One Quarter of a Century...A Short Span in Miami's Search for Pure Water

Pure water which flows from faucets in urban Miami should not be taken for granted. There is a common misconception that water as provided by nature is best. However, all water for domestic, commercial, or industrial purposes needs considerable refinement by means of chemical treatment. These improvements to nature's gift are necessary to make water pure to drink and satisfactory to use.

What is "pure" water? Nature does not provide "pure" water. If it were possible to connect a pipeline to the clouds, the availability and quality of water would be no problem. The supply would not be contaminated by impurities in the air or by seepage through the ground. Miami must look to its rainfall which seeps through the ground for its water, and look further to chemists and engineers to remove the impurities which the rainfall collects.

Nature stores the rain which falls in South Florida in a large area known as the Everglades, where it collects and seeps through porous underlying rock – the Biscayne Aquifer – a natural waterholding underground strata.

This aquifer is the source of the water supply for the Greater Miami area. Any well driven, or dug, 10 to 12 feet below the local ground will yield water. But this water is not pure nor safe for drinking purposes.

How, then, is Miami's water made pure? The bacteria count, a source of disease, is eliminated by the addition of chlorine – a bacteria killing chemical.

People do not seek only purity in water. They want water which is clear, odorless, and relatively free of hardness minerals.

The Department of Water and Sewers attains eye appeal for its supply by bleaching out organic color and by filtration, which removes all solid matter so that it is crystal clear. Lack of odor is secured by chlorination which removes tastes and odors by chemical oxidation. A water softening process reduces the natural hardness, or objectionable dissolved mineral content.

Pure water is the result of the Department's many efforts to improve nature's great gift to mankind.

Miami grew from a settlement of less than 2,000 people to a metropolitan area of 730,000 in less than fifty years. It is one of the few large cities of the world built on land only a few feet above sea level. With rain as the only source of fresh water, and no hills to divert and retain the water high above the level of the ocean, Miami pioneers often found their wells turning brackish from sea water seeping inland through the porous limestone rock which underlies South Florida.

How the demands of an exploding population were met, how underground intrusion of salt water from the sea was stopped, how fresh water supplies ample for all time were found, how our bay and waterways are being cleared of contamination . . . how the physical plant was constantly expanded and still some ten million dollars was returned to the people . . . these are the things which play a vital part in the story of the Department of Water and Sewers of the City of Miami.

Our Beginnings

Miami was incorporated in 1896, soon after Henry M. Flagler extended the Florida East Coast Railroad from West Palm Beach to what is now our metropolitan city. A short time before the incorporation of Miami as a city, the area was a tiny agricultural and Indian trading settlement, consisting of two dwellings: a storehouse and Fort Dallas, a stone structure used as an outpost during the Seminole Indian wars.

THE FIRST water customer — Royal Palm Hotel — 1896.

AN EARLY WATER MAIN installation by pick and shovel in Flagler St. and 1st Ave. in the year 1913.

1896: The first city well was drilled the same year as the construction of Flagler's famous Royal Palm Hotel was begun in the present Dupont Plaza area. The next year Flagler installed a pump at a spring in Musa Isle on the Miami River, east of today's 27th Avenue Bridge.

1898: The first pumping station and stand pipe were built at the site of the present electric plant on the Miami River at the end of the transmission main from Musa Isle. When Miami totaled 1,681 citizens in 1900, new wells were experimented with — later concentrated in the Miami Country Club land, which is now our Civic Center. These were connected to the pumping station at the river by the first big transmission main. Flagler's East Coast Hotel Company continued to operate and expand Miami's water and electric facilities under a long-term franchise from the City. Later Flagler turned the water properties over to his Miami Water Company.

1920: Now began the scene of one of the greatest land booms in the country. During this time both the water company and the electric facilities were purchased by the American Power and Light Company. Both utilities then were combined under the new Florida Power and Light Company.

1924: The demands of the growing boomtime population lowered the water level in the city wells to the point where sea water from the bay crept in. Many people were using bottled water. While the private water company was still functioning, the city fathers became concerned with the quality of the water and decided to do something about it. They purchased 184 acres of land for a well field in the present City of Miami Springs, plus a site for a water softening plant in the future City of Hialeah.

MIAMI SEEKS TREATED WATER — Hialeah Treatment Plant 1925.

1925: The hurried completion of a year's work brought the new water system into operation. This system included eight new wells and pump houses, raw water collection system, a softening plant of 10 million gallons per day capacity, a 30-inch redwood stave transmission main from the plant to two 2.5 million gallon reservoirs, and a pumping station at what is now Moore Park on N.W. 36th Street. Two emergency wells were also added, and the transmission main was extended to the Miami Country Club (now our Civic Center) pumping station, where the private water

company purchased its treated supply for distribution within the City of Miami.

1926: By this year a small distribution system had been constructed on Miami Beach and water was being supplied from the City of Miami.

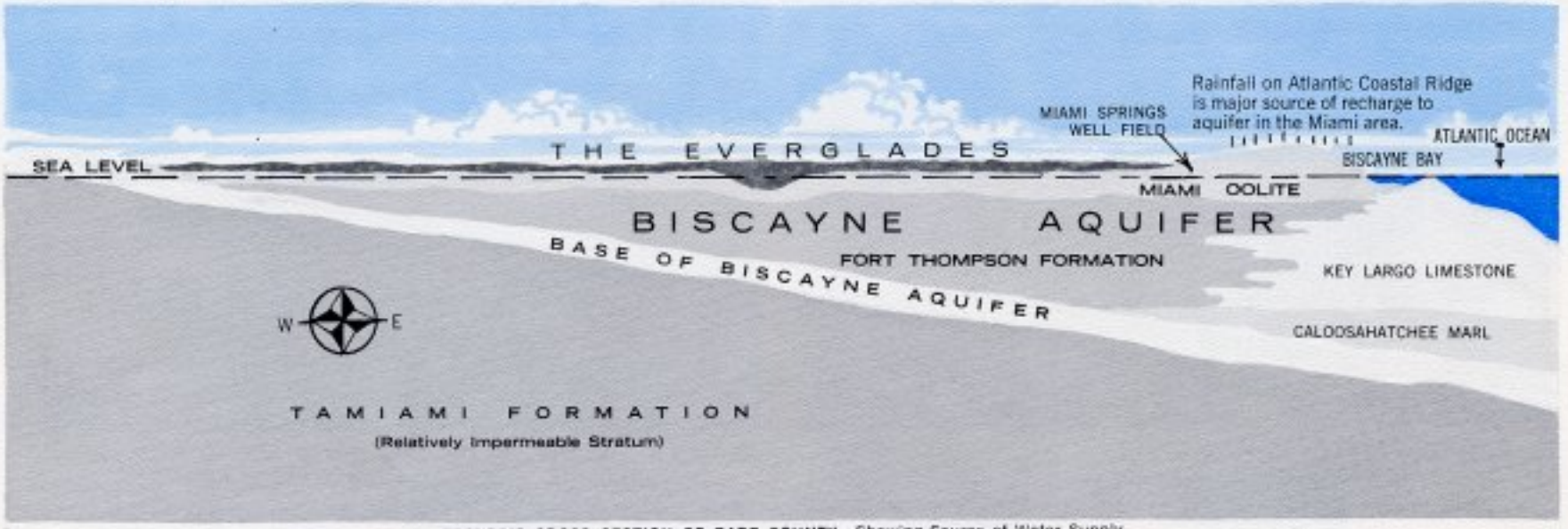
1932: In the seven years after the boom, 80 water systems in subdivisions were absorbed and the Miami Shores system was acquired by the Miami Water Company. These extensions called for more rapid expansion of supply capacity: three new wells at Hialeah, doubling of the treatment plant capacity, plus a large new pumping station near the City Incinerator. This station grew to three steam turbine pumps powered by boilers fired by city trash, with a capacity of 27 million gallons daily.

1934: To serve Coral Gables, a new 24-inch main was completed. Later softened water was supplied to Hialeah and Miami Springs. Federal Public Works funds soon made possible a third 36-inch cast iron main from the Hialeah Plant to two 2.5 million gallon storage tanks near the Incinerator Pumping Station. Also, cast iron mains replaced one of the old wood stave mains. Federal funds also spurred the major project of doubling capacity of the Hialeah Plant to 40 million gallons per day, supplied by 15 wells, by the end of 1937.

BOOMTIME WOODEN WATER MAINS, 1925 - 1941. California redwood transmission mains were installed from the Hialeah Plant to downtown Miami. The mains were 30 and 36-inches in diameter, made of wood staves fastened together with steel bands. They were short-lived and leaks were many and frequent. They are no longer in service.

1940: The City of Miami created the Department of Water and Sewers.

1941: Florida State Legislature created the Water and Sewer Board of the City of Miami.



GEOLOGIC CROSS SECTION OF DADE COUNTY Showing Source of Water Supply

Salt Water Intrusion

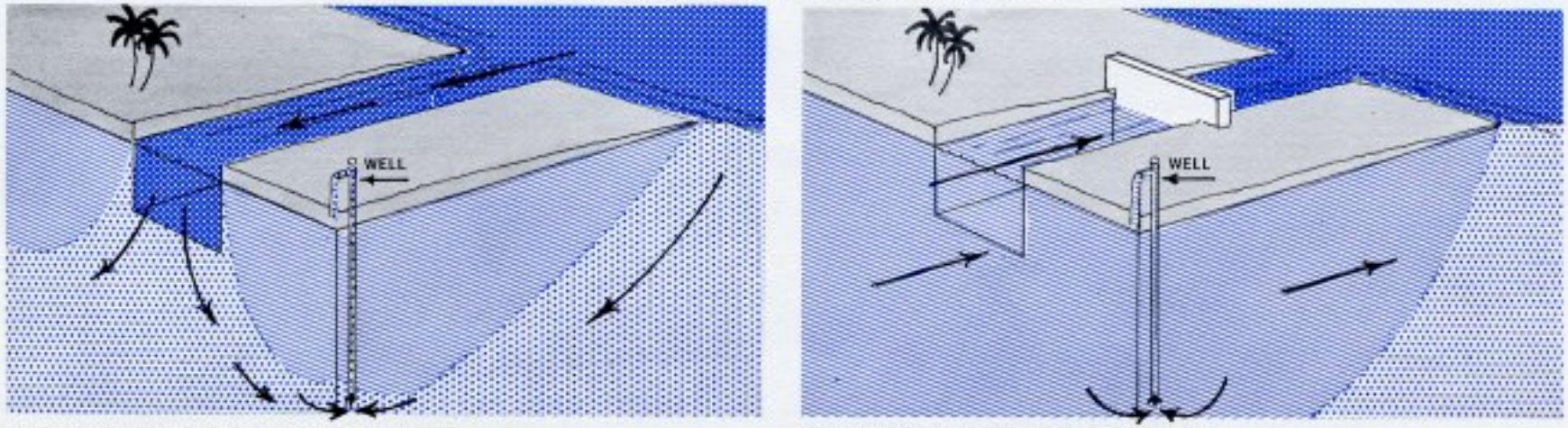
Early land promoter's dreams to make Miami the Venice of the Western World with myriad canals and waterways to reside by and travel by brought unforeseen problems with their completion. Sea water, which nature had confined along the coastal areas, began creeping upstream in the waterways and through the porous limestone and rocky soil. Fresh water from wells soon became salty.

Thus began a water "war" between man and nature which went on for nearly fifty years. In the first half of this period, the only peace was by retreat – by abandoning salty wells and drilling new ones farther from the sea. By the time Miami's boom started in 1924, all of the 15 wells within the city had been given up to salt water. The city developed new wells and built a new water plant in the then distant Hialeah area.

But in 1939 the sea water moved up the Miami River and posed a threat to the wells in the Hialeah and Miami Springs area, and it became necessary to build a temporary dam on the river near N.W. 36th Street.

