DESCRIPTION OF WATER SUPPLY FACILITIES
of the
MIAMI-DADE WATER AND SEWER AUTHORITY
DECEMBER, 1976

WATER RESOURCES AND SUPPLY

A glance at the map of the State of Florida will show that Dade County is located at the point near the southern end of the peninsula on Biscayne Bay which is an arm of the Atlantic Ocean. At this latitude, it is less than one hundred miles in an east-west direction from the Atlantic Ocean to the Gulf of Mexico. As the crow flies, it is approximately sixty miles from Miami to Cape Sable, the extreme southern point of the mainland of the United States.

The terrain of the coastal ridge in Dade County consists of an outcropping of a soft, porous, limestone rock -- referred to by geologists as Oolite. This ridge extends along the east coast from a point some thirty miles north of Miami to about the same distance south. The width of the ridge varies from ten to fifteen miles and its general elevation is approximately eight feet above mean sea level.

A vast plain, known as the Everglades, occupies the central portion of the state from Lake Okeechobee to Florida Bay. It is bounded on the east by the coastal ridge and on the west by a much wider ridge which separates it from the Gulf of Mexico. In the Miami area, the ground in the Everglades is considerably lower than the coastal ridge, but it gradually slopes upward toward Lake Okeechobee, where the elevation is some seventeen feet above sea level.

The soil in the Everglades consists almost entirely out of decayed, humus-like, vegetation deposit known as "muck" overlying a rock similar to that which outcrops near Miami. The depth of the muck varies from a minimum of about two to three feet at the southern edge of the area to eight to nine feet in the vicinity of the Lake. The surface of this muck is almost perfectly flat and is covered by a dense growth of sawgrass, vines, tropical shrubs, etcetera, and supports a few trees.

Some sixty years ago, and before any attempt had been made at drainage, water stood at a depth varying from several inches to three feet over nearly the entire Glades area at all times. Beginning about 1910, in an attempt to remove this water and render the land fit for cultivation, work was undertaken on canals through the Glades from the Lake to the sea. During long dry spells, the water disappeared from the surface of the ground and allowed the muck to become dry. In 1949, The Central and Southern Florida Flood Control District, an agency of the State of Florida, was established to combat problems of flooding, drought relief, and salt water intrusion into fresh water supplies. Since 1949 three major conservation areas have been constructed to store water during wet periods and release it through various canals during periods of drought. Dams were also constructed in the various canals to control the flow and level of fresh water and prevent the sea water from contaminating the fresh water supply.

It has been difficult to penetrate the interior of the Glades extensively and, as a consequence, very little data is available as to rainfall except in areas along the main highways traversing the region. Annual rainfall in Dade County averages about 59 inches and it is probably safe to assume that there is an average annual rainfall of at least this amount throughout the entire area. There are no natural water courses or streams through the Glades from Lake Okeechobee to the sea and rainwater which falls in the area seeps into the ground, evaporates, or is stored in one of the conservation areas to be released into the canals during periods of low rainfall, so as to maintain a fresh water head on the upstream side of the control dams.

It is from this tremendous natural storage basin -- the Everglades -- that Dade County residents receive their water supply. Wells have been drilled into the surface rock in and around the area close to the edge of the Glades, and water drawn from these wells is pumped to the water plants for treatment, prior to being repumped into the distribution system for general consumption.

By drilling wells approximately one thousand feet deep, it is possible, to tap a different strata of water-bearing rock from which an artesian supply may be obtained, but as this artesian water is too highly mineralized to be fit for public consumption, no attempt has been made to utilize it.

THE MIAMI-DADE WATER AND SEWER AUTHORITY

The Miami-Dade Water and Sewer Authority, a county-wide water and sewer agency, was formed in 1973 by merging the Department of Water and Sewers of the City of Miami with Dade County Water and Sewer Authority, following approval of the necessary Dade County charter amendment in the referendum of October 3, 1972.

Since 1924, the former Miami Department of Water and Sewers had continuously operated and maintained the raw water supply, purification system and low pressure transmission system. The distribution system and a considerable portion of the high pressure pumping system were acquired from the Miami Water Company in 1941. Many of the Authority's present employees have continued to serve through these successive ownerships of the water properties and 66 or approximately 8 percent have over twenty years service. The following facilities of the Authority provide water supply to some 1,100,000 persons in Metropolitan Dade County today.

HIALEAH TREATMENT PLANT AND WELL FIELDS

The well fields that supply the Hialeah Treatment Plant are located about eight miles northwest of downtown Miami and lie partly in the City of Miami Springs and partly in the City of Hialeah. There are twenty-three wells scattered over a fairly large area. Each well consists of either a 12-inch or 14-inch upper steel casing, and an open hole which has been drilled to a depth which appeared to supply the best flow of water for the individual well. They average from eighty-five to ninety feet in depth. Each well is equipped with a motor-driven centrifugal pump which discharges into a manifold pipe line extending from the well fields to the treatment plant. The largest raw water line is a 60-inch diameter cast iron pipe. All but two of these pumps have a capacity of 3.5 million gallons in twenty-four hours; the two exceptions are rated at 5 million gallons in twenty-four hours. The water as drawn from the ground is fairly hard, or high in dissolved mineral content, contains dissolved iron, is rather highly colored, and has a disagreeable taste. It would not furnish an acceptable public supply without treatment. A softening and filtration plant provides the treatment which produces a potable supply for household usage.

The Hialeah Treatment Plant is located at Okeechobee Road and West 2nd Avenue in the City of Hialeah, on the north bank of the Miami Canal. A diagram showing how the water flows through the Hialeah Plant is attached. Water first enters the vertical flow tanks, known as sand traps, where small amounts of sand carried from the wells are removed. Excess sludge from the lime plant sludge concentrators is added to the raw water at the sand traps in order to obtain its remaining chemical treatment value.

The water flows to the mixing tanks where activated silica is added. Activated silica is produced by mixing sodium silicate, water, and sodium silcofluoride, a fluoride compound. The activated silica is an aid in water softening to improve the settling characteristics of the sludge formed in the flocculators and removed in the clarifiers. The fluoride compound is added to reduce the formation of cavities in children's teeth. Slaked quicklime is added as the water enters the flocculators in which slow moving paddles aid the coagulation of finely divided insoluble limestone particles, produced by the combination of the lime added to the bicarbonate hardness in the raw water. Leaving the flocculators, large siphons convey the water to the center of the clarifiers, and in flowing through these large tanks, sludge or insoluble limestone particles in suspension are allowed to settle out.

