CITY OF MARGATE

BROWARD COUNTY, FLORIDA

COMPREHENSIVE PLAN 1989

ELEMENT III

Sanitary Sewer

Solid waste

Drainage

Potable Water &

Natural Groundwater

Aquifer Recharge

MARGATE COMPREHENSIVE PLAN

ELEMENT III

SANITARY SEWER, SOLID WASTE, DRAINAGE, POTABLE WATER AND NATURAL GROUNDWATER AQUIFER RECHARGE ELEMENT

Prepared by the Engineering Department of the City of Margate, Florida. Funds for this purpose were received from the State of Florida under the Local Government Comprehensive Planning Assistance Program. September 30, 1987. Edited October 1988. Revised May 1, 1989.

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Comprehensive Plan Amendment

Element III
Sanitary Sewer, Solid Waste, Drainage, Potable Water & Natural Groundwater Aquifer Recharge

Part 1 – Potable Water

September 2024

City of Margate – Comprehensive Plan Amendment

Element III

Sanitary Sewer, Solid Waste, Drainage, Potable Water & Natural Groundwater Aquifer Recharge

Part 1 – Potable Water

October 2020

Hazen and Sawyer

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1. Service Area

The City of Margate provides water services to approximately 62,300 people located within the City limits of the City of Margate and the southern portion of the City of Coconut Creek. The service area encompasses 10.7 square miles and the land use is predominantly residential. The City owns and maintains the entire water supply, treatment, and distribution system, and is the sole entity responsible for planning, financing, constructing, and operating the facilities that supply water within its service area.

In 1957, a private utility company, the Margate Utilities Corp. was established and the City's first water treatment plant and distribution system was built. In June 1968, the company was sold to the Margate Utility Authority (MUA), a not-for-profit corporation. In 1977, the City assumed the operation of the utility and MUA's debt. The City's Department of Environmental and Engineering Services (DEES) currently owns and operates the potable water supply and wastewater treatment facilities serving the entire geographical area within the City's corporate limits and a portion of the City of Coconut Creek. The detailed service area boundary map is provided in **Figure III-1**. The City and its water service area are primarily residential with a mix of apartments, condominiums, single-family homes, shopping centers, schools, and health care facilities.

2. Population and Water Consumption

Population projections and the average historic five-year water demand per person per day were used to forecast water demand within the City's water service area. The historic and forecasted populations and water demands are provided in Section 4 of the 2020 update to the City of Margate Water Supply Facilities Work Plan (Work Plan) provided in **Attachment – A**.

3. Existing Facilities

The raw water source for the City's water system is the Biscayne Aquifer, a porous underground formation that underlies most of Miami-Dade, Broward, and Palm Beach Counties. The Biscayne Aquifer has been designated as a "sole source" of drinking water supply for Southeastern Florida by the United States Environmental Protection Agency.

In addition to direct rainwater recharge, the aquifer receives stored fresh water from Lake Okeechobee and the interior Conservation Areas through a system of canals owned and operated by the South Florida Water Management District (SFWMD). These canals are hydrologically linked to the shallow aquifer. Except for the relatively high calcium hardness and occasionally high iron content, the Biscayne Aquifer water is suitable for most domestic, commercial, and industrial uses.

The City's water system includes a 13.5-million gallon per day (mgd) water treatment plant (WTP) fed with raw water from 12 Biscayne Aquifer wells; a water distribution system with 213.4 miles of distribution mains; a remote 2 million gallon (MG) water storage tank facility, and four interconnects with neighboring municipalities. The distribution system includes 17,004 service connections to residential, commercial, and local government customers.

This 2020 update reflects new language and replaces entire text from the 2015 update of the Potable Water Element. Therefore, the text in this update is not underscored. This update also incorporates the updated Water Supply Facilities Work Plan, required by the Florida Legislature.

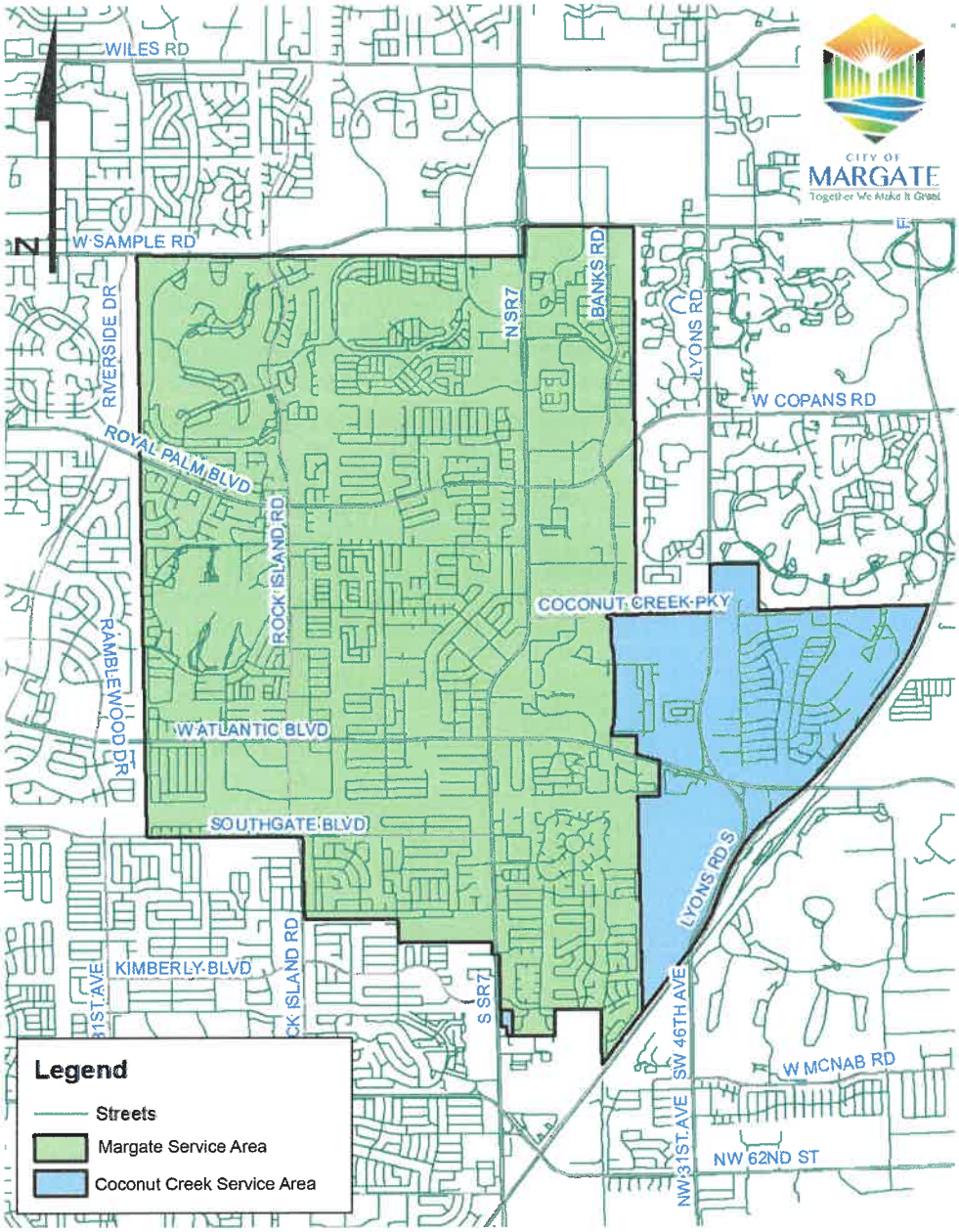

Figure III-1: City of Margate's Water Service Area Boundaries

This 2020 update reflects new language and replaces entire text from the 2015 update of the Potable Water Element. Therefore, the text in this update is not underscored. This update also incorporates the updated Water Supply Facilities Work Plan, required by the Florida Legislature.

4. Water Supply

The raw water quantities permitted to be pumped from the City's wellfield are governed by the SFWMD. Currently, the City may withdraw up to an annual average daily quantity of 8.53 mgd from the Biscayne aquifer through its 12 withdrawal wells. This quantity represents the City's "base condition water use". Under the SFWMD's Regional Water Availability (RWA) Rule adopted on February 16, 2007, raw water withdrawals from the Biscayne Aquifer are limited to the permittee's "base condition water use" which is defined as the basis for establishing permitted water quantities. For a water utility, the "base condition water use" is the maximum quantity of water withdrawn by the applicant from the permitted source during any consecutive twelve-month period during the five years preceding April 1, 2006.

After the year 2040, the City's forecasted raw water demand will be greater than its "base condition water use". Withdrawals from the Biscayne aquifer above the established base condition water use are only authorized if the Permittee has received the required offset water to prevent an increase in volume or change in timing of surface and groundwater withdrawn from the Lower East Coast Everglades Waterbodies over the base condition water use.

On December 4, 2019, the City signed a capacity allocation agreement for 2.00 mgd of storage capacity in the C-51 Reservoir that will allow the City to withdraw an additional estimated 2.00 mgd from its wellfield once the reservoir becomes operational. In its recent water use permit modification application, which was approved by the SFWMD on September 2, 2020, the City requested that 1.57 mgd of this 2.00 mgd be used as offset water to supply future water demands through 2065. This offset will allow the City to withdraw an annual average daily quantity of 10.10 mgd and an annual average daily maximum month quantity of 11.09 mgd. The reservoir is expected to become fully operational by September 2022 at which time the City will be able to withdraw all of its allocated 10.10 mgd.

5. Adequacy of Water Supply through 2040

During the period 2020 to 2040, the forecast of average daily raw water withdrawals from the City's Biscayne Aquifer wellfield is below the City's base condition water use. Once the C-51 Reservoir becomes operational, permitted water withdrawals from the Biscayne aquifer will increase to 10.10 mgd providing sufficient water supply through 2040 and beyond. During the period 2020 to 2040, there is enough water treatment capacity available to supply the forecasted water demand.

6. Water Supply Capital Improvements

The City's capital improvement projects include the purchase of water storage from the C-51 Reservoir in an amount that will provide 2.00 mgd of water supply on an annual average daily basis. This water supply will be used as offset water to support additional permitted withdrawals from the Biscayne aquifer to supply the future water demands of the City's water service area through the year 2065. Other than capacity from the C-51 Reservoir, all capital improvement items included in the City's five-year capital improvement plan are intended to replace and rehabilitate the existing water infrastructure as components reach the end of their useful lives.

This 2020 update reflects new language and replaces entire text from the 2015 update of the Potable Water Element. Therefore, the text in this update is not underscored. This update also incorporates the updated Water Supply Facilities Work Plan, required by the Florida Legislature.

7. Performance Assessment

The following measures are established to assess the performance of the water system:

1. Meet or exceed all existing federal, State, and local water quality standards.
2. Every five years after the year 2020, prepare an annual utility report to evaluate the operational and fiscal status of the water system.
3. Evaluate treatment and water use permit capacity annually and implement appropriate measures to address deficiencies, if any.

8. Goals, Objectives, and Policies

All goals, objectives, and policies related to Part 1 – Potable Water are provided in Section 7.0 of the Work Plan provided as **Attachment – A**.

This 2020 update reflects new language and replaces entire text from the 2015 update of the Potable Water Element. Therefore, the text in this update is not underscored. This update also incorporates the updated Water Supply Facilities Work Plan, required by the Florida Legislature.

Attachment A

City of Margate Water Supply Facilities Work Plan Update - 2020

This 2020 update reflects new language and replaces entire text from the 2015 update of the Potable Water Element. Therefore, the text in this update is not underscored. This update also incorporates the updated Water Supply Facilities Work Plan, required by the Florida Legislature.

Water Supply Facilities Work Plan Update

April 24, 2020

Revised July 1, 2024

Hazen

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Section 1.0 – History and Statutory Overview

The City of Margate (City) in northern Broward County is approximately ten miles inland from the Atlantic Coast. The City is bordered on the north and east by the City of Coconut Creek, on the north and west by the City of Coral Springs and on the south by the City of North Lauderdale. The City is 9.17 square miles in size with no opportunity for annexation of additional lands. The City was chartered as a town government in 1955 and incorporated as a City in 1961.

In 1957, a private utility company, the Margate Utilities Corp. was established and the City's first water treatment plant and distribution system was built. In June 1968, the company was sold to the Margate Utility Authority (MUA), a not-for-profit corporation. In 1977, the City assumed the operation of the utility and MUA's debt. The City's Department of Environmental and Engineering Services (DEES) currently owns and operates the potable water supply and wastewater treatment facilities serving the entire geographical area within the City's corporate limits and a portion of the City of Coconut Creek. The location of the City and its service area within Broward County is provided in **Figure 1.1**. The detailed service area boundary map is provided in **Figure 1.2**. The City and its water service area are primarily residential with a mix of apartments, condominiums, single-family homes, shopping centers, schools, and health care facilities.

The City's water utility draws its potable water from the Biscayne Aquifer, the primary water supply source in Broward and Miami-Dade counties and southeastern Palm Beach County. Water withdrawal from the Biscayne Aquifer is governed by the South Florida Water Management District (SFWMD) through the issuance of Consumptive Use Permits (CUPs).

Chapter 163, Part II, Florida Statutes (F.S.), requires local governments to prepare and adopt 10-Year Water Supply Facilities Work Plans into their comprehensive plans within 18 months after the SFWMD approves a regional water supply plan or its update. The 2018 Lower East Coast Water Supply Plan Update (2018 LECWSP Update) was adopted by the SFWMD's Governing Board on November 8, 2018. Therefore, local governments within the Lower East Coast Region are required to amend their comprehensive plans and include an updated 10-year Water Supply Facilities Work Plan and related planning elements by May 8, 2020.

The State of Florida requires that the 10-Year Water Supply Facilities Work Plan Update address the development of traditional and alternative water supplies and management strategies, including conservation and reuse. The data and analyses, including population projections and water demand, must span at least a 10-year planning period and be consistent with the 2018 LECWSP Update. The data presented herein are for the planning period through the year 2040.

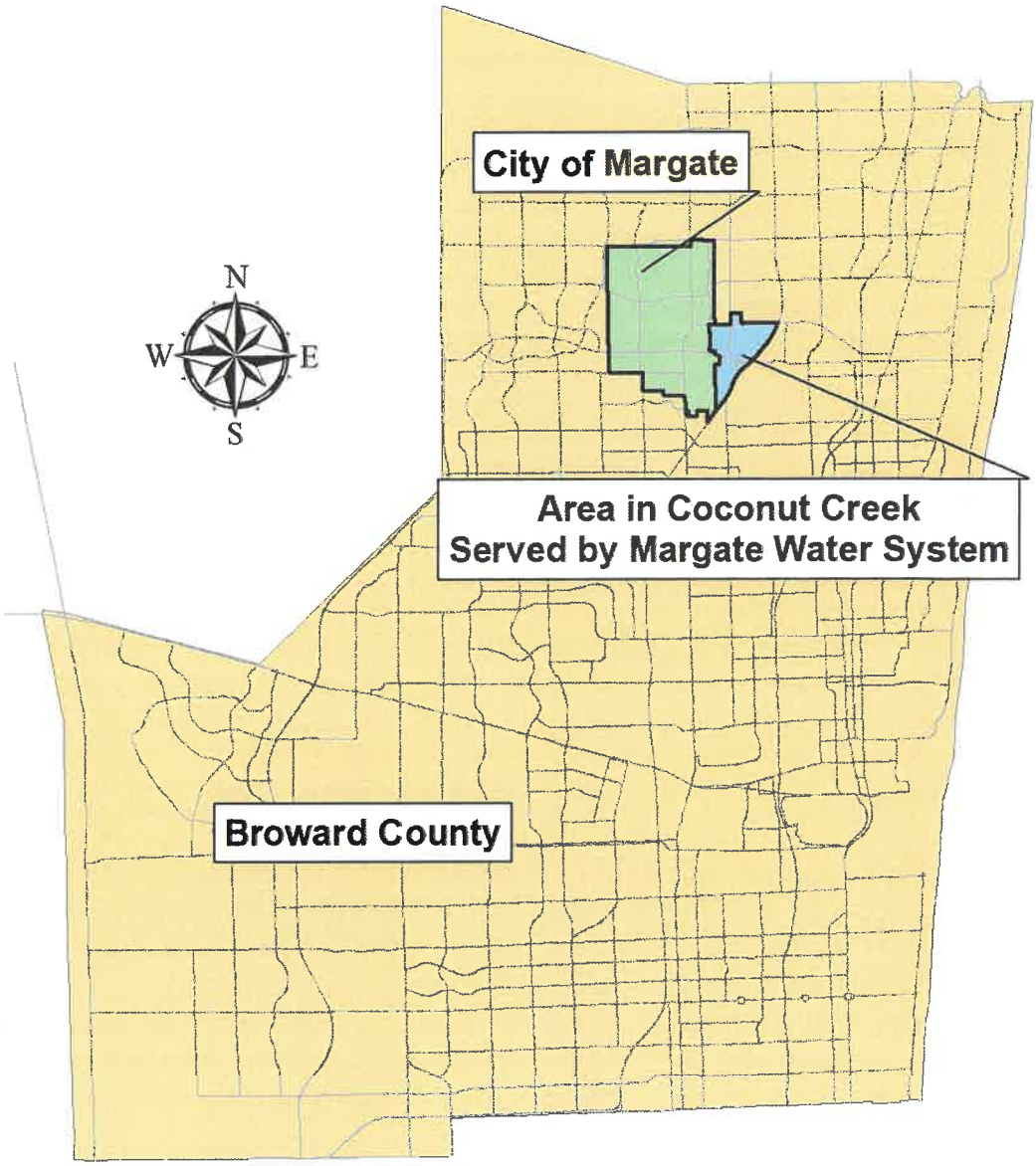


Figure 1.1 Location of City of Margate's Water Service Area

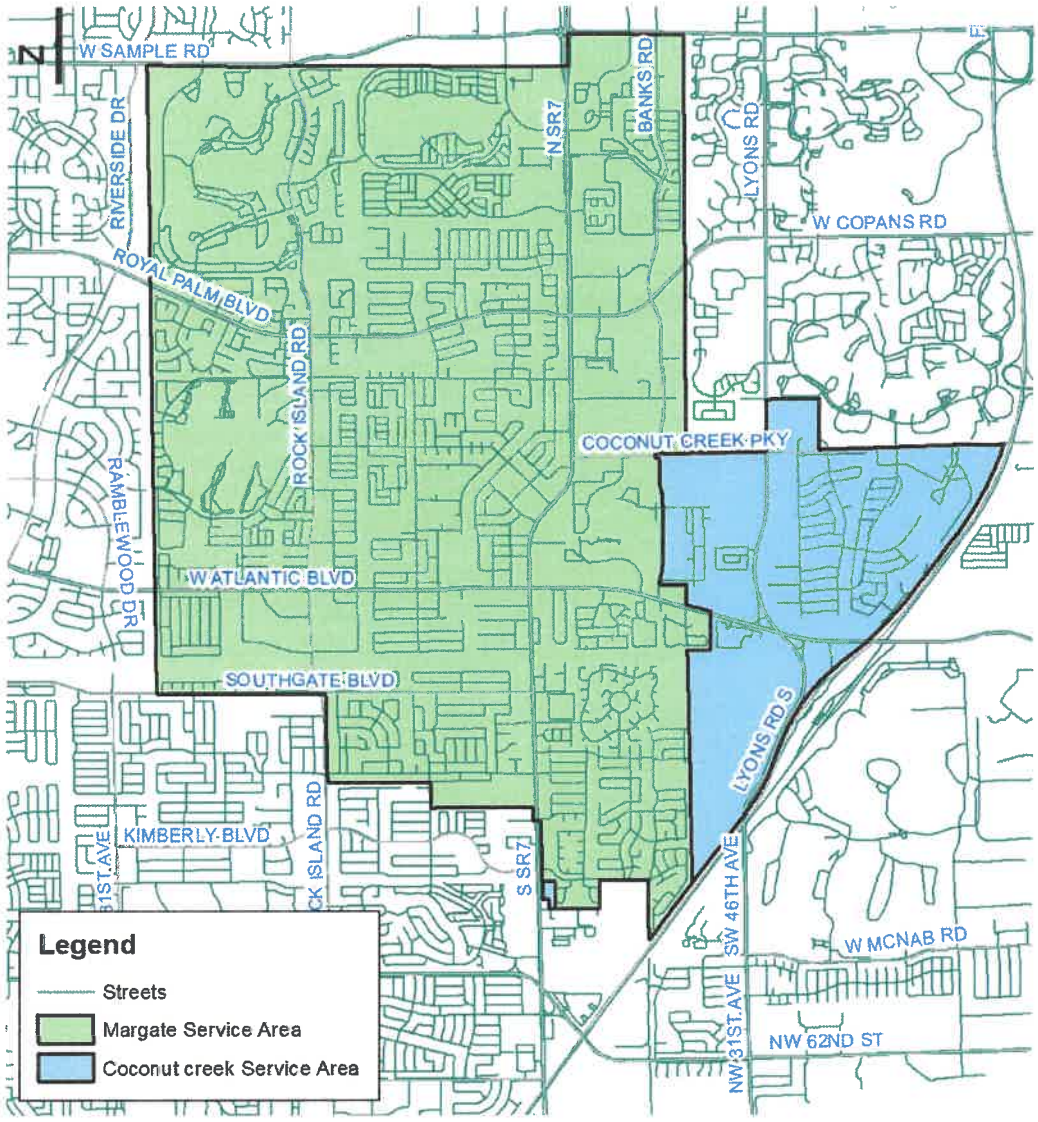


Figure 1.2 City of Margate's Water Service Area Boundaries

Section 2.0 – Work Plan Objectives

The City withdraws potable water from the Biscayne Aquifer in conformance with its consumptive use permit (CUP) number 06-00121-W issued by SFWMD. The City's 35-year CUP was issued on September 2, 2020 and expires on December 27, 2065. This work plan provides a detailed plan to serve water demands in its service area for the required 10-year planning period and through 2040.

This Water Supply Facilities Work Plan 2020 Update includes the following items.

- Assessment of the City's current water supply sources and treatment capacities (Section 3.0)
- Identification of water conservation and reuse practices and regulations within the City's service area. (Section 3.0)
- Five-year population and water demand projections through the year 2040 within the City's jurisdiction and in the portion of the City of Coconut Creek served by the City (Section 4.0).
- Recognition of the regional water supply planning issues that have the potential to impact the City. (Section 5.0)
- Identification of the City's water supply capital improvement projects including alternative water supply. (Section 6.0)
- Identification of Goals, Objectives, and Policies (GOP's) required to implement the Work Plan and water supply concurrency requirements. (Section 7.0)

Section 3.0 – Water Supply System

3.1 System Overview

3.1.1 Service Area

The City provides water and wastewater services to approximately 62,254 people located within the City limits of the City of Margate and the southern portion of the City of Coconut Creek. The service area encompasses 10.7 square miles and the land use is predominantly residential. The City owns and maintains the entire water supply, treatment, and distribution system, and is the sole entity responsible for the planning, financing, construction and operation of the facilities that will supply water within its service area.

The City's water system includes a 13.5-million gallon per day (mgd) water treatment plant (WTP) fed with raw water from 12 Biscayne Aquifer wells; a water distribution system with 213.4 miles of distribution mains; a remote 2 million gallon (MG) water storage tank facility, and four interconnects with neighboring municipalities. The distribution system includes 17,004 service connections to residential, commercial and local government customers.

3.1.2 Large Users of Utility Potable Water

The City's billing records were evaluated to identify water customers with the highest consumption over the past three years. The top 100 consumers include schools, multifamily communities and a regional hospital. The top 10 users of potable water from the City's system are listed in **Table 3.1**.

Table 3.1 City of Margate Water Service Area Top 10 Potable Water Customers by Water Use

Customer Name	Average Gallons Per Day from CY 2017 to 2019
School Board of Broward County (Schools)	97,146
Coral Cay Plantation - Mobile Home Community (MHC)	88,628
Northwest Regional Hospital	80,167
Cross Creek Apartments	71,058
City Of Margate	48,530
Townhomes Of Oriole Association	35,024
Banyan Bay Apartment Homes	32,425
Holiday Springs Condominiums	29,941
Palm Lakes Association Condominiums	27,220
Margate Village Condominiums	24,912

3.1.3 Large Users with Individual Consumptive Use Permits (CUPs)

Large users with individual consumptive use permits were identified using the SFWMD water use permit portal and searching by Section/Township/Range. The overwhelming majority of the CUPs identified within the service area are for landscape irrigation purposes. These include CUPs issued to golf courses, parks, condominiums, schools, churches and commercial facilities. The number of CUPs and the acreage associated with these permits by water use type are provided in **Table 3.2**. There are about 72 CUPs serving about 623 acres within the City of Margate's water service area. Landscape irrigation is the dominant water use.

