supply development projects identified in the plan. In addition, a five-year water resource development work program is required to describe the District's implementation strategy for the water resource development component of the approved plan. The work program is subject to review by the Office of the Governor and the Department and may be commented on by interested parties.

Along with administrative type responsibilities, District staff will undertake a number of coordination and technical work activities necessary to support implementation and further development of the plan. In many cases, these activities will help to facilitate and coordinate the activities of utilities that may wish to participate in cooperative water supply planning efforts or plan implementation. These water supply planning efforts will lead to plan updates and should result in increased availability of water supplies as outlined in this plan that are protective of existing water resources. This includes assistance with development of inland wellfields, reuse, conservation, aquifer storage and recovery, and surface water for water supply. A crucial element of this plan will be continued technical support for inland wellfield development. This will include further investigation of capital project options, well siting, raw water transport, hydrogeology, and related engineering work for development of inland ground water sources, including the Floridan Aquifer and the Sand-and-Gravel Aquifer. These further investigations will lead to the identification of specific water supply development projects that support dependable and sustainable supplies of water. The District will also continue to provide technical support, research, brochures and educational assistance to utilities in Region II to promote water conservation efforts.

Hydrologic Data Collection and Analysis

The NWFWMD has a limited hydrologic data collection network of streamgages and wells in Region II. As part of the regional water supply planning process and implementation of the RWSP, the District will need to enhance its ground- and surface water monitoring capabilities. This includes an expanded network for the Sand-and-Gravel Aquifer and the Floridan Aquifer where new water sources have been identified. The expanded network will be useful for future water supply planning and making refinements in ground water models used for making management decisions and developing water management strategies.

Specific tasks include:

- Development of an enhanced database of Floridan and Sand-and-Gravel aquifer wells suitable for inclusion in future potentiometric surface mapping efforts.

- Development of a plan for an enhanced monitoring network of long-term ground water and surface water sites, including both quantity and quality considerations as related to new areas of water withdrawal.

- Implementation of the enhanced monitoring plan.

- Measurement of the enhanced Region II aquifer networks and preparation of potentiometric surface maps at specified intervals, beginning Spring 2001.

- Documenting the outcome of recently completed Region II Floridan Aquifer and Sand-and-Gravel Aquifer tests.

- Conducting ongoing monitoring of selected surface water and ground water sites for basic water quality parameters, water levels, and flow in the vicinity of sites that may be or are being given consideration as future water supply withdrawal points.

- Continuation of the modernization of water use data management programs, including the development of water use data collection programs, which automate the data collection and mapping processes for the purpose of projecting and reporting water use.

- Continued support of the development, enhancement and maintenance of the 3-D numerical model developed for the Floridan Aquifer in Region II. The model will continue to be applied to assist with water management decisions that involve the cumulative impacts of water withdrawals and regional water management strategies.

This will be an ongoing project on an annual basis. It is supportive of all the water resource and water supply development projects and water supply planning efforts in Region II. All of the new and existing sources for water supply discussed in this plan are

provided a significant level of protection through its implementation. The estimated cost of this project in FY 2000-2001 is $100,000. Funding sources include the District's general fund, Water Management Lands Trust Fund, federal funding, and local governments.

Abandoned Well Plugging

The NWFWMD has an active program to plug abandoned artesian wells. The overall goal of this program is to protect available ground water resources from old, uncontrolled or improperly constructed abandoned wells. The District achieves the proper abandonment of such wells through the use of two methods. The first approach is to require water well contractors to plug abandoned wells as they occur during construction or are found on site. These wells are normally of small diameter. Within Region II, from 1976 through mid-2000, the District has required the plugging of approximately 1,500 abandoned wells.

The second approach has been to initiate a well abandonment contract with a well-owner or local government to provide financial assistance in those cases where plugging the abandoned well is considered critical to protecting the water resource or the public health. Within Region II, from 1990 to mid-2000, the District has entered into 10 well plugging contracts, resulting in the proper plugging of 139 abandoned wells that met this criterion.

Remaining within Region II are an estimated 40 known wells to be plugged. The cost of plugging these additional wells is estimated at $62,000. This project would support District efforts to sustain coastal water supply sources, which currently are withdrawn at more than 25 Mgal/d. Sources of funding for abandoned well plugging have traditionally been through cooperative efforts including the Florida Pollution Recovery Trust Fund, EPA, state general revenues, individual well-owners, and local governments. The District will continue to fund the well plugging program with the current sources of funding.

Chapter 6
PUBLIC INTEREST AND COST SAVINGS

Public Interest and Cost Savings

Section 373.0361(2)(e), F.S. requires that the RWSP consider how options under the water supply and water resource development components serve the public interest or lessen overall costs by preventing the loss of natural resources or avoiding greater future expenditures. Considering what the replacement costs of all the water supply facilities along the coast would be, it is easy to see the cost savings and public benefits of the water source options and water resource development activities of this RWSP. If, for example, all the production wells withdrawing water from the Floridan Aquifer along the coast needed to be replaced, approximately 30 Mgal/d of new water would be needed. Planning level cost estimates for such a project are placed at $120 to $180 million (year 2000 dollars). If, on the other hand, the aquifer were managed in a sustainable manner

(so that only 10 Mgal/d withdrawal could remain on the coast), the cost of new water sources would be approximately $70 to $120 million, or $50 to $60 million less than the full replacement cost. Even as a rough estimate, these cost savings are considerable. Furthermore, the steps taken to protect and sustain the Floridan Aquifer benefit the public since they must ultimately pay for the difference in increased expenses if these water management steps are not taken.

In addition to cost savings, the water that would be produced from water supply options and water resource development is also of significant value to the public. First, it is anticipated that water obtained from the most likely alternative water supply sources will be obtained in an environmentally suitable manner without harming natural resources or other water users. Second, the cost of the water from the options addressed is essentially the same as water currently being obtained from traditional sources relative to consumer incomes in Region II. This value may be viewed as the amount of money water users are willing to pay (revenues received by the utilities) including the cost for water supply. Finally, the added value of water, which is the gross revenue of the all the current and future producers in Region II who will depend on this water, should also be considered. For without the development of alternative water supplies, the gross revenues of the producers and economic growth in Region II could not be supported.

To compute this value with reasonable accuracy, a number of data sources can be considered. A conservative minimal estimate of the gross revenues of this Region could be based on the population income. This gross revenue estimate may be compared to the costs of producing water from the alternative sources. The current regional gross income estimate ranges from approximately $14,200 to $18,000 on a per capita basis (Fiedler and deHaven-Smith 2000). The current population served by public water supply in the region is estimated based on the USGS open file report 98-269 at 301,000 (USGS, 1998) and 403,574 in 2020. Based on the mid-range of the per capita income, total annual income of the population served is approximately $4.8 billion. The per capita annual cost (wholesale) for water supply utilizing the alternative water supply source options may be estimated based on (1) an estimate of per capita usage of 161 gal. per capita day, and (2) a range in water supply costs for the new sources, which is estimated to be approximately $1.00 to $2.00 per 1,000 gal. (year 2000 dollars). This amounts to an estimated per capita cost ranging from $59 to $118 per capita annual cost (year 2000 dollars) in 2020. Thus, the cost of new water supply sources is less than one percent of the per capita income. In addition, the costs of the water supply alternatives on a per capita basis are not substantially different from the current costs of producing water (relative to regional gross revenues). Thus the value of the new water, in broad economic terms, is very near the same value as the current water being produced.

