

INFRASTRUCTURE ELEMENT

Sanitary Sewers

Solid Waste

Drainage

Potable Water

Groundwater/Aquifer Recharge

INTRODUCTION

This element addresses the basic utility services of the City of Plantation. The collection, transmission and treatment of sewage are provided exclusively by the City of Plantation. The City's solid waste collection and disposal are handled under a franchise-agreement with Waste Management, Inc. of Florida, a private garbage collection company. The City's drainage area is composed of three drainage areas, each controlled by a different agency. The area of the City east of the Florida Turnpike and an area west of Flamingo Road are handled by the City of Plantation. The Old Plantation Water Control District (OPWCD) provides drainage for the central majority of the City and the Plantation Acres Improvement District (PAID) for the western portion of the City, namely, Plantation Acres. All three districts are under the overall control of the South Florida Water Management District: (SFWMD).

All information pertaining to the water, sewer, and drainage systems were quoted or summarized from the following documents:

1. Water Master Plan for the City of Plantation, Florida (May, 1985) by Camp Dresser & McKee, Inc.
2. Comprehensive Plan for the City of Plantation (June, 1981) by the State of Florida, Department of Community Affairs.
3. Procedures Manual for Plantation Acres Improvement District.
4. City Code of Ordinances for the City of Plantation.
5. Water and Wastewater Master Plan for the City of Plantation (January, 1978) by Ross, Saarinen, Rolton & Wilder.
6. Franchise Agreement. for Collection and Disposal of Solid Wastes with Waste Management, Inc. of Florida (July 2002, amended May 2007).
7. An Interlocal Agreement with Broward County for Solid Waste Disposal Service (1987).
8. Report from Old Plantation Water Control District (OPWCD) (2005).
9. Report from Plantation Acres Improvement District (PAID)(Capital Improvements Analysis), 2005.
10. Monthly Operational data from the Regional Wastewater Treatment Plant and from the Central and East Water Treatment Plants.
11. City of Plantation Stormwater and Floodplain Management Plan, November 2001.

12. South Florida Water Management District *Lower East Coast Water Supply Plan, 2005-2006 Update*
13. South Florida Water Management District *Consumptive Use Report, June 10, 2004.*
14. Florida Department of Environmental Protection **Operating Permit** for the City of Plantation Regional Wastewater Treatment Facility (dated May 3, 2007 – 2012).

SANITARY SEWERS

Service Areas

The City of Plantation currently provides all of the sewage collection and all of the treatment for the incorporated area. Sewers are provided for all residents in the east district, except for some homes in the Fort Lauderdale Country Club area, in older areas of Plantation with 1 acre lots, and some development along Tropical Way. At the present time, there are plans to eventually sewer these areas. Septic tanks are being allowed in some unsewered areas of the City. All commercial multi-family, and some single-family developments in that area are sewerred.

Septic Tanks

Areas that are served by septic tanks in the City are shown in Figure 2.31. None of the soil types in the City of Plantation are suited for septic tank drain fields (see Table 2.39). For this reason, septic tank drain fields are constructed by removing the existing soils and placing more permeable soils in the drain fields prior to placement of the septic tank. Because the soils in the City of Plantation are not suitable for septic tank drain fields, no more septic tanks should be allowed within the city limits of Plantation, except on an interim basis where extension of sewer lines is not financially feasible. In these cases, the County Health Department rules will continue to be followed i.e., soil replacement and at least 75 feet from any well. Where economically feasible and technically acceptable, existing septic tanks should be removed after the facilities that they serve are connected to the City sewer system.

Table 2.39
Soil Types and their Suitability
for Septic Tank Drain Fields

Soil Type	Name	Suitability for Septic Tank Drain Fields
HA	Hallandale Fine Sand	poor
Hb	Hallandale-Urban Land Complex	poor
Iu	Immokalee-Urban Land Complex	poor
Ma	Margate Fine Sands	poor
Mu	Margate-Urban Land Complex	poor
pp	Pompano Fine Sand	poor

Source: USDA Soil Conservation Service Broward County
Soil Survey, 1984.

Wastewater Treatment Plants

The Regional Wastewater Treatment Plant treats all of the City's wastewater. Its design capacity of 18.9 million gallons per day based on three-month “running” average daily flow (MGD) of domestic sewage. The treatment plant’s effluent is discharged into two 24-inch deep wells for injection to the Boulder Zone 3,500 feet below the ground.

Collection System

There are approximately 196 miles of gravity sewer lines in the City, ranging from 4 to 15 inches in diameter. These sewers are constructed of vitrified clay pipe (VCP), polyvinyl chloride (PVC), and some cast iron (CIP) pipe. There are approximately 50 miles of force mains in the City, ranging in size from 4 to 30 inches. Approximately 60 percent of these force mains are constructed of gray cast iron (CIP) with the remainder constructed of ductile iron pipe (DIP). There are 138 sewage pump stations in the City. These stations range in size from 42 to 6,000 gallons per minute (gpm) and have submersible pumps, above ground suction lifts, and drywell/wetwell flooded suction type applications. The daily pumping time for these stations varies from 1 to 18 hours, but averages approximately 4 hours.

The Collection system and Pumping Systems are maintained on a continuous basis and radio telemetry equipment has been added to 127 of the sewage pumps.

Projections

The present and projected flows of sewage to the 16.9 MGD plant are shown in Table 2.40.

Table 2.40
Existing and Future Sewage Flow Projections

Year	Population Served	Average Daily Flow (MGD)
2005	85,684	13.0
2010	90,832	13.9
2015	97,061	14.8
2020	100,826	15.8
2025	105,944	16.1

Sources: City of Plantation Planning and Utilities Departments, 2005 includes seasonal population and assumes buildout at 2015.

Analysis and Conclusion

The full existing land use pattern is served by the public sewer system, except the two residential areas shown in Figure 2.31. The collection and treatment system is currently providing a level of service of 160 gallons per person per day during 2006.

Because of soil limitations, a better mechanism for inspection of on-site disposal systems is needed. This is the only concern about impact upon natural resources.

The deep well injection process used by the wastewater treatment plant poses no problem.

SOLID WASTE

Collection and Level of Service

The Citywide solid waste collection and disposal is handled under a franchise agreement with Waste Management, Inc. of Florida. The solid waste collected must be transported to and disposed of in an approved Broward County landfill or other approved appropriate disposal facility. Presently, the solid waste collected in the City weighs approximately 41,600 tons per year. The existing level of service is adequate. The solid waste generated in the City is expected to increase at the same rate as the population. A recycling program has been in place since 1990 to reduce the amounts generated. Presently, the recycled material collected weighs 5,600 tons per year. Broward County is actively working on plans to better accommodate, treat, and dispose of solid wastes. Currently, the City uses approximately 3 percent of the County's disposal demand.

The current and projected level of service will require the collection system to meet the peak season daily average poundage of 467,352 at buildout in 2015.

County Disposal System

The projected annual demand and capacity of the Broward County disposal system is shown in Table 2.41.

After years of study and discussion with all of the cities in Broward County, the County Commission determined that the solution to the solid waste problem would be the use of two mass burn resource recovery plants; one located near the intersection of U.S. 441 and S.R. 84 (adjacent to Plantation) the other located at the Waste Management, Inc. landfill on Powerline Road in Pompano Beach. The County has requested all municipalities to enter into an agreement. with the County to endorse and commit to use the plant. Plantation signed the agreement in March, 1987.

Both resource recovery plants have been built (1991) and are operated by private enterprise backed by a County-issued industrial development bond.

Broward County plans to phase out all of its traditional landfill operations, and those that remain will accept only non-biodegradable trash and incineration ash from the resource recovery plants.

The City is in conformance with the new State recycling requirement.

Table 2.41
Solid Waste Facilities Capacity (In Tons)
Broward County 2005-2015

YEAR	CDSL WASTE	CDSL CAPACITY	CDAL WASTE	CDAL CAPACITY	BICSL WASTE	BICSL CAPACITY	SBAL WASTE	SBAL CAPACITY
2005	316,567	3,118,236	230,000	2,092,000	240,000	2,174,000	2300,000	1,312,000
2010	186,272	2,931,669	230,000	942,000	400,000	1,774,000	230,000	0
2015	44,996	2,886,673	0	0	570,000	1,204,000		

Source: Broward County Office of Integrated Waste Management , 2005.

Conclusion

The private collection system and County disposal system both have adequate capacity to meet the City's level of service, particularly with the introduction of recycling. County monitoring of the Pompano Beach disposal facility assures no adverse impact of the leachate upon the groundwater - or other natural resources.

DRAINAGE

Facilities and Level of Service:

Plantation, like all other municipalities in South Florida, is developed on an area with very little relief and land elevations only slightly above sea level. The average elevation in the City is in the range of 10 feet above mean sea level with virtually no slope from one location in the City to another. There are no natural drainage features in Plantation. All drainage has to be collected and discharged to man-made drainage facilities such as storm sewers and then to canals. Storm water in the City is collected through a series of catch basins and street swales to storm sewers, which, in turn, empty into secondary canals in the City. These drainage systems provide relief from frequent storm runoff events (secondary system) and major flood flow conditions (primary system), and are designed to accommodate flows that rarely occur, such as the 25-year storm event. Storm water facilities must be designed so that these facilities meet the following levels of service:

Primary drainage system - 25 year - 3 day storm event. Cumulative rainfall total of 17.0".