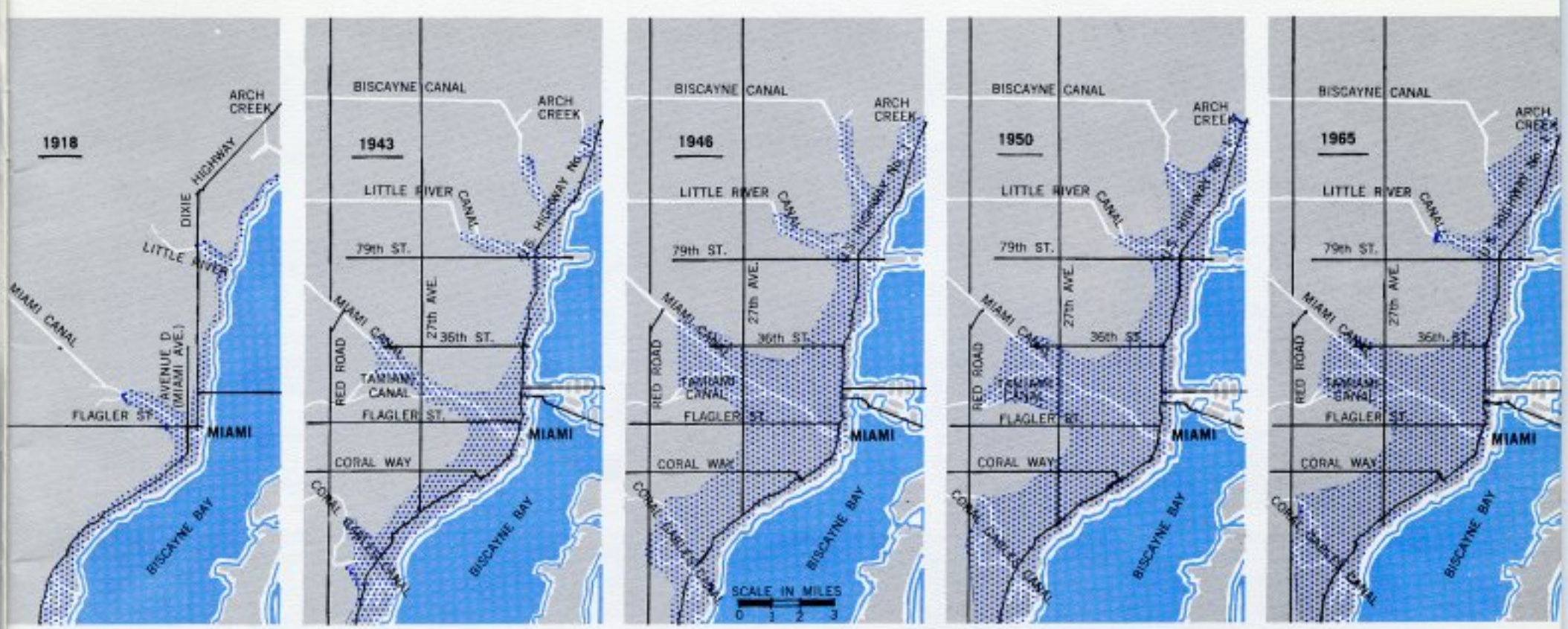
Up-stream land owners, fearing floods, forced this dam to be removed. An adjustable tidal gate replaced it. Its function was to regulate the flow of fresh water to the Bay and to prevent the heavier sea water from pushing upstream along the bottom of the Miami River. The installation of this tidal gate was not achieved easily; indeed, the battle went through the hands of many experts and scientific researchers and finally to the State Legislature.

THE EFFECT OF CANALS TO THE SEA ON WELL WATER SUPPLY.



Uncontrolled canal causes salt water intrusion to well.

Dam in canal prevents salt water intrusion to well.



MAPS SHOWING HOW SALT WATER ENCROACHMENT IN THE MIAMI AREA HAS BEEN CONTROLLED.

This took place in the early days of the Miami Water and Sewer Board – a body of citizens who realized that neither Miami nor any city can become great without ample fresh water supply assured.

Research revealed that with a porous rock strata 100 feet deep under this area, it required a minimum of two and one-half feet of fresh water head, or ground water surface level, above the sea level to prevent the movement of sea water inland – up the river and elsewhere. Also, when the fresh water in the ground receded to low levels, the sea water moved inland up the Miami River and into the aquifer.

And still the battle flared on. Land owners complained bitterly when long dry seasons made it necessary to close the tidal gate to back up sufficient fresh water to protect the wells.

Aside from this control in the Miami River, temporary control structures in other waterways and canals throughout Dade County were installed. Later, the Central and Southern Florida Flood District included the construction of many permanent control structures in their overall plan for flood and water control of the area.

Today the Board feels that the wells are adequately protected and the danger of sea water intrusion into the Hialeah wells is temporarily under control. The U.S. Geological Survey engineers state that our supplies of fresh water are assured for the future, provided we protect them with adequate controls from the intrusion from the sea.

Conversion of salt water to fresh water has always been a prohibitively expensive process. Recent developments in this area of science and engineering have still not produced a method of conversion which compares favorably with the present supply and treatment.

The Water and Sewer Board is Formed

In 1939 the City began steps toward purchase of the distribution system and other facilities then owned by the Miami Water Company, a subsidiary of Florida Power and Light Company. It was evident that this divided ownership impeded progress and administration.

A special election approved the purchase by the City. Final payment of $5,179,945 from a revenue bond issue of $8,000,000 was made in April of 1941. To provide the long needed business acumen, free of politics, the City Commission created a new Department of Water and Sewers, and a Water and Sewer Board was established by a special act of the State Legislature amending the City Charter.

Members of the original Board were: William A. Glass, Chairman and Director of the Department; Fred W. Borton, Investments; Adrian McCune, Appraiser; Charles A. Thomas, Insurance; and John E. Preston, District Manager of Gulf Oil Corporation.

First major efforts of the Water Board were directed at the salt water intrusion threatening the Hialeah wells from the Miami River. Wells farther west of Hialeah were recommended. And in the Board's first years, during World War II, our population leaped by more than 100,000 troops based here. They required many millions of gallons of additional treated water daily. This new demand was utilized in obtaining government priorities and funds for the purchase of much needed equipment and cast iron water mains to replace the redwood stave mains.

In 1945 the tidal gate in the Miami River was damaged and it was necessary to replace it with a steel sheet pile dam. During the same year the County Commission introduced in the State Legislature a bill to protect Dade County's water supply and to control surface water levels. Water and Sewer Board members and engineers attended the hearings in Tallahassee to help sponsor the measure and fight it through. The bill was passed, and the County Commission became the Water Control Board, and since then it has maintained the temporary steel pile dam in the Miami River.

It was during this period that the Board obtained studies and tests which located ample reserve water supplies, considerably removed from the danger of salt water intrusion. This property was state owned land, seven miles west of Hialeah. After long negotiations with the Everglades Drainage Board and the State Internal Improvement Fund, the Water and Sewer Board purchased 1,815 acres of water reserve land, at less than $5 per acre, for supply purposes in case existing salt water controls became ineffective.

The Miami area's constant growth and rising demands required five new wells in the upper Miami Springs field by 1945. In 1947 the Hialeah Treatment Plant was enlarged from a daily capacity of 40 to 60 million gallons per day.

Today there are 23 wells supplying the Hialeah plant with a total capacity of approximately 80 million gallons per day. The Alexander Orr, Jr., Plant has 20 wells with a total capacity of another 130 million gallons. Plans for gradual expansion of these supply facilities are under constant study and planned into the future as far as the year 2000.

The Department, however, does not serve all areas of Dade County. It does serve the metropolitan Miami area where people enjoy better public health, at minimal rates. The Board, entirely independent of any City agency, meets its own payrolls and pays its own bills. It submits budgets for approval to the City Commission. From income derived from its operations, they return to the City General Fund hundreds of thousands of dollars annually, as a return on the City's original investment in its water properties.

The present offices of the Board are situated on 10 acres in Coconut Grove on Le Jeune Road – a property which served as a well field and treatment plant for the Coconut Grove area until saltwater infiltration made it necessary to abandon the wells. In an attractively designed two-story building, all administrative, financial and engineering personnel perform their duties. The Water and Sewer Board holds public meetings every two weeks. The members of the Board are given an annual salary of $600

1966 WATER AND SEWER BOARD • CITY OF MIAMI DEPARTMENT OF WATER AND SEWERS

25th ANNIVERSARY

FRED W. BORTON

JOHN E. "TED" PRESTON

Two men who have served the Miami Water and Sewer Board continuously since 1941 are Fred W. Borton and John E. Preston. Twenty-five years of continued dedication to this public service sees these senior members of the Board still active today, and very much the guiding light for the Board's newer members. Their counsel has proven invaluable over the years, and their continued enthusiasm for the service provided to the public and the Board's customers merits outstanding recognition. It is, therefore, appropriate that this booklet be dedicated in their honor.

The Water and Sewer Board

Chairman
JOHN E. PRESTON
Gulf Oil Corporation
Retired District Manager

Members
FRED W. BORTON
Investments

HARRY C. McCARTHA, JR.
Sentell Supply Co., Inc.
Vice-President

THOMAS B. McGAHEY, JR.
McGahey Motor Co.
Vice-President

RICHARD C. MURPHY
Richard Plumer Co.
Executive Vice-President

THE WATER AND SEWER BOARD MEETS. Left to right: Fred W. Borton, Chairman John E. Preston, Harry C. McCartha, Jr., Richard C. Murphy, Thomas B. McGahey, Jr. study future designs of both water and sewage facilities. The year 1980 is their design objective.

The year 1966 marks the twenty-fifth anniversary of the Water and Sewer Board. Original appointees to the Board included John E. Preston, Fred W. Borton, Adrian McCune and Charles A. Thomas, with William A. Glass, the Director of the Department of Water and Sewers, serving as Chairman. Since 1945, Mr. Preston has served as Chairman and the present members of the Board continue to include Mr. Borton in addition to Harry C. McCartha, Jr. since 1957, Thomas B. McGahey, Jr. since 1958 and Richard C. Murphy since 1963. Other former Board members have included Leslie D. Cann (1945-46), W. Stanley Dodd (1945-58), Alvin E. Fuller (1946-47) and George C. Estill (1947-57).

The Miami City Commission

The City of Miami has a Commission-Manager form of government with an elected commission composed of five members. Four of the members serve for four years and are elected in pairs at two year alternate elections. The fifth member, the Mayor, serves for two years. A City Manager is appointed by the Commission for administration of their policies. The five-man Commission has the power to approve budgets and Revenue Bond Issues of the Department of Water and Sewers. The vote of four members of the Commission is required to disapprove an appointment to the Water and Sewer Board by that Board's members.

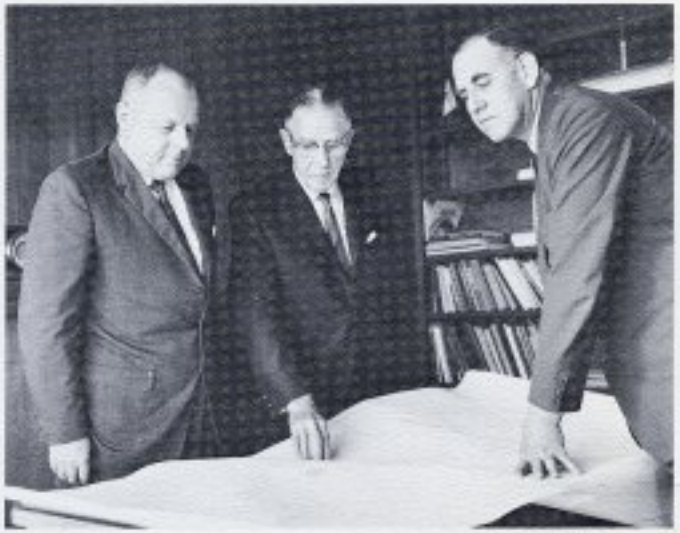
The present City Commission consists of The Honorable Robert King High, Mayor, and Commissioners Stephen P. Clark, Irwin G. Christie, David T. Kennedy and Mrs. M. Athalie Range.