Table 3.2 - Number of SFWMD Consumptive Use Permits and Acres Permitted in the City of Margate Water Service Area

Water Use Type	Number of CUPs	Acres Served
Landscape	67	484
Golf Course	2	125
Industrial	3	14
Total	72	623

3.1.4 Private Wells and Septic Systems

The City is not aware of private wells for potable water located within its service area or other uses exempt from permitting (40E-2.051, Florida Administrative Code) such as fire-fighting. The only unsewered area within the City's water service area is in the City of Coconut Creek and is comprised of 24 single-family lots each about one-acre in size and totaling 26 acres.

3.2 Description of the City's Water Supply System

3.2.1 Raw Water Sources

The City is permitted by the SFWMD to extract water from the Biscayne Aquifer using a total of twelve raw water supply wells. Raw water extracted from the Biscayne Aquifer is metered at the City's water treatment plant. The location of the raw water wells is mapped in **Figure 3.1**.

3.2.2 Treatment Facilities

Raw water mains from each well combine into a 30-inch raw water header main, which then splits to feed two parallel treatment trains. Separate venturi meters record the flow entering each of the two parallel trains. Each train consists of cascade aerators to oxidize iron and manganese (for subsequent precipitation and removal by the filters) and remove hydrogen sulfide and carbon dioxide; a lime softening unit to reduce hardness; and a 4-bay filter unit consisting of four 2.5 mgd bays with granular media. Chloramination is used for disinfection. Treated water is collected in a clearwell and subsequently transferred to the ground storage tanks. The softening units are upflow solids contact clarifiers, with integral mixing and quiescent zones, rated at 13.5 mgd each. A process flow schematic of the WTP is provided in **Figure 3.2**. An overview of the overall WTP site plan is provided in **Figure 3.3**.

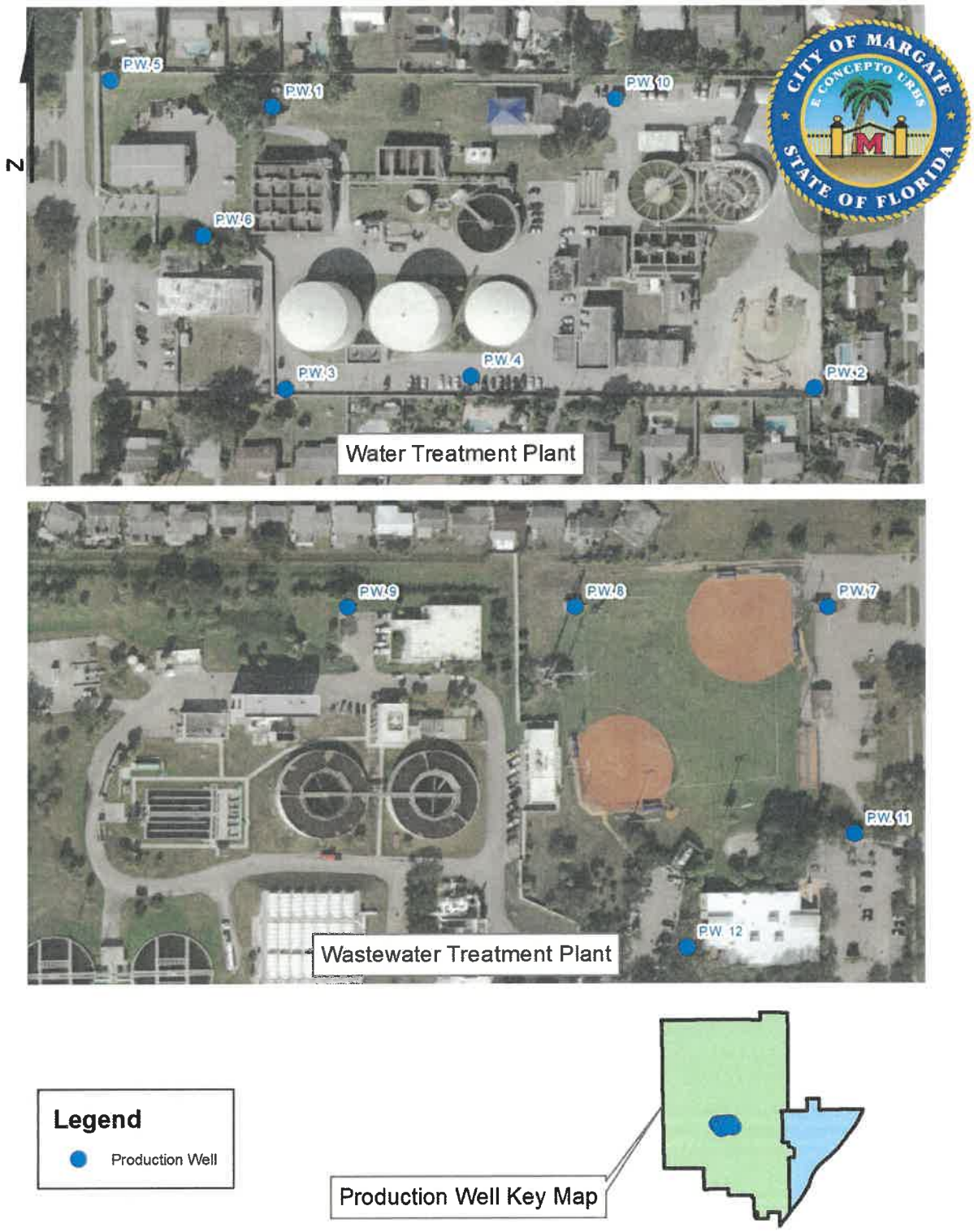


Figure 3.1 Raw Water Well Locations

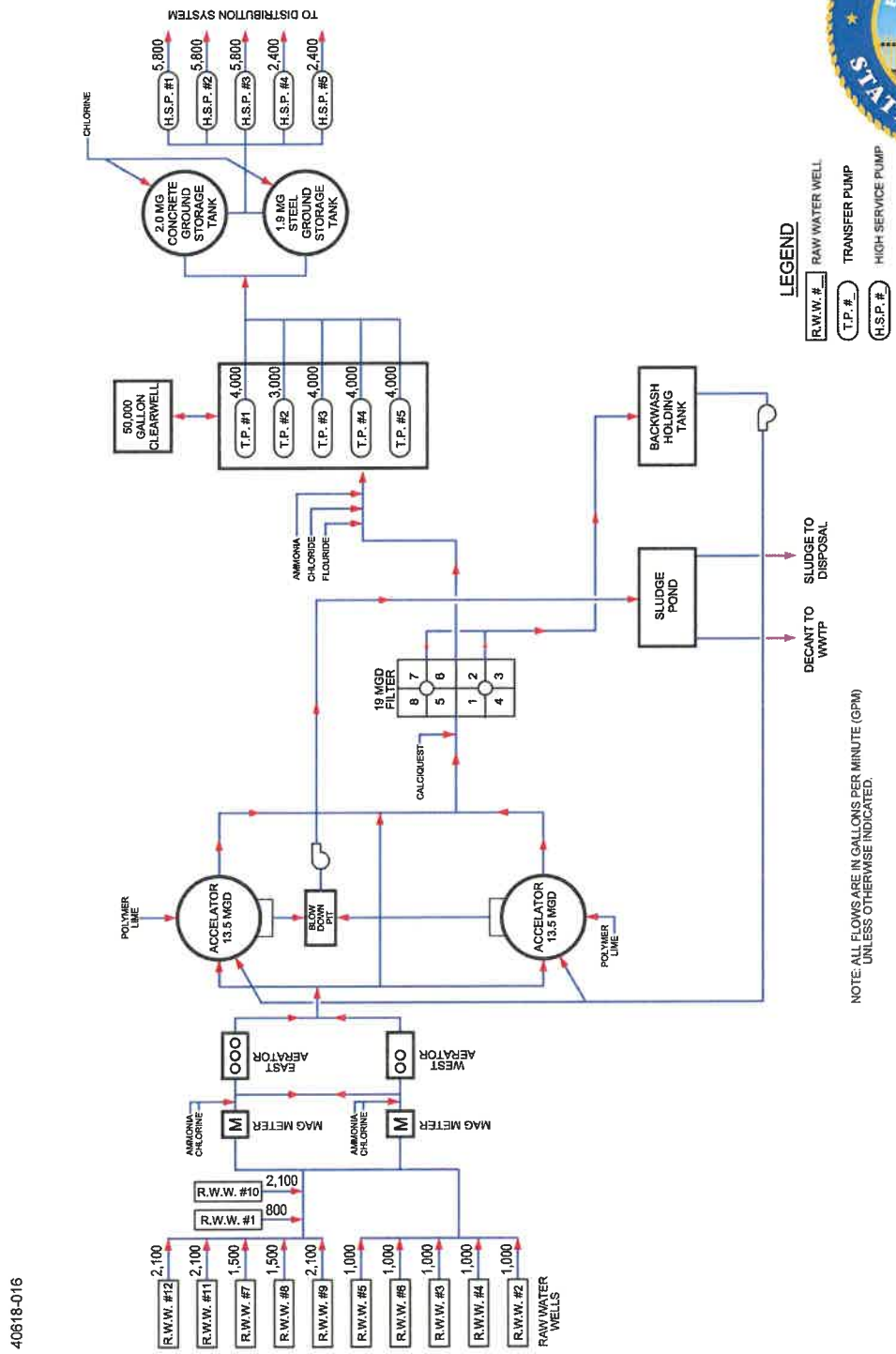


Figure 3.2 – City's Water Treatment Plant Process Flow Diagram

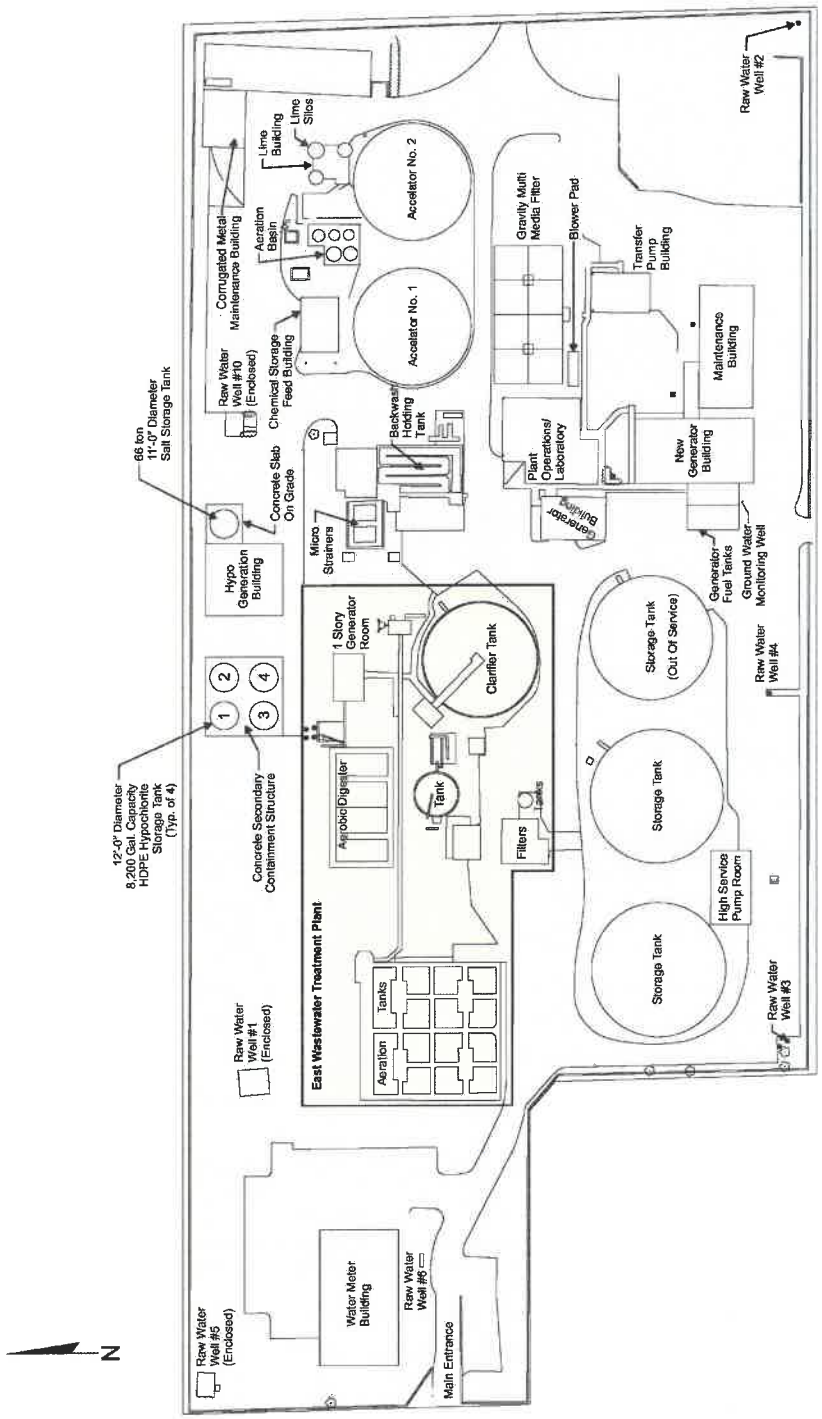


Figure 3.3 - Water Treatment Plant Existing Site Plan

3.2.3 Storage Facilities

From the clearwells water is transferred to two aboveground storage tanks located at the WTP: a 1.9 MG steel tank and a 2.0 MG concrete tank. A remote 2.0 MG tank, located at Coral Gate Park, approximately 1.5 miles from the plant in the northeast portion of the City's service area, is connected to the distribution mains and is filled or emptied using a valve located within the remote facility. This valve is controlled from the treatment plant via the Supervisory Control and Data Acquisition (SCADA) system.

3.2.4 Distribution System

High service pumps at the treatment plant are equipped with variable frequency drives to maintain an average pressure of 64 pounds per square inch (psi). The City's distribution system consists of 213.4 miles of distribution mains and 17,004 service connections. The service area includes the entire City of Margate and that portion of the City of Coconut Creek located south of Coconut Creek Parkway. An overview of the distribution system is provided in **Figure 3.4**.

3.2.5 Interconnects

The City's distribution system has four interconnects with neighboring community water systems for use during emergency situations. There is a 4-inch interconnect along the southern boundary with the City of North Lauderdale, a 12-inch interconnect at the northern boundary with the City of Coral Springs, an 8-inch interconnect along the western boundary with the Coral Springs Improvement District, and a 10-inch interconnect along the eastern boundary with the City of Pompano Beach. All interconnects are straight piped and are isolated by valves located on either side of the service area boundaries. The interconnect locations are also shown in **Figure 3.4**.

3.3 Water Utility Consumptive Use Permit

The City's current CUP was renewed by the SFWMD on September 2, 2020 (Permit No. 06-00121-W). This permit allows the City to withdraw a specified quantity of water from the Biscayne Aquifer until the permit expires on December 27, 2065. The City's CUP provides for the following in Condition 5:

"Total annual allocation is 3,686.72 million gallons (MG) (10.10 million gallons per day (MGD)) and total maximum monthly allocation of 337.34 MG."

"Total base condition allocation is 3,112.8 MG per year (8.53 MGD) and 285.34 MG maximum month."

"Between September 1, 2040 and December 27, 2065 without renewal of the base allocation, withdrawals from the Biscayne aquifer that are offset from the C-51 Reservoir, Phase 1 Project shall be limited to 730 MG (2.0 MGD) annual allocation and 66.92 MG maximum monthly."

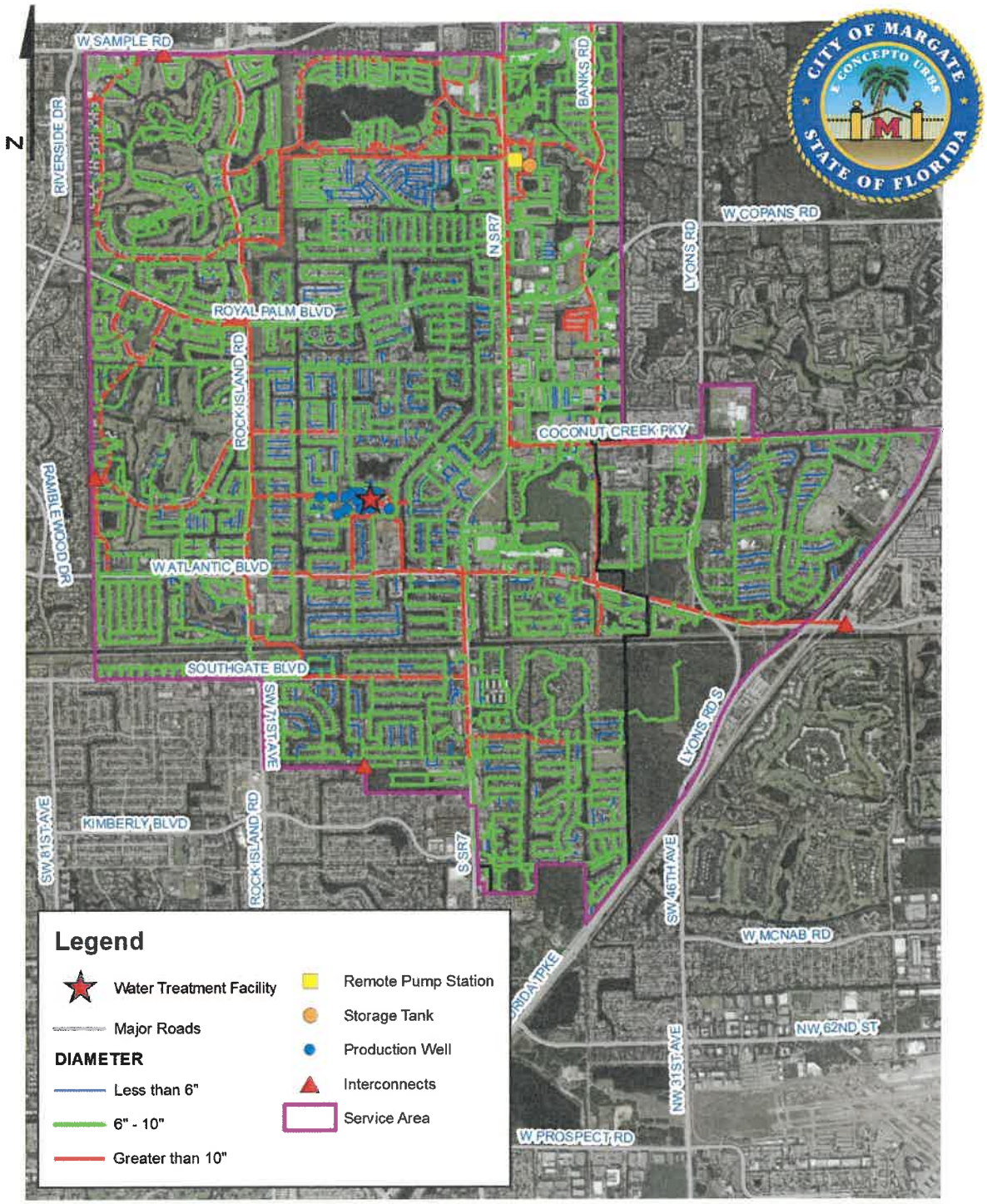


Figure 3.4 - City of Margate's Water Distribution System

3.4 City's Water Conservation Program

The City continues to implement the conservation programs summarized below.

Broward Community Water Conservation and Incentives Program – The City of Margate is a partner community in the Broward Water Partnership (marketed as the "Conservation Pays" program), a collaboration of 19 municipalities and water utilities with an annual goal of distributing 2,000 toilet rebates, along with production of promotional materials, articles, a recognition program, and community outreach. The City actively participates in this Broward Water Partnership to provide residents and businesses with rebates for replacing older toilets with new, high-efficiency models, provide residents with free, high-efficiency faucet aerators and showerheads, and provide food service businesses with high-efficiency pre-rinse spray valves. The program provides for a consistent marketing and media campaign to promote the program and advance overall water conservation efforts. In Fiscal Years 2015 through 2020, the City issued 655 toilet rebates and distributed 1,928 high-efficiency fixtures. From October 1, 2020, to June 30, 2024, the City issued 293 high-efficiency toilet rebates and distributed 2472 high-efficiency fixtures.

NatureScape Irrigation Service - The City of Margate has partnered with Broward County NatureScape Irrigation Service (NIS). The goal of the NIS is to reduce urban water consumption and improve the quality of surface waters through efficient irrigation and environmentally-friendly landscape practices. The NIS program targets large properties such as government facilities, parks, schools, and multi-family complexes where conservation efforts can produce the greatest water savings. The NIS staff are technically trained and skilled in irrigation efficiency and have the capacity to perform comprehensive system audits for participating partners. Since fiscal year 2014 until 2020, the City audited 19 properties, achieving a combined annual water savings of 3,666,336 gallons. From 2020 to 2024, the City audited 32 properties, resulting in a combined annual water savings of 4,810,546 gallons. In 2019, Broward County introduced a pilot program to the NIS for residential irrigation rebates. In Year 4, in the City of Margate, 10 residents applied for rebates, 7 sites were visited, and 4 received rebates, resulting in an estimated additional water savings of 157,997 gallons.

Lawn and ornamental irrigation limits - Landscape irrigation is addressed in Chapter 39, Article VI, Section 39-56 (and Section 40.706(L)8 of the City Code of Ordinances which provides for restriction of irrigation to two days per week. Irrigation is not permitted between the hours of 10:00 a.m. and 4:00 p.m. No more than one (1) inch of water may be applied per cycle and overspray is not permitted.

Use of Florida-friendly landscaping principles - Section 39-57 of the City Code adopts by reference Chapter 373.185, Florida Statutes regarding Florida-friendly landscape planning requirements. Compliance is administered through the City's Development Review Committee.

Requirements of rain-sensor over-rides for new lawn sprinkler systems - Section 39-58 of the City Code requires the installation of a rain-sensor override on all new automatic lawn sprinkler systems. Compliance is administered through the City's Building Department.

Turf limitation and minimum non-turf landscaping for commercial development – Section 40.704(G) and (H) of the Code of the City of Margate provide for minimum non-turf landscaping in addition to a maximum of fifty (50) percent turf for perimeter landscaping strips, and not more than seventy (70) percent turf for parking areas.

Requirement of ultra-low volume plumbing - Section 4613(C) of the Florida Building Code was adopted by reference and is included in Section 39-60 of the City Code.

Leak detection programs – The City has successfully completed the installation of Automated Metering Infrastructure (AMI) on all water meters served by the City of Margate water utility. We are now focusing on updating "smart meters" that are due for replacement due to age or malfunction. The AMI devices transmit and record hourly water use measured at each meter. The City's Water Billing Division uses software to provide notifications to property owners when a water leak is suspected or when there is any unusual water use at their property, which may indicate a leak.

Water conservation public education programs The City has an ongoing water conservation educational program using communications on its website, social media, Margate Matters (newsletter), the annual Water Quality Report, and other available means. Additionally, the City, in partnership with the Florida Section of the American Water Works Association, sponsors an annual water conservation poster contest for students in the City's water service area. Nine local schools are invited to participate to educate their students on water conservation. The students then create a poster that depicts water conservation with the City ultimately voting on winners in grade-based categories. The winner from each category is then submitted to the statewide contest.

Water conservation rate structures - Margate employs an increasing block rate structure where higher rates are charged for greater water use as summarized in the table below. This rate structure provides an economic incentive to conserve water.

Monthly Consumption (gallons)	Monthly Charge per 1,000 Gallons ($) Inside Margate
0 to 6,000	$4.64
6,001 to 15,000	$5.80
15,000 to 25,000	$6.97
Above 25,000	$8.12

City Facilities and Distribution System – City staff regularly reviews water use and unaccounted-for water loss at all City facilities each month to identify opportunities for water savings and address any issues promptly. This ongoing internal process has significantly reduced water use at City facilities in recent years, and our unaccounted-for water loss has consistently remained below 2%. Annual water loss reports are also being provided to the South Florida Water Management District (SFWMD).

Impact of the City's Water Conservation Programs on Water Use – The City's water conservation programs appear to have increased customer water use efficiency. As demonstrated in Section 4.0, water use per person has fallen each year over the past five years, from 110.3 gallons per person per day (gpcd) in 2015 to 87.9 gpcd in 2019. This reflects a reduction in total water use as the total population served increased each year. Over the past two years (2018 to 2019), total water use fell by 0.86 percent while the total number of customer accounts increased by 0.98 percent. Water use by single-family customers fell by 0.89 percent while the total number of single-family customers increased by 1.20 percent.

3.5 City's Reuse Program

The City does not currently treat wastewater for reuse. A reuse feasibility study was completed in 2005 and concluded that implementing a reclaimed water program was not feasible because the identified end users were obtaining water at a much lower cost. In 2008, a water reuse program was again considered to obtain water offsets that could be added to the City's CUP to augment the City's water supply. Afterward, the 2009 economic downturn and the City's water conservation programs reduced water use to the point that the offsets were not needed. The reuse project was put on hold and has since been evaluated periodically. The City's next Reuse Feasibility Study will be conducted in conjunction with the domestic wastewater treatment plant permit renewal, which is required every five years, or during any construction or modification of the domestic wastewater treatment plant.