Another data source used to estimate the value of water is based on what consumers are willing to pay. This is roughly estimated based on the amount water users are willing to pay today. As previously discussed, this estimate is based on local utilities year 2000 data at $2.50-$4.00 per 1,000 gal. The planning level cost estimates for the most likely (least cost) water supply alternatives in this plan are less than this market value.

Assuming the mid-range per capita use rate of 161 gal/d (Ryan et al. 1998) for Region II for 2020, the annual per capita usage is estimated to be approximately 59,000 gal. Thus, the estimated per capita retail cost would be approximately $148 to $236 per capita per year which is about one percent of the per capita income, or $59 to $95 million per year based on the total population served. Assuming that one- to two-thirds of the water supply in 2020 would be from new sources, the annual value of the new sources of water is estimated to be from $20 to $63 million (year 2000 dollars).

Chapter 7
MINIMUM FLOWS AND LEVELS

Establishment of Minimum Flows and Levels

The District's priorities for establishing minimum flows and levels (MFL) include the Apalachicola River and the Floridan Aquifer in coastal Okaloosa, Santa Rosa, and Walton counties. Establishment of minimum flows on the Apalachicola River is the District's highest priority and is scheduled for completion in September 2000 pending the outcome of the Apalachicola-Chattahoochee-Flint River (ACF) Interstate Compact and negotiations for a water allocation formula between the states of Florida, Georgia, and Alabama. Establishment of minimum levels in the Floridan Aquifer in the coastal counties of Region II is scheduled for January 2005. Minimum aquifer water levels established in this region would be to protect water supplies from potential saltwater encroachment into the potable waters of the Floridan Aquifer.

Within Region II, several research and analysis activities associated with minimum ground water levels need to be completed prior to establishment of the minimum levels. These include:

- Establishment of a methodology for establishing minimum levels in the Region II coastal area.

- Development of a water level and water quality monitoring network to establish pre-existing conditions and to verify that established MFLs are protecting water resources from saltwater migration.

- Collection of additional data that is sufficient to support the establishment of scientifically sound minimum levels.

- Performing detailed analyses utilizing the Floridan Aquifer Sustainability models that are currently being developed to simulate ground water flow and saltwater migration.

- Providing information on MFLs to local governments for development and revision of comprehensive plans [373.0391(2) F.S.].

- Coordinating with regulatory agencies and utilities for the implementation of MFLs.

- Development of local advisory groups and providing for the scientific peer review of all scientific and technical data used to establish MFLs.

Implementation of MFLs for ground water in Region II is primarily through the District's Water Supply Planning and Consumptive Use Permitting programs. The overall approach is to prevent excessive water withdrawals that cause the encroachment of saltwater into the Floridan Aquifer, thus rendering it unusable as a potable water source. Establishment of MFLs would need to consider:

- Impacts to ground water quality due to lateral, downward, and upward migration of saltwater.
- Impacts to existing legal users.
- Consideration of impacts to surface water resources that may be interconnected to the aquifer for which MFLs are established.

After the necessary research is conducted and considerations are made for the use of the resource there may also be a need to consider, at least at a planning level, what quality of ground water must be maintained. Decisions on water quality would generally help to guide MFL implementation efforts.

Methods of Expressing Ground Water MFLs in Region II

The general approach to expressing MFLs in Region II will require the use of the ground water modeling tools that are currently being developed as part of the District's sustainability modeling effort. The ground water models simulate water levels and saltwater migration from coastal areas as a result of ground water withdrawals. The application of these models allow for a demand-based management approach to establishing MFLs, whereby the limits or minimum water levels are determined on the basis of withdrawals which can occur without causing significant harm to water resources.

One major difficulty in establishing MFLs is that the future footprint of withdrawal points and withdrawal amounts may not be known prior to defining an acceptable water level or water level surface (potentiometric surface) at specific locations. There are any number of potentially acceptable footprints or demand-management approaches that may be acceptable even though the same amount of water is withdrawn from an aquifer. It should also be recognized that the expression of MFLs as water levels need not be constant over time but may be a dynamic set of water level conditions that are closely tied to the very slow movement of saltwater. Thus, in Region II, the cumulative effects of water withdrawals from the Floridan Aquifer and expected changes in salinity must be well understood as part of the process to establish ground water MFLs.

Recovery and Prevention Strategies

Section 373.0421(2) F.S. states:

> "If the existing flow or level in a water body is below, or is projected to fall within 20 years below, the applicable minimum flow or level established pursuant to s. 373.042, the department or governing board, as part of the regional water supply plan described in s. 373.0361, shall expeditiously implement a recovery or prevention strategy, which includes the development of additional water supplies and other actions, consistent with the authority granted by this chapter."

The primary strategy of the District is to maintain water levels at or above MFLs once they are established for Region II (a major undertaking regarding the ongoing Region II sustainability modeling effort). This effort will provide considerable information to assist the District, local governments, and utilities to determine what measures will be most effective to prevent harmful effects of the migration of saltwater into the potable water sources of the Floridan Aquifer along the coast. There are also a number of ongoing activities to prevent MFLs from being violated in the future.

These include:

- Development of additional inland supplies by utilities in cooperation with the NWFWMD
- Reductions in water allocations along the coast through the District's Consumptive Use Permitting program
- Other regulatory and planning efforts to require the use of alternative (non-Floridan Aquifer) water supply sources such as reuse and Sand-and-Gravel Aquifer sources for non-potable uses
- Development of new water supply and water resource development alternatives

Once MFLs are established for the coastal Floridan Aquifer, the primary focus will be to continue development and implementation of the Region II water supply plan and to continue with the measures taking place through the District's permitting program. This will include the evaluation of the cumulative effects of aquifer withdrawals through the Consumptive Use Permitting process. These actions would be monitored to insure that they are preventing aquifer levels (and protecting water quality) from dropping below the MFLs established. In light of current water quality conditions in the Floridan Aquifer, the need for a recovery strategy is not anticipated at this time. The primary focus is to continue with NWFWMD activities currently in place and the planned additional preventive measures as previously discussed. However, should further analysis, establishment of MFLs, or monitoring indicate otherwise, the RWSP would be revised to address a recovery strategy, and further steps for protecting water supply sources would be taken.

Chapter 8
RECOMMENDATIONS

Overview

As an overall regional plan, this water supply plan is a useful tool in determining which of several water supply source actions should be undertaken. When utilities develop alternative water supply sources, care must be taken by the District to coordinate this plan with other local initiatives in Region II and other regional water management plans. The plan is also subject to change due to technological, social-environmental, economic and other new data, and periodically will need to be updated and revised to remain current. One particular activity that the District should continue, is to seek the full participation of interested stakeholders, state and federal government agencies, and other members of the public that have been involved in this planning process. The plan document should be widely distributed through various media, including the District's internet site, CD-ROM and printed copies.

Public participation in the planning process for plan updates should continue in the form of public workshops and meetings with the technical working groups. The stakeholders involved in this process should include the local governments, government-owned and

privately-owned utilities, self-suppliers, and the Regional Utility Authority (RUA). The RUA is a working group that has a large membership of Region II utilities that has already been playing a significant role in participating in District activities to sustain the water resources of the area. Suggestions from the members of the RUA Technical Advisory Committee, as well as others from the public, may point to other alternatives that have yet to be considered. The views of the public are also an important consideration in the further evaluation of alternatives, and future feasibility analyses.