M. L. REESE
City Manager of Miami

Department of Water and Sewers

An efficient staff of over 400 employees, including chemists, engineers, accountants, electricians, technicians, pipe fitters, mechanics, plant operators, painters, and other skilled personnel are administered by the Water and Sewer Board. Some of the staff have had over forty years of experience in local water works service to the residents of Miami. To keep abreast of developments, staff members are in close contact with national organizations aimed at improvements in water and sewage treatment.

GARRETT SLOAN — Director. Mr. Sloan was the Chief Engineer for the Department from 1955 to early in 1966. A sanitary engineer by profession, he has had many years of experience with public health services and in the field of consulting engineering on waterworks and sewerage.



Left to right: Paul M. Kiel, Resident Engineer, Claude F. Wertz, Resident Engineer from 1946 to 1955 and Director of the Department from 1955 to 1966, Thomas W. Hopper, Vice-President of Day and Zimmermann.

DAY & ZIMMERMANN, INC. — Consulting Engineers
As Resident Engineer, Paul M. Kiel has served the Department since 1955, representing this internationally recognized firm of engineers — who have been consultants to the Water and Sewer Board since 1941.

FRANKLIN PARSON
General Counsel
Mr. Parson has served the Department as its attorney since 1961. He has some thirty years' experience representing municipal and county boards, agencies and commissions and has a wide reputation in the field of governmental law.

RALPH C. WILLITS, Chief Engineer, GORDON BODDINGTON, Secretary and GEORGE B. SCOTT, Treasurer, Water and Sewer Board hold a conference.

RUSSELL J. BREHM
Production Superintendent

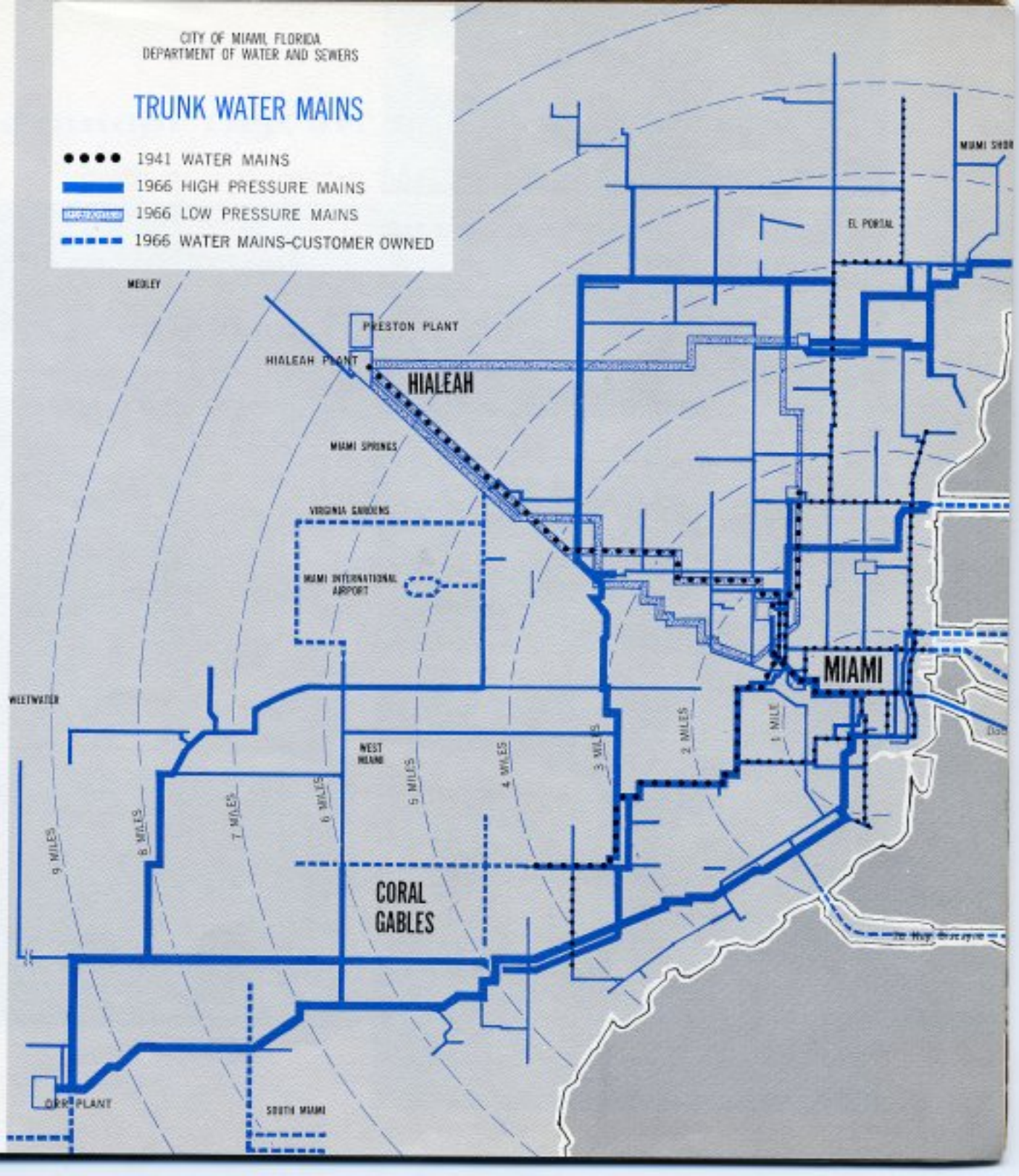
THOMAS M. PECK
Distribution Superintendent

DAVID P. BACKMEYER
Sewage Treatment Superintendent

WALTER E. DINN
Planning Engineer

GROWTH and PROGRESS

	1941	1966
Land Owned	278 Acres $151,296	2,555 Acres $628,497
Production Facilities	$1,317,716	$14,252,528
Wells	15	43
Treatment Plants	1	2
Lime Plant	0	1
Pumping Stations	1	2
Supply Mains	2.7 Miles	11.4 Miles
Transmission Facilities	$1,962,390	$8,980,543
Transmission Mains	22.9 Miles	34.3 Miles
Ground Storage Tanks	6	9
Pumping Stations	3	4
Distribution Facilities	$5,503,766	$26,880,046
Distribution Mains	543.6 Miles	989.0 Miles
Cities and Towns Served	8	17
Population Served	220,000	730,000
Gallons of Water Pumped	8,343,843,000	51,310,450,000
Total Revenue	$1,463,431	$6,014,283
Operation and Maintenance Expenses	$581,520	$2,863,587
To General Fund, City of Miami 25 Years		$10,655,935



Alexander Orr, Jr., Water Treatment Plant

Hialeah Water Treatment Plant

John E. Preston Water Treatment Plant

Distribution Center

Main Office Building

CITY OF MIAMI

Department of Water and Sewers

ALEXANDER ORR, JR., WATER TREATMENT PLANT
6800 Galloway Road

HIALEAH WATER TREATMENT PLANT
Okeechobee Road at West 2nd Avenue

JOHN E. PRESTON WATER TREATMENT PLANT
(UNDER CONSTRUCTION) West 2nd Avenue at West 9th Street

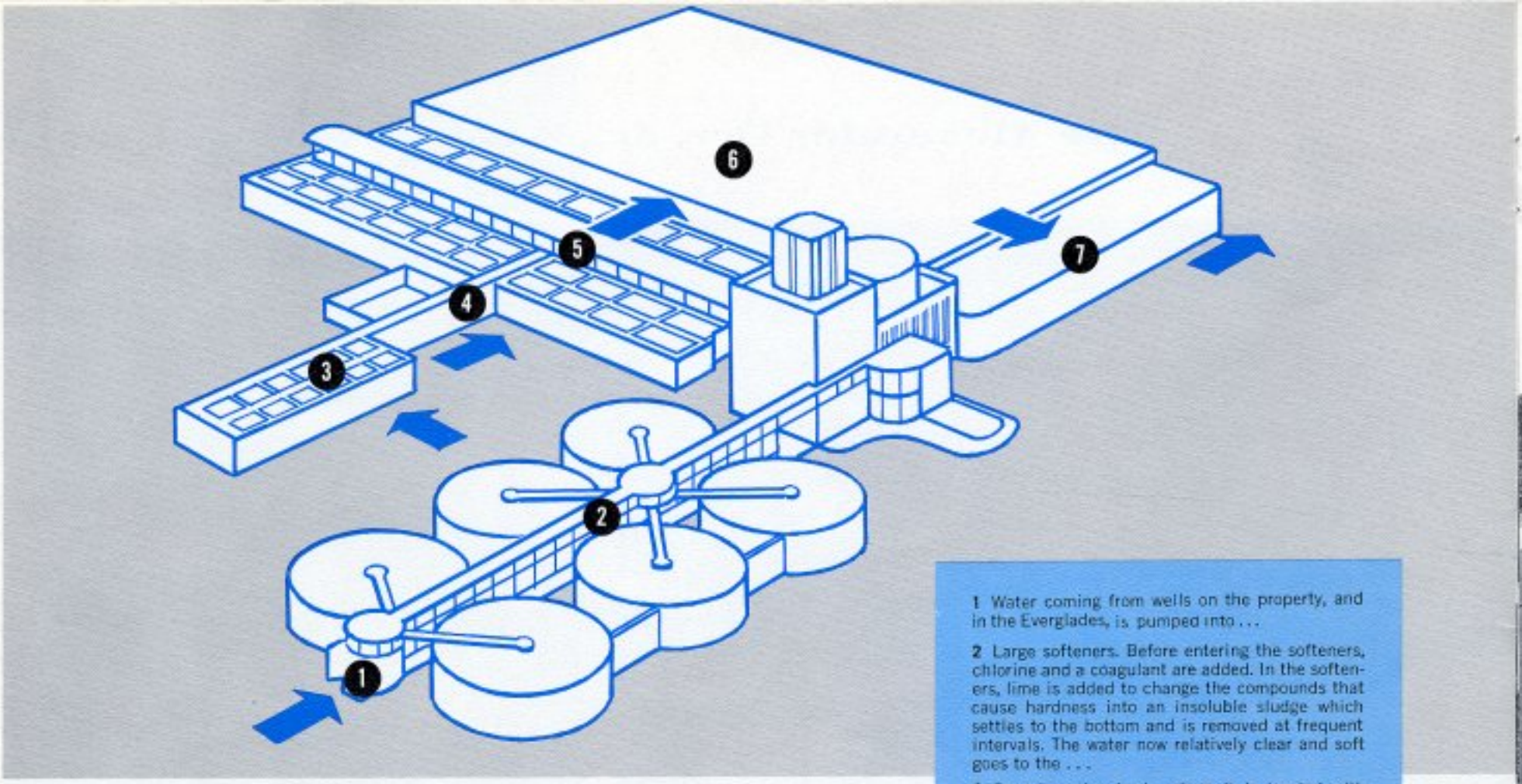
DISTRIBUTION CENTER
1001 Northwest 11th Street

SEWAGE TREATMENT PLANT
Rickenbacker Causeway – Virginia Key

MAIN OFFICE BUILDING
3575 South LeJeune Road

Sewage Treatment Plant

The Alexander Orr, Jr., Water Treatment Plant



1 Water coming from wells on the property, and in the Everglades, is pumped into . . .

2 Large softeners. Before entering the softeners, chlorine and a coagulant are added. In the softeners, lime is added to change the compounds that cause hardness into an insoluble sludge which settles to the bottom and is removed at frequent intervals. The water now relatively clear and soft goes to the . . .

3 Recarbonating basin where it is treated with carbon dioxide to produce water which is neither corrosive nor scale forming.

4 Next the water is again treated with chlorine to kill harmful bacteria. A minute amount of fluoride is added to help prevent tooth decay.

5 The water now flows into rapid sand filters which remove any traces of suspended matter and flows by gravity into . . .

6 The reservoirs. From these covered reservoirs . . .

7 A battery of pumps, driven by huge Diesel engines, delivers the water many miles away, through large transmission mains, and a wide spread network of underground pipes.

