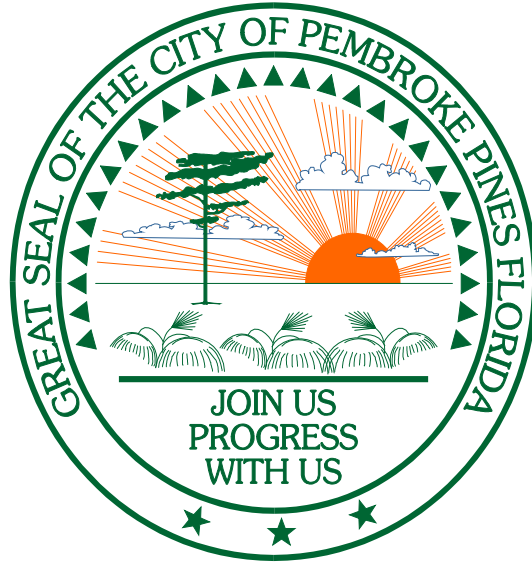




CITY OF PEMBROKE PINES, FLORIDA

10 YEAR WATER SUPPLY FACILITIES WORK PLAN

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EXECUTIVE SUMMARY

The South Florida Water Management District (SFWMD) approved the 2018 Lower East Coast Water Supply Plan Update (2018 LEC Update) on November 8, 2018. As a result, the City of Pembroke Pines (City) is required per Section 163.3177(6)(c)(3), Florida Statutes to prepare and adopt the Water Supply Facilities Work Plans (Work Plan) into their Comprehensive Plans no later than 18 months after the approval of the 2018 LEC Update. The City will be incorporating the adopted Work Plan as part of the Infrastructure Element within the Water Supply section of the Comprehensive Plan. The City's Work Plan must confirm the ability of the water supply and facilities to meet the water demand for the next 10-year planning period from 2020 to 2030. This Work Plan includes an analysis of water demands and flow projections that were developed using population projections and actual per capita water demands. The per capita water demand of 82.68 gallons per day per capita was calculated based on the actual treated water supply data from 2017 through 2019. Based on this per capita water demand and the future population projections established in the 2018 LEC Update, the current water supply facilities have the capacity to meet the future water demand for the required 10-year planning period and beyond through the year 2040.

On February 15, 2007 as part of the SFWMD's water use permit program, the Regional Water Availability Rule was adopted which reduced reliance on the regional system for future water supply needs, mandates the development of alternative water supplies, and increased water conservation and reuse. In the 2018 LEC Update, the SFWMD has identified the following regional issues for 2040 in the Lower East Coast Planning Region:

1. Fresh surface water and groundwater are limited; further withdrawals could have impacts on the regional system, wetlands, existing legal uses, and saltwater intrusion. As a result, additional alternative water supplies need to be developed.
2. Surface water allocations from Lake Okeechobee and the Water Conservation Areas are limited in accordance with the Lake Okeechobee Service Area RAA criteria.
3. Construction of additional storage systems (e.g., reservoirs, aquifer storage and recovery systems) to capture wet season flow volumes will be necessary to increase water availability during dry conditions and attenuate damaging peak flow events from

Lake Okeechobee.

4. Expanded use of reclaimed water is necessary to meet future water supply demands and the Ocean Outfall Law.
5. Expanded use of brackish groundwater from the Floridan aquifer system requires careful planning and wellfield management to prevent undesirable changes in water quality.

Although sufficient capacity is available in the City's water supply and facilities to meet future demand through 2040, the City will continue to address these regional issues by developing appropriate policies and establishing best practices at the local level which may include the following:

1. Employment of alternative sources of water supply. The City has investigated Alternative Water Supplies and prepared a study examining a project that would provide for Biscayne Aquifer recharge with highly treated reclaimed water. The "Alternate Water Supply (AWS) Facility Phase II Pilot Study Summary Report", dated October 17, 2011, was prepared by Calvin, Giordano and Associates, Inc. Although this Biscayne Aquifer recharge project with highly treated reclaimed water appears to be technically feasible, it would appear to not be financially feasible from an economic standpoint due to the stringent water quality requirements established in the Broward County of Ordinances Chapter 27 for water discharged into the ground, surface or marine waters. Therefore, the City has no plans at this time to implement the Biscayne Aquifer recharge project and is investigating other alternative sources of water supply, such as the use of the C-51 Reservoir, as a contingency plan to meet potential shortfalls.
2. Promotion of water conservation. The City continues to be a participant in both the Broward Water Partnership and Conservation Pays programs.
3. Adherence to Broward County standards for water use including mandates for the use of water-conserving appliances in the construction of new homes, restrictions on the hours of lawn irrigation, and establishment of a Florida Landscape Ordinance.
4. Incorporation of objectives and policies within the Comprehensive Plan that ensure resiliency of existing and future water resources.

PART 1 - SECTION ONE

INTRODCUTION

1.01 PURPOSE & SCOPE

The purpose of the City of Pembroke Pines (City) Water Supply Facilities Work Plan (Work Plan) is to identify and plan for the water supply sources and facilities needed to meet the water needs within the City of Pembroke Pines during the 10-year period from 2020 – 2030, and to address water supply related issues affecting Florida’s Lower East Coast Region. Section 163.3177(6)(c)(3), Florida Statutes requires local governments to prepare and adopt Work Plans into their Comprehensive Plans no later than 18 months after the water management district approves a regional water supply plan or its update. The 2018 Lower East Coast Water Supply Plan Update (2018 LEC Plan) was approved for the region by the South Florida Water Management District (SFWMD) on November 8, 2018. Therefore, the deadline for local governments within the Lower East Coast jurisdiction to adopt a Work Plan and amend their Comprehensive Plans to ensure consistency with the 2018 LEC Plan is May 8, 2020. This 10-Year Work Plan has been prepared for the City of Pembroke Pines, located in Broward County, and will be incorporated as part of the Infrastructure Element within the Water Supply section of the Comprehensive Plan.

Water supply options will be developed based upon withdrawals from the Biscayne Aquifer and Alternative Water Supplies. Also, the Eastern and Western wellfields will be reviewed as potential water supply resources. Water demands and flow projections will be developed by using population projections and actual per capita water demands.

1.02 STATUTORY HISTORY

The Florida Legislature enacted bills during the 2002, 2004, 2005, 2011, 2012, 2015, and 2016 sessions to address the state’s water supply needs. These bills, particularly Senate Bills 360 and 444 enacted during the 2005 legislative session, strengthened the statutory links between the regional water supply plans (RWSPs) prepared by water management districts and the Comprehensive Plans prepared by local governments through changes to Chapters 163 and 373, Florida Statutes (F.S.). These changes improved coordination between local land use planning and

regional water supply planning.

1.03 STATUTORY REQUIREMENTS

There are multiple statutory provisions each local government must consider when updating its Work Plan, as summarized below:

1. Coordinate appropriate aspects of the Comprehensive Plan with the applicable RWSP [Section 163.3177(4)(a), F.S.].
2. Ensure the Future Land Use Plan is based on availability of adequate water supplies and public facilities and services [Section 163.3177(6)(a), F.S.]. Data and analyses demonstrating that adequate water supplies and associated public facilities will be available to meet projected growth demands must accompany all proposed Future Land Use Plan and Plan amendments submitted for review.
3. In consultation with the water supplier, ensure adequate water supplies and potable water facilities are available to serve new development no later than the issuance by the local government of a certificate of occupancy or its functional equivalent [Section 163.3180(2), F.S.].
4. For local governments subject to an RWSP, revise the General Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge element (the “Infrastructure element”) through a Comprehensive Plan amendment to:
 - a. Identify and incorporate the alternative water supply project(s) selected by the local government from projects identified in the applicable RWSP, or alternative project(s) proposed by the local government under Section 373.709(8)(b), F.S. [Section 163.3177(6)(c), F.S.];
 - b. Identify the traditional and alternative water supply projects and the conservation and reuse programs necessary to meet water needs identified in the applicable RWSP [Section 163.3177(6)(c)3., F.S.]; and
 - c. Update the Work Plan for at least a 10-year planning period for constructing the public, private, and regional water supply facilities identified in the element as necessary to serve existing and new development [Sections 163.3177(6)(c)3. and (5), F.S.].
5. Revise the Five-Year Schedule of Capital Improvements to include water supply, reuse,

and conservation projects and programs to be implemented during the 5-year period [Section 163.3177(3)(a)4., F.S.].

6. To the extent necessary to maintain internal consistency after making changes described in Paragraph 1 through 5 above, revise the Conservation element to assess projected water needs and sources for at least a 10-year planning period, considering the applicable RWSP and water use permit(s) [Section 163.3177(6)(d), F.S.]. The comprehensive plan must address the water supply sources necessary to meet the existing and projected water use demand for the established planning period, considering the applicable RWSP [Section 163.3167(9), F.S.].
7. To the extent necessary to maintain internal consistency after making changes described in Paragraphs 1 through 5 above, revise the Intergovernmental Coordination element to ensure consistency between the Comprehensive Plan and the applicable RWSP [Section 163.3177(6)(h)1., F.S.].
8. Local governments are required to comprehensively evaluate and update the Comprehensive Plan to reflect changes in local conditions every seven years. The evaluation could address the local government's need to update their Work Plan, including the development of alternative water supplies, and determine whether the identified alternative water supply projects, traditional water supply projects, and conservation and reuse programs are meeting local water use demands [Section 163.3191(3), F.S.].
9. Local governments may be exempt from updating their Work Plan if they meet certain criteria. A local government that does not own, operate, or maintain its own water supply facilities and is served by a public water supply entity with a permitted allocation of 300 million gallons per day or greater is not required to amend its Comprehensive Plan when an RWSP is updated if the local government uses less than 1 percent of the public water supply entity's total permitted allocation. However, the local government must cooperate with the public water supply entity that provides service within its jurisdiction and must keep the Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge element up to date, pursuant to Section 163.3191, F.S. A local government should contact the Florida Department of Economic Opportunity (DEO) to verify its qualifications for the

exemption [Section 163.3177(6)(c)4., F.S.].

10. Local governments with a Sector Plan adopted in accordance with Section 163.3245, F.S., should incorporate information from the adopted Sector Plan, Master Plan, and Detailed Specific Area Plan into the Work Plan. The focus should be on water needs, water supply and resource development, conservation measures, and intergovernmental coordination activities with the SFWMD and water supply development projects needed to address projected development in the Sector Plan area [Section 163.3245, F.S.].

1.04 RELEVANT REGIONAL ISSUES

As the State agency responsible for water supply in the Upper and Lower East Coast planning areas, the SFWMD plays a pivotal role in resource protection, through criteria used for Consumptive Use Permitting. As pressure increased on the Everglades ecosystem resource, the SFWMD Governing Board initiated rulemaking to limit increased allocations dependent on the Everglades system. As a result, the Regional Water Availability Rule was adopted by the Governing Board on February 15, 2007 as part of the SFWMD's water use permit program. This reduced reliance on the regional system for future water supply needs, mandates the development of alternative water supplies, and increased water conservation and reuse.

The following are the regional issues identified for 2040 in the Lower East Coast Planning Region:

1. Fresh surface water and groundwater are limited; further withdrawals could have impacts on the regional system, wetlands, existing legal uses, and saltwater intrusion. As a result, additional alternative water supplies need to be developed.
2. Surface water allocations from Lake Okeechobee and the Water Conservation Areas are limited in accordance with the Lake Okeechobee Service Area RAA criteria.
3. Construction of additional storage systems (e.g., reservoirs, aquifer storage and recovery systems) to capture wet season flow volumes will be necessary to increase water availability during dry conditions and attenuate damaging peak flow events from Lake Okeechobee.
4. Expanded use of reclaimed water is necessary to meet future water supply demands and the Ocean Outfall Law.

5. Expanded use of brackish groundwater from the Floridan aquifer system requires careful planning and wellfield management to prevent undesirable changes in water quality.

The City of Pembroke Pines will continue to address these regional issues by developing appropriate policies and establishing best practices at the local level which may include the following:

1. Employment of alternative sources of water supply. The City has investigating Alternative Water Supplies and prepared a study examining a project that would provide for Biscayne Aquifer recharge with highly treated reclaimed water. The “Alternate Water Supply (AWS) Facility Phase II Pilot Study Summary Report”, dated October 17, 2011, was prepared by Calvin, Giordano and Associates, Inc. Although this Biscayne Aquifer recharge project with highly treated reclaimed water appears to be technically feasible, it would appear to not be financially feasible from an economic standpoint. Therefore, the City has no plans at this time to implement this project and is investigating other alternative sources of water supply such as the use of the C-51 Reservoir.
2. Promotion of water conservation.
3. Adherence to Broward County standards for water use including mandates for the use of water-conserving appliances in the construction of new homes, restrictions on the hours of lawn irrigation, and establishment of a Florida Landscape Ordinance.
4. Incorporation of goals, objectives and policies within the Comprehensive Plan that ensure resiliency of existing and future water resources in areas.

With portions of the City of Pembroke Pines being provided water service from other utilities, such as Broward County Water and Wastewater Services (BCWWS) and the City of Hollywood, the proposed water supply projects identified in the 2018 LEC Plan for those utilities has been incorporated into this Work Plan. Although these utilities have identified their ability to meet their water demand for the year 2040, these projects are being proposed to diversify their water sources or improve their current treatment methods to increase capacity. Those projects include:

1. City of Hollywood plans to expand its reverse osmosis treatment plant by 2.00 MGD

- and install two additional Floridan Aquifer System wells, which will provide a total of 4.00 MGD of additional water.
2. BCWWS (District 1) has constructed two Floridan Aquifer System wells and plans to add reverse osmosis treatment to its water treatment plant, which will provide a total of 3.00 MGD of additional water.
 3. BCWWS (District 2A/North Regional Wellfield) plans to add Florida Aquifer System wells and expand its water treatment plan to include reverse osmosis treatment or utilize 3.00 MGD in Phase 1 of the C-51 Reservoir for impact offsets, which will provide a total of 9.00 MGD of additional water.
 4. BCWWS (South Regional Wellfield) has entered into an agreement for 3.00 MGD capacity allocation in Phase 1 of the C-51 Reservoir with Palm Beach County Aggregates.
 5. BCWWS (District 2A/North Regional Wellfield) has entered into an agreement for 3.00 MGD capacity allocation in Phase 1 of the C-51 Reservoir with Palm Beach County Aggregates.

PART 2 - SECTION TWO

10 YEAR PROJECTIONS

2.01 POPULATION PROJECTIONS

Projections of population growth are essential for estimating future water demands. Anticipated population growth within the City of Pembroke Pines is projected on the basis of historical trends and expected land use development. Population projections developed in this Section are used to estimate future water demands.