Summary of Alternative Source Options

Development of alternative water supply sources that will reduce the reliance on the coastal Floridan Aquifer is necessary to ensure the aquifer's long-term sustainability. A number of alternative water supply source options were analyzed to determine whether, and to what extent, each of these potential sources could be utilized to address the future water needs of Region II. The alternative source options examined include:

- Floridan Aquifer Inland Well Sites
- Sand-and-Gravel Aquifer
- Conservation
- Reclaimed Wastewater (Reuse)
- Aquifer Storage and Recovery
- Surface Water
- Desalination

Recommended Projects for Water Supply and Water Resource Development

This RWSP identifies a number of water supply source options, water supply development projects, and water resource development projects that will help meet future water supply needs. The plan also includes estimated costs, funding sources, and implementation strategies. The following are water supply and water resource development projects recommended for Region II:

- Current Utility Initiatives
- Completion of Floridan Aquifer Sustainability Model
- Detailed Sand-and-Gravel Aquifer Analysis
- Aquifer Storage and Recovery Feasibility Analyses
- Development of Wellfield Protection Strategies
- Reuse Coordination and Assistance
- Planning and Coordination

Current Utility Initiatives

Efforts supporting the ongoing initiatives of various utilities in Region II to reduce Floridan Aquifer coastal withdrawals and to develop new sources of water should continue. Funding and technical assistance to develop the Sand-and-Gravel Aquifer for the Fair Point Peninsula is the District's highest priority water supply development project at the present time.

Completion of Floridan Aquifer Sustainability Model

This effort is the District's highest priority water resources development project and should be completed in the next two years. The District is currently conducting research,

monitoring, test drilling, and other related activities to develop a salinity transport model to help estimate a sustainable amount of withdrawal from the Floridan Aquifer.

Detailed Sand-and-Gravel Aquifer Analysis

The Sand-and-Gravel Aquifer, if utilized as an alternative water supply source in Region II, may support a dependable and sustainable supply of water in the future. Ongoing efforts to investigate and develop inland sites utilizing this source should continue. Financial support for the development of this source may be necessary to make it economically competitive with other sources.

Aquifer Storage and Recovery Feasibility Analysis

A comprehensive feasibility study of ASR applicability within Region II should be performed within the early years of the 20-year planning horizon to clearly identify the specific advantages and disadvantages of ASR in Region II, as well as the estimated costs of implementing such a program. In particular, the question should be addressed as to whether ASR is needed as a barrier to saltwater intrusion. This question can not be answered until sustainability modeling efforts are completed. If needed and technically feasible, ASR should also be evaluated for financial feasibility and economic benefit.

Development of Wellfield Protection Strategies

Careful development of additional Sand-and-Gravel Aquifer water within Region II is necessary because of the aquifer's susceptibility to contamination from surface pollution. Development of a Sand-and-Gravel Aquifer protection strategy should begin at or about the time analyses are completed to determine the additional quantities of water available for withdrawal. The protection strategy will likely require wellhead protection or preservation areas where new wells are sited in addition to the implementation of other strategies.

Reuse Coordination and Assistance

As a major conservation measure, the District encourages the continued reuse of wastewater, the development of future water reuse projects, and participation by local governments, utilities, and the public regarding regional reuse development projects. The District's primary focus regarding reuse will be to continue to facilitate coordination between DEP and the utilities. Additional detailed analysis, and mapping of reuse facilities and distribution systems within Region II, will also continue to assist with the location and evaluation of reuse water for future applications. The District will also try to obtain and provide grant funds for reuse projects identified as economically feasible or made economically competitive through financial assistance.

Conservation

The District's regulatory and public information programs have been actively supporting water conservation efforts in Region II. The District will continue these programs and also consider ways of enhancing conservation. These enhancements will be primarily through heightening public awareness for the need to save water, and to disseminate information on new and innovative approaches toward efficient water use. The District

will support new technology or more efficient water use methods based upon studies documenting actual water savings and economic effectiveness.

Planning and Coordination

A number of planning activities are being undertaken to implement water resource and water supply development projects under the proposed RWSP. These activities include administration of funding and project management and coordination with federal, state and other government agencies as necessary. Continued planning and coordination with local governments and utilities is essential for the development of any new sources of water. In the interest of the general public, and as a cost savings measure, the District will continue to encourage cooperation among the individual utilities to the greatest extent possible.

Funding for Water Supply Development

The primary source of funding for water supply development projects will continue to be through utility revenues and remain the responsibility of local governments, utilities, and other legal users. However, there are several other funding sources that may be applicable to the water supply development projects discussed in this plan. The most attractive alternative sources for regional water supply development assistance include:

- Federal revenues
- Private investments

- Florida Forever
- Regional water supply authorities

Implementation Strategies and Funding Sources for Water Resource Development Projects

Water resource development projects are primarily the responsibility of the NWFWMD. The schedule, basic strategies, and funding for ongoing or planned water resources are as follows:

- **Floridan Aquifer Sustainability Model Analysis:** This sustainability model will be utilized as part of the ongoing implementation of the RWSP and development of regional water management strategies. The primary goal of this effort is to estimate the amount of sustainable Floridan Aquifer withdrawals from coastal Floridan Aquifer sources, as well as the quantity of water that will be needed from new sources. Funding sources for this project are from the Water Management Lands Trust Fund, local governments, and general revenues of the District. This project will take approximately two years to complete.

- **Inland Sand-and-Gravel Aquifer Water Resources Development:** This project involves the completion of a detailed numerical model of the Sand-and-Gravel Aquifer flow system that will be utilized to analyze the development of the aquifer as an alternative supply. Model results will be used to determine the amount of additional ground water that can safely be withdrawn from the area to meet regional water supply needs. The long-term project goal is to identify at least 10 Mgal/d of additional water available from this source. Funding for this project is through the Water Management Lands Trust Fund. The initial numerical modeling and resource evaluation analysis stage of this project will take approximately 18 months to complete.

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- **Coastal Sand-and-Gravel Aquifer Sources:** The District will continue to evaluate this local source of water as part of the solution to alleviate coastal pumping from the Floridan Aquifer and will work cooperatively with utilities interested in the further development of this water source. Technical assistance will be provided for the development of as much as 5 Mgal/d of available water from this source for public water supply. This project is ongoing.

- **ASR Viability:** ASR may be tested and developed as a means of meeting coastal water supply demands and/or as a means to protect the Floridan Aquifer from saltwater encroachment. Possible funding sources for future ASR testing and development include Florida Forever, Water Management Lands Trust Fund, the federal government, and public utilities. ASR feasibility projects may be scheduled to begin after completion of the Floridan Aquifer sustainability model.

- **Water Reuse Coordination Program:** With this project, the District has an ongoing role as a coordinator and facilitator for planning and implementing water reuse efforts among Region II utilities. Through further reuse development, there is an estimated potential to reduce water withdrawals from the coastal area of the Floridan Aquifer by as much as 5 Mgal/d. Current funding for this project is through the District's general revenues and the Water Management Lands Trust Fund. This project is ongoing.

- **Surface Water Monitoring for Surface Water Supply Feasibility:** The primary efforts directed toward surface water will be to provide adequate hydrologic and water quality data

for major riverine sources that may be considered for future development. Preliminary efforts by the District will include stream flow monitoring on the Yellow and Choctawhatchee rivers and water quality monitoring for treatability and basin yield analyses. If surface water supply facilities become feasible or necessary, possible funding sources include public utilities, Florida Forever, and the federal government. It is estimated that it will take the next three years to complete the District's preliminary efforts with this project. Surface water data collection and monitoring activities should also be designed to support future ASR feasibility analyses.