Section 4.0 – Water Demand Forecast and Supply Adequacy

The City's water utility service area includes the entire City of Margate and that portion of the City of Coconut Creek located south of Coconut Creek Parkway. The population, raw water pumpage, and treated water production of the Margate service area as presented in this section reflect this geographic area.

Population projections and the average historic five-year water demand per person per day were used to forecast water demand within the City's water service area. The historic and forecasted populations are from the Broward County Planning and Development Management Division, PFAM 2017, published 6/17/2018. The data are by Traffic Analysis Zone (TAZ) and include the City of Margate and the area of Coconut Creek served by the City. A map of the TAZs in the City's water service area is provided in **Figure 4.1**.

Population estimates for the City's service area organized by TAZ are provided in **Table 4.1**. For TAZs split between more than one municipality, the Broward County Planning and Development Division divided the population within that TAZ between each municipality pursuant to the Broward County Land Use Plan.

Table 4.1 - Historic and Forecasted Population by TAZ in the City of Margate's Water Service Area: Years 2010-2040 (5-Year Increments)

TAZ	2010	2015	2020	2025	2030	2035	2040
83	2,453	2,790	3,129	3,258	3,420	3,536	3,623
84	138	159	177	278	359	416	473
85	1,485	1,655	1,754	1,955	2,149	2,276	2,385
86	1,957	2,370	2,773	2,940	3,097	3,215	3,317
87	6,406	7,211	7,974	8,096	8,310	8,521	8,675
88	5,706	5,733	5,632	5,528	5,445	5,624	5,738
89	4,315	4,285	4,207	4,395	4,563	4,715	4,836
90	2,813	2,823	2,774	2,948	3,098	3,262	3,402
91	1,035	1,219	1,436	1,635	1,778	1,887	1,982
92	1,944	1,925	1,892	2,101	2,249	2,370	2,471
93	1,108	1,096	1,079	1,313	1,465	1,585	1,688
94	694	692	682	911	1,062	1,183	1,288
95	772	770	755	981	1,129	1,239	1,336
96	415	427	426	490	488	486	484
97	5,241	5,313	5,243	5,149	5,072	5,052	5,014
98	2,316	2,381	2,353	2,393	2,369	2,362	2,343
99	905	895	874	865	859	879	889
100	192	196	211	459	613	737	850
101	2,117	2,135	2,098	2,060	2,029	2,163	2,256
148	0	0	0	0	0	0	0
149	2,268	2,439	2,505	2,693	2,863	2,986	3,094
150	2	2	2	2	2	2	2

Table 4.1 - Historic and Forecasted Population by TAZ in the City of Margate's Water Service Area: Years 2010-2040 (5-Year Increments)

TAZ	2010	2015	2020	2025	2030	2035	2040
151	5,195	5,479	5,436	5,601	5,971	6,187	6,351
152	696	682	669	911	1,067	1,186	1,299
153	393	394	390	385	386	386	385
154	664	647	638	630	625	621	617
155	1,094	1,078	1,060	1,045	1,034	1,053	1,061
156	2,236	2,203	2,160	2,398	2,563	2,691	2,799
157	644	710	762	1,122	1,192	1,242	1,287
195	3,107	3,092	3,051	3,010	3,039	3,019	2,999
880	0	0	0	0	0	0	0
Total	**58,312**	**60,800**	**62,142**	**65,552**	**68,296**	**70,880**	**72,945**
Growth from previous year		**2,488**	**1,342**	**3,410**	**2,744**	**2,585**	**2,065**

(a) The populations reported in this table represent only the portion of the TAZ within the City's Water Service Area. The data include the City of Margate jurisdiction and the area of Coconut Creek served by the City. The Coconut Creek TAZs are 85, 149, 195 and 880. Source: Broward County Planning and Development Management Division.

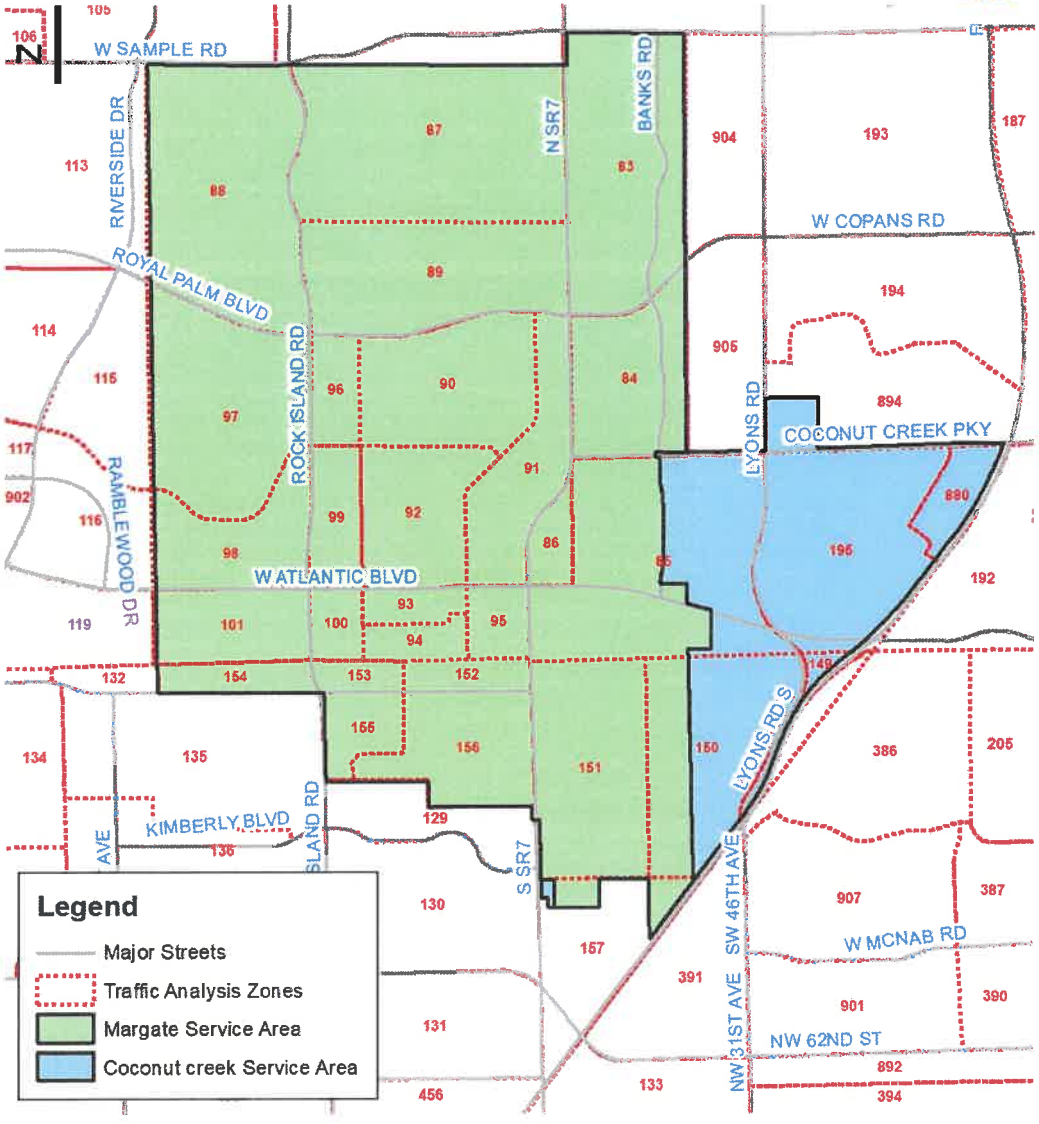
The City's service area population and treated water production from 2015 to 2019 is provided in **Table 4.2**. The amount of treated water supplied to customers in the City of Margate and the amount supplied to customers in Coconut Creek are not known. Billing records indicate that 90 percent of the City of Margate's treated water supply is sold to customers within the City of Margate and 10 percent is sold to customers in Coconut Creek.

Table 4.2 - City of Margate's Historic Water Service Area Population and Total, Per Capita, and Maximum Monthly Treated Water Production (Calendar Year 2015 to 2019)

Year	Service Area Population	Treated Water Production				
		Annual Average (mgd)	Daily Per Capita (gallons)	Maximum Month (MG)	Average Month (MG)	Maximum to Average Month Ratio
(1)	(2)	(3)	(4) = [(3) x 10^6] / (2)	(5)	(6)	(7) = (5) / (6)
2015	60,800	6.70	110.3	221.34	203.90	1.09
2016	61,066	6.47	105.9	230.65	196.68	1.17
2017	61,334	5.95	97.0	193.52	180.93	1.07
2018	61,602	5.57	90.4	189.89	169.42	1.12
2019	61,872	5.44	87.9	182.69	165.45	1.10
5-year Average			**98.3**			**1.11**
3-year Average			**91.8**			**1.10**

Sources: 2015 and 2020 populations were taken from Broward County population forecasts by TAZ adjusted for the percent of Margate's service area within each TAZ. Yearly populations from 2016 through 2019 were interpolated between the two years. Treated water production is from the City of Margate's Monthly Operating Reports.

Figure 4.1 – TAZs Within the City of Margate Water Service Area



The service area population, the annual average treated water production and the average daily per capita water use are provided in columns (2), (3) and (4) of the table. The annual service area population values were interpolated between the 2015 and 2020 values provided in **Table 4.1**. In 2015, the City's water utility provided water service to 60,800 people. By 2019, the population served had grown to 61,872. In 2015, the annual average daily treated water production was 6.70 mgd which fell to 5.44 mgd by 2019. This trend reflects a significant reduction in water use per person per day, from 110 gallons in 2015 to only 88 gallons in 2019.

The average per capita water use over the five year period is 98.3 gallons per day which was used to prepare the forecast of treated water demand through 2040. Use of the five-year period is consistent with the method used by the SFWMD in determining annual average daily permitted water quantities for public water supply permittees and applicants. (SFWMD Applicant's Handbook for Water Use Permit Applications, page WUAH – 48)

The maximum month treated water production and the average monthly treated water production over the past five years in million gallons are provided in columns (5) and (6) of the table. Both the maximum month and average month treated quantities fell over the five-year period. The ratio of maximum to average month production is provided in column (7) and averages 1.10 over the past three years. This ratio was used to forecast the maximum month water production consistent with the method used by the SFWMD in determining the maximum month permitted water quantities for public water supply permittees and applicants.

Calculation of the forecasted treated water demand that must be met by the City's water production is provided in **Table 4.3**. Annual average monthly treated water demand was forecast as the product of service area population (column (2)) and daily per capita water use of 98.3 gallons (column (3)) converted to monthly demand (column (4)). This value is further converted to annual average daily demand in column (5). Annual average daily demand is forecast to be 6.11 mgd in 2020 and increases to as high as 7.17 mgd by 2040.

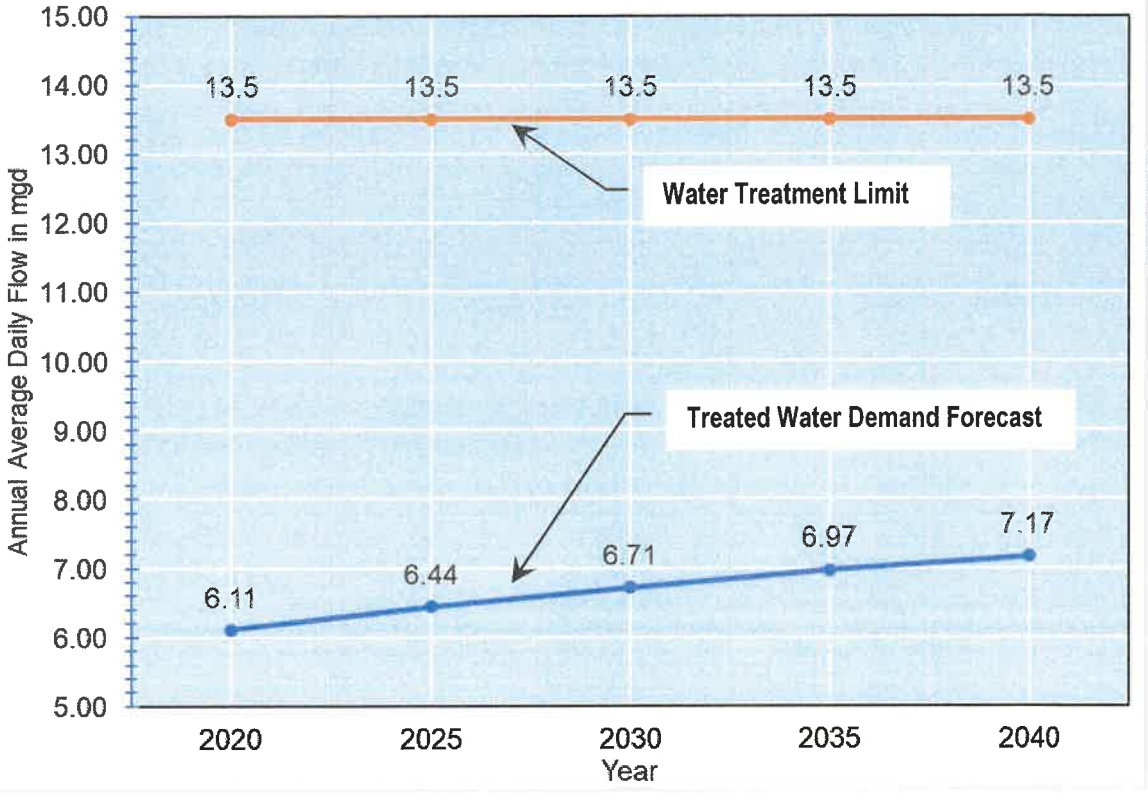
Maximum month demand in million gallons (column (6)) was calculated as the product of average monthly demand (column (4)) and the maximum to average ratio of 1.10 as was calculated in **Table 4.2**. This forecast was converted to average daily mgd in column (7). Maximum month average daily demand is forecast to be 6.71 mgd in 2020 and increases to as high as 7.87 mgd by 2040. Given that the City's water treatment plant capacity is 13.5 mgd, there is enough treatment capacity available through 2040.

Table 4.3 - City of Margate Forecasted Water Service Area Population and Treated Water Demand, Five-year increments from 2020 to 2040

Year	Service Area Population	Treated Water Demand				
		Daily Per Capita (gallons)	Average Month (MG)	Annual Average Daily (mgd)	Maximum Month (MG)	Maximum Month Average Daily (mgd)
(1)	(2)	(3)	(4) = {[(2) x (3) x 365] / 12} / 10^6	(5) = [(2) x (3)] / 10^6	(6) = (4) x 1.10	(7) = (6) x (365/12)
2020	62,142	98.3	185.79	6.11	204.03	6.71
2025	65,552	98.3	195.98	6.44	215.23	7.08
2030	68,296	98.3	204.18	6.71	224.23	7.37
2035	70,880	98.3	211.91	6.97	232.72	7.65
2040	72,945	98.3	218.08	7.17	239.50	7.87

The comparison of forecasted treated water demand to the available water treatment capacity is provided in **Figure 4.2**. During the period 2020 to 2040, there is enough treatment capacity available to supply the forecasted demand.

Figure 4.2 - Comparison of Treated Water Demand Forecast to Treatment Limit for the City of Margate Water Service Area



Treated water demand was converted to raw water withdrawal demand using the average percent treatment loss over the past five years. The calculation of average percent treatment loss is provided in **Table 4.4**. Annual average daily raw water pumpage is provided in column (2) and average daily treated water production is provided in column (3). The percent treatment loss is calculated from these two values in column (4). Treatment loss was 11.9 percent in 2015 and increased to 19.0 percent in 2019. The average over the past five years is 14.7 percent which was used to convert treated water demand to the needed raw water withdrawals. The City is currently replacing several water meters and performing recalibrations to determine if the increase in treatment loss is associated with the measurement of the losses and not an actual increase in losses.

Table 4.4 - City of Margate's Historic Raw Water Pumpage, Treated Water Production and Percent Treatment Loss

Year	Raw Water Pumpage, Average Daily mgd	Treated Water Production, Average Daily mgd	Percent Treatment Loss (Raw - Treated)/(Raw)
(1)	(2)	(3)	(4) = [(2) - (3)] / (2)
2015	7.61	6.70	11.9%
2016	7.32	6.47	11.7%
2017	6.82	5.95	12.8%
2018	6.83	5.57	18.4%
2019	6.70	5.44	18.8%
Average Percent Treatment Loss			**14.7%**

The calculations of annual average daily and maximum month raw water pumpage needed to meet forecasted treated water demand are provided in **Table 4.5**. The annual average daily raw water withdrawal is provided in column (3) and is the ratio of the annual average treated water demand and one minus the proportional treatment loss (0.147). The result is an annual average raw water withdrawal requirement of 7.16 mgd in 2020 that increases annually to 8.41 mgd in 2040.

Maximum month raw water pumpage is provided in column (5) and is similarly calculated as the ratio of the maximum month treated water demand and one minus the proportional treatment loss (0.147). The result is a maximum month raw water pumping requirement of 242 million gallons in 2020 that increases annually to 284 million gallons in 2040.

Table 4.5 - City of Margate Forecasted Raw Water Pumpage, Annual Average Daily and Maximum Month, Five Year Increments from 2020 to 2040

Year	Treated Water Demand, Average Daily mgd	Raw Water Pumpage, Average Daily mgd	Treated Water Demand, Maximum Month MG	Raw Water Pumpage, Maximum Month MG
(1)	(2)	(3) = (2) / (1-0.147)	(4)	(5) = (4) / (1-0.147)
2020	6.11	7.16	204.03	239.28
2025	6.44	7.56	215.23	252.41
2030	6.71	7.87	224.23	262.97
2035	6.97	8.17	232.72	272.92
2040	7.17	8.41	239.50	280.87

The raw water quantities permitted to be pumped from the City's wellfield by the South Florida Water Management District are provided in **Table 4.6**. The relevant time period is "After April 13, 2010" when the City is permitted to withdraw up to 3,106 million gallons of water from the Biscayne Aquifer each year(8.51 mgd). This quantity is the City's "base condition water use". Under the SFWMD's Regional Water Availability (RWA) Rule adopted on February 16, 2007, raw water withdrawals from the Biscayne Aquifer are limited to the permittee's "base condition water use" which is defined as the basis for establishing permitted water quantities. For a water utility, the "base condition water use" is the maximum quantity of water withdrawn by the applicant from the permitted source during any consecutive twelve-month period during the five years preceding April 1, 2006. The City of Margate's "base condition water use" is 3,106 million gallons per year or 8.51 mgd.

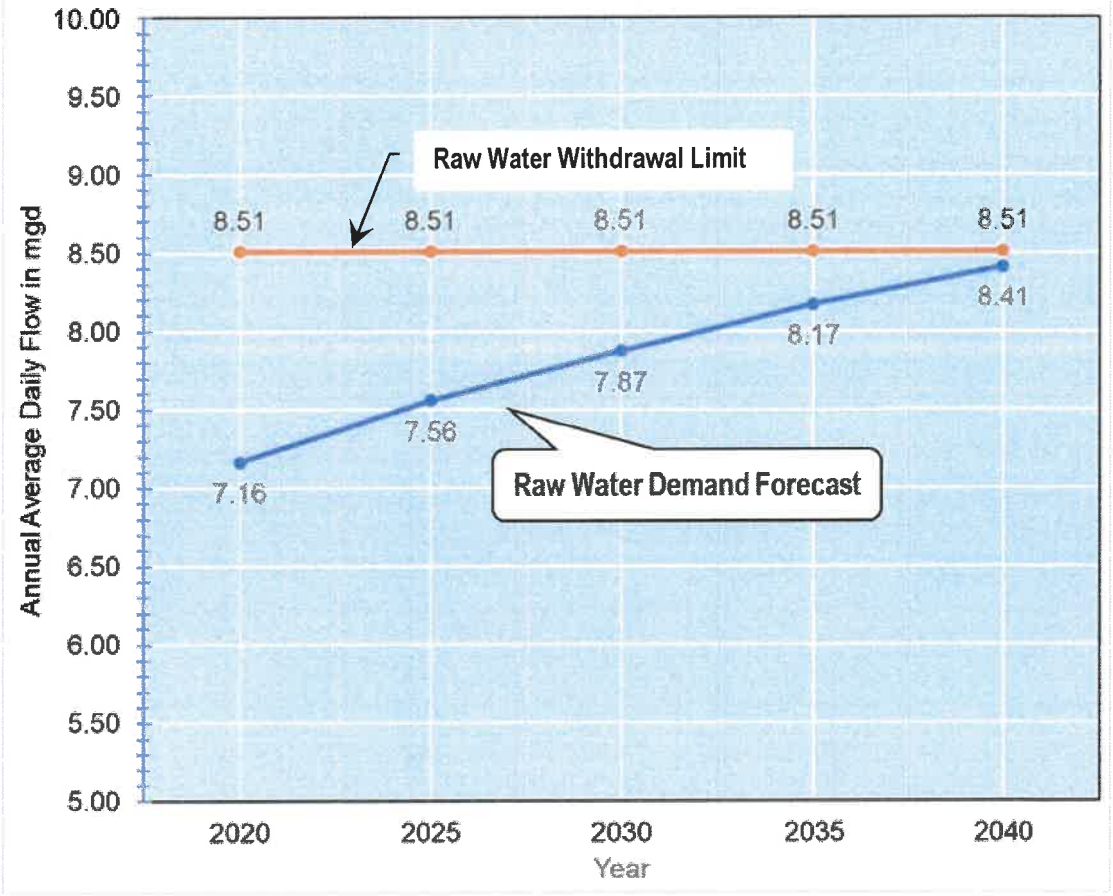
Table 4.6 - City of Margate's Permitted Raw Water Quantities from the Biscayne Aquifer

Time Period	Annual (MG)	Average Daily (mgd)	Maximum Month (MG)	Maximum Month Average Daily (mgd)
(1)	(2)	(3) = (2) / 365	(4)	(5) = (4) / [365/12]
Through April 13, 2010	3,396	9.30	313.9	10.32
After April 13, 2010	**3,106**	**8.51**	279.2	**9.18**

Source: SFWMD Water Use Permit Number 06-00121-W

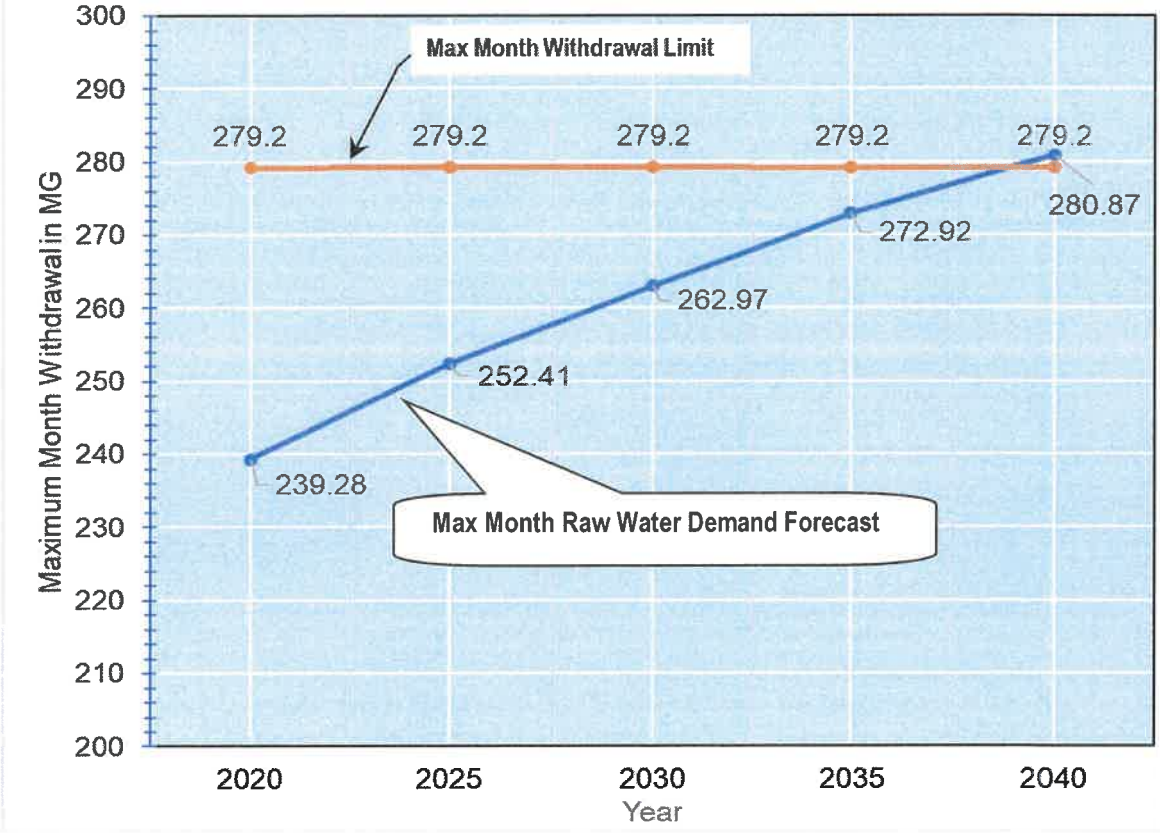
Comparison of the forecasted annual average daily raw water withdrawal to the permitted quantity is provided in **Figure 4.3**. During the period 2020 to 2040, the forecast of average daily raw water withdrawals from the City's Biscayne Aquifer wellfield is below the City's permitted quantity. However, by 2025 the difference is less than one mgd and by 2040 raw water demand is only 0.10 mgd below the permitted quantity.