Secondary drainage system - 3 year storm event with varying time of concentration duration. Cumulative rainfall derived from Florida Department of Transportation (FDOT) Rainfall Intensity Duration -Frequency Curves for zone 10.

Roadways - Roadways and parking lot elevations at, or above, at the 10-year flood stage.

Both OPWCD and PAID have met the level of services adopted in Policy 4.1.1 of the Infrastructure Element of this plan. The existing drainage facilities of both drainage districts were designed to pump a maximum flow rate of 71 cubic feet per second (cfs) per square mile. These facilities are capable of handling the design flow for both planning periods.

Service Areas

The drainage in Plantation is handled administratively by the City and three drainage districts (Old Plantation Water Control District, Plantation Acres Improvements District and the South Florida Water Management District, managed locally by the Surface Water Division of the Broward County Environmental Protection Department). The eastern portion of the City is handled by the City, which includes approximately 1,500 acres east of the Florida Turnpike (mostly residential with some commercial). The westernmost portion of the City west of Flamingo Road, which includes approximately 590 acres of residential and vacant land, is also handled by the City. The central portion of the City is handled by the Old Plantation Water Control District, (OPWCD), which includes approximately 10,000 acres east of the SFWMD C-42 canal (residential, commercial and industrial). The western portion of the City from the SFWMD C-42 canal to Flamingo Road is handled by the Plantation Acres Improvement District (PAID) which includes approximately 2,065 acres of residential and vacant land. These drainage districts are shown in Figure 2.33.

East Service Area: The drainage area handled by the City east of the Florida's Turnpike is drained only by the storm drains located on Broward Boulevard and those drains on S.R. 7 from just south of Broward Boulevard to Sunrise Boulevard. This storm sewer empties by gravity into the SFWMD canal C-12 just east of S.R. 7. No other storm sewers or drainage canals exist in this area. All storm water in this area is collected into local swales and percolates directly into the Biscayne Aquifer. The City of Plantation Public Works Department is responsible for the maintenance of all the components of the drainage system in this area. SFWMD has delegated its permitting to the BCEPD Surface Water Management Division for projects under 40 acres.

Central Area: The OPWCD contains 30 miles of major lateral canals and four pumping stations draining 10,000 acres. Three of the pumping stations discharge to the SFWMD New River Canal and each station has four pumps with a capacity of 45,000 gallons per minute. The other pump station has three pumps, each rated at 45,000 gpm with its discharge to the SFWMD C12 canal. None of the canals in the OPWCD are interconnected with the other drainage districts that are in Plantation, except through the pumping stations that discharge to the SFWMD canals. The design capacity of the OPWCD system is 1,100 cubic feet per second (cfs). The existing demand is approximately 30 percent of this design capacity. The City of Plantation Public Works Department is responsible for the maintenance of all the components of the drainage system in this area.

The OPWCD drainage system is completed, and almost all of the work of this district is maintenance. In addition to the drainage responsibility, OPWCD has a Diversion and Impoundment permit from SFWMD for recharge of the secondary canal network. This benefits the recharge of the well fields and numerous irrigation withdrawals in the area. Each pump station and culverts connected to SFWMD C-42 waterway have this recharge ability. The expected life of the existing pumping equipment for OPWCD is 15 to 20 years, so no major expenditures are expected within the next 10 years.

Plantation Acres: The PAID drainage system presently consists of six major east-west laterals, each approximately one-mile long and located approximately one-half mile apart. This system drains 2,065 acres. Each canal has a pump station located within the right-of-way of the C-42 canal and discharges into the SFWMD canal. There are also two minor north and south canals in the district. Each of the six pumps in the district is designed to discharge at 20,000 gpm. The system is designed and permitted for the 25 year-3 day design storm, the finished floor elevations are set above the 100 year-3 day-zero discharge elevation and the road crown elevations are above the 10 year-1 day design storm. The existing demand on the facility is approximately 20 percent of the design demand. The design capacity is 230 cfs.

All canals and canal culverts are completed and interconnected. There are six east-west canals, each approximately one mile, and two north-south canals, each approximately three miles. All six pump stations have received new pumps and motors. Three have been automated. The remaining three are scheduled to be automated in the near future. Plans are underway for neighborhood drainage improvements along 118th Avenue and in the South Acres.

The Plantation Acres Improvements District is responsible for the maintenance of all the components of the drainage system in this area

POTABLE WATER

Service Areas

The City of Plantation harvests, treats and distributes all of the water in the incorporated area except for the area east of State Road 7.

West District: Formerly, the water in this area was supplied by the City of Sunrise; however, with the construction of transmission and distribution mains by the City in 1992, the City of Plantation supplies all water to the West District.

Wellfields

The City's water utility operates two membrane softening water treatment facilities, the East and Central Water Treatment Plants (WTPs). These wellfields provide the source water for the respective treatment facilities (Figure 2), with a total of 16 active wells and a combined capacity of 35.5 MGD. Each wellfield contains eight active wells deriving source water from the Biscayne Aquifer. Wellfields serving the two treatment plants are located both within the treatment plant boundaries and in nearby environmentally protected areas within the City parks. The East wellfield has the infrastructure to pump 18.9 MGD. The Central wellfield has the infrastructure to pump 16.6 MGD. The permitted

The SFWMD adopted the Regional Water Availability Rule in February 2007. This rule limits the amount of water that can be withdrawn from the Biscayne aquifer for water supply needs where it results in impacts to the Lower East Coast Everglades Water bodies or the North Palm Beach County/Loxahatchee River Watershed Water bodies. Compliance with this rule will result in the need for alternative water sources to provide water supplies for a growing population in the Broward County. Based on the restrictions identified in the RWAR, the City of Plantation water allowance from the Biscayne Aquifer is capped at 17.4 MGD annual average daily flow (AADF).

Salt water intrusion into the Biscayne Aquifer in the area of Plantation is not considered to be a problem now.

Treatment Plants

East District Plant: This plant was constructed in 1955. A major addition in 1977 increased the plant capacity utilizing lime softening. In 1997, a *membrane softening* treatment facility was built with an initial capacity of 6.0 MGD. This plant went on-line in December 15, 1997. At that time the lime softening plant was taken off-line. In August 2002, construction was started at the treatment facility to expand the capacity from 6.0 MGD to 12.0 MGD. The expansion went on-line late August – early September 2004. The East facility supplies approximately 46 percent of the City's total daily demand.

Central District Plant: This plant consists of a 12.0 MGD membrane softening plant which has been on-line since May of 1991. The Central facility supplies approximately 54 percent of the City's total daily demand.

Both water treatment plants meet or surpass current safe drinking water standards.

Water Projections and Existing Level of Service

The present and projected population and water demand are shown in Table 2.42:

Table 2.42
Existing and Future Population and Water Demand Projections

Year	Population Served	City of Plantation Average Daily Water Demand (MGD)
2005	85,157	15.69
2010	90,832	15.53
2015	96,463	16.50
2020	100,826	17.24
2025	105,944	18.12

Source: City of Plantation Utilities Dept., 2008.

The City consumes water at the rate of approximately 154.5 gallons of finished water per person per day. Five percent of the finished water is unaccounted for and includes losses associated with leaks, testing and construction and fire suppression. The water required for the peak day is approximately 1.5 times the average day.

This means that the treatment plants should be sized for 1.5 times the values shown in Table 2.43. which equates to the present capacity of 24.0 MGD.

Distribution System

The City owns and maintains more than 324 miles of water mains with a size of 2 to 30 inches. These pipes are predominantly cast iron, ductile iron, PVC and some asbestos cement. The smaller 2-inch mains are predominantly galvanized, but are being replaced with PVC pipes on a yearly basis. Presently, there is adequate pressure in the entire distribution system. System pressure is currently maintained at 40 to 50 psi leaving the plant in order to assure adequate service at the extents of the distribution system, which is set at the minimum per the SFWMD requirements.

The City has 4.0 MG of finished water storage capacity at the East Water Treatment Plant and 4.5 MG of finished water storage at the Central WTP.

The fire flow requirements for the City were established by City Ordinance 1320. This ordinance requires a maximum of 2,500 gpm for residential fires and 2,000 gpm for commercial/industrial fires. This results in a total minimum storage requirement for the buildout population in 2015 of 6.6 mg.

The present storage capacity is adequate for the projected 2015 buildout population.

The high service pump capacity at both treatment plants exceed the treatment plant rated capacity. High service pump capacity at the East plant totals 24.192 MGD [3 @5,600 gpm], and high service capacity at the Central plant totals 24.696 MGD [7 @2,450 gpm] for a total capacity of 48.888 MGD or 33,950 gpm. The maximum high service pumping capacities required to accommodate both domestic and fire flow for the maximum hour of the maximum day for the buildout population in 2015 is 20,542 gpm.

The distribution system is considered to be in good condition, but programs for the elimination of dead ends and leak detection are ongoing as is the replacement of galvanized piping, moving water mains to front-street easements and the installation of new water mains. The City has recently replaced the water meters throughout the City. The new water meters are more accurate and better account for water used. They are also capable of data profiling and identifying probable leaks, for quick resolutions. The data profiling will assist with conservation efforts by showing detailed analyses of water use and misuse.