- **Development of Regional Water Management Strategies and RWSP Updates:** This project involves ongoing administrative support, project management, coordination, grant writing for implementation funding, status reporting, plan updates, coordination with local governments and utilities, and providing technical assistance to local utilities. The water management strategies development component of this project should be an adaptive management approach that will likely result in plan revisions over time. This approach integrates and makes use of all the major components of the Region II water supply plan, including sustainability modeling efforts, water resources monitoring data and analyses, water use reporting, water demand projections, implementation of water supply development activities, and demand management activities through regulatory or other means. Project work also includes preparation of a five-year water resources development work program and associated plan revisions as needed. Funding is from the Water Management Lands Trust Fund. This project is ongoing.

- **Hydrologic Data Collection and Analysis:** This project is intended to enhance the District's capabilities for water resources monitoring and analysis as related to water supply and resource development activities. Funding for this project is from the District's general fund, Water Management Lands Trust Fund, federal and local governments. This project will be ongoing on an annual basis.

- **Abandoned Well Plugging:** This is an ongoing program to properly plug abandoned artesian wells in order to protect the water resource and/or public health. Funding for this project is through cooperative efforts, including EPA grants , state grants and general revenues, private well-owners, local governments, and the NWFWMD. This project is ongoing.

Summary

This regional water supply plan is the beginning of an integrated water resource and water supply decision-making process. It identifies the long-term alternatives and options for alternative sources of water that will be needed to alleviate or prevent future problems anticipated with the continued use of the Floridan Aquifer in coastal areas of Region II. Coordination and cooperation among local governments, utilities, other interested parties, and the NWFWMD will be crucial in contributing to the success of the regional water supply plan. At the present time, a number of public supply utilities exist in close proximity to one another in various portions of Region II. A regional decision-making approach regarding the development of strategies to meet future demands will result in the most beneficial use of the water resources for all existing and reasonably anticipated future uses.

Therefore, the overall view of this plan is to provide guidance and assistance on matters concerning water supply and water resource planning, development, and implementation, but not to mandate actions to be taken by local agencies, utilities, and other water users. Coordinated and cooperative implementation of the strategies outlined in this plan should ensure that water resources of Santa Rosa, Okaloosa and Walton counties are properly managed and sufficient supplies are available to meet the anticipated demands of the region.

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Appendix A

Water Supply Statutes

373.019 Definitions.--When appearing in this chapter or in any rule, regulation, or order adopted pursuant thereto, the following words shall, unless the context clearly indicates otherwise, mean:

(1) "Coastal waters" means waters of the Atlantic Ocean or the Gulf of Mexico within the jurisdiction of the state.

(2) "Department" means the Department of Environmental Protection or its successor agency or agencies.

(3) "District water management plan" means the regional water resource plan developed by a governing board under s. 373.036

(4) "Domestic use" means the use of water for the individual personal household purposes of drinking, bathing, cooking, or sanitation. All other uses shall not be considered domestic.

(5) "Florida water plan" means the state-level water resource plan developed by the department under s. 373.036

(6) "Governing board" means the governing board of a water management district.

(7) "Groundwater" means water beneath the surface of the ground, whether or not flowing through known and definite channels.

(8) "Impoundment" means any lake, reservoir, pond, or other containment of surface water occupying a bed or depression in the earth's surface and having a discernible shoreline.

(9) "Independent scientific peer review" means the review of scientific data, theories, and methodologies by a panel of independent, recognized experts in the fields of hydrology, hydrogeology, limnology, and other scientific disciplines relevant to the matters being reviewed under s. 373.042

(10) "Nonregulated use" means any use of water which is exempted from regulation by the provisions of this chapter.

(11) "Other watercourse" means any canal, ditch, or other artificial watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted.

(12) "Person" means any and all persons, natural or artificial, including any individual, firm, association, organization, partnership, business trust, corporation, company, the United States of America, and the state and all political subdivisions, regions, districts, municipalities, and public agencies thereof. The enumeration herein is not intended to be exclusive or exhaustive.

(13) "Reasonable-beneficial use" means the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest.

(14) "Regional water supply plan" means a detailed water supply plan developed by a governing board under s. 373.0361

(15) "Stream" means any river, creek, slough, or natural watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted. The fact that some part of the bed or channel has been dredged or improved does not prevent the watercourse from being a stream.

(16) "Surface water" means water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs shall be classified as surface water when it exits from the spring onto the earth's surface.

(17) "Water" or "waters in the state" means any and all water on or beneath the surface of the ground or in the atmosphere, including natural or artificial watercourses, lakes, ponds, or

diffused surface water and water percolating, standing, or flowing beneath the surface of the ground, as well as all coastal waters within the jurisdiction of the state.

(18) "Water management district" means any flood control, resource management, or water management district operating under the authority of this chapter.

(19) "Water resource development" means the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities.

(20) "Water resource implementation rule" means the rule authorized by s. 373.036 ,which sets forth goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources, based on statutory policies and directives. The waters of the state are among its most basic resources. Such waters should be managed to conserve and protect water resources and to realize the full beneficial use of these resources.

(21) "Water supply development" means the planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use.

(22) For the sole purpose of serving as the basis for the unified statewide methodology adopted pursuant to s. 373.421, as amended, "wetlands" means those areas that are inundated or saturated by surface water or groundwater at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands generally consists of facultative or obligate hydrophytic macrophytes that are typically adapted to areas having soil conditions described above. These species, due to morphological, physiological, or reproductive adaptations, have the ability to grow, reproduce, or persist in aquatic environments or anaerobic soil conditions. Florida wetlands generally include swamps, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps and marshes, hydric seepage slopes, tidal marshes, mangrove swamps and other similar areas. Florida wetlands generally do not include longleaf or slash pine flatwoods with an understory dominated by saw palmetto. Upon legislative ratification of the methodology adopted pursuant to s. 373.421, as amended, the limitation contained herein regarding the purpose of this definition shall cease to be effective.

(23) "Works of the district" means those projects and works, including, but not limited to, structures, impoundments, wells, streams, and other watercourses, together with the appurtenant facilities and accompanying lands, which have been officially adopted by the governing board of the district as works of the district.

History.--s. 3, part I, ch. 72-299; s. 37, ch. 79-65; s. 1, ch. 80-259; s. 5, ch. 82-101; s. 6, ch. 89-279; s. 21, ch. 93-213; s. 15, ch. 94-122; s. 251, ch. 94-356; s. 1, ch. 96-339; s. 1, ch. 96-370; s. 2, ch. 97-160.

373.036 Florida water plan; district water management plans.--

(1) FLORIDA WATER PLAN.--In cooperation with the water management districts, regional water supply authorities, and others, the department shall develop the Florida water plan. The Florida water plan shall include, but not be limited to:

(a) The programs and activities of the department related to water supply, water quality, flood protection and floodplain management, and natural systems.

(b) The water quality standards of the department.

(c) The district water management plans.

(d) Goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources, based on statutory policies and directives. The state water policy rule, renamed the water resource implementation rule pursuant to s. 373.019, shall serve as this part of the plan. Amendments or additions to this part of the Florida water plan shall be adopted by the department as part of the water resource implementation rule. In accordance with s. 373.114, the department shall review rules of the water management districts for consistency with this rule. Amendments to the water resource implementation rule must be adopted by the secretary of the department and be submitted to the President of the Senate and the Speaker of the House of Representatives within 7 days after publication in the Florida Administrative Weekly. Amendments shall not become effective until the conclusion of the next regular session of the Legislature following their adoption.