Figure 4.3 - Comparison of Raw Water Demand Forecast to Withdrawal Limit for the City of Margate Water Service Area



Comparison of the maximum month raw water withdrawal to the maximum month permitted quantity finds that the permitted quantity is exceeded after 2035 as demonstrated in **Figure 4.4**. Therefore, given this conclusion and the conclusion that the difference between the permitted and actual withdrawal is forecasted to be less than one mgd by 2025, it would be prudent to begin development of an alternative water supply. The City recently signed a capacity allocation agreement for 2 mgd of storage capacity in the C-51 Reservoir that will allow the City to withdraw an additional estimated 2 mgd from its wellfield. The City of Margate recently signed a capacity allocation agreement for 2 mgd of storage capacity in the C-51 Reservoir that will allow the City to withdraw an additional estimated 2 mgd from its wellfield. The City submitted a permit modification to the District to add this additional quantity to its permitted water quantities from the Biscayne Aquifer.

Figure 4.4 - Comparison of Raw Water Maximum Month Forecast to Withdrawal Limit for the City of Margate Water Service Area



Section 5.0 – Regional Issues

The City is aware of and studies the regional issues that impact or have the potential to impact water supply, water demand, and utility infrastructure. The City works with other local governments and utilities within the region to address these issues. This section summarizes the regional issues being followed by the City including:

- Regional Climate Action Plan;
- Climate Change;
- Sea Level Rise;
- Saltwater Intrusion;
- Extreme Weather Events;
- Infrastructure Development;
- C-51 Reservoir;
- Lake Okeechobee Surface Water Allocation Limitations;
- Lowering Lake Okeechobee Level;
- Infrastructure Planned to Attenuate Damaging Peak Flow Events from Lake Okeechobee; and,
- Use of brackish groundwater from the Floridan Aquifer.

Each is discussed in turn. Much of the information provided in this section was taken from the Broward County Water Supply Facilities Work Plan, 2020, DRAFT.

5.1 Regional Climate Action Plan

Southeast Florida's unique geographic characteristics make it one of the most vulnerable regions to be impacted by climate change and sea level rise. These characteristics include low land elevations, flat topography, a porous geology, and dense coastal development. In combination, climate change and sea level rise are expected to present significant challenges relating to water resource planning, management, and infrastructure for communities throughout the region, which includes Palm Beach, Broward, Miami-Dade and Monroe counties. These communities have agreed to partner in regionally-coordinated climate mitigation and adaptation strategies as part of the Southeast Florida Regional Climate Change Compact (Compact) and have jointly developed and adopted a Regional Climate Action Plan (RCAP) including 21 recommendations that address "Water Supply, Management, and Infrastructure".

The water supply-related recommendations from the Regional Climate Action Plan 2.0 are summarized in Table 5.1.[1] These recommendations are intended to advance water management strategies and infrastructure improvements needed to mitigate the adverse impacts of climate change and sea level rise. They are incorporated throughout this Water Supply Facilities Work Plan Update and related comprehensive planning element updates.

[1] http://southeastfloridaclimatecompact.org/regional-climate-action-plan/

Table 5.1 - Water Supply Recommendations of the 2019 Regional Climate Change Action Plan

Item	Recommendations
WS-1	Foster innovation, development, and exchange of ideas for managing water.
WS-2	Ensure consistency in water resource scenarios used for planning.
WS-3	Plan for future water supply conditions.
WS-4	Coordinate saltwater intrusion mapping across Southeast Florida.
WS-5	Maintain regional inventories of water and wastewater infrastructure.
WS-6	Develop a spatial database of resilience projects for water infrastructure.
WS-7	Modernize infrastructure development standards in the region.
WS-8	Address the resilience of the regional flood control system.
WS-9	Update the regional stormwater rule.
WS-10	Integrate combined surface and groundwater impacts into the evaluation of at-risk infrastructure and the prioritization of adaptation improvements.
WS-11	Encourage green infrastructure and alternative strategies.
WS-12	Integrate hydrologic and hydraulic models.
WS-13	Practice integrated water management and planning.
WS-14	Advance comprehensive improvements to regional and local stormwater management practices.
WS-15	Foster scientific research for improved water resource management.
WS-16	Expand partnerships and resources to further innovation in water resource management.
WS-17	Advance capital projects to achieve resilience in water infrastructure.
WS-18	Coordinate innovation and regional funding.
WS-19	Recognize adaptable infrastructure.
WS-20	Support the Comprehensive Everglades Restoration Plan (CERP).
WS-21	Expand regional surface water storage.

5.2 Climate Change

Investigations and evaluations conducted at the national, regional, and local levels have reinforced the need to plan for the predicted impacts of more frequent and severe drought and increases in tidal and storm-related flooding. To protect the City's water supply infrastructure, ongoing planning efforts should be flexible to adapt to these climate changes.

The City of Margate, together with its municipal and regional partners, understands that local governments and water utilities must integrate water supply and climate change

considerations through coordinated planning efforts. The City works to provide relevant updates to the 10-year Water Supply Facilities Work Plan and to enhance the Goals, Objectives and Policies (GOPs) of its comprehensive plan.

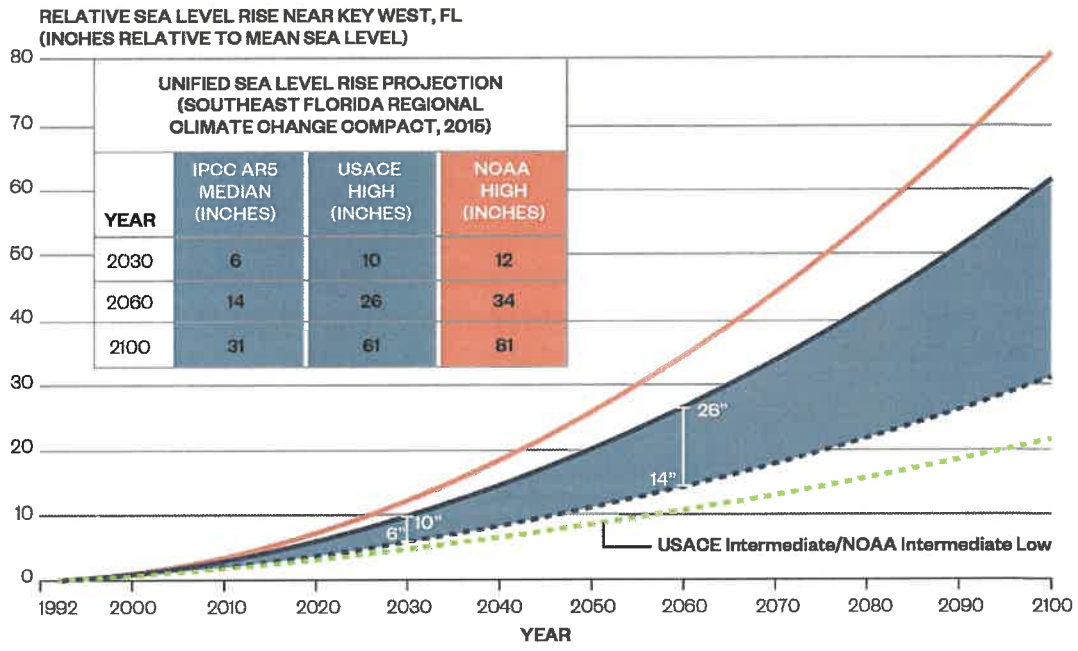
The City is a leader in developing planning tools and identifying achievable and cost-effective goals that meet the needs of its community. In 2013, the City signed a resolution endorsing the Mayor's Climate Action Pledge in support of the Southeast Florida Regional Climate Change Compact and the Regional Climate Action Plan.

The City is a participant in the Southeast Florida Regional Climate Change Compact. The Compact outlines an ongoing collaborative effort among the Compact participants to foster sustainability and climate resilience on a regional scale. The Compact participants include local communities, regulatory agencies, and the counties of Broward, Miami-Dade, Monroe, and Palm Beach.

5.3 Sea Level Rise

The City of Margate and its raw water wells are located well inland from the Atlantic Ocean and, at this time, no impacts are expected from sea level rise. However, development of cost-effective sea level rise adaptation strategies to ensure the sustainability of the water supply in Broward County is critical to the wellbeing of all county residents, including those in Margate. A unified projection by the Southeast Florida Regional Climate Change Compact developed in 2015, is illustrated in Figure 5-1. It shows a 6- to 10-inch increase in sea level in the near term, and a 14- to 26-inch rise by mid-century.

Figure 5-1 – Sea Level Rise Projection (2015)



The sea level rise projection was recently updated by the Compact (in December 2019) that

increases the projected magnitude of sea level rise. The revised projection is provided in Figure 5-2. This update is now being used as the basis for planning throughout the region.

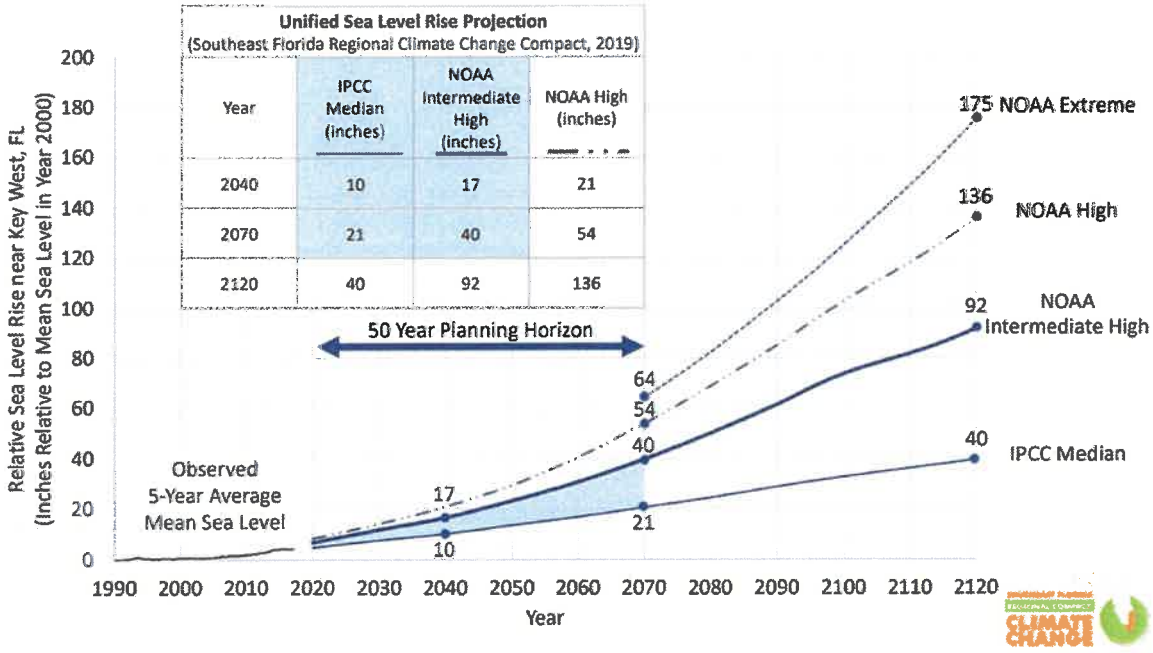


Figure 5-2 – Sea Level Rise Projection (2019)

In terms of infrastructure, every aspect that is underground or touches the ground will need to be assessed for its vulnerability and, if necessary, protected. This includes basic services, such as provision of drinking water, sewage treatment, electricity and waste disposal.

5.4 Saltwater Intrusion

The Biscayne Aquifer is the City's primary water supply. It is a shallow, surficial, highly transmissive aquifer. Coastal saltwater intrusion of the aquifer has occurred in eastern parts of Broward County. The extent of saltwater intrusion is measured by the depth and location of the 250 mg/L chloride concentration toe. The mapping of this saltwater intrusion front is supported by local governments throughout the region, the United States Geologic Survey (USGS), and the SFWMD. The SFWMD's 250 mg/L Isochlor Line in Broward County is illustrated in Figure 5-3 along with the location of the City's raw water wells. At the toe of the saltwater front, chloride concentrations exceed drinking water standards of 250 mg/L and thus restrict and/or require abandonment of wellheads located east of the saltwater intrusion line. It has been concluded that movement of the saltwater front is primarily caused by the historic lowering of the water table in western Broward County for the construction of regional drainage canals. While the City's Biscayne Aquifer wellfields are located sufficiently west of the 250 mg/L Isochlor, the City monitors its movement and the potential impact on the City's water supply.

Figure 5-3 – 250 mg/L Isochlor Line in Broward County and Location of City's Raw Water Production Wells (SFWMD)

5.5 Extreme Weather Events

An increase in frequency and severity of extreme weather events may be an impact of climate change. Comprehensive planning should consider impacts and risks associated with drought, water shortages and reduced groundwater tables, all of which can hasten saltwater intrusion and exacerbate water supply deficits. Conversely, more intense rainfall will cause flooding, increased runoff, impacts to the natural systems and provide more recharge potential for wellfields. Integrated water resource management strategies will help to mitigate for these impacts, particularly those projects that can serve to provide additional long-term storage of stormwater runoff and redistribution of excess rainfall during dry periods and drought. Regional surface water reservoirs and below ground aquifer storage and recovery systems (ASR) are potentially viable alternative water supply projects and climate adaptation strategies.

5.6 Infrastructure Development

To ensure the long-term sustainability of key facilities in the face of climate change, sea level rise and extreme weather events, it becomes critical to diversify water supply sources, improve treatment technologies, and develop adaptive stormwater and wastewater infrastructure design criteria. Strategic infrastructure planning should incorporate these opportunities and work within the GOPs of the Comprehensive Planning process and 10-year Water Supply Facilities Work Plans to provide for long-term sustainability and a balanced approach to future development.

Increases in groundwater elevations, as a direct and indirect response to sea level, will challenge the function of drainage systems and is expected to exacerbate future flooding for even mild storm events. Future conditions will be more severe with extreme rainfall events increasing damage to low-lying utility infrastructure and contributing to prolonged surface water flooding. Planning for the combined influences of storm events, high tides and sea level rise on drainage system functions and other public infrastructure is a critical need as is the assessment of viable water supplies and impacts to the natural systems from prolonged droughts.

Options that provide for a diversification of water projects and protection of resources will be fundamental and may include changing treatment technologies; developing regional water storage such as the C-51 Reservoir; improving (or relocating) infrastructure in low lying areas; and enhancing operational flexibility. The City's planning effort regarding water supply infrastructure includes use of water capacity from the C-51 Reservoir as an alternative water supply source.

The Regional Water Availability (RWA) Rule was adopted by the SFWMD on February 16, 2007. The RWA limits raw water withdrawals from the Biscayne Aquifer to the maximum quantity withdrawn during any consecutive five years preceding April 2006. Cities needing additional water supplies are required to seek sources that are not dependent upon the Everglades for recharge. These alternative water supply solutions include recycling water, using reclaimed water to recharge the Biscayne Aquifer, or drawing water from the deeper Floridan Aquifer. As a result of the RWA Rule, the City's CUP provides for the following in

Condition 5: "Total annual allocation is 3,686.72 million gallons (MG) (10.10 million gallons per day (MGD) and total maximum monthly allocation of 337.34 MG."

5.7 C-51 Reservoir

The City of Margate recently signed a capacity allocation agreement for 2 mgd of storage capacity in the C-51 Reservoir that will allow the City to withdraw an additional estimated 2 mgd from its wellfield. The City submitted a permit modification to the District to add this additional quantity to its permitted water quantities from the Biscayne Aquifer. The C-51 Reservoir project is a public-private partnership to construct 60,000 acre-feet of storage for use as an alternative water supply source in southeast Florida. The reservoir will divert water away from the Lake Worth Lagoon and improve the management of freshwater flows which was formally identified as a priority restoration strategy in the 1992 USACE Restudy of the C & SF Flood Control Project.

Over the past decade, the SFWMD, Lake Worth Drainage District, Palm Beach Aggregates, local governments, water managers, and water utilities in Broward and Palm Beach counties jointly investigated the feasibility of a regional reservoir to capture and store excess surface water runoff discharged to Lake Worth Lagoon, primarily during wet weather conditions, and release the water into the C-51 Canal during dry periods to meet water demands.

The site of the C-51 Reservoir is adjacent to the SFWMD's existing L-8 Flow Equalization Basin in Palm Beach County and is expected to share the same impermeable geologic formation that provides for significant inground storage capacity. The C-51 Reservoir is included in the 2018 LECWSP Update as an alternative water supply to meet forecasted increases in regional water demand in 2040. Beyond water supply, the reservoir captures excess stormwater flows and enhances stormwater management including the reduction of harmful discharges and associated nutrient loads to the Lake Worth Lagoon and mitigation of saltwater intrusion by maintaining higher canal stages and recharging coastal wellfields.

Hydrologic modeling indicates that the C-51 Reservoir can capture enough basin runoff to reduce excess stormwater flows from the western C-51 Basin to the Lake Worth Lagoon by about 40 percent with an associated reduction in nutrient loads. The SFWMD would operate the reservoir and could redistribute the stored water through the existing canal network to provide Biscayne Aquifer recharge that can be used to increase SFWMD permitted water quantities of water utilities in southeast Florida. In addition, the stored water could be used to help sustain regional water resources. The C-51 Reservoir is modeled to support approximately 150 mgd in stormwater reuse for beneficial purposes while achieving critical water quality improvements in the Lake Worth Lagoon. The proposed project is expected to provide the following benefits.

Reduce harmful water quality and quantity discharges to the Lake Worth Lagoon via the S-155 structure.

- Improve water quality in the Everglades Protected Area from additional storage and, in conjunction with the L-8 Flow Equalization Basin, optimize flows to the Stormwater Treatment Areas (STAs).

- Aid the SFWMD in meeting the objectives of the Loxahatchee River Watershed Restoration Project.

- Improve the quality of water delivered to the STAs by blending water from the C-51 Reservoir with water from the L-8 Flow Equalization Basin.

- Mitigate stormwater impacts and flooding in western and central Palm Beach County.

- Mitigate saltwater intrusion and protect wellfields in coastal communities.

- Serve as a regional alternative water supply source.

- Support water resource protection and potential adaptation strategies to mitigate the effects of sea level rise and drought.

From a financial standpoint, the C-51 Reservoir is expected to provide the following benefits.

- Achieve "Economies-of-Scale" as a regional water resource development project providing diverse benefits to the region.

- Capitalize on the current construction and engineering work at the existing L-8 Flow Equalization Basin, including use of the L-8 Flow Equalization Basin's intake structure and pumping facilities.

- Capitalize on the SFWMD's operations of the L-8 Flow Equalization Basin resulting in operational coordination and reduced costs.

- Provide a cost-competitive solution relative to end-of-pipe water quality treatment, environmental degradation and associated economic losses, flood impacts, and other types of alternative water supplies and treatment technologies.

- Capitalize on current mining activities that create large pits in southeast Florida.

- Relies largely upon existing conveyance infrastructure.

- Reduces longer-term need for new water infrastructure and energy-intensive treatment technologies.

In 2017, the Florida Legislature approved the project as a priority water supply project under enabling legislation Senate Bill 10 and the SFWMD designated the C-51 Reservoir Phase 1 as a pilot alternative water supply development project, pursuant to Section 373.037, F.S.

Water utilities have executed agreements with the property owner to purchase storage capacity. To date, agreements have been executed for 13 mgd of storage capacity out of Phase 1's available 35 mgd: Broward County (6 mgd); Sunrise (5 mgd); and Hallandale Beach and Dania Beach (1 mgd each). The utilities have received or are processing modifications to their water use permits to reflect this AWS source as a means for meeting future demands. Senate Bill 92 (2019) clarified language and intent of the project and allowed the SFWMD to negotiate for any portion of the project not already committed to partners for water supply.

The mining operation for Phase 1 is complete and designed to store an estimated 14,000 acre-feet of surface water and provide 35 mgd of canal/surficial aquifer recharge near water utility wellfields. The FDEP has issued a diversion and impoundment consumptive use permit and an environmental resource permit for construction and operation of Phase 1. Phase 2 of the project could provide an additional 46,000 acre-feet of storage, most likely for natural systems. The FDEP has issued a conceptual environmental resource permit for Phase 2.

Additionally, water routed south to the Hillsboro Canal could be redistributed to recharge local canals and drainage districts in Broward County, pursuant to an operations and maintenance agreement between the SFWMD and Palm Beach Aggregates and implemented through an operating plan with the SFWMD (under development) or other local water control districts.

Phase 1 construction was completed by the end of 2023 and is now operational, as fully accepted by the SFWMD compliance letter dated March 30, 2024. The C-51 deliverable satisfies the City of Margate's permit conditions 24, 25, 26, 28, 30, and 31, which require the submission of the C-51 Reservoir Project Phase 1 status, operating plan, and associated authorizations. Phase 2 aims to expand the project area to include 46,000 acre-feet of storage and potentially provide another 115 mgd, which is envisioned for environmental purposes.

5.8 Lake Okeechobee Surface Water Allocation Limitations

Surface water allocations from Lake Okeechobee and the Water Conservation Areas are limited in accordance with the Lake Okeechobee Service Area Restricted Allocation Area (RAA) criteria. In 2008, the SFWMD adopted RAA criteria for the Lake Okeechobee Service Area as part of the Minimum Flow and Minimum Water Level (MFL) recovery strategy for Lake Okeechobee. The criteria limit allocations from Lake Okeechobee and integrated conveyance systems hydraulically connected to the lake to base condition water uses that occurred from April 1, 2001 to January 1, 2008. After adoption of the RAA, all irrigation users in the Lake Okeechobee Service Area were required to renew their water use permits.

In 2007, the SFWMD adopted the LEC Regional Water Availability criteria to prohibit increases in surface water and groundwater withdrawn from the North Palm Beach County/Loxahatchee River Watershed Waterbodies and Lower East Coast Everglades Waterbodies above base condition water uses permitted as of April 1, 2006. This also includes canals that are connected to and receive water from these water bodies. New

direct surface water withdrawals are prohibited from the Everglades and Loxahatchee River watersheds and from the integrated conveyance systems. These criteria are components of the MFL recovery strategies for the Everglades and the Northwest Fork of the Loxahatchee River.

While the City is not directly impacted by the Lake Okeechobee surface water allocation limitations, the City is directly impacted by the LEC Regional Water Availability criteria as it applies to the Lower East Coast Everglades Waterbodies. These criteria impact the amount of permitted water quantities available to the City from the Biscayne Aquifer.

5.9 Lowering Lake Okeechobee Level

In January 2019, Florida's Governor announced his promotion of a plan to lower the minimum level of the Lake Okeechobee Regulation Schedule to 10.5 feet. The current Lake Okeechobee Regulation Schedule (LORS) ranges from a minimum level of 12.5 feet to a maximum of 15.5 feet.

While lowering Lake levels could provide environmental benefits to the Lake and the coastal estuaries, dropping the minimum level to 10.5 feet would reduce the amount of water stored in Lake Okeechobee, potentially reducing the amount of water available to recharge the Biscayne Aquifer. Should this happen, the risk of water shortages in the LEC, including the City of Margate, would increase. The City continues to monitor this issue and, when appropriate, will develop a policy to address any potential impacts to its water utility.

5.10 Infrastructure Planned to Attenuate Damaging Peak Flow Events from Lake Okeechobee

Construction of additional storage systems (e.g., reservoirs, aquifer storage and recovery systems) to capture wet season flow volumes may be needed to increase water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee. The C-51 Reservoir project located in southwestern Palm Beach County is one such project.

The infrastructure planned to attenuate damaging peak flows to surface water bodies and coastal ecosystems located near the City are those underway in Broward County by the SFWMD and the US Army Corps of Engineers under the Comprehensive Everglades Restoration Project (CERP).