The impurities in raw water and the hardness are two separate factors which must be controlled by a water treatment plant with constant technical supervision necessary at all times. Why does hard water constitute a problem? Hard water builds up scale deposits in all water-using appliances. Scale is one of the most serious problems caused by mineral deposits. This particular by-product of hard water shortens the usable life of many water-using appliances. It clogs water pipes and seriously reduces the heating efficiency of a boiler or water heater.

Miami's water treatment plants employ the excess lime process to reduce the high levels of calcium found in the form of bicarbonates. The sludge from the excess lime process is removed by sedimentation and filtration. Mechanical rakes scrape this sludge into sumps for removal by pumps. The sludge is then burned in the lime reclaiming plant to produce the lime used for the softening process.

The Alexander Orr, Jr., Water Treatment Plant

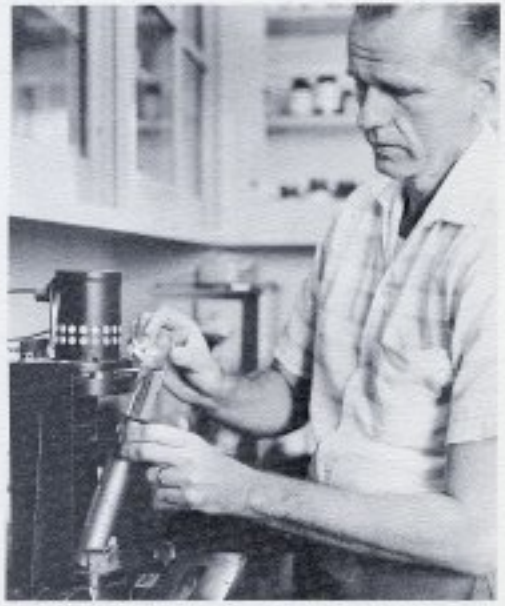
In the early days of the Miami Water and Sewer Board, additional wells were built in the Miami Springs well field, and the expansion of the Hialeah Plant attained. But by long range planning, the Department could foretell that new wells and a second water treatment plant would soon be needed.

After comprehensive studies and drilling of test wells in several remote locations in the County, the new Southwest Water

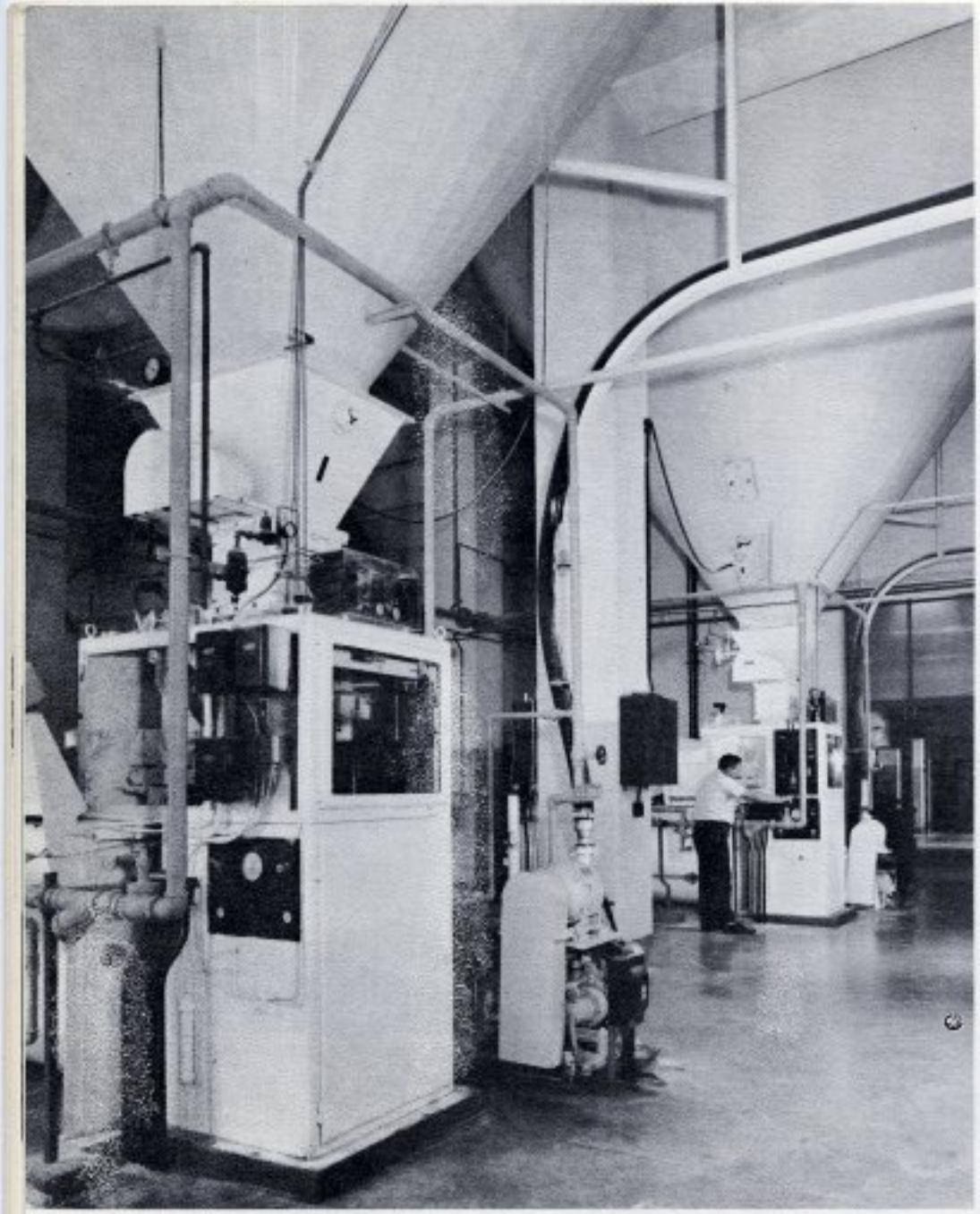
Continued

THE RAW PRODUCT. Twenty wells, 90 to 100 feet down into the Biscayne Aquifer, supply this plant.

AN IMPROVEMENT ON NATURE. These softening units remove the natural hardness found in the raw water.



TO BE SURE. Laboratory control for constant guarding of purity requires trained chemists. Here chemist Jerry Tools checks water quality regularly.



MAKING WATER "SOFT." Controlled application of lime for the softening units.

The Alexander Orr, Jr., Water Treatment Plant

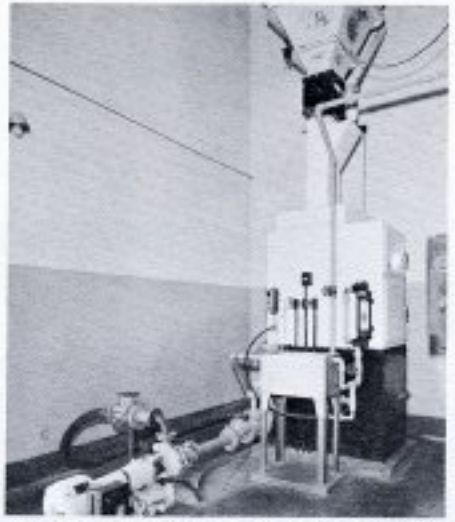
Supply System with its large treatment plant was designed and built. This modern plant was named in honor of Alexander Orr, Jr., former Mayor of Miami, whose foresight had aided in creating the present Department of Water and Sewers and its Board.

The Orr Plant, located five miles southwest of Miami at 6800 Southwest 87th Avenue, became the second water treatment plant of the system now serving an area extending from Dadeland to Bal Harbour, from Key Biscayne to Hialeah.

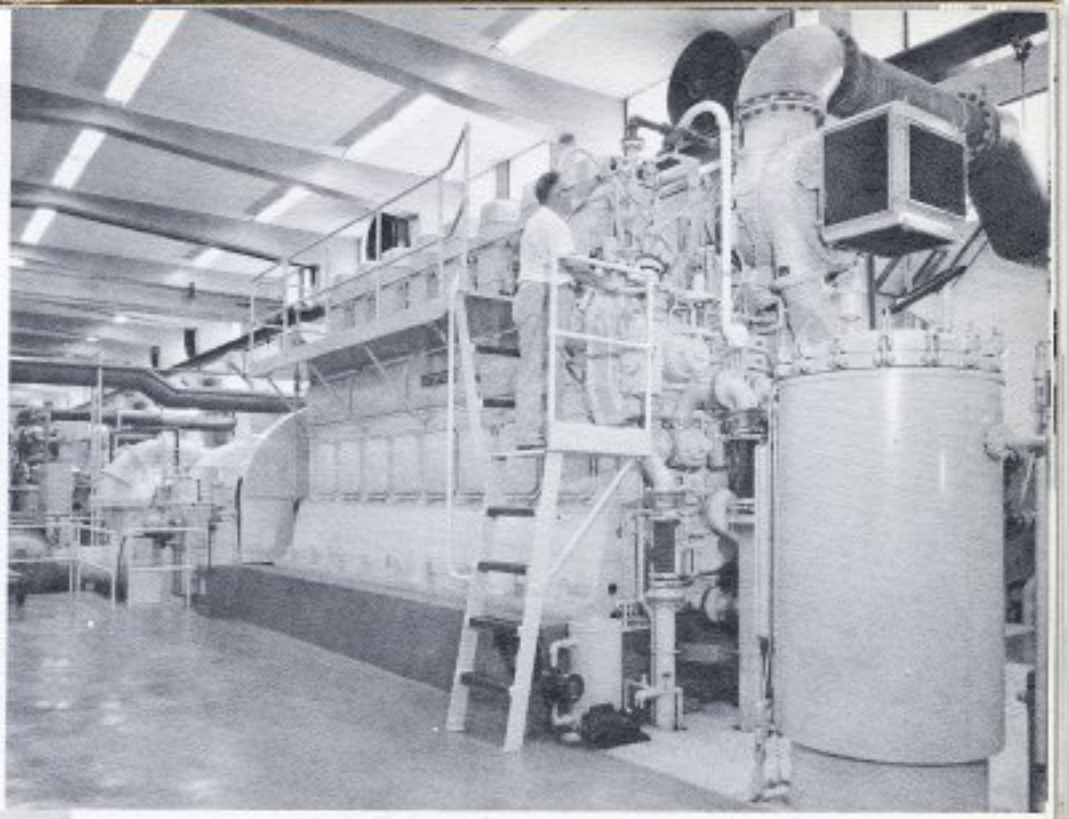
Diesel driven pumps with a total capacity of 128 mgd. are constantly ready to cope with high peaks of daily consumption and can give continuous hours of service in times of electrical interruptions such as may occur during hurricanes.

FILTER CONTROLS. The architecturally attractive walkway contains the filter control tables.

MAKING WATER PURE. To eliminate color, taste, odor and bacteria, chlorine is applied under constant and careful supervision.



AN ADDED BENEFIT. Natural fluoride in the water is carefully raised to the level recommended by dental and health authorities.



THE FINAL PUSH. The Main Pump Room contains large Diesel driven pumps to deliver pure water to the consumers, completely independent of commercial electric power during power interruptions.

A FINAL POLISH. These rapid sand filters remove minute particles of suspended matter so the water is crystal clear prior to entering the distribution system.

ON ITS WAY. Large transmission mains carry pure water from the treatment plant to the distribution system where "Willing Water" serves your needs.

THE HIALEAH PLANT. First built in 1925 and gradually enlarged to a capacity of 80 million gallons a day, it remains a fine example of early Miami architecture utilizing local "oolite" as a facade.

CONTROLLED BEAUTY. The walkway of the filter controls exemplifies the beauty of early Miami architecture as well as the assurance that consumers receive pure water that has no equal.

The HIALEAH Water Treatment Plant

The Hialeah Plant, built on the Miami Canal a mile north of downtown Hialeah, has a capacity of 80 million gallons per day. Built in 1925, it has been expanded several times over the years from its original 10 million gallon per day capacity.