The settled water is then given a large dose of chlorine for the purpose of killing any bacteria which may be present and for removing color. One-half to one hour of contact between the chlorine and the water is provided in four tanks. Finally, the water passes to the filters to remove all remaining suspended limestone particles. In the filters, the water flows downward through a bed of sand and gravel into an underground reservoir known as a "clear well", from which the finished product, pure potable water, is pumped at high pressure to the City of Hialeah and the City of Miami Springs and at low pressure through three large transmission mains to storage reservoirs in Miami. The storage tanks, at four separate locations, are constructed on the surface of the ground. High pressure pumps, located at the four widely separated pumping stations in Miami, draw water from the low pressure mains and storage reservoirs and deliver it to the distribution system at the higher system pressure.

Immediately adjacent to the Hialeah Treatment Plant is a lime recovery plant where the calcium carbonate sludge ($CaCO_3$), produced and removed in the softening process, is remade into quicklime (CaO) for re-use in softening the water. This plant, with a production capacity of 100 tons of lime per day, is one of the few rotating-kiln plants in the United States, owned and operated by a publicly owned water utility.

THE JOHN E. PRESTON TREATMENT PLANT AND WELL FIELD

The need to meet the increasing demand for water in the Miami area resulted in the building of the John E. Preston Water Treatment Plant with its on-site raw water supply, located just north of and adjacent to the Hialeah Treatment Plant. The raw water supply for this plant is obtained from seven electric powered wells located at the plant site, 1100 West 2nd Avenue, Hialeah. The wells are 90 feet deep and are 42-inch diameter cased to 60 feet deep with a 24-inch open hole extending to the bottom of the well. These wells each have a capacity of 9,000,000 gallons daily.

This treatment plant was named in honor of Mr. John E. Preston for his service as the Chairman and member of the Water and Sewer Board of the City of Miami from 1941 to 1966. It is a complete treatment plant, consisting of three softeners, one recarbonation or stabilization channel, one chlorine contact basin, twelve rapid sand filters, one storage basin for filtered water, an electric motor-driven high pressure pumping station, and an emergency Diesel-electric generating station.

The three softeners are upflow units where complete mixing, softening and settling processes occur in one circular basin. Each basin is 90 feet in diameter and 20 feet deep. The coagulant used is activated sodium silicate which is added to the raw water before it reaches the softeners. Softening is accomplished by adding slaked quicklime to the raw water as it enters the bottom of the basin. Limestone sludge produced is continuously evacuated from the softener by time and flow controlled pumps and returned to the Hialeah Plant lime kiln to be converted into lime.

The softened water is then given a dose of chlorine for the purpose of killing any bacteria which may be present and for removing color. Some 1.25 hours of contact between the chlorine and the water is provided in one large tank, from which the water is conveyed to the filters. In the filters, the water flows downward through a bed of sand and gravel into an underground reservoir known as a "clear well", from which the finished product can flow by gravity to the Hialeah Plant clear well or be pumped at high pressure through a large transmission main into the distribution system by one 30 million gallons per day and two 15 million gallons per day pumps driven by electric motors. A flow diagram of this treatment plant is attached.

This plant has a 2,500 kilowatt Diesel engine-driven generator to provide emergency power to operate it, the Hialeah Plant, many of the wells and the lime plant during outages of commercial power.

The new Medley Well Field located at N. W. 74th Street at N. W. 74th Avenue has six wells, 90 to 100 feet deep, 42-inch diameter, cased to a depth of 60 feet and 24-inch open hole below. These wells will provide an alternative to the existing Hialeah/Miami Springs/ Preston Well Fields, which are too close to the coastal salinity dams. Under the conditions of the Central and Southern Florida Flood Control District permit, a maximum installed pumping capacity for these well fields which supply the Hialeah and Preston Plants is 194 million gallons per day, although the maximum day withdrawal allocation is limited to 146 million gallons.

Another new well field will soon be developed in the vicinity of N. W. 74th Street and N. W. 137th Avenue on property owned by the Authority. Ten wells, each with 10 million gallons a day capacity, will be installed; although the present permit is limited to a maximum day withdrawal of 87.5 million gallons, it does allow a maximum installed pumping capacity of 100 million gallons per day.

ALEXANDER ORR, JR., TREATMENT PLANT AND WELL FIELDS

The raw water supply for this plant is obtained from seven dual drive Diesel/electric powered wells and three electric

powered wells in the well field at the treatment plant site - 6800 S. W. 87th Avenue - approximately three miles southwest of Coral Gables. In addition there are ten electric powered wells in the Southwest Well Field situated approximately four miles west of the plant. The plant wells each have a capacity of 6 million gallons daily, and the southwest wells each have a capacity of 7 million gallons daily. A new field located near Snapper Creek Canal at S. W. 102nd Avenue has been completed to provide an additional permissible average day withdrawal of 10 million gallons per day although its pump capacity will be 40 million gallons per day. All of the wells are 90 to 100 feet deep range in diameter from 30-inch to 42-inch with upper casing 40 to 50 feet in depth and 24-inch diameter open hole below. Allowable installed pump capacity for all the wells which supply the Orr Plant is 180 million gallons per day as permitted by the Central and Southern Florida Flood Control District. The maximum day allocation is 126 million gallons per day according to the permit.

The treatment plant was named in honor of Alexander Orr, Jr., a former City of Miami mayor and pioneer. It is a complete treatment plant, consisting of eight softeners, a recarbonation or stabilization basin, twenty rapid sand filters, three storage basins for filtered water, and a Diesel-powered high pressure pumping station.

The softeners are upflow units where a complete mixing, softening and settling cycle occurs in one circular basin. Each basin is sixty-nine feet in diameter and eighteen feet deep. The coagulant used is activated sodium silicate which is added to the raw water before it reaches the softeners to aid in the settling of sludge. Softening is accomplished by adding slaked quicklime to the raw water as it enters the bottom of the basin. Sludge produced by the softening reaction is continuously evacuated from the softener by an automatic valve.

The water is then treated with chlorine; fluoride solution is added; then the water is filtered through sand and gravel and stored in the three storage reservoirs which have a total capacity of 20 million gallons. Chlorine may be added to the water just before it enters the reservoir, although this has not been found necessary to date.

