BOND REPORT

2020 CAPITAL IMPROVEMENT PROGRAM

Roslyn Water District
Town of North Hempstead
Nassau County, New York

H2M Project No.
RLWD2004

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1.0 SCOPE AND PURPOSE

The Board of Commissioners of the Roslyn Water District (District) has authorized H2M architects + engineers to prepare this report for submission to the Town of North Hempstead in support of the District's petition for bond and financing for capital improvements. This report will identify the capital improvement projects necessary for the District to continue to meet existing and anticipated water supply demands while meeting or exceeding current and impending regulatory water quality standards. The projects proposed to be financed by this bond are in response to the detection of emerging contaminants in the District's raw water sources, including 1,4-dioxane, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), the need to replace existing ageing underground fuel oil tanks, as well as the need to update other ageing infrastructure. New York State has added a new regulation establishing a maximum acceptable level for the emerging contaminants to the New York State Register with an effective date of August 26, 2020.

1,4-Dioxane is a synthetic chemical commonly used as a stabilizer for chlorinated solvents. It is classified as a likely carcinogen. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are part of a water contaminant group known as polyfluoroalkyl substances (PFAS). As PFAS exhibits properties that allow resistance to water, grease, and stains, they are used in many products, including carpets, clothing, fabrics for furniture, paper packaging for food and other materials including cookware and firefighting foams. There is evidence that exposure to PFAS can lead to adverse human health effects.

Currently, there is no official federal maximum contaminant level (MCL) for 1,4-dioxane, PFOA, or PFOS. On July 24, 2019, the New York State Department of Health (NYSDOH) published a proposed amendment to Subpart 5-1 of Title 10 (Health) of the Official Compilation of Codes, Rules and Regulations of the State of New York to include MCLs for these three contaminants. The MCLs are as proposed by the Drinking Water Quality Council, which are 1.0 μg/L (0.0010 mg/l) for 1,4-dioxane, 10.0 ng/L (0.0000100 mg/l) for PFOA and 10.0 ng/L (0.0000100 mg/L) for PFOS. As indicated previously, an MCL has been published in the New York State Register on August 26, 2020, adopting the proposed MCLs.

The NYSDOH initially issued the proposed rule in July 2019. Following a public comment period, the NYSDOH revised the proposed rule in January 2020 followed by a 45-day comment period which ended on March 6, 2020. A Notice of Adoption was issued on August 26, 2020, the compliance schedule for the rule states that the MCLs are effective immediately. The revised regulations allow water suppliers to request a deferral of any MCL violation within 90 days of the regulation being published and of their obligation to comply with the MCL for two years, plus an additional one year if needed as the State recognizes the necessary remediation will be costly and time consuming. The District will have to provide public notification if it receives a deferral.

The District has detected the emerging contaminants, 1,4-dioxane and/or PFOA and PFOS, in seven (7) of its eight (8) active water supply wells. The highest concentration of these contaminants has been detected at Plant Nos. 4 and 8 for 1,4-dioxane and Plant Nos. 4, 5 and 8 for PFAS. With the majority of the District's wells detecting 1,4-dioxane, PFOA and/or PFOS, it is critical to identify wells that, based upon levels now detected, will require treatment systems to comply with the regulations to ensure a reliable and adequate water supply.

Appropriate treatment technologies for 1,4-dioxane include Advanced Oxidation Processes (AOP), and for PFOA and PFOS include Granular Activated Carbon (GAC) adsorption. The predominant AOP process also requires GAC for quenching the hydrogen peroxide used in the process. Since AOP treatment is not widely used in New York State and Long Island, pilot testing for this process is required by the NYSDOH. AOP pilot studies have been completed for the Roslyn Water District's Plant Nos. 4 and 8.

