City of North Miami Beach

DRAFT
10-Year Water Supply Facilities Work Plan
2020
(12/02/2020)

THE CORRADINO GROUP
Engineers • Planners • Program Managers • Environmental Scientists
Helping communities since 1970

ACKNOWLEDGEMENTS

City Commission

Mayor Anthony F. DeFillipo

Commissioner Paule Villard

Commissioner Phyllis S. Smith

Commissioner Fortuna Smukler

Commissioner McKenzie Fleurimond

Commissioner Barbara Kramer

Commissioner Michael Joseph

City Staff

City Manager Esmond K. Scott

Assistant City Manager Sharon Ragoonan

City Attorney Daniel Espino

City Clerk Andrise Bernard, CMC

Prepared By:

The Corradino Group

4055 NW 97 Avenue

Miami, FL 33178

Table of Contents

SECTION 1: INTRODUCTION

The City of North Miami Beach (City) acknowledges the importance of water conservation and has included policies in its Comprehensive Plan in order to assist in implementing related strategies. The City also recognizes the importance of maintaining a proactive water conservation program. The State of Florida has created legislation over the past years with the purpose to strengthen the linkage between growth and water availability based on specific demands identified in the water supply planning process. Section 373.709, Florida Statutes, Section 163.3177(6)(c)3, Florida Statutes, requires that the water supply work plan be updated within 18 months after a water management district's governing board approves an updated regional water supply plan to reflect whatever changes in the regional plan affect their local water supply and work plan. The City's last Water Supply Facilities Work Plan was prepared and adopted in 2014. The South Florida Water Management District (SFWMD) performed an update to the Lower East Coast Regional Water Supply Plan in November 2018. The previous 2015 10-Year Water Supply Facilities Work Plan (Work Plan) was prepared for the City of North Miami Beach (City), located within Miami-Dade County (County). It was prepared in response to the requirements for local governments to revise their Comprehensive Plan within 18 months after the date the Regional Water Supply Plan was adopted.

According to state guidelines, the Work Plan and the Comprehensive Plan (Comp Plan) elements must address the development of traditional and alternative water supplies, bulk sales agreements and conservation and reuse programs that are necessary to serve existing and new development for at least a 10-year planning period.

The purpose of the City of North Miami Beach's new 2020 10-Year Water Supply Facilities Work Plan Update is to identify and plan for the water supply sources and facilities needed to serve existing and new development within the local government's jurisdiction. This Work Plan will be adopted to be consistent with both the Miami-Dade County and South Florida Water Management District Water Facilities Work Plans. Chapter 163, Part II, F.S., requires local governments to prepare and adopt Water Supply Work Plans into their comprehensive plans within 18 months after the water management district approves a regional water supply plan or its update. Updates to the original Work Plan are required every five years. The City is in the South Florida Water Management District region in southeast Florida. The Lower East Coast Water Supply Plan Update (LEC) was approved by the South Florida Water Management District (SFWMD) in November of 2018. Therefore, local governments within the South Florida Water Management District Lower East Coast jurisdiction should amend their comprehensive plans by adopting a Work Plan or Update by May 2020.

The City's Work Plan is divided into five sections:
Section 1 – Introduction
Section 2 – Background Information
Section 3 – Data and Analysis
Section 4 – Intergovernmental Coordination
Section 5 – Capital Improvement Elements
Section 6 – Goals, Objectives, Policies

1.1 Statutory History

The Florida Legislature has enacted bills in the 2002, 2004, 2005, 2011, 2012, 2015, and 2016 sessions to address the state's water supply needs. These bills, especially Senate Bills 360 and 444 (2005 legislative session), significantly changed Chapter 163 and 373 Florida Statutes (F.S.) by strengthening the statutory links between the regional water supply plans prepared by the water management districts and the comprehensive plans prepared by local governments. In addition, these bills established the basis for improving coordination between the local land use planning and water supply planning.

1.2 Statutory Requirements

The City of North Miami Beach has considered the following statutory provisions when updating the Water Supply Facilities Work Plan (Work Plan):

1. Coordinate appropriate aspects of its comprehensive plan with the South Florida Water Management District's Regional Water Supply Plan, [163.3177(6)(a), F.S.].
2. Ensure that its future land use plan is based upon availability of adequate water supplies and public facilities and services [s.163.3177(6)(a), F.S. Data and analysis demonstrating that adequate water supplies and associated public facilities will be available to meet projected growth demands must accompany all proposed Future Land Use Map amendments submitted for review.
3. In consultation with the water supplier, ensure that 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 [s.163.3180 (2)(a), F.S.].
4. For local governments subject to a regional water supply plan, 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 updated SFWMD Regional Water Supply Plan or the alternative project(s) proposed by the local government under s. 373.709(8)(b), F.S. [s. 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 SFWMD Regional Water Supply Plan [s. 163.3177(6)(c), 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. [s. 163.3177(6)(c), 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 five-year period [s. 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 SFWMD Regional Water Supply Plan, the applicable District Water Management Plan, as well as applicable consumptive use permit(s). [s.163.3177 (6)(d), F.S.]. The plan must address the water supply sources necessary to meet and achieve the existing and projected water use and demand for the established planning period, considering the SFWMD Regional Water Supply Plan [s.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 coordination of the comprehensive plan with the SFWMD Regional Water Supply Plan [s.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 alternate water supply projects, traditional water supply projects, and conservation and reuse programs are meeting local water use demands [s.163.3181(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.].

SECTION 2: BACKGROUND INFORMATION

2.1 Overview

The intent of this section is to provide an overview of the City including information on land use and population.

Beginning in 2002, the State of Florida Legislature took steps to improve the coordination of a Regional Water Supply Plan developed by a Water Management District and individual local government land use planning activities. This strengthened coordination started requiring some local governments to prepare a 10-Year Water Supply Facilities Work Plan (Work Plan) if the local government was located within an area that had a Regional Water Supply Plan and if the local government had responsibility for all or a portion of their water supply facilities. Now, all local governments are required to submit a Work Plan to ensure linkage between the Regional Water Supply Plan and their individual comprehensive plans. Each Work Plan should address infrastructure and conservation requirements, needed capital improvements, and inter-governmental and water supplier coordination.

Growth Management Statute and Rule Requirements Related to Water Supply Planning, provides a

summary of regulatory requirements that impact local governments and their water supply planning efforts. As a result of their required regional water supply planning efforts, the South Florida Water Management District (SFWMD) evaluated the adequacy of existing water supplies to meet existing and future water demands and determined that traditional water supply resources from the Biscayne Aquifer will not be adequate to meet future demands. The Lower East Coast Water Supply Plan Update indicates most future water supply needs will need to be met by the implementation of alternative water supply sources. All local governments located within the Lower East Coast regional area are now required to develop a Work Plan to ensure linkage between the regional water supply plan and their individual comprehensive plans.

Since the SFWMD updated the Lower East Coast Water Supply Plan, local governments are required to revise their Comprehensive Plan to include their updated Water Supply Facilities Work Plan within 18 months after the date the Regional Water Supply Plan is adopted. The purpose of this Work Plan is to fulfil the legislative requirement and to present an implementation plan that will guide the City's efforts to develop and maintain sustainable sources of water for its overall Water Service Area in coordination with the LEC Plan. A description of the City's existing and proposed water supply, treatment, storage, transmission and distribution facilities to satisfy projected water demands is included. As required, it is anticipated that this update will occur every five years or within 18 months of a revision to the LEC Plan.

SECTION 3: DATA & ANALYSIS

The intent of the data and analysis section of the Work Plan is to describe the information that local governments need to provide to state planning and regulatory agencies as part of their proposed comprehensive plan amendments, particularly those that would change the Future Land Use Map (FLUM) to increase density and/or intensity. Additionally, population projections were reviewed for consistency between the County and the South Florida Water Management District's Water Supply Plan.

This section evaluates the historical and future population projections for the City of North Miami Beach Service Area. The development of population projections is a collaborative effort between the City of North Miami Beach, City of Aventura, City of Miami Gardens, City of Sunny Isles Beach, Town of Golden Beach and Miami-Dade County.

3.1 Local Government Overview

NMB Water provides potable water service to approximately 180,000 people in the municipalities of North Miami Beach, Aventura, Sunny Isles Beach, Miami Gardens, Town of Golden Beach, and unincorporated Miami-Dade County. NMB Water provides wastewater service to a smaller area containing approximately 45,000 people, including approximately half of the city of Miami Gardens, small areas of North Miami Beach, and the county. The City's Water Service Area is approximately 16,000 acres or 25 square miles in size.

The City of North Miami Beach stopped purchasing water from MDWASD in 2008 and has a 30-year wholesale agreement with MDWASD to purchase and/or sell water on an as needed basis. NMB Water does not purchase any water from MDWASD and supplies 100% of its total water needs on a regular basis. NMB Water only purchases water from MDWASD under emergency conditions.

The City's Water Service Area was established between 45 and 65 years ago as development began in the area and private water systems located inside and outside the City Limits were acquired by the City. The City currently provides potable water for commercial, industrial, residential and other uses for approximately 180,000 people in the City's Water Service Area under its Consumptive Use Permit.

The City of North Miami Beach is located in the northeastern portion of Miami-Dade County, Florida. The City's Water Service Area is comprised roughly of the area bounded by the Atlantic Ocean on the east; NW 37 Avenue on the west; NW 128 NW 135, NW 143 and NE 146 on the south; and, Ives Dairy Road and Snake Creek Canal on the north.

MDWASD supplies water to 15 wholesale customers, 15 municipal retail customers and areas of unincorporated Miami-Dade County. MDWASD serves as a backup water supply for NMB system. The other utilities such as North Miami Beach, North Miami, Homestead and Florida City also supply other local governments within Miami-Dade County as well as unincorporated areas. Miami Dade County Population Projection for the City of North Miami Beach is 55,208 for Year 2035 and 58,225 for Year 2040.

Water Suppliers for Local Governments

Miami-Dade Water and Sewer Department (WASD) Wholesale Customers	
Municipality	% **Population Served byWASD**
Bal Harbour	100%
Bay Harbour Island	100%
Hialeah	100%
Hialeah Gardens	100%
Homestead	3 MGD Max
Indian Creek	100%
Medley	100%
Miami Beach	100%
North Bay Village	100%
North Miami [2]	25%
North Miami Beach [3]	as needed only
Opa Locka	100%
Surfside	100%
Virginia Gardens	100%
West Miami	100%

Other Utilities - North Miami Beach (NMB)	
Municipality	% **Population Served by NMB**
Aventura[1]	32%
Golden Beach	100 %
Miami Gardens[5]	41%
Sunny Isles	100%
North Miami Beach	100%
Unincorporated	N/A

Other Utilities - Homestead	
Municipality	% **Population Served by Homestead**
Homestead[6]	96%
Unincorporated	N/A

Miami-Dade Water and Sewer Department (WASD) Retail Municipal Customers	
Municipality	% **Population Served byWASD**
Aventura[(1)]	68%
Coral Gables	100%
Cutler Bay	100%
Doral	100%
El Portal	100%
Key Biscayne	100%
Miami	100%
Miami Lakes	100%
Miami Shores [4]	97%
Miami Springs	100%
Palmetto Bay	100%
Pinecrest	100%
South Miami	100%
Sweetwater	100%
Miami Gardens[5]	57%
Unincorporated	N/A

Other Utilities - North Miami (NM)	
Municipality	% **Population** Served by NM
North Miami[2]	75 %
Biscayne Park	100%
Miami Shores [4]	3 %
Unincorporated	N/A

Other Utilities - Florida City	
Municipality	% Population Served by Fl City
Florida City	100%

Note:

(l) Aventura is supplied by MDWASD, North Miami Beach, and City of Opa-Locka (3% of population)

(2) 25% of North Miami's demand is supplied by MDWASD. Sixty-five (65%) is supplied by North Miami

(3)North Miami Beach is supplied on an as needed basis only by MDWASD

(4)Miami Shores is supplied by MDWASD and North Miami

(5)Miami Gardens is supplied by MDWASD, North Miami Beach, and Opa-Locka. Opa-Locka is a wholesale customer of MDWASD

(6) 4% of Homestead's population is within WASD's service area

3.2 Relevant Regional Issues

Regional issues that affect the City of North Miami Beach include minimizing pressure on the Everglades and Biscayne Bay ecosystems and, Biscayne and Upper Floridan Aquifers. To that end, the Comprehensive Everglades Restoration Plan (CERP) is providing the foundation for one of the largest ecosystem restoration projects in the world. The SFWMD and the US Army Corps of Engineers have partnered in order to restore, protect and preserve the water resources of central and southern Florida, including the Everglades. Various projects under CERP help ensure the proper quantity, quality, timing, and distribution of waters to the Everglades and all of South Florida. The goal of CERP is to capture fresh water that now flows unused to the Atlantic Ocean and the Gulf of Mexico and redirect it to areas that need it most.

Recently, the SFWMD's priorities have focused on creating Water Reservation rules to facilitate construction of CERP project components. The City is in support of CERP and other restoration projects in the LEC area that support the Northern/Southern Everglades 20-year commitment to Everglades restoration, including the C-111 South Dade, C-111 Spreader, Biscayne Bay Coastal Wetland BBCW L-31 East Floway, BBCW Deering Estate, BBCW Cutler Wetlands projects.

The South Florida Water Management District is the state agency responsible for water supply in the Lower East Coast planning area which includes the jurisdictional boundaries of North Miami Beach. SFWMD plays a pivotal role in resource protection, through criteria used for Consumptive Use Permitting. As pressure increased on the Everglades ecosystem resource, the 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 increasing conservation and reuse.

Even with an ever-increasing population, withdrawals from the Aquifers will be limited, greater conservation will be required to reduce per capita use; and, reclaimed water must continue to be an important alternative water source per the Ocean Outfall Program. The City does not have any domestic wastewater treatment facilities which discharge to the ocean but supports Miami-Dade County efforts in reducing wastewater outflows and providing for reuse.

The Lower East Coast's 2018 Plan Update notes that a number of utilities have diversified their water supplies, including treatment and storage technologies, and water conservation programs. These alternatives include constructing brackish Upper Floridan aquifer wells and reverse osmosis treatment plants, reclaimed water treatment and distribution facilities, and aquifer storage and recovery systems. From FY2013 to FY2018, the SFWMD provided more than $3 million in alternative water supply funding for 11 projects in the LEC Planning Area. Funded projects created 9.25 million gallons per day (mgd) of new reclaimed water capacity and 4.19 mgd of additional reclaimed water distribution or storage in the LEC Planning Area.

The 2018 Lower East Coast Water Supply Plan Update water supply issues are as follows:

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 Upper Floridan aquifer system requires careful planning and wellfield management to prevent undesirable changes in water quality.

The following are some of the City's Objectives and Policies that address the identified regional issues above:

Policy 1.3.7
The City's Utilities Department shall hold an annual workshop during June of each calendar year with the government jurisdictions located within its water service area, Miami-Dade Water and Sewer Department, Miami-Dade County Division of Environmental Resources Management, and South Florida Water Management District. The workshop will focus on water supply needs, implementation of alternative water supply projects (including reuse and other conservation measures), and the establishment of level of service standards.

Policy 1.2.11
The City shall continue to evaluate alternative potable water supply sources evaluation techniques and technologies for water capture and reuse, including rainwater harvesting, and revise its Land Development Regulations as necessary to allow for these options with local building design.

Additionally, the City is addressing regional issues related to the construction of additional storage systems. The Florida Administrative Code (F.A.C.) Section 62.555.348 Planning for Expansion of Public Water System Source, Treatment, or Storage Facilities requires a Capacity Analysis Report (CAR) within 6 months after the month in which the total maximum day quantity of finished water produced by all WTPs connected to a water system exceeds 75 percent of the total permitted maximum day operating capacity of the system. In March of 2018, Norwood WTP's production periodically exceeded 75 percent of the total maximum day operating capacity. Therefore, the CAR was prepared and submitted to Miami-Dade County's Florida Department of Health in September 2018.

3.3 Population Projections

Population projections for the potable water service area were prepared through the year 2030. The basis of the projections was data obtained from Miami-Dade County Department of Regulatory and Economic Resources (RER), which provided population projections for Miami-Dade County. To develop the population projections for interim years, such as 2030, a straight-line interpolation was conducted. An exception to using the county-developed TAZ projections was an adjustment upward to population in areas within the city that were rezoned during the City Council meeting held on November 3, 2015. With this rezoning, eight areas within the city along NE 163 Street and Biscayne Boulevard were approved for development density increases

accounting for new residential units. Based on 2.5 people per residential unit, it was estimated that 23,818 people would be added to the city's population by 2030 as a result of the rezoning. However, this growth is contingent on economic factors and while accounted for in the County's projections, the current assumptions for the County's growth projections uses a more modest growth rate in regard to this additional population. Therefore, the population projections assume that some but not all of the 23,818 is included in the revised growth projections. This plan uses this more modest growth rate in order to align the City's and County's plans.