Historical population and growth trends are available from the U.S. Census Bureau, the City's Planning & Economic Development Department, Broward County, South Florida Water Management District (SFWMD), and the University of Florida Bureau of Economic and Business Research (BEBR) medium range population projections. We have used the 2018 LEC Plan population forecasting model results for population estimates which uses the Bureau of Economic and Business Research population projections report published in *Projections of Florida Population by County, 2020-2040, with Estimates for 2016* (Rayer, S. and Y. Wang, 2017).

The City boundary is not anticipated to change unless future annexation occurs. If boundary expansions take place in the future, the only areas likely to expand are the northwestern or northeastern portions of the City. The northwestern area is comprised of estate type homes, ranches and agricultural type land uses, and is therefore not anticipated to have a significant impact on future water demands and wastewater flows.

Land use revisions are usually difficult to get approved since the City, County, Regional Planning Council and Department of Economic Opportunity (DEO) must approve revisions to the current approved land uses. Land use revisions are particularly difficult to accomplish in Broward County. It is therefore believed that the current land uses will remain unchanged.

Table 2-1 shows the historic and projected population for the entire City of Pembroke Pines. Build-out is expected to occur in next few years with infill occurring after build-out, based upon the City Planning & Economic Development Department's current estimations.

2.02 WATER DEMANDS AND FUTURE RAW WATER SUPPLIES

Before facilities can be sized, the future demands for water within the City served by the facilities must be determined. To project future water demands, past consumption and future expected consumption must be analyzed. A thorough review of the City's past and present water consumption and demands was performed, which included the Water Treatment Plant Monthly Operation Reports from January 2017 through December 2019. The past three years of data was analyzed and are presented in Table 2-2. The January 2019 to December 2019 data indicates the Average Daily Demand (ADD) for raw water was 12.81 Million Gallons per Day (MGD). Total raw water pumped from the Biscayne Aquifer was 4,673.96 MG. The Maximum ADD per month pumpage was 13.41 MGD and occurred in March 2019. The average peak factor ratio of Maximum ADD pumpage to average monthly ADD pumpage over the past three years was 1.05. See Appendix A for Combined Wellfield Pumpage Reports for the East and Central Wellfields.

Historical and Past Water Usage was also analyzed from 2010 through 2019 and the results are shown in Table 2-3. The City is a largely year round residential community with no seasonal demand peaks. Water use is relatively constant over the entire year. The City does not allow irrigation with potable water so there is no effect due to increased or decreased irrigation demand. Due to water restrictions imposed as a result of draught conditions, and the permanent water restrictions in place as mandated by the SFWMD, the average gallons per capita day for the past three years has been used for forecasting future water usage and it is projected that the population will continue to use less water than previously due to:

- A conservation rate structure and,
- Public awareness of the need to conserve water.

Projected water use for the City was calculated and is presented in Table 2-4. Projected water use was calculated from 2020 through 2040. The ADD was based upon a 2017 through 2019 treated water data and the per capita water usage was calculated to be 82.68 gallons per capita per day (gpcd). For the year 2040, the estimated ADD was calculated to be 13.43 MGD.

Broward County WWS supplies water to a portion of Pembroke Pines which is within District 3BC. The residential area is bounded to the east by the Florida Turnpike, SW 72nd Ave to the

west, SW 9th St. to the north and South Airport Rd. to the south. The area also includes North Perry Airport. Based on Table WS23, in the 2020 Broward County Water Supply Facilities Work Plan, Table 2-4 indicates projected use by the City of Pembroke Pines.

The City of Pembroke Pines routinely coordinates with Broward County WWS concerning the management of their water distribution system. Although there is no formal interconnect agreement that governs this coordination, these coordination efforts and development procedures that are in place are adequate to ensure future water demand is available. At this time, the future water demand for this small portion of the City of Pembroke Pines that is served by Broward County WWS is not anticipated to increase because this area has reached buildout conditions.

2.03 WELLFIELDS INFORMATION

Figure 2-3 is a map of the City's two wellfields that are both located on Johnson Street. The wellfields are approximately one mile apart. The City's only water use withdrawal facilities are the nine (9) wells located in these two wellfields. Table 2-5 describes wells 1 through 5, which are located at the water treatment plant (Central Wellfield), and wells 6, 9, 10, and 11, which are located on the corner of N.W. 72 Avenue and Johnson Street (Eastern Wellfield). The nine wells are owned and operated by the City of Pembroke Pines.

The following capital improvement projects, affecting the wellfield system, will be completed in the next five years.

1. New raw water main between the eastern wellfield and the water treatment plant. This will provide a redundancy as the existing 24" Raw Water Main will also be rehabilitated. The project is anticipated to be completed in 2022.
2. Variable frequency drives will be installed on the pumps at the central wellfield. This will allow more control of the pumps to better meet regulatory requirements. The project is anticipated to be completed in 2020.
3. Evaluation of raw water well #6. A physical and hydrogeological assessment will be performed to determine how to address the current state of the well and what steps may be taken to upgrade the well. The project is anticipated to be completed in 2020.

The current water use permit expires on August 18, 2030. The current permitted withdrawal amount is 5695 million gallons (MG) per year which equates to approximately 15.60 MGD.

2.04 SERVICE AREA AND OTHER SERVICE PROVIDERS

The City of Pembroke Pines current and future water service area with interconnects is presented as Figure 2-2. The City currently has four (4) emergency interconnects with neighboring municipal water systems, which include one (1) with Cooper City, two (2) with the City of Miramar, and one (1) with the City of Sunrise but does not provide water to these or other surrounding municipalities. The Town of Southwest Ranches is not serviced by the City of Pembroke Pines nor are there plans to provide water service in the future. There are, however, 5 individual homes (population of approximately 12 people total) in the Town of Southwest Ranches that requested and were allowed to connect to the City's water system. The City intends to continue to provide service to these accounts but has no plans to make additional connections. There are no domestic water self-supply systems in the City.

Broward County Water and Wastewater Services (BCWWS) provide water to a small portion of the southeastern section of the City of Pembroke Pines. The residential area is bounded to the east by the Florida Turnpike, SW 72nd Ave to the west, SW 9th St. to the north and South Airport Rd. to the south. The area also includes North Perry Airport. Table 2-4 indicates Pembroke Pines's projected water use from BCWWS. Projected water use was calculated from 2020 through 2040 using population numbers and a per capita water usage of 127 gallons per capita per day from the 2020 Broward County Water Supply Facilities Work Plan. BCWWS purchases water through an agreement with the City of Hollywood. Currently, the City of Hollywood has no capital needs to meet future demands (see attached section, from the Hollywood Water Supply Capital Improvements, in appendix). However, if capacity is needed, the reverse osmosis system can be expanded as outlined in the 2018 LECWSP (see attached section from, Hollywood Capital Improvement listed in 2018 LECWSP, in appendix). BCWWS intends to continue to provide service to these homes and has accounted for this area in its Work Plan. The estimated water distribution from BCWWS to the City of Pembroke Pines is as follows:

Broward County's WUP No. 06-00038 -W states a maximum allowable annual average raw water withdrawal from the Biscayne Aquifer, of 11,205 MG (30.7 MGD). WUP No. 06-00038-W also

states a maximum allowable annual average raw water withdrawal from the Floridan Aquifer of 3,168 MG (8.7 MGD). The maximum monthly withdrawal from the Biscayne Aquifer is 1,062.20 MG and the maximum month withdrawal from the Florida Aquifer is 259.00 MG.

The Broward County Water Supply Facilities Work Plan has taken into consideration the City of Pembroke Pines' customers in its Work Plan and additional coordination between the two governmental entities will occur (see attached section, Broward County Water Supply Facilities Work Plan, in appendix)

- Current and future water sources:

Current water sources for the Broward County water system consist of purchasing finished water from the City of Hollywood WTP and reselling to a small portion of the City's jurisdiction. The City of Hollywood's WTP treats water from its own Biscayne Aquifer wellfield, the Broward County South Regional Biscayne Wellfield, as well as water from the Floridan Aquifer wells.

- Existing and future water treatment facilities and capabilities to meet demand over planning period:

Each district under BCWWS has different water treatment facilities treating their water, District 1 service area contains all of Lauderdale Lakes and portions of the cities of Fort Lauderdale, Lauderdale, North Lauderdale, Oakland Park, Plantation, Pompano Beach and Tamarac. The raw water is treated at the District 1 Water Treatment Plant, operating under permit no. 06-58-00009. The projected raw water use of the year 2040 accounts for 56% of the water treatment plant capacity, thus the facility is capable of meeting future demands.

District 2 service area contains portions of the cities of Deerfield Beach, Lighthouse Point and Pompano Beach; and provides water to portions of the City of Coconut Creek. The raw water is treated at the District 2 WTP, operating under permit no. 06-58-00010. The projected raw water use of the year 2040 accounts for 49% of the water treatment plant capacity, thus the facility is capable of meeting future demands.

District 3 service area contains portions of the cities of Dania Beach, Davie, Fort Lauderdale, Miramar, West Park Pembroke Park, Pembroke Pines and Hollywood, as well as Fort Lauderdale-Hollywood International Airport. District 3 does not have water treatment facilities. The water for District 3 is supplied by the City of Hollywood under CUP no. 06-00038-W.

- Infrastructure and capital improvement needs of BCWWS, including needs identified in the 2018 lower east coast water supply plan update.
- The City of Hollywood Capital Improvement Plan can be seen in the Hollywood Water Supply Capital Improvements, page WS 6-1, attached in appendix.

Furthermore, the Broward County Capital Improvements Plan is displayed in the 2018 LECWSP update (see attached section, Broward County Water Supply Development Projects listed in 2018 LECWSP, in appendix).

2.05 FACILITIES

A. WATER TREATMENT PLANT

The existing water treatment plant has a rated capacity of 18.0 million gallons per day (MGD). Six (6) MGD treatment capacity was added for redundancy. The facility is located at the intersection of Johnson Street and University Drive in the City of Pembroke Pines. The City has two (2) 2.0 million gallons (MG) and one (1) 1.0 million gallons (MG) finished water storage tanks located at the water treatment plant. The method of treatment is by lime softening, carbon dioxide injection, filtration, ion exchange, and disinfection with sodium hypochlorite. Figure 2-3 shows the layout of the water treatment plant and various components of the water treatment process, and Table 2-6 details the predominant features of the water treatment plant. The water treatment plant is supplied by a total of nine (9) wells.

In addition to the water treatment plant, the City has two (2) water booster pumping stations. The first is located in the north central part of the City at Academic Village, and the second is located in the extreme western end of the City at Holly Lake. The Academic Village booster pump station is rated at 5,200 gallons per minute (GPM) and includes one (1) 2.5 million gallon (MG) finished water storage tank, a high service pump building, and a sodium hypochlorite disinfection facility.

The Holly Lake booster pump station is rated at 10,000 gallons per minute (GPM) and includes two (2) 2.5 million gallons (MG) finished water storage tanks, a high service pump building, and a sodium hypochlorite disinfection facility. Figures 2-4 and 2-5 show the layout of Academic Village and Holly Lake booster stations respectively.

The City has four (4) large mag-meters for raw water flow on the incoming or influent end of the water treatment plant. These meters register all raw water entering the plant from both wellfields. The City has installed individual mag-meters for metering flow from all wells. The City also meters finished (treated) water leaving the plant with two (2) large (24" and 16") water meters. Each customer receiving water has a water meter to register and total the amount of water consumed.

The shallow Biscayne Aquifer is the sole source of water for the City of Pembroke Pines as well as most of Broward County. The Biscayne Aquifer lies just below the surface. The City's wellfield draws from a portion of the Biscayne Aquifer approximately 112 feet deep. Private irrigation wells are reported to draw from a shallower portion of the aquifer.

The City of Pembroke Pines has the highest municipal firefighting rating available with an ISO rating of 1. Fire hydrants are available throughout the City and are tested annually. The City's high service pumps at the water treatment plant, Academic Village Booster Station, and at the Holly Lake Booster Station provide the City with up to 34,055 GPM pumping capacity. Emergency power for the pumps is provided at each site. The total water storage tank capacity is 12.5 MG and provides the City with more than a 10-hour firefighting duration.

The following capital improvement projects, affecting the water treatment plant, will be completed in the next five years.

1. Install three (3) 30" isolation valves on the lime softening treatment units discharge process pipes. This will allow the pipes to be cleaned and maintained without interfering with water treatment plant operations. The project is anticipated to be completed in 2020.
2. Install an inline flowmeter/totalizer on the existing 30" treated water distribution pipe. This will allow more accurate measurement of the treated water leaving the water treatment plant. The project is anticipated to be completed in 2020.

B. WASTEWATER TREATMENT PLANT

The City is separated into two wastewater collection and treatment zones, the eastern and western zones. Each serves approximately ½ of the City. The western portion of the City is considered to be the area west of Flamingo Road. Wastewater flows are presented from readings of the effluent meter at the Pembroke Pines WWTP from injection wells 1 and 2. The average Pembroke Pines wastewater effluent production for the western portion of the City amounted to approximately 6.85 MGD in 2017-2019.

In addition, the City of Pembroke Pines owns and operates a wastewater collection and transmission system east of Flamingo Road. The wastewater generated by this area is transmitted to the City of Hollywood regional wastewater treatment facility and is governed by a Large User Agreement. The wastewater from this area averages (years 2017-2019) approximately 7.64 MGD. Therefore, the total amount of wastewater generated the eastern and western portions of the City is approximately 14.49 MGD.

Table 2-1 City of Pembroke Pines Historical and Projected Population

YEAR	HISTORICAL AND PROJECTED POPULATION
2010	*152,002
2011	*152,733
2012	*153,464
2013	*154,195
2014	*154,926
2015	*155,657
2016	**161,337
2017	**162,041
2018	**162,744
2019	**163,448
2020	**164,152
2025	**165,917
2030	**167,682
2035	**167,210
2040	**166,913

* Populations Based on South Florida Water Management District Lower East Coast Water Supply Plan Update - 2013

** Populations Based on South Florida Water Management District Lower East Coast Water Supply Plan Update - 2018

Table 2-2 City of Pembroke Pines Water Use For 3 Year Period

FROM: January 2019 TO: December 2019

DATE	RAW WATER PUMPED AVG DAY (MG)	TOTAL RAW WATER PUMPED (MGM)	TOTAL WATER TREATED (MGM)
Jan-19	13.08	405.43	398.86
Feb-19	12.88	360.59	355.69
Mar-19	13.41	415.77	409.34
Apr-19	13.01	390.40	387.40
May-19	12.68	393.05	378.93
Jun-19	12.72	381.46	372.79
Jul-19	12.62	391.20	378.94
Aug-19	12.49	387.30	369.08
Sep-19	12.68	380.38	369.13
Oct-19	12.90	399.91	387.27
Nov-19	12.67	380.24	371.22
Dec-19	12.52	388.23	381.11
TOTAL		4673.96	4559.76
AVERAGE	12.81	389.50	379.98
MAX PUMPED (DAY)	15.12		
PEAK FACTOR	1.18		

Information obtained from the City of Pembroke Pines 2019 Water Balance Summary Sheet.