The SFWMD has determined that traditional water supply sources will not be sufficient to meet the demands of the growing population and needs of the environment, agriculture and industry over the next two decades. The Florida Legislature enacted bills in 2002, 2004, and 2005 in order to more effectively address the state water supply needs as potential limitations of the continued use of traditional water supplies, such as the Biscayne Aquifer, became increasingly apparent. In 2005, significant changes were made to Chapters 163 and 373, F.S. to improve the coordination of water supply and land use planning. Senate Bills 360 and 444 strengthened the linkage between the regional water supply plans prepared by the water management districts and comprehensive plans prepared by the local governments. Consequently, the City of Plantation prepared a 10-year Water Supply Plan and incorporated it as part of the local government's comprehensive plan amendments to comply with the current provisions of Chapter 163, F.S. and the Florida Department of Community Affairs (DCA). The City of Plantation 10-Year Water Supply Plan is part of this data and analysis. The Water Supply Plan is to be updated annually.

The City of Plantation water service area population is expected to increase by roughly twelve percent over the next ten years. The average per capita water usage for the City is 190 gallons of raw water per capita per day and 154.5 gallons of finished water per capita per day. Current water consumption rates coupled with population projections for the service area lead to a total raw water demand from the Biscayne Aquifer of 18.2 MGD AADF and finished water demand of 14.8 MGD AADF in 2018. Based on the water withdrawal restrictions from the Biscayne Aquifer outlined in the RWAR, the City will have to provide the raw water equivalent of .8 MGD AADF. This difference between projected demand and the maximum withdrawal rate from the Biscayne Aquifer identified in the RWAR is known as the demand-not-met and must be supplied through alternative water sources or demand management. The most feasible options for meeting the City's ten-year demand not met include developing the wastewater reuse projects such as spray irrigation of two golf courses, and water conservation initiatives. The City of Plantation in February 2008 initiated an ordinance to enable the City to enforce SFWMD restrictions through fines. This ordinance is coupled with an existing tiered rate system currently employed by the City.

The City of Plantation intends to adopt a water conservation ordinance (See Infrastructure Element Policy 7.5.4) by June 2009, that will have water conservation results similar in nature to the water restrictions that were in place in 2001; resulting in a water consumption rate of 171 GPCD (139 GPCD finished water) or a 10% reduction from the average daily use of 158 GPD (SFWMD Lower East Coast Water Supply Plan Update 2005-2006). The City of Plantation is limiting residential water usage, including landscape irrigation, in order to reduce per capita water consumption, through the tiered rate for water usage, and fines imposed as previously stated.

Similarly, per capita water consumption dropped considerably in 2007 to 159 GPCD (raw water) in the wake of water restrictions, or a reduction of sixteen percent. First quarter pumpage comparisons (January to April 2008) shows a 22% reduction of consumption when compared to the first quarter last year.

The City of Plantation plans to construct facilities at the Regional Wastewater Treatment Plant to treat secondary effluent to high level disinfection standards in order to supply two golf courses located within the City, the Plantation Preserve Golf Course and Jacaranda Golf Club, with 1.4 MGD(AADF) of reclaimed water for spray irrigation. It is anticipated that existing consumptive use permits held by the golf course will be transferred to the City, thereby providing Plantation with an additional 1.0 MGD withdrawal allowance from the Biscayne Aquifer. The raw water DNM of 0.77 MGD will be supplied through the construction of reuse facilities. Distribution pipelines are also planned to provide for the delivery of reclaimed water to the Plantation Preserve and Jacaranda Golf Clubs, which are both located within the City. Conservation initiatives also play a vital role in the demand management aspect of water supply planning, as mentioned in previous sections

NATURAL GROUNDWATER AQUIFER RECHARGE

Biscayne Aquifer

The principle source of water supply in South Florida is the Biscayne Aquifer. In 1979, the U.S. Environmental Protection Agency (EPA) designated the Biscayne Aquifer as the "sole source" of drinking water for Broward County. The Biscayne Aquifer is recharged by two primary methods within the City: 1) rainfall and 2) water in the drainage/recharge canals. The rainfall that falls on the ground either percolates into the soil and then into the Biscayne Aquifer, or it runs off the surface of the ground and into the drainage canals. The drainage canals flow eventually to the ocean, but on the way, some of this water infiltrates into the Biscayne Aquifer. During periods of little precipitation, water from the Water Conservation Areas is released into the canals and this water infiltrates into the ground and into the Biscayne Aquifer. The excess water from irrigation projects also is effective in providing recharge for the Biscayne Aquifer. The SFWMD requires that all development projects provide at least 13 percent of the area devoted to lakes, or other recharge features.

County, Regional and State Protection Mechanisms

Recognizing the importance of the Biscayne Aquifer, Broward County proceeded with several avenues to protect this sole source of drinking water. The efforts by the County to protect the water supply wells and their recharge area will result in stable and reliable water supply for the City.

The Broward County Environmental Protection Department (EPD) passed the Storage Tank Regulation (84-3) in May, 1984. Its purpose is to prevent hazardous discharge to ground and surface water by requiring storage tank facilities designed to recover spilled hazardous substances. For example, underground storage tanks within the wellfield protection zones must have a containment barrier, recovery system and monitoring wells.

In August, 1984, the County passed the Wellfield Protection Ordinance (84-60). The purpose is to safeguard the public health by preventing contamination of potable water supply wells by restricting the use and storage of specific hazardous substances within the zones of influence or recharge of potable water supply wells.

Standards for septic tank systems as set forth in Chapter 10D-6 of the Rules of Florida Department of Health and Rehabilitative Services (MRS) require that septic tank systems shall not be located within 200 feet of a public potable water system well. Similarly, the South Florida Water Management District (SFWMD) (Chapter 40E-3) requires that well sites be at least 200 feet from any septic tank system. An examination of the City's septic tank map and the City's wellfield area indicates that this rule is not violated. The County Health Department requires replacement of soil for new septic tanks.

Broward County has established itself as a leader in the nation in groundwater protection. The City of Plantation meets or surpasses all of the requirements of this regulation.

Pollution

Diffuse sources of water pollution or nonpoint source pollution (occurring over a wide area), such as agricultural and urban runoff, are major causes of water quality problems. The "National Water Quality Inventory, 1988 Report to Congress" provided a general assessment of water quality based on biennial reports submitted by States under Section 305(b) of the Clean Water Act (CWA). The Assessment concluded that pollution from diffuse sources, such as runoff from agriculture, urban areas, construction sites, land disposal and resource extraction, is cited by the States as the leading cause of water quality impairment.

The Clean Water Act (CWA) and the Water Quality Act (WQA) requires the Environmental Protection Agency (EPA) to establish regulations setting forth National Pollutant Discharge Elimination System (NPDES) permit application requirements for storm water discharges associated with industrial activity and discharges from municipal separate storm sewer systems.

The City of Plantation, along with most jurisdictions in Broward County, is a NPDES permittee. Each jurisdiction covered by this permit contributes to the development, revision, and implementation of a comprehensive Storm Water Management Program (SWMP), including pollution prevention measures, treatment or removal techniques, storm water monitoring, use of legal authority, and other appropriate means to control the quality of storm water discharged from

the Municipal Separate Storm Sewer System (MS4). The SWMP is consistent with State Water Policy pursuant to the Florida Administrative Code (FAC)62-40.431(1)-(3).

Policy 3.1.1 of the Infrastructure Element, Potable Water, discourages land use plan amendments that propose industrial uses that could result in contamination of the groundwater.

Conservation

The City's water conservation program is related to the rate structure for water consumption and the distribution of educational materials related to conservation of water. Effective January 1, 1984, the City Council enacted City Ordinance No. 2275, which altered the method used to charge for sewerage services. Sewage charges are now based on the metered water used rather than the number of bathrooms, as was the case. Conservation Rates, with increasing, tiered rate schedule and surcharges based on SFWMD Water Restrictions went into effect June 20, 2002 to deter excessive use.

Existing and Planned Infrastructure Facilities

Table 6.5 summarizes the infrastructure facilities (sewage, solid waste, drainage, potable water, and ground waster), the operational responsibility, the design capacity, the current demand, and the level of service of these facilities.

Table 2.43
Existing and Planned Infrastructure Facilities

<i>Facility</i>	<i>Operational Responsibility</i>	<i>Service Area</i>	<i>Design Capacity</i>	<i>Current Demand</i>	<i>Level of Service</i>
Sewage					
Collection	City	City-wide	N/A	N/A	152 gpcd
Treatment	City	City-wide	16.9 MGD	15.8 MGD	152 gpcd
Solid Waste					
Collection	City	City-wide	As required	5,051 tons per month	4.5 lb/cap/d
Disposal	Broward County	County-wide	N/A	N/A	N/A
Drainage					
City	City-wide for Roads & Development	N/A	N/A		<ul style="list-style-type: none"> • 3 yr., 1 day storm in ROW Min. crown elev=6' S of Broward Min. crown elev=7' N. or Broward • 10 yr., 1 day storm on site • 72 hrs. to drain road swales
	OPWCD	W. of Fla. T.P. & E of C-42	1,100 cfs	30%	25 year storm for canals only

Table 2.43 (Continued)
Existing and Planned Infrastructure Facilities (Continued)