Touring the Hialeah plant, one is impressed with the meticulous condition of the buildings and equipment. Because of the excellent maintenance, the 41-year-old water treatment plant can still use most of the original equipment, and can expect many more years of service.

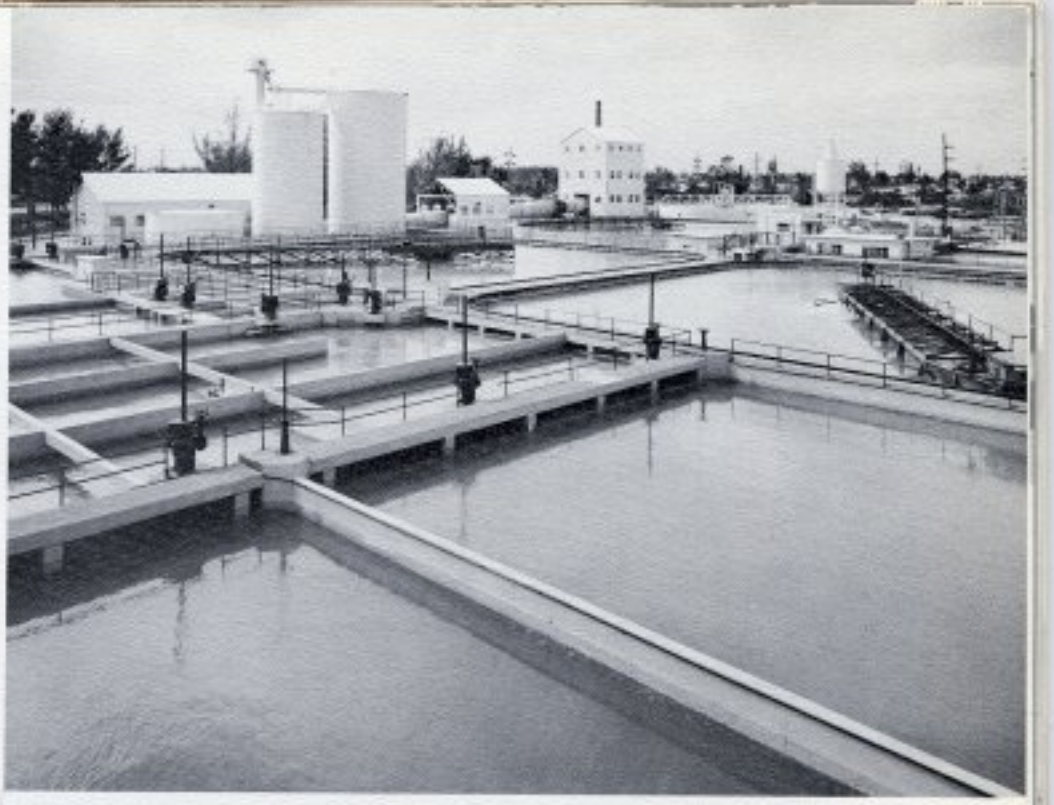
Electric powered pumps deliver the treated water to consumers; high pressure pumps directly to Hialeah and Miami Springs; low pressure pumps through large transmission mains to high pressure pumping stations, with storage facilities in Miami.

The high pressure pumping stations in Miami are operated by remote control from the Hialeah Plant. The operator can start and stop pumps,

control pressures throughout the system, and control the amount of water in the ground storage tanks at the pumping stations. He also controls the flow of water from the plants.

War years brought scarcity and high prices for the tons of quicklime necessary for the softening of water. Starting in 1943, the Water and Sewer Board undertook an innovation which had never before been tried by a municipal water works anywhere: a lime plant that reclaimed all the lime used in softening. The $792,000 which the plant cost was amortized in five years.

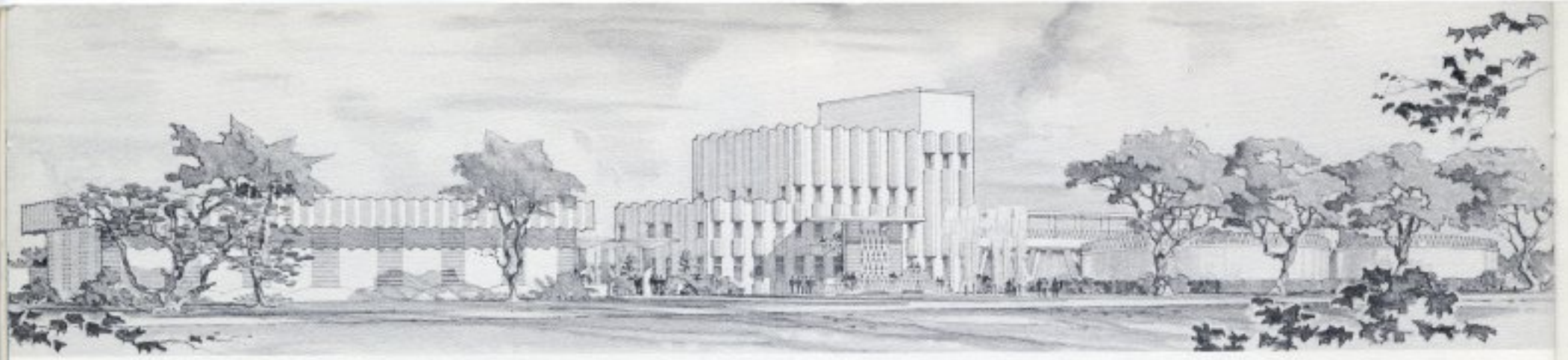
This waste product from the softening process, which looks like wet powdered limestone, used to be thrown away. Now it is hauled to the kiln, dewatered, then burned at high temperature to form quicklime. The plant reclaims 50% more quicklime than was put into the water in the softening process. It saves water consumers over $200,000 per year.



ACRES OF WATER. The addition of lime to remove the natural hardness of the well water and of chlorine to remove the organic color prepares the water for clarifying.

SOFT AND CLEAR. Eighty million gallons a day can pass through these filters to provide a sparkling water supply to the consumers where and when they need it.

THE CONSTANT WATCH. Twenty-four hours each day are used to be sure that "Willing Water" is ready to serve. This Supervisory Control Board is the assurance to every consumer that quantities of water at the required pressures are ready to serve domestic, commercial and industrial needs as well as fire fighting demands.



TO MEET FUTURE DEMANDS

The John E. Preston Water Treatment Plant

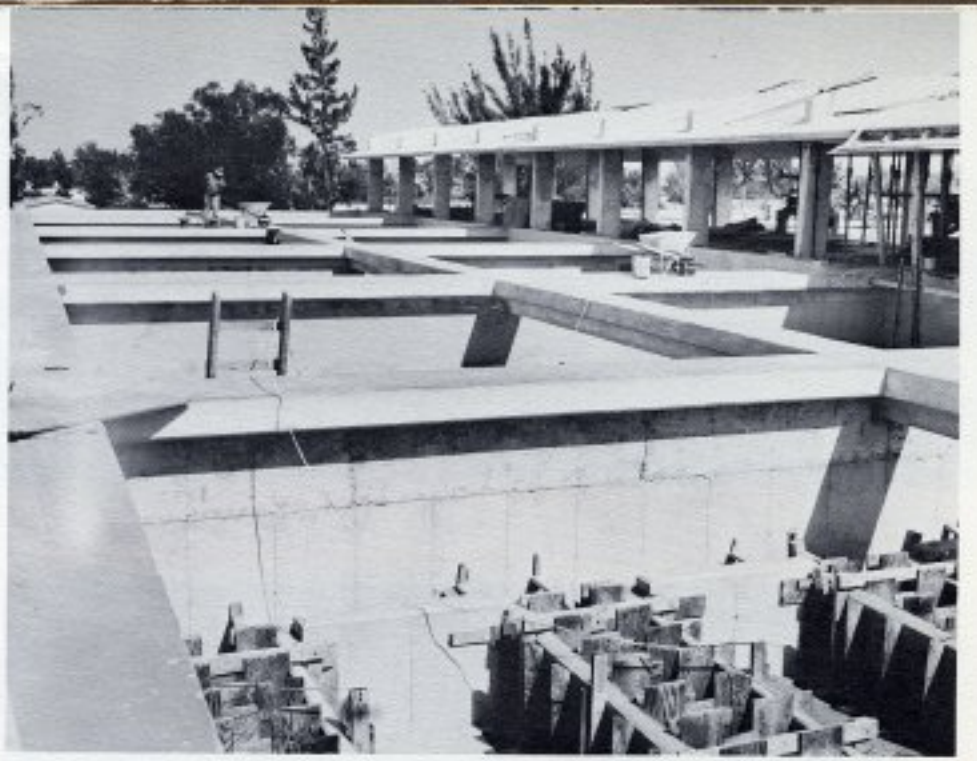
Adjacent to the enlarged Hialeah Water Treatment Plant, a new water treatment plant, named in honor of John E. Preston, Member of the Water and Sewer Board since 1941 and Chairman since 1945, is to be placed into operation during 1967. This concept of the Department's third water treatment plant is the result of long range plans for supplying future water demands, particularly in the northern portion of the distribution system. The Alexander Orr, Jr., Treatment Plant has previously been enlarged to meet the future needs in the southern portion of the Department's distribution system. The Hialeah Treatment Plant has already been enlarged to its greatest possible capacity, limited by its site restrictions. However the future demands in the northern portion of the distribution system have already exceeded that capacity, and a significant portion of these demands are currently being supplied by the Alexander Orr, Jr., Plant.

Due to the availability of extremely abundant ground water resources for supply in the vicinity of the Hialeah Treatment Plant, as well as available land for an additional treatment plant, the Department has designed and is currently constructing a 100 mgd. plant just north of the Hialeah Plant. Engineering investigations led to a decision to build the new plant in two stages. Construction of a first stage of 60 mgd. capacity was begun in 1963, when a 9.0 million gallon covered ground storage

TONS OF CONCRETE. The pumping station at the John E. Preston Plant requires vast amounts of concrete and reinforced steel.

reservoir for treated water was completed and connected to the Hialeah Plant. Since that time, construction of the John E. Preston Treatment Plant has progressed. When completed during 1967, the plant will be connected to the 9.0 million gallon reservoir and to the distribution system. It is anticipated that the second stage of 40 mgd. capacity will be constructed prior to 1975.

The John E. Preston Treatment Plant will be a modern, fully automated, softening and rapid-sand filtration type of water treatment plant, similar to the Alexander Orr, Jr., Treatment Plant. It will differ, however, in pumping equipment. It will not have Diesel driven pumping units for discharge to the transmission and distribution systems. All units will be driven by electric motors for normal use — as in the Hialeah Plant. An electric generator station, powered by either gas turbines or Diesel engines, will supply the necessary power for the electrically driven pumps in both the Hialeah and John E. Preston Plants in the event of the loss of commercial electric power service at either of the two plants.



TONS OF WATER. Through these filters will pass tons of softened water which will be cleared of all sediment and will sparkle as consumers' faucets flow with pure water.

SIX FOOT PIPE. In the construction of the John E. Preston Treatment Plant, pipes up to 72-inches in diameter have been installed.

MORE CLEAR WATER. Completion of the construction of the filters for the John E. Preston Plant will provide the customary pure, clear, softened water.

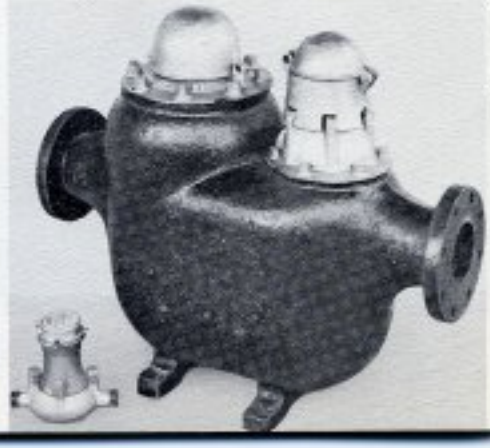
THE OLD AND THE NEW. The Hialeah Treatment Plant, originally built in 1925, will be interconnected to the John E. Preston Plant of 1966 through pipes such as these.