The City anticipates that some of the rezoned areas will be fully developed by 2030. It was assumed that these 8 areas would reach full buildout development by 2030 and their growth was calculated based on a straight-line interpolation between 2015 and 2030. There is a smaller percentage of growth projected for other areas of the City of North Miami Beach that accounts for the total projected growth in the water service populations during the planning period. For Miami-Dade County, Miami Gardens, Aventura, Sunny Isles, and Golden Beach, it was assumed that population growth would be as shown in the TAZ-based population projections.

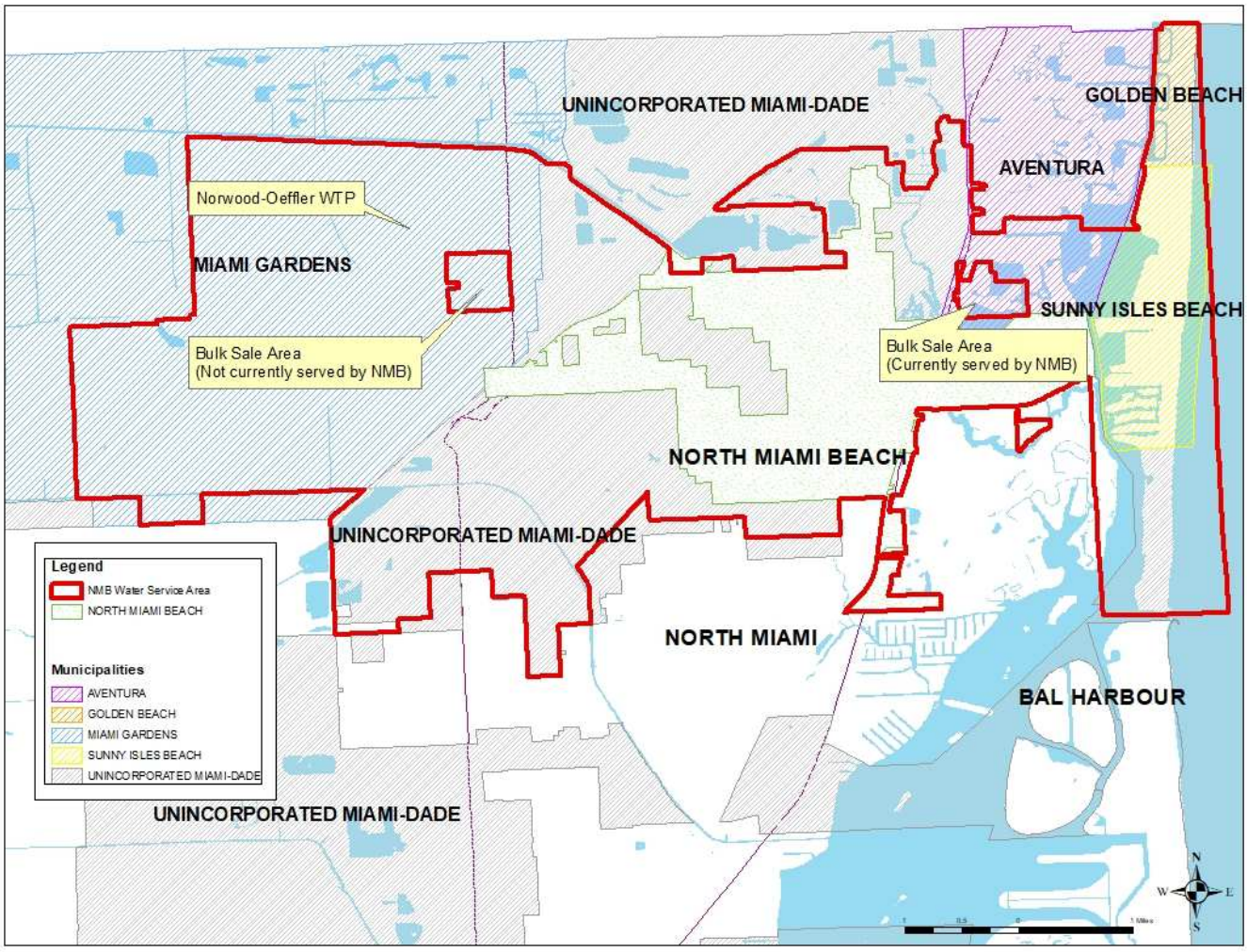
Projected Water Service Population

Historical and Projected Population served					
	2010	**2015**	**2020**	**2025**	**2030**
Aventura	10,267	10,735	11,204	11,673	12,141
Golden Beach	903	955	1,007	1,058	1,110
Sunny Isles Beach	19,509	21,104	22,698	24,293	25,887
Miami Gardens	42,871	44,471	46,071	47,671	49,271
City of North Miami Beach	40,089	43,136	46,182	49,228	52,274
Miami-Dade County	43,382	45,590	47,798	50,006	52,215
Total	**157,021**	**165,991**	**174,960**	**183,929**	**192,899**
Source: MDWASD 2019					

3.4 Maps of Current and Future Areas Served

The map provided below is only a depiction of current areas served. The City of North Miami Beach has no plans of modifying the service area in the future, and therefore the current map depicts future areas served. No areas within the City is serviced by a domestic self-supply system.

Map of Current and Future Areas Served



Source: NMB Water October 2019

3.5 Potable Water Level of Service Standard

North Miami Beach owns and operates the Norwood WTP located at 19150 NW 8 Avenue, Miami Gardens, Florida. The water treatment facility began as a small lime softening plant in the late 1940s and has been expanded over the years. Nanofiltration (NF) and reverse osmosis (RO) membrane-based treatment systems were added in 2008, increasing the plant's permitted capacity to a total of 32 million gallons per day (mgd) (including bypass flows). However, the WTP lacks backup treatment units and its reliable, or firm capacity, is much lower (18.5 mgd). In long-term agreements with MDWASD there has been a sharing of service area, treated water "pass-through" from MDWASD through the City's distribution system back into MDWASD Service Area, and some bulk sales arrangements from the City to MDWASD retail service area customers. An agreement with MDWA SD in 2001 has led to the City's expansion of its Norwood-Oeffler WTP using membranes and a normal day separation of water service areas; whereas, the City serves its retail Water Service Area completely plus it provides wholesale service to one small MDWASD retail area.

The level of service criteria for the NMB Water potable water transmission system are as follows:

- Minimum pressure throughout system at peak-hour demand: 40 psi; goal is 45 to 50 psi
- Minimum pressure throughout system at MDD with fire flow: 20 psi; goal of 25 to 30 psi
- Maximum pipeline flow velocity at peak-hour demand: 8 feet per second
- Minimum pipe size to support fire flow: 6-inch-diameter residential and 8-inch-diameter commercial
- Existing water mains under 6-inches in diameter that do not serve fire hydrants will be replaced with minimum 4-inch mains

The Miami-Dade County Code of Ordinances contains the following requirements for firefighting infrastructure:

- Minimum water main size serving fire hydrants in residential areas must be 6 inches in diameter with a minimum fire flow capacity of 750 gpm for the system.
- Minimum water main size serving fire hydrants in commercial, industrial, and multi-family developments must be 8 inches in diameter with a minimum fire flow capacity of 1000 gpm, systemically 300 gpm.

Higher Density Residential.

- Minimum system shall deliver not less than 2000 gpm at 20 psi residual on the system. Each fire hydrant shall deliver not less than 750 gpm.
- Minimum residual system pressure during fire flow must be 20 psi. NMB Water goal is 25 psi minimum pressure to be applied in planning evaluations.

NMB Water established the following level of service criteria:

- Provide uninterrupted sanitary sewer service without back-ups
- Avoid overflows
- Limit excessive infiltration and inflow (I/I)
- Control odor
- Provide suitable maintenance and replacement of aging components
- Prevent unpleasant conditions at PSs
- Avoid excessive costs while providing services
- Develop and manage business processes to update asset condition on an ongoing basis
- Determine appropriate staffing and provide training needed to perform condition assessments
- Develop a business process team to perform continuous monitoring, innovative improvements and provide support to the assessment teams

Level of service criteria as listed above are evaluated for all new site plan applications through the City's Concurrency report as part of its development review processes, to ensure timely and adequate reporting and estimates of anticipated future demands on the City's water system.

The City's current and projected retail Water Service Area, as well as one small wholesale service area (MDWASD Retail Area) that are supplied treated water by North Miami Beach are provided. The estimated population served is also provided. The recent annual treated water billed within the Water Service Area along with the bulk water sales is also provided. The per capita treated water usage ranged from 118 to 129 gpcpd (gallon per capita per day) with the average being 121 gpcpd. Information will be revised with the City's Master Plan update. The per capita is a function of several variables including some such as rainfall, economy, rates, conservation restrictions, seasonal

population influx, etc. As a utility provider, the City has to provide water to its customers no matter the situation. The City had previously adopted the per capita rate of 144 gpcd, consistent with its Consumptive Use Permit 13-00060-W and Comprehensive Plan to be able to provide water within the service area regardless of the fluctuating variables. However, in re-evaluation of existing trends, the historic treated water per capita usage of 144 gpcpd is very high given the 118 to 129 gpcpd historical range. When a shorter historical timeframe is used, the range further decreases to 118 to 121 gpcpd; thus, 121 gpcpd was used as a conservative estimate for future demand projections.

Prior to the NMB Utility beginning a conservation program in the late 1990s, the per capita treated water usage was above 150 gpcpd. Due to the success of local conservation efforts and based on the historical water usage results shown below, an average per capita treated water usage of 121 gpcpd is utilized for projections through 2030. Per capita water use over the last six years averaged 121 gpdc as shown below.

Per Capital Potable Water Use
Water and Wastewater Master Plan

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	157,022	129
2011	20.5607	158,816	129
2012	20.48075	160,609	128
2013	20.168	162,403	124
2014	20.665	164,197	126
2015	20.226	168,447	120
2016	20.236	169,977	119
2017	20.319	171,507	118
2018	20.88059	173,037	121
Average			**123 (10 Years)** **(121 for past 6 years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **Unincorporated Miami-Dade**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	43,381	47
2011	20.5607	43,823	47
2012	20.48075	44,265	46
2013	20.168	44,706	45
2014	20.665	45,148	46
2015	20.226	45,590	44
2016	20.236	46,032	44

2017	20.319	46,473	44
2018	20.88059	46,915	44
Average			**45 (9 Years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **Aventura**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	10,266	20
2011	20.5607	10,360	20
2012	20.48075	10,454	20
2013	20.168	10,548	19
2014	20.665	10,641	19
2015	20.226	10,735	19
2016	20.236	10,829	19
2017	20.319	10,923	18
2018	20.88059	11,017	19
Average			**19 (9 Years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **Golden Beach**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	903	22
2011	20.5607	913	22
2012	20.48075	924	26
2013	20.168	934	21
2014	20.665	944	22
2015	20.226	955	21
2016	20.236	965	21
2017	20.319	976	21
2018	20.88059	986	21
Average			**22 (9 Years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **Miami Gardens**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	42,870	47
2011	20.5607	43,190	47
2012	20.48075	43,510	47
2013	20.168	43,830	46
2014	20.665	44,150	47
2015	20.226	44,471	45
2016	20.236	44,791	45
2017	20.319	45,111	45
2018	20.88059	45,431	46
Average			**46 (9 Years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **North Miami Beach**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	40,089	50
2011	20.5607	40,698	50
2012	20.48075	41,307	49
2013	20.168	41,917	48
2014	20.665	42,526	48
2015	20.226	43,136	47
2016	20.236	43,745	46
2017	20.319	44,354	46
2018	20.88059	44,963	46
Average			**48 (9 Years)**

(Note: gpd= gallon per day)

Per Capital Potable Water Use **Sunny Isles Beach**

Year	Average Day WTP Production; mgd	Estimated Water Service Population	Per Capita Use; gpd
2010	20.28115	19,509	103
2011	20.5607	19,828	103
2012	20.48075	20,146	101

2013	20.168	20,465	99
2014	20.665	20,784	99
2015	20.226	21,104	96
2016	20.236	21,423	94
2017	20.319	21,741	93
2018	20.88059	22,060	95
Average			**98 (9 Years)**

(Note: gpd= gallon per day)

Historical Average Day and Maximum Day Production

The table below provides the maximum day and annual average daily quantities of finished water produced by each treatment system at the Norwood WTP and the total plant production during each of the past 10 years. The table below presents the historical Norwood WTP daily production rates between 2009 and 2018.

Finished Water Produced during the Past 10 Years

Year	Lime Softening		Nanofiltration		Reverse Osmosis		Total Production	
	Average Day WTP production (mgd)	Maximum Day Production (mgd)	Average Day WTP production (mgd)	Maximum Day Production (mgd)	Average Day WTP Production (mgd)	Maximum Day Production (mgd)	Average Day WTP Production (mgd)	Maximum Day Production (mgd)
2009	12.15	14.76	5.04	10.37	4.31	9.04	21.27	24.36[b]
2010	10.15	14.27	5.67	10.31	4.25	6.53	20.02	24.77[b]
2011	10.80	13.92	5.57	11.63	4.18	5.86	20.56	23.48
2012	11.43	14.44	5.92	10.84	3.14	5.78	20.48	24.64[b]
2013	11.48	13.48	6.14	8.86	2.60	6.48	20.17	22.99
2014	11.59	14.04	6.20	10.18	2.87	7.67	20.66	23.78
2015	10.25	13.34	6.46	9.28	3.52	6.48	20.22	24.63[b]
2016	11.85	16.17	5.50	9.93	2.85	6.80	20.20	25.22[b]
2017	13.10	15.45	4.99	10.28	2.21	6.43	20.30	23.17
2018[a]	12.98	14.60	4.90	8.36	2.13	3.99	21.14	24.78

Notes:

[a] Data range from January 1, 2018 through June 30, 2018.

[b] This maximum day production value was a non-recurring, isolated anomaly, as evident in Figure 2-1.

3.6 Water Demand Projections

Projected Demand in MGD

Year	Population	Per Capita Use	Average Use MGD

2019	173,166	121	20.95
2020	174,960	121	21.17
2025	183,929	121	22.25
2030	192,899	121	23.34

Un-Incorporated Miami-Dade

Year	Population	Per Capita Use	Average Use MGD
2019	47,357	44	20.95
2020	47,798	44	21.17
2025	50,006	44	22.25
2030	52,215	44	23.34

Aventura

Year	Population	Per Capita Use	Average Use MGD
2019	11,110	19	20.95
2020	11,204	19	21.17
2025	11,673	19	22.25
2030	12,141	19	23.34

Golden Beach

Year	Population	Per Capita Use	Average Use MGD
2019	996	21	20.95
2020	1,007	21	21.17
2025	1,058	21	22.25
2030	1,110	21	23.34

Miami Gardens

Year	Population	Per Capita Use	Average Use MGD
2019	45,751	45	20.95
2020	46,071	46	21.17
2025	47,671	46	22.25
2030	49,271	47	23.34

North Miami Beach

Year	Population	Per Capita Use	Average Use MGD
2019	45,573	46	20.95
2020	46,182	46	21.17

2025	49,228	45	22.25
2030	52,274	44	23.34

Sunny Isles Beach

Year	Population	Per Capita Use	Average Use MGD
2019	22,379	93	20.95
2020	22,698	93	21.17
2025	24,293	91	22.25
2030	25,887	90	23.34

The table below presents the projected potable water demand and wastewater flows. Water demand include growth from the 2015 rezoning to mixed use development of eight areas within the City of North Miami Beach and the addition of a new wholesale water customer.