FROM: January 2018 TO: December 2018

DATE	RAW WATER PUMPED AVG DAY (MG)	TOTAL RAW WATER PUMPED (MGM)	TOTAL WATER TREATED (MGM)
Jan-18	12.65	392.25	420.04
Feb-18	12.89	360.90	385.51
Mar-18	13.02	403.57	433.40
Apr-18	13.22	396.47	409.83
May-18	12.44	385.73	410.85
Jun-18	12.31	369.35	398.69
Jul-18	12.47	386.61	418.95
Aug-18	12.48	386.90	413.78
Sep-18	12.60	378.13	402.76
Oct-18	12.65	392.07	415.99
Nov-18	12.99	389.62	414.02
Dec-18	13.10	406.14	430.46
TOTAL		4647.74	4954.28
AVERAGE	12.73	387.31	412.86
MAX PUMPED (DAY)	15.52		
PEAK FACTOR	1.22		

Information obtained from the City of Pembroke Pines 2018 Water Balance Summary Sheet.

FROM: January 2017 TO: December 2017

DATE	RAW WATER PUMPED AVG DAY (MG)	TOTAL RAW WATER PUMPED (MGM)	TOTAL WATER TREATED (MGM)
Jan-17	12.72	394.36	400.28
Feb-17	12.96	362.86	383.19
Mar-17	12.71	393.97	423.43
Apr-17	12.67	380.08	402.37
May-17	12.47	386.56	415.46
Jun-17	11.81	354.25	378.64
Jul-17	11.96	370.73	400.67
Aug-17	12.25	379.90	405.78
Sep-17	12.48	374.45	399.44
Oct-17	12.42	384.91	404.11
Nov-17	12.53	375.92	402.35
Dec-17	12.59	390.46	419.19
TOTAL		4548.45	4834.91
AVERAGE	12.46	379.04	402.91
MAX PUMPED (DAY)	16.23		
PEAK FACTOR	1.30		

Information obtained from the City of Pembroke Pines 2017 Water Balance Summary Sheet.

Table 2-3 City of Pembroke Pines Past Water Use

YEAR	PAST POPULATION PEMBROKE PINES SERVICE AREA	PAST POPULATION BROWARD COUNTY SERVICE AREA	(1, 2) AVERAGE DAY DEMAND (MG) PEMBROKE PINES SERVICE AREA	(1, 2) PER CAPITA USAGE PEMBROKE PINES SERVICE AREA	(3, 4) PER CAPITA USAGE BROWARD COUNTY SERVICE AREA	(3, 4) AVERAGE DAY DEMAND (MG) BROWARD COUNTY SERVICE AREA
2010	*148,050	***3,952	11.98	80.39	118	0.47
2011	*148,762	***3,971	11.90	80.00	126	0.50
2012	*149,474	***3,990	11.90	79.64	122	0.49
2013	*150,186	***4,009	12.59	83.80	127	0.51
2017	**157,863	***4,178	13.25	83.91	122	0.51
2018	**158,498	***4,246	13.57	85.64	127	0.54
2019	**159,133	***4,315	12.49	78.50	127	0.55

(1) Based on Pembroke Pines 10 Year Water Supply Facilities Work Plan (gpcd) – 3/12/15 for 2010- 2013.

(2) Based on a 2017, 2018 and 2019 average per capita (gpcd) usage of 82.68.

(3) Based on Broward County 10 Year Water Supply Facilities Work Plan - 4/21/20 for 2010 – 2017.

(4) Based on Broward County 10 Year Water Supply Facilities. Work Plan – 4/21/20 per capita (gpcd) usage of 127 and Table WS23 for 2018 and 2019.

* Population based on South Florida Management District Lower East Coast Water Supply Plan Update - 2013

**Population based on South Florida Management District Lower East Coast Water Supply Plan Update – 2018

***Population based on Broward County 10 Year Water Supply Facilities Work Plan – 4/21/20

Table 2-4 City of Pembroke Pines Projected Water Use

YEAR	(1) PROJECTED POPULATION PEMBROKE PINES SERVICE AREA	(2) PROJECTED POPULATION BROWARD COUNTY SERVICE AREA	(3) AVERAGE DAY DEMAND (MG) PEMBROKE PINES SERVICE AREA	(4) AVERAGE DAY DEMAND (MG) BROWARD COUNTY SERVICE AREA	(5) MAXIMUM DAY DEMAND (MG) PEMBROKE PINES SERVICE AREA	(6) MAXIMUM DAY DEMAND (MG) BROWARD COUNTY SERVICE AREA
2020	159,768	4,384	13.21	0.56	15.82	0.60
2025	161,583	4,334	13.36	0.55	16.00	0.59
2030	163,388	4,294	13.51	0.55	16.19	0.58
2035	162,793	4,417	13.46	0.56	16.12	0.60
2040	162,436	4,477	13.43	0.57	16.09	0.59

(1) Based on SFWMD Lower East Coast Water Supply Plan Update – 2018.

(2) Based on Broward County 10 Year Water Supply Facilities Work Plan – 4/21/20.

(3) Based on a 2017, 2018 and 2019 average per capita (gpcd) usage of 82.68.

(4) Based on Broward County 10 Year Water Supply Facilities. Work Plan – 4/21/20 per capita (gpcd) usage of 127 and Table WS23.

(5) Based on a three year average peak factor of 1.23.

(6) Based on Broward County 10 Year Water Supply Facilities Work Plan – 4/21/20 five year average peak factor of 1.08.

Table 2-5 City of Pembroke Pines Central Wellfield Description

DESCRIPTION	WELL No. 1	WELL No. 2	WELL No. 3	WELL No. 4	WELL No. 5
Map Designation	WEST	WEST	WEST	WEST	WEST
Existing or Proposed	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING
Diameter (inches)	12	12	12	16	16
Total Depth (feet)	112.5	112	111	144	115
Cased Depth (feet)	105	105	105	114	103
Screened Interval	NONE	NONE	NONE	NONE	NONE
Pumped or Flowing	PUMPED	PUMPED	PUMPED	PUMPED	PUMPED
Working Valve, If Artesian (yes or no)	NO	NO	NO	NO	NO
Pump Manufacturer and Model Number	B.JACKSON 12 HQR	INGERSOLLRAND 10 NKH	FAIRBANKS MORSE 11M-7000	PEERLESS1 2 HXB	PEERLESS1 4 HXB
Pump Type (Centrifugal, Jet, Deep Jet, Turbine, etc.)	TURBINE	TURBINE	TURBINE	TRUBINE	TURBINE
Intake Depth (NGVD)	39'	23'	23'	23'	30'
Pump or Flow Capacity (GPM at Ft. of Head)	2000 GPM@ 45'	1000 GPM@ 32'	825 GPM@ 58'	2100 GPM@ 43'	2350 GPM@ 57'
Active (yes or no)	YES	YES	YES	YES	YES
Year Drilled	1963	1963	1963	1973	1973
Type of Meter	MAG	MAG	MAG	MAG	MAG

DESCRIPTION	WELL No. 6	WELL No. 9	WELL No. 10	WELL No. 11
Map Designation	EAST	EAST	EAST	EAST
Existing or Proposed	EXISTING	EXISTING	EXISTING	EXISTING
Diameter (inches)	10	18"	18"	18"
Total Depth (feet)	94	125'	123'	125'
Cased Depth (feet)	90	102'	100'	102'
Screened Interval	NONE	NONE	NONE	NONE
Pumped or Flowing	PUMPED	PUMPED	PUMPED	PUMPED
Working Valve, If Artesian (yes or no)	NO	NO	NO	NO
Pump Manufacturer and Model Number	FLOWAY16MKL	FLOWAY16MKL	B. JACKSON15HQ	B. JACKSON15HQ
Pump Type (Centrifugal, Jet, Deep Jet, Turbine, etc.)	TURBINE	TURBINE	TURBINE	TURBINE
Intake Depth (NGVD)	39'	47'	49'	49'
Pump or Flow Capacity (GPM at Ft. of Head)	1580 GPM@ 52'	3000 GPM@ 60'	3000 GPM@ 60'	3000 GPM@ 60'
Active (yes or no)	YES	YES	YES	YES
Year Drilled	2000	1994	1995	1995
Type of Meter	MAG	MAG	MAG	MAG

Information obtained from South Florida Water Management District Permit No. 06-00135-W, dated 8/16/2010.

Table 2-6 City of Pembroke Pines Water Treatment Plant Features

COMPONENT	DESCRIPTION
RAW WATER WELLS:	The City has nine (9) raw water wells. Five are located on the water treatment plant site (Central Wellfield) and four (4) are located one mile east of the water treatment plant at the Eastern Wellfield site. The total rated capacity of the wellfields is 18,855-gpm.
WATER TREATMENT UNITS:	There are four (4) steel pre-engineered Accelator treating units (softeners) each rated at 6.0 MGD.
CO2 INJECTION SYSTEM	There are four (4) 40 lbs./hr. CO2 injection systems and one (1) 26 ton CO2 storage tank.
GRAVITY SAND FILTERS:	There are four (4) Greenleaf multi-media four cell filter units.
LIME SILOS:	There are three (3) lime silos for storing and mixing the lime.
CLEARWELL AND TRANSFER PUMPS:	Pumps transfer water from the clearwell to the storage tanks and to the Ion Exchange filters and the clearwell as needed.
GROUND STORAGE TANKS:	There are two (2) 2.0 MG and one (1) 1.0 MG pre-stressed concrete ground storage tanks.
HIGH SERVICE PUMP STATION:	Nine (9) motors range from 40 hp to 125 hp; pumps are 4" through 8" size and are capable of pumping a total of 18,120 gallons per minute (GPM).
BACKWASH BASIN AND TRANSFER PUMPS:	Recovers filter backwash water and transfers water to the head of the plant.
SLUDGE POND:	Provides for a discharge of lime softening sludge.
MAINTENANCE BUILDING:	Houses the office of maintenance supervisors and equipment for both the distribution system and the treatment system.
CONTROL BUILDING:	Houses the plant laboratory, water quality testing equipment, and the controls and monitoring equipment used by the chief water plant operator.
CHEMICAL FEED BUILDING:	Houses the plant chemical feed processing equipment.
ELECTRICAL BUILDING:	Houses the FPL transformer and the emergency diesel generator set including switchgear.

Information obtained from Broward County Health Department Permit No. 0125162-203-WC, dated 2/2/2007.

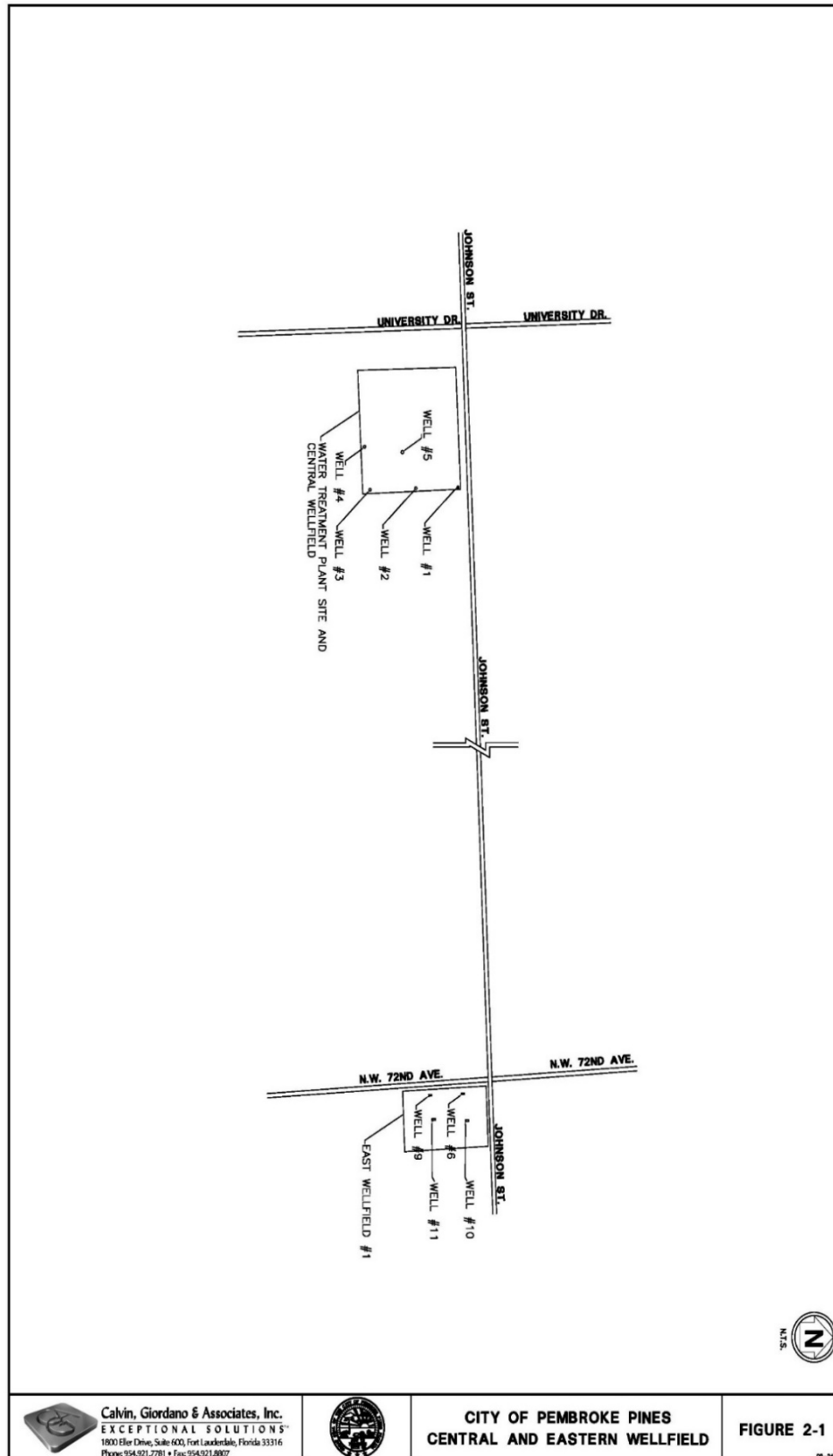


Figure 2-1 Central and Eastern Wellfield (June 3, 2020)