Seven high pressure pumps, four at 16.5 million gallons per day capacity, driven by 825 HP Diesel engines, one at 30 million gallons per day capacity, driven by a 1,500 HP dual-fuel Diesel engine, one at 38 million gallons per day capacity, driven by a 2,113 HP dual-fuel Diesel engine, and one 45 million gallon per day capacity driven by a 2,000 HP electric motor (under construction), remove water from the storage basins and deliver it to the consumers through two 48-inch high pressure transmission mains. One of the 825 HP Diesel engines has a 750 KVA electric generator coupled to it as an alternative to service for pumping. This generator is capable of supplying the entire plant and nine electric wells in the plant well field with auxiliary electric power. Seven of the plant wells can also be operated by Diesel engines. This makes the Alexander Orr, Jr., Water Treatment Plant completely independent of an outside electric power source in case of a hurricane or other serious interruption of the area power supply. A flow diagram of this treatment plant is attached.

OTHER WATER SUPPLY FACILITIES

The Authority also has two small independent water treatment plant facilities. The Goulds-Perrine Plant has a capacity of 4 million gallons per day and has been placed into standby service for emergency use since the acquisition of the South Miami Heights Public Utilities Corporation permitted the interconnection of the distribution systems served by each plant. The South Miami Heights Water Treatment Plant has limited capacity softening facilities, as well as sand filtration, chlorination and pumping capacity at 1.9 million gallons per day. It will be phased out of service in the future, when a proposed 48-inch transmission main from the Alexander Orr, Jr., Water Treatment Plant is installed and connected to these small distribution systems.

OPERATIONAL STATISTICS

The rated capacity of the Hialeah Treatment Plant and the John E. Preston Treatment Plant is 60 million gallons per day of each plant. The Alexander Orr, Jr., Treatment Plant's original installation in 1954 had a rated capacity of 40 million

gallons per day, and a planned expansion program gradually increased the plant to a firm capacity of 100 million gallons per day and a peak capacity of 120 million gallons per day. Thus, the three plants have a total design capacity of 220 million gallons per day and a peak capacity of 240 million gallons per day. During the twelve months ending September 30, 1976, a total of 69,751,500,000 gallons, or an average of 191.1 million gallons per day, of water was produced of which an average of 73.2 million gallons per day, was produced at the Hialeah Treatment Plant, an average of 37.3 million gallons per day, was produced at the John E. Preston Treatment Plant and an average of 80.6 million gallons per day, was produced at the Alexander Orr, Jr., Treatment Plant. Daily average consumption during the peak month of April, 1976 was 205 million gallons, and an all-time peak was reached on July 28, 1976, when 229.2 million gallons were pumped from the three major plants.

The Miami-Dade Water and Sewer Authority owns and operates all of the supply facilities and distribution system for the City of Miami, Miami Shores, El Portal, Sweetwater and extensive unincorporated areas of Dade County.

The distribution system facilities consist of 1,334 miles of water mains ranging in size from 2-inches to 72-inches in diameter, one 2 million gallon elevated storage tank, service connections and other real and personal property necessary for the rendition of water service.

As of September 30, 1976, the Authority had 125,232 retail water customers and approximately 45 percent of the total water production was sold to volume customers for resale.

The waterworks system of the Authority consists of water supply, treatment, transmission, storage, pumping and distribution facilities representing an investment, as of June 30, 1976, of $109,246,427. These facilities render complete water service at retail throughout the City of Miami, the City of Sweetwater and the Villages of Miami Shores and El Portal, and in a number of adjacent unincorporated sections of Dade County, some of which were formerly served by private utilites and now have been acquired by the Authority.

Volume sales are rendered by long term contracts to the City of Miami Beach (which in turn supplies water to the communities of Surfside, Bal Harbour, Bay Harbor Islands, North Bay Village and Indian Creek Village, as well as to its own inhabitants), the City of Hialeah, the City of West Miami, the City of Miami Springs, the City of North Miami (supplemental), and to General Waterworks Corporation for distribution at retail in the cities of Coral Gables and South Miami and an adjacent large unincorporated section of Dade County. In addition to General Waterworks Corporation, one other private water utility, a subsidiary of General Waterworks Corporation, obtains water at volume rates, while the Town of Medley, the Village of Virginia Gardens and three private utilities obtain water at the retail rate.

Typical average analyses of the raw and treated water for the large plants are attached. Fluoridation of the water supply was inaugurated in April, 1952.

The foregoing description of the Authority's water supply is too limited to describe many features which might be of interest to the reader, but it covers the more salient points involved.