Projected Water Demands and Wastewater Flows

Source: Water and Wastewater Master Plan to be updated by NMB Water in the future

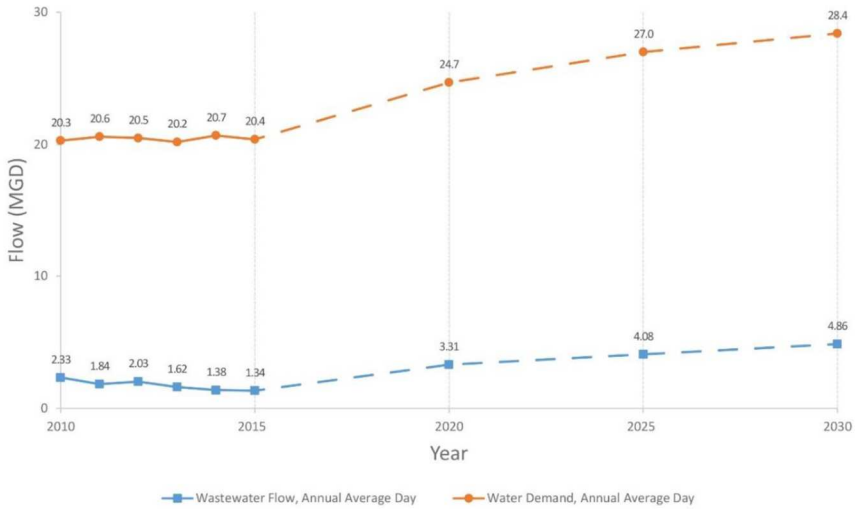
Records of daily raw and treated water produced from the Norwood WTP from 2010 through 2015 show that the average finished water production over this 6-year period was flat, averaging 20.4 mgd.

WUP Groundwater Supply Allocation (WUP No. 13-00060-W)
Water and Wastewater Master Plan

	Annual Allocation	Biscayne Aquifer	Upper Floridan Aquifer
MGY	14,009	9,603	4,406
Maximum Month Avg.	1308.6	897	411.6

Note:
mgy = million gallons per year

The supply allocation is contingent on the following stipulations:



- The City will operate the Floridian aquifer wells to withdraw a minimum of 10% of the quantity of water withdrawn from the Biscayne aquifer wells on an annual average basis.
- The City must utilize the older Biscayne aquifer wells consistent with production volume needed for the lime softening portion of the treatment plan.
- The Biscayne aquifer wells drilled in 2002 will be used to supply raw water to the nanofiltration portion of the treatment plant consistent with the nanofiltration production needed.
- It is estimated that when the lime softening facilities are phased out of operation (estimated at 15 to 20 years hence); the City must show a greater reliance on the Floridian aquifer with total withdrawal from the Biscayne averaging no more than 26.31 mgd approved on an annual basis.

3.7 Water Supply Sources and Projects

The Norwood WTP was originally built in the late 1940s and used lime softening for water treatment. The lime softening facilities were expanded in the 1970s. In 2008, the plant was expanded further to also include nanofiltration (NF) and low-pressure reverse osmosis (RO) treatment facilities. Water from the Biscayne aquifer is treated by lime softening or NF, while water from the Upper Floridan aquifer is treated using RO. Existing onsite treatment facilities include a 15 mgd lime softening treatment process and a 17 mgd membrane treatment system. The membrane treatment system includes a 9 mgd NF system with a 1.5 mgd raw water bypass for blending and a 6 mgd low-pressure RO system with a 0.5 mgd raw water bypass for blending.

NMB Water currently has 20 raw water supply wells. Four wells are installed in the Upper Floridan aquifer and feed the RO system. There are 16 wells installed in the Biscayne aquifer, 5 of which are dedicated to supply water to the NF system, while the remaining 11 wells are dedicated to supply water to the lime softening system. All 20 wells are equipped with submersible pumps. Groundwater withdrawals for drinking water production are regulated by the South Florida Water Management District (SFWMD) under Water Use Permit (WUP) No. 13 00060 W, which expires August 9, 2027.

The existing finished water storage system for NMB Water includes two ground storage tanks (GST) located at the Norwood WTP and one GST located at Operations Center Repumping Station. The two onsite GSTs include a 4.2 million gallon (MG) pre-stressed concrete and a 2 MG steel tank. The 4.2 MG tank has a concentric internal tank-within-tank with a capacity of 0.8 MG that is currently used for disinfection contact from the lime softening process.

Raw Water Supply

NMB Water operates 20 wells. Sixteen wells are installed in the Biscayne aquifer and four (4) wells are installed in the Upper Floridan aquifer. The total depths of the Biscayne aquifer wells generally do not exceed 100 feet below land surface (bls) – with one exception (Well 11 at 58 feet), with inner casing depths ranging from 52 to 90 feet bls. The total depths of the Upper Floridan aquifer wells do not exceed 1,250 feet and each well has an inner casing depth of 1,000 feet. All wells are equipped with submersible pumps.

Eleven of the 16 wells installed in the Biscayne aquifer supply water to the lime softening treatment process at Norwood WTP. These wells provide a firm pump capacity, that is with largest producing well pump out of operation, of 12,850 gallons per minute (gpm), or 18.5 mgd, at a range of 60 to 80 feet total dynamic head (TDH), based on manufactured supplied pump curves and original design set points. The remaining five Biscayne aquifer wells supply water to the NF membrane treatment process at Norwood WTP. These wells have a firm pump capacity of 10,000 gpm, or 14.4 mgd, at 210 feet of TDH.

Of the 20 wells operated by NMB Water, four (4) are Upper Floridan aquifer wells that supply water to the RO membrane treatment process. The firm pump capacity of these wells totals 6,000 gpm, or 8.64 mgd, at 155 TDH based on manufacturer supplied pump curves and original design set points. Data and capacity information of each NMB Water production well and well pump is shown below.

Existing Raw Water Supply Wells Capacity

Well ID	Rated Pump Capacity (gpm)		Casing Depth (fblsa)	Well Total Depth (fblsa)	Year Constructed
Lime Softening Biscayne Wells (17,200 gpm or 24.8 mgd of total rated well pump capacity)					
1	1,500		43	48	1949
2	1000		43	48	1949
3	1,500		51	56	1957
4	1,250		58	63	1957
5	900		49	54	1968
6	1250		55	60	1968
7	1250		47	52	1968
8			Decommissioned in 2005		
9	1250		79	84	1970
10	1250		79	84	1970
11	4,167		48	58	1988
12	4,167		110	131	1988
NF Biscayne Wells (12,500 gpm or 18 mgd of total rated well pump capacity)					
13	2,600		85	100	2002
17	2,600		50	95	2002
19	2,600		80	90	2002
20	2,600		52	62	2002
21	2,600		80	99	2002
RO Floridan Wells (8000 gpm or 11.5 mgd of total rated well pump capacity)					
F-1	2,000		1,020	1,235	2002
F-2	2,000		1,000	1,231	2002
F-3	2,100		1,025	1,250	2002
F-4	2,100		1,020	1,250	2002
Note: fbls = feet below land surface					

Data Source NMB Water

Groundwater withdrawals by NMB Water are regulated by the SFWMD under WUP No. 13-00060-W, which expires on August 9, 2027. The following limitations to annual withdrawals are stipulated in the WUP are as follows:

- Biscayne aquifer – 9,603 MG
- Upper Floridan aquifer – 4,406 MG

The following limitations to maximum monthly withdrawals from specific sources are stipulated:

- Biscayne aquifer – 411.60 MG
- Upper Floridan aquifer – 897.00 MG

- The City will operate the Upper Floridan aquifer Wells to withdraw a minimum of 10 percent of the quantity of water withdrawn from the Biscayne aquifer wells on an annual average basis.
- The City must utilize the older Biscayne aquifer wells consistent with production volume needed for the lime softening portion of the treatment plant.
- The Biscayne aquifer wells drilled in 2002 will be used to supply raw water to the nanofiltration portion of the treatment plant consistent with the nanofiltration production needed.
- It is estimated that when the lime softening facilities are phased out of operation (estimated at 15 to 20 years hence); the City must show a greater reliance on the Floridian aquifer with total withdrawal from the Biscayne averaging no more than 26.31 mgd approved on an annual basis.

FDEP regulations (Chapter 62-555.315(3), F.A.C.) require that well capacity, with the largest producing well out of operation, equal at least the system design ADD and preferably the design MDD to demonstrate firm water supply capacity. A fifth Upper Floridan aquifer well was determined to be needed no later than 2025 The earlier implementation of the Well F-5 will achieve full supply reliability serving the RO treatment system. Upsizing one aquifer well is also recommended as part of the WTP upgrades project. The permitted groundwater withdrawals are adequate to allow for installing additional wells to meet future expanded treatment demands and increase system redundancy and reliability. The Biscayne aquifer capacity and planned withdrawals are adequate and in compliance through 2030. The Upper Floridan aquifer planned withdrawals are projected to be within the WUP annual allocation through 2030.

Norwood Water Treatment Plant

NMB Water provides potable water service to approximately 180,000 people in the municipalities of North Miami Beach, Aventura, Sunny Isles Beach, Miami Gardens, and Miami-Dade County. NMB Water owns the Norwood Water Treatment Plant (WTP), which produces water for the entire water service area. The Norwood WTP has a permitted maximum day operating capacity of 32 million gallons per day (mgd).

The Florida Administrative Code (F.A.C.) Section 62.555.348 Planning for Expansion of Public Water System Source, Treatment, or Storage Facilities requires a Capacity Analysis Report (CAR) within 6 months after the month in which the total maximum day quantity of finished water produced by all WTPs connected to a water system exceeds 75 percent of the total permitted maximum day operating capacity of the system. In March of 2018, Norwood WTP's production periodically exceeded 75 percent of the total maximum day operating capacity. Therefore, the CAR was prepared and submitted to Miami-Dade County's Florida Department of Health in September 2018.

The CAR evaluates the capacities of the source, treatment, and storage facilities in the system as required by the FAC Section 62.555.348 and contains the following information:

• The maximum day and annual average daily quantities of finished water produced by the Norwood WTP during the past 10 years.

• Projected service area total water demands for the next 10 years – total annual average daily demand (ADD) and total maximum day demand (MDD), including fire-flow demand, and projected total finished water storage needed, including fire storage.

• Norwood WTP's source water facilities and treatment facilities capacity, the permitted maximum-day operating capacity and, if applicable, and the useful capacity of each finished water storage facility.

• An estimate of the time remaining before the maximum day water demand, including fire-flow demand, exceeds the current total permitted maximum day operating capacity of the WTP, and an estimate of the time remaining before the finished water storage needs, including fire storage, exceeds the existing total useful finished water storage capacity.

• Planned expansions of source, treatment, or storage facilities, including schedules for design, permitting, and construction of planned expansions.

Nanofiltration and Reverse Osmosis Systems

The NF treatment process includes four sand separators, chemical pre-treatment with sulfuric acid, three NF feed cartridge filters, two bypass cartridge filters, four feed pumps, and three membrane skids. The three NF skids operate at approximately 80 percent recovery, with each train producing approximately 3.0 mgd of permeate. The current facilities were designed to accommodate a future additional sand separator, NF feed pump, and NF skid. The table below presents information on major equipment in the NF treatment process.

Major Equipment for Nanofiltration Treatment Process

Major Equipment	Number of Units	Design Capacity (each) (gpm)	Design Pressure (psi)	Notes
Sand Separators	5	2,955	150	Lakos, One Redundant Unit
Cartridge Filters (NF Feed Pretreatment)	3	5,210	120	296 Cartridges per Unit
Cartridge Filters (Blend)	2	1,400	120	86 Cartridges per Unit
NF Feed Pumps	5	2,605	134	
NF Skids	4	2,082	134	54:27 Array, 7 Elements per Vessel

Notes:psi = pounds per square inch

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

The RO treatment process includes chemical pretreatment with sulfuric acid and scale inhibitor, three RO feed cartridge filters, two bypass cartridge filters, and three RO skids with energy recovery devises (ERDs). The three RO

skids operate at approximately 75 percent recovery. Each train has a permeate production capacity of 2.0 mgd. The table below presents information on the major equipment for the RO treatment process.

Major Equipment for Reverse Osmosis Treatment Process

Major Equipment	Number of Units	Design Capacity (each) (gpm)	Design Pressure (psi)	Notes
Cartridge Filters (RO Feed Pretreatment)	3	3,475	120	176 Cartridges per Unit
Cartridge Filters (Blend)	2	350	120	22 Cartridges per Unit
RO Feed Pumps	4	1,855	251	
RO Skids	3	1,388	250	36:18 Array, 7 Elements per Vessel

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

NF and RO permeate and bypass streams are conveyed to four degasifiers and flow by gravity into the post- treatment structure east and west chlorine contact basins. Sodium hypochlorite is injected directly upstream of the contact basins to generate the target free chlorine residual concentration for primary disinfection and achieve a minimum of four-log inactivation. Ammonia is injected at the basins' effluent, to form chloramines for secondary disinfection in the distribution system. The degasifiers remove hydrogen sulfide from the blended permeate and raw water.

After ammonia injection, the chloraminated water flows into the post-treatment structure blending basin, where it blends with lime-softened water. Fluoride and sodium hydroxide are injected into the blending basin for dental health and pH adjustment, respectively. Transfer pumps deliver the blended finished water to two onsite GSTs.

The Norwood WTP is permitted to dispose NF and RO concentrate reject water produced from the membrane treatment process via a single onsite deep injection well (DIW). This DIW is regulated by the following two permits:

- FDEP Operating Permit No. U210044-004-U0/1X, Name IW, Class 1 WTP Concentrate Injection Wells – the permit was issued on December 31, 2014 and expires on December 30, 2019. It allows the onsite DIW to have a capacity of 7.37 mgd. The permit was issued for the well with 14.5-inch tubing to 2,848 meters bls and an open hole from 2,858 to 3,420 meters bls. The maximum permitted wellhead operating pressure is 129 psi. A mechanical integrity test was performed on the well by October 21, 2019. The maximum allowable flow velocity in the well casing is 12 feet per second.
- Miami-Dade County RER, Environmental Resources Management Industrial Waste Pre-treatment Annual Operating Permit, No. IWP-000438-2014/2015(p) – Permit allows for discharge of concentrate from the NF and RO to the Miami-Dade Water and Sewer Department collection system via a 20-inch disposal main when the well is out of service for mechanical integrity testing. Permit conditions include a maximum daily flow of 6.5 mgd, pH range of 5.5 to 11.5 and a total suspended solids load of 145 pounds per day. This permit is issued annually.

Lime Softening and Filtration System

The lime softening process includes a raw water receiving basin, two lime softening clarifiers, and carbon dioxide is now injected upstream of the recarbonation basins directly into the pipe, and 11 dual-media gravity filters. The filtered water flows by gravity into either the east or west clearwells. Vertical turbine (VT) pumps transfer water from the lime system east and west clearwells to the 0.8-million-gallon lime side chlorine contact tank, which is constructed inside the 4.2-million-gallon GST.

Sodium hypochlorite and anhydrous ammonia are added directly in the pipeline upstream of the raw water receiving tank, which splits the raw water flow to the two-existing lime softening clarifiers. To reduce calcium hardness, slaked lime is added to the raw water in the lime softening clarifiers. The lime storage and feeding facilities include three steel silos, each with a lime feeder and slaker system, slurry tanks, and lime slurry pumps. NMB Water purchases pebble quick lime, which is hydrated in the slaker systems to form a slurry that is fed into the lime softening clarifiers.

The lime softening clarifiers have a nominal rated capacity of 5 and 10 mgd, with design weir loading rates of 24,485 and 31,454 gallons per day per linear foot, respectively. The design surface loading rates at 5 mgd are 2.2 to 2.1 gpm per square foot (ft^2). Removal of calcium hardness in the lime softening clarifiers occurs at a pH of approximately 10.0. Approximately 1 mgd of flow is bypassed around the lime softening clarifiers to increase the finished water alkalinity and hardness for optimized lead and copper corrosion control.

Each lime softening clarifier has two lime sludge pumps that remove sludge from the bottom of each clarifier. The sludge is pumped from each clarifier to a single lime sludge thickener. Supernatant from the thickener is pumped to the influent of Lime Softening Clarifier 3. Thickened sludge is pumped to a tanker truck and removed for offsite disposal location by private hauling company.

Carbon dioxide is now injected upstream of the recarb basins, directly into the pipe. A new CO2 storage and feed system was installed in 2018. The east and west recarbonation chambers have volumes of 7,800 gallons and 30,600 gallons, respectively. There are 11 gravity media filters for suspended solids and turbidity removal. Two of the filters were installed with the original plant in 1953. Both filters measure 12 feet wide by 18 feet long, with an effective surface area of 216 ft^2. Nine filters were added during several plant expansion projects, each of these newer filters measures 17 feet wide by 21 feet long, with an effective surface area of 357 ft^2.

At the total rated lime softening plant capacity of 15 mgd, the filters hydraulic loading rate is 2.86 gpm per ft^2 with all filters in operation and 3.17 gpm per ft^2 with one of the large filters offline, within typical filtration rates - 2 to 4 gpm per ft^2 per Ten State Standards (Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 2012 and 2014). Filters are periodically backwashed using the transfer pumps located at the clearwells. Backwash water is discharged to the backwash reclaim tanks. The spent backwash water can be pumped to the gravity sludge thickener and then returned to plant for recycle.