<i>Facility</i>	<i>Operational Responsibility</i>	<i>Service Area</i>	<i>Ultimate Design Capacity</i>	<i>Current Demand</i>	<i>Level of Service</i>
	PAID	W. of C-42 & E. of Flamingo Rd.	230 cfs	20%	25 year storm
	SFWMD	Southeastern	N/A	N/A	10 year storm for canals only
Potable Water					
Distribution	City	City-wide	24 MGD	11.8 MGD*	140 gpcd
Treatment	City	City-wide	24 MGD	11.8 MGD*	140 gpcd
Storage	City	City-wide	8.5 mg	N/A	N/A
Pumping	City	City-wide	33,950 gpm	9622 gpm	N/A
Pressure	City				70 psi at the plant trunk line or As per SFWMD requirements
Ground Water					
Recharge	SFWMD	City-wide	N/A	N/A	13% of development for recharge

Source: Water Treatment Plant Records, 2005

*Finished water demand includes bulk sale to BCWWS

City of Plantation

Unsewered Areas

Figure 2.31



Prepared by: IT - GIS Division



Legend

- City Boundary
- Streets
- Unsewered Areas

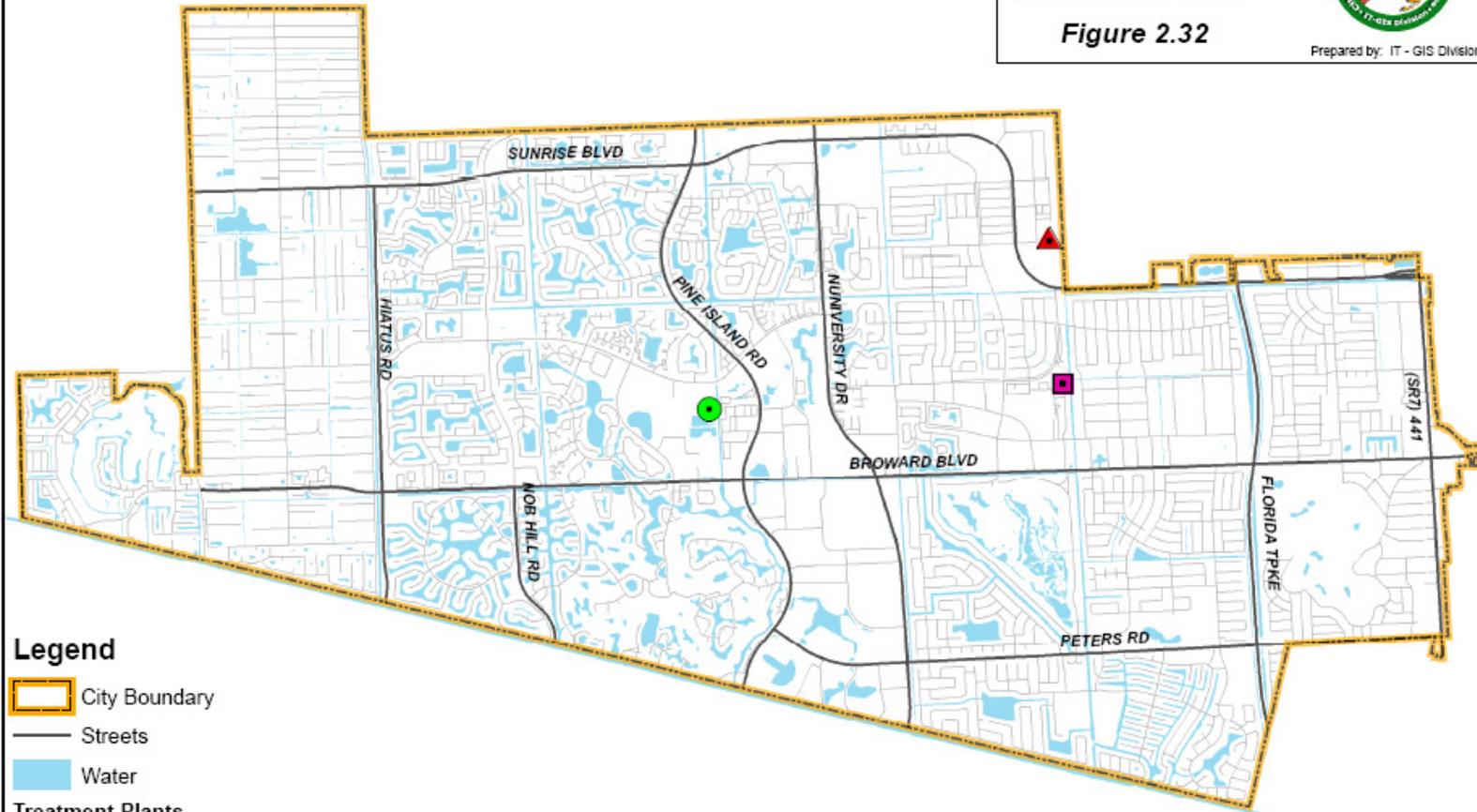


Source: City of Plantation, Utilities Department, 2007

City of Plantation
Sewage and Water
Treatment Plants
Figure 2.32



Prepared by: IT - GIS Division



Legend

-  City Boundary
-  Streets
-  Water
- Treatment Plants**
-  Central Water
-  East Water
-  North Regional Wastewater



Source: City of Plantation, Public Works Department, 2007

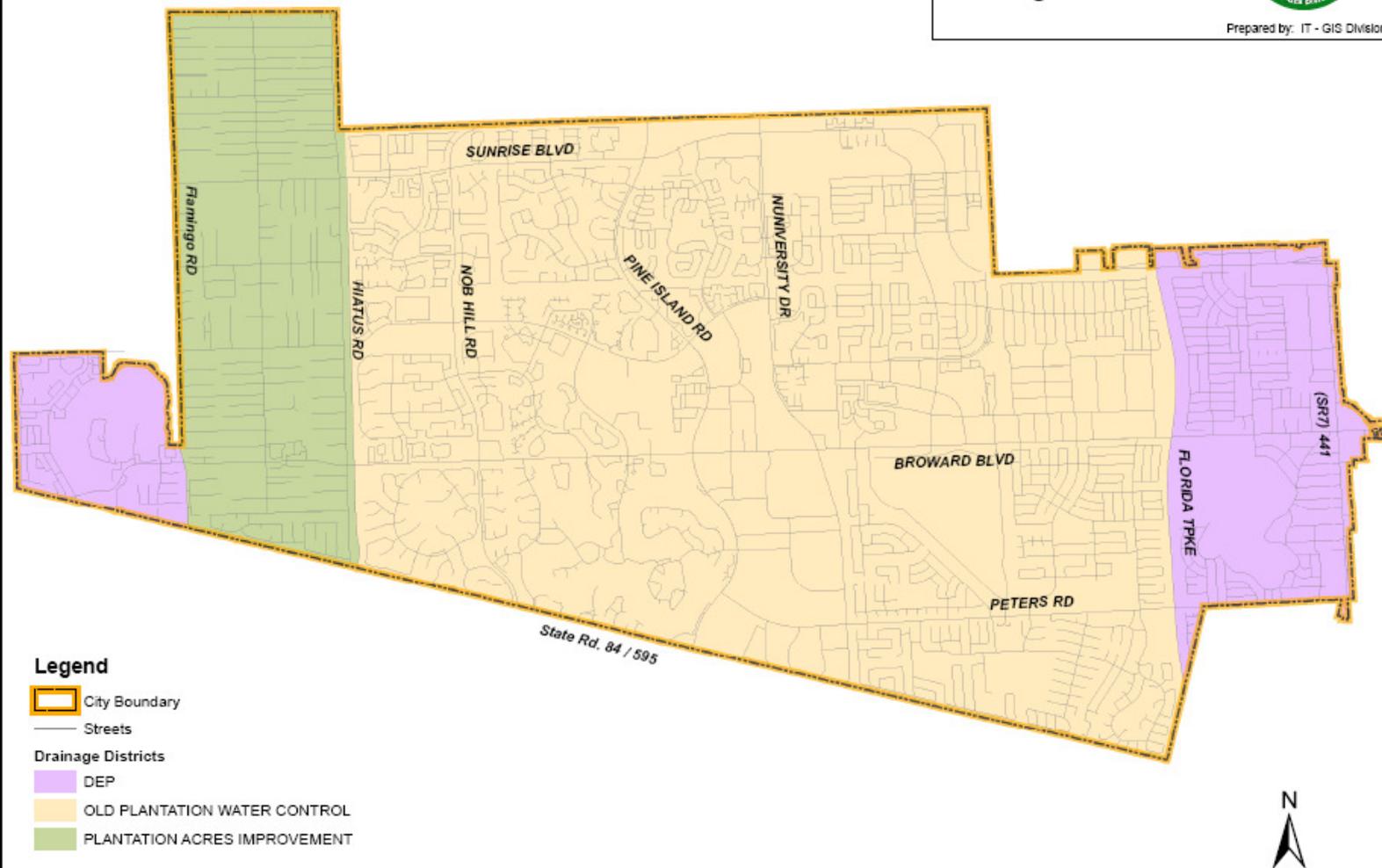
City of Plantation

Drainage Districts

Figure 2.33



Prepared by: IT - GIS Division



Source: City of Plantation, Utilities Department, 2007

APPENDIX
City of Plantation Water Supply Plan



Plantation
the grass is greenerSM

City of Plantation
Water Supply Plan
2008

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INTRODUCTION

A. BACKGROUND

The South Florida Water Management District (SFWMD) has determined that traditional water supply sources will not be sufficient to meet the demands of the growing population and needs of the environment, agriculture, and industry over the next twenty years. The Florida Legislature enacted bills in 2002, 2004 and 2005 in order to more effectively address the state's water supply needs as potential limitations on the continued use of traditional water supplies, such as the Biscayne Aquifer, became increasingly apparent. Significant changes were made to Chapters 163 and 373, Florida Statutes (F.S.) in 2005 to improve the coordination of water supply and land use planning. Senate Bills 360 and 444 strengthened the linkage between the regional water supply plans prepared by the water management districts and comprehensive plans prepared by the local governments.