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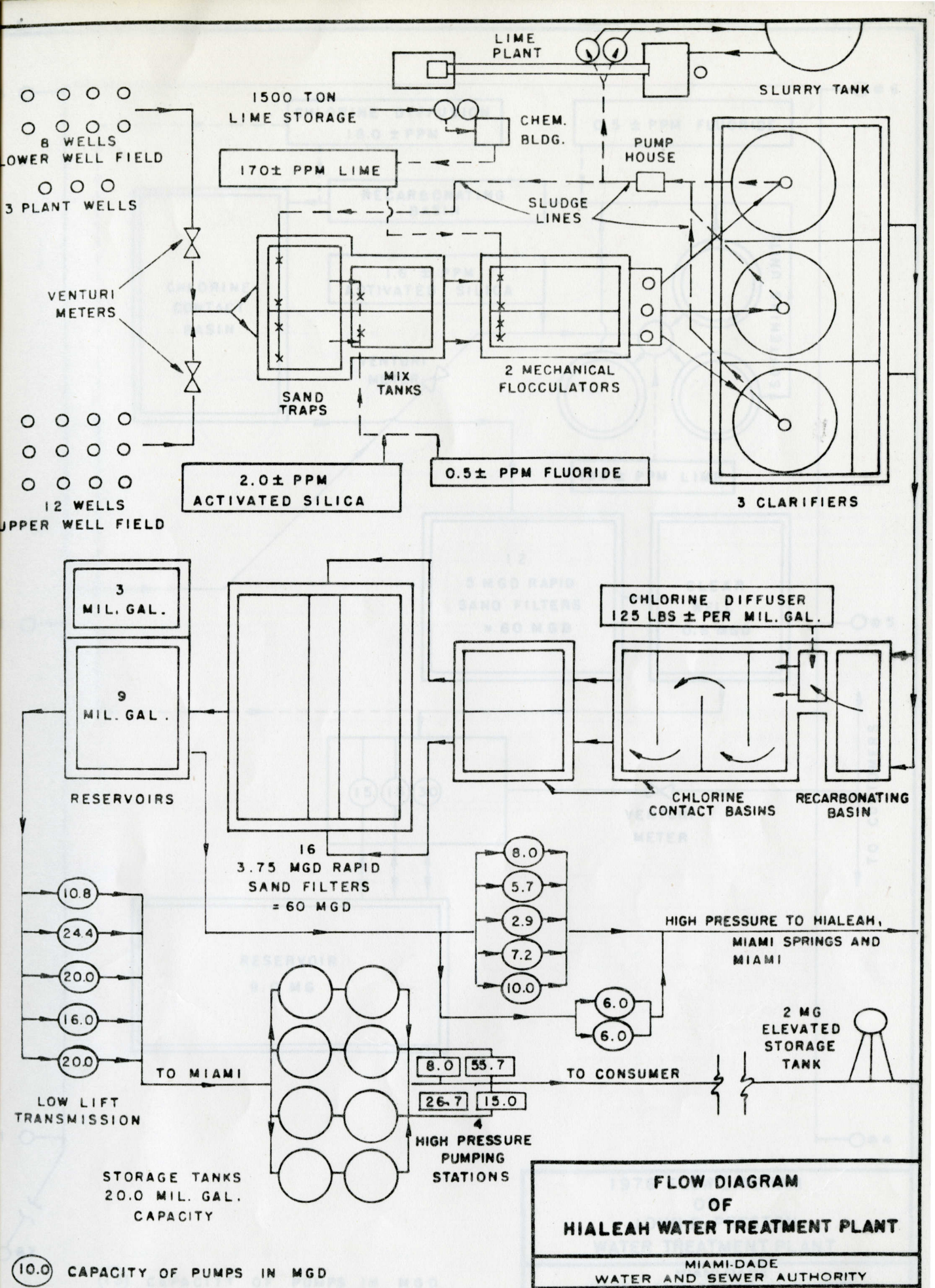
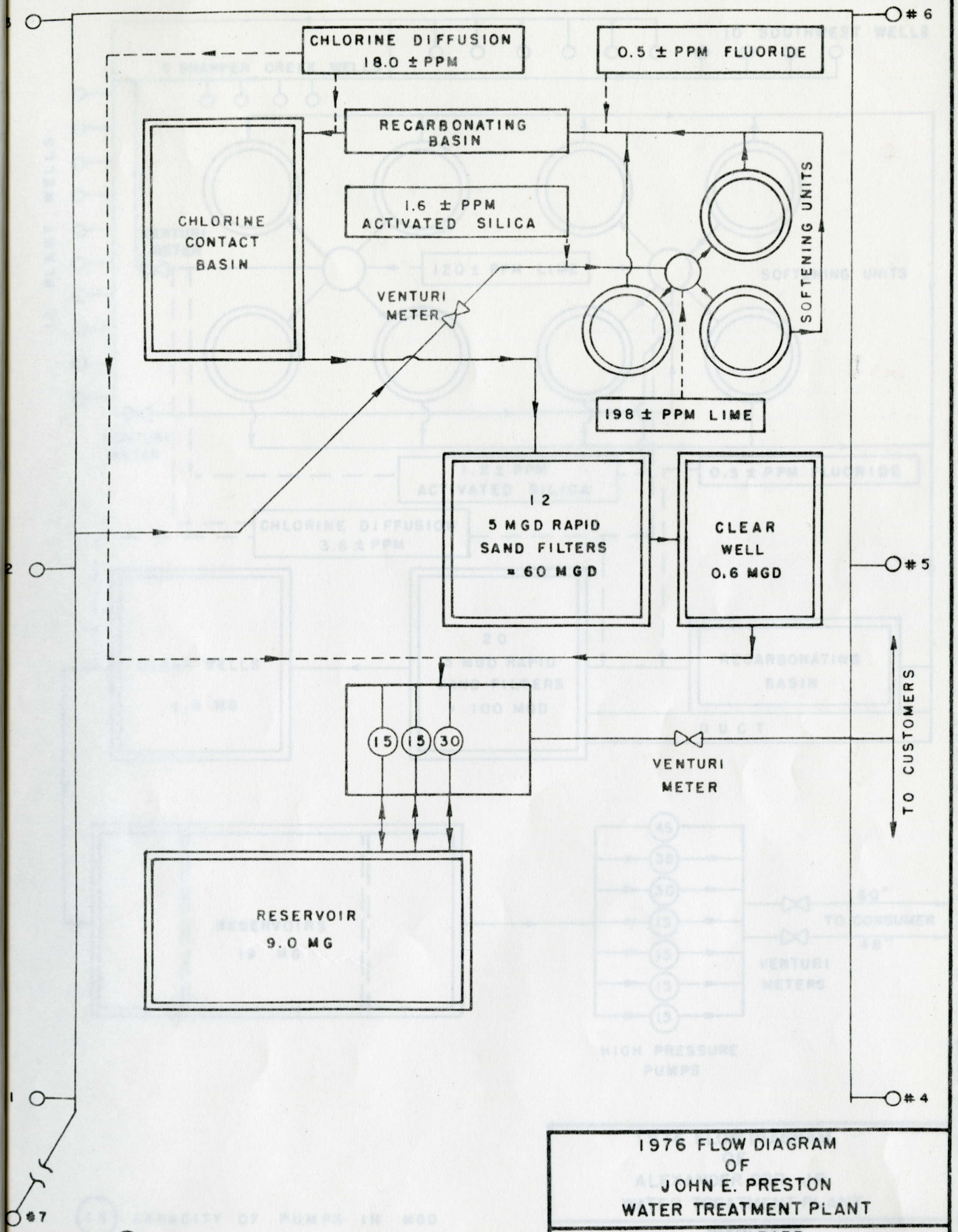