The Broward County Water Preserve Areas project is part of the CERP and was designed to perform three primary functions:

1. Reduce seepage loss from WCA-3A/3B to developed areas (i.e., the C-11 and C-9 basins);

2. Capture, store, and distribute surface water runoff from the western C-11 Basin; and,

3. Restore wetlands, recharge groundwater, improve hydroperiods in WCA-3A/3B, and maintain flood protection.

The following major infrastructure features will be constructed as part of the project.

- C-11 Impoundment – A 1,168-acre impoundment to capture and store runoff from the C-11 Basin, reduce pumping of surface water into the WCAs, and provide releases for other regional uses.

- WCA-3A/3B Seepage Management Area – A 4,353-acre seepage management area that would establish a buffer to reduce seepage from WCA-3A/3B, connect the C-11 and C-9 impoundments via conveyance canal, and maintain flood protection.

- C-9 Impoundment – A 1,641-acre impoundment to capture and store surface runoff from the C-9 Basin, store C-11 Impoundment overflow, manage seepage, and provide releases for regional benefit.

These infrastructure features will provide various functions such as reducing seepage from WCA-3A, reducing phosphorus loading to WCA-3A, capturing stormwater otherwise lost to tide, and providing conveyance features for urban and natural system water deliveries. The preserve areas will benefit federally listed threatened and endangered species and many wading birds. This project provides water supplies identified in the Everglades MFL recovery strategy. The project received congressional authorization in 2014. Design efforts are under way for the C-11 Impoundment, and construction began in October 2017 on a portion of the mitigation area. Construction of the C-11 Impoundment is expected to be completed in 2027. The WCA-3A/3B Seepage Management Area is anticipated to begin construction in 2027. Construction of the C-9 Impoundment is expected to begin in 2030. The City continues to monitor the status of environment restoration projects in the LEC.

5.11 Use of brackish groundwater from the Floridan Aquifer

The use of brackish water from the Floridan Aquifer for potable use after treatment is considered an alternative water supply. At this time, the City of Margate has no plans to develop this resource.

Section 6.0 – Water Supply Capital Improvements

While there is no immediate need for an alternative water supply, the City has signed an agreement to obtain 2.0 mgd of water capacity from the C-51 Reservoir to address increases in future water demand. This cost and the FY 2020 approved five-year capital improvement plan are provided in Table 6.1. Other than capacity from the C-51 Reservoir, all capital improvement items are intended to replace and rehabilitate the existing water infrastructure as components reach the end of their useful lives.

Table 6.1: City of Margate Five-Year Capital Improvement Program for Water Service

Item	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total Five-Year
Water Line Replacement	$2,450,000	$950,000	$950,000	$950,000	$950,000	$6,250,000
Computer Equipment	$0	$30,000	$0	$0	$0	$30,000
Water & Wastewater Equipment	$459,500	$551,500	$406,500	$489,000	$324,000	$2,230,500
Install Water Meters/ Service Connections	$750,000	$750,000	$150,000	$150,000	$150,000	$1,950,000
Electronic Meter Reading	$600,000	$300,000	$100,000	$100,000	$100,000	$1,200,000
Rehabilitate Raw Water Wells	$60,000	$90,000	$30,000	$60,000	$30,000	$270,000
Replace all (16) mag meters	$60,000	$0	$0	$0	$0	$60,000
Upgrade Telemetry system	$0	$50,000	$50,000	$50,000	$50,000	$200,000
Rehabilitate Generator Systems	$120,000	$60,000	$0	$0	$0	$180,000
4-Log Implementation	$0	$0	$250,000	$3,000,000	$0	$3,250,000
Water Main / Force Main Control Improvements	$200,000	$200,000	$200,000	$225,000	$225,000	$1,050,000
Rehabilitate DEES Administration Building	$550,000	$40,000	$0	$77,500	$365,000	$1,032,500
Aerial Utility Crossings	$250,000	$0	$0	$0	$0	$250,000
Emergency Interconnect	$0	$200,000	$0	$0	$0	$200,000
Repair Water Treatment Plant Accelators	$450,000	$0	$0	$0	$0	$450,000
Rehabilitate Backwash Holding Tank	$200,000	$0	$0	$0	$0	$200,000
Rehabilitate Water Treatment Plant Filters	$400,000	$0	$0	$0	$0	$400,000
SCADA System Upgrades	$650,000	$500,000	$0	$0	$0	$1,150,000

Table 6.1: City of Margate Five-Year Capital Improvement Program for Water Service

Item	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Total Five-Year
Security System Upgrades	$0	$100,000	$0	$0	$0	$100,000
Rehabilitate High Service Pump Building	$0	$50,000	$0	$0	$0	$50,000
Asphalt Resurfacing - WTP	$0	$0	$0	$0	$200,000	$200,000
Lime Sludge Handling Process	$0	$0	$250,000	$3,000,000	$3,000,000	$6,250,000
Water Treatment Plant Infrastructure Improvements	$0	$0	$250,000	$2,000,000	$2,000,000	$4,250,000
Total - Budgeted	**$7,199,500**	**$3,871,500**	**$2,636,500**	**$10,101,500**	**$7,394,000**	**$31,203,000**
C-51 Reservoir Capacity Cost-Share - 2 mgd	$0	$0	$9,200,000	$0	$0	$9,200,000
Total	**$7,199,500**	**$3,871,500**	**$11,836,500**	**$10,101,500**	**$7,394,000**	**$40,403,000**

Source: Total - Budgeted Items from "City of Margate FY 2020 Adopted Budget and Five-Year Capital Improvement Program". Some items include the costs associated with both water and wastewater service. C-51 Reservoir Capacity Cost Share is from "Agreement for Capacity Allocation of the Phase 1 of the C-51 Reservoir, City of Margate".

Section 7.0 – Goals, Objectives and Policies

The proposed changes to the Goals, Objectives and Policies of the City's Comprehensive Plan are indicated by the yellow highlighted text.

Goal Statement

~~Establish procedures to identify water supply resources to address allocation deficiencies, if any, during the current 10-year planning period and beyond.~~

Regularly assess the sufficiency of the City's water supply to water customers in the City and in its water service area and identify water supply sources to address deficiencies.

Objective 1.1:

~~Update Population Projections and Demand patterns to quantify water supply needs.~~

Annually update population and water demand projections to quantify water supply needs.

Policy 1.1.1.:

Track and update population projections annually, as published by Broward County Planning Services Division. Compare projections with the figures published in the South Florida Water Management District's 2018 Lower East Coast Water Supply Plan Update and the City's 2020 Water Supply Facilities Work Plan Update.

Policy 1.1.2:

Track and update water demand projections annually based on actual demand figures as recorded in the monthly operating reports. Compare projections with the figures published in the South Florida Water Management District's 2018 Lower East Coast Water Supply Plan Update and the City's 2020 Water Supply Facilities Work Plan Update.

Policy 1.1.3:

Based on changes identified in Policy #1.1.1 and 1.1.2, modify the scope and size of future AWS projects or other water resources projects which may be required to address long term water supply needs.

Objective *1.2:*

On an annual basis, track regional water resources projects and/or changes in treatment technologies, which may impact the selection of ~~water resources~~ AWS projects~~, including the previously proposed reuse system,~~ including the participation in the C-51 Reservoir project, to address future water supply ~~needs during the current planning period and beyond~~.

Policy 1.2.1:

As needed, proactively participate in regional pilot or bench scale studies which have a potential to mitigate or minimize the future demands and/or costs associated with implementation of AWS projects.

Policy 1.2.2:

Develop inter-local agreements to facilitate participation in programs stated in Policy # 1.2.1.

Objective 1.3:

As needed, identify revenue sources to fund additional AWS projects, if required, to address water supply needs of the current planning period and beyond.

Policy 1.3.1:

By 2023, develop a comprehensive water and wastewater master plan to identify system needs over a long-term planning period (i.e. beyond the current 10-year planning period).

Policy 1.3.2:

As needed, perform a comprehensive rate study to identify revenue sources to implement the recommendations of the master plan identified in Policy # 1.3.1.

Policy 1.3.3:

As needed, revise the rate structure or identify additional funding sources to fund the projects identified in the master plan to meet the water supply needs beyond the current 10-year planning period.

Policy 1.3.4:

Adopt an ordinance, if required, which incorporates the revised rate structure to fund projects to meet the water supply needs beyond the current 10-year planning period.

Section 8.0 – References

1. 2018 Lower East Coast Water Supply Plan Update, SFWMD, November 8, 2018
2. Applicant's Handbook for Water Use Permit Applications, SFWMD, Effective September 7, 2015
3. Broward County Water Supply Facilities Work Plan, April 2020
4. City of Margate Water Supply Facilities Update, 2015
5. Water Supply Facilities Work Plan Updates – SFWMD Technical Assistance Guide, January 2019

PART 2. SANITARY SEWER

Service Area

The sanitary sewer service area is the same as the water distribution area, which is shown in Figure Ill-1. Included is the entire City of Margate as well as portions of the City of Coconut Creek generally located south of Coconut Creek Parkway (State Road 912), and portions of the Collier City Neighborhood of the City of Pompano Beach.

The Utilities Dept. service area is coterminous with the North Central Service Area of the 201 Facilities Plan for Broward County. That plan was prepared pursuant to Section 201 of the Federal Water Pollution Control Act. The reason for the study was to determine the necessary wastewater transmission, treatment, and disposal facilities for Broward County through the year 2000. Cities build and require connection to wastewater facilities because we want to eliminate the degradation of surface waters, including the Biscayne Aquifer. The Facility Plan is intended to provide a county-wide wastewater treatment approach that works, is cost effective, environmentally sound, and implementable. Ironically, the initial purpose of the plan was to qualify the County for Federal funding of the requisite capital improvements. Now that such funding is unavailable, other mechanisms will be presented to implement Margate's portion of this plan.

Existing Conditions

The Margate Utilities Department wastewater system contains these major operating components:

1. A wastewater treatment plant, which provides secondary treatment.
2. A deep well injection effluent disposal system.
3. A series of gravity collection mains which serve specific geographical neighborhoods and which discharge into the wet wells of one or more sewage pumping stations strategically located in each area.
4. An integrated system of pumping stations that pump raw sewage into force mains and interceptors leading to the wastewater treatment plant.

The treatment facilities are located at the geographic center of the City of Margate. The plant site is divided into two parcels that are separated by NW 66th Avenue The west parcel contains a total treatment capacity of 5.0 mgd and the deep well injection facilities. The treatment is done in rotating biological contactors, (rbc's). The east parcel contains a complete 3.0 mgd wastewater treatment plant, which we shall call the

“Margate” plant. The Utility has an 8.0 mgd operating permit issued by the Florida Department of Environmental Regulation and an NPDES permit issued by the U.S. Environmental Protection Agency. In addition, the facilities are subject to the effluent standards and other regulations, established by the Broward County Environmental Quality Control Board.

A simplified process flow diagram of the existing wastewater treatment facilities is presented in Figure Ill-5. The plant is of the activated sludge type with aerobic digestion. The raw wastewater enters the west plant site under pressure and the flow is divided proportionately in the headwork’s building to the west and Margate plants. Following aeration, clarification, and digestion, all wastewater flows through chlorine contact tanks and the effluent pumping station located at the Margate site. The treated secondary effluent is disposed of by means of deep well injection with the digested sludge being recycled at a local plant and foliage nursery. The Utilities Dept. is currently pursuing the development of alternate means of sludge disposal.

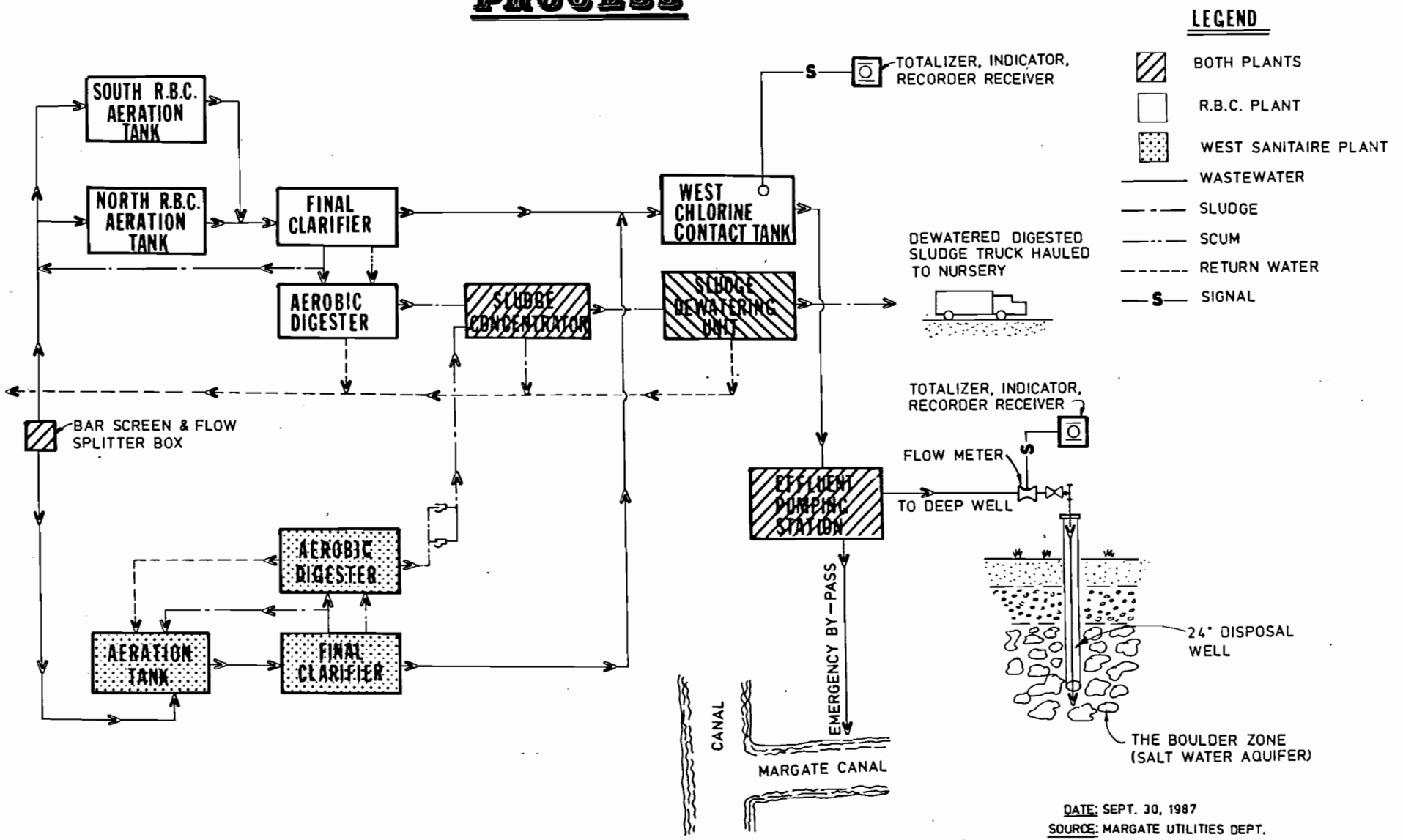
The Utility disposes its treated effluent by means of deep well injection. These wells are drilled much deeper than the Biscayne Aquifer. They extend to a depth of 3,200 feet and terminate in a saltwater formation known as the Boulder Zone. An aquaclude exists between this brackish formation and the freshwater Biscayne Aquifer. These wells use 3 vertical turbine effluent disposal pumps located at the wetwell on the end of the chlorine contact chamber. Monitoring wells, as required by the State regulatory agencies, are located nearby. The disposal well has a design capacity of 17.Omgd.

There exists an emergency backup disposal system that formerly was the only effluent discharge system. This consists of an outfall to the Margate Canal, which is hydraulically connected to the C-14 Canal. The Utility has an NPDES permit that allows a direct discharge in emergency situations. Since the installation of the deep well, discharges to the Margate Canal have been virtually eliminated. The Utility has recently installed a second deep well that can handle effluent disposal should the other well be down for any reason. Later in this element will be a discussion of the opportunities for effluent recycling via spray irrigation. Margate has long been an advocate of effluent reuse and has acted by installing a not yet utilized backbone transmission main.

The gravity portion of the sewage collection system encompasses between 55 to 60 miles of sewers ranging from 8 to 12 inches diameter. These are sized adequate for the catchment area in which they are located. This network is composed of various materials with the majority being VCP, vitrified clay pipe. In the newly emerging communities of the service area, PVC gravity sewer mains are predominant.

FIGURE III – 5

MARGATE WASTEWATER TREATMENT PROCESS



DATE: SEPT. 30, 1987
SOURCE: MARGATE UTILITIES DEPT.
PREPARED BY: CITY OF MARGATE ENGINEERING DEPT.

Because of the flat terrain of South Florida, a gravity system needs to be supplemented by pumping stations. The Utility owns and operates 46 lift stations. The oldest was installed in 1956 and the most recent in 1987. Several of the lift stations have submersible pumps and the remainder, have either dry pits with flooded suction pumps or surface mounted pumps with self-priming suction. The department has a regular operations and maintenance program to keep the stations in good working condition. Additionally, there are 6 private lift stations connected into the system.

All lift stations discharge into one of the four major force main networks, which convey raw sewage to the treatment plant. Figure III-6 illustrates the configuration and major components of the pumped sewage system. There are about 21 miles of variously sized force mains. The major materials are ACP, asbestos cement pipe and CIP, cast iron pipe. The newer areas are required to install DIP, ductile iron pipe. This is the most durable material available today.

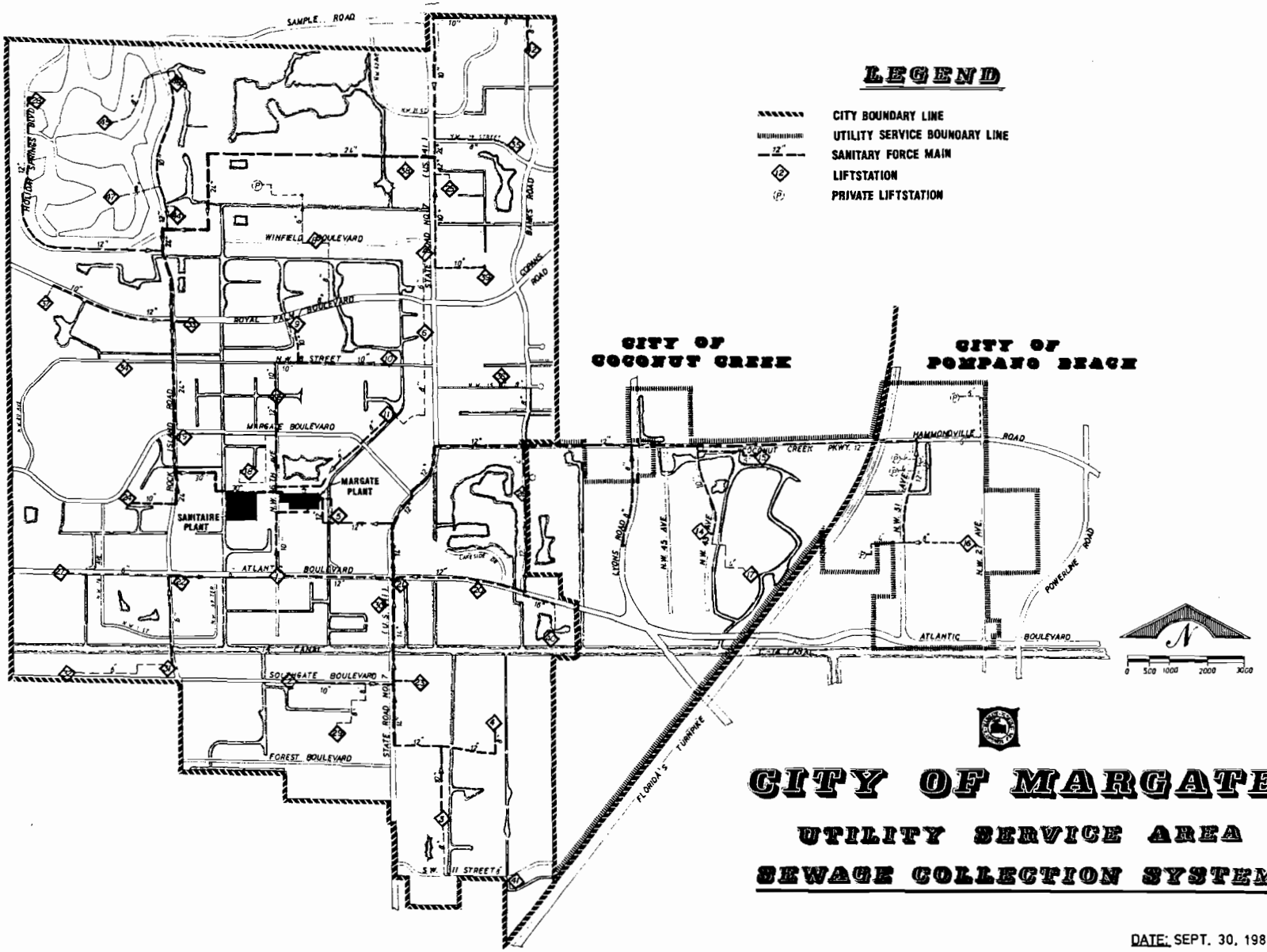
Approximately 425 dwelling units and several commercial establishments, all located within the Collier City community of the City of Pompano Beach, are served by private underground disposal facilities. These septic tank systems provide onsite wastewater treatment. Effluent from septic tanks is discharged into a drainfield where it is allowed to percolate into the soil. Solid residues from septic tanks, called septage, must be removed periodically and hauled by private contractors to treatment plants.

The 201 Facilities Plan recommended the eventual phasing out of all septic tanks. All new construction within the city limits of the City of Margate will be connected to the wastewater treatment plant. New construction with septic tank disposal in other jurisdictions within the service area is discouraged. If septic tanks are used in some unforeseen instance, they shall be installed in accordance with Rule 10(d)(6), FAC, as administered by the Broward County Health Dept.

Needs Assessment

The service area experienced phenomenal growth between 1970 and 1986. Rapid community development is forecast to continue during the planning period with build-out occurring around the year 2000. The population projections set forth in Table III-3 of the Potable Water Subelement are also applicable here because of the coterminality of the service areas. Improvement needs will be based on demand for adequate capacity to

FIGURE III – 6



CITY OF MARGATE

UTILITY SERVICE AREA

SEWAGE COLLECTION SYSTEM

DATE: SEPT. 30, 1987

SOURCE: MARGATE UTILITIES DEPT.

PREPARED BY: CITY OF MARGATE ENGINEERING DEPT.

serve existing and projected users at a level of service, which meets health, safety, and performance objectives.

In order to establish that level of service, Table III-7 sets forth historic average daily wastewater flow values. When divided by the Census or estimated population, a level of service expressed in gallons per capita per day is yielded. This table also includes the percentage of ADF to Average Daily Consumption of potable water. That percentage shows a dramatic increase, going from 60% in 1970 to 92% in 1986. A high water demand and relatively low percentage of sanitary sewage return indicates that substantial water is being utilized for construction activity and establishing new lawns and ground cover. When there has been a relative slowing of building activity, an increase in the percentage of multi-family and non-residential sectors vis-a-vis single family homes, and a maturation of lawns, a higher percentage of water is returned to the sewer system.

TABLE III-7
MARGATE UTILITIES SERVICE AREA
HISTORIC WASTEWATER FLOWS

Year	Annual Average Daily Flow*	Percentage of Potable Water ADC	Level of Service**
1970	1.O5mgd	60	88.5
1980	4.B4mgd	82	113.3
1986	5.42mgd	92	114.7

* *City of Margate Utilities Dept*.
** *Indicated in gallons, per capita, per day.*

The latest ratio of wastewater flow to potable water consumption, 92 percent, is most reflective of development conditions that will prevail throughout the duration of the planning period.

The City of Margate land development regulations, Chapter 16 1/2, requires adequate wastewater and disposal service prior to issuance of any development permit. During platting process, Section 198(f) of the Broward County land development code requires adequacy of wastewater treatment and disposal service of developments within municipalities. Adequacy of service is based upon the demonstration that an existing wastewater treatment and disposal facility has sufficient capacity to provide for the needs of the new development.

Currently, the Broward County Environmental Quality Control Board (EQCB), which has permitting authority countywide, including Margate, utilizes the following unit flows for determining adequacy of wastewater service during the development review process.