The SFWMD approved the Lower East Coast Water Supply Plan 2005-2006 Update in February 2007, which encouraged the development of alternative water supply projects in the wake of uncertainty concerning water availability from the regional system. Accordingly, the SFWMD adopted the Regional Water Availability Rule (RWAR) in February 2007, which limits the amount of water that can be withdrawn from the Biscayne Aquifer for future water supply. Based on the restrictions identified in the RWAR, the City of Plantation raw water allowance from the Biscayne Aquifer is capped at 17.4 million gallons per day (MGD) annual average daily flow (AADF). Consequently, the development of alternative water supply (AWS) projects is critical for the City of Plantation and other communities within the Lower East Coast (LEC) Planning Area to ensure adequate water supply to satisfy growing demands.

The City of Plantation is required to submit a 10-year water supply facilities work plan (hereinafter referred to as the Work Plan) in order to comply with the current provisions of Chapter 163, F.S. and the Florida Department of Community Affairs (DCA). The Work Plan must address the development of traditional and alternative water supplies, sales agreements, and conservation and reuse programs that are necessary to serve existing and new development for at least a 10-year planning period. Chapter 163, F.S. requires local governments to prepare and adopt Water Supply Plan into their comprehensive plans within 18 months following water management district approval of a regional water supply plan or its update.

B. CITY OF PLANTATION

The City of Plantation is located in the geographic center of Broward County (Figure 1). The City contains 22.8 square miles. The City is generally bound by West Sunrise Boulevard to the north, State Road 7 (U.S. 441) to the east, Interstate 595 to the south, and NW 136th Avenue and North Flamingo Road to the west, as shown in Figure 1.

Plantation is bordered to the north by the City of Sunrise and the City of Lauderhill, to the east by the City of Lauderhill and the City of Fort Lauderdale, to the south by the Town of Davie, and to the west by the City Sunrise.

C. WATER SUPPLY

The ability to meet future water demands without impacting the natural system will require water supply and water resource planning, and coordination among Broward County, the South Florida Water Management District and the City of Plantation.

The Biscayne Aquifer is one of the most productive aquifers in the world and is the primary source of water to residents of Broward County, Miami-Dade County, and southeastern Palm Beach County. In 1979 it was designated a sole source aquifer by U.S. Environmental Protection Agency (EPA), under the Safe Drinking Water Act (1974). The South Florida Water Management District (SFWMD) is the state agency responsible for water supply planning in the Lower East Coast Planning Area, which includes all of Broward County. Withdrawals from the Biscayne Aquifer are managed by the SFWMD through the issuance of Consumptive Use Permits (CUPs).

The relationship between withdrawals from the Biscayne Aquifer and minimum flows and levels (MFLs) was analyzed in the Lower East Coast Regional Water Supply Plan (LECRWSP). Due to the uncertainty regarding future water demands, water availability, and population growth, it was evident that water supply plans needed to be reviewed and updated, and that local governments needed to take a proactive role in water supply planning.

Population growth and increasing water demands will constitute a significant challenge for water supply planners during the next two decades. Based on data collected during the 2000 Census, and population modeling performed by the Broward County Planning Services Division and University of Florida's Bureau of Economic and Business Research (BEBR), Plantation's population is projected to increase approximately 12 percent from 88,562 persons in 2008 to 99,081 persons in 2018 . Consequently, water supply planning has become an issue of considerable importance.

D. THE 10-YEAR WATER SUPPLY PLAN

A 10-Year Water Supply Plan development is required of all local governments with responsibility for all or a portion of their water supply facilities, located in an area where a Regional Water Supply Plan (RWSP) has been developed by the water management district. The City of Plantation is located within the Lower East Coast Planning Area and is responsible for ensuring adequate water resource development and water delivery to areas served by the City's water utility. City Planning and Utilities Department staff worked with the Broward County Water and Wastewater Services (BCWWS), and Hazen and Sawyer, P.C. in developing a Water Supply Plan to address future water supply needs in the City of Plantation for the next 10-year requirement.

The purpose of the City of Plantation Water Supply Plan is to identify the future water supply needs for the City and to develop a framework for meeting projected water demands. The City's Utilities Department identified the future water supply needs for the City and determined the most appropriate methodologies for meeting the water needs. The City Utilities Department provided data required for the needs assessment, confirmed the accuracy of the analysis, and generated a 10-year water supply plan for meeting water demands in the utility's service area.

Needs assessments were developed based on current water operations and the existing customer base, compared to population projections through 2018. Population modeling was performed by the Broward County Planning Services Division (BCPSD), which developed a Population Forecasting Model that was approved by the State of Florida's Department of Community Affairs and adopted as part of the Broward County Comprehensive Plan in 1989. The model provides details about the Broward County Cities' expected population with respect to age, gender, and race and provides forecasting at 1-year intervals. The model also accounts for changes in land use patterns that are expected through development and redevelopment.

The Water Supply Plan presented includes an analysis of existing water facilities, current and projected water demands versus water availability (based on permitting), and the presentation of water supply plans for the provider utility.

The Water Supply Plan begins with an analysis of the water supply needs, which includes a description of the service area, and current production and treatment facilities; establishes a baseline condition; presents a needs assessment; identifies specific needs; and concludes with a utility-specific workplan.

In addition, the plan contains a letter from Broward County Water and Wastewater Services (BCWWS) verifying sufficient wellfield and treatment capacity to meet water demands through 2018 based on analysis from the Water Supply Facilities Workplan prepared by the BCWWS for the District 1 utility.

II. ANALYSIS

A. Service Area

The City of Plantation owns and operates its water utility, providing potable water service to approximately 85,000 City residents over an area of approximately 22.8 square miles. The City's Utilities Department retail customers consists primarily of residential and commercial properties within the City of Plantation, and maintains an agreement for wholesale potable water supply with Broward County for Broadview Park, an unincorporated neighborhood of Broward County (Figure 2). Emergency potable water interconnects are maintained with the City of Fort Lauderdale, the City of Sunrise, and the City of Lauderhill. There are no anticipated changes to the service area.

Most of the gross acreage in the City is dedicated to residential use (48.5%). The remaining gross acreages are allocated to non-residential uses such as commercial and office (9%), industrial (1%), parks (3%), golf course/commercial recreation (6.5%), community facility (3.5%), utilities (0.5%), vacant (3%), and water (7%). and transportation (18%). Figure 3 presents a future land use map for the City of Plantation. The City does not anticipate any increases in land area in the near future and population growth observed over the next 20 years is expected to be within the existing land uses designated for residential development, including some commercial areas.

B. Production and Treatment Facilities

The City of Plantation Utilities Department provides for the delivery of potable water. The Plantation water service area includes the City of Plantation (excluding a small 0.17 square mile area located to the immediate east of State Road 7). The City also provides bulk finished water to Broadview Park, an unincorporated neighborhood of Broward County which is located within the Broward County Water and Wastewater Services (BCWWS) District 1. Figure 1 illustrates the Plantation water service area, which is approximately 23.8 square miles in area with a customer base of approximately 85,000. Presently, raw water is supplied from the Biscayne Aquifer and treated at two membrane softening facilities, each having its own wellfield. Emergency potable water interconnects are maintained with the City of Fort Lauderdale, the City of Sunrise, and the City of Lauderhill.

The City's water utility operates two membrane softening water treatment facilities, the East and Central Water Treatment Plants (WTPs). These wellfields provide the source water for the respective treatment facilities (Figure 2), with a total of 16 active wells and a combined capacity of 35.5 MGD. Each wellfield contains eight active wells deriving source water from the Biscayne Aquifer. Wellfields serving the two treatment plants are located both within the treatment plant boundaries and in nearby environmentally protected areas within the City parks. The East wellfield has the infrastructure to pump 18.9 MGD. The Central wellfield has the infrastructure to pump 16.6 MGD.

Table 1 provides specifications relating to the individual water supply wells. Historical flow data for the Biscayne Aquifer withdrawals are presented in Table 2; Figure 1 illustrates the location of water supply wells within the East and Central Wellfields. Combined, the City's two wellfields cannot exceed 17.4 MGD, based on the June 10, 2004 CUP limitations.