(2) DISTRICT WATER MANAGEMENT PLANS.--

(a) Each governing board shall develop a district water management plan for water resources within its region, which plan addresses water supply, water quality, flood protection and floodplain management, and natural systems. The district water management plan shall be based on at least a 20-year planning period, shall be developed and revised in cooperation with other agencies, regional water supply authorities, units of government, and interested parties, and shall be updated at least once every 5 years. The governing board shall hold a public hearing at least 30 days in advance of completing the development or revision of the district water management plan.

(b) The district water management plan shall include, but not be limited to:

1. The scientific methodologies for establishing minimum flows and levels under s.373.042, and all established minimum flows and levels.

2. Identification of one or more water supply planning regions that singly or together encompass the entire district.

3. Technical data and information prepared under ss. 373.0391 and 373.0395.

4. A districtwide water supply assessment, to be completed no later than July 1, 1998, which determines for each water supply planning region:

a. Existing legal uses, reasonably anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts; and

b. Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems.

5. Any completed regional water supply plans.

(c) If necessary for implementation, the governing board shall adopt by rule or order relevant portions of the district water management plan, to the extent of its statutory authority.

(d) In the formulation of the district water management plan, the governing board shall give due consideration to:

1. The attainment of maximum reasonable-beneficial use of water resources.

2. The maximum economic development of the water resources consistent with other uses.

3. The management of water resources for such purposes as environmental protection, drainage, flood control, and water storage.

4. The quantity of water available for application to a reasonable-beneficial use.

5. The prevention of wasteful, uneconomical, impractical, or unreasonable uses of water resources.

6. Presently exercised domestic use and permit rights.

7. The preservation and enhancement of the water quality of the state.

8. The state water resources policy as expressed by this chapter.

(3) The department and governing board shall give careful consideration to the requirements of public recreation and to the protection and procreation of fish and wildlife. The department or governing board may prohibit or restrict other future uses on certain designated bodies of water which may be inconsistent with these objectives.

(4) The governing board may designate certain uses in connection with a particular source of supply which, because of the nature of the activity or the amount of water required, would constitute an undesirable use for which the governing board may deny a permit.

(5) The governing board may designate certain uses in connection with a particular source of supply which, because of the nature of the activity or the amount of water required, would result in an enhancement or improvement of the water resources of the area. Such uses shall be preferred over other uses in the event of competing applications under the permitting systems authorized by this chapter.

(6) The department, in cooperation with the Executive Office of the Governor, or its successor agency, may add to the Florida water plan any other information, directions, or objectives it deems necessary or desirable for the guidance of the governing boards or other agencies in the administration and enforcement of this chapter.

History.--s. 6, part I, ch. 72-299; ss. 2, 3, ch. 73-190; s. 122, ch. 79-190; s. 3, ch. 97-160; s. 7, ch. 98-88; s. 164, ch. 99-13.

373.0361 Regional water supply planning.--

(1) By October 1, 1998, the governing board shall initiate water supply planning for each water supply planning region identified in the district water management plan under s. 373.036, where it determines that sources of water are not adequate for the planning period to supply water for all existing and projected reasonable-beneficial uses and to sustain the water resources and related natural systems. The planning must be conducted in an open public process, in coordination and cooperation with local governments, regional water supply authorities, government-owned and privately owned water utilities, self-suppliers, and other affected and interested parties. A determination by the governing board that initiation of a regional water supply plan for a specific planning region is not needed pursuant to this section shall be subject to s. 120.569. The governing board shall reevaluate such a determination at least once every 5 years and shall initiate a regional water supply plan, if needed, pursuant to this subsection.

(2) Each regional water supply plan shall be based on at least a 20-year planning period and shall include, but not be limited to:

(a) A water supply development component that includes:

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

2. A list of water source options for water supply development, including traditional and alternative sources, from which local government, government-owned and privately owned utilities, self-suppliers, and others may choose, which will exceed the needs identified in subparagraph 1.

3. For each option listed in subparagraph 2., the estimated amount of water available for use and the estimated costs of and potential sources of funding for water supply development.

4. A list of water supply development projects that meet the criteria in s. 373.0831.

(b) A water resource development component that includes:

1. A listing of those water resource development projects that support water supply development.

2. For each water resource development project listed:

a. An estimate of the amount of water to become available through the project.

b. The timetable for implementing or constructing the project and the estimated costs for implementing, operating, and maintaining the project.

c. Sources of funding and funding needs.

d. Who will implement the project and how it will be implemented.

(c) The recovery and prevention strategy described in s. 373.0421.

(d) A funding strategy for water resource development projects, which shall be reasonable and sufficient to pay the cost of constructing or implementing all of the listed projects.

(e) Consideration of how the options addressed in paragraphs (a) and (b) serve the public interest or save costs overall by preventing the loss of natural resources or avoiding greater future expenditures for water resource development or water supply development. However, unless adopted by rule, these considerations do not constitute final agency action.

(f) The technical data and information applicable to the planning region which are contained in the district water management plan and are necessary to support the regional water supply plan.

(g) The minimum flows and levels established for water resources within the planning region.

(3) Regional water supply plans initiated or completed by July 1, 1997, shall be revised, if necessary, to include a water supply development component and a water resource development component as described in paragraphs (2)(a) and (b).

(4) Governing board approval of a regional water supply plan shall not be subject to the rulemaking requirements of Chapter 120. However, any portion of an approved regional water supply plan which affects the substantial interests of a party shall be subject to s. 120.569.

(5) By November 15, 1997, and annually thereafter, the department shall submit to the Governor and the Legislature a report on the status of regional water supply planning in each district. The report shall include:

(a) A compilation of the estimated costs of and potential sources of funding for water resource development and water supply development projects, as identified in the water management district regional water supply plans.

(b) A description of each district's progress toward achieving its water resource development objectives, as directed by s. 373.0831.

(6) Nothing contained in the water supply development component of the district water management plan shall be construed to require local governments, government-owned or privately owned water utilities, self-suppliers, or other water suppliers to select a water supply development option identified in the component merely because it is identified in the plan. However, this subsection shall not be construed to limit the authority of the department or governing board under part II.

History.--s. 4, ch. 97-160.

373.0831 Water resource development; water supply development.--

(1) The Legislature finds that:

(a) The proper role of the water management districts in water supply is primarily planning and water resource development, but this does not preclude them from providing assistance with water supply development.

(b) The proper role of local government, regional water supply authorities, and government-owned and privately owned water utilities in water supply is primarily water supply development, but this does not preclude them from providing assistance with water resource development.

(c) Water resource development and water supply development must receive priority attention, where needed, to increase the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems.

(2) It is the intent of the Legislature that:

(a) Sufficient water be available for all existing and future reasonable-beneficial uses and the natural systems, and that the adverse effects of competition for water supplies be avoided.

(b) Water management districts take the lead in identifying and implementing water resource development projects, and be responsible for securing necessary funding for regionally significant water resource development projects.

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

(d) Water supply development be conducted in coordination with water management district regional water supply planning and water resource development.

(3) The water management districts shall fund and implement water resource development as defined in s. 373.019.

Each governing board shall include in its annual budget the amount needed for the fiscal year to implement water resource development projects, as prioritized in its regional water supply plans.

(4)(a) Water supply development projects which are consistent with the relevant regional water supply plans and which meet one or more of the following criteria shall receive priority consideration for state or water management district funding assistance:

1. The project supports establishment of a dependable, sustainable supply of water which is not otherwise financially feasible;

2. The project provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options; or

3. The project significantly implements reuse, storage, recharge, or conservation of water in a manner that contributes to the sustainability of regional water sources.