Upstream of the lime softening system, raw water from the Biscayne aquifer can be treated by air stripping to remove volatile organic compounds (VOCs). Construction of new stripping system was completed in 2015.

Pumping Systems

The NF system includes four high-pressure feed pumps, with a combined design capacity of 10,420 gpm (15.0 mgd), to supply approximately 2,600 gpm (3.75 mgd), projected to be 4.12 mgd after on-going expansion,of chemically pretreated raw water to each of the three NF treatment skids. The NF bypass and blend water pipeline flows parallel to the NF skid treatment systems and has a rated capacity of 1.5 mgd, projected to be 2.5 mgd after on-going expansion, NF blend water and skid permeate are combined prior to degasification. The process building was designed to accommodate a future additional NF skid and NF feed pump, currently being installed.

The RO system includes four feed pumps (combined design capacity of 7,420 gpm) to supply approximately 3.75 mgd of chemically treated raw water to each of the three RO treatment skids. An RO blend water pipeline flows parallel to the RO skid treatment system at approximately 208 gpm. RO blend water and permeate are combined prior to degasification.

The lime softening plant includes various pumping systems: Lime Softening Clarifier 2 has two sludge pumps with VFDs. Lime Softening Clarifier 3 uses two sludge pumps with VFDs. The lime softening clarifier sludge pumps transfer sludge to the gravity lime sludge thickener. The sludge thickener has three sludge transfer pumps with design flow rates of 250 gpm, each, to transfer thickened sludge to the thickened sludge storage tank and then periodically to the sludge hauling trucks. Two supernatant return pumps with design flow rates of 700 gpm each transfer supernatant fluid from the gravity sludge thickener to Lime Softening Clarifier 3, or, when plant conditions occasionally dictate, to the raw water receiving tank.

The VOC stripping tower system contains four post-stripping transfer pumps, each at 3,820 gpm (5.5 mgd) capacity.

The circular and rectangular backwash-reclaim tanks use two transfer pumps with 350 gpm each. Filter backwash and Transfer Pumps 1, 6, 7, and 8 are used to pump gravity filter effluent from the east clearwell into the lime side chlorine contact tank. Filter backwash and Transfer Pumps 2, 3, 4, and 5 are used to pump gravity filter effluent from the west clearwell into the lime side chlorine contact tank. Filter backwash and transfer pumps have varying design flow rates ranging from 2,082 gpm (Pump 1, 3.0 mgd), to 3,123 gpm (Pumps 2, 3, 5, 6, and 7, 4.5 mgd), to 5,205 gpm (Pumps 4 and 8, 7.5 mgd). Six transfer pumps are used to pump disinfected water from the post-treatment structure to the GSTs. These pumps have design flow rates of 6,425 gpm each. Furthermore, there are three scrubber recirculation pumps with a total capacity of 1,755 gpm.

Pump Equipment Information and Capacities

Pumps	Quantity	Design Capacity (gpm) (each)	hp (each)	TDH (feet)	Drive Type
RO Systems					
RO Feed Pumps	4	1,855	450	580	2 VFD, 2 Constant Speed
NF Systems					
NF Feed Pumps	4	2,605	300	310	2 VFD, 2 Constant Speed

Common NF and RO Systems					
Degasifier Recirculation Pumps	3	585	15	N/A	Constant Speed
Concentrate Disposal Pumps	3	1,736	40	65	Constant Speed
Lime Softening Systems					
Sludge Pumps from Clarifier 2	2	90	3	25	VFD
Sludge Pumps from Clarifier 3	2	180	7.5	25	VFD
Sludge Pumps from Thickener	3	250	25	56	Constant Speed
Supernatant Return Pumps	2	700	15	30	Constant Speed
Transfer Pumps from Sludge Recirculation Tanks (Circular Basins)	2	180	7.5	47	Constant Speed
Transfer Pumps from Sludge Recirculation Tanks (Rectangular Basins)	2	180	10	59	Constant Speed
Filter Backwash/Transfer Pump	1	2,082	20	N/A	Constant Speed
Filter Backwash/Transfer Pumps	5	3,123	30	N/A	Constant Speed
Filter Backwash/Transfer Pumps	2	5,205	50	N/A	Constant Speed
Common to blended NF, RO, and Lime Softening Finished Water					
Chlorine Contact Basin Transfer Pumps	6	6,425	100	50	Constant Speed

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Finished Water Storage

FDEP regulations under Chapter 62-555.320(19), F.A.C. (Finished Drinking Water Storage Capacity) require that the total useful finished water storage capacity, excluding any storage capacity for fire protection use, shall, at a minimum, equal 25 percent of the system's MDD.

The NMB Water system contains the following ground-level finished water GSTs:

- Norwood WTP – 4.2 MG prestressed concrete GST and 2 MG steel GST
- Operations Center Repump Station – 2 MG prestressed concrete GST

The total in-service nominal storage capacity is equal to 8.2 MG. The table below shows the projected finished water storage requirements through 2030. The existing 0.8 MG tank inside the 4.2 MG GST (current used as a disinfectant contact basin for the lime softening system) has previously been planned to be converted to a finished storage tank and is undergoing reevaluation.

Potable Water Storage Requirements

Year	MDD (mgd)	Storage to Meet MDD (MG)	Storage for Fire Protection (MG)	Total Storage Needed (MG)	Storage Capacity (MG)
2019	20.95	5.24	0.54[a]	5.78	8.2
2020	21.17	5.29	0.54	5.83	8.2
2025	22.25	5.56	0.54	6.10	8.2
2030	23.34	5.84	0.54	6.38	8.2

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Notes:

[a] The maximum fire flow capacity planned for the NMB Water system is 3,000 gpm fire flow for a 3-hour duration, based on Miami-Dade County Code of Ordinances (Part III, Article XIV A – Water Supply for Fire Suppression). The zoning classifications associated with this fire flow are:

a. Business District: BU-1A, BU-1, BU-2, BU-03
b. Industrial District: IU-1, IU-2, IU-3, IU-C

Projections indicate that the available and planned potable water storage is sufficient to meet demands, including fire flow for the next 10 years and through the year 2030.

Finished Water Pumping

Per FDEP rule 62-555, the HSP system is required to meet, at a minimum, the water system's peak hour demand (PHD) or the water system's design fire flow rate plus MDD, whichever is greater. The HSP firm capacity must be provided to meet these demands with the largest pump out of service.

As shown on the table below, the firm capacity of the HSP system is 49.74 mgd when one of the largest pumps is removed from service, and while maintaining 70 psi in the common discharge header. The firm capacity is greater than the 2030 PHD (49.1 mgd), and that of the MDD-plus-fire-flow demand (39 mgd = 34.7 mgd + 3000 gpm).

The existing HSP system's capacity is sufficient to meet FDEP requirements through 2030. However, it is expected that before 2030 pumps in HSP Station 1 will have reached the end of their useful life.

Existing High Service Pump System Capacity

High Service Pump Station Number	Pump Number	Pump Type/Speed/Drive	Pump Operating Point[a] (gpm at feet)	Pump Capacity (mgd)
1	5303	SCH/CS/DD	1,906 at 169.8	2.74
1	5304	SCH/AS/SD	3,333 at 178.9	4.80
1	5305	SCH/AS/SD	3,653 at 172.9	5.26
1	5306	SCH/AS/SD	3,506 at 179.8	5.05
1	5307	SCH/AS/DD	3,623 at 173.5	5.22
1	5308	SCH/AS/DD	3,262 at 180.1	4.70
2	5311	VT/AS/SD	7,609 at 161.1	10.96

2	5312	VT/AS/SD	7,642 at 159.3	11.01
2	5313	VT/AS/SD	Standby	Standby
Firm Capacity				**49.74**
2030 Peak Hourly Demand:				**49.10**
2030 FDEP Required Capacity (MDD + Fire Flow):				**39.00**

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Notes:

[a] Both pump stations operate by maintaining 70 psi in the common discharge header. Values below based on largest pump out of service and pulling from the 5 MG GST with 5 feet of depth. All pumps are designed to operate at 70 psi of pressure. Additional pump capacity is available at their design point of 70 psi.

AS = adjustable speed CS = constant speed
DD = dual drive (electric motor and natural gas engine) SCH = split case horizontal
SD = single drive

Norwood WTP Expansion and Improvements Plan

In 2017, CH2M HILL, Inc. (CH2M) (a fully owned subsidiary of Jacobs Engineering Group Inc.) developed a Water and Wastewater Master Plan (CH2M, 2017) for NMB Water that identified necessary improvements to enhance operations and long-term viability of the water supply, treatment, distribution, and wastewater collection facilities. The Master Plan identified Norwood WTP's capacity needs and developed a phased approach to increase the facility's capacity and reliability to meet future demands.

Two expansion projects are planned for the Norwood WTP, referred to as the Phase 1 and Phase 2.

The Phase 1 expansion project includes scope to expand both the NF and RO treatment systems by a total of 9.1 mgd. A permit to construct the Phase 1 project has been received. This project is planned to include the following improvement scope items:

- Increase the capacity of the three existing NF skids from 3.0 mgd to 3.5 mgd each.
- Add a fourth new 3.5 mgd NF skid.
- Increase the NF bypass/blend rated capacity from 1.5 mgd to 2.5 mgd.
- Increase the capacity of the three existing RO skids from 2.0 mgd to 2.5 mgd each.
- Increase the RO bypass/blend rated capacity from 0.5 mgd to 0.6 mgd.
- Improvements to expand capacity of ancillary NF and RO systems, including the addition of a new sand separator, a new NF feed pump, degasifier feed yard piping and flow metering improvements, addition of scale inhibitor feed for NF pretreatment, and allow higher recovery NF.

The Phase 2 improvements project includes scope to improve the lime softening treatment systems and add new raw water wells. This project is planned to include the following capacity expansion scope items:

- Add one Floridan aquifer well to supply water to the RO system.
- Improve and expand chemical storage and feed system to accommodate the proposed expanded lime softening treatment system capacity.

The table below presents the current plant capacity, and the future planned capacity with the implementation of Phase 1 and Phase 2 expansion projects. After implementation of the Phase 1 and Phase 2 expansion projects, the Norwood WTP is expected to be able to meet MDD with firm capacity beyond 2030.

Capacity Expansion Plan

Treatment Trains	Existing Rated Capacity		Phase 1 Membrane System Expansion		Phase 2 ~~Lime System Expansion~~ Improvements	
	Total Capacity (mgd)	Firm Capacity[a] (mgd)	Expanded Total Capacity (mgd)	Expanded Firm Capacity[a] (mgd)	Expanded total Capacity (mgd)	Expanded Firm Capacity[a] (mgd)
NF	9.0	6.0	14.0	10.5	14.0	10.5
NF Bypass	1.5	1.0	2.5	2.0	2.5	2.0
RO	6.0	6.0	9.0	9.0	9.0	9.0
RO Bypass	0.5	0.5	0.6	0.6	0.6	0.6
Lime Softening	15.0	5.0	15.0	5.0	15.0	5.0
Total	**32.0**	**18.5**	**41.1**	**27.1**	**41.1**	**27.1**

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Notes: This criteria will be revised on the Master Plan revision, by having only the largest component out.

[a] Largest membrane skid offline and largest lime softening clarifier offline.

The tables below provides the planned schedules for design, permitting, and construction of the new or expanded source, treatment, and storage facilities for Phase 1 and 2 improvement projects. These schedules are subject to securing of funding and the City of North Miami Beach Commission's approval.

The Phase 1 expansion project schedule is presented in below. This project includes scope to expand both the NF and RO treatment systems. The design is complete and permitting is currently underway. Construction is expected to be completed by March 2020.

Schedule for Phase 1 Nanofiltration and Reverse Osmosis Systems Expansion

Task Description	Date
Design *(completed)*	June 2017- December 2017
Permitting *(completed)*	October 2017- December 2018
Construction *(ongoing)*	September 2018 - March 2020

Preliminary Schedule for Norwood WTP - Phase II Improvements

Task Description	Date
Design	September 2020- September 2021
Permitting	April 2021 - September 2021
Construction	April 2022 - May 2024

The existing finished water storage system for NMB Water includes two ground storage tanks (GST) located at the Norwood WTP and one GST located at Operations Center Repumping Station. The two onsite GSTs include a 4.2 million gallon (MG) pre-stressed concrete and a 2 MG steel tank. The 4.2 MG tank has a concentric internal tank-within-tank with a capacity of 0.8 MG that is currently used for disinfection contact from the lime softening process.

NMB Water operates 20 supply wells installed in the Biscayne aquifer and Upper Floridan aquifer. The Biscayne aquifer underlies NMB Water as the local water table aquifer and is the source of groundwater for 16 of NMB Water's wells. Four wells are installed in the Upper Floridan aquifer, a deep confined aquifer.

Groundwater withdrawals are regulated by the South Florida Water Management District (SFWMD) under Water Use Permit No. 13-00060-W, which expires on August 9, 2027. The Biscayne aquifer capacity and planned withdrawals are adequate through 2030. The Upper Floridan aquifer planned withdrawals are in compliance through 2030; however, the MDD will exceed the firm capacity of the four-Floridan wells. A fifth Upper Floridan aquifer well (F-5) is needed and is included in the WTP Capacity Improvement Phase 2 project; projected to be operational in 2020.

A total of approximately 550 miles of water transmission and distribution mains make up the system. The majority of the pipelines are fabricated of cast or ductile iron, asbestos cement, or, for pipes 2 inches and smaller, galvanized steel and newer polyethylene lines. Given the age of the system's pipes, it is recommended that the system continue to proactively upgrade its pipes to prevent future leakages. NMB Water has multiple interconnects to systems adjacent to its service area.

Hydraulic modeling of the existing transmission system was employed to evaluate the performance and potential improvements to correct deficiencies and capacity needs, and to develop capital improvements projects required to support growth and development over the planning period.

City's Bulk Water Purchase Interconnection Locations with MDWASD From MDWASD 48-inch Regional Transmission Main

	Interconnection Number	Location Description	Size (inches) / [Quantity]	Status
1	MDWASD 50	NW 179 Street & NW 31 Ave	8 / [two]	CLOSED
2	MDWASD 51	NW 22 Ave & NW 191 Street	6 / [two]	PSV
3	MDWASD 52	NW 8 Avenue & NW 191 Street	Venturi	CV
4	MDWASD 53	NE 18 Avenue & NE 181 Street	8 / [two]	PSV
5	MDWASD 54	NE 18 Avenue & NE 168 Street	6 / [two]	PSV
6	MDWASD 55	NE 18 Avenue & NE 164 Street	6 / [two]	CLOSED
7	MDWASD 56	NE 18 Avenue & NE 161 Street	Venturi	CV
8	MDWASD 57	NE 18 Avenue & NE 153 Street	8 / [two]	PSV