"WILLING WATER" TRAVELS. Through these pipes travels the finest quality water chemists can provide. Installation of pipe lines is a continual project for the Department to deliver.

DISTRIBUTION

The distribution system is more than the silent unseen network of pipe lines, totaling 989 miles in length and extending to serve every customer. This system is in service 24 hours a day. Pipes are sized to supply peak hour demands in the system, and the diameters vary up to 60 inches. These pipes are made of cast iron, steel, or prestressed-reinforced concrete. Approximately 11,000 valves have been installed on the distribution pipe lines to limit service interruptions whenever repairs or extensions are required. In addition, there is a shut off valve on each of the 92,000 metered service lines to customers.

The performance of the distribution system is monitored 24 hours a day by automatic telemetric devices which deliver information to the water treatment plants. Radio communications



ACCURACY COUNTS. Over 92,000 water meters have been installed for the consumers of "Willing Water." Periodic tests of meter accuracy are performed on each of the meters. It takes many sizes and styles of meters to accurately measure the demands of consumers.

SERVICE — WHEN NEEDED. Twenty-four hours a day — these crews and trucks are ready to roll.

between the treatment plants and Distribution Center are relayed to mobile radio units installed in repair trucks so that any disruption of service in the distribution system can be repaired within minutes after it occurs.

Each of the 92,000 meters which measure the volume of water to the customers is tested periodically for accuracy and when necessary, is repaired or replaced. Thus a customer can be assured that his water bill is based on the actual amount of water used. Adequate capacity and reliability have been proven characteristics of Miami's water distribution system since 1941; the capacity — to meet the seeable future water demands; the reliability — dependable service to each customer, regardless of location and varying seasonal needs.

SERVICE TO A CONSUMER. Mechanical equipment is used to install a service pipe between the water main in a street and the consumer's property line.

TO SUIT THE JOB. The storage yard at the Distribution Center has an assortment of pipe fittings in all sizes which will become part of a vast network of pipes in the distribution system.

Cooperation with Others

Some years before the Miami Water and Sewer Board was created, the City of Miami Beach made long-term contracts to obtain its supply from Miami's water distribution system and treatment facilities. The City of Coral Gables looked to the same source for its water needs not long afterwards.

Since 1941, the Board has continued to cooperate with additional communities in an effort to help the Greater Miami Area develop at a rapid pace.

Approximately 35 per cent of the population supplied by the Department's water treatment facilities reside in seventeen neighboring municipalities. And, an additional 18 per cent reside in the unincorporated areas of Dade County.

During recent years in the history of Metropolitan Dade County government, the Department of Water and Sewers has diligently cooperated with the County government to provide water to the many thousands of residents in unincorporated areas. This has been accomplished by forming "Water Improvement Special Taxing Districts." Water mains are designed and installed by the Department, and residents in the Districts are assessed the cost of mains borne by the Metropolitan Dade County, while the Department bears the difference in cost of larger mains required for conformance with its Master Plan. The residents thus benefitted become retail customers of the Department, and are charged the same water rates as customers residing inside the City of Miami.

Eleven private water companies purchase the water supply for various areas on a wholesale basis, then distribute it through their own water systems. Such large-volume purchases permit a savings to the customers of these companies, which otherwise would have to produce and treat their own water supply on a smaller scale at much higher unit cost to their customers.

In recent years the Department has been rendering sewage disposal service to the Miami International Airport, Key Biscayne and will serve the City of Coral Gables in the near future.

COOPERATION WITH OTHER COMMUNITIES

Percent of the Total Population Supplied By Department

City of Miami	47%
Other Municipalities	35%
Unincorporated Dade County	18%

POPULATION SERVED
BY DEPARTMENT OF WATER & SEWERS
RETAIL SERVICE AREA

	Population
City of Miami	342,900
Miami Shores	8,870
El Portal	2,500
Dade County	53,500
TOTAL RETAIL POPULATION	407,770

WHOLESALE SERVICE AREA – POPULATION SUPPLIED

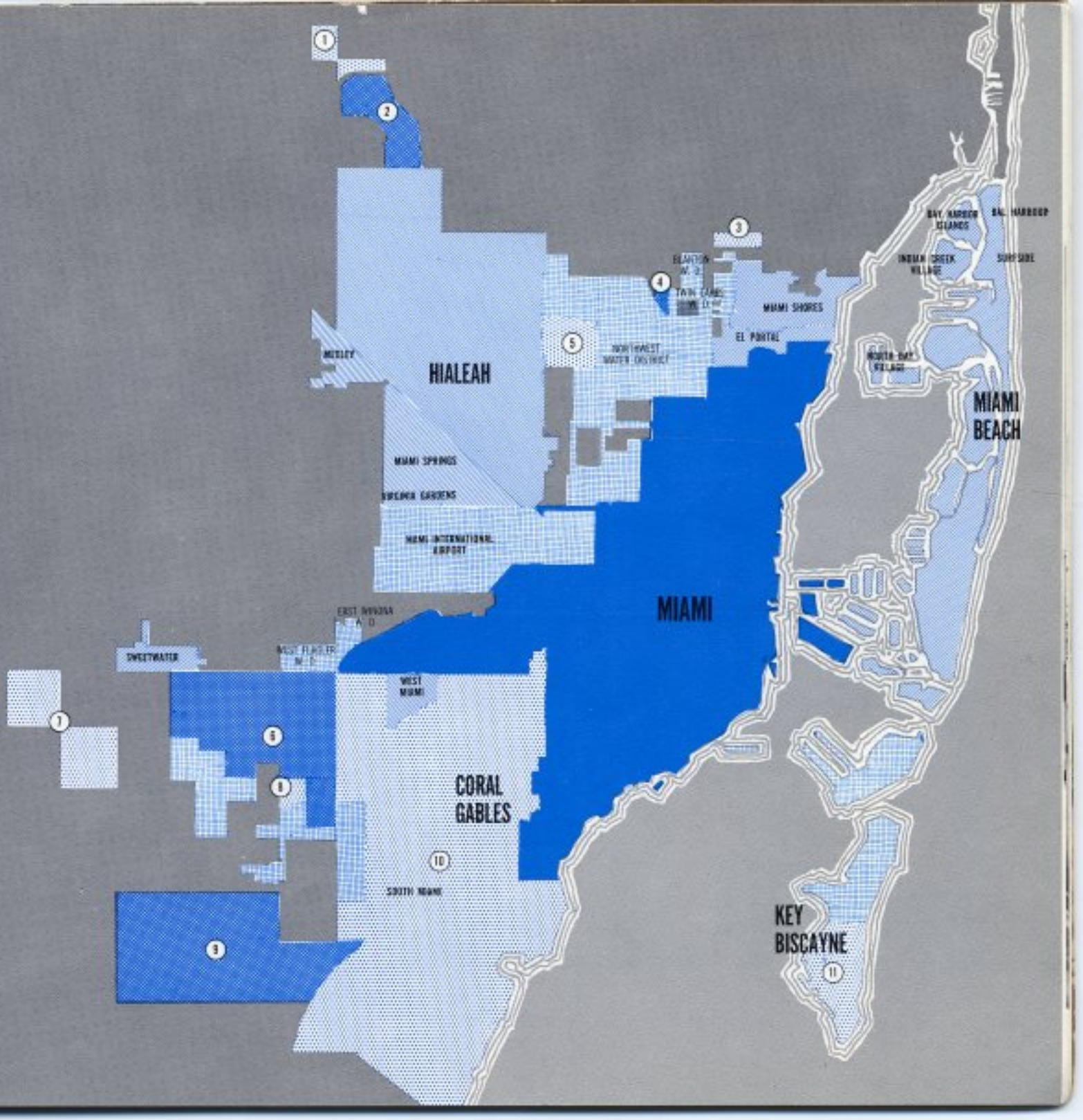
Municipal:	
Miami Beach Permanent	75,100
Miami Beach Average Tourist Season	123,000
Hialeah	83,300
Miami Springs	11,950
Surfside	3,300
Bal Harbour	2,000
Bay Harbor Islands	3,570
West Miami	5,400
North Bay Village	2,750
Virginia Gardens	2,750
Indian Creek Village	70
Medley	200
Sweetwater	980
Total Municipal	191,370
Total Private Companies	128,279
TOTAL WHOLESALE CUSTOMERS	319,649
TOTAL PERMANENT POPULATION SUPPLIED (or 66% of Perm. Dade Co. Pop.)	**727,419**

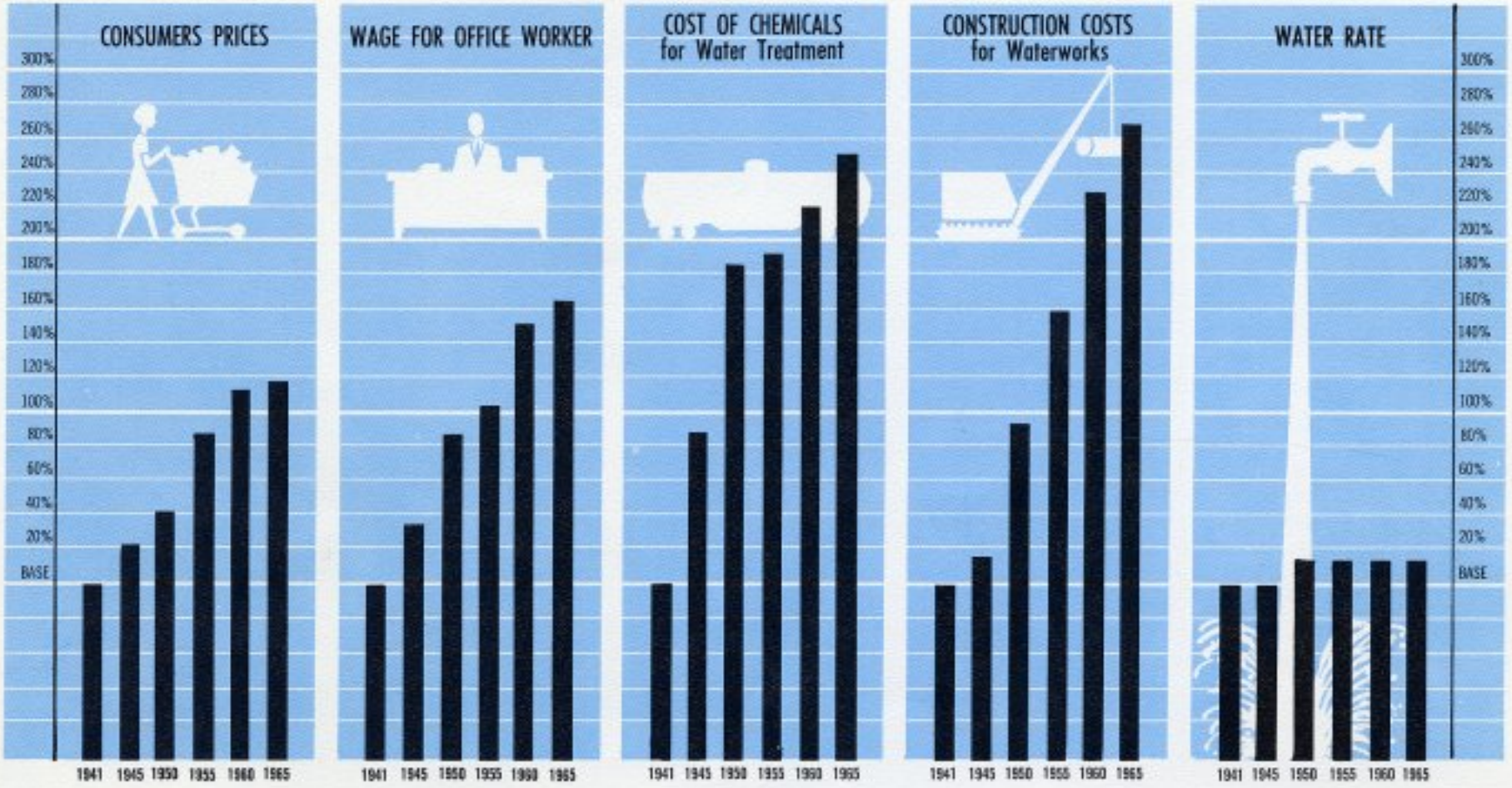
COOPERATION WITH OTHERS

On this map are shown the retail and wholesale water service areas

- CITY OF MIAMI
- COUNTY
- MUNICIPALITIES
- PRIVATE COMPANIES

1. Miami Utilities Inc.
2. Miami Lakes Utilities Inc.
3. Oakridge Utility Company
4. Lake & Shaw Water Company
5. Broadmoor Water Company
6. Community Utilities Corp.
7. Southland Utilities Company
8. Tropical Highlands Water Company
9. Peninsula Utilities Corp.
10. Consumers Water Company
11. Key Biscayne Water Company





For 16 Years - The Same Rate

Since 1941 the cost of consumer goods has risen about 118%; wages have increased 165%; chemicals for water treatment plants 245%; construction costs for water works have risen 265%. But your water rate has gone up only 14%. At the same time, approximately ten and a half million dollars have been paid into the City General Fund from revenue from water bills. In 1965, the amount given to this Fund was $536,000. With increasing costs of maintenance and production, your water bill may not remain as low as it is today, but the indications on the graph on this page show that the efficient operation and management of the City of Miami's Department of Water and Sewers assures that only a minimum price increase may be expected. The Department takes pride in the fact that its water consumers have not been subjected to the average increases in prices which prevail in nearly every phase of purchasing in today's markets.