Table 1: City of Plantation Biscayne Aquifer Water Supply Wells

Plantation Pump ID	District Well ID	Wellfield	Casing Diameter [Inches]	Casing Depth [Feet]	Total Depth [Feet]	Year Drilled	Flow [GPM]
East #1	28219	East	24	86	130	1997	1680
East #2	28220	East	24	88	130	1997	1680
East #3	28221	East	24	97	130	1997	1680
East #4	28225	East	24	86.5	130	1997	1680
East #5	28222	East	24	75	117	1997	1680
East #6	28226	East	12	92	130	1997	1400
East #7	28227	East	24	94	130	1997	1680
East #8	28228	East	24	99	130	1997	1680
Central #1	28213	Central	14	75	140	1987	1400
Central #2	28214	Central	14	75	140	1987	1400
Central #3	28216	Central	14	75	140	1987	1400
Central #4	28215	Central	14	75	140	1987	1400
Central #5	28223	Central	14	75	140	1987	1400
Central #6	28224	Central	14	75	140	1987	1400
Central #7	28217	Central	14	75	140	1987	1400
Central #8	28218	Central	14	75	140	1987	1400

Table 2: City of Plantation Historical Biscayne Aquifer Withdrawals

Year	East Wellfield		Central Wellfield		Total	
	Actual Annual Average Daily Flow (MGD)	Max Actual Daily Flow (MGD)	Actual Annual Average Daily Flow (MGD)	Max Actual Daily Flow (MGD)	Actual Annual Average Daily Flow (MGD)	Max Actual Daily Flow (MGD)
1998	3.149	6.559	11.396	13.679	14.545	20.238
1999	3.129	6.830	11.831	13.431	14.960	20.261
2000	6.282	7.121	9.094	11.350	15.876	18.471
2001	7.005	7.550	7.265	9.725	14.270	17.275
2002	6.941	9.600	9.462	11.701	16.403	21.301
2003	6.987	9.708	9.818	11.973	16.805	21.681
2004	8.536	10.830	8.779	10.689	17.315	21.519
2005	7.708	10.580	8.833	10.849	16.541	21.429
2006	7.235	11.990	9.352	11.416	16.587	23.406
2007	6.740	9.722	7.876	9.770	14.616	19.492

East Water Treatment Plant

The East Water Treatment Plant was constructed in 1955 and is located in the eastern portion of the City. In 1997, a membrane softening facility was constructed with an initial capacity of 6.0 MGD and the lime-softening plant was subsequently taken out of service. The membrane plant was expanded from 6.0 MGD to 12.0 MGD capacity in 2004. The East Water Treatment Plant currently supplies approximately 46 percent of the total daily finished water demand for the City.

Central Water Treatment Plant

The Central Water Treatment Plant, originally a lime softening facility, was purchased from Gulfstream Utilities in 1985 to provide potable water to western portions of the City. The membrane softening plant was constructed in 1991 and has a rated capacity of 12.0 MGD and supplies 54 percent of the total daily finished water demand for the City.

Distribution System

The City owns and maintains over 324 miles of water mains with sizes ranging between 2 and 30 inches in diameter. Piping systems are generally cast iron, ductile iron, and PVC pipe with some asbestos cement pipe. The smaller 2-inch mains are predominantly galvanized, but are currently being replaced with PVC on an annual basis. Presently, adequate pressure exists within the entire distribution system. Currently the City is following the recent SFWMD water shortage restrictions (Order No. 2008-166-DAO-WS) and reducing the lowest system pressure point to approximately 45 psi at the furthest point in the system.

Storage Facilities

The East WTP provides 4.0 MG of ground on-site storage for finished water. The Central WTP provides 4.5 MG of on-site storage for finished water (Table 3) in the form of on-site storage tanks. The City of Plantation's East and Central WTPs together offer 24.0 MGD of treatment capacity and 8.5 MG of finished water storage capacity.

Consumptive Use Permit and Baseline Condition

The City of Plantation holds a 20-year CUP (No. 06-00103-W) from the SFWMD. The CUP was issued to the City June on 10, 2004, with an expiration date of May 13, 2024. (Appendix A). The CUP is broken down into two time frames and two corresponding withdrawal rates. The raw water withdrawal limit specified from the date of issuance to May 13, 2009 is 19.51 MGD on an annual average daily flow (AADF) basis. Similarly, the raw water withdrawal rate from May 13, 2009 to May 13, 2024 is limited to 17.24 MGD (AADF). Under the Regional Water Availability Rule, the reduced withdrawal rate in effect from May 13, 2009 to May 13, 2024 becomes 17.4 MGD (AADF).

The CUP also restricts maximum monthly allocation. In the development of the CUP, the District reviewed monthly withdrawal data for the preceding five-year period and

determined a ratio between the maximum month and average month. This ratio, also known as a peaking factor, accounts for seasonal variations. As such, the CUP restricts maximum monthly allocation to 569 MG from May 13, 2009 to May 13, 2024. The peaking factor established in the CUP to convert annual average daily flow to maximum monthly flow is 1.09. The projected finished water demand for the City of Plantation and Broadview Park is 16.13 MGD (AADF) in the year 2028, and accordingly, the projected maximum monthly finished water flow demand is 18.55 MGD. Therefore, since the City of Plantation water treatment plants are capable of producing a combined 24.0 MGD of finished water, the City maintains sufficient treatment capacity to handle the 2028 finished water demand for the maximum month condition.

**Table 3
Statistics Summary for the City of
Plantation Water Treatment Plants**

Water Treatment Plant	Treatment Type	Treatment Capacity (MGD)*	Storage Capacity (MG)**	Source Water
Plantation, East	Membrane Softening	12.0	4.0	City of Plantation, East Wellfield
Plantation, Central	Membrane Softening	12.0	4.5	City of Plantation, Central Wellfield

***Treatment capacity is in millions of gallons per day (MGD).**

****Storage capacity is in millions of gallons (MG)**

The City of Plantation is committed to continued water conservation and has recently, in 2005, implemented a “tiered” water rate increase to encourage the City of Plantation Utilities customers to conserve water. February 27, 2008, the City Council passed an ordinance that gives our officers authority to ticket water utility customers not following water restriction requirements.

Population Projections

Population projections, along with per capita water demand rates developed using historical demand data, provide the basis for projected water demands and water supply infrastructure planning for the City. The analysis presented herein uses population data from the Broward County Planning Services Division to project the population of the City of Plantation to the year 2030. The Broward County Planning Services Division estimated populations by traffic analysis zones (TAZ) using the Year 2000 U.S. Census population data and the Broward County Population Forecast Model (BCPFM), 2005. Future water needs for Broadview Park were obtained through coordination with BCWWS to ensure sufficient availability of water to meet the needs of Broadview Park residents according to the level of service (LOS) established by Broward County.

Population projections for the City of Plantation are summarized in Table 4 for select intervals beginning in 2000 and continuing through 2030. Table 5 presents population and resulting finished water demand data for Broadview Park obtained from BCWWS.

Table 4

City of Plantation Projected Population	
Year	Projected Population
2000	82,934
2005	85,157
2008	88,562
2010	90,832
2015	96,463
2018	99,081
2020	100,826
2025	105,944
2028	108,096
2030	109,530

Table 5

**Broadview Park Projected Population and Finished Water Demand
(Table Provided by Broward County)**

Year	Projected Population*	Finished Water Demand Potential (Average Day in MGD)	Finished Water Demand Potential (Max. Day in MGD)**
2000	0	0.0	0.0
2005	6,743	0.9	1.2
2010	7,166	1.0	1.4
2015	7,389	1.0	1.4
2020	7,682	1.0	1.4
2025	8,145	1.1	1.5
2028	8,347	1.1	1.5
2030	8,481	1.1	1.5

* Based on 2000 Census estimates for BCWWS Utility Analysis Zones

** Based on a maximum day to average day ratio of 1.36

Historical Water Demand

Per capita water consumption rates were developed using water demand data from recent years and provide the basis for water demand projections. Table 6 provides annual flow data (raw and finished water) for the City of Plantation for years 2000, 2003, 2004, 2005, and 2006 along with corresponding water consumption rates. Recently, medium to long-term mandatory water use restrictions emerged as a factor that must be considered in water supply planning. Significant decreases in water demand were observed in 2001 and 2007, periods when water restrictions were issued by the SFWMD. These periods are atypical and hence data from 2001 and 2007 are not used in the calculation of a representative per capita consumption rate for the City. Similarly, data from the year 2002 were not included in this analysis as the City began providing Broadview Park finished water on approximately March 25, 2002. Table 6 reveals consumption rates of 190.0 gallons of raw water per capita per day and 154.5 gallons of finished water per capita per day which are used in this analysis to estimate future water demands for the City of Plantation.

**Table 6: City of Plantation Water Consumption Rates from Recent Years
(Excluding 2001, 2002, and 2007)**

Year	City of Plantation Population	Raw Water Demand (Excluding Broadview Park)		Finished Water Demand (Excluding Broadview Park)	
		(MGD)	(GPCD)	(MGD)	(GPCD)
2000	82,934	15.40	185.6	13.11	158.1
2003	83,968	16.09	191.6	13.08	155.8
2004	84,604	16.50	195.0	13.32	157.4
2005	85,157	15.69	184.3	12.27	144.1
2006	86,292	16.58	192.1	13.54	156.9
Average		16.05	190.0	13.07	154.5

Note that since total raw and finished water flows from the water treatment plants were used in the development of representative per capita water consumption rates for the City, seasonal variations in flow for the years considered have been taken into account for this analysis.

C. Needs Assessment

Water Conservation

The City of Plantation is committed to enacting several water conservation programs in order to reduce water consumption. The City expects that a ten percent reduction in per capita water usage could be achieved given that water restrictions similar in nature to those the City intends to adopt were in place during the 2001 drought, resulting in a raw water consumption rate of approximately 171 GPCD (139 GPCD finished water), equating to a reduction of roughly ten percent from current average usage. Similarly, per capita water consumption dropped considerably in 2007 to 159 GPCD (raw water) in the wake of water restrictions, or a reduction of sixteen percent. First quarter pumpage comparisons (January to April 2008) shows a 22% reduction of consumption when compared to the first quarter last year.