Type of Structure	Design Flow per Unit in gallons per day
Assembly Halls (Per seat)	2
Bar and Cocktail Lounge (No food service)	20
Beauty Parlors Per 100 sq. ft. of work	30
Bowling Alleys Per lane (including Bar & Foodservice)	200
Churches Per sanctuary seat	2
Dance Halls Per person	2
Factories Sanitary wastes, per person/per shift	15
Hospitals and Nursing Homes Per bed space	200
Each resident staff	100
Institutions Per person (including resident staff)	100
Laundries Per machine	100
Office Buildings (Allow 100 sq. ft. net per employee) Per employee	7
Parks (Public) (With Comfort Stations equipped with flush toilets) Per person	5
Recreation Buildings Per person	100
Residences Single family, detached	100
Multi-family buildings	100
Motel/Hotel Units Bedroom additions to SFR	100
Mobile Homes	100

Type of Structure	Design Flow per Unit in gallons per day	
Restaurants		
24 hour runof, per seat (including bar)	50	
Less than 24-hour runoff/seat (including bar)	30	
Drive-ins, per space	15	
Carry-out facilities	50 *	
* Per 100 sq. ft. floor space + 10/ employee (in addition to seat and drive-in space charges)		
Schools	Elementary	High
Each pupil per day	10	15
Add for shower/pupil	5	5
Add for cafeteria/pupil	5	5
Boarding each pupil	100	100
Service Stations		
Full Service Stations		
First two bays	750	
Each additional bay	300	
Per fuel pump	100	
Self Service Stations		
Per fuel pump	50	
Shopping Centers		
Per sq. ft. of floor space (no food service or laundry)	0.1	
Theaters	5	
Indoor, per seat		
Outdoor, per speaker	10	
Warehouses		
Per sq. ft. of storage space	0.1	

A system specific level of service standard for the City's sanitary sewer facilities shall be 365 gallons per day (GPD) per equivalent residential connection in accordance with the water and wastewater connection charges, 1985 update. Land use data, past and projected land development trends; population growth and records of historical treatment flow were used in determining the above level of service. All other levels of service standards utilized by the Broward County Environmental Quality Control Board pertaining to sanitary sewer facilities shall be applied to the City's sanitary sewer facilities.

With the exception of infiltration of stormwater runoff into the sanitary sewer system, the wastewater flow is exclusively a function of potable water demand. The infiltrated groundwater needs to be sent through the same treatment process as raw sewage. It is expensive to permit this to occur, and so in the early 1980's, the Utility engaged in an continuing program that has reduced the rate of infiltration. With the success of this program, it must therefore follow that the ratio of Maximum to Average Daily wastewater flow is portionate to the Maximum to Average Day ratio of potable water consumption. That ratio has previously been established at 1.35 times the average day.

Future wastewater flows are based on the following formula:

Average Daily Flow	=	Projected Population @ time (t)	X	Level of Service Standard
Maximum Daily Flow	=	Average Daily Flow	X	Ratio of Maximum/Average Flow

TABLE III-8
MARGATE UTILITIES SERVICE AREA
PROJECTED WASTEWATER FLOWS

Year	Average Daily Flow	*Average Peak Flow
1988	6.19 mgd	7.12 mgd

1989	6.31 mgd	7.26 mgd
1990	6.43 mgd	7.39 mgd
1991	6.56 mgd	7.54 mgd
1992	6.69 mgd	7.69 mgd
1993	6.83 mgd	7.85 mgd
1994	6.96 mgd	8.00 mgd
1995	7.10 mgd	8.17 mgd
1996	7.25 mgd	8.34 mgd
1997	7.39 mgd	8.50 mgd
1998	7.54 mgd	8.67 mgd
1999	7.69 mgd	8.84 mgd
2000	7.84 mgd	9.02 mgd

Source: City of Margate

* Peak flow ratio of 1.15 base on James Montgomery Report using historical plant data.

TABLE III-9
PROPORTIONATE ALLOCATION OF WASTEWATER TREATMENT,
MARGATE UTILITIES SERVICE AREA

Year	Margate	Coconut Creek	Pompano Beach
1988	89.5%	6.0%	4.5%
1990	89.7%	5.9%	4.4%
1995	90.1%	5.8%	4.1%
2000	90.5%	5.7%	3.8%

Source: *City of Margate*

The projections of Table III-8 indicate that an increase of the existing 8.0 mgd wastewater treatment plant to 11.75 mgd will be required to serve existing and projected development. In addition to volumetric expansion, a partial rehabilitation and reconstruction of the existing plant will be necessary. A listing of the major wastewater capital improvement projects is set forth in Table Ill-10.

As an alternative to deficit financing, the city has adopted the following policy. The portion of the connection charge, as enacted by ordinance, which is necessitated by the cost of new facilities for new users, must be paid by the new users at the time that said users indicate to the Utilities Dept. that they request wastewater treatment plant capacity specifically built and reserved for their proposed developments. The allocation of connection charges between new and existing users is based upon the Update of the 1982 Utility Connection Charge Report prepared for the Utilities by Envisors, Inc. A copy of this study is available for inspection at city offices.

The Utilities Dept. will construct no additional plant capacity unless it has been requested and paid for prior to- construction. In this manner, the expansion of plant capacity will not be paid for, nor supported by a pledge against, the rates of existing users. This financing method anticipates a series of phased plant expansions, with the size of each determined by the expressed aggregate request of developers and/or landowners.

TABLE III-10
UTILITIES DEPT. SERVICE AREA
WASTEWATER CAPITAL IMPROVEPIENT PROGRAM

1. Expand permitted treatment plant capacity, in a series of phased expansions whose size is determined by pre-paid connection charges, to 11.flmgd. Installation of rotating biological contactors is deemed most cost effective at this time. This involves the relocation of all sewage treatment to the west side of the plant.

2. Convert one Sanitaire plant into sludge digesting facility.

3. Rebuild, upgrade, and rehabilitate lift stations, various locations.

4. Sewer reconstruction and upgrading, along State Road 7 between C-U Canal and Kimberly Blvd.

5. Improve process controls and recordation at plant.

6. Improve force main capability from lift station No.1 to plant infall.

Performance Assessment

As explained in the potable water section of this element, the Utilities Dept. employs, on a regular basis, a consulting engineer to evaluate the overall status of wastewater collection and treatment facilities. The most recent report, by Envisors, Inc., was issued

in Fiscal Year 1985-86. This report and discussions with the Director and staff of the utility form the basis for this assessment of the facilities performance.

Included for study in this section are the hydraulics, treatment, electro-mechanical, controls, and principal unit processes of the treatment plants. The existing facilities produce a satisfactorily treated effluent that meets all regulatory requirements. Mechanical and electrical equipment and major structures are in sound condition, with a few exceptions. Emergency generator capacity is provided to operate critical equipment during power outages.

The unit processes, including headworks and all major individual treatment units were evaluated to determine their performance levels. With some exceptions, all unit processes have detention times, loading, overflow, and BUD's and suspended solids reduction rates well within accepted standards. Sludge digestion procedures at the Margate (east) plant have occasionally created excessive odors.

The Utilities' water and wastewater systems appear to be operated and maintained to standards equal or better than those normally encountered in other systems of comparable size and operating conditions. Envisor's concluded that the bondholders are being well served. Exceptions include some older components of the gravity collection system that are slated for replacement as outlined in Table III-10. The Utilities maintains an on-going program utilizing television and grouting systems to reduce stormwater infiltration. There has also been an upgrading of older lift station pumps and electrical panels.

Although adequate capacity is presently available, there is still a need is to increase the capacity of the wastewater treatment plant to maintain an adequate level of service as the area grows in population and non-residential construction. The design of the ultimate upgraded and expanded facilities is complete and construction of Phase I began in 1985 with funds provided by the prepaid connection charge method discussed above.

Table III-11 indicates the proportional capacity allocated to wastewater service area served by the City of Margate Wastewater Treatment Plant. The City's Treatment plant is at present permitted by the Florida Department of Environmental Regulation at 8.0 mgd. Expansion to 11.75 mgd is underway and slated to be placed on line and permitted by 1992.

TABLE III-11

PROPORTIONAL CAPACITY ALLOCATED TO WASTEWATER SERVICE AREA

MILLION GALLONS PER DAY (MGD)

YEAR	PLANT CAPACITY	MARGATE AVG. DAILY FLOW	MARGATE ALLOCATED CAPACITY	COCONUT CREEK AVG. DAILY FLOW	COCONUT CREEK ALLOCATED CAPACITY	COLLIER CITY AVG. DAILY FLOW	COLLIER CITY ALLOCATED CAPACITY
1988	8.0	5.54	7.16	0.37	0.48	0.28	0.36
1989	8.0	5.65	7.16	0.38	0.48	0.28	0.36
1990	8.0	5.77	7.18	0.38	0.47	0.28	0.35
1991	8.0	5.88	7.18	0.39	0.47	0.29	0.35
1992	8.0	6.00	7.18	0.40	0.47	0.29	0.35
1993	11.25	6.13	10.54	0.40	0.69	0.30	0.52
1994	11.75	6.24	10.54	0.41	0.69	0.31	0.52
1995	11.75	6.40	10.58	0.41	0.68	0.29	0.49
1996	11.75	6.53	10.58	0.42	0.68	0.30	0.49
1997	11.75	6.66	10.58	0.43	0.68	0.30	0.49
1998	11.75	6.79	10.58	0.44	0.68	0.31	0.49
1999	11.75	6.93	10.58	0.45	0.68	0.31	0.49
2000	11.75	7.10	10.63	0.45	0.67	0.29	0.45

Source: City of Margate D.E.E.S.

Goals, Objectives and Policies

GOAL STATEMENT

PROVIDE AND MAINTAIN A WASTEWATER COLLECTION AND TREATMENT SYSTEM THAT WILL ENSURE COMPLIANCE WITH THE STANDARDS PROMULGATED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION, THE BROWARD COUNTY WATER RESOURCES DIVISION, AND THE CITY OF MARGATE.

Objective 2.1 Future developments should be responsible for bearing the proportionate cost of the expansion and/or construction of wastewater treatment and collection facilities required for their use.

Policy 2.1.1 Require connection to sanitary sewer collection system serviced by the City of Margate Wastewater Treatment Plan for all development and redevelopment within the service area.

Policy 2.1.2 The connection charges shall be in accordance with the Water and Wastewater Rate Study dated September 2008, or per future updates of the rate study for various categories of sewer users based on an analysis of historical wastewater flows for that type of user and a cost analysis of the capital improvements set forth in this element.

Objective 2.2 Meet the service demand and, if required, upgrade the Wastewater Treatment Plant to buildout conditions.

Policy 2.2.1 Monitor population projections and plan for upgrades to meet service demands.

Policy 2.2.2 The level of service standard for the City's Sanitary facilities of 335 gallons per day (gpd) per equivalent residential connections (ERC's) shall be maintained to assess adequacy of service; all other levels of service standards utilized by the Broward County Water Resources Division pertaining to Sanitary sewer facilities shall be adopted and utilized to assess adequacy of service as follows:

Type of Structure	Specific Condition	Per unit in Gallons per day
Assembly Halls	(a) per seat	2
Barber and beauty shops	(a) per dry service chair	100
	(b) per wet service chair	200
Bar and cocktail lounges (No food service)	(a) per seat	20
Bowling alleys	(a) per lane (no food operation)	100
Camper or RV trailer park	(a) per space	150
Car wash	(a) automatic type	3500
	(b) automatic type (recycled water)	350
	(c) hand wash	1750
Churches	(a) per sanctuary seat	3
Dance halls	(a) per person	2
Dentist offices:	(a) per dentist	250
	(b) plus per wet service chair	200
Doctor offices:	(a) per physician	250
	(b) plus per square foot of office space	0.20
Drive-in theater	(a) per car space	5
Fire station	(a) per bed	100
Health spa	(a) per square foot (does not include food service)	0.35
Hospitals and nursing homes	(a) per bed space (does not include public food service areas and offices)	210
Institutions	(a) per person (including resident staff)	100
Kennels	(a) per animal space	30

Type of Structure	Specific Condition	Per unit in Gallons per day
	(b) per veterinarian	250
Laundries	(a) per coin-operated machine	400
	(b) per commercial not coin-operated machine	650
Office Building	(a) per square foot of floor space	0.20
Parks, public with comfort stations	(a) per visitor	10
Pet grooming parlors	(a) per wash basin (does not include retail sales)	200
Recreation/pool buildings	(a) per person (300 gallon minimum)	2
Residences	(a) Single family, detached each	300
	(b) Multiple family per dwelling unit	250
	(c) Motel/hotel units, per bedroom	150
	(d) Bedroom additions to single family residence	150
	(e) Mobil homes, each	300
Restaurants	(a) open 24 hours, per seat including bar	50
	(b) open less than 24 hours, per seat including bar	30
	(c) open less than 24 hours, with drive-through window, per seat including bar	35
	(d) drive-ins, per space	50
	(e) carry out food service only per 100 square feet	50
Schools:		

Type of Structure	Specific Condition	Per unit in Gallons per day
Elementary/Middle	(a) per pupil per day	10
	(b) add for shower/pupil	5
	(c) add for cafeteria/pupil	5
High School	(a) per pupil per day	15
	(b) add for shower/pupil	5
	(c) add for cafeteria/pupil	5
Boarding School	(a) per pupil	100
Service stations and		
auto repair shops	(a) per water closet	250
	(b) plus per service bay	100
Shopping centers		
and retail shops	(a) per square foot of floor space	0.10
	(does not include food service or laundry)	
Theaters and auditoriums	(a) per seat	5
Warehouse, mini-storage, with resident manager	(a) per square foot of floor space	0.01
	(b) plus residence	250
Warehouses	(a) per square foot of floor space	0.10

Objective 2.3 Maintain existing minimum standards for the extension of a sanitary sewer system that will meet or exceed EPA, FOE~~R~~P, and Broward County Water Resources Division rules and recommendations.

Policy 2.3.1 Require engineering plans and specifications prior to any system addition or alteration.

Policy 2.3.2 Require surety bonds for the completion and/or restoration for any work performed within a public right-of-way or easement.

Policy 2.3.3 Prohibit the introduction into any sanitary sewer of substances that can damage the collection or treatment system or which are not amenable to treatment or reduction by sewage treatment processes.

Objective 2.4 The existing capacity of the wastewater system will be utilized to the maximum extent feasible before the provision of new capacity is required.

Policy 2.4.1 Maintain current land development regulations prohibiting development that requires on-site septic systems and localized package treatment plants - thus discouraging urban sprawl.

Policy 2.4.2 The Department of Environmental and Engineering Services shall coordinate on-going engineering and planning activities for sanitary sewer services in a cost-effective manner.

Implementation and Monitoring Procedures Implementation Procedures

The City Planner shall prepare a compendium of goals, objectives, and policies (GOP); achievement monitoring procedures; and updating procedures to be distributed to all departments, committees and agencies participating in plan implementation. Those agencies shall be required to incorporate GOP's, under their authority, into their annual work programs and to request appropriations for operations and capital facilities necessary to implement the GOP's during the annual operating and capital programming process of the office of the City Manager.

The plan implementation procedures shall be primarily the responsibility of the City Planner.

Monitoring Procedures

- Achievement of Objectives may be evaluated based on analysis for several performance criteria including:

- Financial reporting included in the City of Margate Annual Financial Report, especially those special sections devoted to revenue and debt coverage items.

- The Annual Engineering Report of the Water and Wastewater Treatment Plant.

- Continued compliance with requirements of the Florida Department of Environmental Regulation in monthly operating and other reports.

- Continued growth in customers served and use of reserve capacity.

The Department of Environmental and Engineering Services will be responsible for implementing the policies and monitoring all objectives of the Element within its jurisdiction. All objectives are monitored on a continued basis. The goals and objectives should be maintained as an on-going objective if applicable and should be reviewed on an annual basis based on demand and the availability of new the technologies to improve service and to satisfy implementation procedures.

PART 3. DRAINAGE

"Water will run down hill!" The people of Florida should "knock a hole in the wall of coral [the coastal ridge] and let a body of water obey a natural law and seek the level of the sea..."

Gov. Napoleon B. Broward, 1905-1909

Existing Conditions

The above quotation of our erstwhile Governor is used to illustrate the prevailing attitude of Florida from statehood until 1972. With very little understanding of the complex hydrology of South Florida, drainage of the Everglades and dredging and filling of coastal estuaries and interior wetlands were developer prerequisites and sanctioned state policy. The destruction of wildlife habitat, the loss of water quality, and the threat to our burgeoning population's water supply have changed the prevailing attitude toward drainage.

The historic policy of flood control created a network of drainage canals outfalling to the Atlantic Ocean. With the urbanization of a drainage basin come a greater percentage of impervious surfaces in the form of rooftops and parking lots. As a result, the capacity of natural drainage features and previously constructed facilities are exceeded more frequently and localized flooding problems increase. At this juncture, further direct drainage improvements would be expensive and could have detrimental effects on water quality. Oil, grease, pesticides and fertilizers from urban land uses are washed into the canal system by stormwater runoff where they mix with the water of the Biscayne Aquifer.

The regulatory apparatus has moved toward a strategy of stormwater management, which attempts to create a balance between flood protection and pollutant removal. Some of the techniques being implemented include increased retention, i.e. impoundments which release stormwater by percolation into the ground with no direct discharge into surface waters. Other techniques are the provision of on-site landscaping, pretreatment of the first flush, which is very high in pollutants, and the preservation and enhancement of natural drainage features such as isolated wetlands.

The City of Margate is characterized by gently sloping terrain with level or nearly level topography. The elevation of the city ranges from 9.0 to 15.0 feet above mean sea level. According to the Soil Survey of Broward County, Florida that was prepared by the Soil

Conservation Service of the United States Dept. of Agriculture, the majority of soils in the city are of the Hallandale, Immokallee, and Margate associations. Approximately 90 per cent of the city's soil consists of nearly level, poorly drained soils that were formed in sandy marine sediment over limestone. Figure I-14 in the Future Land Use Element depicts the major soil groups found in the city. Low percolation rates and an impervious substrata contribute to the presence of numerous man-made lakes and an extensive system of drainage canals.

Average annual precipitation is equal to 62 inches. This amount of rainfall generates 27.07 mgd within the city limits. Approximately 55 per cent of the annual rainfall occurs during the rainy season lasting from June through October, with the majority resulting from convective thunderstorms. Typically, these storms have heavy localized rain, which diminishes in intensity radially outward of the storm's center. Consequently, there is seldom an even distribution of rainfall.

In Southeast Florida and Broward County (including the City of Margate), drainage boundaries are not determined by topographic ridgelines as they are in other areas. This is because of the flat topography and the extent of man-made drainage modifications. A review of canal operations in the Areawide Clean Water Management Plan, prepared by the Broward County Planning Council pursuant to Section 208 of the Federal Water Pollution Control Act, resulted in the City of Margate being placed within the C-14 West basin.

The C-14 Canal extends east to west across the breadth of the city for a distance of 2.5 miles. It was dredged in 1948 as part of the Corps of Engineers' Central and Southern Florida Flood Control District system and serves as the primary conveyor of stormwater runoff to the Atlantic Ocean. The usual direction of water flow is toward the ocean in all seasons. This flow has the capability of being reversed into the Everglades Conservation District. Water level and flow is determined by a series of control structures operated by the SFWMD. The District is continuously balancing runoff capacity, water quality, and the preservation of enough head [pressure] in the aquifer to prevent salt-water intrusion in the coastal cities. These control structures are set to automatically open and close in response to the stage of the canals. The gates can also be operated manually in response to emergencies.

Branching throughout the city is a 26.85-mile system of lateral, secondary, and primary canals. Of this distance, 20.42 miles are publically owned and maintained. These convey, via hydrostatic pressure, the runoff from various subdivisions to the C-14 Canal. Particularly in post-1980 developments, stormwater runoff is contained, to a degree, on site prior to staged discharge.

There are a total of 163 surface acres of lakes within the city's boundaries. Of this number, 25.5 acres are publically owned and maintained. Lake Margate was once operated as a public beach but the excessive liability associated with that operation caused it to be shutdown. Figure III-9 identifies public and private canal systems in the City of Margate. The C-14 canal is maintained by the SFWMD while the rest of the, public canal system is maintained by the City and the County.

The city has not had a specific policy dealing with the reclamation of rock and sand quarries. However, there are minimum sloping requirements for the banks, which must also be sodded to the mean water line and kept free of holly and other weeds. All of the abandoned quarries in the city have been turned into attractive lakes that are surrounded by residential developments. There is one fill operation that is currently phasing out of operation. The city is currently considering a rezoning of the pit and its surrounding uplands that will permit the development of a planned residential community with the "lake" as its primary amenity. No additional quarrying activity will be permitted as a result of the requirements of the SFWMD, this Comprehensive Plan and the Margate Zoning Ordinance.

Regulator Framework

The City of Margate is in the geographical jurisdiction of the South Florida Water Management District. The SFWMD is responsible for setting water quality standards as delegated by FOER. The SFWMD has permitting authority for dredging, the construction and operation of drainage works, and the withdrawal of water from the aquifer within the city. They are responsible for the maintenance of the C-14 Canal and control the ground water elevation in the entire C-14 basin through weirs regulating the amount of runoff into the Atlantic Ocean.

The District issues construction and operation permits for proposed surface water management activities and operation permits for existing systems. The criteria used for the approval of a surface water management permit can be found in a manual prepared by the District titled "Basis of Review". The current edition of the SFWMD's Groundwater Rule to Stormwater Discharges, including the "Basis of Review", has been adopted by the City of Margate as the minimum requirements for drainage permitting within the city.

The Margate Engineering Dept. is responsible for implementing these provisions as part of the development review process. During the review of surface water management, the permittee must comply in several broad categories: Floodplain encroachment; offsite discharge load and design, upstream/down; on-site storage for water quality and quantity. Additionally, the city has adopted a Floodplain Management Ordinance that

recognizes flood hazard zones. The first floor of all new buildings must be at or above the base flood elevation as set forth by the Federal Flood Insurance Rate Map.

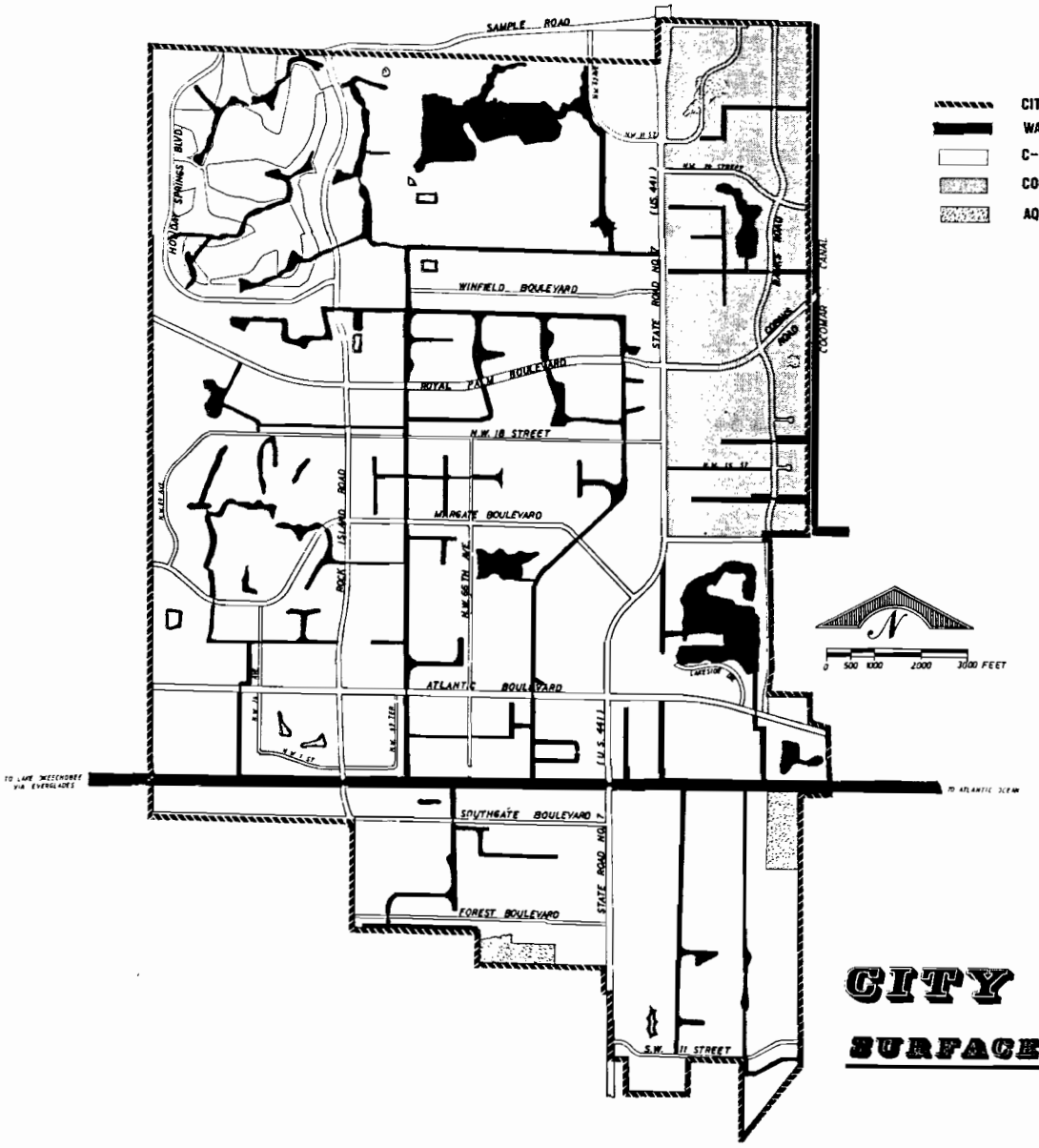
While the entire City of Margate lies within the C-14 Basin, that portion of the city located east of State Road 7 and north of Coconut Creek Parkway forms part of the Cocomar Water Control District. A portion of the City of Coconut Creek makes up the balance of the district. The district was created by Broward County and given taxing authority in order to implement water control projects within its boundaries. Runoff from the described area is routed through the Cocomar Canal prior to discharge into the C-14. The Broward County Water Resources Management Division is responsible for the maintenance of the Cocomar Canal and the design water level in the district. They also review and issue surface water management permits within the district. The Cocomar Water Control District is shown in Figure III-7. This map is also used to indicate the major components of the city's canal network.