Due to the presence of the emerging contaminants discussed above, in some of the wells of the Roslyn Water District, the District has identified three (3) capital improvement projects that are necessary to treat the contamination, ensure adequate system capacity for peak water demands and fire flow, and comply with the New York State Department of Health 1,4-dioxane, PFOA, and PFOS MCLs. Additionally, due to aging infrastructure the District has identified six (6) more capital improvement projects associated with this proposed improvement program. The significant cost of these projects will require the District to obtain improvement bond financing through the Town of North Hempstead. The projects anticipated to be included in the improvement programs are as follows:

1. Wellhead treatment (AOP) at Plant No. 4.
2. Wellhead treatment (GAC) at Plant No. 5.
3. Wellhead treatment (AOP) at Plant No. 8.
4. Fuel oil tank replacement at Plant No. 1.
5. Fuel oil tank replacement at Plant No. 5.
6. Fuel oil tank replacement at Plant No. 6.
7. New generator at Plant No. 3.
8. Additional capital improvements for emergency contaminant treatment at Plant Nos. 1, 2, 3, 4, 5, 6, 7 and 8.

These improvements will be necessary for the District to continue to provide high quality water in sufficient quantity to its customers during periods of high demand or production shortages. This report will include a basic overview of the District, descriptions of the required capital improvement projects, and the estimated opinions of construction costs.

The District is constantly evaluating projects that may require to be undertaken. As water quality changes, and as new contaminant detections are found, the needs of the District may also change. As such, the District may need to reprioritize capital projects and allocate funding accordingly.

2.0 EXISTING WATER SUPPLY SYSTEM

2.1 Water System Description

The Roslyn Water District serves approximately 17,900 persons over a service area of approximately 5.1 square miles, within the Town of North Hempstead. An additional 1,800 persons are served by the District in Albertson and Glenwood. There are no significant areas adjacent to the District that would warrant consideration for a future District extension.

Geographically, the Roslyn Water District is located in the northwestern section of Nassau County within the Town of North Hempstead. The District is bounded on the north by the Port Washington and Glenwood Water Districts; on the east by the Jericho Water District and the Village of Old Westbury; on the south by the Albertson Water District; and on the west by the Manhasset-Lakeville Water District. Figure 2-1 indicates the District’s service area.

The District is within the Nassau County Sewer District and approximately 30 percent of the District is served by the public sewers. The sewage is discharged to the Nassau County operated Cedar Creek Park Water Pollution Control Center with the treated effluent being discharged though a marine outfall pipe into the Atlantic Ocean.

2.2 Water System Management

The decision-making authority of the District is vested in the Board of Commissioners. There are three (3) members of the Board, each of whom is elected for a term of three (3) years by the residents that reside in the Water District service area. The Chairman serves as Chief Executive Officer, the Treasurer serves as Chief Financial Officer and the Secretary serves as Chief Administrative Officer. Primary responsibilities of the board include approval and authorization of expenditures and annual budget, establishment of water rates and charges and establishment and promulgation of District ordinances and policies.

A Superintendent, classified and hired pursuant to the regulations of the Nassau County Civil Service Commission, is responsible for the day-to-day management of the District, administration of District ordinances and policies, and reports to the Board of Commissioners on a regular basis. As the operator of the system, the Superintendent must be a certified New York State Health Department 1B water treatment plant operator. All field water service personnel are trained in water supply and distribution operations. Most field personnel are certified by the New York State Health Department in various grades and facets of water supply operation.

2.3 Topography

The topography of the District can generally be classified as hilly with elevations of the terrain varying from 11.5 to 357 feet above mean sea level (MSL). The highest land elevations are located between the western and eastern central portions, at 357 feet above MSL, located in the areas of Tara Drive, Diana's Trail, and Birch Drive. The lowest elevations above MSL are recorded around Hempstead Harbor where land elevations drop to approximately 11.5 feet above MSL. The District has too great of an elevation difference to operate the entire system on one pressure system. Therefore, the District is separated into four pressure zones. The high pressure zones are located in the areas of Tara Drive, Diana's Trail, and Birch Drive. The remainder of the District is classified as the low zone. Figure 2-2 indicates the District's topographical location.