FLOW DIAGRAM OF HIALEAH WATER TREATMENT PLANT

MIAMI-DADE WATER AND SEWER AUTHORITY

DATE DEC. 1976 | SCALE NONE

W-5472-C



(15) CAPACITY OF PUMPS IN MGD

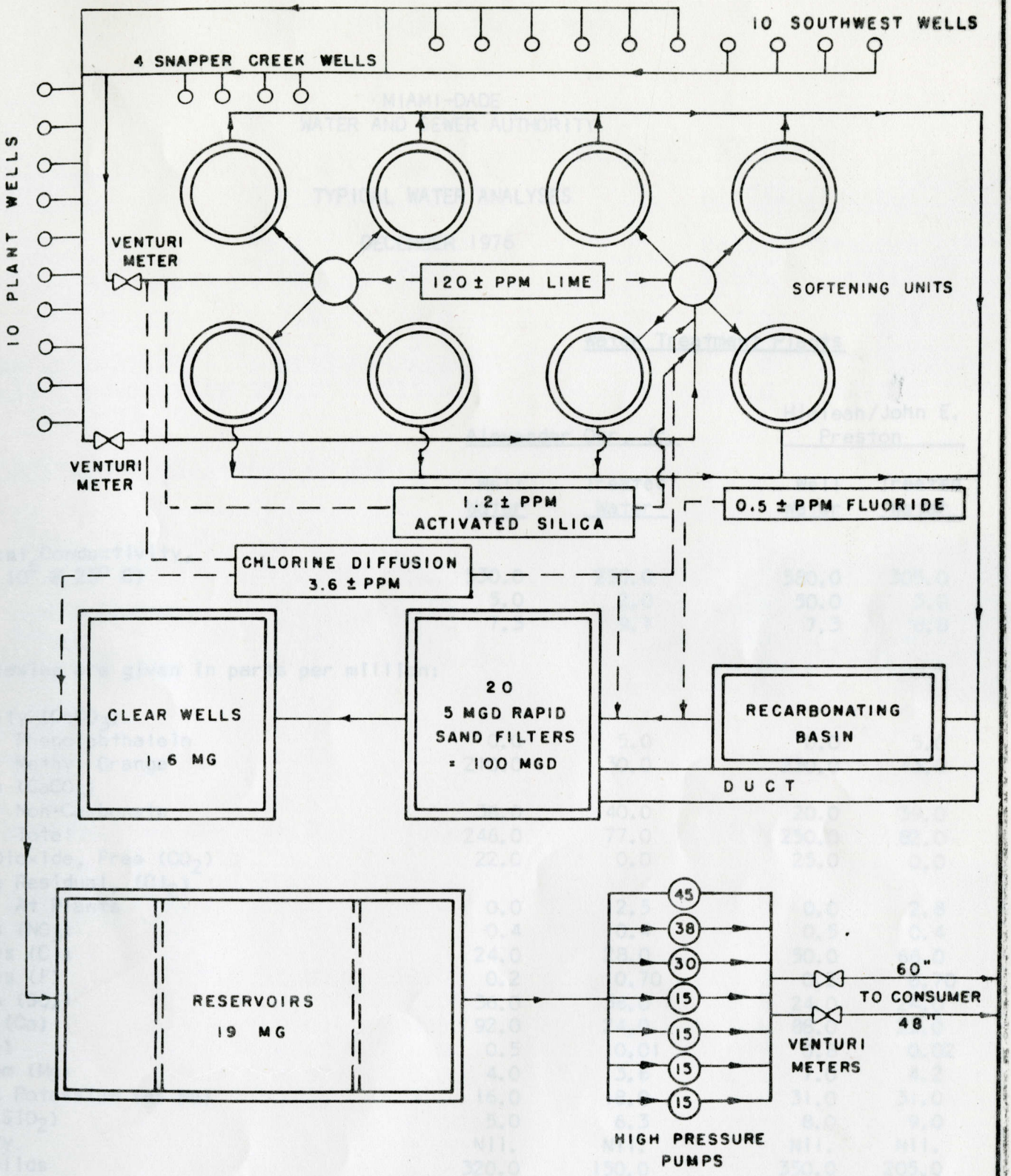
○ WELL

1976 FLOW DIAGRAM OF JOHN E. PRESTON WATER TREATMENT PLANT

MIAMI-DADE WATER AND SEWER AUTHORITY

DATE DEC. 1976 | SCALE NONE

W-5468-C



(15) CAPACITY OF PUMPS IN MGD

1976 FLOW DIAGRAM
OF
ALEXANDER ORR, JR.
WATER TREATMENT PLANT

MIAMI-DADE
WATER AND SEWER AUTHORITY

DATE DEC. 1976	SCALE NONE
	W-5470-C

MIAMI-DADE
WATER AND SEWER AUTHORITY

TYPICAL WATER ANALYSES

DECEMBER 1976

	Water Treatment Plants			
	Alexander Orr, Jr.		Hialeah/John E. Preston	
	Well Water	Treated Water	Well Water	Treated Water
Electrical Conductivity, (EC x 10^6 @ 25° C)	530.0	250.0	580.0	305.0
Color	5.0	2.0	50.0	3.0
pH	7.3	9.1	7.3	8.8
The following are given in parts per million:				
Alkalinity ($CaCO_3$)				
Phenolphthalein	0.0	5.0	0.0	5.0
Methyl Orange	210.0	30.0	230.0	43.0
Hardness ($CaCO_3$)				
Non-Carbonate	36.0	40.0	20.0	39.0
Total	246.0	77.0	250.0	82.0
Carbon Dioxide, Free (CO_2)	22.0	0.0	25.0	0.0
Chlorine Residual, (Cl_2)				
At Plants	0.0	2.5	0.0	2.8
Nitrates (NO_3)	0.4	0.4	0.5	0.4
Chlorides (Cl)	24.0	28.0	50.0	66.0
Fluorides (F)	0.2	0.70	0.2	0.70
Sulfates (SO_4)	36.0	36.0	24.0	24.0
Calcium (Ca)	92.0	24.0	88.0	23.0
Iron (Fe)	0.5	0.01	0.8	0.02
Magnesium (Mg)	4.0	3.6	7.0	4.2
Sodium & Potassium (as Na)	16.0	18.0	31.0	31.0
Silica (SiO_2)	5.0	6.3	8.0	9.0
Turbidity	Nil.	Nil.	Nil.	Nil.
Total Solids	320.0	150.0	350.0	205.0