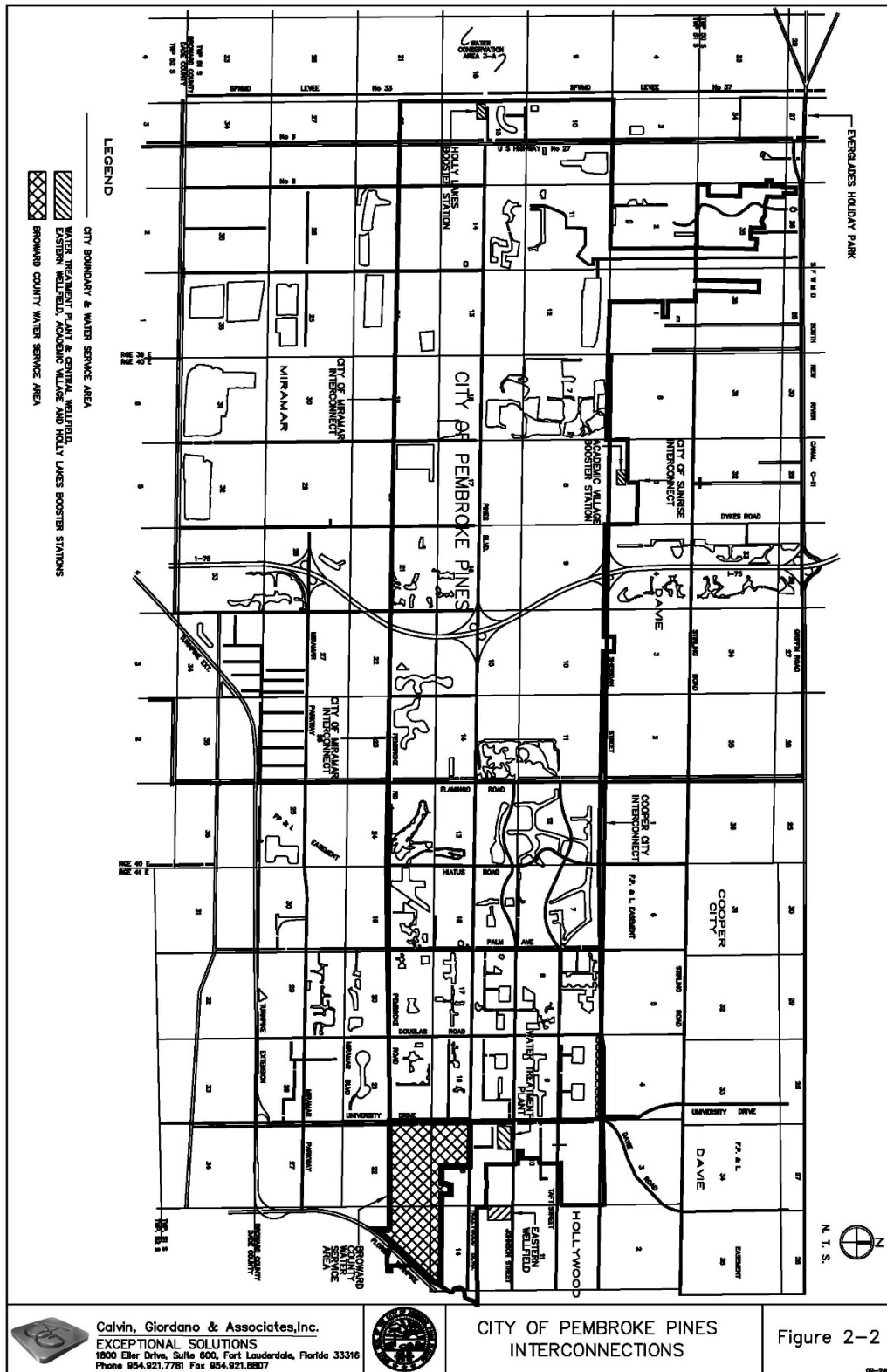
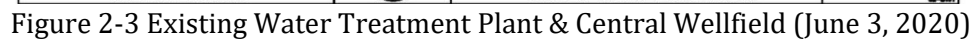


Figure 2-2 Interconnections (June 3, 2020)



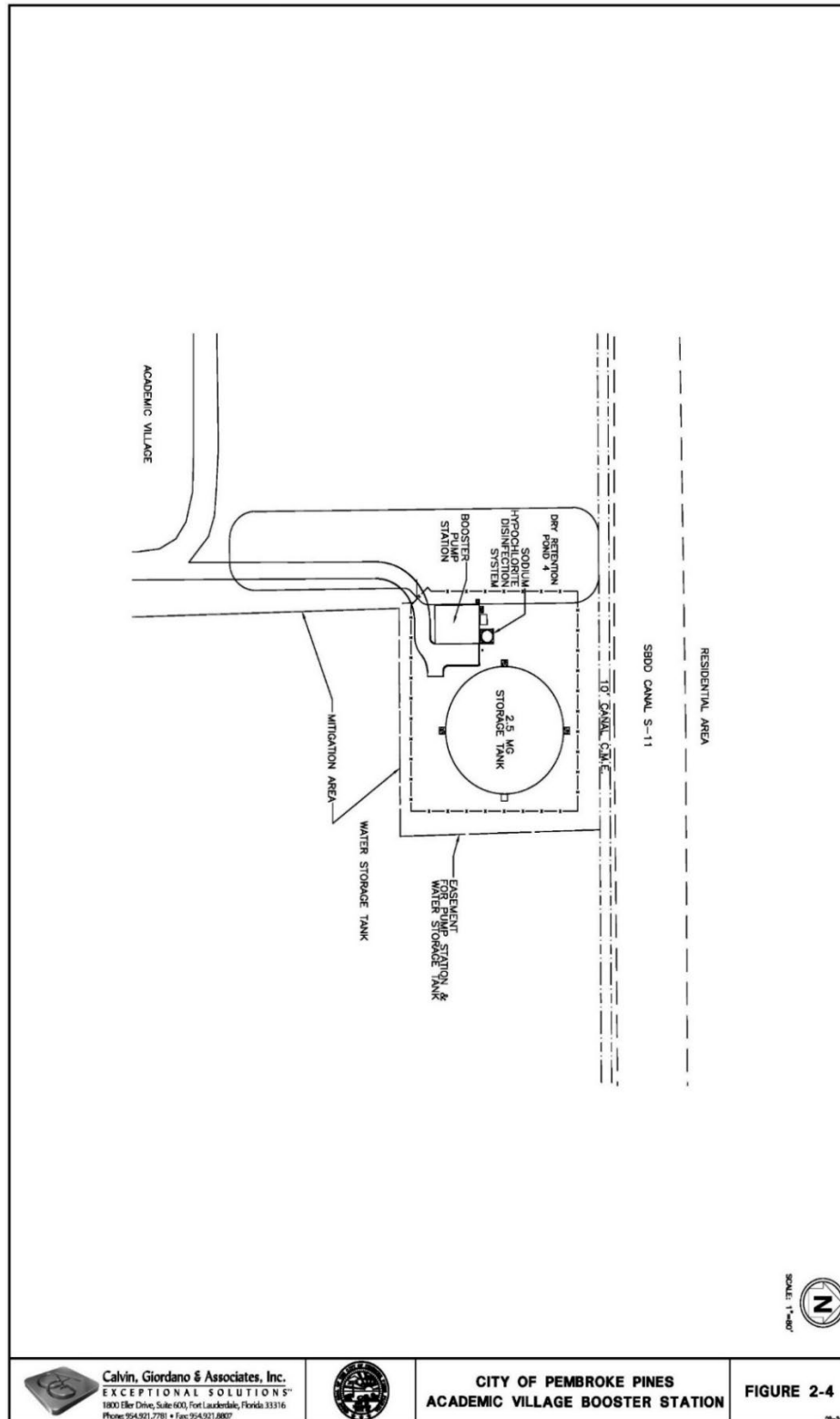


Figure 2-4 Academic Village Booster Station (June 3, 2020)

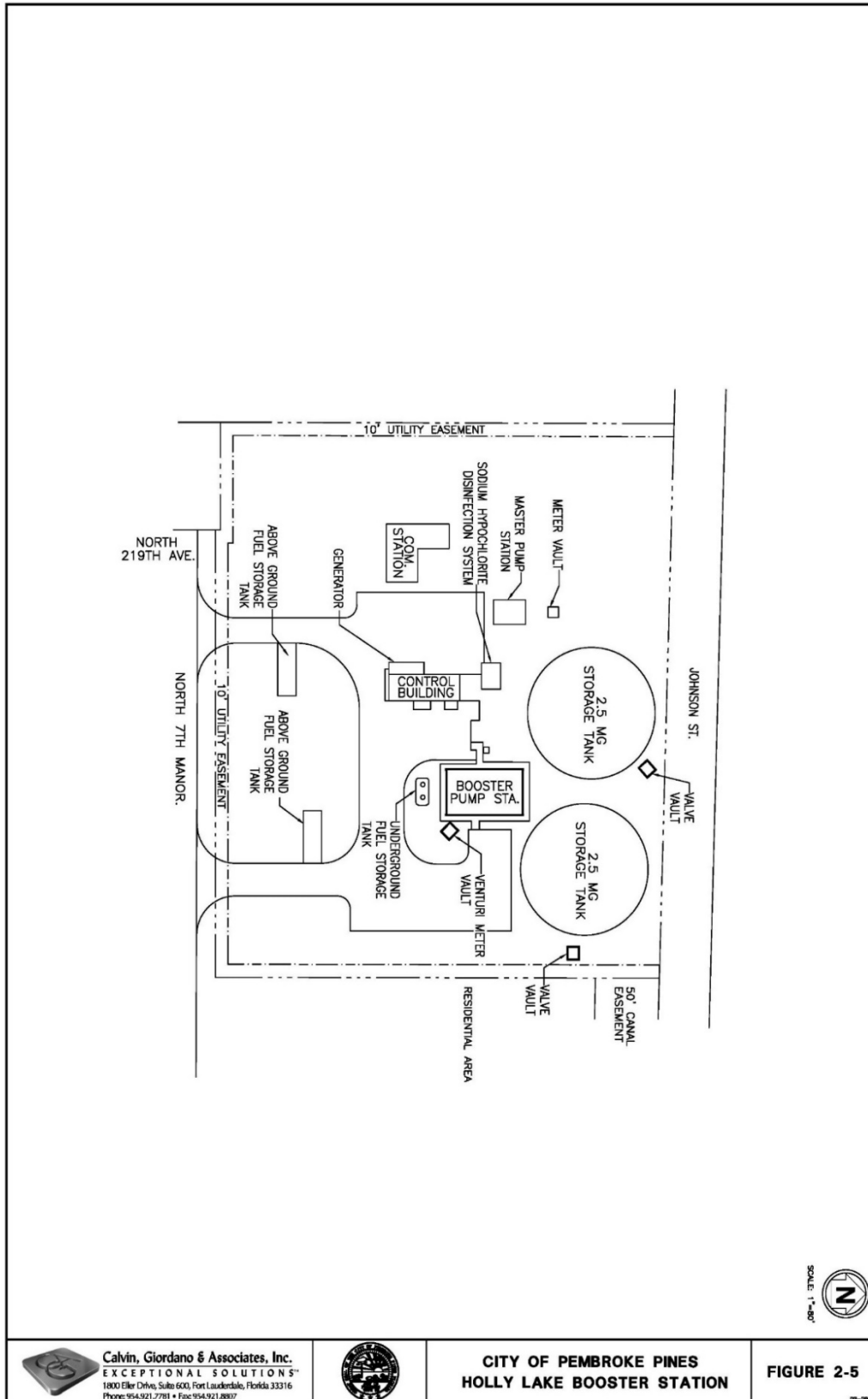


Figure 2-5 Holly Lake Booster Station (June 3, 2020)

PART 3 - SECTION THREE

ALTERNATIVE WATER SUPPLY CONSIDERATIONS

3.01 ASSESSMENT OF CONTINUED AND INCREASED WATER WITHDRAWALS FROM THE BISCAYNE AQUIFER

A. Saline Intrusion of Wellfields

The City's eastern wellfield is located approximately 2 miles from the C-10 spur canal, the closest possible source of saline water. The potential for saline intrusion into the eastern wellfield was evaluated in the detailed model prepared for the eastern wellfield by Blasland, Bouck and Lee, Inc. for the latest Consumptive Water Use Permit (CUP). The model indicated that the City of Hollywood's wellfield restricted the City of Pembroke Pines eastern wellfields cone of influence and prevents possible saline intrusion from the C-10 spur canal. Therefore, the potential for adverse impacts from saline water intrusion as a result of the proposed maximum daily withdrawal rate is considered minimal.

B. Broward County Wellfield Protection Ordinance

The City has complied with the Broward County Wellfield Protection Ordinance, and there are no current or anticipated wellfield protection ordinance problems with the City and their wellfields. Increased withdrawals over the last ten (10) years have shown no major changes in draw down in the area of the City wellfields and therefore no problems are anticipated with saltwater intrusion or from any other potential problems.

3.02 PLANS FOR WATER SHORTAGES DUE TO WELLFIELD FAILURES

The City currently has sufficient backup raw well capacity and also has sufficient finished water storage capacity to handle peak hour demands and fire flow demands in its current system. Both the east and the central wellfields have emergency power provisions to maintain operation during power outages. The City's water transmission and distribution system is also interconnected with several neighboring municipal water systems that are available in the event of a wellfield failure that could interrupt their water supply.

3.03 CONSERVATION MEASURES TO HELP REDUCE AQUIFER STRESS

The City's Water Conservation Plan was submitted with the full Consumptive Water Use Permit Application. The City does not allow irrigation with potable water. The City has implemented a water conservation plan with elements such as Florida Friendly Landscaping, a leak detection program, water conserving rate structure, and a permanent irrigation ordinance and rain sensor devices. These items contribute to the overall plan for water conservation and help reduce stress on the aquifer and allow the City to maintain one of the lowest per capita water use values in the county. Detailed descriptions of the City's conservation efforts can be found in the Comprehensive Plan Conservation Element Adoption Document (2020), Future Land Use Element Adoption Document (2020), and the Infrastructure Element Adoption Document (2020).

The City has an Agreement with Broward County, titled Cost Share Support of Water Conservation Incentives Program, established in October 2016. The Agreement is County wide and is intended to conserve water quality and quantity. It establishes an enduring water conservation ethic using education, rebates and incentives. The program uses print media, internet, posters, mailings, newsletters (electronic and printed), Facebook and Twitter to educate the public on the use of water conserving plumbing fixtures and other water conservation efforts. Incentives and rebates are given for the installation of water conserving plumbing fixtures.

The City has an established Water Utility Rate Schedule which has an ascending water rate as usage increases. The first 3,000 gallons/month is \$0.00579/gallon increasing constantly to \$0.00646/gallon at 10,000 gallons/month.

3.04 DESCRIPTIONS OF THE ALTERNATIVES CONSIDERED

Water supply options were developed herein outlining the City's plan to supply potable water for the next 10-years. The City has considered multiple options for a long-term water supply plan, including reuse systems for irrigation reuse and aquifer recharge with highly treated reclaimed water. The City is also aware of and investigating the C-51 Reservoir as an alternative water source on a technical level and is considering it as a contingency plan to address any potential shortfalls.