The high zones are each supplied by booster stations, which increase the pressure in their respective areas. Each booster station is coupled with a storage tank. The Diana's Trail standpipe, Tara Drive standpipe, and Birch Drive ground storage tank "float" off the low zone and merely supply water to the booster stations to supply the high zone. Diana's Trail operates at a hydraulic grade line of 330.4 feet, Tara Drive operates at a hydraulic grade line of 386.5 feet, and Birch Street operates at a hydraulic grade line of 473.0 feet.

2.4 District Population and Land Use

The majority of the land within the Roslyn Water District is zoned for residential use. Single family homes are the predominant use. Each subdivision in the District falls in this majority, ranging from 50-90 percent of residential use. The northern part of the District is heavily situated with commercial and industrial users by almost 20 percent of land.

The southern end of the District has a larger percentage of smaller lots and thus a higher population density. It is important to note that almost 70 percent of the entire service area utilizes on-site septic systems for wastewater disposal. Only a few isolated areas, approximately 30 percent of the District, are serviced by a sewer collection and treatment plant.

2.5 Source of Water Supply

The District currently obtains its entire water supply from fifteen (15) deep wells drilled into the Magothy and Lloyd aquifers at eight (8) plant sites throughout the service area, as detailed in Table 2-1. As shown, eight of the wells are at a single plant site, Plant No. 1, which is comprised of a suction well field and booster pump. Collectively, the District has a total authorized supply well capacity of 9,300 gallons per minute (GPM).

Water treatment methods employed by the District include disinfection, pH adjustment, and volatile organic compound (VOC) removal. Treatment for VOC removal is accomplished by packed tower aeration or granular activated carbon (GAC).

2.6 Storage Facilities

The District maintains three (3) water storage tanks located at three separate sites throughout the District with a total available operating capacity of 6.0 million gallons. The location and description of existing storage facilities are summarized in Table 2-2.

2.7 Water Distribution System

The District distributes water from its supply sources to its consumer's through an efficient piping network. The network consists of moderately sized transmission mains and smaller lateral distribution mains which form an interconnected grid located throughout the entire service area.

As of 2019, the transmission and distribution system consist of approximately 104 miles of water main, varying in size from 6 inches to 20 inches in diameter. The linear footage of water main by size is summarized in Table 2-3.

2.8 Interconnections

The District maintains ten (10) interconnections with five (5) other neighboring water suppliers for use during emergencies, as shown in Table 2-4. Normally closed, these interconnections can be manually opened to distribute water between the District and neighboring suppliers. The hydraulic gradients at each interconnection are compatible such that the interconnections are at elevations that facilitate the distribution of water between the District and neighboring suppliers.

Not all interconnections are metered. For interconnections where water is not sold regularly or regularly transferred between neighboring systems, metering such interconnections is not necessary. Seven of the ten interconnections are metered. Three of the four interconnections with the Port Washington Water

District are metered, the interconnection with the Jericho Water District is not metered, and one of the two interconnections with the Village of Old Westbury is metered. The Roslyn Water District regularly supplies the Glenwood Water District with water via two master meters to register the supply provided. The Roslyn Water District also regularly supplies the Albertson Water District; however, there are no master meters. Rather, the Roslyn Water District personnel reads the Albertson residential meters that were supplied by the Roslyn Water District. The Nassau County Department of Health has issued requirements to public water suppliers to test their interconnections annually. Typically, water suppliers would test by placing the valve key on the valve and making sure it was unobstructed. The Department now wants water to flow.

2.9 Pumpage and Demand

Table 2-5 demonstrates consumptive water use from 2013 to 2019. Over this period, the total annual pumpage has fluctuated slightly from year to year, mainly due to variations in precipitation. 2014 experienced the lowest pumpage with 1,166.31 million gallons (MG), while 2016 experienced the highest pumpage with 1,312.48 MG. On average, the District pumped approximately 1.26 billion gallons over the last six years.

The estimated non-revenue water percentage for calendar year 2019 was 8.8 percent of the total water supply for that year. This is calculated by subtracting from the total production, the total metered water consumed including Glenwood residents and portions of Albertson residents. This is the amount of water used during the year for flushing hydrants, firefighting, main breaks, and service line leaks.