Miami Dade Water and Sewer Authority

Typical Average Water Analyses

1977-1978

	WATER TREATMENT PLANTS			
	Alexander Orr, Jr.		Hialeah/Preston	
	Well Water	Treated Water	Well Water	Treated Water
pH	7.2	9.0	7.3	8.9
Color	8.0	5.0	53.0	6.0
Turbidity (NTU)	nil	nil	1.0	.5
Electrical Conductivity (EC x 10^6 @ 25 C)	550.0	255.0	680.0	425.0
The following are expressed in ppm.				
Alkalinity ($CaCO_3$)				
Phenolpthalein	0.0	5.0	0.0	5.0
Methyl Orange	211.0	32.0	232.0	40.0
Hardness ($CaCO_3$)				
Non-carbonate	29.0	38.0	17.0	40.0
Total	240.0	70.0	249.0	80.0
Total dissolved solids	325.0	155.0	390.0	260.0
Chlorine residual, free Cl_2 at plants	0.0	2.0	0.0	2.0
Chlorides (Cl)	26.0	28.0	63.0	84.0
Fluorides (F)	0.15	0.70	0.20	0.70
Nitrate (NO_3)	0.32	0.30	0.40	0.30
Sulphate (SO_4)	27.0	30.0	24.0	24.0
Carbon Dioxide, free CO_2	26.0	0.0	24.0	0.0
Average Metal Analyses (expressed in ppm)				
Calcium	90.0	22.0	91.0	21.5
Chromium	0.01	0.01	0.001	0.00
Copper	0.01	0.002	0.02	0.015
Iron	0.60	0.015	0.95	0.025
Lead	0.002	0.001	0.002	0.001
Magnesium	3.25	3.50	5.00	4.60
Manganese	0.01	0.002	0.03	0.001
Potassium	1.50	2.00	2.60	2.60
Silicon	3.20	4.20	5.20	7.00
Sodium	16.0	17.0	45.0	47.0

MIAMI-DADE WATER AND SEWER AUTHORITY

JOHN E. PRESTON WATER TREATMENT PLANT

BASIC DESIGN DATA

October 1980

1. General

Design capacity, mgd 110

Treatment - lime softening with activated sodium silicate added prior to lime, recarbonation, breakpoint chlorination, ammoniation, fluoridation and filtration.

Instrumentation - principally electric; filter controls - pneumatic

2. Typical Water Analysis

	Well Water	Treated Water
Electrical Conductivity, (EC x 10_6 @ 25° C)	580.0	305.0
Color	50.0	3.0
PH	7.3	8.8
The following are given in parts per million:		
Alkalinity ($CaCO_3$)		
Phenolphthalein	0.0	5.0
Methyl Orange	230.0	43.0
Hardness ($CaCO_3$)		
Non-Carbonate	20.0	39.0
Total	250.0	82.0
Carbon Dioxide, Free (CO_2)	25.0	0.0
Chlorine Residual, (Cl_2)		
At Plant	0.0	2.8
Nitrates (NO_3)	0.5	0.4
Chlorides (Cl)	50.0	66.0
Fluorides (F)	0.2	0.70
Sulfates (SO_4)	24.0	24.0
Calcium (Ca)	88.0	23.0
Iron (Fe)	0.8	0.02
Magnesium (M_g)	7.0	4.2

2. Typical Water Analysis (continued)

	Well Water	Treated Water
Sodium & Potassium (as Na)	31.0	31.0
Silica (SiO_2)	8.0	9.0
Turbidity	Nil	Nil
Total Solids	350.0	205.0

3. Source of Supply

Wells at John E. Preston Water Treatment Plant

No. of Wells	7
Total capacity, mgd	60
Pumps - vertical turbine, electric motor driven, H.P.	100

Medley Wellfield

No. of Wells	6
Total Capacity, mgd	60
Pumps - vertical turbine, electric motor driven, H.P.	150

Northwest Wellfield (available 1982)

No. of Wells	15
Total capacity, mgd	150
Pumps - vertical turbine, 2-speed electric motor driven, H.P.	250

4. Venturi Meters

Raw Water

1 - 60 in. No. 1, capacity, mgd	80
1 - 72 in. No. 2, capacity, mgd	100
Total Capacity, mgd	180

Treated Water

1 - 60 in. No. 1, capacity, mgd	100
1 - 60 in. No. 2, capacity, mgd	120
Total capacity, mgd	220

5. Softening Units

3 Hydrotreaters at 20 mgd each, total capacity, mgd	60
3 Accelators at 25 mgd each, total capacity, mgd	75
Largest unit out of service capacity, mgd	110

Hydrotreaters

Type of Units - sludge blanket, upflow	
Maximum hydraulic capacity each unit, mgd	25
Side water depth, ft.	20
Diameter tanks, ft.	90
Upflow velocity at 20 mgd, ft./min.	0.28
Surface loading, gals./sq. ft./min.	2.18
Effective volume each tank, cu. ft.	127,234
Detention at 20 mgd./unit, min.	69
Motor drive, hp	5

Accelators

Type of units - slurry recirculation, upflow	
Maximum hydraulic capacity each unit, mgd	30
Side water depth, ft.	21
Diameter tanks, ft.	92
Upflow velocity at 25 mgd, ft./min.	0.44
Surface loading, gals./sq. ft./min.	3.26
Effective volume each tank, cu. ft.	104,431
Detention at 25 mgd/unit, min.	45
Motor drive, hp	60

6. Recarbonation Systems

Basin No. 1

83 ft. long x 6 ft. wide x 16 ft. water depth, volume, cu. ft.	7,968
Detention at 60 mgd, min.	1.2
Velocity through basin, f.p.s.	1.0
Diffusers - pipe grids with orifices, controlled manually	
CO_2 - from Lime Plant exhaust, lbs. mg.	150
Rate of feed - 20% CO_2, 75% absorption at 8.5 psi and 60 mgd rate, cfm	240

Basin No. 2

95 ft. long x 10 ft. wide x 16 ft. water depth, volume, cu. ft.	15,200
Detention at 75 mgd, min.	2.2
Velocity through basin, f.p.s.	0.7
Diffusers - pipe grids with orifices, controlled manually	
CO_2 - from Lime Plant exhaust, lbs./mg	150
Rate of feed - 20% CO_2, 75% absorption at 8.5 psi and 75 mgd rate, cfm	300