A. ALTERNATIVE REUSE SYSTEMS

In 2011, the City completed a pilot study project evaluating the feasibility of recharging the surficial aquifer system using highly treated reclaimed water. The “Alternate Water Supply (AWS) Facility Phase II Pilot Study Summary Report”, dated October 17, 2011, was prepared by Calvin, Giordano and Associates, Inc. In this system, wastewater would be highly treated to greater than secondary standards and then discharged to either surface water or surficial aquifer ground water. However, the Broward County Code of Ordinance Chapter 27 currently has some of the most stringent water quality requirements in the State of Florida for discharge into the ground, surface, or marine waters. At this time, it appears that reverse osmosis membrane technology may be the only technology that may meet these regulations. Traditional Advanced Waste Treatment (AWT) technologies will not meet these stringent nutrient limitations for phosphorous and nitrogen.

Pretreatment processes would also be required prior to reverse osmosis treatment and disinfection requirements would be met through the use of UV light in place of chlorine. The pretreatment processes would include strainers to remove large particles and ultrafiltration membranes to remove reverse osmosis foulants. The reverse osmosis system would then be used to meet the stringent water quality requirements followed by UV disinfection. At that point, the highly treated reclaimed water would be discharged to the exfiltration trenches or directly into the Biscayne Aquifer through injection wells. The reject water that did not meet the water quality requirements would either be retreated or pumped down the existing deep injection wells at the City’s WWTP.

Reuse water storage tanks should not be required as there is no diurnal customer demands and effluent not meeting standards would be retreated or disposed of through the deep well system. The system would be continuously monitored and it can be stopped immediately upon effluent being out of specification.

B. Use of the C-51 Reservoir

The C-51 Reservoir project is a public-private partnership for the construction of 60,000 acre-feet of storage for use as an alternative water supply in Southeast Florida. Water supply authorities and public water supply utilities along with the property owners have investigated the feasibility of this regional reservoir to capture and store excess surface water runoff discharged into Lake Work Lagoon and release it into the C-51 Canal during dry periods to meet water demands. The C-51

Reservoir is a rock mine that is owned by Palm Beach Aggregates in Central Palm Beach County, north of the C-51 Canal in Palm Beach County adjacent to the SFWMD's L-8 flow equalization basin. Many public water supply utilities, such as BCWWS, have executed agreements with the property owners to purchase capacity as part of the total reservoir and have processed modifications to their Water Use Permit to reflect this alternative water supply source as a means to meet future demands. Although the City has sufficient water supply allocated in their Water Use Permit to meet future demands for the next 10-year planning period, the use of the C-51 Reservoir as an alternative water source is being investigated on a technical level and is being considered as a contingency plan to meet potential shortfalls.

PART 4 - SECTION FIVE EVALUATIONS OF ALTERNATIVES

4.01 GENERAL

When evaluating alternative water supply options, multiple considerations must be evaluated including the economic affects to the City's residents, technical feasibility of the implementation, and the impacts to the environment.

4.02 ECONOMIC CONSIDERATIONS – ALTERNATIVE REUSE

The City of Pembroke Pines only serves the western half of the City with wastewater service. The eastern portion of the City is served by the City of Hollywood, over which the City of Pembroke Pines has no control. As a result, the customers affected by a reuse program initiated by the City of Pembroke Pines would likely be confined to those residents in the western half of the City. This may create disparity in rates charged to the City's residents.

The City's wastewater treatment plant customers would be responsible for paying the majority of the cost for treatment. While the cost of creating systems to use reclaimed water is greater than systems for disposal via ocean outfalls or deep injection wells, the latter options provide for no beneficial use of the water. The benefit for potable water customers is a reduction in competition for the water resource and possible recharge of the aquifer. A cost-benefit analysis should be conducted to determine the proper cost allocations between wastewater customers and water customers.

The present value analysis would normally include an evaluation of water saved by implementing the reuse alternatives, however, the City does not allow potable water to be used for irrigation. City Ordinance No. 50.01.35 approved in 1982 forbids the use of the City's municipal water for irrigation purposes. When implemented, the City's proposed alternative reuse system will not actually be saving potable water, therefore, the "benefit of water savings analysis" was not performed. While it is recognized that there is a benefit to the environment by not having to withdraw groundwater to irrigate lawns and golf courses, the use of private, un-metered wells make it impossible to quantify and qualify a value or cost for groundwater as can be done with potable water.

4.03 TECHNICAL FEASIBILITY – ALTERNATIVE REUSE

A proposed wastewater reclamation facility should not have any technical problems in the design, construction and operation that would render it "technically infeasible." The design of an advanced type wastewater treatment plant and ancillary equipment are within the capabilities of most Professional Consulting Civil/Environmental Engineering firms in the State of Florida. The City's wastewater effluent can be transformed into usable aquifer recharge quality water using today's technology. The level of technology required in Broward County may be higher than other parts of the State due to the stringent water quality requirements.

The construction of a proposed reuse facility for Pembroke Pines should not pose any severe technical problems nor be any problem for a qualified contractor. A wastewater reclamation facility would be located on the existing City Wastewater Treatment Plant site.

4.04 ENVIRONMENTAL ASSESMENT – ALTERNATIVE REUSE

Although the City may not be able to conserve potable water by implementing reuse because its citizens are not allowed to use potable water for irrigation, there would be benefits of additional Biscayne Aquifer water available for potable uses and possibly irrigation. The Biscayne Aquifer is the City's sole source of raw drinking water. Another environmental advantage to reusing wastewater is that the City would reduce the quantity of discharge secondary effluent pumped through the deep injection wells down into the boulder zone.

The physical impact on the environment due to the implementation of the reuse system should be minimal. The pipelines will run inside the City's right of way and on the WWTP site. The wastewater reclamation facility would also be on the existing WWTP site. Complaints from neighboring communities (Century Village) due to noise and dust may occur.

The negative biological impact due to the reuse project will be insignificant. Actually, the impact should be positive as the effluent will help re-hydrate the surficial aquifer. Plant effluent would be filtered and disinfected before being discharged into the environment. Safety features in the treatment system would provide immediate shutdown of the system and transfer of reject water if the monitoring system detects insufficient treatment. Therefore, untreated reuse water would not leave the WWTP site.

PART 5 - CONCLUSION

5.01 WATER SUPPLY

The per capita water demand of 82.68 gallons per day per capita for the City of Pembroke Pines water service area was calculated based on the actual treated water supply data from 2017 through 2019. Based on this per capita water demand and the future population projections established in the 2018 LEC Update, the City's current water supply facilities have the capacity to meet the future water demand within their service area. In addition, an evaluation of the Broward County Water Supply Facilities Work Plan has been performed and, based on their per capita water demand of 127 gallons per day per capita, sufficient capacity exists for the small area of the City that is within their service area. Therefore, it has been concluded that the existing water supply facilities serving the City is sufficient to meet the future demand for the required 10-year planning period and beyond through the year 2040.

5.02 ALTERNATIVE REUSE

Although there are multiple benefits to the implementation of a wastewater reclamation system, the City would not be generally in favor of incurring the additional expense associated with treating reclaim water for aquifer recharge due to the increases on the rate payers. The City of Pembroke Pines currently has 9.5 MGD of deep well injection capacity that has already been permitted, bonded, and paid for and based on flow projections this capacity is sufficient to meet the City's needs well into the future. The City also has an 18 MGD lime softening water treatment plant with innovative ion exchange color removal technology that has already been permitted, bonded, and paid for and based on flow projections this capacity is sufficient to meet the City's demands through 2040.

Generally, for the above financial reasons illustrated above, an alternative water supply using aquifer recharge with highly treated reclaimed water would be deemed to not be financially feasible at the present time, especially since the City's water withdrawal permit is sufficient through buildout. Although the evaluation concluded that this would be feasibility from a technical standpoint, it is not feasible from a financial standpoint. Therefore, the City has decided to not pursue aquifer recharge with highly treated reclaimed water as the primary options for an alternative water supply. However, the City is investigating the use of the C-51 Reservoir as an

alternative water source on a technical level and is being considered as a contingency plan to meet potential shortfalls in the future.

5.03 INTERGOVERNMENTAL COORDINATION

The City, in preparation of this Work Plan, coordinated with a number of governmental agencies in order to establish consistency with the future water supply planning efforts. The City's Work Plan incorporates the relevant information included in the water supply facilities planning 2020 documents prepared by the Broward County Water and Wastewater Services Department (BCWWS) City of Hollywood and the SFWMD current LEC Plan

The City routinely coordinates with BCWWS concerning the management of their water distribution system. Although there is no formal interconnect agreement that governs this coordination, these coordination efforts and development procedures that are in place are adequate to ensure future water demand is available. At this time, the future water demand for this small portion of the City of Pembroke Pines that is served by Broward County WWS is not anticipated to increase because this area has reached buildout conditions.

In addition, the City has incorporated the Intergovernmental Coordination Element into the Comprehensive Plan to identify and resolve incompatible goals, objectives and policies; to identify and resolve incompatible development between and among local government comprehensive plans; and to determine and respond to the needs for coordination processes and procedures with adjacent local governments, and regional and state agencies. The City has reviewed the goals, objectives and policies of the Intergovernmental Coordination Adoption Element related to water supply and determined no updates were needed at this time.

5.04 COMPREHENSIVE PLAN GOALS, OBJECTIVES, AND POLICIES

Comprehensive Plan Goals, Objectives, and Policies (GOPs) are included in the adopted Future Land Use Element (2020), Infrastructure Element (2020), and Conservation Element (2020) to ensure implementation and future updates of the 10 Year Work Plan as required by Section 163.3177 (6) (c), F.S. As GOPs are often amended outside of the cycle for Work Plan amendments (i.e. Evaluation and Appraisal Report amendments every seven (7) years), the GOPs are contained in the Comprehensive Plan and are not part of the officially adopted Work Plan. Associated

Comprehensive Plan amendments to relevant GOPs will be adopted concurrently with the Work Plan update.

APPENDIX A

COMBINED WELLFIELD PUMPAGE REPORTS

Unaccounted for Water

Annual Water Balance Summary														
Line #	Utility Name:	CITY OF PEMBROKE PINES												
	Permit Name:	CITY OF PEMBROKE PINES												
	Reporting Period:	JANUARY-DECEMBER 2017												
	Water Use Permit #:	06-00135W												
	Name of Person Completing Form:	Juquitta Drieth												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
1.0	Total Raw Water Withdrawn (should match pumpage reports submitted to SFWMD)	394.36	362.86	393.97	380.08	386.56	354.25	370.73	379.90	374.45	384.91	375.92	390.46	4,548.45
2.0	Volume of Finished Water Produced	400.28	383.19	423.43	402.37	415.46	378.64	400.67	405.78	399.44	404.11	402.35	419.19	4,835
3.0	Treatment Losses (subtract line 2 from line 1)	-5.92	-20.33	-29.46	-22.29	-28.90	-24.40	-29.94	-25.88	-25.00	-19.20	-26.43	-28.73	-286
4.0	% Treatment Loss (divide line 3 by line 1)	-1.50%	-5.60%	-7.48%	-5.86%	-7.48%	-6.89%	-8.08%	-6.81%	-6.68%	-4.99%	-7.03%	-7.36%	-6.30%
5.0	Total Volume of Water Imported (if applicable)	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0	System Input (Finished Water Produced plus Total Water Imported) (line 2 plus line 5)	400.28	383.19	423.43	402.37	415.46	378.64	400.67	405.78	399.44	404.18	402.35	419.19	4,835
7.0	Billed Authorized Consumption (total volume of water billed including Exports-if applicable)	338.75	313.47	316.35	354.93	373.00	367.77	316.97	305.90	375.96	273.23	331.19	322.51	3,990
8.0	Unbilled Authorized Consumption (include estimates of fire protection, line flushing, and other utility-authorized non-billed uses). An estimate of 1.25% of the System Input can be used if no other data is available.	5.00	4.79	0.17	0.17	0.17	0.16	0.16	0.16	0.17	0.16	0.17	0.17	11
9.0	Total Authorized Consumption (Billed Authorized Consumption plus Unbilled Authorized Consumption) (line 7 plus line 8)	343.75	318.26	316.52	355.10	373.17	367.93	317.13	306.06	376.13	273.39	331.36	322.68	4,001
10.0	Total Water Losses (Line 6 minus line 9)	56.54	64.93	106.90	47.27	42.29	10.71	83.54	99.73	23.32	130.79	70.99	96.50	834
11.0	% Water Loss (line 10 divided by line 6)	14.12%	16.94%	25.25%	11.75%	10.18%	2.83%	20.85%	24.58%	5.84%	32.36%	17.64%	23.02%	17.24%
-----What are Total Water Losses From Line 10 Made Up Of?-----														
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	SEP	SEP	SEP	Total
12.0	Total Real Water Losses (the amount of water losses associated with leakage from distribution mains, storage tanks, service connections, etc.)	0	0	0	0	0	0	0	0	0	0	0	0	0
13.0	Apparent Water Losses / Gains:													
	a) Billing Errors													0
	b) Meter inaccuracies													0
	c) Illegal water consumption/theft													0
	d) Other (describe):													0
14.0	Total Apparent Water Losses (line a through d)	0	0	0	0	0	0	0	0	0	0	0	0	0
15.0	Total Real and Apparent Water Losses (l. 12 plus l. 14) <i>should equal l. 10</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
16.0	Real Water Losses as a percentage of System Input (based on System Input calculated above) (line 12 divided by line 6)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
17.0	Apparent Losses as a percentage of System Input (based on System Input calculated above)(line 14 divided by line 6)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Unaccounted for Water

Annual Water Balance Summary														
Line #	Utility Name:	City of Pembroke Pines												
	Permit Name:	City of Pembroke Pines												
	Reporting Period:	January 2018 to December 2018												
	Water Use Permit #:	06-00135-W												
	Name of Person Completing Form:	Michael Cepeda												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1.0	Total Raw Water Withdrawn (should match pumpage reports submitted to SFWMD)	392.25	360.90	403.57	396.47	385.73	369.348	386.61	386.90	378.13	392.07	389.62	406.14	2,694.88
2.0	Volume of Finished Water Produced	420.04	385.51	433.40	409.83	410.85	398.69	418.95	413.78	402.76	415.99	414.02	430.46	2,877
3.0	Treatment Losses (subtract line 2 from line 1)	-27.79	-24.62	-29.83	-13.35	-25.12	-29.34	-32.35	-26.88	-24.63	-23.92	-24.40	-24.32	-182
4.0	% Treatment Loss (divide line 3 by line 1)	-7.08%	-6.82%	-7.39%	-3.37%	-6.51%	-7.94%	-8.37%	-6.95%	-6.51%	-6.10%	-6.26%	-5.99%	-6.77%
5.0	Total Volume of Water Imported (if applicable)	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0	System Input (Finished Water Produced plus Total Water Imported) (line 2 plus line 5)	420.00	386.00	433.00	410.00	411.00	399.00	419.00	414.00	403.00	416.00	414.00	430.00	4,955
7.0	Billed Authorized Consumption (total volume of water billed including Exports-if applicable)	340.13	324.69	330.55	330.27	324.98	335.79	302.33	333.06	313.51	303.29	329.25	325.84	3,894
8.0	Unbilled Authorized Consumption (include estimates of fire protection, line flushing, and other utility-authorized non-billed uses). An estimate of 1.25% of the System Input can be used if no other data is available.	42.45	47.93	43.61	25.61	38.51	38.78	39.54	37.06	31.86	28.59	27.79	27.92	430
9.0	Total Authorized Consumption (Billed Authorized Consumption plus Unbilled Authorized Consumption) (line 7 plus line 8)	383	373	374	356	363	375	342	370	345	332	357	354	4,324
10.0	Total Water Losses (Line 6 minus line 9)	37	13	59	54	47	24	77	44	57	84	57	77	630
11.0	% Water Loss (line 10 divided by line 6)	8.81%	3.37%	13.63%	13.17%	11.44%	6.02%	18.38%	10.63%	14.14%	20.19%	13.77%	17.91%	12.71%