The projected water demand for the City of Plantation was realized through multiplication of the projected population by the per capita water consumption representing conservation conditions, or 171 GPCD and 139 GPCD for raw and finished water, respectively. The conservation water use rates reflect a ten percent reduction in average per capita water demands (excluding years with water restrictions). Results are presented in Table 7.

**Table 7
Projected Raw and Finished Water Demands for the City of Plantation
(Excluding Broadview Park)**

Year	City of Plantation Population	Raw Water Demand (MGD)	Finished Water Demand (MGD)
2008	88,562	15.14	12.31
2010	90,832	15.53	12.63
2015	96,463	16.50	13.41
2018	99,081	16.94	13.77
2020	100,826	17.24	14.01
2025	105,944	18.12	14.73
2028	108,096	18.48	15.03
2030	109,530	18.73	15.22

The projected raw and finished water demands for the City of Plantation shown above were combined with finished water demands for Broadview Park provided by Broward County. Total projected water demands for the City of Plantation (including Broadview Park) are presented in Tables 8 and 9. Finished water demands supplied by BCWWS were converted to raw water flows through application of a treatment recovery of 81.5%, which is representative of membrane treatment at the City of Plantation based on historic data.

**Table 8
Projected Raw Water Demands for the City of Plantation (Including Broadview Park)**

Year	City of Plantation Raw Water Demand (MGD)	Broadview Park* Raw Water Demand (MGD)	Total Raw Water Demand (MGD)
2008	15.14	1.10	16.25
2010	15.53	1.23	16.76
2015	16.50	1.23	17.72
2018	16.94	1.23	18.17
2020	17.24	1.23	18.47
2025	18.12	1.35	19.47
2028	18.48	1.35	19.83
2030	18.73	1.35	20.08

* Broadview Park data supplied by BCWWS.

**Table 9
Projected Finished Water Demands for the City of Plantation (Including
Broadview Park)**

Year	City of Plantation Finished Water Demand (MGD)	Broadview Park Finished Water Demand (MGD)	Total Finished Water Demand (MGD)
2008	12.31	0.9	13.21
2010	12.63	1.0	13.63
2015	13.41	1.0	14.41
2018	13.77	1.0	14.77
2020	14.01	1.0	15.01
2025	14.73	1.1	15.83
2028	15.03	1.1	16.13
2030	15.22	1.1	16.32

* Broadview Park data supplied by BCWWS.

The 2007 Regional Water Availability Rule limits the ultimate consumptive use allocation from the Biscayne aquifer to the highest consecutive 12-month period of usage during the five year period proceeding April 1, 2006. This “base condition water use” restricts Plantation to a 17.4 MGD AADF allowance from the Biscayne Aquifer. The term Demand-Not-Met (DNM), as identified in the Regional Water Availability Rule, refers to the amount of water needed to support future demands that cannot be fulfilled from the Biscayne Aquifer as a source. Therefore, the DNM is calculated as the difference between the allowable withdrawal rate and the projected water demand. Table 10 presents projected DNM values through 2030 for both raw and finished water. The raw water DNM of 0.77 MGD (AADF) and the finished water DNM of 0.60 MGD (AADF) for the year 2018 are addressed herein.

Table 10 (Revised 8/12/08)

Quantity	2005	2008	2010	2015	2018	2020	2025	2028	2030
Population Served (City of Plantation)	85,157	88,562	90,832	96,463	99,081	100,826	105,944	108,096	109,530
Raw Water									
City of Plantation Demand per Capita (GPD)	184.3	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0
City of Plantation Average Daily Demand (MGD)	15.69	15.14	15.53	16.50	16.94	17.24	18.12	18.48	18.73
Broadview Park Average Daily Demand (MGD)	1.10	1.10	1.23	1.23	1.23	1.23	1.35	1.35	1.35
Total Average Daily Demand (MGD)	16.79	16.25	16.76	17.72	18.17	18.47	19.47	19.83	20.08
Permitted Amount (MGD, Annual Average)	19.50	19.50	17.40	17.40	17.40	17.40	17.40	17.40	17.40
Permitted Surplus (Deficit) ^{1,2}	2.71	3.25	0.64	(0.32)	(0.77)	(1.07)	(2.07)	(2.43)	(2.68)
Finished Water									
City of Plantation Demand per Capita (GPD)	144.1	139.0	139.0	139.0	139.0	139.0	139.0	139.0	139.0
City of Plantation Average Daily Demand (MGD)	12.27	12.31	12.63	13.41	13.77	14.01	14.73	15.03	15.22
Broadview Park Average Daily Demand (MGD)	0.90	0.90	1.00	1.00	1.00	1.00	1.10	1.10	1.10
Total Average Daily Demand (MGD)	13.17	13.21	13.63	14.41	14.77	15.01	15.83	16.13	16.32
Permitted Amount (MGD, Annual Average) ³	15.89	15.89	14.18	14.18	14.18	14.18	14.18	14.18	14.18
Permitted Surplus (Deficit) ^{1,2}	2.72	2.68	0.56	(0.23)	(0.59)	(0.83)	(1.65)	(1.95)	(2.14)
¹ The City is limited by the permitted amount only. Water treatment plant capacity is not a limiting factor. ² Calculated by subtracting Average Daily Demand from Permitted Amount. ³ Equates to the amount produced using the existing treatment process with an assumed 81.5% treatment recovery.									

D. Specific Needs

The City's Utilities Department has adequate wellfield capacity (18.9 MGD and 16.6 MGD) and sufficient treatment capacity (24.0 MGD) to meet the projected water supply needs. Although the City of Plantation has sufficient wellfield and treatment capacity to meet the projected demands, the utility's current consumptive use permit along with the 2007 Regional Water Availability Rule limits withdrawals from the Biscayne Aquifer, the sole source of water for both the East and Central WTPs, to an average of 17.4 MGD, leaving a raw water DNM of 0.77 MGD in the year 2018.

III. The Water Supply Alternatives and Demand Management

The City of Plantation does not have immediate plans to expand either of its water treatment facilities at this time. In the absence of being able to obtain an increase in raw water allocation from the Biscayne Aquifer, water utilities will be required to develop alternative water resources in order to meet additional demands. Through development of alternative water resources, the water supplier can reduce its reliance on the Biscayne Aquifer. Alternative water resource development considers possible alternatives, and changes in technology, as part of the planning process. The City continues to pursue the most cost-effective and low-risk alternatives as part of their comprehensive plan.

The City has elected to pursue a combination of efforts which combine aspects of the development of alternative water sources and demand management in order to address the 2018 raw water DNM of 0.77 MGD (AADF) from the Biscayne Aquifer. The raw water DNM of 0.77 MGD will be supplied through the construction of reuse facilities at the City of Plantation Regional Wastewater Treatment Plant to treat secondary effluent to High Level Disinfection Standards in order to provide reclaimed water for use in irrigation of area golf courses. Distribution pipelines are planned to provide for the delivery of reclaimed water to the Plantation Preserve and Jacaranda Golf Clubs, which are both located within the City. Conservation initiatives also play a vital role in the demand management aspect of water supply planning, as mentioned in previous sections.

A. Spray Irrigation-Reuse

The SFWMD RWAR maintains that additional withdrawals from the Biscayne Aquifer that result in additional aquifer recharge from the regional system be offset by alternative sources. The replacement of permitted use of the Biscayne aquifer with reclaimed water can provide the required offset. Reuse projects, unlike other AWS options, require that hydrologic modeling be performed in order to determine the amount of credit in terms of additional raw water allowance that can be expected from the SFWMD in exchange for groundwater recharge resulting from the application of reclaimed water. Preliminary modeling of the surficial aquifer system indicates that a return of roughly 60% of the consumptive use permit (CUP) can be expected for application of 0.52 MGD (the amount prescribed in the existing golf course CUP) of reclaimed water at Plantation Preserve Golf Club. Similarly, a return of approximately 79% can be provided for the application of 0.87 MGD (the amount provided in the existing golf course CUP). Overall, modeling reveals that approximately 1.0 MGD of raw water DNM can be offset.

The design capacity of the proposed reuse facilities was determined to be 3.5 MGD in order to accommodate existing reclaimed water demands at the plant (existing non-potable water system and on-site irrigation) in addition to the flow demands imposed by the two golf courses. The proposed AWS project will need to provide for the treatment of 1.5 MGD to satisfy existing reclaimed water demands. Delivery of reclaimed water to the golf course application points, or on-site ponds, was assumed to take place 75 percent of the time rather than continuously in order to incorporate a factor of safety in the design capacity. Hence the total design capacity was arrived at through the following calculation, where the total CUP allocated receiving capacity for the golf courses is 1.4 MGD.

$$Q_{Capacity} = \frac{1.4mgd}{0.75} + 1.5mgd = 3.5mgd$$

B. Water Conservation Programs

The City of Plantation has recently replaced the water meters throughout the City. The new meters are more accurate and better account for water used. The new meters have automatic meter reading and “data profiling” capabilities. The data profiling will assist with conservation efforts by showing detailed analyses of water use and misuse.

In 2005, the City of Plantation implemented a “tiered” water rate increase to encourage the Utilities Department customers to conserve water by increasing water rate fees. February 27, 2008, the City Council passed Ordinance No. 2405 giving authority to the officers (police and code enforcement) to write tickets to water utility customers that do not follow the SFWMD water restriction requirements.