7. Disinfection System

Breakpoint Chlorination followed by Ammonia to form Chloramine	
Contact basins, 2 units, 150 ft. x 150 ft. x 19 ft., volume, cu. ft.	854,000
Detention at 110 mgd, hrs.	1.36
Overflow rate at 110 mgd, gals./sq. ft./min.	1.70
Chlorine Dosage (breakpoint), ppm	18.0
Chlorine Dosage at 110 mgd, lbs. per day	16,000
Ammonia Dosage, ppm	3.0
Ammonia Dosage at 110 mgd, lbs. per day	2,750
Chlorinators - (3) capacity ea., lbs./day	10,000
Ammoniators - (5) capacity ea., lbs./day	1,000

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THE JOHN E. PRESTON TREATMENT PLANT AND WELL FIELD

The need to meet the increasing demand for water in the Miami area resulted in the building of the John E. Preston Water Treatment Plant with its on-site raw water supply, located just north of and adjacent to the Hialeah Treatment Plant. The raw water supply for this plant is obtained from seven electric powered wells located at the plant site, 1100 West 2nd Avenue, Hialeah. The wells are 90 feet deep and are 42-inch diameter cased to 60 feet deep with a 24-inch open hole extending to the bottom of the well. These wells each have a capacity of 9,000,000 gallons daily.

This treatment plant was named in honor of Mr. John E. Preston for his service as the Chairman and member of the Water and Sewer Board of the City of Miami from 1941 to 1966. It is a complete treatment plant, consisting of three softeners, one recarbonation or stabilization channel, one chlorine contact basin, twelve rapid sand filters, one storage basin for filtered water, an electric motor-driven high pressure pumping station, and an emergency Diesel-electric generating station.

The three softeners are upflow units where complete mixing, softening and settling processes occur in one circular basin. Each basin is 90 feet in diameter and 20 feet deep. The coagulant used is activated sodium silicate which is added to the raw water before it reaches the softeners. Softening is accomplished by adding slaked quicklime to the raw water as it enters the bottom of the basin. Limestone sludge produced is continuous evacuated from the softener by time and flow controlled pumps and returned to the Hialeah Plant lime kiln to be converted into lime

8. Filters (continued)

Gravel, Filters No. 1-12	
Bottom layer, size 5/8 inch to 1 inch, depth, inches	3
Second layer, size 3/8 inch to 5/8 inch, depth, inches	3
Third layer, size 3/16 to 3/8 inch, depth, inches	3
Top layer, size No. 10 to 3/16 inch, depth, inches	3
Total depth, inches	12
Gravel, Filters No. 13-22	
Bottom layer, size 3/8 inch to 5/8 inch, depth inches	3
Second layer, size 3/16 inch to 3/8 inch, depth inches	3
Top layer, size No. 10 to 3/16 inch, depth inches	4
Total depth, inches	10
Backwash rate, inches rise/min.	30-35
Surface wash - rotary type sweeps	
Rate controllers - capacity range, mgd	8.5
Loss of head gages - range, ft.	0-10
Underdrains, Filters 1-12, precast Wheeler type	
Underdrains, Filters 13-22, precast Leopold type	
Control - Master pneumatic filter level, control of rate, controllers	
Elevated washwater tank, 44 ft. 10 x 17 ft. deep, usable capacity for backwash, gals.	176,000
Washwater pump, capacity, gpm	4,000
Washwater receiver, capacity, gals.	280,000
Washwater return pumps, 2, capacity each, gpm	2,000

9. Filtered Water Storage Facilities

Reservoir No. 1, 305 ft. x 257 ft. x 16 ft., capacity, mg	9.0
Reservoir No. 2, 353 ft. x 257 ft. x 21.5 ft., capacity, mg	14.0
Clear well under 22 filters, capacity, mg	1.1
Total storage capacity, mg	24.1

10. High Pressure Pumping Station (all electric)

2-15 mgd units, total capacity, at 70 psi, mgd	30
1-30 mgd unit, 1500 HP, capacity at 70 psi, mgd	30
3-45 mgd units, 1500 HP, total capacity at 70 psi, mgd	135
Total capacity, at 70 psi, mgd	195

11. Diesel Generator Station

(3) 2,750 KW - Diesel engine driven, total	8250 KW

12. Sodium Silicate System

Dosage (as SiO_2) ppm	1.6
Dosage (as SiO_2) lbs. per mg	13.3
Activation - Continuous activation of silicate of soda by chlorine	
Storage tanks - 2 units, capacity each, gals.	12,000
Feed pumps - Adjustable speed piston type	
Control - Automatic proportional to summated raw water flow to each bank of softeners	
Point of application - Prior to softeners	

13. Lime System (Pebble or Quick Lime)

Dosage, ppm	198
Dosage, lbs. per mg	1,650
Dosage at 110 mgd, lbs. per day	181,500
Feeders, 2, capacity each feeder, lbs./hr.	8,000
Feeders, 2, capacity each feeder, lbs./day	192,000
Storage bins, 2 units, usable capacity each bin, 170 tons, total 2 bins, tons	340
Storage bins - Lime Plant, tons	1,500

Control - Automatic, proportioned to total raw water flow

14. Fluoride System

Dosage (sodium silicofluoride) to maintain 0.7 ppm (F), ppm (F)	0.4 - 0.5
Dosage (as sodium silicofluoride), lbs./mg	5 - 7
Feeders - loss in weight, vibratory, gravimeter type, number	2
Capacity each, lbs./hr.	37.5
Capacity each, lbs./day	900
Feed pumps - centrifugal capacity each, gpm	25

Point of application - After softeners

Control - Automatic, proportional to summated raw water flow to softeners

15. Chemical Conveyor System

Type - pneumatic, capacity (at 50 lbs./cf) ton/hr. 10

125-hp blower at Lime Plant and 125-hp vacuum pump at Chemical House

The system conveys lime from Lime Plant to Chemical House (using both blower and vacuum pump) and from railroad and truck unloading stations to Chemical House (using vacuum pump alone).