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

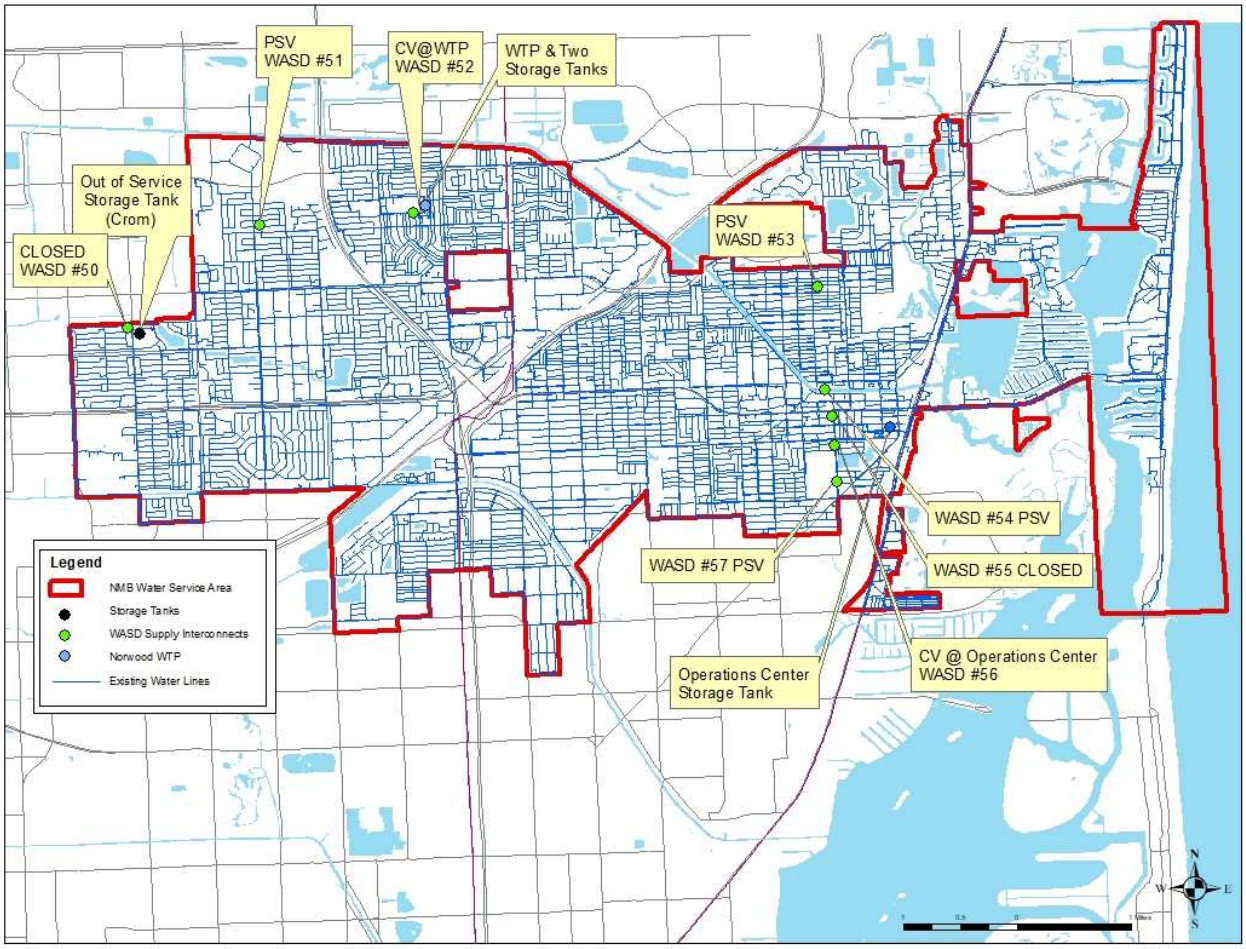
Notes:

1. CLOSED indicates normal status of interconnection; however, each interconnection can be opened for emergency purposes.
2. PSV indicates that interconnection has been equipped with pressure sustaining valves that will open automatically should pressure in the City's system drop below a set pressure level. It is also possible for some of these interconnections to be reconfigured to manually provide emergency service back to MDWASD.
3. CV indicates that interconnection has been equipped with a control valve that can open to help fill a North Miami Beach Storage Tank.

A portion of the water purchased from MDWASD was used within the City's Water Service Area. Another portion was resold ("passed-through") back to MDWASD to serve areas of Aventura and unincorporated Miami-Dade County located outside the City's retail Water Service Area. MDWASD now provides most of the water needs directly to those areas of Aventura and unincorporated Miami-Dade County that used to be served through this "pass-through" arrangement.

Presently, the City provides bulk sales MDWASD retail areas, encompassing the bay area east of Biscayne Boulevard and roughly north of 175 Street and South of 179 Street. This distinct MDWASD retail area served by the City is identified as the outlined area (Point East).

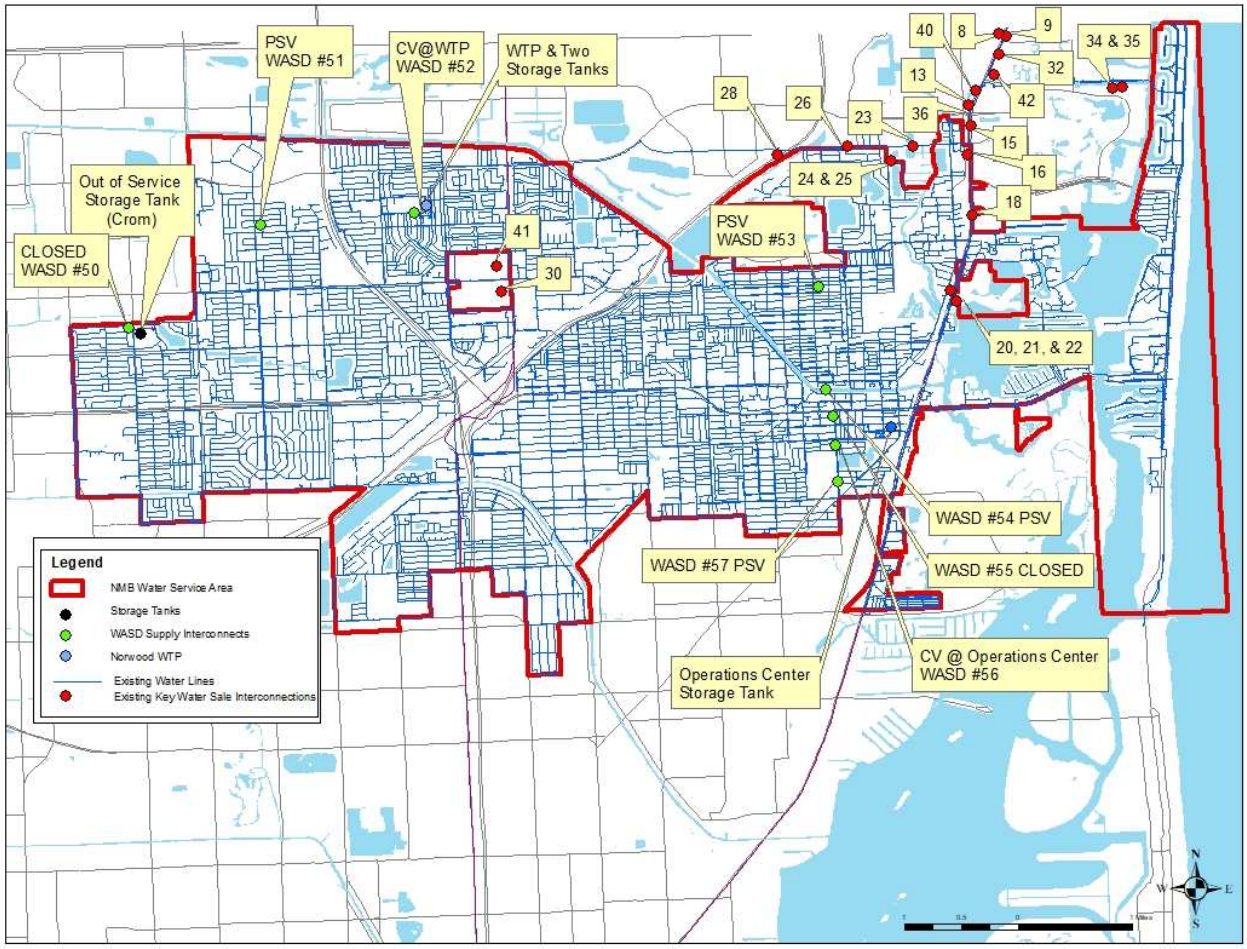
MDWASD Retail Area Served by NMB Water



CV= Control Valve
PSV= Pressure Sustaining Valve Location
Source: NMB Water October 2019

The City also continues to provide some supplemental bulk water sales for the MDWASD retail system through three (3) other interconnection locations (MDWASD23, MDWSD24 and MDWASD28). These service areas are not delineated on the previously referenced figures since they are not able to be discreetly isolated but provide some supplemental treated water into the MDWASD retail service area. Key water sales interconnections to MDWASD are shown below.

Water Sales Interconnections to MDWASD



Source: NMB Water October 2019

The City of Hallandale Beach has also periodically purchased water from the City to meet their potable water demands. The interconnections along Biscayne Boulevard with the City of Hallandale Beach will be kept operable to supply some requested service when appropriate. Also, physical changes were made to enable this connection to be used in a bi-directional way for emergency purposes.

Existing Water Sales Interconnection Locations

Int. No.	Interconnect with	Location Description	Meter Size (inches) / [Quantity]	Status
8	City of Hallandale Beach	Biscayne Blvd and County Line Rd.	8	Emergency or Bulk Water Sale
9	City of Hallandale Beach	Biscayne Blvd and County Line Rd.	8	Emergency or Bulk Water Sale

10	MDWASD	NE 207 St. and 34th Ave.	6	Disconnected
11	MDWASD	NE 207 St. and 34th Ave.	6	Disconnected
12	MDWASD	NE 207 St. and 34th Ave.	10	Disconnected
13	MDWASD	20700 Biscayne Blvd	10	Closed
14	MDWASD	20700 Biscayne Blvd	4	Closed Oct.2005
15	MDWASD	20300 Biscayne Blvd	6	Closed
16	MDWASD	19975 Biscayne Blvd	8	Closed Oct.2005
17	MDWASD	19975 Biscayne Blvd	8	Closed Oct.2005
18	MDWASD	19101 Biscayne Blvd	6	Closed Oct.2005
19	MDWASD	18851 NE 29 Ave.	6	Closed
20a	MDWASD	17655 Biscayne Blvd	10 / [two]	Open
20b	MDWASD	17655 Biscayne Blvd	2 / [two]	Open
21	MDWASD	17655 Biscayne Blvd	1.5	Open
22	MDWASD	17655 Biscayne Blvd	6 / [two]	Closed
23	MDWASD	19891 NE 24 Ave.	6	Open
24	MDWASD	19700 NE 23 Ave.	2	Open
25	MDWASD	19700 NE 23 Ave.	6	Open
26	MDWASD	NE 19 Ct. and 20 Ave. at 199 St.	6	Closed
27	MDWASD	NE 19 Ct. and 20 Ave. at 199 St.	8	Closed
28	MDWASD	20101-29 NE 15 Ct. at 199 St	8	Open
29	MDWASD	20101-29 NE 15 Ct. at 199 St.	8	Open
30	MDWASD	17900 NW 5 Ave.	6	Closed
31	MDWASD	17900 NW 5 Ave.	2	Closed Jan.2005
32	MDWASD	NE 212 St. and Biscayne Blvd.	8	Closed
33	MDWASD	NE 212 St. and Biscayne Blvd.	8	Closed
34	MDWASD	36 Ave. / NE 207 St.	6	Closed
35	MDWASD	36 Ave. / NE 207 St.	6	Closed Jan.2005
36	MDWASD	20403 Biscayne Blvd	6	Closed
37	MDWASD	20403 Biscayne Blvd	6	Closed
38	MDWASD	17985 Biscayne Blvd	2	Open
39	MDWASD	17985 Biscayne Blvd	2	Open
40	MDWASD	20955 Biscayne Blvd	2	Open
41	MDWASD	183rd St. at NW 5th Ave.	6	Open
42	MDWASD	20801 Biscayne Blvd.	6 / [two]	Closed

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Notes:

1. EMERGENCY OR BULK WATER SALE indicates that interconnections are operable for emergency service or bulk water sale from City of North Miami Beach to City of Hallandale Beach only.
2. DISCONNECTED indicates that MDWASD has separated the service lines.
3. OPEN indicates an active meter providing sales to MDWASD for their retail service area.
4. CLOSED indicates that the interconnection is normally closed since MDWA SD normally supplies potable water directly to the area. It is also possible for these interconnections to be operated manually to provide emergency service to these MDWASD retail service areas.

Water Supply Distribution Provided by City

The City's water supply system consists of raw water wellfields (both traditional and alternative), Norwood-Oeffler Water Treatment Plant, four storage tanks, high-capacity high service pumps, pipeline interconnections and approximately 550 miles of water transmission and distribution pipelines.

North Miami Beach operates 20 supply wells installed in the Biscayne aquifer and Upper Floridan aquifer. The Biscayne aquifer underlies North Miami Beach as the local water table aquifer and is the sources of

groundwater for 16 of NMB Water's Wells. The total depth of the wells installed in the Biscayne aquifer do not exceed 100 feet bls, with inner casing depths ranging from 52 to 90 feet bls. Four wells are installed in the Upper Floridian aquifer, a deeper confined aquifer. The Upper Floridian aquifer system contains two aquifer units. The shallower unit, called the Upper Floridian aquifer, provides drinking water supplies to much of South Florida. The deeper unit, the Lower Floridian aquifer, is used primarily for the disposal of wastewater and treatment plant residuals through injection wells.

NMB Water's 20 wells are located in two separate wellfields. Seventeen wells are located on the Norwood WTP site or adjacent school and park property. Three wells (19, 20, and 21) are located approximately one-half mile to the southwest of the Norwood WTP, bounding the east side of the Florida Turnpike. Groundwater withdrawals for drinking water production are regulated by SFWMD under WUP No. 1300060W, which expires February 11, 2029. NMB Water should initiate WUP renewal actions in 2029.

The Norwood-Oeffler Water Treatment Plant (WTP) uses the Biscayne Aquifer in both the lime softening and nano-filtration (NF) treatment processes and the Upper Floridan Aquifer in the reverse osmosis (RO) treatment process to meet its water supply needs as shown in the table below. The City's Biscayne and Floridan wellfields are located in the vicinity of the WTP (east of the Florida Turnpike, west of NW 7 Avenue, south of NW 195 Street and generally north of NW 184 Street). The wellfields include twenty (20) municipal supply wells.

Sixteen (16) municipal water supply wells have been constructed into the Biscayne Aquifer. Eleven (11) of the sixteen wells are used only for the lime softening treatment process.

LimeSoftening Biscayne Aquifer Well Capacity Analysis

Well No.	Capacity (gpm)	Capacity (mgd)
1	1,333	1.92
2	417	0.60
3	1,167	1.68
4	1,500	2.16
5	833	1.20
6	583	0.84
7	1,000	1.44
9	1,500	2.16
10	1,500	2.16
11	4,500	6.48
12	4,167	6.00
TOTAL	**18,500**	**26.64**
TOTAL with largest well out of service	**14,000**	**20.16**
Treatment Capacity	**-**	**15**

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Five (5) out of the sixteen Biscayne Aquifer Wells (Wells No. 13, 17, 19, 20, and 21) were constructed in 2003-2004 primarily for the NF treatment process. Well No. 13 and No. 17, are within the existing well field (offsite). Well No. 19, 20 and 21, are located further west along the Florida Turnpike between NW 183 Street and NW 188 Street. Three wells will be in operation generally at any one time to provide

source water to produce 9 mgd of finished water. Two other w ells will serve as back up. The table below presents characteristics for these five Nano Filtration Biscayne Aquifer Wells.

Five Nano Filtration Biscayne Aquifer Well Characteristics

Well No.	Aquifer	PVC Casing (inches)	Surface Casing Depth (ft)	Casing Depth (ft)	Total Depth (ft)	Design Capacity (gpm)
13	Biscayne	30	45	90	100	2600
17	Biscayne	30	45	75	95	2600
19	Biscayne	30	45	80	90	2600
20	Biscayne	30	45	52	62	2600
21	Biscayne	30	45	85	95	2600

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Four (4) out of the twenty municipal supply wells are Floridan Aquifer wells. These wells are treated by the RO treatment process. Well No. 1F, 2F and 4F are located within the WTP site and Well No. 3F is located at a nearby school. The wells pump raw water from the Upper Floridan Aquifer directly to the membrane process building for pre-treatment prior to arriving at the low-pressure RO treatment facilities. Each raw water supply well was designed so that one (1) well will supply sufficient raw water for operation of one (1) low-pressure membrane skid, plus additional capacity to provide the ability to blend some raw water when appropriate from the Upper Floridan Aquifer. It is expected that one well will be in operation at any one time to provide source water to produce finished water. Other wells will serve as back-up unless the WTP is operating at its full 6 mgd capacity, in which case only one well will be in reserve. The table below presents characteristics for these four Floridan Aquifer wells.

Four Floridan Aquifer Well Characteristics

Well No.	Aquifer	PVC Casing (inches)	Surface Casing Depth (ft)	Total Casing Depth (ft)	Total Depth (ft)	Maximum Design Capacity (gpm)
1F	Floridan	17.4	300	1000	1235	2500
2F	Floridan	17.4	300	1000	1231	2500
3F	Floridan	17.4	300	1000	1250	2500
4F	Floridan	17.4	300	1000	1250	2500

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Over the past several years the City has upgraded portions of its raw water supply mains. One length of raw water supply main conveying Floridan Aquifer source water from Floridan w ell 3F to the WTP included 350 linear feet of 16-inch diameter PVC piping and 760 linear feet of 20-inch diameter PVC piping.