The varied activities of the Department of Water and Sewers are dedicated to safeguarding the public health: the Water and Sewer Board administers them as efficiently and economically as possible.

Long Range Planning

The Water and Sewer Board has been able to practice the sound business of long range planning, with the continuity of administration to carry out these plans.

Since its inception, the Department has made constant studies as a basis for sound plans.

Future water demands have been estimated, based on past demands, for the projected needs of population, industry, fire flow and other factors. Future plant capacities and financial requirements have been determined.

In the past twenty-five years the water demand has increased 490%. Studies show that by 1980 the total population served in the metropolitan area will be more than one million, with a normal water demand of 170 million gallons per day. During the 1980 tourist season, peak day demands are estimated at 250 million gallons. The year 1980 is the design objective for present long range plans.

It has been a policy of the Department to make frequent engineering investigations of the pipe grid system to determine capacity of the transmission and distribution systems. Such studies have included flow measurements and loss of head tests.

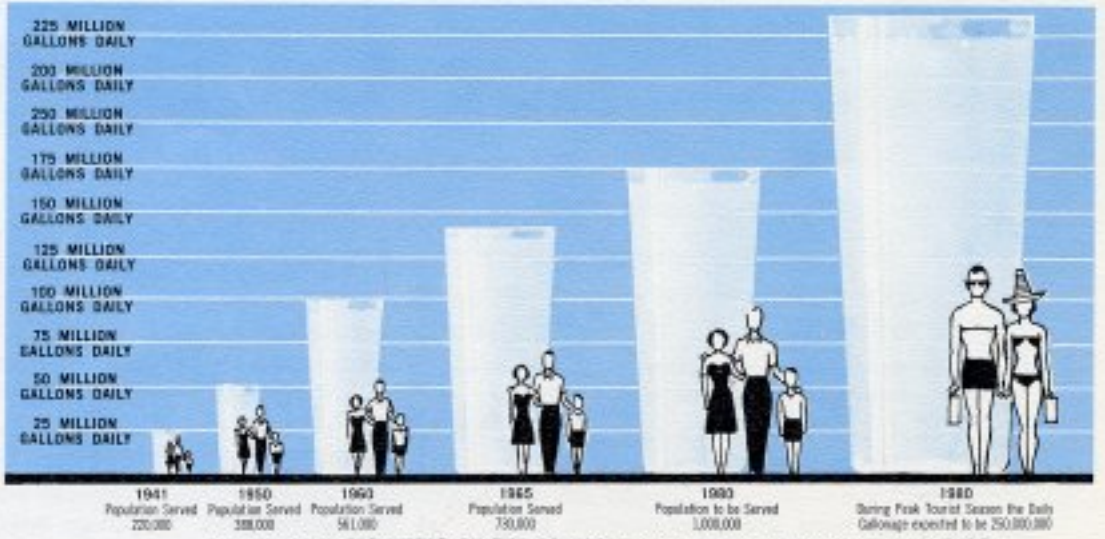
Each year the Department is called upon to furnish water to outlying areas – requiring studies of the feasibility of extending the service area limits.

To produce additional lime for the two existing plants and the John E. Preston Plant, now under construction, a new lime plant is planned for 1970 at the Orr Plant.

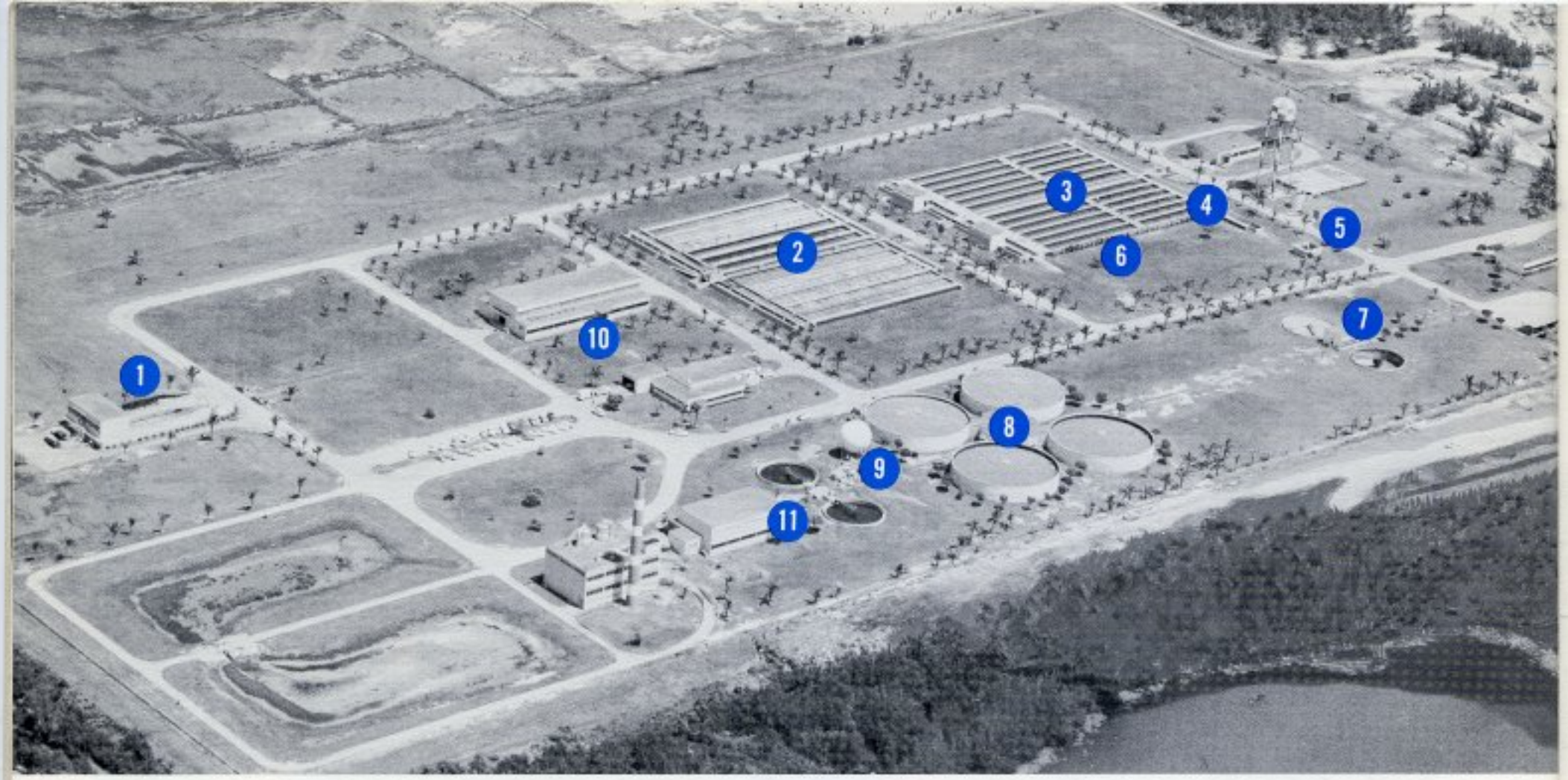
The present tentative program of future improvements is based upon the continued increase in population served and its demands. Any change in the anticipated rate of increase will advance or retard this program.

Research to provide better water for the public started soon after the creation of the Board. For two years, starting in 1942, a pilot treatment plant was operated to determine the best and cheapest way to remove more color from the water leaving the Hialeah Treatment Plant. Other studies were carried on, and when the Orr Treatment Plant was completed in 1954, it included a complete research laboratory.

LONG-RANGE PLANNING. To meet future water and sewage demands, the Engineering Section of the Department works at future designs of both water and sewage facilities.



THE DEMAND FOR WATER BY THE POPULATION WE SERVE, PAST, PRESENT, FUTURE.



1 Raw sewage, which has been screened at the Miami end, is chlorinated and delivered to grit chambers where sand and other mineral matter are removed.

2 The sewage then passes into the aeration tanks, where engine driven blowers pump tremendous quantities of air into it, to provide the oxygen necessary for stabilization. In the tanks, besides air, a certain amount of sludge from the settling tanks is added, to provide the purifying organisms, to feed upon the waste material. The sewage now containing a biological floc, a substance jelly-like in appearance, flows into the . . .

3 Final settling tanks, where the settleable solids separate and pass to the bottom of the tanks.

4 The overflow from these tanks, called the final effluent, enters a channel on its way to the ocean.

5 Chlorine is added for further purification and the final effluent is discharged into the sea.

6 Solids called sludge are continuously being removed from the bottom of the tanks. One-third of the sludge goes back to the aeration tanks, the remainder goes to . . .

7 The concentration tanks. Here the sludge is thickened and pumped into . . .

8 The digester tanks. The sludge solids are held here for from 60 to 100 days. During this time about 60% of the material is converted to gas. The remainder, odor-free liquid digested sludge, is piped into shallow lagoons and is disposed of by spreading on the plant grounds where it dries, oxidizes and eventually disappears entirely.

9 The sewage gas goes to the scrubber, which makes it fit to be used as fuel by the plant engines in the . . .

10 Blower building. There is always a half day's supply held in reserve in the ball-shaped storage tank.

11 These three units (not now in use) are held in reserve for such time when the quantity of sludge will be so great that it will become necessary to dewater and incinerate it.

THE CITY OF MIAMI

Sewage Treatment Plant on Virginia Key

Visitors to the nearby Bahama Islands are always impressed with the crystal clear waters – a far cry from the polluted water which surrounds large metropolitan seaside cities. Old-timers in the Miami area like to recall when Biscayne Bay was sparkling and clear . . . and even the Miami River was free from oil slickened debris.

Over forty years of hard-fought effort to provide Miami with a proper and adequate sewer system are finally showing promise that once again our Bay and waterways will be beautiful and free from pollution.

The Miami Herald has called the results of the sewer system "a thrilling story in restoration of our natural resources". Few thought that the huge modern sewage disposal plant on Virginia Key would so quickly provide results of a drop in bacteria count in Biscayne Bay.

Miami's first sewers extended inland from the river and westward from the bayshore, as far as ground contour would permit. Continued complaints about unsanitary conditions caused the City, in 1924, to retain a consultant hydrographer to study the sewage disposal problem. Work was begun with an experimental plant, but the bursting of the "boom" and the hurricane of 1926 stopped all work until 1949 when a contract was signed with consulting engineers to prepare a new study and report on pollution control.