Chemical House Receiving Station with screw conveyor to each bin

MIAMI-DADE WATER AND SEWER AUTHORITY

Typical Average Water Analyses

Alexander-Orr

1980-1981

	RAW	TREATED	E.P.A. Primary & Secondary Drinking Water Standards
pH	7.2	9.0	6.5 to 8.5 *
Color	12.0	5.0	15.0
Corrosivity	non corrosive	non corrosive	non corrosive
Odor	2	1	3(T.O.N.)**
Turbidity (NTU)	0.6	0.5	1.0
Electrical Conductivity (EC x 1.0@25C) as u mhs/cm	540	250	-
The following are expressed in ppm			
ALKALINITY ($CaCO_3$)			
@ Phenolpthalein	0	8	-
Methyl Orange	217	35	-
Hardness Total ($CaCO_3$)	247	73	-
Hardness Non Carbonate	30	38	-
Total Dissolved Solids	327	168	500.0 *
Chlorine Residual at Plant (As Free Cl_2)	0	1.8	-
Chlorides (Cl)	32	40	250.0 *
Fluorides (F)	0.17	0.65	1.4
Nitrate (NO_3)	1.0	1.0	10.0
Sulphate (SO_4)	19.0	6.2	250.0
Carbon Dioxide, Free CO_2	25.0	0.0	-
Surfactants	0.0	0.0	0.5 *
Average Metal Analyses (Expressed in ppm as the element)			
Arsenic	0.00	0.00	0.05
Barium	0.02	0.02	1.00
Cadmium	0.001	0.001	0.01
Calcium	91.4	22.4	-
Chromium	0.00	0.01	0.05 *
Copper	0.00	0.00	1.0
Iron	0.98	0.02	0.30 *
Lead	0.01	0.01	0.05
Magnesium	4.6	4.0	-
Manganese	0.01	0.00	0.05
Mercury	0.000	0.000	0.002
Potassium	1.50	2.00	-
Selenium	0.00	0.00	0.01
Silica (as SiO_2)	2.30	3.70	-
Silver	0.00	0.00	0.05
Sodium	17	19	-
Zinc	0.0	0.0	5.0 *
BACTERIOLOGICAL (Coliform) Colonies/100 ml	< 1	< 1	+1 (non-Consecutive samples)
Gross Alpha radioactivity express in pCi/l, (Picocurie per liter)	0.1	0.1	15.0

\- No Limit Set
* Secondary Standard
** Threshold Ordor Number

MIAMI-DADE WATER AND SEWER AUTHORITY
JOHN W. BERGACKER, WATER PRODUCTION SUPERINTENDENT
JERRY F. TOOLS, LABORATORY SUPERVISOR
MIAMI-DADE WATER LABORATORIES, STATE CERTIFIED LAB ID Nos. 56056 & 56084

TYPICAL AVERAGE ANALYSES FOR HIALEAH / PRESTON TREATMEMT PLANTS 1981

PARAMETERS	EXPRESSED IN	MCL[a]		RAW WATER	FINISHED WATER
METALS					
Arsenic (as As)	mg/l	0.01	c	< 0.01	0.00
Barium (as Ba)	"	1.0	b	0.03	0.04
Cadmium (as Cd)	"	0.010	b	0.000	0.001
Calcium (as Ca)	"	-	d	90.0	25.
Chromium (as Cr)	"	0.05	b	0.00	0.00
Copper (as Cu)	"	1.0	c	0.00	0.00
Iron (as Fe)	"	0.3	c	0.87	0.03
Lead (as Pb)	"	0.05	b	0.01	0.01
Magnesium (as Mg)	"	-	d	3.1	2.9
Manganese (as Mn)	"	0.05	c	0.02	0.00
Mercury (as Hg)	"	0.002	b	0.000	0.000
Potassium (as K)	"	-	d		
Selenium (as Se)	"	0.01	b	0.00	0.00
Silicon (as Si)	"	-	d	3.3	4.2
Silver (as Ag)	"	0.05	b	0.00	0.00
Sodium (as Na)	"	-	d	50.	52.6
Zinc (as Zn)	"	5.	c	0.1	0.1
ANIONS					
Chlorides (as Cl^-)	"	250.	c	77.	95.
Cyanides (as CN^-)	"	0.01	c	< 0.01	0.01
Fluoride (as F^-)	"	1.4	b	0.2	0.7
Nitrates (as N)	"	10.	b	0.0	0.2
Sulfates (as $SO_4^=$)	"	250.	c	17.	25.
PHYSICAL & CHEMICAL PROPERTIES					
Alkalinity (as $CaCO_3$)					
Phenolphthalein	"	-	d	0	2.
Methyl Orange	"	-	d	226.	44.
Ammonia (as NH_3)	"	-	d	0.5	0
Carbon dioxide (as free CO_2)	"	-	d	24.	0
Chlorine Residual at Plant (as free/total Cl_2)	"	-	d	0	2.5/3.0
Color	PCU	15.	c	39.	4.
Conductivity	umhos/cm	-	d	572.	461.
Hardness (as $CaCO_3$)					
total	mg/l	-	d	253.	90.
non-carbonate	"	-	d	26.	46.
Hydrogen Sulfide (as H_2S)	"	0.05	f	< 0.05	0.00
pH	pH	6.5-8.5	f	7.3	8.5
Silica (as SiO_2)	mg/l	-	d	7.0	9.1
Surfactants (MBAS)	"	0.5	c	0.00	0.00
Threshold Odor Number	TON	3.	c	3.	1.
Total Dissolved Solids	mg/l	500.	c	436.	307.
Turbidity	NTU	1.0	b	0.6	0.3
BACTERIOLOGY					
Coliform	colonies/100ml	+1	e	< 1	< 1
ORGANICS	mg/l				
Endrin	"	0.0002	b	< 0.0001	< 0.0001
Lindane	"	0.004	b	< 0.001	< 0.001
Methoxychlor	"	0.1	b	< 0.01	< 0.01
Phenols	"	0.001	c	0.001	0.001
Total Trihalomethanes	"	0.10	b	0.00	0.237
Toxaphene	"	0.005	b	< 0.001	< 0.001
2,4-D	"	0.1	b	< 0.01	< 0.01
2,4,5-TP (Silvex)	"	0.01	b	< 0.001	< 0.001
RADIONUCLIDES					
Gross alpha	pCi/l	15.	b	0.55	0.35
Gross Beta	pCi/l	50.	g & b	1.6	0.85
Radium 226/radium 228	pCi/l	5.	b		

NOTES

a: MCL- Maximum Contaminant Level. Values are for the agency with the most stringent levels

b: MCL set by Florida State Law 17.22.104 for drinking water

c: MCL set by Dade County Code #24-12 for drinking water

d: No limits set

e: As the arithmetic mean of all samples/month

f: MCL - EPA Proposed Secondary Standards for drinking water

g: 4. Millirem/year total body or organ dose equivalents

<: Less than