The City has approximately 4,470 LF of 30-inch, 3,200 LF of 24-inch, 2,160 LF of 20-inch and 3,240 LF of 16-inch raw water transmission mains. An interconnection was constructed to connect the newer Biscayne Aquifer raw water main to the old Biscayne Aquifer raw water main. This interconnection is normally closed; however, it could be opened for emergency purposes.

The City owns and operates the WTP, which is located on the northeast corner of NW 191 Street and NW 9 Avenue in the City of Miami Gardens. The existing, older and now refurbished, portion of the WTP is a lime softening water treatment facility that was initially constructed in 1953. The City currently uses the facility to apply lime softening treatment of ground water withdrawn from City owned Biscayne Aquifer raw water w ells.

The City uses three different treatment process for the production of finished water at its Norwood WTP. These processes include a 15.0 mgd lime softening facility, 9.0 mgd nanofiltration (N F) facility, 6.0 mgd low pressure reverse osmosis (RO) facility, and 2.0 mgd filtered raw water blend. The total permitted capacity of the facility is 32.0 mgd. Permeate flow streams from the membrane processes are combined for post treatment/ stabilization and subsequently blended with finished water from the lime softening process and transferred to on-site ground storage reservoirs.

Treatment Process – The plant employs three major treatment processes: lime softening, NF, and RO. Original parts of the lime softening system components have reached the end of their service life and are in need of major renewal and replacement (R&R) work and system replacement. The treatment system consists of a 15-mgd lime softening treatment process and a 17-mgd membrane treatment system (9 mgd of NF, 6 mgd of low pressure, RO, and 2 mgd of raw water bypass for blending). The lime softening plant is composed of two reactors/clarifiers: One rated at 10 mgd and one rated at 5 mgd.

The WTP is expandable within current facilities to approximately 38.5 mgd with the addition of a RO membrane treatment skid and additional RO vessels plus associated pre- and post- treatment equipment.

Lime Softening

Water hardness is reduced at the WTP using conventional lime softening treatment. The present treatment capacity, including filtration and chlorination is approximately 15 mgd and normal operation is at approximately 15 mgd. The process includes the following:

1. Raw water supply from BiscayneAquifer.
2. Raw water receiving basin – 39,500 gallons.
3. Three air stripping units.
4. Two Hydrotreaters (5 mgd unit built in 1965; 10 mgd unit built in 1972).
5. Re-carbonation.
6. Filtration (11 sand filters 17 feet wide by 21 feet long).
7. Clearwell.
8. Transfer pumps.
9. High service pumpingfacilities.

Nano-Filtration

The NF membrane softening facilities are designed to produce 9.0 mgd (3 skids at 3.0 mgd). This was initially expected to be expandable up to a capacity of 12.0 mgd (4 skids at 3.0 mgd), but Biscayne Aquifer restrictions by SFWM D requires future expansion from the alternative water supply source, the Upper Floridan Aquifer. The process includes the following:

1. Raw water supply from BiscayneAquifer.
2. Sand separationequipment.
3. Pre-treatment sulfuric acid feeding system.

4. Micron Filtration.
5. High pressure feedpumps.
6. Two stage NF membrane treatment units.
7. Post treatment degasification.
8. High service pumpingfacilities.
9. Concentrate Deep Injection Well shared with RO portion of the WTP (refer to Section 3.2.4.1 for description).

Reverse Osmosis

The low-pressure RO membrane facilities are designed to produce 6.0 mgd (3 skids at 2.0 mgd). This was initially expected to be expandable with additional pressure vessels up to a capacity of 8.0 mgd (3 skids at 2.67 mgd). With new er technology the current RO skids can add vessels and membranes to expand that portion of the WTP to 9.0 mgd. With the possible addition of a new membrane skid, even more capacity can be achieved (2.5 to 4.0 mgd). The process includes the following:

1. Raw water supply from Upper Floridan Aquifer.
2. Pre-treatment sulfuric acid and anti-scalant feeding system.
3. Micron Filtration.
4. High pressure feedpumps.
5. Two stage low pressure RO membrane treatment units.
6. Energy recovery equipment
7. Post treatment degasification.
8. High service pumpingfacilities.
9. Concentrate Deep Injection Well shared with NF portion of the WTP (refer to Section 3.2.4.1 for description).

Other Related Facilities

The WTP has onsite standby power generation facilities and dual grid sources from Florida Power and Light (FPL). Additionally, the City has a 2,500 KW generator for membrane bay and operations building, a 2,000 KW generator for high service pumps and wells, a 1,500 KW generator for lime softening process, a 750 KW generator for re-pumping at operation center and two 250 KW portable generators. Other plant facilities are as described in following sections.

Membrane Concentrate Disposal Deep Injection Well

The water treatment by-product (i.e. membrane concentrate) from the membrane treatment process is disposed of by a deep injection w ell system. The deep injection well system consists of one 14.5-inch I.D Class I injection well, one 6-inch dual zone monitoring well, and one booster pump station. The injection well system provides a permitted concentrate disposal capacity of 7.4 mgd, which is adequate to serve both Phase I and II WTP expansions with a combined membrane process capacity over 38 mgd.

Back up for the disposal of membrane concentrate is to the MDWASD sewer system. A 20-inch PVC

concentrate disposal main has been constructed to connect the membrane concentrate pipeline to the trunk force main portion of the MDWASD sewer system.

Post Treatment Structure – Degasification and Odor Control System

Three degasifiers and two odor control systems are used for post treatment of the membrane permeate. The degasifier system provides for the removal of hydrogen sulfide, carbon dioxide and stabilization of permeate. Each odor control scrubber system has a rated air flow capacity of 39,000 cfm and hydrogen sulfide removal efficiency of greater than 98%.

High Service Pumps

There were eight (8), existing high service pumps (HSP), numbered 1 through 8 prior to this recently completed plant expansion. All of these pumps are horizontal split case pumps. HSP number 1 is no longer in service. HSP No. 3, 5, and 7 have a total system capacity of 10,500 gpm with a total system head of 170 feet. These pumps connect to an 18-inch discharge main and 20-inch transmission main. H SP No. 5 has been changed to run by VFD. HSP No. 3 and No. 7 have auxiliary engine drives to allow them to continue to run during a power outage.

HSP No. 2, 4, 6, and 8 have a total system capacity of 11,800 gpm with a total system head of 170 feet. These pumps connect to an existing 24-inch discharge main and a 30-inch transmission main. HSP No. 4 has been changed to run by VFD and HSP No. 8 has an auxiliary engine drive.

As the Capacity of Norwood-Oeffler Water Treatment Plant increased, three (3) new high service pumps were installed as part of the expansion program (on- site), which has a total system capacity of 22,000 gpm with a total system head of 170 feet. These vertical turbine pumps connect to a 36-inch transmission main.

The firm high service pumping capacity at the WTP is 53 mgd at 75 psi (with largest pump out of service). This capacity will meet the projected peak hour demand. The characteristics of the high service pumps are shown below.

High Service Pumping Capacity

	Existing Pumps (Nos. 2-8)	**New Pumps (3 pumps)**	**Total**
Pump Type	Horizontal Split Case	Vertical Turbine in Barrel/ Can	
Motor Power	1-75 HP 1-125 HP 5-200 HP, each	450 HP, Each	
Pumping Capacity	32 mgd (total)	21 mgd (total)	53 mgd (with largest pump out of service)

Motor Control	Constant Speed; (No.4 & No. 5 use Variable Frequency Drive)	2VFD and 1 Constant Speed	
Discharge Pressure	75 PSI	75 PSI	75 PSI

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

FINISHED WATER STORAGE

The City has 10.5 million gallons (MG) of finished water storage in four above-ground (ground level) storage tanks. Finished water is stored in two above- ground storage tanks at the WTP (5 MG and 2 MG) prior to being pumped into the City's water transmission and distribution system. The third storage tank (2 MG) is located at the Operations Center and the fourth storage tank (1.5 MG) is located at the Myrtle Grove site and is not in service.

Norwood-Oeffler WTP

The City has two ground storage tanks located at the WTP. The first tank is an existing steel ground storage tank that holds 2 M G. The second ground storage tank is a pre-stressed concrete potable water tank that was completed in 2007 and holds 5 M G. This tank is 155 feet in diameter and 47 feet high. It was constructed as two tanks, one inside of the other. The inner tank has a 0.8 MG volume while the outer tank has a 4.2 MG volume. The inner tank will serve as a chlorine contact tank for the lime-softening process.

Operations Center

In 2007 the City constructed a 2 MG above-ground (ground level) storage tank at its Operations Center site. It is 135 feet in diameter and 20 feet high and has a re- pumping facility with standby power available.

Myrtle Grove

The City's Myrtle Grove above-ground storage tank was built in 1982 and it holds 1.5 MG. This tank is presently out of service, but plans have been completed to enable reactivation of this facility in the future.

WATER TRANSMISSION AND DISTRIBUTION SYSTEM

The City's water transmission and distribution system is continually improved and upgraded. The City's Water Service Area contains water mains ranging from 2-inches to 36-inches in diameter. There is roughly 2.87 million feet or 548 miles of water mains in the Water Service Area system as shown below.

Summary of Existing Transmission and Distribution System

Pressure Pipes Inventory (inches)	Estimated Total Pipe Length (ft)[1]	Estimated Total Pipe Length (mi)
less than 2.0 in	4,400	0.8
2	810,880	153.58

3	49,500	9.38
4	89,257	16.90
6	759,057	143.76
8	440,241	83.38
10	57,450	10.88
12	384,437	72.81
16	139,510	26.42
18	18,870	3.57
20	32,590	6.17
24	60,380	11.44
30	31,760	6.02
36	18,010	3.41
Total	**2,872,505**	**548.55**

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Note: Total pipe lengths were calculated from City's CAD atlas maps.

Two-Inch Line Replacement Program

The City has been executing a multiple phased program to replace two-inch galvanized steel pipe located in backyards and alleyways. While performing these replacements, the City has been improving fire hydrant coverages in those areas at the same time, wherever possible. Its goal has been to replace one to two percent of the 2-inch water lines per year.

Emergency Connections

The City maintains emergency interconnections with the City of Hallandale Beach, the City of North Miami, the City of Opa-Locka, the Village of Bal Harbour and the MDWASD. These emergency interconnect locations are identified below and are in addition to those eight interconnections with MDWA SD previously shown.

Existing Emergency Interconnection Locations

	Interconnect With	Location Description	Meter Size (inches) / [Quantity]	Status
1	City of Opa Locka	2781 N.W 151 Street	6	Working
2	City of Hallandale Beach	A 1A & Massina	6	Working
3	City of Hallandale Beach	A 1A & Massina	6	Working
4	City of Hallandale Beach	Biscayne Boulevard at County Line	8 / [two]	Working
5	MDWASD	19900 NE 10 Avenue	10	Working
6	MDWASD	19900 NE 10 Avenue	10	Working

7	City of North Miami	Highland Drive and NE 135 Terrace	10	Working
8	Village of Bal Harbour	Collins Avenue at Bakers Haulover Cut	8 / [two]	Working

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

Note: Dual metering occurs where two interconnections are shown at the same location.

Hydraulic Analysis

The City's efforts to end its daily reliance on MDWASD to serve its finished water needs required an increase in the City's water supply and treatment capacity. This w as accomplished through a water treatment expansion program. An integral part of this expansion was the completion of an updated transmission, distribution, storage and fire hydrant system hydraulic model to include the existing retail service area in addition to existing or proposed bulk sale customers. The existing system was evaluated to determine its adequacy to serve the current and future potable water and fire protection needs in the City's Water Service Area.

In 2006 and in 2018 the City completed an updated hydraulic model network for its existing facilities including meters, valves, pump stations, storage tanks, the WTP and related pipelines. Only pipelines with diameters greater than or equal to 6-inches were included in the network model. Approximately 1.8 million feet of existing water mains are represented in the network model as shown previously.

At a later date, this hydraulic model was used to predict changes in velocity and flow direction in the City's transmission and distribution system for two different operating scenarios. These scenarios were selected to reflect the changed conditions associated with ending water purchases from MDWA SD and relying solely on the capacity of the City's upgraded WTP. The results of these analyses w ere used to create a flushing program that was implemented by the City to minimize potential water quality impacts experienced by its customers when the transition was executed.

The hydraulic model was run using Extended Period Simulation (EPS). The overall results show ed that flows (measured in the field) matched the EPS data flows and that field pressure measurements fell within a +/- 3 psi range from the model. This is good calibration of the hydraulic model.

At average flow conditions now, the hydraulic model indicates that the pressure range in the system is between 63 and 75 psi with the 75 psi value representing the pressure leaving the WTP. At average flow on maximum day, the hydraulic model indicates pressures maintained in the system were between 56 and 75 psi with the 75 psi value representing the pressure leaving the WTP. Only small isolated areas show pressures below 60 psi during average flow on the peak day. During the peak hour flow of the year 2007, the hydraulic model indicates the pressure range in the system is between 52 and 75 psi with the 75 psi value representing the pressure leaving the WTP. Under all normal scenarios, the predicted delivery pressure throughout the system stayed well above the target minimum of 40 psi.

The hydraulic model was also run with flows projected in 2015 and 2030. Only one very small area show ed pressure slightly below 40 psi (predicted 36 psi minimum) when using flows predicted in 2030. Even in

2030, only 44 nodes show ed pressure challenges with a 1000 gpm fire flow applied (this value is double the County's single-family residential fire flow standard rate of 500 gpm). When a 500 gpm fire flow was applied, only one node did not meet the 500 gpm, 20 psi residual standard in the year 2030.

The hydraulic model has shown that the City's system does need improvements to obtain better fire hydrant coverage and is predicted to continue to perform into the future (year 2030), with segments of pipelines to be replaced to comply with County Code.

Pressure Sustaining Valves

The City recognizes the importance of maintaining some of the MDWASD interconnects for emergency backup purposes and has incorporated a pressure sustaining valve (PSV) installation at four of the existing water system interconnects with MDWASD. The purpose of these valves is to manage and attenuate distribution system pressures when necessary during peak demand periods or emergency situations. Each PSV installation has pressure sustaining and pressure reducing capabilities. Under peak demand or emergency conditions, when the City's water system pressure drops, the valve will open so that MDWASD water can supplement the City's system. Under normal operating conditions, the pressure will be greater in the City's water system than in the MDWASD water system. The check valve feature prevents water from flowing from the City's system to the MDWA SD system through the valve. The pressure-sustaining feature will keep the control valve open so long as the upstream MDWA SD water system pressure is above the minimum adjustable pressure set point of 45 psi. The PSV locations are identified in the table below and were shown previously.

Pressure Sustaining Valve Locations

	PSV Identifier	Location
1	WA SD #51	NW 22nd Avenue and NW 191st Street
2	WA SD #53	NE 181st Street and NE 18th Avenue
3	WA SD #54	NE 168th Street and NE 18th Avenue
4	WA SD #57	NE 153rd Street and NE 18th Avenue

Water automatically flows from the MDWA SD system to the City through any or all of these PSVs in emergencies or when pressure drops are experienced in the City's system. These PSV interconnections could be retrofitted to send water in an emergency situation from the City to the MDWA SD system, but it would need to be done manually and carefully to avoid a sudden overdraft on the City's system.

The City also has control valves that allow the introduction of water from MDWASD to fill its storage tanks at two locations. Flow passes through WA SD#52 to the storage tanks located at the WTP and WA SD#56 to the storage tank at the Operations Center.

Under *Paragraph 3 MUTUAL OBLIGATIONS* of the March 19, 2001 Agreement between the City and County, provisions are made for water to be provided each to the other in event of emergencies (e.g. water transmission breaks), scheduled interruptions of service (e.g. maintenance) and some resale service.

The City of North Miami Beach is planning a two-phase RO WTP expansion with additional FAS wells that will provide 8.00 mgd of water.

		WTP –Phase 2	WTP.			
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

Data Source NMB Water Norwood Water Treatment Plant 2018 Capacity Analysis Report

3.8 Conservation

In order to meet the water demands of existing and future populations and to ensure that habitats and ecosystems are protected, South Florida's as well as the nation's waters must be sustainable and renewable. Sound water resources management, which emphasizes careful, efficient use of water, is essential in order to achieve these objectives. Efficient water use can have major environmental, public health and economic benefits by helping to improve water quality, maintain aquatic ecosystems and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the link between water quantity and water quality becomes more important. Water conservation is one way of addressing water quantity and quality goals. Other methods of assuring water quantity and quality involve demand management, regional storage, reduction of raw and treated water losses and alternative supply or offsetting reuse of water.