Unaccounted for Water

Annual Water Balance Summary														
Line #	Utility Name:	City of Pembroke Pines												
	Permit Name:	City of Pembroke Pines												
	Reporting Period:	January 2019 to December 2019												
	Water Use Permit #:	06-00135-W												
	Name of Person Completing Form:	Michael Cepeda												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1.0	Total Raw Water Withdrawn (should match pumpage reports submitted to SFWMD)	405.43	360.59	415.77	390.40	393.05	381.46	391.20	387.30	380.38	399.91	380.24	388.23	4,673.96
2.0	Volume of Finished Water Produced	398.86	355.69	409.34	387.40	378.93	372.79	378.94	369.08	369.13	387.27	371.22	381.11	4,560
3.0	Treatment Losses (subtract line 2 from line 1)	6.57	4.90	6.43	3.00	14.12	8.67	12.26	18.22	11.26	12.64	9.01	7.12	114
4.0	% Treatment Loss (divide line 3 by line 1)	1.62%	1.36%	1.55%	0.77%	3.59%	2.27%	3.13%	4.70%	2.96%	3.16%	2.37%	1.83%	2.44%
5.0	Total Volume of Water Imported (if applicable)	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0	System Input (Finished Water Produced plus Total Water Imported) (line 2 plus line 5)	399.00	356.00	409.00	387.00	379.00	373.00	379.00	369.00	369.00	387.00	371.00	381.00	4,560
7.0	Billed Authorized Consumption (total volume of water billed including Exports-if applicable)	353.27	316.01	298.76	314.62	330.56	322.68	307.58	317.45	313.76	310.74	313.86	312.17	3,811
8.0	Unbilled Authorized Consumption (include estimates of fire protection, line flushing, and other utility-authorized non-billed uses). An estimate of 1.25% of the System Input can be used if no other data is available.	0.38	0.89	6.63	1.60	2.99	1.19	7.77	2.72	1.44	8.01	3.97	6.96	45
9.0	Total Authorized Consumption (Billed Authorized Consumption plus Unbilled Authorized Consumption) (line 7 plus line 8)	354	317	305	316	334	324	315	320	315	319	318	319	3,856
10.0	Total Water Losses (Line 6 minus line 9)	45	39	104	71	45	49	64	49	54	69	53	62	704
11.0	% Water Loss (line 10 divided by line 6)	11.33%	10.90%	25.39%	18.37%	11.98%	13.13%	16.78%	13.25%	14.61%	17.69%	14.38%	16.26%	15.34%

December 2019 C M O R

APPENDIX B

BROWARD COUNTY 10 YEAR WATER SUPPLY FACILITIES WORK PLAN (APRIL 21, 2020)



Water Supply Facilities Work Plan

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LIST OF ACRONYMS

ASR	Aquifer Storage and Recovery
AWS	Alternative Water Supply
BCWWS	Broward County Water and Wastewater Services
BCPDMD	Broward County Planning and Development Management Division
BEBR	Bureau of Economic and Business Research
BMP	Best Management Practice
BMSD	Broward County Municipal Services Districts
CADA	Central Aquifer Drainage Assessment
CEPP	Central Everglades Planning Project
CERP	Comprehensive Everglades Restoration Plan
CIE	Capital Improvements Element
CUP	Consumptive Use Permit
DSS	Domestic Self Supply
EPA	Environmental Protection Agency
EPGMD	Environmental Protection and Growth Management Department
EPCRD	Environmental Planning and Community Resilience Division
FDEP	Florida Department of Environmental Protection
FPL	Florida Power and Light Corporation
F.S.	Florida Statutes
GOP	Goals, Objectives, and Policies
gpcd	Gallons Per Capita Per Day
IWRP	Integrated Water Resources Plan
LEC	Lower East Coast
LECWSP	Lower East Coast Water Supply Plan
LORS	Lake Okeechobee Regulation Schedule
LOS	Level of Service
LOSS	Level of Service Standard
LOSDM	Lake Okeechobee System Operating Manual
MFL	Minimum Flow and Minimum Water Level
MG	Million Gallons
MGD	Million Gallons Per Day
mg/L	Milligrams per Liter
MGM	Million Gallons Per Month
NADA	North Aquifer Drainage Assessment
NCA	National Climate Assessment
NIS	NatureScape Irrigation Services
PFAM	Population Forecast and Allocation Model
ppb	Parts per billion

RCAP	Regional Climate Action Plan
RO	Reverse Osmosis
SADA	South Aquifer Drainage Assessment
SAS	Surficial Aquifer System
SEFRCCC	Southeast Florida Regional Climate Change Compact
SFWMD	South Florida Water Management District
SRW	South Regional Wellfield
STA	Stormwater Treatment Area
SWR	Surface Water Routing
TAZ	Traffic Analysis Zones
TIP	Transportation Improvement Program
UAZ	Utility Analysis Zones
URO	Urban Runoff
USACE	U.S. Army Corps of Engineers
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
WCA	Water Conservation Areas
WPA	Water Preserve Areas
WRRDA	Water Resources Reform and Development Act
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant



BROWARD COUNTY COMPREHENSIVE PLAN

Water Supply Facilities Work Plan

EXECUTIVE SUMMARY

This Broward County Water Supply Facilities Work Plan (2020 Work Plan) addresses traditional and alternative water supply (AWS) source development and management strategies to meet existing and projected water use demand. The 2020 Work Plan primarily focuses on Broward County's Public Works Water and Wastewater Services (BCWWS) service areas and unincorporated Broward County neighborhoods entitled the Broward County Municipal Services Districts (BMSD). It also contains updates about the implementation of the urban water resource management strategies, including water conservation programs, prioritized at the 2019 Broward Countywide Integrated Water Resources Plan (IWRP), coordinated by Broward County Environmental Planning and Community Resilience Division (EPCRD). Overall, approximately 240,000 people receive water and wastewater services in these areas and the population is expected to be 281,000 by 2040. The BMSD's water and wastewater services are provided by BCWWS and the City of Fort Lauderdale's utilities. BCWWS' southernmost service area receives potable water through connections with the City of Hollywood.

Florida Law (Section 163.3177(6)(c)3., Florida Statutes [F.S.]) requires local governments to adopt water supply facilities work plans into their comprehensive plans within eighteen months after the South Florida Water Management District (SFWMD) approves a regional water supply plan update. The SFWMD approved the 2018 Lower East Coast Water Supply Plan Update (LECWSP, SFWMD, 2018) on November 8, 2018, with final administrative order on January 11, 2019. The 2020 Work Plan is Broward County's required update based on that plan's adoption. In addition, Broward County integrated its comprehensive plan's water resources elements and the new version is included in the 2020 Work Plan.

Like most Southeast Florida water utilities, BCWWS' primary public water supply source water is the Surficial Aquifer System (SAS) located from ground surface to approximately 240 feet underground. BCWWS' groundwater withdrawal wells range between 75 to 130 feet below ground. Broward County's primary SAS feature is the Biscayne Aquifer and it provides the vast majority of BCWWS and BMSD populations' water supply needs.

However, the Biscayne Aquifer is considered a finite water resource by the SFWMD. In 2007, the SFWMD mandated through a Regional Water Availability Rule that AWS will be used to serve future population growth (SFWMD, 2007). For example, the brackish Upper Floridan Aquifer (approximately to 1000 – 1700 feet underground) can be withdrawn and treated with more complex processes than used for the Biscayne Aquifer water. Other AWS options include, but are not limited to, water conservation, water reuse, and surface water storage development. The 2020 Work Plan outlines future BCWWS AWS projects to serve future populations as well as projects that maintain and optimize BCWWS' current systems. Similar projects are covered for the City of Fort Lauderdale and the City of Hollywood.

The regional C-51 Reservoir project is the primary BCWWS AWS project to meet future population growth demands. Located in Central Palm Beach County, the C-51 Reservoir project is a public-private partnership to construct 60,000 acre-feet (equal to almost 20 billion gallons) of surface water storage. Captured stormwater from the C-51 watershed will be stored in the reservoir and moved across the region via canal systems to recharge local aquifers. BCWWS is planning to use up to six million gallons a day from the C-51 Reservoir project.

The Broward County and Palm Beach County water reuse partnership is another important regional AWS initiative. This beneficial reuse water project is BCWWS' strategy to comply with Florida's Ocean Outfall Law (Section 403.086(9), F.S.). The project also provides beneficial water reuse supply to the Southern Palm Beach County region as well as portions of the North Springs Improvement District, Coconut Creek, Deerfield Beach, and Pompano Beach. BCWWS is currently increasing its water reuse production capacity to twenty-six million gallons a day from the current ten million gallons a day to implement this project.

Additional regional drivers for Broward County's water supply include regional climate impacts such as sea level rise, saltwater intrusion, and extreme weather events. Sea level rise threatens future South Florida water conveyance that could negatively impact aquifer recharge and flood control management practices. Due in large part to a porous aquifer, future sea level rise also will increase saltwater intrusion's negative effect on public water supplies. Saltwater intrusion from the ocean will likely move further inward and pose contamination risk for freshwater aquifers. Future extreme weather events may include longer dry weather patterns that could decrease public water supply levels and, may also increase saltwater intrusion's landward extent.

Broward County, together with its municipal and regional partners, supports and facilitates water supply and climate change planning integration and implementation including:

- The Broward County Climate Action Plan's water supply actions (Broward County, 2015) to maintain adequate water supply through conservation and adaptation, and integrated water resource management.
- The Southeast Florida Regional Climate Change Compact's (SEFRCCC) Southeast Florida Regional Climate Action Plan's (RCAP) critical water supply planning components (SEFRCCC, 2017).
- The goals of the Resilient Utility Coalition - an outgrowth from the Compact -to "operationalize resilience" in common water utility practices.

A major regional plan to restore Florida's Everglades – the Comprehensive Everglades Restoration Plan (CERP) – will also change future water resource conditions. CERP will construct additional water storage systems to capture wet season flow volumes and provide critical natural system water needs as well as maintain public water supply. CERP features within Broward County and in other SFWMD regions should collectively benefit local water supply sustainability throughout South Florida.

The 2019 IWRP Update provides key planning, assessment and coordination tools to optimally manage water resources. Its five main objectives are to:

- Make the most of local water resources, so that Broward's long-term water supply needs are met;
- Coordinate a diverse water management community, ensuring the efficient and effective management of Broward's water resources;
- Match up local water sources and users to ensure that water supplies are available when and where they're needed;
- Diversify water supplies so that the needs of urban and natural systems are met under wet and dry conditions; and,
- Promote water resource resiliency by evaluating future conditions, including potential climate impacts and adopt strategies, to mitigate, adapt, and prevent disruptions to our overall goal of more efficient and effective water management.

Additionally, the IWRP program developed, and continues to develop, several numerical hydrologic models used in decision making and to assist sustainable investments. Optimizing integrated secondary canal management is one hallmark success for the IWRP modeling. Broward County's Water Reuse Master Plan was developed to facilitate more projects Countywide and its implementation is greatly assisted with the IWRP's AWS grant investments.

Water conservation remains a critical AWS strategy in the 2020 Work Plan. In 2010, the Broward County Board of County Commissioners passed an irrigation ordinance adopting year-round irrigation restrictions limiting landscape watering to two days per week. In addition, Broward

County implements a broad set of water conservation programs that are designed to produce long-term demand reductions along with water quality improvements. These programs, targeted at various user groups, including Broward Water Partnership Conservation Pays, NatureScape Irrigation Services (NIS), NatureScape Broward, Know the Flow, Water Matters Day, and the NatureScape Broward School Board Environmental Partnership Agreement. The current IWRP goal of Broward County's water conservation programs combined is 10 gallons per day per capita reduction in water use Countywide by 2028.

Finally, the 2020 Work Plan data analysis demonstrates BCWWS will continue to meet its "Retail Potable Water Level of Service Standards". Special recommendations and a ten-year work plan outline the major C-51 Reservoir Project (27.6 million dollars) and Palm Beach County Reuse Partnership (104 million dollars) investments and components. In addition, water treatment plant (WTP) upgrades and water conservation projects are described. BCWWS' robust 5-year Capital Improvement Program is scheduled to spend over 123 million dollars on over sixty components to maintain and optimize the current system as well as build new features. All the 2020 Work Plan projects contribute towards BCWWS successfully managing future challenges to provide excellent water and wastewater services for its service areas.

Table WS19 Projected Average Day Finished Water by Municipality within
District 2 in MGD ¹

Municipality	2015 ²	2020	2025	2030	2035	2040
COCONUT CREEK	0.01	0.01	0.01	0.01	0.01	0.01
DEERFIELD BEACH	2.60	2.52	2.59	2.71	2.76	2.78
LIGHTHOUSE POINT	1.02	0.99	0.98	1.00	1.00	1.01
POMPANO BEACH	2.64	2.59	2.67	2.76	2.78	2.78

1. Calculated using District 2 Finished Water 5-Year Average Gallons Per Capita Day of 112 gpcd
2. 2015 demand Calculated using District 2 Finished Water Actual Gallons Per Capita Day of 114 gpcd

BCWWS District 3A and 3BC:

District 3 service area is divided into two geographically separate subdistricts 3A, Figure WS10, and 3BC, Figure WS11. The County purchases bulk treated water primarily from the City of Hollywood and distributes the treated water through the County's distribution system. District 3 has a combined service area of approximately 14.3 square miles and contains 223 miles of transmission and distribution mains. Subdistrict 3A contains the Fort Lauderdale-Hollywood International Airport which is approximately 20 percent of the total area of the district. District 3A has interconnects with the City of Hollywood, for its primary water supply, and with the City of Fort Lauderdale and the City of Dania Beach, to provide for emergency water supply. Subdistrict 3BC has interconnects with the City of Hollywood for its primary water supply, and the Cities of Pembroke Pines and Miramar to provide for emergency water supply.