(b) Water supply development projects which meet the criteria in paragraph (a) and also bring about replacement of existing sources in order to help implement a minimum flow or level shall be given first consideration for state or water management district funding assistance.

History.--s. 11, ch. 97-160

Appendix B

Floridan Aquifer Demand Projections

To assess the hydrologic effect and sustainability of various Floridan Aquifer usage scenarios, the anticipated 2020 demand on the Floridan Aquifer was prepared for all users with consumptive use permits greater than 50,000 gal/d ADR. The projected 2020 Floridan Aquifer demand is derived from demand projections provided by the USGS (Marella et al. 1998). The Floridan Aquifer demand projections are based on the assumption that current Floridan Aquifer usage trends will continue through 2020. The majority of these water supply needs are for public supply.

The USGS water use projections for 2020 were compiled by utility systems and are based on historical use data for specific geographic service areas. The USGS projections did not specify future demands in terms of water source or location of production facilities. Most Region II systems utilize either the Floridan Aquifer or the Sand-and-Gravel Aquifer. Some systems, however, utilize both sources. The USGS projections were adjusted for systems that use both sources in order to provide an estimate of the Floridan Aquifer portion of the future demand. Further adjustments were made for the wholesale transfer of water between permittees in order to assign the projected demand to the proper withdrawal system. A few systems whose USGS 2020 projection (based on pumping through 1995) was less than their actual 1998 pumpage were also adjusted. Finally, the 2020 demand was estimated for currently permitted agricultural water use not included in the USGS projections. All adjustments assume past production trends will continue into the future. The projected 2020 demand on the Floridan Aquifer is shown by consumptive use permittee in Table B.2. Where differences exists between the USGS 2020 projection and the projected 2020 Floridan Aquifer demand, an explanation regarding the adjustment is provided.

In order to quantify and assess the cumulative impact of currently permitted withdrawals, a 'current adjusted ADR' scenario was constructed. In defining the 'current adjusted ADR' scenario (45.7 Mgal/d), it was assumed that individual systems would not require withdrawals greater than their projected 2020 Floridan Aquifer demand estimates. Further, permittees were not

allowed to exceed their currently permitted ADRs, or, for systems that utilize multiple sources, the Floridan portion of their permitted ADR allocated according to historical use patterns (Table B.2). The net effect was for individual systems to be included at the lesser of their projected 2020 Floridan Aquifer demand or the Floridan portion of their currently permitted ADR. The difference between the 'current adjusted ADR' scenario and the 2020 Floridan Aquifer demand projection is 5.1 Mgal/d.

The projected 2020 Floridan Aquifer demand for systems found in Table B.2 is 50.8 Mgal/d. For comparison, the actual 1998 water use for these systems was 35.7 Mgal/d. Recently issued permits for WRP, OCWS-Mid-County, Crestview and Freeport provide for about two-thirds of the 15.1 Mgal/d difference between 1998 water use and the projected 2020 Floridan Aquifer demand. At a minimum, the remaining one-third will require development of alternate sources. Coastal reductions, if required, would necessitate additional development of alternate water sources. The projected sub-regional water supply needs are summarized by county in Table B.1.

The Floridan Aquifer demand projections were used in a variety of regional ground water flow model simulations designed to aid in determining the sustainable rate of withdrawal from the aquifer. No endorsement regarding the sustainability of the projected 2020 Floridan Aquifer demand or other projected withdrawal rates should be inferred. Sustainability of any given withdrawal rate will not depend solely on the rate of withdrawal. Sustainability will also depend on the distribution of the withdrawal sites and on the planning period over which sustainability is desired.

Table B.1 Sub-Regional 2020 Water Supply Needs by County for Suppliers Identified in Table B.2

	USGS 2020 Demand (Mgal/d)	2020 Floridan Aquifer Demand (Mgal/d)	Current Adjusted ADR Demand (Mgal/d)	Quantity Requiring Development of Alternate Sources[1] (Mgal/d)
Santa Rosa County Inland	1.85	0.37	0.34	0.03
Santa Rosa County Coastal	8.18	1.52	1.52	0.00
Okaloosa County Inland	7.37	10.26	9.29	0.97
Okaloosa County Coastal	31.86	25.51	22.59	2.92
Walton County Inland	4.04	11.46	10.48	0.98
Walton County Coastal	5.75	1.67	1.45	0.22
Total	59.05	50.79	45.67	5.12

[1]Assuming no saltwater encroachment of coastal wellfields

Table B.2

County	Use	Sub-region	Permittee	Current Permitted ADR	Actual 1990 Floridan Aquifer Pumpage	Actual 1998 Floridan Aquifer Pumpage	USGS Projected 2020 System Demand	Projected 2020 Floridan Aquifer Demand	Current Adjusted ADR
Walton	PS	inland	S Walton Utility Co	4.840	0.000	0.000	0.000	4.840	4.840
Walton	PS	inland	Freeport	2.330	0.150	0.647	0.600	2.330	2.330
Walton	PS	inland	DeFuniak Springs	1.080	0.900	0.796	1.140	1.140	1.080
Walton	PS	inland	Perdue Farms Inc	1.020	0.840	0.720	1.710	1.710	1.020
Walton	PS	inland	FCSC	0.300	0.000	0.000	0.000	0.430	0.300
Walton	PS	inland	Paxton WS	0.265	0.190	0.192	0.180	0.309	0.265
Walton	GI	inland	Red Bay Golf	0.304	ND	0.077	0.181	0.181	0.181
Walton	AI	inland	Richardson #1	0.151	ND	0.045	NA	0.151	0.151
Walton	PS	inland	Mossy Head WW	0.170	0.080	0.131	0.150	0.150	0.150
Walton	AI	inland	Richardson #2	0.089	ND	0.026	NA	0.089	0.089
Walton	PS	inland	Argyle WS	0.077	0.069	0.085	0.080	0.138	0.077
Walton	AI	inland	Owl's Head - "A"	0.540	0.000	0.000	NA	0.000	0.000
Santa Rosa	PS	inland	E Milton WS	1.690	0.000	0.210	1.850	0.370	0.338
Okaloosa	PS	inland	OCWS--Mid-County	3.610	0.349	0.491	0.780	3.610	3.610
Okaloosa	PS	inland	Crestview	3.710	1.630	2.177	3.140	3.140	3.140
Okaloosa	PS	inland	Auburn Water System	1.400	0.983	1.191	2.030	2.030	1.400
Okaloosa	PS	inland	Baker Water System	0.245	0.155	0.204	0.260	0.260	0.245
Okaloosa	PS	inland	Dept. of Corrections	0.240	0.130	0.223	0.170	0.240	0.240
Okaloosa	PS	inland	Laurel Hill	0.170	0.128	0.135	0.190	0.190	0.170
Okaloosa	PS	inland	Milligan WS	0.155	0.090	0.133	0.450	0.450	0.155
Okaloosa	PS	inland	Holt Water Works	0.130	0.060	0.098	0.140	0.140	0.130
Okaloosa	PS	inland	Eglin AFB # 6	0.174	0.081	0.072	0.124	0.124	0.124
Okaloosa	PS	inland	Eglin AFB # 3	0.082	0.106	0.068	0.082	0.082	0.082
			SUBTOTAL	22.772	5.941	7.721	13.257	22.104	20.117
Walton	PS	coastal	S Walton Utility Co	2.450	1.540	2.013	3.180	1.287	1.287
Walton	PS	coastal	Inlet Beach WS	0.090	0.025	0.080	0.240	0.211	0.079
Walton	PS	coastal	North Bay Water	0.079	0.056	0.069	0.170	0.170	0.079
Walton	PS	coastal	FCSC	0.140	0.383	0.755	2.160	0.000	0.000
Santa Rosa	PS	coastal	Holley-Navarre WS	2.200	0.981	1.823	3.730	0.937	0.937
Santa Rosa	PS	coastal	Midway Water System	2.520	1.365	1.580	1.470	0.578	0.578
Santa Rosa	PS	coastal	Navarre Beach	0.347	0.344	0.276	0.430	0.000	0.000
Santa Rosa	PS	coastal	Gulf Breeze	NP	NP	NP	1.110	0.000	0.000
Santa Rosa	PS	coastal	S Santa Rosa US	NP	NP	NP	1.440	0.000	0.000
Okaloosa	PS	coastal	OCWS--Garniers	6.250	4.975	4.952	7.210	4.500	4.500
Okaloosa	PS	coastal	Fort Walton Beach	4.078	3.853	3.252	4.450	3.972	3.600
Okaloosa	PS	coastal	Niceville	3.030	2.510	2.822	4.820	4.820	3.030
Okaloosa	PS	coastal	Eglin AFB Housing	3.390	2.730	1.997	2.998	2.998	2.998
Okaloosa	PS	coastal	Destin Water Users	3.390	2.570	3.125	4.960	2.013	2.013
Okaloosa	PS	coastal	Eglin AFB Main	2.040	2.342	1.124	1.686	1.686	1.686
Okaloosa	PS	coastal	OCWS--Bluewater	1.560	0.878	1.050	1.520	1.520	1.520
Okaloosa	PS	coastal	Valparaiso	0.863	0.610	0.659	0.640	0.863	0.863
Okaloosa	PS	coastal	OCWS--West	0.810	0.570	0.735	0.930	0.810	0.810
Okaloosa	PS	coastal	Hurlburt Field	0.740	0.641	0.773	1.280	1.280	0.740
Okaloosa	PS	coastal	Mary Esther	0.720	0.700	0.711	0.930	0.930	0.720
Okaloosa	PS	coastal	Seminole CC	0.114	0.106	0.098	0.090	0.114	0.114
Okaloosa	GI	coastal	Bluewater Bay Resort	0.248	0.284	0.032	0.350	0.000	0.000
			SUBTOTAL	35.059	27.463	27.926	45.794	28.689	25.554
			REGION II TOTAL	57.831	33.404	35.647	59.051	50.793	45.671
Santa Rosa	WI	injection	Sterling Fibers/Cytec	-1.730	-0.817	-0.843	0.000	-1.290	-1.290