A more comprehensive conservation-based Ordinance is being considered with a June 2009 implementation that will bring together all of the various items currently in place and/or items being planned, such as:

1. Continue water main rehabilitation projects to eliminate leaks,
2. Enforce landscape conservation measures,
3. Water master plan includes reuse of treated wastewater,
4. Enforcement of year-round conservation measures,
5. Assure recordation of “unaccounted for” water from water main breaks, large fire fighting operations, routine fire hydrant flushing, new construction main flushing,
6. Automatic meter reading/data profiling,
7. Initiate conservation rate structure,
8. Initiate toilet and shower nozzle retrofit program,
9. Continue conservation education via water bills and City publications,
10. Participate in public speaker forum on water conservation issues,
11. Provide citizen-centric water bill.

IV. SUMMARY AND CONCLUSIONS

The City of Plantation has elected to construct reuse facilities at its Regional Wastewater Treatment Plant (WWTP) to provide reclaimed water for use in irrigating area golf courses, coupled with conservation initiatives currently being implemented in order to meet the 2018 raw water DNM of 0.77 MGD from the Biscayne Aquifer.

The City's Utilities Department will need to continue assessing its ability to meet the needs of its customers, not so much as a function of infrastructure capacity, but in terms of water availability. The City will continue to work together with SFWMD and Broward County to balance water supply needs with the appropriate sources and technologies.

Water conservation programs offer a relatively inexpensive and immediate means of "alternative water resource development" and will be more actively pursued at all levels.

The City will continue to work with SFWMD and Broward County in developing and facilitating water resource programs that have regional benefits to assist local municipalities and utilities in meeting the water supply needs of a growing population.

Figure 1

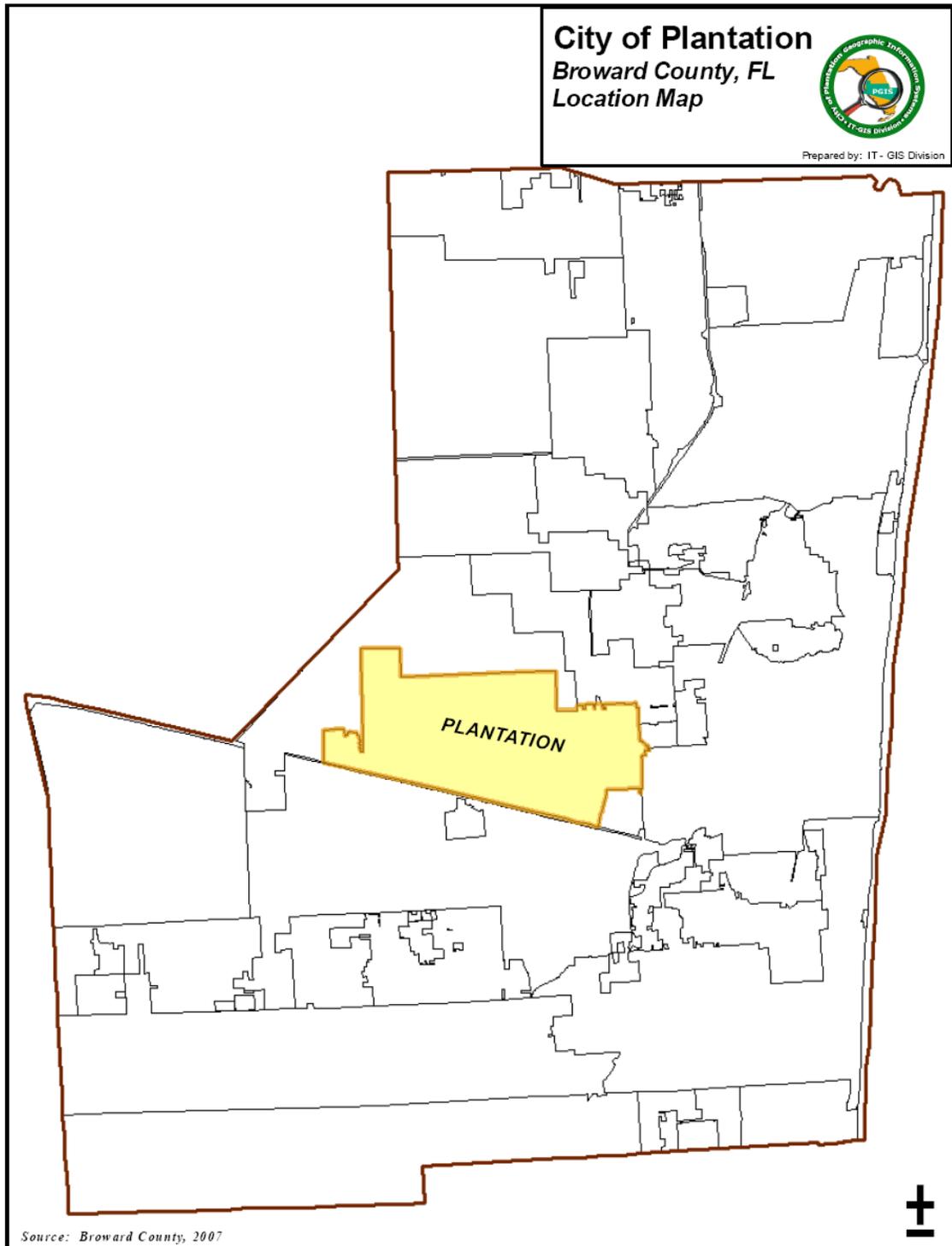
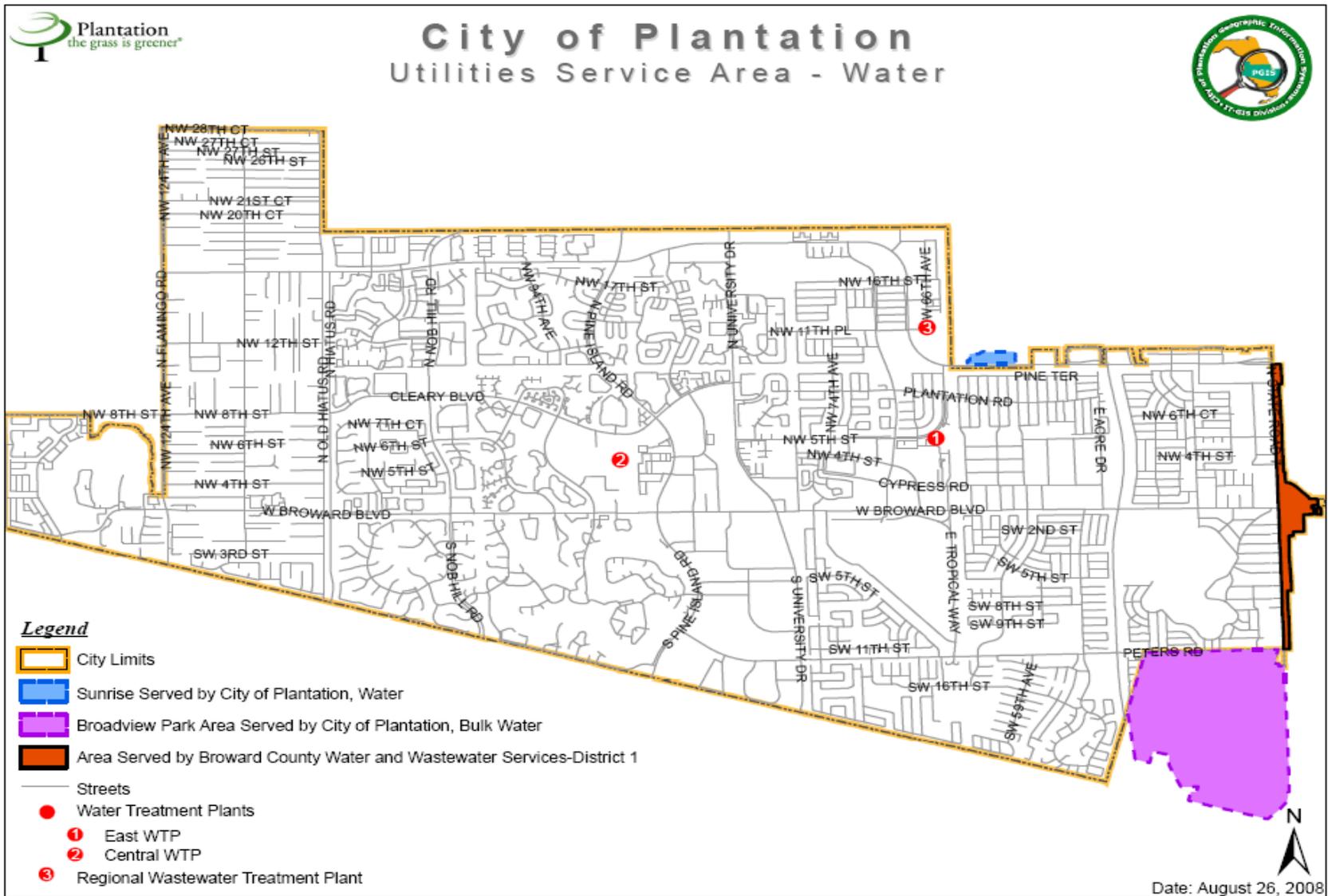


Figure 2



City of Plantation FUTURE LAND USE MAP

Figure 1.1



Broward County, Florida
July 2008