The City of Hollywood is responsible for ensuring adequate raw water supply and treatment facilities to serve the County District 3 service areas. The City's existing CUP (Permit No. 06-00038-W) was issued by the SFWMD on April 9, 2008 and expires April 9, 2028. The Hollywood CUP raw water allocation for the subdistrict 3A/3BC areas is 13.16 MGD to meet demands through the year 2028.

BCWWS' current finished water demand for District 3 averages around 6.4 MGD and is projected to increase to 8.3 MGD by 2040 as shown Table WS20 below. District 3's raw water demand is anticipated to be around 9.0 MGD in 2045 as shown in Table WS21, based on historical raw to finished water ratio of 1.09. BCWWS continues to coordinate closely with the City to ensure that future demands for District 3 are adequately addressed.

Finished water demand was estimated as shown in Table WS22 (District 3A) and WS23 (District 3BC) by using the finished water 5-year historical gallons per capita day of 127 and the municipal populations for District 3A and District 3BC. Year 2015 was calculated using the actual gallons per capita day of 130.

Broward County District 3A Service Area, 2019

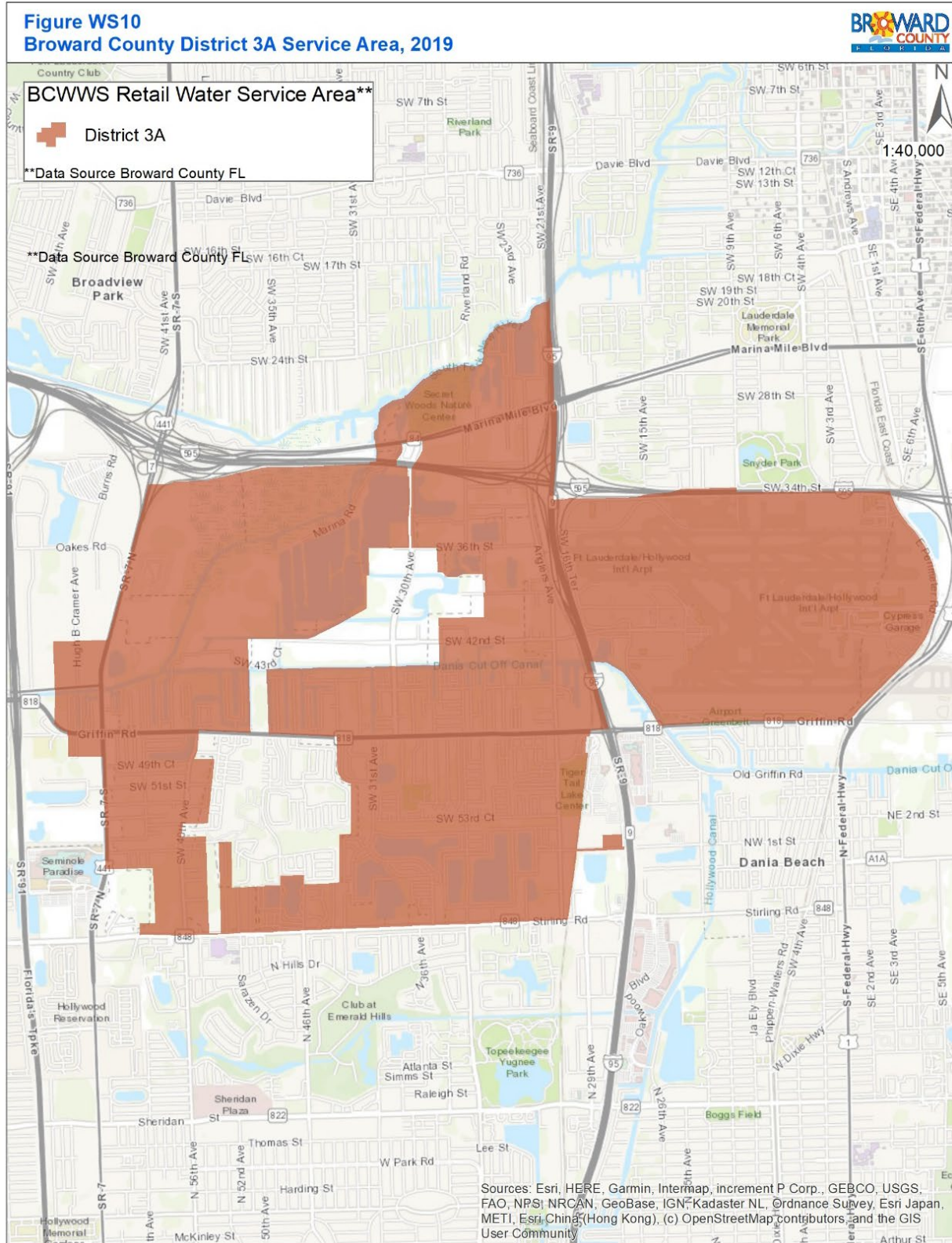


Figure WS10 BCWWS District 3A Service Area

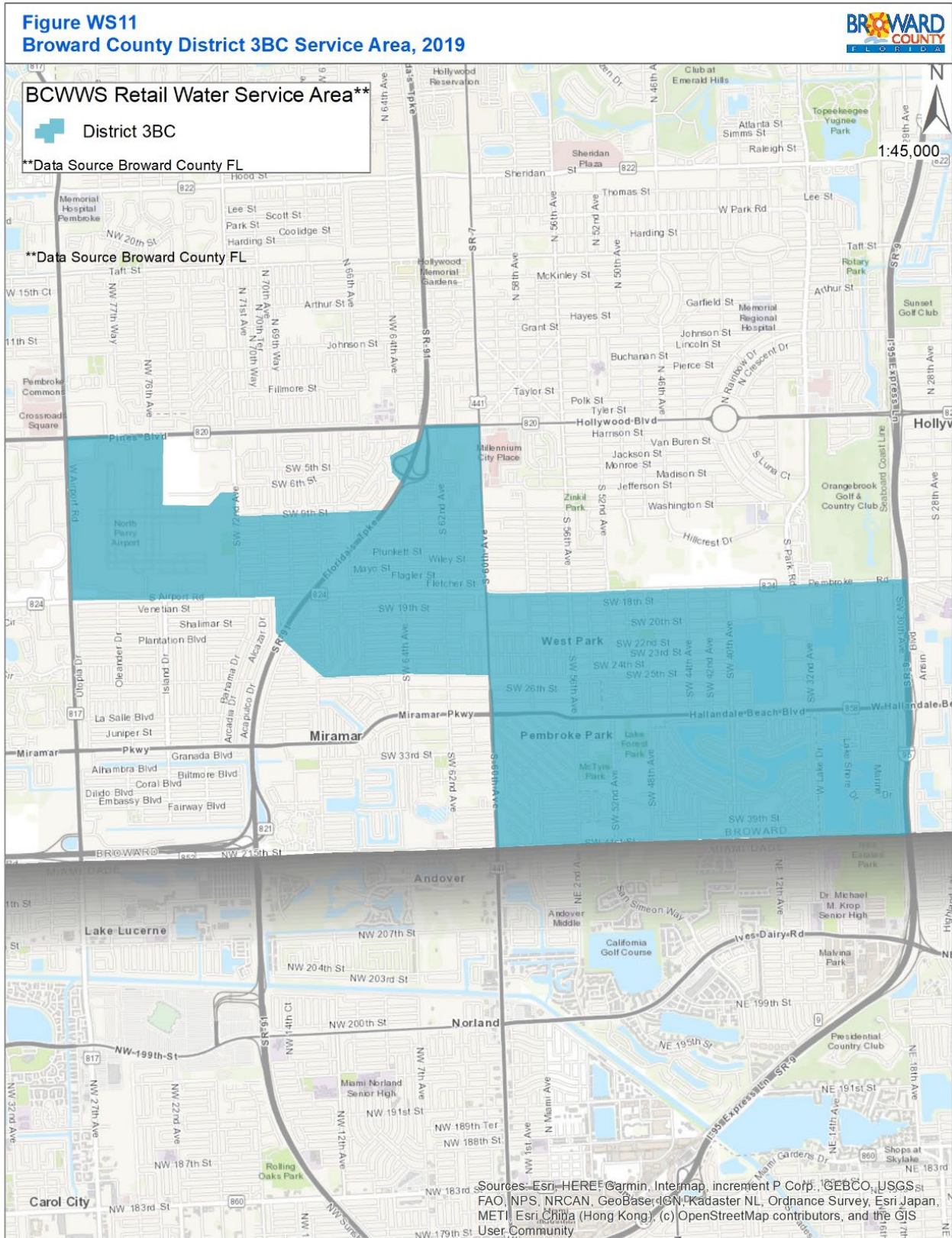


Figure WS11 BCWWS District 3BC Service Area

Table WS20 District 3A and 3BC Actual and Projected Finished Water Demands

Planning Year	Population (UAZ Estimate)	Finished Water Demands				
		Annual (MG)	Average Day (MGD)	Per Capita Use	Maximum Month (MGM)	Max Mo : Avg Day Ratio
Actual Water Use ¹						
2010	32,480	2,080	5.70	118	192	33.74
2011	49,158	2,210	6.05	126	196	32.42
2012	50,014	2,230	6.11	122	200	32.79
2013	50,871	2,362	6.47	127	204	31.59
2014	51,727	2,369	6.49	125	221	33.99
2015	52,584	2,490	6.82	130	222	32.51
2016	52,946	2,491	6.82	129	218	31.97
2017	53,308	2,383	6.52	122	212	32.48
Projected Water Use ^{2,3}						
2020	54,394	2,523	6.91	127	244	32.51
2025	56,972	2,642	7.24	127	256	32.51
2030	60,221	2,793	7.65	127	270	32.51
2035	62,325	2,891	7.92	127	280	32.51
2040	63,734	2,956	8.09	127	286	32.51

1. BCWWS Monthly Operating Reports for 3A, 3B and 3C Finished Water Meters
2. Projected Water Use based on Finished Water Per Capita (5-Year Average) of 127 gallons per capita day
3. Projected Finished Water Maximum Month based on Actual Finished Maximum Month to Average Day Ratio (5-Year Average) of 32.51

Table WS21 District 3A and 3BC Actual and Projected Raw Water Demands

Planning Year	Finished Water Annual Demand (MG)	Raw Water Demands			
		Raw: Finished Ratio	Annual (MG)	Average Day (MGD)	Maximum Month (MGM)
Actual Water Use ¹					
2010	2,080	1.09	2,267	6.21	210
2011	2,210	1.09	2,409	6.60	214
2012	2,230	1.09	2,431	6.66	218
2013	2,362	1.09	2,575	7.05	223
2014	2,369	1.09	2,582	7.07	240
2015	2,490	1.09	2,714	7.44	242
2016	2,491	1.09	2,715	7.44	238
2017	2,383	1.09	2,599	7.12	231
Projected Water Use ^{2,3}					
2020	2,523	1.09	2,743	7.52	244
2025	2,642	1.09	2,873	7.87	256
2030	2,793	1.09	3,037	8.32	270
2035	2,891	1.09	3,143	8.61	280
2040	2,956	1.09	3,214	8.81	286

1. BCWWS Monthly Operating Reports for 3A, 3B and 3C Finished Water Meters
2. Projected Raw Water based on SFWMD LECWSP 2018 Update, Appendix B, Table B-4 entry for Hollywood of 1.09
3. Actual and Projected Raw Water Maximum Month based on Actual Finished Maximum Month to Average Day Ratio (5-Year Average) of 32.51

Table WS22 Projected Average Day Finished Water by Municipality within District 3A in MGD ¹

Municipality	2015 ²	2020	2025	2030	2035	2040
DISTRICT 3A TOTAL	2.12	2.15	2.30	2.42	2.50	2.55
DANIA BEACH	1.99	2.02	2.13	2.21	2.25	2.26
DAVIE	0.01	0.01	0.04	0.07	0.09	0.11
FORT LAUDERDALE	0.09	0.09	0.09	0.12	0.13	0.15
HOLLYWOOD	0.03	0.03	0.03	0.03	0.03	0.03

1. Calculated using District 1 Finished Water 5-Year Average Gallons Per Capita Day of 127 gpcd
2. 2015 demand Calculated using District 1 Finished Water Actual Gallons Per Capita Day of 130 gpcd

Table WS23 Projected Average Day Finished Water by Municipality within District 3BC in MGD ¹

Municipality	2015 ²	2020	2025	2030	2035	2040
DISTRICT 3BC TOTAL	4.71	4.76	4.94	5.23	5.42	5.54
HOLLYWOOD	0.58	0.59	0.64	0.68	0.71	0.73
MIRAMAR	0.86	0.84	0.93	1.05	1.12	1.18
PEMBROKE PINES	0.53	0.56	0.55	0.55	0.56	0.57
PEMBROKE PARK	0.90	0.88	0.86	0.91	0.93	0.93
WEST PARK	1.85	1.89	1.95	2.04	2.09	2.12

1. Calculated using District 1 Finished Water 5-Year Average Gallons Per Capita Day of 127 gpcd
2. 2015 demand Calculated using District 1 Finished Water Actual Gallons Per Capita Day of 130 gpcd

South System Regional Wellfield (SRW):

BCWWS operates the SRW located in Cooper City, west of Pine Island Road, just north of Sheridan Street. The SRW supplies Biscayne Aquifer raw water from eight production wells to the Cities of Dania Beach, Hollywood, and Hallandale Beach and to the Florida Power and Light (FPL) Dania Beach Energy Center under large user agreements. The SRW CUP (06-01474-W) issued March 2018, and successfully modified July 10, 2019, reflects the complexities of providing regional raw water. The CUP allocation is divided into three portions that have individual expiration dates as shown in Table WS24 and Table WS25 details the individual large user allocation limitations.

APPENDIX C

HOLLYWOOD WATER SUPPLY CAPITAL IMPROVEMENTS

WATER SUPPLY PLAN

POTABLE WATER SUB-ELEMENT



PREPARED BY
THE UTILITIES DEPARTMENT AND
BROWN AND CALDWELL

CITY OF HOLLYWOOD
HOLLYWOOD, FLORIDA
JANUARY 2015

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Appendices

- A. Broward County 2014 Water Supply Facilities Work Plan
- B. City of Fort Lauderdale 2014 Water Supply Facilities Work Plan

6. Water Supply Capital Improvements

This section identifies the capital improvements required to build all public water supply facilities to serve the existing and new development within the City of Hollywood jurisdiction. The five-year schedule of Capital Improvements for HLWD-DPU is supported by an overview of financial feasibility.

The City's overall FY 2015 – 2019 Capital Improvement Program (CIP) identifies capital improvement projects for the City's DPU that are related to repair and replacement work needed to proactively maintain the level of service for the City's water distribution system. Since the City already has sufficient existing water supply and treatment infrastructure in place, no capital expenditures are required to meet the City's water supply needs over the planning horizon.