For activities involving dredge and fill, depending on the particulars of the situation, permits from the U.S. Army Corps of Engineers and the Broward County Environmental Quality Control Board may also be required.

Analysis of Existing Conditions

The effectiveness of a drainage system is frequently measured by the extent to which it reduces damage and inconvenience from flooding. Based on this measurement the City's canal system is adequate to meet existing and future demands. The system will be able to accommodate all discharges in accordance with design criteria established by the SFWMD. Table III-12 identifies the design capacity of the C-14 canal. The City of Margate Code of Ordinances assures that discharges from the secondary canal system do not exceed design capacities. Any development, prior to the City issuing water management permit, has to obtain permit from the SFWMD and Broward County Water Resources Division.

FIGURE III – 7



LEGEND

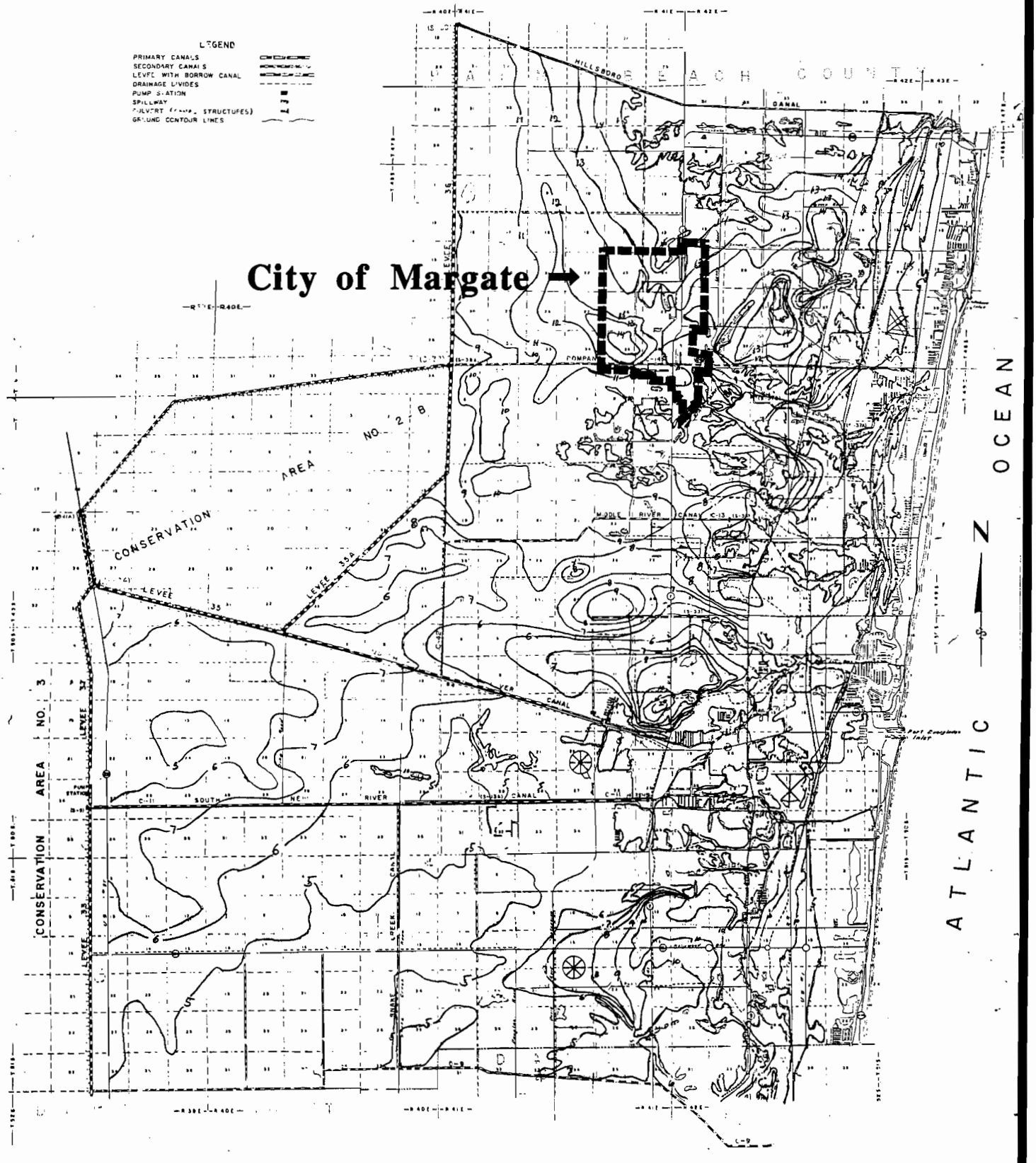
- CITY BOUNDARY LINE
- WATERWAYS
- C-14 DRAINAGE DISTRICT
- COCOMAR DRAINAGE CONTROL DISTRICT
- AQUIFER RECHARGE AREA (WETLAND)

CITY OF MARGATE

SURFACE WATER MANAGEMENT SYSTEM

DATE: SEPT. 30, 1987
SOURCE: MARGATE ENGINEERING DEPT.
PREPARED BY: CITY OF MARGATE ENGINEERING DEPT.

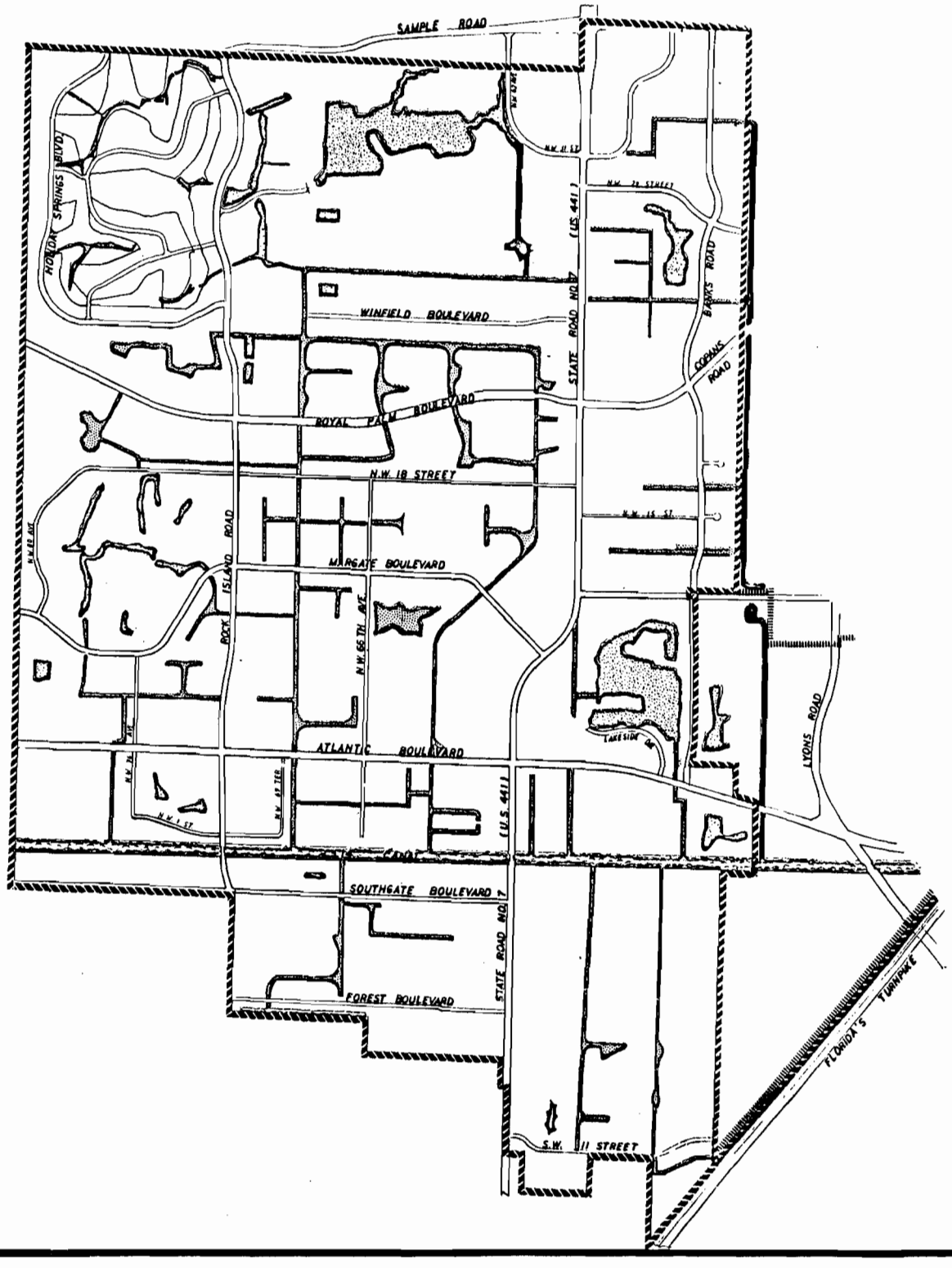
(FIGURE III-8)



TOPOGRAPHIC MAP

SOURCE: BROWARD COUNTY WATER RESOURCES MANAGEMENT

(FIGURE III-9)



CITY OF MARGATE

SURFACE WATER MANAGEMENT SYSTEM MAP (Public & Private Facilities)

LEGEND:

- CITY MAINTAINED
- PRIVATELY MAINTAINED
- S.F.W.M.D.
- MARGATE CITY BOUNDARY
- COUNTY MAINTAINED

Most of Broward County, (including Margate), has been crisscrossed with a series of interconnecting structured canals, the length, size, volume and capacity of the primary and secondary canals and the conservation management practices used to control, regulate, direct and store water therein preclude the significance of the few remaining and a really limited natural drainage features in Broward County.

Discharges from the secondary system to the primary system are limited to the SFUMD allowable criteria by control structures placed between the two systems. However, uncontrolled connections exist that discharge in excess of the drainage area's prorata share of the receiving primary canal. Such conditions reduce the capacity available to property that is served by controlled secondary canals, thus increasing the effect of rainfall on the property. These conditions could be reduced and the management of water enhanced if unrestricted connections were to be brought into conformance and inadequate primary canals were improved to a capacity corresponding to reasonable land use expectations.

Highly regulated flood control systems will be needed to not only control and distribute the volume of rainfall but also to retain or detain water based on best management practices as defined by the South Florida Water Management District and the Broward County Water Resource Management Division. The best management practices of retention and detention are also designed to hold run-off and erosion generated sediments from infiltrating too rapidly and reducing the quality of water that will recharge the aquifer.

In addition to their drainage and aquifer recharge functions, some canals increase the water level of the aquifer between the wellfield and the ocean and, thereby, prevent saltwater intrusion to wellfields.

With the exception of those isolated wetlands identified in the Conservation Element, there are no natural drainage features that remain within the City. The natural drainage and aquifer recharge functions of these areas are protected through the application of regulations by the DER and EQCB that preserve wetlands.

TABLE III-12

ALLOWABLE DISCHARGES PRIMARY CANAL (C-14)

Allowable Runoff 69.2csm

Drainage Design Frequency .....25 year 3-day storm

Source: *South Florida Water Management District*

SFWMD limits the amount of discharge from the secondary canals into the primary canal system. In order to meet these requirements, developments are required to retain a great portion of the stormwater runoff through developments of lakes, ponds and canals with control structure prior to overflow into the system.

Providing good drainage requires careful design and placement of drainage systems. Section 5-198(d) of the Broward County Land Development Code requires adequacy of water management works for developments within municipalities including Margate, which are required to plat.

Broward County including the City of Margate has expressed its level of service in terms of performance-based criteria. The reason levels of service are expressed in this manner is because the discharge limitation SFWMD sets upon its primary canals will serve to become the effective limitation upon water managements to serve future development. Since it is not possible to predict such limitations, therefore it is not possible to design a master secondary canal system without knowing with certainty what this discharge limit will be. To spend public funds and tax the public to provide as elaborate secondary canal system without knowledge of permissible discharge into the primary canal system would be ill advised and would serve to encourage urban sprawl.

Application of the level of service standards through the regulatory systems of the SFWMD and Broward County assures that a development permit shall not be issued unless the necessary drainage facilities either exist at the time of application or are provided for through an approved plan of concurrent construction with financial assurance in the form of bond or cash deposit. This method of providing drainage facilities as a part of the development process provides flood protection for existing and developing areas but reduces the incentive to develop beyond the urban development area thus discouraging urban sprawl.

Since the City off Margate is a part of the County's drainage service areas and that no development order are issued by the City without the approval of Broward County water Resources Division and SFIIJMD, the level of service standards for the City are the same as the County. The minimum standards are implemented through the review process as follows:

SUBJECT	ADOPTED LEVEL OF SERVICE STANDARD
Road Protection	Residential streets not greater than fifty feet to have crown elevation~ no lower than the elevation for the respected area depicted on the ten-year "Flood Criteria Map." Rights-of-way greater than fifty feet wide to have an ultimate edge of pavement no lower than the elevation for the respective area depicted on ten-year "Flood Criteria Map".
Buildings	To have the lowest floor elevation no lower than the elevation for the respective area depicted in the "100-Year Flood Elevation Map
Off Site Discharge	Not to exceed the inflow limit of SFWMD primary receiving canal or the local conveyance system, whichever is less.
Storm Sewers	Design frequency minimum to be three-year rainfall intensity off the State Department of Transportation Zone 10 Rainfall curves.
Flood Plain Routing	Calculated flood elevations based on the ten year and one hundred year return frequency rainfall of three day duration shall not exceed the corresponding elevations of the ten year "Flood Criteria Map" and the "100 Year Flood Elevation Map".
Antecedent Water Level	The higher elevation of either the control elevation or the elevation depicted on the map "Average Wet Sea son Water Levels."
On Site Storage	Minimum capacity above antecedent water level and below flood plain routing elevations to be design rainfall volumes minus off site discharge occurring during design rainfall.

Best Management Practices	Prior to discharge to surface or ground water, BMP's will be used to reduce pollutant discharge.

These standards are enforced through regulatory programs of the SFWMD, Broward County and the City of Margate. The submission of detailed drainage plans and calculations is required to show how conformance is to be achieved.

The regulatory process working in conjunction with the development review process of the land development regulations of the City of Margate reduces the probability of future development that does not conform to the adopted level of service standards for drainage. Proposed development in accordance to City Code will not receive a permit without having received approval from the SFWMD and Broward County Water Resources Division, of a water management plan that meets the level of service requirements.

The drainage level of service standards are based on rainfalls with predicted return frequency but they do not define the frequency of flooding due to other effects of due to other rainfall events. The design rainfall for determining minimum crown elevations has a ten percent annual change of occurrence. When normal groundwater levels were found to be high enough to saturate road base material the minimum road crown elevation was adjusted upward sufficiently to place the base material above the groundwater. Also when the design flood condition did not recede below the base material within a reasonable period of time the road crown elevation was adjusted upward. Building protection is based on a design rainfall that has a one percent annual chance of occurrence. The flood elevations predicted as a result off the one percent design rainfall are depicted on Broward County's "100 Year Flood Elevation Map". Design storms have not been adopted for the protection of other areas such as parking lots and yards. In general, yards and other open spaces, and to a lesser extent parking lots are allowed, to be used for stormwater storage on an as needed basis. The need has been found to be greatest in lower density residential development and in higher coverage non-residential development.

The application of LOS standards within the City will assure that adequate drainage systems are provided.

The quality of water entering the aquifer is also a major concern. In urban areas runoff collects pollutants from the surface and carries them into the aquifer. This type of runoff is known as non-point. Run-off in urban areas is largely associated with impervious surfaces such as roads and parking lots, which impede percolation.

The accepted means to alleviate non-point source pollution is to limit quantity of runoff. Controlling urban runoff maybe accomplished by achieving an appropriate ratio of impervious and pervious area as well as providing properly designed and operated on-site detention/retention facilities. This requires the use of appropriate land management practices, which reduce the amount of runoff resulting from storm events. These land management practices are referred to as Best Management Practices (BMP) and include use of vegetation, graded slopes, mulching and catch basins.

Needs Assessment

The major canals, identified in Figure III-7, are all existing or under construction as of this writing. The principal improvements required to implement this plan are limited to canal widening and grading, and the provision of drainage facilities and retention areas on the site of individual building projects.

In order to reduce the amount of pollutants washed by rainfall from the city's street system, the city has initiated a street sweeping program. Mechanical broom trucks sweep sectors on a periodic basis. Many of the post-1980 commercial developments contain retention areas within their developed site. It has been observed that many of these areas have become putrid with trash, landscape clippings, and algae. The city needs to develop a set of guidelines and regulations for the maintenance of such areas. Element I and Part 5 of this element discuss the several isolated wetlands that are being set aside for preservation and use as receiving bodies for stormwater runoff of the surrounding upland parcels. An effective program for the removal of exotic plants and/or illegally dumped trash must be worked out with the property owners involved.

TABLE III-13
CITY OF MARGATE
MAJOR DRAINAGE IMPROVEMENT PROJECTS

1. CORAL BAY, lake-canal connector.
2. Eastern Tier industrial tract, north perimeter canal widening.
3. Swap Shop site, dedication and grading / seawall.
4. Section 19-48-42, connections to wetland receiving body
5. SPRINGS GATEWAY, install approved system.
6. CORAL BAY, create littoral zone at lake.
7. HOLIDAY SPRINGS, on-site retention / detention.

GOALS, OBJECTIVES AND POLICIES

GOAL STATEMENT

PROVIDE A STORMWATER MANAGEMENT SYSTEM THAT PROTECTS LIFE AND PROPERTY FROM FLOOD HAZARD WHILE, PREVENTING DEGRADATION OF WATER QUALITY IN LAKES, CANALS, AND THE AQUIFER.

Objective 3.1 Require all new developments to meet the standards of the South Florida Water Management District for quantity and quality of stormwater runoff.

Policy 3.1.1 No building permit will be issued unless a construction and operation or general permit is first obtained from SFWMD.

Policy 3.1.2 New developments and redevelopments shall be responsible for the granting of rights-of-way and construction of storm drainage and flood protection required for their use.

Policy 3.1.3 The banks of all canals, lakes, and retention areas not containing sea walls shall be graded so that they are stable, free of Brazilian Pepper, and easily maintained.

Policy 3.1.4 Bridges and/or culverts along major canals (identified in Figure III-6) shall provide sufficient draft and headroom for passage of small boats.

Policy 3.1 .5 The first floor elevation of all structures within the City of Margate shall be at or above the base flood elevation established by the Federal Flood Insurance Rate Map.

Objective 3.2 Ensure that all development in the City is afforded reasonable flood protection.

Policy 3.2.1 By November 16, 1989 or when required by legislative mandate, land development regulations shall be adopted implementing the following minimum design criteria for water management as the level of service standards to asses adequacy of service during the development process.

SUBJECT	ADOPTED LEVEL OF SERVICE STANDARD
Road Protection	Residential streets not greater than fifty feet to have crown elevations no lower than the elevation for the respected area depicted on the ten year “Flood Criteria Map.”
Road Protection	Rights-of-way greater than fifty feet wide to have an ultimate edge of pavement no lower than the elevation for the respective area depicted on ten- year “Flood Criteria Map”.
Buildings	To have the lowest floor elevation no lower than the elevation for the respective area depicted in the “100 Year Flood Elevation Map.”
Off Site Discharge	Not to exceed the inflow limit of SFWMD primary receiving canal or the local conveyance system, whichever is less.
Storm Sewers	Design frequency minimum to be three-year rainfall intensity off the State Department of Transportation Zone 10 Rainfall curves.
Flood Plain Routing	Calculated flood elevations based on the ten year and one hundred year return frequency rainfall of three day duration shall not exceed the corresponding elevations of the ten year “Flood Criteria Map” and the “100 Year Flood Elevation Map”.
Antecedent Water Level	The higher elevation of either the control elevation or the elevation depicted on the map “Average Wet Sea son Water Levels.”
On Site Storage	Minimum capacity above antecedent water level and below flood plain routing elevations to be design rainfall volumes minus off site discharge occurring during design rainfall.
Best Management Practices (BMP)	Prior to discharge to surface or ground water, BMP’s will be used to reduce pollutant discharge.

These levels of service shall be used to determine adequacy at the time of plat and site plan approval for all properties within the City.

Policy 3.2.2 Ensure the periodic maintenance of catch basins, drainage pipes, silt removal and aquatic weed control to prevent ponding.

Policy 3.2.3 Monitor existing developments for street flooding and include capital projects as the need arises.

Objective 3.3 Continue to implement the use of existing water management system facilities so as to discourage urban sprawl.

Policy 3.3.1 Margate's land development regulations mandates that new developments provide adequate areas and easements for provision of a water management system in accordance with applicable drainage standards and criteria.

Section 5-198(d) of the Broward County land development code requires adequacy of water management works for developments within municipalities including Margate, which are required to plat.

Objective 3.4 Implement the use of Best Management Practices for all stormwater runoff systems.

Policy 3.4.1 Encourage the use of BMP's in accordance with regulations of the South Florida Water Management District and the Broward County Environmental Quality Control Board.

Policy 3.4.2 Prohibit stormwater discharges from commercial and industrial facilities, other than dry detention, within zone 1 of weilfield zones of influence as designated in the Future Land Use Map.

Policy 3.4.3 Coordinate with SFWMD to protect and maintain isolated wetlands pursuant to Chapter 373.414, Florida Statutes.

Implementation and Monitoring Procedures Implementation Procedures

The City Planner shall prepare a compendium of goals, objectives, and policies (GOP); achievement monitoring procedures; and updating procedures to be distributed to all departments, committees and agencies participating in plan implementation.

Those agencies shall be required to incorporate GOP's, under their authority, into their annual work programs and to request appropriations for operations and capital facilities necessary to implement the GOP's during the annual operating and capital programming process of the office of the City Manager.

Monitoring Procedures

Achievement of objectives for the stormwater management is monitored through the Development Review process. Chapter 7 of the Margate City Code established minimum design criteria and adopts the South Florida Water Management District's Groundwater Rule to Stormwater Discharges including the basis of review for surface water management permit applications. At the time property development plans are submitted, a determination is made by the City Engineer and Building Official that the proposed finished floor elevation is at or above the minimum prescribed by City Code and the National Flood Insurance Program and require all new developments to meet the standards of the South Florida Water Management District for quantity and quality of the stormwater runoff. To monitor objective 7 of the element, the City code requires that buildings vulnerable to floods, including facilities, which serve such buildings, be protected against flood damages at the time of construction or substantial completion.

All objectives within this element, if applicable, should be maintained and rewritten as Best Management Practice for all stormwater runoff systems become available.

PART 4. SOLID WASTE

Disposal is a dead end. Recycling is a new beginning.

Advertisement

The Waste Stream

The proper disposal of garbage presents a community development dilemma. As a community grows, it creates larger amounts of solid waste and yet has fewer places in which to dispose of it as land values increase and new residents oppose disposal facilities in their neighborhood. This inevitable crisis has been exacerbated generally by the growth of disposable packaging and products, and in South Florida particularly by the vulnerability of the Biscayne Aquifer and by our year round generation of landscape and construction trash.

The City of Margate's solid waste stream consists of six components. The largest by weight and volume is municipal solid waste (MSW) which is the accumulation of curbside and dumpster collections. Next in size is trash, which consists of construction debris, tree branches and household and commercial bulk items. The Broward County Solid Waste Division estimates the combined generation rate of these two components to be 3.75 pounds (1.7 kilograms) per capita per day.

The third and fourth components of the solid waste stream are the by-products of water and wastewater treatment. The Margate Utilities Dept. produces residual lime from treating potable water and sewage sludge from wastewater treatment. The Department's record indicate that the lime is produced at the rate of approximately 0.67 pounds and the sludge at 0.73 pounds per capita per day. The other components of the solid waste stream are hazardous wastes, which are toxic, corrosive, flammable, or radioactive chemical by-products usually associated with certain industries, and pathological waste, which is the infectious blood, tissue, and medical instruments from hospitals and clinics. The U.S. EPA and FOER have established separate disposal techniques and facilities for hazardous and pathological wastes.