The City of North Miami Beach continues to utilize technologies and practices that result in consistent reductions in potable water in all City-owned irrigation systems and has adopted by reference an ordinance of Miami-Dade County providing for permanent, year-round restrictions on irrigation during peak daylight hours. Additionally, the City promotes efficient water use through landscaping and irrigation design. This Best Management Practice (BMP) is provided through North Miami Beach Land Development Code, Article XI, Landscaping Section 24. Article XI mandates use of automatic rain sensors, emphasizes use of water efficient plants and promotes the use of water use zones when designing a landscape.

3.8.1County-wide Efforts

Section 4.5 Water Conservation and Reuse of the Miami-Dade WASD 20-year Water Supply Facilities Work Plan (2014-2033) Support Data (November 2014) outlines additional MDWASD efforts (pages 4-6 and 7).

Miami-Dade Consolidated PWS Water Use Permit No. 13-00017-W Water Conservation Plan 2018 Annual Report Section I states BMPs implemented since the plan inception resulted in declining per capita water consumption. Because of public outreach efforts as of December 31, 2018, the County is currently experiencing actual finished water demands of 328.08 MGD, which is approximately 14 MGD lower than 2006 actual finished water demands of 341.62 MGD (as of 12/31/2006, the year prior to implementation of the WUE Plan).

Presently, water utilities are saving substantial amounts of water through strategic water-efficiency programs and Best Management Practices (BMP) included in their Water Use Efficiency Plan. The savings from water conservation often translate into more potable water available for residential and non-residential use, capital and operating savings, which allow systems to defer or avoid significant expenditures for water supply facilities and wastewater facilities.

Miami Dade County water demands have decreased primarily as a result of the implementation of the County's Water Conservation Program. The City of North Miami Beach continues to remain in full support of the water conservation initiatives adopted by the SFWMD and Miami-Dade County.

While the City is not responsible for the Comprehensive Everglades Restoration Project, it is supportive of the regional water conservation efforts related to this regional rehydration of the Florida Everglades. The City is also supportive of mandating yard water restrictions that have been directed by the South Florida Regional Water Management District.

The City will continue to coordinate future water conservation efforts with WASD and SFWMD to ensure that proper techniques are applied. In addition, the City will continue to support and expand existing goals, objectives and policies in the Comprehensive Plan that promote water conservation in a cost-effective and environmentally sensitive manner. The City will continue to actively support SFWMD and Miami-Dade County in the implementation of new regulations or programs that are designed to conserve water.

Reuse

For the past years, the State of Florida is leading the nation in water reuse. The water reuse effort in the state is primarily led by utilities, local governments, the water management districts and state agencies. The intent of their efforts is to implement water reuse programs that increase the volume of reclaimed water used and promotes public acceptance of reclaimed water. The City of North Miami Beach is in full support of the water reuse initiatives under consideration by both the SFWMD and Miami-Dade County. The current MDWAS Water Use Permit (WUP) identifies a total of 117.5 MGD of reuse projects. At the present time, MDWAS is evaluating all potential cost-effective projects to increase the reuse of reclaimed wastewater and remain committed to meeting the Ocean Outfall Legislation (OOL) requirements. The County has committed to implement a total of 170 mgd of water reuse as noted in the County's 20-year water use permit.

3.8.2 City Specific Actions, Programs, Regulations, or Opportunities

The City began implementing a water conservation program in 1999 for the purpose of promoting the efficient use and conservation of clean drinking water. The creation of a formal conservation program was a result of a requirement by the SFWMD and the City's desire to better manage its water resources. The program includes a combination of educational, financial, operational and regulatory initiatives to encourage efficient water use while remaining consistent with the overall mission, goals and objectives of the City of North Miami Beach. All water conservation programs and incentives, current and future, implemented by the Public Utilities Department will support the goals and objectives of the 2018 Lower East Coast Water Supply Plan Update implemented by the South Florida Water Management District. The City's water conservation program will also conform to Florida Statute 62-40.412 – Water Resource Implementation Rule: Water Conservation.

NMB Water has a developed and formalized a preventive maintenance (PM) plan each year (2018 and

2019) and is in the process of improving their PM Plan to improve maintenance and asset reliability, including addition of:

- Maintenance mission, vision, and values
- Maintenance and reliability principles
- Planning and scheduling
- Predictive maintenance

The City updated its Water Conservation Plan in 2014. The City's water conservation program continues to develop and implement educational, operational, financial and regulatory best management practices (BMP) that promote the most efficient use of the regions natural water resources and the utility's allocated water supplies. All BMPs are implemented to achieve one or more of the following goals:

- Reduce and/ or control per capita water demands
- Reduce and/ or control peak water demands
- Low unaccounted for water loss
- Greater accountability for water produced/ sold
- Overall efficient development of existing water supplies and infrastructure
- Extend functional life of utility infrastructure
- Lower treatment, energy and capital costs
- Utility revenue stability
- More effective drought response
- Improved consumer confidence and awareness
- Educating customers of all ages

Other programs that promote and support the water conservation program for NMB Water are discussed below.

Showerhead Exchange Program

The City of North Miami Beach implemented a voluntary, residential retrofit BMP that encourages customers to trade in old showerheads for new, high-efficient showerheads, faucet aerators and other items that promotes water efficiency. The City is also in support of the County's Water Conservation Rebate Program and information pertaining to the program will be provided in the City's Conservation website.

Unaccounted for Water

Conservation and utility staff work cooperatively with relevant departments/ divisions to identify and account for water produced versus water delivered to the City's Water Service Area customers. The Engineering Division and the Finance Division quantify and track non-revenue water loss on a monthly basis. As negative trends are identified, conservation and utility staff assist in problem solving activities. Quantitative and financial methods for monitoring aggregate water use are also employed to readily identify disparities in water production versus water delivery.

Metering Practices

Accurate metering is essential to the City's financial and production accountability. Conservation and utility staff work cooperatively with related departments/ divisions to ensure proper meter placement

and replacement, accuracy and monitoring. The City implements an on-going meter accuracy program throughout the distribution network. Although most 5/8 meters are completely changed out either through the previous meter replacement program or through the AMR meter replacement program, other meters may be repaired and/ or rebuilt to improve accuracy. The primary purposes of this BMP are to achieve and maintain greater water use metering accuracy and to reduce non-revenue water loss.

NMB Customer Service assessed meter service length for accounts they service daily. Meters and Backflow Division also assess meter service lengths on a case- by-case basis.

Implemented through the department's Meters and Backflow Division, 2,500 meters were targeted annually to maintain a length of service no more than 10 years. This program was carried out by the City until 2009. The Public Utilities Department is always looking to find ways to conserve water through Demand Management. Since 2009, the City developed and implemented an Automatic Meter Reading (AMR) Program. This program shall track consumer's water usage and detect leaks in the user's system. Once detected, the consumer will be notified. This program will also be used to track the efficiency of various BMPs that have been implemented.

Leak Detection

Water Production/ Distribution & Pipeline System leaks can be identified as main breaks or during other operational practices and miscellaneous occurrences. The City on a quarterly basis performs a leak survey of a portion of water distribution system to identify any leaks in piping network. At the end of the survey a report is prepared to quantify the leaks with estimated amount of water loss identified. The City also piloted a leak detection program in 2014 to pinpoint hard to detect leaks in large diameter water transmission mains. The City conducted the pilot project on two subaqueous mains and the project was successful in identifying two small leaks. The City currently has 11,000 leak sensors as part of the AMI system.

Automated Hydro-Flushers

The City employs ten automated Hydro Flushers in designated portions of the distribution network. The primary purpose is to improve and maintain water quality through limited, automatically scheduled, timed discharges used during the flushing process. Hydro Flushers provide water savings as opposed to traditional hydrant flushing by automatically stopping the flushing process on a timed basis when adequate water volumes have flushed out the system, based on water quality analysis from examination of previous month's data.

Water Conservation Rate Structure

The City implemented a rate structure for water and sewer billing that promotes water conservation. Adopted by ordinance by the Mayor and City Council, the rate structure consists of multiple tiers. Base water rates and incremental rates are evaluated annually. To date, three classifications of water users include single-family, multi-family and non-residential. The City recently adopted a new rate structure in late 2019 that tiers rates and usage to aid positive water conservation outcomes, and is in the process of implementing this new structure.

Permanent Irrigation Ordinance

The City supports and conveys the intent of Miami-Dade County Code, Chapter 32, Section 32-8.2. This Section of the County Code prohibits landscape irrigation during periods of high evaporation and further prohibits irrigation systems to be operated in a manner causing water to be wasted. The County Code prohibits irrigation between the hours of 10:00 a.m. and 4:00 p.m., seven days a week, from Monday to Sunday. Per County Ordinance, the irrigation days are determined by the odd/even number of the property street address. The City of North Miami Beach amended its Land Development Code to support the Miami-Dade County code in with Ord. No. 2005-21 § 2 on 12/20/05 and Ord. No. 2008-22 § 2 on 12/16/08.

Water Shortage/Emergency Ordinance

In the event a water shortage is declared by the SFWM D and per Chapter 40E-21,F.A .C or an emergency situation resulting in a water shortage, the City is prepared to address these situations using City of North Miami Beach, Code of Ordinances, Chapter 19, Article III, Division 5. This ordinance provides for the application, authority to implement, prescribed water restrictions or use curtailments and enforcement.

Water Efficient Plumbing Fixtures Code

The City requires and enforces the guidelines established by the Florida Building Code, Chapter 46 - Plumbing. Chapter 46 of the Florida Building Codes supports the requirements set forth by the South Florida Water Management District for use of water efficient plumbing fixtures. The City also adopted by reference and enforces the Miami Dade County Water and Sewer Ordinance No. 32-84, 32-85, 32-86- Plumbing. This BMP requires the installation of water efficient plumbing fixtures in all new construction. Miami Dade County plumbing fixture requirements are listed under Section 8-31, Article III of the Florida Building Code.

Public Education, Outreach and Demonstration Projects

Education and public awareness are key components of any water conservation program. Educational and outreach programs must be tailored to appeal to a broad audience. Conservation and utility staff constantly evaluate products and technology that relate to water efficiency and initiate the use of those determined to be effective. The City has a voluntary water use assessment survey program for single-family residential and small commercial customers. Customers complete a comprehensive questionnaire on their water use habits, and responses from the surveys are compared to current and historical water billing data to determine the potential for water savings by the customers. A customized written report is provided to the customer containing an assessment of their water consumption and recommendations on how to achieve greater water use efficiency.

The Water Conservation Program provides outreach and other services to industrial, commercial and institutional (ICI) water customers. Water customers in these categories include retail, restaurant, condominium, multi-family and others. Informational fact sheets are made available for customers. The Program makes presentations to students, civic, residential and other groups as invited resulting from ongoing partnerships with schools/ teachers, word of mouth, organized career day events etc. The Program implements an annual water conservation poster contest for elementary school students. Local winners are then forwarded to state wide poster contest coordinated by Florida Section of American Water Works Association.

Water Efficient Landscaping and Irrigation

NMB Water is a significant resource for the City's water customers regarding the installation and care of water efficient landscapes (Florida-friendly landscaping techniques) and efficient irrigation practices. Miami Dade County Landscaping requirements are included in Chapter 18-A and 18-B of the Miami Dade County Code. NMB Water and utility staff use reference materials from South Florida Water Management District, American Water Works Association and the Irrigation Association to educate customers about the principles and techniques to be practiced. The City also created a partnership with the Florida Yards & Neighborhoods Program to facilitate this measure. Amendments addressing Florida-friendly landscaping and irrigation codes are pursuant to FS 373.185 and FS 373.62.

Water Conservation Month and Drinking Water Week

Conservation and utility staff coordinate various educational activities to recognize, celebrate and commemorate Water Conservation Month and Drinking Water Week (DWW). Water Conservation Month, initiated by the Florida Water Wise Council, is a statewide campaign for promoting water conservation issues during the month of April. The Governor recognized the initiative by proclamation. DWW is the international celebration of clean drinking water during the first full week of May. Target audiences during Water Conservation Month and DWW are school students and the general public as well as City employees. Diverse educational opportunities have been developed for these audiences. Similar activities have also been planned to recognize Public Works Week and other citywide special events. NMB "Water Fest" and the water conservation poster contest are two other annual events the City hosts as part of the Water Conservation Month and DWW.

Water Reuse

Water reuse is a practical and beneficial water conservation tool when resources are available. The City does not own or operate a wastewater treatment facility. Wastewater generated by the City's water customers is treated by MDWASD. There are no readily available sources of reclaimed water at this time; however, the City has and will continue to hold discussions with MDWASD and SFWMD in an attempt to begin a reuse program using reclaimed water from the MDWASD North District Wastewater Treatment Plant, if it becomes available.

An assessment was conducted by the City to determine the feasibility of installing water reuse infrastructure within the corridors of pipelines due for construction as part of the Water Treatment Plant Expansion Program. This evaluation of the installation of reuse water pipelines was performed to identify permitting requirements, potential future usage applications, design criteria, and associated capital costs. A benefit analysis was conducted to evaluate the advantages and disadvantages of the installation of the reuse water pipeline.

The feasibility assessment recommended that a more in-depth evaluation should be performed to identify the best source of reclaimed water (City owned wastewater plant versus acquiring effluent from others), the appropriate selection of a future treatment facility location, and confirmation of the pipe route to be selected.

Alternative Water Supply

The City of North Miami Beach Public Services Department (Water services is now NMB Water) was the first utility in Miami-Dade County to commit to and then implement a substantive Alternative Water Supply

Program for their Water Service Area. The City's CUP requires that the Floridan aquifer wells operate to withdraw a minimum of 10 percent of the quantity of water withdrawn from Biscayne aquifer wells on an annual average basis. This system has been in service since 2008.

While demand management and conservation are key focus items, as previously mentioned in this Section, opportunities for alternative supplies or Biscayne Aquifer offsets will continue to be pursued by the City. Reuse water, up to approximately 100,000 gpd, if reasonably available, could be used for a Public Works Vehicle Washing Station. Another option discussed has been the possibility of a wastewater scalping facility to provide reuse water for irrigation or ground water recharge.

3.8.3 MDWASD Specific Regulations

Miami-Dade County implements water conservation through the following Ordinances:

20-4.5 - Landscaping and tree protection requirements for all zoning districts.
(F) Landscape Plans Review Criteria
In order to conserve water, reduce maintenance, and promote plant health, plant species shall be selected and installed based on their water needs, growth rate and size, and resource inputs. Plants with similar water needs shall be grouped in hydrozones. Adequate growth area based on natural mature shape and size shall be provided for all plant materials.

20-4.6 - Environmental review standards.
The following standards shall be utilized by the environmental review and preservation board in their review and evaluation of all site and landscape plans as required by this Code.
(A) Natural Environment.
(1) Proposed development shall be designed in such a manner so as to preserve and protect existing environmentally-sensitive lands and natural resources, such as and including soils, ground water, surface water, shorelines, vegetative communities, fisheries and wildlife habitats.

Section 4: Intergovernmental Coordination

The City's utilities department administration and Elected Officials have cooperated and coordinated with numerous other public agencies in order to accomplish:

A. The first alternative water supply and treatment facility in the County.

B. A 20-Year Consumptive Use Permit (CUP) from the SFWMD with commitments for additional alternative supply and treatment.

C. A stellar, award winning conservation program that is continuing to press forward on both "Demand Management" and "Corrective Actions"; such as leak detection and automated meter reading (AMR).

D. An expanded water treatment site available, rezoned, and large enough to meet all future water supply and treatment demands for at least 20 years.

As part of the previous cooperation and coordination efforts the City met with those local governments and the County where growth was taking place to ascertain projects and land use changes that could affect long-term water demands on the system. Aventura, Sunny Isles Beach, Miami Gardens and North Miami Beach were areas with the most buildings under construction, land use changes, site plan approvals, and zoning changes that would affect raw and treated water needs. Meetings with these public entities provided input into the population and water needs of the City's Water Service Area. This data was discussed and reviewed in numerous meetings with the SFWMD prior to issuance of the City's 20-Year WUP. Also, numerous meetings were held with Miami-Dade Water and Sewer Department (MDWASD) to make sure the Traffic Analysis Zone (TAZ) Population Projections for the City's Water Service Area matched with those of the County. Where the various communities within the City's Water Service Area indicated ongoing and projected growth exceeding that shown in the County TAZ projections, adjustments were made in a coordinated effort with the SFWMD and these growing communities.

The agreement between the City and County with regards to service area separation, cooperative efforts in permitting and providing emergency backup services has provided the basis for continued coordination of activities to benefit all consumers.