Santa Rosa	WI	injection	Air Products	-2.500	0.000	0.000	0.000	-1.900	-1.900
Escambia	WI	injection	Solutia/Monsanto	-3.456	-2.160	-3.154	0.000	-3.280	-3.280
			SUBTOTAL	-7.686	-2.977	-3.997	0.000	-6.470	-6.470

Note: ND means no data available. NA means the USGS did not perform a system 2020-demand projection.
NP means the system has no independent capacity to produce water.

Methodology Used to Estimate 2020 Floridan Aquifer Demands

Typically, the 2020 Floridan Aquifer demand was set equal to the 2020 USGS system demand. Some systems required an alternate approach. The specific assumptions of alternate approaches are given below, on a system-by-system basis.

Inland Systems

South Walton Utility Company (initially permitted as WRP)—The USGS did not make a separate demand projection for WRP. Rather, the demands for this system are contained in demand projections for Destin Water Users and South Walton Utility Company. The 2020 Floridan Aquifer demand projection is set equal to the currently permitted ADR.

OCWS—Mid-County—The 2020 Floridan Aquifer demand projection is set equal to the currently permitted ADR.

Freeport—The 2020 Floridan Aquifer demand projection is set equal to the currently permitted ADR.

Florida Community Services Corp.—This system is unique in that the system demand is located in the coastal area and the 2020 Floridan Aquifer demand will be satisfied by water produced from the inland area. The combined USGS 2020 demand projection for Freeport and FCSC is 2.76 Mgal/d. Freeport is currently permitted to provide 2.33 Mgal/d of this amount. Therefore, the remaining 2020 Floridan Aquifer demand is ascribed to FCSC in the amount of 0.43 Mgal/d. This water will be obtained from the vicinity of Rock Hill in south-central Walton County.

East Milton Water System—One of East Milton's four wells produces from the Floridan Aquifer. The remaining three produce from the Sand-and-Gravel Aquifer. In 1998, the Floridan Aquifer well accounted for about 20 percent of the total system production. To determine the 2020 Floridan Aquifer demand projection the USGS 2020 demand projection was reduced by 80 percent, reflective of the current distribution of pumping between the Floridan and Sand-and-Gravel aquifers.

Paxton Water System—The 2020 Floridan Aquifer demand projection represents a 2.2 percent annual increase over 1998 actual pumping. The 2.2 percent annual increase represents the average growth rate required to increase 1998 pumpage to the 2020 USGS demand projection for 31 public water supply systems in Santa Rosa, Okaloosa and Walton counties. This approach was necessitated by the fact that the 1998 pumpage was greater than the USGS 2020 demand projection.

Department of Corrections/Okaloosa County— The 2020 Floridan Aquifer demand projection is set equal to the currently permitted ADR.

Richardson #1—The USGS did not make a 2020 demand projection for this system. The 2020 Floridan Aquifer demand set to currently permitted ADR.

Argyle Water System—The 2020 Floridan Aquifer demand projection represents a 2.2 percent annual increase over 1998 actual pumping. The 2.2 percent annual increase represents the average growth rate required to increase 1998 pumpage to the 2020 USGS demand projection for 31 public water supply systems in Santa Rosa, Okaloosa and Walton counties. This approach was necessitated by the fact that the 1998 pumpage was greater than the USGS 2020 demand projection.

Richardson #2—The USGS did not make a 2020 demand projection for this system. The 2020 Floridan Aquifer demand set equal to currently permitted ADR.

Owl's Head Farm "A" —Floridan Aquifer water use presently expected to be phased out by 2020.

Coastal Systems

OCWS—Garniers—The projected USGS 2020 demand for the combination of the four Okaloosa County systems is 10.44 Mgal/d. The projected 2020 Floridan Aquifer demand for Mid-County, Bluewater and West satisfies 5.94 Mgal/d of this demand. Therefore, the remaining 4.5 Mgal/d is assumed to be provided by the Floridan Aquifer within the Garniers system.

Fort Walton Beach—The Fort Walton Beach 2020 Floridan Aquifer demand projection is the USGS 2020 demand less the 1998 actual Sand-and-Gravel Aquifer usage.

Destin Water Users—The difference between the USGS demand projection and the 2020 Floridan Aquifer demand projection is that water supplied to DWU by the South Walton Utility Company (SWUC) from the remote wellfield. The value of 2.013 Mgal/d was derived by 1) summing the DWU and SWUC USGS 2020 demands (8.14 Mgal/d), 2) subtracting the 4.84 Mgal/d produced by SWUC at the remote wellfield, 3) dividing the remaining demand (3.3 Mgal/d) between DWU and SWUC, and 4) assuming that DWU would produce 61 percent of the difference. The 61 percent figure is based on the 1997 production ratio (actual) between DWU and SWUC. That ratio was preserved for the 2020 Floridan Aquifer demand projection.