6.1. Financial Feasibility

The City of Hollywood has historically supplemented its revenues from impact fees with the following three main funding sources: alternative water supply grants, low-interest state revolving funds (SRFs), and bond proceeds (debt financing). The City anticipates continuing the use of these revenue and funding sources over the next five years as they will be sufficient for the implementation of the Capital Improvement Projects for repair, replacement, and upgrades of existing infrastructure, with no funding being needed for water supply or treatment expansion. The overall financial sufficiency of the City's CIP is demonstrated in the analysis included in the Comprehensive Plan / Capital Improvement Element. Table 6-1 presents the public utilities funding priorities for upgrade, repair and replacement projects over the next five years. It should be noted that water supply rates can be increased by City Commission action, without third party concurrence, to support the issuance of revenue bonds for any projects not funded by other means. However, as of the date of this water supply plan, no rate increases are projected within the CIP's planning horizon.

APPENDIX D

BROWARD COUNTY WATER SUPPLY DEVELOPMENT PROJECTS LISTED IN 2018 LECWSP

Water Supply Development Projects

This chapter summarizes the proposed water supply development projects, including potable, nonpotable, and conservation projects, intended to help meet anticipated water needs in the Lower East Coast (LEC) Planning Area for the 2016 to 2040 planning horizon. Public Water Supply (PWS) utilities, local governments, and large self-supplied water users, including Industrial/Commercial/Institutional (ICI) and Agricultural Irrigation (AGR), are primarily responsible for water supply development projects. For this *2018 Lower East Coast Water Supply Plan Update* (2018 LEC Plan Update), water supply development projects described in this chapter are only from PWS utilities. For each PWS utility supplying 0.10 million gallons per day (mgd) or more to its service area (**Appendix A**), a utility summary is included in **Appendix E**. Each utility summary includes population and demand projections (**Chapter 2; Appendix B**), permitted water allocations, potable water and wastewater permitted treatment capacities, and proposed water supply development projects.

TOPICS

- ◆ Link to Water Use Permitting
- ◆ Projects Identified for this Plan Update
- ◆ Cooperative Funding Program
- ◆ Summary of Water Supply Development Projects

LINK TO WATER USE PERMITTING

PWS utilities and local governments are required to use best available data when preparing Comprehensive Plans, Water Supply Facilities Work Plans, and water use permit applications (**Appendix A**). Population projections in such plans and applications should consider data from the most recent regional water supply plan update. Future water supply development projects should be consistent among the plans and permits. Proposed projects also must meet or exceed projected water demands through the planning horizon. However, local economic conditions and population growth may affect when water is needed, which projects are required, and how water use permits need to be modified to accommodate demand.

- ◆ **Florida City** Water and Sewer Department is working to reduce unaccounted-for water and its per capita use rate; however, if necessary, the SFWMD suggests developing interconnections with the City of Homestead and the Florida Keys Aqueduct Authority (FKAA) and purchasing 1.00 mgd (2020) to 2.50 mgd (2040) of bulk water from either entity. Florida City Water and Sewer Department can implement this suggestion or determine an alternative source to meet its demands starting in 2020.
- ◆ The **City of Homestead** is working to reduce unaccounted-for water and its per capita use rate; however, if necessary, the SFWMD suggests purchasing additional bulk water from MDWASD (1.00 mgd starting in 2030 and up to 2.50 mgd in 2040) or determine an alternative source to meet its demands starting in 2030.
- ◆ **MDWASD** is planning four projects:
 - ◆ A 2.50-mgd expansion of its Hialeah RO WTP;
 - ◆ A two-phase project for the South Miami Heights FAS and SAS wellfields with an RO WTP plant that will provide 17.50 mgd of treatment for FAS water and 2.55 mgd for SAS water (which still will be treated via lime softening);
 - ◆ A new South Dade Regional SAS wellfield, which will provide 10.00 mgd of additional water; and
 - ◆ The proposed SAS Facilities Optimization project to maximize use of wet and dry season non-regional flows throughout Miami-Dade County. The project will incorporate operational flexibility between the utility's WTPs and wellfields.

The following projects have been proposed by utilities that can meet their 2040 demand but want to diversify their water sources or improve their current treatment methods to increase capacity:

- ◆ **Seacoast Utility Authority** plans to install two additional FAS wells that will provide a total of 4.00 mgd of additional water.
- ◆ **Broward County WWS District 1** has constructed two FAS wells and plans to add RO treatment to its WTP, which will provide a total of 3.00 mgd of additional water.
- ◆ **Broward County WWS District 2A/North Regional** plans to add FAS wells and expand its WTP to include RO treatment, or utilize 3 mgd in Phase 1 of the C-51 Reservoir for impact offsets, which will provide a total of 9.00 mgd of additional water.
- ◆ The **City of Hollywood** plans to expand its RO treatment plant by 2.00 mgd and install two additional FAS wells, which will provide a total of 4.00 mgd of additional water.
- ◆ The **City of Lauderhill** plans to replace an existing SAS well with one that will provide 5.50 mgd water. In addition, the City is planning multi-phase projects to install five FAS wells and construct an RO WTP, which will provide a total of 8.00 mgd of additional water.
- ◆ The **City of Pompano Beach** plans to improve the efficiency of its nanofiltration WTP by adding a concentrate recovery system that will yield 0.60 mgd of water.

County	Implementing Agency or Entity	Project Name	Project Description	Project Capacity (mgd)	Total Capital (\$M)	Estimated Completion Date
Potable – FAS						
Palm Beach	Seacoast Utility Authority	FAS Well F-6	Construct FAS water supply well and connecting raw water transmission main.	2.00	4.00	2018
Palm Beach	Seacoast Utility Authority	FAS Well F-9	Construct FAS water supply well and connecting raw water transmission main.	2.00	4.00	2020
Broward	BCWWS (District 1)	District 1 Water Supply Improvement Alternatives	Construct FAS water supply wells and connecting raw water transmission main and RO treatment to the WTP.	3.00	5.60	2025
Broward	BCWWS (District 2A/North Regional Wellfield)	District 2 WTP Expansion	Construct FAS water supply wells and expand treatment capacity of WTP 2A by adding approximately 6 mgd of RO process treatment.	6.00	33.34	2026
Broward	Fort Lauderdale, City of	Dixie FAS Water Supply/Treatment Facility	Expansion of the Peele-Dixie nanofiltration WTP to include RO treatment.	6.00	22.90	2030
Broward	Hollywood, City of	RO Train E	Installation of new RO train.	2.00	2.00	2034
Broward	Hollywood, City of	FAS Wells F14 and F15	Construction of 2 FAS wells.	4.00	3.00	2034
Broward	Lauderhill, City of	FAS Well Drilling Equipping and Testing (Phase 1)	Installation of 3 FAS wells.	3.00	2.50	2021
Broward	Lauderhill, City of	Construction of RO facility (Phase 1)	Phase 1 of construction of an RO WTP.	1.00	2.00	2021
Broward	Lauderhill, City of	FAS Well drilling equipping and testing (Phase 2)	Installation of 2 FAS wells.	2.00	2.50	2024
Broward	Lauderhill, City of	Construction of RO facility (Phase 2)	Phase 2 of construction of an RO WTP.	2.00	3.00	2025
Broward	NSID	FAS Wells and RO WTP	Installation of FAS wells and construction of an RO facility.	2.50	4.00	2031
Miami-Dade	MDWASD	Hialeah Floridan Aquifer RO WTP (Phase 1-b)	Installation of 4 FAS wells.	2.50	4.00	2017
Miami-Dade	MDWASD	South Miami Heights WTP –Phase 1 (FAS portion)	Phase 1 includes installation of FAS production wells and construction of an RO WTP.	12.45	289.95	2021
Miami-Dade	MDWASD	South Miami Heights WTP –Phase 2	Phase 2 of construction of an RO WTP.	5.00	4.00	2031
Miami-Dade	North Miami Beach, City of	FAS Wells, Lines, Mains, and RO WTP (Norwood WTP) Phase I	Phased construction of an 8.00-mgd RO WTP (when all phases complete).	3.00	35.60	2019
Miami-Dade	North Miami Beach, City of	FAS Wells, Lines, Mains, and RO WTP (Norwood WTP) Phase II	Phased construction of an RO WTP, adding 5 mgd of capacity.	5.00	37.50	2030

County	Implementing Agency or Entity	Project Name	Project Description	Project Capacity (mgd)	Total Capital (\$M)	Estimated Completion Date
Nonpotable – Surface Water/Stormwater						
Palm Beach	Jupiter, Town of	Surface Water Recharge System	The final phase of the project includes connecting the regional system to recharge wetlands and recharging the local aquifer.	16.16	1.76	2019
Palm Beach	WPB Public Utilities, City of	C-17 Water Supply Pump Station	Constructed a pump station withdrawing water from the Congress Avenue Canal and pumping it into the City's adjacent M-Canal (Lake Mangonia). Pump station will consist of 1 electric submersible pump housed in a belowground concrete wet well structure.	10.00	1.50	2017
Palm Beach	WPB Public Utilities, City of	Grassy Waters Preserve Water Quality, Diversion & Storage Improvements	Evaluate, design, and construct recommended improvements within the City's surface water supply system to increase the water storage and treatment capacity of the existing Grassy Waters and Apoxee Preserves.	3.00	6.00	ND
Broward	BCWWS (South Regional Wellfield)	C-51 Reservoir Phase 1	BCWWS has entered into an agreement for capacity allocation in Phase 1 of C-51 Reservoir with Palm Beach Aggregates.	3.00	13.80	2020
Broward	BCWWS District 2A/NR Wellfield	C-51 Reservoir Phase 1	BCWWS has entered into an agreement for capacity allocation in Phase 1 of C-51 Reservoir with Palm Beach Aggregates.	3.00	13.80	2026
Broward	Dania Beach, City of	C-51 Reservoir Phase 1	The City of Dania has entered into an agreement for capacity allocation in Phase 1 of C-51 Reservoir with Palm Beach Aggregates.	1.00	4.60	2023
Broward	Hallandale Beach, City of	C-51 Reservoir Phase 1	The City of Hallandale Beach has entered into an agreement for capacity allocation in Phase 1 of C-51 Reservoir with Palm Beach Aggregates.	1.00	4.60	2023
Broward	Sunrise, City of	C-51 Reservoir Phase 1	The City of Sunrise has entered into an agreement for capacity allocation in Phase 1 of C-51 Reservoir with Palm Beach Aggregates.	5.00	23.00	2020

ASR = aquifer storage and recovery; BCWWS = Broward County Water and Wastewater Services; FAS = Floridan aquifer system; FKAA = Florida Keys Aqueduct Authority; FPL = Florida Power & Light; LEC = Lower East Coast; MDWASD = Miami-Dade Water and Sewer Department; mgd = million gallons per day; ND = no data; NR = North Regional; NSID = North Springs Improvement District; PBCWUD = Palm Beach County Water Utilities Department; PWS = Public Water Supply; RO = reverse osmosis; SAS = surficial aquifer system; WPB = West Palm Beach; WTP = water treatment plant; WWTF = wastewater treatment facility.

^a Based on planning-level screening, water supply projects are identified in this plan update to meet 2040 projected demands and have a likelihood of being permitted. However, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, F.S., and the implementing criteria found in Chapter 40E-2, F.A.C., and will be reviewed on an application-by-application basis.

APPENDIX E

HOLLYWOOD CAPITAL IMPROVEMENTS LISTED IN 2018 LECWSP

CITY OF HOLLYWOOD

Service Area: Cities of Hollywood and West Park, portions of the City of Dania Beach, Town of Davie, City of Fort Lauderdale, and Seminole Tribe of Florida Hollywood Reservation. The City of Hollywood provides treated water to Broward County Water and Wastewater Services to serve portions of unincorporated Broward County and bulk sales.

Description: Most potable water supplies are obtained from the SAS, and water is treated at three WTPs using lime softening, membrane filtration, and RO treatment processes. The City purchases bulk raw water from the BCWWS-SRW and provides treated (finished) water to BCWWS District 3, which includes the cities of Pembroke Park and West Park, and the western portions of Dania Beach. The City also sells bulk finished water to the Seminole Tribe of Florida Hollywood Reservation. The City maintains interconnections with the cities of Dania Beach, Hallandale Beach, and Pembroke Pines.

B
R
O
W
A
R
D

Population and Finished Water Demand							
				Existing	Projected		
				2016	2020	2030	2040
Population (City of Hollywood service area)				146,455	153,521	168,115	178,271
Bulk Population (BCWWS District 3 service area)				51,390	53,801	58,749	62,149
Total Population (City of Hollywood and bulk)				197,845	207,322	226,864	240,420
Average 2012-2016 Per Capita (gallons per day finished water)				112			
Potable Water Demands (daily average annual finished water in mgd)				16.40	17.19	18.83	19.97
Bulk Potable Water Demands (daily average annual finished water in mgd for BCWWS District 3)				5.76	6.03	6.58	6.96
Total Potable Water Demands (daily average annual finished water in mgd)				22.16	23.22	25.41	26.93
SFWMD Water Use Permitted Allocation (mgd)							
Potable Water Source				Permit Number 06-00038-W (expires 2028)			
SAS				24.80			
FAS				8.68			
Bulk Raw Water Purchase (from BCWWS-SRW)				5.90			
Bulk Raw Water (Finished Water Sale to Seminole Tribe of Florida)				(0.08-0.11)			
Total Allocation (including bulk water purchase)				39.38			
FDEP Potable Water Treatment Capacity (PWS ID # 4060642)							
Permitted Capacity by Source				Cumulative Facility & Project Capacity (mgd)			
				Existing	Projected		
				2016	2020	2030	2040
SAS				55.50	55.50	55.50	55.50
FAS				4.00	4.00	4.00	6.00
Total Potable Capacity				59.50	59.50	59.50	61.50
Nonpotable Alternative Water Source Capacity (mgd)							
Reclaimed Water				3.00	3.00	7.80 ^a	7.80 ^a
Total Nonpotable Capacity				3.00	3.00	7.80	7.80
Project Summary							
Water Supply Projects	Source	Completion Date	Total Capital Cost (\$ million)	Projected Cumulative Design Capacity (mgd)			
				2020	2030	2040	
Potable Water							
RO Train E	FAS	2034	\$2.00	0.00	0.00	2.00	
FAS wells F14 and F15	FAS	2034	\$3.00	0.00	0.00	4.00	
Total Potable Water			\$5.00	0.00	0.00	6.00	
Nonpotable Water							
No Projects							
Total Nonpotable Water			\$0.00	0.00	0.00	0.00	
Total New Water			\$5.00	0.00	0.00	6.00	

^a Projection to meet Ocean Outfall Law requirements. To meet this capacity, the City has suggested several potential end users; see **Appendix F** for more information.