It should be clear that the City must approve (from a water supply, treatment, and distribution system standpoint) each of the developments that occur within their Water Service Area. If new water mains, fire hydrants, meters, or services are needed the City review s said plans and insists that such facilities be implemented. The City also review s the status of the water supply and treatment facilities to assure adequate capacity is available prior to approval of the building permit within their Water Service Area. The City also must install or approve installation of new meters or service lines to any new or redeveloped site. It is during this review process that new or redeveloped site developments must submit their "Fire Flow Fees" and "Connection (Impact) Fees" to help defray the costs of system expansion and improvement to the degree they impact the system.

Section 5: Capital Improvements

The information contained in the Comprehensive Development Master Plan Amendments adopted September 2018 and the Miami-Dade WASD 20-year Water Supply Facilities Work Plan (2014-2033) Support Data (November 2014), the *2018 Lower East Coast Water Supply Plan Update* (LEC) approved by the South Florida Water Management District (SFWMD) on November 8, 2018, the MDWASD Consumptive Use Permit approved on September 21, 2015, and additional information found within Water Use Permit 13-00017-W are herein incorporated by reference. The City's latest adopted Capital Improvement Plan for water infrastructure (2019) is enclosed as Appendix A.

Section 6: Goals, Objectives and Policies

The following existing goals, objectives and policies of the City's Comprehensive Plan are in support of the City's 10-Year Water Supply Facilities Work Plan:

- Adopt, implement and update the 10-Year Water Supply Facilities Work Plan recommended projects and implementation schedule. (Future Land Use Element; Infrastructure Element; Conservation Element, and Capital Improvement Element)

- The City through its Land Development Regulations and in coordination with the 10-Year Water Supply Facilities Work Plan will coordinate current land uses and any future land use changes with the availability of water supply system. (Future Land Use Element, Policy 1.1.7)

- The City shall require proposed amendments to the Future Land Use Map provide data and analysis demonstrating adequate water supply and facilities are available (Future Land Use Element, Policy 1.1.8)

- Through the Technical Review of Applications for Development (TARD) Process, assure adequate provisions for the water supply, treatment, and distribution system are planned for (Future Land Use Element, Policy 1.9.2)

- Potable Water: The City's water system shall provide 144 gallons per capita per day at a pressure of 40 pounds per square inch. (Infrastructure Element, Policy 1.2.4)

- The City shall consult with the City's Public Services Department prior to the approval of a building permit to determine whether adequate water supplies to serve new development will be available no later than the anticipated date of issuance of the Certificate of Occupancy. (Infrastructure Element, Policy 1.2.7).

- Maintain and expand water conservation, water reuse, and alternative water supply programs (Infrastructure Element, Objective 1.3)

- Utilize the City's Water Conservation Program Plan, based on SFWM D requirements and in support of the goals and objectives of the Lower East Coast Water Supply Plan to assist in guiding water resource management (Infrastructure Element, Policy 1.3.1)

- The City shall promote the use of ultra-low -flow plumbing fixtures through its Showerhead Exchange Program and requires and enforces the guidelines established by the Florida Building Code, Plumbing (Infrastructure Element, Policy 1.3.3)

- Continue to use a water and sewer billing rate structure that encourage conservation (Infrastructure Element, Policy 1.3.4)

- The City's Water Conservation Program Plan will also conform to anticipated

amendments to Florida Statute 62-40.412-Water Resource Implementation Rule: Water Conservation and support the goals and objectives of the Lower East Coast Water Supply Plan (Infrastructure Element, Policy 1.3.6)

- The City shall continue to use automated Hydro Flushers to improve and maintain water quality (Infrastructure Element, Policy 1.3.7)

- The City shall continue to support and implement its own version of Miami-Dade County's ordinance that prohibits landscape irrigation during periods of high evaporation and operation of irrigation systems in wasteful manners. (Infrastructure Element, Policy 1.3.8)

- The City shall continue to implement Ordinance 81-22 during water shortage events declared by SFWM D or during other emergency situations resulting in water shortages. (Infrastructure Element, Policy 1.3.9)

- The City shall continue to implement and evaluate the expansion of its water conservation public education, educational water related events, outreach and demonstration projects. (Infrastructure Element, Policy 1.3.10)

- The City shall continue to utilize the three 10,000-gallon storage tanks installed at its Operation Center for on-site and citywide irrigation purposes. (Infrastructure Element, Policy 1.3.11)

- The City shall continue the evaluation of water reuse by identifying the most feasible source of reclaimed water (a potential City owned wastewater plant versus effluent acquired from others). (Infrastructure Element, Policy 1.3.12)

- The City shall continue to implement the requirements of Water Use Permit 'RE-ISSUE 13-00060-W" issued on February 11, 2029 by SFWMD and as described in the City's 10-Year Water Supply Facilities Work Plan to further increase its utilization of raw water as an Alternative Supply. (Infrastructure Element, Policy 1.3.13).

- The City shall continue to cooperate with the SFWMD in monitoring of groundwater supply conditions and consumptive use review. (Infrastructure Element, Policy 1.3.14).

- The City of North Miami Beach Water Supply Facilities Work Plan (Work Plan), as prepared by the City of North Miami Beach Public Services Department in conjunction with MWH Consultants and dated March 2015, is incorporated by reference into the Comprehensive Plan. This document is designed to: assess current and projected potable water demands; evaluate the sources and capacities of available water supplies; and, identify those water supply projects, using all available technologies, necessary to meet the City's water

demands till 2030. The Work Plan shall remain consistent with the City's Water Use Permit renewals and with projects as listed in SFWMD's Lower East Coast Regional Water Supply Plan. The Work Plan will be updated, at a minimum, every 5-years and within 18 months after the SFWMD's approval of an updated Lower East Coast Regional Water Supply Plan. The potable water supply facilities necessary to satisfy projected water demands during the 2015-2030 period are shown in Table 6.3 of the Work Plan. (Infrastructure Element, Policy 1.7.1).

- The basis for developing and updating the City's 10-Year Work Plan will be the current approved version of SFWMD's 2013 Lower East Coast Water Supply Plan Update. (Infrastructure Element, Policy 1.7.2).

- The City shall coordinate appropriate aspects of its Comprehensive Plan with jurisdictions within its water service area and the SFWM D's 2013 Lower East Coast Regional Water Supply Plan Update. The City shall amend its Comprehensive Plan and Water Supply Facilities Work Plan as required to provide consistency with the District plan. (Infrastructure Element, Policy 1.7.3).

- The City shall continue to utilize, expand and pursue the development of new alternative water supplies as detailed in the Work Plan to meet the City's existing and future water supply needs. (Infrastructure Element, Policy 1.8.1).
- The City shall take the steps necessary to assure that all its potable water wellfields remain available for use and possible future expansion. (Infrastructure Element, Policy 1.8.2).

- In the development of its future potable water supplies the City shall to the maximum extent feasible, utilize methods which preserve the integrity of the Floridan Aquifer and are compatible with the SFWM D's Lower East Coast Regional Water Supply Plan, and comply with the land use and environmental protection policies of the Miami-Dade County CDMP, the Strategic Regional Policy Plan for South Florida, and the State Comprehensive Plan. (Infrastructure Element, Policy 1.8.3).

- The City shall continue to evaluate the development and implementation of reclaimed water use strategies to augment the water supplies of the Biscayne and Floridan Aquifers when feasible and where appropriate. (Infrastructure Element, Policy 1.8.4).

- Utilize the City's Water Conservation Program Plan dated April 2008, based on the SFWM D requirements and in support of the goals and objectives of the Low er East Coast Water Supply Plan to assist in guiding water resource management. (Conservation Element, Policy 1.2.3)

- The implementation of the 10-Year Water Supply Facilities Work Plan shall ensure that sufficient water supplies and public facilities are available to serve the water supply demands of North Miami Beach and the other cities and portions of Miami-Date County within the water service area. (Conservation Element, Policy 1.2.7)

- The City's Public Services Department shall hold an annual workshop during June of each calendar year with the government jurisdictions located within its water service area, Miami-Dade Water and Sewer Department, Miami-Dade County Department of Environmental Resources Management and South Florida Water Management District. The workshop will focus on water supply needs, implementation of alternative water supply projects (including reuse and other conservation measures), and the establishment of level of service standards (Conservation Element, Policy 1.2.8; Intergovernmental Coordination Element, Policy 1.3.7).

- The City of North Miami Beach Public Services Department's Water Supply Facilities Work Plan shall consider, coordinate, and be compatible with the South Florida Water Management District's 2013 Lower East Coast Water Supply Plan Update.

- The development of future potable water supplies and the City of North Miami Beach 10-Year Water Supply Facilities Work Plan, shall consider, and be compatible, with the South Florida Water Management District's Lower East Coast Regional Water Supply Plan (Intergovernmental Coordination Element, Policy 1.9.6).

- Appropriate mechanisms will be developed and adopted by the City of North Miami Beach in order to assure that adequate water supplies are available to all water users of the City of North Miami Beach Public Service Department. Furthermore, the City of North Miami Beach Public Services Department shall be responsible for monitoring the availability of water supplies for all water users of the City of North Miami Beach Public Services Department and for implementing a system that links water supplies to the permitting of new development. (Capital Improvement Element, Policy 1.2.16).

- The City shall incorporate capital improvements affecting its levels of service by referencing the Capital Improvements Schedules of state agencies, regional water supply authorities and other units of government providing services but not having regulatory authority over the use of land into its 5-Year Schedule of Capital Improvements. The City Schedule shall be maintained and updated annually. (Capital Improvement Element, Policy 1.2.17).

Comprehensive Plan Amendments:

The following are proposed **amendments** to the goals, objectives and policies of the City's Comprehensive Plan are in support of the City's 2020 10-Year Water Supply Facilities Work Plan:

Infrastructure Element

Policy 1.2.4

Potable Water. The City's water system shall provide 121 ~~144~~ gallons per capita per day at a pressure of 40 pounds per square inch.

Policy 1.2.7

The City shall consult with the City's ~~Public Services~~ Utilities Department prior to the approval of a building permit to determine whether adequate water supplies to serve new development will be available no later than the anticipated date of issuance of the Certificate of Occupancy. (Infrastructure Element, Policy 1.2.7).

Policy 1.3.1

~~Utilize~~ Continue to review and update as necessary the City's Water Conservation Program Plan dated August 2014, based on the SFWMD requirements and in support of the goals and objectives of the 2018 Lower East Coast Water Supply Plan and updates to assist in guiding water resource management.

Policy 1.3.3

The City shall continue to promote the use of ~~ultra-low-flow~~ high efficiency plumbing fixtures through its Showerhead Exchange Program and require~~s~~ and enforce~~s~~ the guidelines established by the Florida Building Code, Plumbing.

~~Policy 1.3.11~~

~~The City shall continue to utilize the three 10,000 gallon storage tanks installed at its Operation Center for on-site and citywide irrigation purposes. (Infrastructure Element,Policy 1.3.11)~~

Policy 1.3.13

The City shall continue to implement the requirements of Water Use Permit "RE-ISSUE 13-00060-W" issued on August 9, 2021 and expires on ~~August 9, 2027~~ February 11, 2029 by SFWMD and as described in the City's 2020 10-Year Water Supply Facilities Work Plan to further increase its utilization of raw water as an Alternative Supply.

Policy 1.7.1

The City of North Miami Beach Water Supply Facilities Work Plan (Work Plan) as adopted on XX, ~~as prepared by the City of North Miami Beach Public Services Department in conjunction with MWH~~

~~Consultants and dates June 2015~~, is incorporated by reference in the Comprehensive Plan. This document is designed to: assess current and projected potable water demands; evaluate the sources and capacities of available water supplies; and, identify those water supply projects, using all available technologies, necessary to meet the City's water demands till 2030. The Work Plan shall remain consistent with the City's Water Use Permit renewals and with projects as listed in the SFWMD's Lower East Coast Regional Water Supply Plan. The Work Plan will be updated, at a minimum, every 5-years and within 18 months after the SFWMD's approval of an updated Lower East Coast Regional Water Supply Plan. ~~The potable water supply facilities necessary to satisfy projected water demands during 2015-2030 period are shown in Table 6.3, of the Work Plan. The potable water supply facilities necessary to satisfy projected water demands during the 2015-2030 period are shown in Table 6.3 of the Work Plan.~~

Policy 1.7.2

The basis for developing and updating the City's 2020 10-Year Work Plan will be the current approved version of SFWMD's ~~2013~~ 2018 Lower East Coast Regional Supply Plan.

Policy 1.7.3

The City shall coordinate appropriate aspects of its Comprehensive Plan with the jurisdictions within its water service area and the SFWMD's ~~2013~~ 2018 Lower East Coast Regional Water Supply Plan. The City shall amend its Comprehensive Plan and Water Supply Facilities Work Plan as required to provide consistency with the District plan.

Policy 1.8.3

In the development of its future potable water supplies the City shall to the maximum extent feasible, utilize methods which preserve the integrity of the Floridian Aquifer and are compatible with the SFWMD's 2013~~3~~8 Lower East Coast Regional Water Supply Plan, and comply with the land use and environmental protection policies of the Miami-Dade County CDMP, the Strategic Regional Policy Plan for South Florida, and the State Comprehensive Plan.

Capital Improvement Element

Policy 1.2.1

Water supply system: shall meet a level of service of 121 ~~150~~ gallons per person per day at 40 lbs/sq. inch pressure.

Policy 1.2.16

Appropriate mechanisms will be developed and adopted by the City of North Miami Beach in order to assure that adequate water supplies are available to all water users of the City of North Miami Beach ~~Public Service~~ Utilities Department. Furthermore, the City of North Miami Beach ~~Public Services~~ Utilities Department shall be responsible for monitoring the availability of water supplies for all water users serviced by ~~of~~ the City of North Miami Beach's system ~~Public Services Department~~ and for implementing a system that links water supplies to the permitting of new development. (Capital Improvement Element, Policy 1.2.16).

Intergovernmental Coordination Element

Policy 1.3.7

The City's ~~Public Services~~ Utilities Department shall hold an annual workshop during June of each calendar year with the government jurisdictions located within its water service area, Miami-Dade Water and Sewer Department, Miami-Dade County Division of Environmental Resources Management, and South Florida Water Management District. The workshop will focus on water supply needs, implementation of alternative water supply projects (including reuse and other conservation measures), and the establishment of level of service standards.

Policy 1.4.4

The City of North Miami Beach ~~Public Services~~ Utilities Department's Water Supply Facilities Work Plan and updates shall consider, coordinate, and be compatible with the South Florida Water Management District's Lower East Coast Regional Water Supply Plan.

Policy 1.9.6

The development of future potable water supplies and the City of North Miami Beach 2020 10-Year Water Supply Facilities Work Plan adopted on XX, shall consider, and be compatible, with the South Florida Water Management District's ~~2013~~ 2018 Lower East Coast Regional Water Supply Plan.

Policy 1.9.7

The City of North Miami Beach will continue to support the County and SFWMD outreach and education events providing information to residents about the region's water resources and the importance of conserving it.

Conservation Element

Policy 1.2.3

Utilize the City's Water Conservation Program Plan dated August 2014, based on the SFWMD requirements and in support of the goals and objectives of the 2018 Lower East Coast Water Supply Plan adopted on November 8, 2018 to assist in guiding water resource management.

Policy 1.2.7

The implementation of the 2020 10-Year Water Supply Facilities Work Plan shall ensure that sufficient water supplies and public facilities are available to serve the water supply demands of North Miami Beach and the other cities and portions of Miami-Dade County within the water service area.

Policy 1.2.8

The City's ~~Public Services~~ Utilities Department shall hold an annual workshop during June of each calendar year with the government jurisdictions located within its water service area, Miami-Dade Water and Sewer Department, Miami-Dade County Department Division of Environmental Resources Management, and South Florida Water Management District. The workshop will focus on water supply needs, implementation

of alternative water supply projects (including reuse and other conservation measures), and the establishment of level of service standards.

Policy 1.2.9
The City shall maximize the use of native plants in City landscaping projects and large redevelopment sites utilizing Florida Friendly Landscape principles to provide and improve urban habitat and connectivity for native species.

Policy 1.2.10
The City shall adopt Florida Friendly Landscape principles into the Zoning and Land Development Code.

Policy 1.2.11

The City shall continue to evaluate alternative potable water supply sources evaluation techniques and technologies for water capture and reuse, including rainwater harvesting, and revise its Land Development Regulations as necessary to allow for these options with local building design.

Future Land Use Element

Policy 1.1.7
The City through its Land Development Regulations and in coordination with the 2020 10-Year Water Supply Facilities Work Plan adopted on XX will coordinate current land uses and any future land use changes with the availability of water supply system.