South Walton Utility Company—The difference between the USGS demand projection and the 2020 Floridan Aquifer demand projection is that water supplied to South Walton Utility Company from the remote wellfield. The value of 1.287 Mgal/d was derived by: (1) summing the DWU and SWUC USGS 2020 demands (8.14 Mgal/d), (2) subtracting the 4.84 Mgal/d produced by SWUC at the remote wellfield, (3) dividing the remaining demand (3.3 Mgal/d) between DWU and SWUC, and (4) assuming that SWUC would produce 39 percent

of the difference. The 39 percent figure is based on the 1997 production ratio (actual) between DWU and SWUC. That ratio was preserved for the 2020 Floridan Aquifer demand projection.

Holley-Navarre Water System—The projected USGS 2020 demand for the combination of Holley-Navarre, Midway, South Santa Rosa, Navarre Beach and Gulf Breeze is 8.18 Mgal/d. The Fairpoint Regional Utility wellfield is assumed to have the capacity to provided 6.0 Mgal/d of this demand. This leaves an ADR of 2.18 Mgal/d that will be provided by the existing Midway and Holley-Navarre coastal infrastructure. For the purposes of apportioning this demand between Midway and Holley-Navarre, it was assumed that each utility would provide one-half. The current Holly-Navarre consumptive use permit specifies that no more than 86 percent of the total system demand be provided by the Floridan Aquifer. That ratio was applied to the 2020 coastal demand projection (1.09 Mgal/d), yielding a 2020 coastal Floridan Aquifer demand of 0.937 Mgal/d.

Valparaiso— The 2020 Floridan Aquifer demand set equal to currently permitted ADR.

OCWS—West—The 2020 Floridan Aquifer demand set equal to currently permitted ADR.

Midway Water System—The projected USGS 2020 demand for the combination of Holley-Navarre, Midway, South Santa Rosa, Navarre Beach and Gulf Breeze is 8.18 Mgal/d. The Fairpoint Regional Utility wellfield is assumed to have the capacity to provided 6.0 Mgal/d of this demand. This leaves an ADR of 2.18 Mgal/d that will be provided by the existing Midway and Holley-Navarre coastal infrastructure.

For the purposes of apportioning this demand between Midway and Holley-Navarre, it was assumed that each utility would provide one-half. Therefore, the Midway 2020 water demand projection is 1.09 Mgal/d. This demand projection was further divided between the Sand-and-Gravel and Floridan aquifers. The current Midway consumptive use permit specifies that no more than 53 percent of the total system demand be provided by the Floridan Aquifer. That ratio was applied to the 2020 coastal demand projection (1.09 Mgal/d), yielding a 2020 coastal Floridan Aquifer demand of 0.578 Mgal/d.

Inlet Beach Water System—One of Inlet Beach's two wells produces from the Intermediate System. In 1998, the Intermediate System well accounted for about 12 percent of the total system production. To determine the 2020 Floridan Aquifer demand projection, the USGS 2020 demand projection was reduced by 12 percent, reflective of the current distribution of pumping between the Floridan Aquifer and the Intermediate System.

Seminole Community Center—The 2020 Floridan Aquifer demand projection represents a 2.2 percent annual increase over 1998 actual pumping. The 2.2 percent annual increase represents the average growth rate required to increase 1998 pumpage to the 2020 USGS demand projection for 31 public water supply systems in Santa Rosa, Okaloosa and Walton

counties. This approach was necessitated by the fact that the 1998 pumpage was greater than the USGS 2020 demand projection.

Florida Community Services Corp. (FCSC)—This system is unique in that the system demand is located in the coastal area and the 2020 Floridan Aquifer demand will be satisfied by water produced from the inland area. The USGS 2020 demand projection for FCSC is 2.16 Mgal/d. Freeport is currently permitted to provide 1.73 Mgal/d of this amount. The remaining 2020 Floridan Aquifer demand is ascribed to FCSC in the amount of 0.43 Mgal/d. This water will be obtained from the vicinity of Rock Hill Rd. in south-central Walton County. The system demand of 2.16 Mgal/d is ascribed to the coastal area. The associated coastal 2020 Floridan Aquifer demand is set to zero in anticipation that use of the FCSC coastal wellfield will be discontinued.

Bluewater Bay Resort—Floridan Aquifer water use is presently expected to be phased out by 2020.

Navarre Beach—The 2020 Floridan Aquifer demand projection is zero to reflect the fact that Navarre Beach presently receives its ADR from the mainland. This is also expected to be the case in 2020.

Gulf Breeze—Presently Gulf Breeze has no Floridan Aquifer ground water production capacity. This is expected to continue through 2020.

South Santa Rosa Utility System—Presently SSRUS has no Floridan Aquifer ground water production capacity. This is expected to continue through 2020.

Systems Lying within the Model Domain and Outside Region II

Gulf Power/Lansing Smith—The currently permitted ADR is 265.8 Mgal/d. All but 1.2 Mgal/d of this amount is saline surface water used for cooling. The 1.2 Mgal/d of ground water presently comes from the Floridan Aquifer and is specifically identified in the consumptive use permit. The USGS did not make a separate 2020 ground water projection. The 2020 Floridan Aquifer demand projection is set equal to the component of the currently permitted ADR ascribed to ground water.

Bonifay—One of Bonifay's three wells produces from the Claiborne Aquifer. In 1998, the Claiborne well accounted for about 31 percent of the total system production. To determine the 2020 Floridan Aquifer demand projection, the USGS 2020 demand projection was reduced by 31 percent, reflective of the current distribution of pumping between the Floridan and Claiborne aquifers.

Department of Corrections/Washington County— The 2020 Floridan Aquifer demand set to currently permitted ADR.

Gulf Power—The USGS did not make a 2020 demand projection for this system. The 2020 Floridan Aquifer demand set to currently permitted ADR.

Snare Waterworks—The 2020 Floridan Aquifer demand projection represents a 2.2 percent annual increase over 1998 actual pumping. The 2.2 percent annual increase represents the average growth rate required to increase 1998 pumpage to the 2020 USGS demand projection for 31 public water supply systems in Santa Rosa, Okaloosa and Walton counties.

EB Pipe Coatings—The USGS did not make a 2020 demand projection for this system. The 2020 Floridan Aquifer demand set equal to currently permitted ADR.

Panama City Beach— Floridan Aquifer water use is presently expected to be phased out by 2020.

Bay Point Leisure Properties—Floridan Aquifer water use is presently expected to be phased out by 2020.

U.S. Navy—Floridan Aquifer water use is presently expected to be phased out by 2020.

Lower Floridan Aquifer Injection Systems

Sterling Fibers/Cytec—The current-permitted ADR is the FDEP-permitted injection rate for the lower Floridan Aquifer injection system. The 2020 Floridan Aquifer demand projection is the average of the actual 1998 injection rate and the permitted capacity. The negative sign reflects injection.

Air Products—The current-permitted ADR is the FDEP-permitted injection rate for the lower Floridan Aquifer injection system. The 2020 Floridan Aquifer demand projection is based on Air Products' internal injection demand projection. The negative sign reflects injection.

Solutia/Monsanto—The current-permitted ADR is the FDEP-permitted injection rate for the lower Floridan Aquifer injection system. The 2020 Floridan Aquifer demand projection is the average of the actual 1998 injection rate and permitted capacity. The negative sign reflects injection.