The report recommended the Sewage Disposal Project in its present form, for an estimated cost of $27,100,000 to be met by General Obligation Bonds in the amount of $16,000,000, and Revenue Bonds for $11,100,000.

In August of the same year, the City Commission adopted an ordinance authorizing and securing the Sewer Revenue Bonds by a sewer service charge equal to 100% of the water bills. This was to become effective upon the initial operation of the completed project. The service charge would provide the funds to pay principal and interest on the Sewer Revenue Bonds and all operating and maintenance costs of the Sewage Disposal Project.

ADMINISTRATION BUILDING. Offices and laboratories for the Sewer Division are located here.

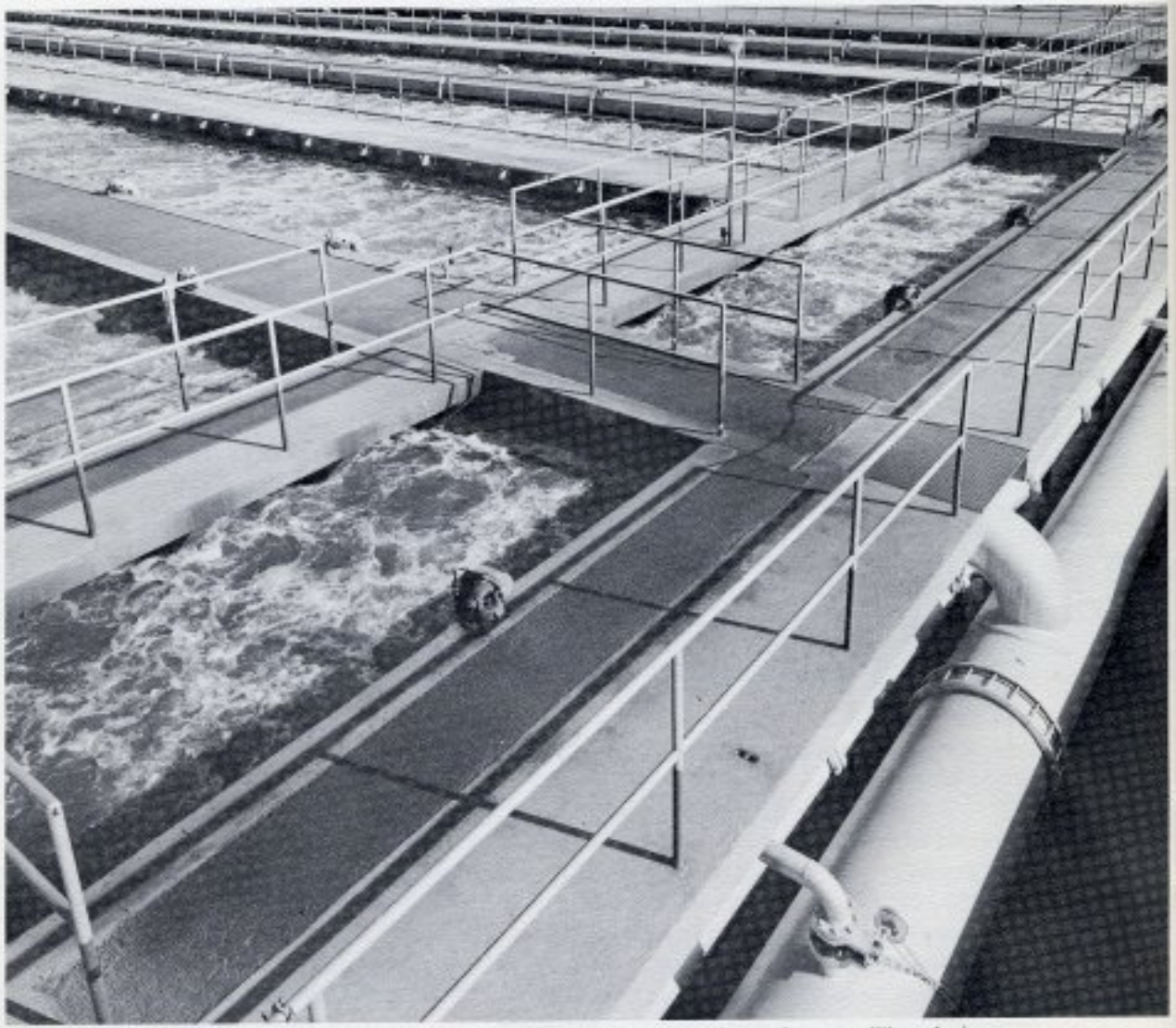
The project included a high rate activated sludge treatment plant to be located on Virginia Key, offshore from the mainland, with an ocean outfall extending 4,000 feet into the Atlantic.

Continued

THE CITY OF MIAMI

Sewage Treatment Plant on Virginia Key

-HERE COMES THE CULPRIT. Raw sewage which formerly caused pollution of Biscayne Bay is now flowing into the grit chambers where sand and other mineral matter are removed, prior to treatment.



AIR — THE MAGIC INGREDIENT. High rate activated sludge treatment requires tremendous quantities of air.

Construction began in 1953. Intercepting sewers were required to collect sewage from existing sanitary sewer systems which had outlets discharging along the shoreline of the Miami River and Biscayne Bay. These intercepting sewers extended up both sides of the river, and along the shoreline of the bay at numerous outlets. By 1956, the sewage treatment plant was completed and the first sewage arrived at the plant on Virginia Key.

Since about 700 miles of city streets remained unsewered, the tax-

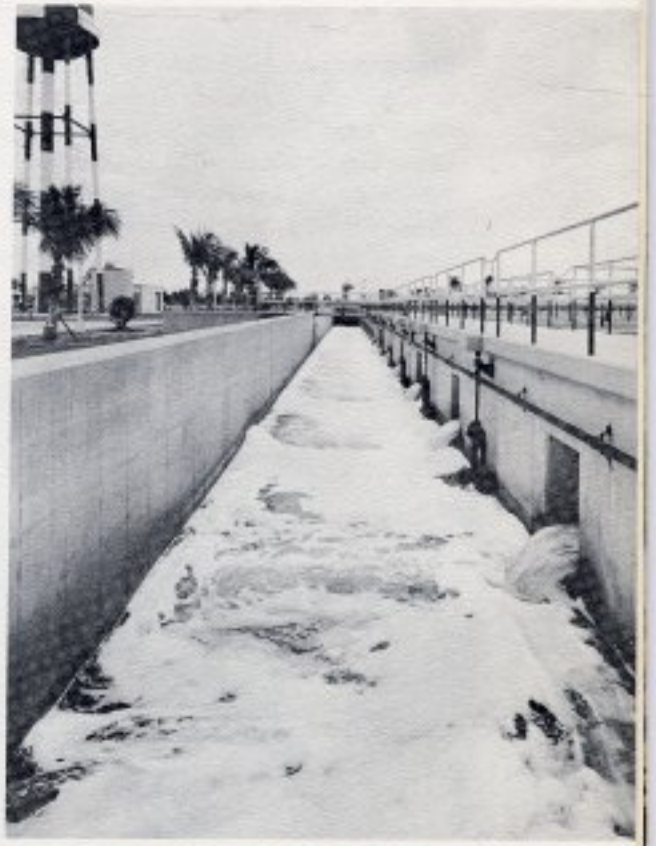
Continued

SAFEGUARDING HEALTH. Chemist Clarence Henry continually analyzes samples of sewage.

CHLORINE — THE PURIFIER. The addition of chlorine is continually applied at several points.

THE TREATMENT CONTINUES. Settleable solids separate from the liquid and pass to the bottom of these settling tanks for removal as sludge.

CLEAR AND CLEAN. The final effluent from the plant is inoffensive as it leaves the final settling tanks ready to be chlorinated.



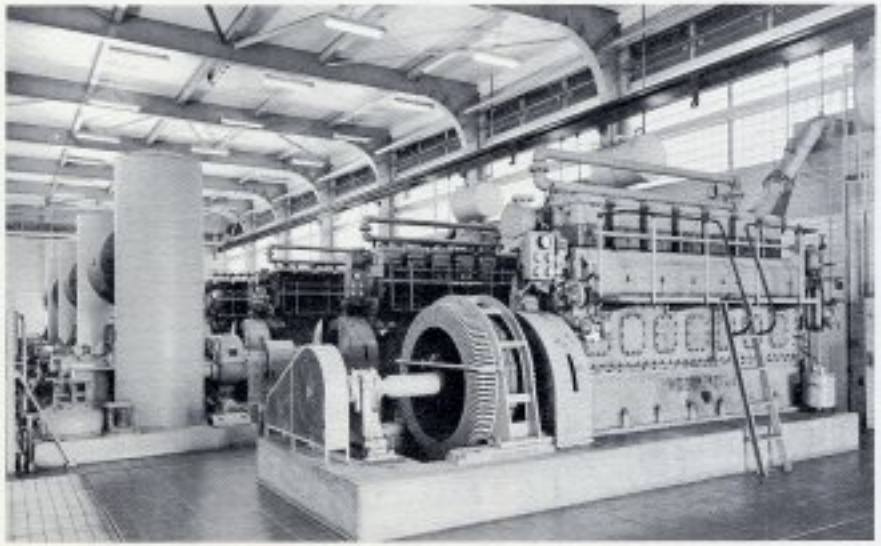
OUT TO SEA. After a final dose of chlorine, all remaining bacteria are killed and the plant effluent is ready for its journey to the sea.

WHERE DO THE SOLIDS GO? Digesters change the solid materials to liquids and gases in 60 to 90 days.

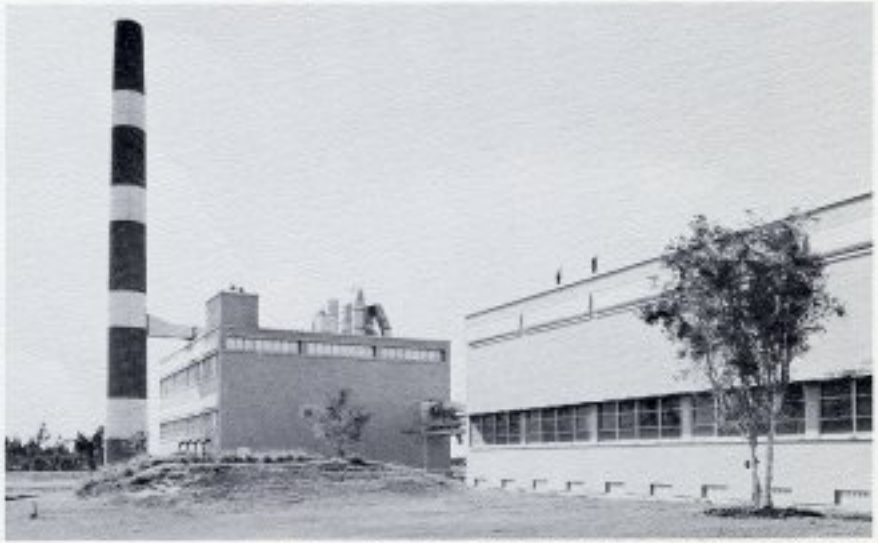
GAS SCRUBBERS reduce sulfides in gases to provide plant fuel.

payers approved another $9,950,000 General Obligation Bond issue to provide a portion of these facilities. Some 85 miles of collecting sewers have been built since that date by the Public Works Department of the City of Miami. After the first two years of operation, the surveys by the Health Department of Dade County and the Marine Laboratories of the University of Miami indicated a pollution reduction of at least 85 percent in the Miami River and in Biscayne Bay.

At present the sludge removed in the sewage treatment process is used to maintain the acreage at the plant on Virginia Key and is also used by the Parks Department which hauls it away in bulk. When the design capacity is reached the digested sludge can be further processed. This plant has a present capacity of 47,000,000 million gallons per day which can be expanded to 70,000,000 million gallons per day at modest cost.



POWER FROM SEWAGE. These huge gas-driven engines provide air and electricity for the plant.



COMPLETE DISPOSAL. The drying and burning of the final sludge will take place in these buildings when the quantity of sludge will be so large that these processes will be required.