TABLE III-14
CITY OF MARGATE, FLORIDA
PROJECTED DAILY SOLID WASTE GENERATION*

Year	Tons**	Percent Increase Over 1988
1988	113	
1990	118	+4%
1995	128	+13%
2000	145	+28%

* Not factoring recycling
** 3.75 lbs./day MSW & trash, 1.42 lbs. / day treatment plant by products

Source: *City of Margate*

Existing Conditions

Margate relies on private carting companies for the collection and disposal of solid waste. The city has entered into a five-year contract with a private hauler for the pickup and disposal of solid waste in all individually (water) metered residential neighborhoods. These include single-family homes, manufactured houses, town homes; and single story multiple family residences. The city collects the carting fee from the property owner by including it in their monthly water and sewer bill. This eliminates the billing cost for the carting company, thus reducing the fee for residents. Garden apartment developments and all non-residential buildings are free to enter into individual contracts with any franchised carting company. City ordinance requires that every building subscribe to refuse collection service.

The existing disposal technique for MSW and trash is through sanitary land filling. The collected solid waste is brought to the privately run Pompano Solid Waste Reduction Center north of Sample Road. Shredders are used to reduce the material, and then it is deposited using the area method of land filling. The material is compacted and covered with soil, wherein it decomposes chemically and biologically. Steps are taken to prevent leachate contamination of the Biscayne Aquifer. The landfill disposed nearly 1 .3 million tons in 1986 (together with the defunct County landfill in Davie). The disposal of lime and sewage sludge is handled by the Utility Department. The two materials are co-deposited in layers at an ornamental nursery site in Parkland. Hazardous wastes are handled separately and sent to an EPA approved site near Livingston, Alabama. The

so-called “red bag” material is sterilized prior to disposal with MSW. Human or animal material is cremated.

Needs Assessment

The solid waste generation rate of Broward County is 3,600 tons per day and climbing. The Pompano Solid Waste Reduction Center is slated for expansion but should reach its capacity by the around 1995. For legal, economic, environmental, and social reasons, the siting and development of new landfills would be extremely difficult.

Broward County’s decision to build solid waste energy recovery facilities is the result of nearly eight years of study, analysis, and planning. The county began this effort in response to Chapter 403.706 of the Florida Statutes, which requires urbanized counties to prepare resource recovery and solid waste management plans. Numerous studies, including Wegman and Pirnie, have demonstrated the need for resource recovery as the long-term solution to the solid waste dilemma. The two proposed sub-regional resource recovery plants will utilize incineration to vastly reduce the volume of landfill material while generating electricity in the process.

The City of Margate has entered into an inter-local agreement with Broward County wherein the city has pledged to direct the delivery of all processable solid waste generated within our corporate limits to the resource recovery facilities developed by the county. The two resource recovery plants and residual landfills will be developed, owned and operated by private corporations. The Broward Solid Waste Disposal District, headed by a Resource Recovery Board, has been created to oversee the entire operation.

The 1988 Legislature approved S.B. 1152, the Solid Waste Act. This legislation establishes a grant program (unfortunately open only to cities with 50,000+ population); directs FDER to adopt rules including tire and oil reclamation, bio-hazardous waste, and ash disposal; mandates county-wide recycling programs in all 67 counties beginning October 01,1989 and achieving an on-going 30% reduction of waste to landfills by December 31,1994, and stresses public awareness of the benefits of recycling.

The benefits of recycling go beyond saving space in landfills. Recycling also saves resources. It is estimated that one ton of recycled newsprint saves 17 trees. Saving trees reduces soil erosion and the loss of wildlife habitat. Recycling offers energy savings, particularly with the reuse of metals. It also offers savings in water consumption, and water and air pollution. Also, for some individuals, it does not seem right that materials, which can be reused or recycled into something useful, should be

thrown away. The mandates of S.B. 1152 and the solid waste disposal crisis make a recycling program an important local government objective.

The Utilities Dept. has embarked on a program to reduce the amount of sewage sludge generated during the wastewater treatment process. The switch to rotating biological contactors for secondary treatment will yield less sludge than the present activated sludge treatment system. The final product of the proposed on-site sludge treatment facility will have great value as a safe and odorless organic fertilizer. At that point it will become, like the lime produced in the water plant already is, a reusable resource.

As stated earlier, the City is under contract with Waste Management, Inc. to cart and disposed off its solid waste. These collected waste are disposed off at the Class I Central Disposal Sanitary Landfill (CDSL), owned and operated by Waste Management, Inc., located at 3000 NW 48th Street in unincorporated Broward County.

The CDSL site consists of five landfill cell and subcell areas totaling approximately 400 acres. Cell 1, with a base of about 122 acres have been the only disposal areas used up until 1988. Subcell 3A has a base area of approximately thirty-five acres became operational during the summer of 1988 and has a design capacity of 1,950,000 cubic yards. Waste Management Inc. is planning to expand capacity to the CDSL. Subcells 3B and 3C, are projected to be constructed in about 1989 and 1994 respectively. Cell 2 will be developed after 2000. All cells are fully permitted by Broward County, the South Florida Water Management District and the Florida Department of Environmental Regulation.

Table III-15 identifies design capacities for future sanitary landfill facilities.

Table III-15
Central Disposal Sanitary Landfill
(Cubic Yards)

CELLS	BASE	DESIGN CAPACITY
Cell 2	69 Acres	6,850,000
Subcell 3A	35 Acres	1,950,000
Subcell 3B	18 Acres	2,310,000
Subcell 3C	28 Acres	7,290,000
	TOTAL	18,400,000

Source: *Broward County Comprehensive Plan - Solid Waste Element*
Table III-16 provides level of service standards for solid waste. The level of service for residential solid waste generation was calculated to be 8.9 pounds per unit per day. Other levels of service were derived from the South Florida Regional Planning Council's Guidelines and Standards for preparing a DRI Application for Development Approval.

Table III-16
Solid Waste Level of Service Standards

LAND USE	LEVEL OF SERVICE
Residential	8.9 lbs. per unit per day
Industrial & Commercial	2 lbs.
Factor y/Warehouse	1 lb.
Office Building	4 lbs.
Department Store	9 lbs.
Supermarket	2 lbs.
Restaurant	Per 100 sq. ft. per day per 100 sq. ft. per day per 100 sq. ft. per day per 100 sq. ft. per day per meal per day
School	
Grade School	10 lbs. per room & 1/4 lb. per pupil per day
Middle School/High School	8 lbs. per room & 1/4 lb. per student per day.
Institution	
Hospital	8 lbs. per bed per day
Nurse or Intern Home	3 lbs. per person per day
Home for Aged	3 lbs. per person per day
Rest Home	3 lbs. per person per day

Source: *Broward County Office of Planning*

South Florida Regional Planning Council

Broward County is responsible in assuring adequacy of service for solid waste facilities in the unincorporated areas and contract cities including Margate.

During and under the term of the interlocal agreement between Broward County and the City of Margate, Broward County is to provide a solid waste disposal system emphasizing resource recovery. The proposed Broward County Resource Recovery and Landfill Facilities Program consists of the development of two sub regional resource recovery plants, a residue and unprocessable waste landfill and an interim/contingency landfill. Broward County's solid waste disposal resources have calculable finite limits. Capacity limits on resource recovery plants are set by physical constraints such as the size of the storage pit, feed hoppers, grates and ash disposal systems and air pollution control equipment. Capacity limits on landfills are set by maximum cubic capacity of cells based on height and base area.

When resource recovery plants are running at maximum output, increased capacity can be achieved by constructing additional modules at existing facilities or by developing new sites. When landfill capacity is depleted, additional capacity, can be developed by broadening the base off existing cell areas, increasing the height of cells or developing new cells.

Broward County have proposed to construct additional facilities in order to provide an adequate level of services for solid waste disposal during the planning periods ending in 1994 and 1999. These facilities and other information's insuring adequacy of service to Broward County's unincorporated areas and contract cities such as Margate can be found on pages 13-1 thru 13-21 of the Solid Waste Element of the Broward County Comprehensive Plan, Volume 2, 1989 and are made referenced to as if part of this element.

GOAL STATEMENT

PROVIDE A SOLID WASTE COLLECTION AND DISPOSAL OPERATION, WHICH EMPHASIZES RESOURCE RECOVERY AND SOURCE SEPARATION OF RECYCLABLE MATERIALS.

Objective 4.1 Emphasize resource recovery as the primary method of solid waste disposal.

Policy 4.1.1 Continue to comply with the interlocal agreement between Broward County and Margate and direct its waste stream to the proposed countywide resource recovery plant and landfill facilities.

Policy 4.1.2 Develop a plan by 1992 to reduce the waste stream by encouraging source separation of solid waste, recycling paper, metals glass, petrochemicals and other recyclable materials.

Policy 4.1.3 The city should initiate composting or other processes to recycle sewage sludge as an alternate to disposal as a solid waste.

Policy 4.1.4 Adopt and utilize the level of service standards for solid waste generation shown below in assessing adequacy of service of the Broward County Solid Waste Facilities.

LAND USE	LEVEL OF SERVICE
Residential	8.9 lbs. per unit per day
Industrial & Commercial	
Factory/Warehouse	School
Office Building	Grade School
Department Store	
Supermarket	Middle School/High School
Restaurant	2 lbs.
	1 lb.

4 lbs.	per 100 sq. ft. per day per meal per day
9 lbs.	10 lbs. per room & 1/4 lbs. per pupil per day
2 lbs.	
per 100 sq. ft. per day per 100 sq. ft. per day per 100 sq. ft. per day	8 lbs. per room & 1/4 lbs. per student per day.

LAND USE	LEVEL OF SERVICE
Institution	8 lbs. per bed per day
Hospital	3 lbs. per person per day
Nurse or Intern Home	3 lbs. per person per day
Home for Aged	3 lbs. per person per day
Rest Home	

These levels of service shall be used to determine adequacy the time of plat and site plan approval.

Implementation and Monitoring Procedures

Implementation Procedures

The City Planner shall prepare a compendium of goals, objectives, and policies (GOP); achievement monitoring procedures; and updating procedures to be distributed to all departments, committees and agencies participating in plan implementation.

Those agencies shall be required to incorporate GOP's, under their authority, into their annual work programs and to request appropriations for operations and capital facilities necessary to implement the GOP's during the annual operating and capital programming process of the office of the City Manager.

Monitoring Procedures

In order to evaluate the City's success in meeting its objectives, the Public Works Department and the Department of Environmental and Engineering Services need to monitor the City's generation of solid waste through its franchised haulers to assure consistency between demand for service and capacity provided. Implementation of

source separation objectives could be monitored by observing reported solids waste disposal tonnages at the landfill as submitted by its franchised haulers.

The objective for this element should be revised as needed to reflect new demands and new time frames if necessary.

PART 5 NATURAL GROUNDWATER AQUIFER RECHARGE

Multiple Approach

Aquifers are water-bearing stratum of permeable rock, sand, or gravel. There are two such formations underlying Broward County; the shallow non-artesian Biscayne Aquifer and the deep Floridian Aquifer. The Biscayne Aquifer, which serves as the source of all fresh water in the county, is composed primarily of limestone, sandstone and sand, ranging in age from late Miocene through Pleistocene. The aquifer is wedge shaped, being more than 200 feet thick along the coast, about 70 feet at the Conservation Area levee, and ending at the surface near the Collier County line.

The Biscayne Aquifer is recharged by rainfall during the rainy season, June through October. During the drier winter months, seepage from surface canals connected to Lake Okeechobee is the primary recharge source. The primary recharge area is in the western two-thirds of the county, which has been set-aside as a Conservation Area and is off limits to urban development. The water in the aquifer is hard, and generally the mineral content increases inland and with the depth of the aquifer. Ground water along the coast is mixed with salt water.

A comprehensive program for aquifer recharge is beyond the scope of any single municipality or county. This task is left to the South Florida Water Management District which is has jurisdiction over 16 counties, including Broward. However, the City of Margate has a part to play within an overall framework for aquifer recharge and groundwater protection. The city's part will be played in tandem with other regulatory agencies in the areas of land use, surface water management, and potable water treatment and conservation efforts, wellfield protection, hazardous material handling, and possibly at some future time, through treated effluent reuse.

The Municipal Role

Element I of this Comprehensive Plan has limited development within the city's wellfield cone of influence to the least intensive land uses, such as single family residences. Within the 100-year floodplain and areas with generally poor percolation, said element has limited land uses to those, which typically generate a low percentage of land coverage and higher quality runoff.

The Future Land Use Plan for the City of Margate has identified six areas as wetlands deserving conservation for use as retention and detention basins for the surrounding upland development. Wetlands serve to filter pollutants from stormwater before it enters the aquifer. Said plan has also set forth policies requiring the preservation of existing trees and the provision of landscaping as a part of project design. The city has a subdivision impact fee requiring the dedication of park acreage for new residential developments.

In Part 1 of this Element, we explained that the Utilities Dept. has stressed water conservation even in times of abundant rainfall. By requiring individual water metering wherever feasible, a permanent economic inducement for water conservation has been created. The city has adopted a Water Shortage Plan pursuant to Rule 40E-21, Florida Administrative Code.

In Part 2 of this Element, we described that sanitary sewer connection for all development within the Service Area is mandatory. An ongoing program to reduce groundwater infiltration into sanitary sewer lines has been initiated. The city has already installed the backbone main for an effluent reuse system.

In Part 3, we indicated that the City of Margate has adopted the SFWMD's Groundwater Rule to Stormwater Discharges for surface water management works. The city is committed to working with other regulatory agencies, including the Corps of Engineers, FDER, EQCB, and WRMD.

The South Florida Water Management District (SFWMD) has not designated any area within Broward County which includes Margate as a "prime groundwater recharge areas " A major source of recharge to the Biscayne Aquifer in Broward County are the Everglades Water Conservation Areas. The three water conservation areas total 790 square miles, which is approximately two thirds of the County's area. Recharge occurs naturally as stormwater, which is stored and purified in the Conservation Areas, seeps into the aquifer. Other major source of recharge includes the system of canals in the developable areas of the city. Since general soil conditions in the City are conducive to recharge of the aquifer, the land surface itself is also a source of aquifer recharge.

Additional protection for groundwater recharge and wellfields has been provided through the countywide application of the Wellfield Protection Program. Through County Ordinances, all potable water wells and accepted proposed potable water well sites are protected from hazardous, toxic materials. Protection is based on travel time within the aquifer. Three regulatory zones have been established. The use, handling and storage of listed toxic materials, has been excluded form the innermost zone with monitoring and other protective measures applied in the middle and outer zones. Prior to inclusion

in the program, wells and proposed well sites must be modeled, mapped and approved by the County Commission.

Groundwater recharge protection is also provided for in the drainage level of service standards. Those standards provide a maximum discharge level, a storage requirement, and the use of Best Management Practices (BMP). Protection is also, provided by the water quality monitoring and enforcement programs of the Broward County Environmental Quality Control Board (EQCB), DER and through cooperative contracts with the U.S. Geological Survey for salt water intrusion monitoring.

The EQCB, through its surface water-permitting program, will provide enforcement of the standards through the review of development plans and the inspection of development construction. EQCB standards require onsite storage of stormwater on a pervious to impervious ratio and the use of BMP's prior to discharge.

With the exception of those isolated wetlands as identified in the Conservation Element of the Comprehensive Plan, Figure III-2, pages 7-5, there are no natural drainage features that remain within the City. The natural drainage and aquifer recharge functions of these areas are protected through the application of regulations by the DER and EQCB that preserve wetlands.

The quality of water entering the aquifer is also a major concern. In urban areas runoff collects pollutants from the surface and carries them into the aquifer. This type of runoff is known as non-point. Runoff in urban areas is largely associated with impervious surfaces such as roads and parking lots, which impede percolation.

The accepted means to alleviate non-point source pollution is to limit the quantity of runoff. Controlling urban runoff may be accomplished by achieving an appropriate ratio of pervious and impervious area as well as providing properly designed and operated on-site detention/retention facilities. This requires the use of appropriate land management practices, which reduce the amount of runoff resulting from storm events. These land management practices are referred to as Best Management Practices (BMP) and include use of vegetation, graded slopes, mulching, and catch basins.

GOALS OBJECTIVES AND POLICIES

GOAL STATEMENT

PROTECT AND MAINTAIN THE FUNCTIONS OF NATURAL GROUNDWATER RECHARGE AREAS.

Objective 5.1 Implement the use of Best Management Practices to improve the overall quality of stormwater runoff.

Policy 5.1.1 Drainage regulations should be adopted consistent with the requirements of 5.163.3202(1), Florida Statue to assure that required retention areas are kept permeable, clean and sodded.

Policy 5.1.2 The City should adopt by ordinance a list of areas designated as Local Areas of Particular Concern (LAPC) as depicted on Figure VII-2 of the Conservation Element and develop, a wide range of programs for the conservation of native vegetative communities such as innovative land development consistent with the requirements of S.163.3202 (1), Florida Statues.

Policy 5.1.3 Coordinate with SFWMD to protect and maintain isolated wetlands pursuant to Chapter 373.414, Florida Statutes.

Objective 5.2 Provide recharge for potable water wellfields and saltwater intrusion abatement.

Policy 5.2.1 The City of Margate will work cooperatively with SFWMD and Broward County to develop plans and operating procedures to increase supply recharge water for the Biscayne aquifer.

Implementation and Monitoring Procedures

Implementation Procedures

The City Planner shall prepare a compendium of goals, objectives, and policies (GOP); achievement monitoring procedures; and updating procedures to be distributed to all departments, committees and agencies participating in plan implementation.

Those agencies shall be required to incorporate GOP's, under their authority, into their annual work programs and to request appropriations for operations and capital facilities necessary to implement the GOP's during the annual operating and capital programming process of the office of the City Manager.

Monitoring Procedures

The performance measure for implementing objective 5.1 of this element is to require all developments to abide by City Code and South Florida Water Management District's permitting requirements. No development permit shall be issued until such objective has been addressed and mitigated. Monitoring of compliance is the responsibility of the Office of the City Engineer in coordination with South Florida Water Management District.

The objectives should be maintained as written and should be revised as other Best Management Practices for overall quality of stormwater runoff become available.

PART 5. NATURAL GROUNDWATER AQUIFER RECHARGE.

Multiple Approach

Aquifers are water bearing stratum of permeable rock, sand, or gravel. There are two such formations underlying Broward County; the shallow nonartesian Biscayne Aquifer and the deep Floridan Aquifer. The Biscayne Aquifer, which serves as the source of all fresh water in the county, is composed primarily of limestone, sandstone and sand, ranging in age from late Miocene through Pleistocene. The aquifer is wedge shaped, being more than 200 feet thick along the coast, about 70 feet at the Conservation Area levee, and ending at the surface near the Collier County line.

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A comprehensive program for aquifer recharge is beyond the scope of any single municipality or county. This task is left to the South Florida Water Management District which is has jurisdiction over 16 counties, including Broward. However, the City of Margate has a part to play within an overall framework for aquifer recharge and groundwater protection. The city's part will be played in tandem with other regulatory agencies in the areas of land use, surface water management, and potable water treatment and conservation efforts, wellfield protection, hazardous material handling, and possibly at some future time, through treated effluent reuse.

The Municipal Role

Element I of this Comprehensive Plan has limited development within the city's wellfield cone of influence to the least intensive land uses, such as single family residences. Within the 100 year floodplain and areas with generally poor percolation, said element has limited land uses to those which typically generate a low percentage of land coverage and higher quality runoff.

The Future Land Use Plan for the City of Margate has identified six areas as wetlands deserving conservation for use as retention and detention basins for the surrounding upland development. Wetlands serve to filter pollutants from stormwater before it enters the aquifer. Said plan has also set forth policies requiring the preservation of existing trees and the provision of landscaping as a part of project design. The city has a subdivision impact fee requiring the dedication of park acreage for new residential developments.

In Part 1 of this Element, we explained that the Utilities Dept. has stressed water conservation even in times of abundant rainfall. By requiring individual water metering wherever feasible, a permanent economic inducment for water conservation has been created. The city has adopted a Water Shortage Plan pursuant to Rule 40E-21, Florida Administrative Code.

In Part 2 of this Element, we described that sanitary sewer connection for all development within the Service Area is mandatory. An ongoing program to reduce groundwater infiltration into sanitary sewer lines has been initiated. The city has already installed the backbone main for an effluent reuse system.

In Part 3, we indicated that the City of Margate has adopted the SFWMD's Groundwater Rule to Stormwater Discharges for surface water management works. The city is committed to working with other regulatory agencies, including the Corps of Engineers, FDER, EQCB, and WRMD.

The South Florida Water Management District (SFWMD) has not designated any area within Broward County which includes Margate as a "prime groundwater recharge areas." A major source of recharge to the Biscayne Aquifer in Broward County are the Everglades Water Conservation Areas. The three water conservation areas total 790 square miles which is approximately two thirds of the County's area. Recharge occurs naturally as stormwater which is stored and purified in the Conservation Areas, seeps into the aquifer. Other major source of recharge include the system of canals in the developable areas of the city. Since general soil conditions in the City are conducive to recharge of the aquifer, the land surface itself is also a source of aquifer recharge.

Additional protection for groundwater recharge and wellfields has been provided through the Countywide application of the Wellfield Protection Program. Through County Ordinances, all potable water wells and accepted proposed potable water well sites are protected from hazardous, toxic materials. Protection is based on travel time within the aquifer. Three regulatory zones have been established. The use, handling and storage of listed toxic

materials, has been excluded form the inermost zone with monitoring and other protective measures applied in the middle and outer zones. Prior to inclusion in the program, wells and proposed well sites must be modeled, mapped and approved by the County Commisison.

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The EQCB, through its surface water permitting program, will provide enforcement of the standards through the review of development plans and the inspection of developoment construction. EQCB standards require onsite storage of stormwater on a pervious to impervious ratio and the use of BMP's prior to discharge.

With the exception of those isolated wetlands as identified in the Conservation Element of the Comprehensive Plan, Figure VII-2, page 7-5, there are no natural drainage features that remain within the City. The natural drainage and acquifer recharge functions of these areas are protected through the applicaiton of regulations by the DER and EQCB that preserve wetlands.

The quality of water entering the aquifer is also a major concern. In urban areas runoff collects pollutants from the surface and carries them into the aquifer. This type of runoff is known as non-point. Runoff in urban areas is largely associated with impervious surfaces such as roads and parking lots which impede percolation.

The accepted means to alleviate non-point source pollution is to limit the quantity of runoff. Controlling urban runoff may be accomplished by achieving an appropriate ratio of pervious and impervious area as well as providing properly designed and operated on-site detention/retention facilities. This requires the use of appropriate land management practices which reduce the amount of runoff resulting from storm events. These land management practices are referred to as Best Management Practices (BMP) and include use of vegetation, graded slopes, mulching, and catch basins.

GOALS OBJECTIVES AND POLICIES

GOAL STATEMENT

PROTECT AND MAINTAIN THE FUNCTIONS OF NATURAL GROUNDWATER RECHARGE AREAS

Objective 5.1 Implement the use of Best Management Practices to improve the overall quality of stormwater runoff.

Policy 5.1.1 Drainage regulations should be adopted consistent with the requirements of S.163.3202(1), F.S. to assure that required retention areas are kept permeable, clean and sodded.

Policy 5.1.2 The City should adopt by ordinance a list of areas designated as Local Areas of Particular Concern (LAPC) as depicted on figure VII-2 of the Conservation Element and develop a wide range of programs for the conservation of native vegetative communities such as innovative land development consistent with the requirements of S.163.3202(1), F.S.

Policy 5.1.3 Coordinate with SFWMD to protect and maintain isolated wetlands pursuant to chapter 373.414, Florida Statutes.

Objective 5.2 Provide recharge for potable water wellfields and saltwater intrusion abatement.

Policy 5.2.1 The City of Margate will work cooperatively with SFWMD and Broward County to develop plans and operating procedures to increase supply recharge water for the Biscayne aquifer.

Implementation and Monitoring Procedures

Implementation Procedures

The City Planner shall prepare a compendium of goals, objectives, and policies (GOP); achievement monitoring procedures; and updating procedures to be distributed to all departments, committees and agencies participating in plan implementation. Those agencies shall be required to incorporate GOP's, under their authority, into their annual work programs and to request appropriations for operations and capital facilities necessary to implement the GOP's during the annual operating and capital programming process of the office of the City Manager.

Monitoring Procedures

The performance measure for implementing objective 5.1 of this element is to require all developments to abide by City Code and South Florida Water Management District's permitting requirements. No development permit shall be issued until such objective has been addressed and mitigated. Monitoring of compliance is the responsibility of the Office of the City Engineer in coordination with South Florida Water Management District.

The objectives should be maintained as written and should be revised as other Best Management Practices for overall quality of stormwater runoff become available.