2.10 Auxiliary Power

The District's auxiliary power is provided by a mixed use of natural gas and diesel. As shown in Table 2-1 Plant Nos. 1, 5, and 6 contain diesel generators while Plant No. 7 has a direct drive diesel engine. Plant Nos. 4 and 8 contain a natural gas generator. Plant Nos. 2 and 3 have no back-up power. The total auxiliary production capacity for the District is 7,100 gallons per minute (GPM) or 10.22 million gallons per day (MGD).

3.0 PROJECT SITE DESCRIPTION

3.1 Plant No. 1

Plant No. 1 of the Roslyn Water District is located at 24 West Shore Road at the intersection of West Shore Road and Northern Boulevard, which is north of the Long Island Expressway, in the Incorporated Village of Roslyn, New York. The plant is located approximately 2.5 miles north of the groundwater divide, which runs east-west approximately 1.0 mile south of the Long Island Expressway. This is the site of the District's Administration Building and maintenance garages. This facility is the command center for District operations and activities. The facility serves as the main headquarters, vehicle storage, equipment storage, maintenance, and primary SCADA center. Plant No. 1 is also marked as a historical district property in the Village of Roslyn and shall be continued to be preserved as such.

Plant No. 1 is the location of eight (8) of the District's wells which were constructed in 1944. Seven of the wells (NYSDEC Nos.: N-1870, N-1871, N-1872, N1873, N-1874, N-1875, N-1876) were drilled into the Magothy aquifer to a depth of 260 feet below grade and one well (NYSDEC No.: N-1877) was drilled into the Lloyd aquifer to a depth of 555 feet below grade. The plant has a total capacity of 1.584 MGD. All eight wells are connected to a single vertical turbine pump which pumps directly to GAC adsorption vessels for the removal of volatile organic compounds (VOCs) such as trichloroethene (TCE) and tetrachloroethene (PCE) with the addition of calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment. These contaminants are generally removed below the detection level before the water enters the distribution system.

This plant is equipped with a 1,100 GPM vertical turbine pump, driven by a 150 HP electric motor and an on-site direct drive diesel engine for emergency power. The discharge piping, calcium hypochlorite disinfection tablet system, pump, caustic, and chlorination treatment equipment are housed in an above ground masonry and wood shingled building, Pump House No. 1.

Also located on the site is an underground 3,000-gallon double-walled #2 fuel oil tank used for backup power fuel supply and building heating systems. The fuel tank was installed in 1997 giving the tank an age of 23 years. It should be noted that underground fuel storage tanks have a general life expectancy of 30 years. However, given the tanks age, presence of ground water, and that this is a potable water supply facility, it is recommended that this tank be replaced in the immediate future. Tightness tests were completed on May 1, 2020 and the tank passed the criteria set forth by the U.S, EPA.

3.2 Plant No. 3

Plant No. 3 of the Roslyn Water District is located on Glen Cove Road. It is the location of Well No. 3 (NYSDEC No. N – 4265) which was constructed in 1954. Well No. 3 was drilled into the Magothy aquifer to a depth of 490 feet below grade with a capacity of 1.728 MGD. Well No. 3 pumps directly to distribution with the addition of calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment.

The site is equipped with a 1,200 GPM vertical turbine pump driven by a 150 HP electric motor. The well screen was replaced, and the well pump rehabilitated in 2015. The site previously held an underground fuel tank and generator; however, they were both removed from the site in 2001 and 2005, respectively.

3.3 Plant No. 4

Plant No. 4 of the Roslyn Water District is located on Diana's Trail, east of Searingtown Road and north of the Long Island Expressway. It is the location of Well No. 4 (NYSDEC No.: N-4623), which was constructed in 1955. Well No. 4 was drilled into the Magothy aquifer to a depth of 503 feet below grade with a capacity of 1.728 MGD. The grade elevation of the site is approximately 255 feet above MSL consisting of three structures: a well house, a 1.0-million-gallon standpipe water tank, and a high zone booster pump station consisting of three (3) booster pumps feeding at 650 GPM each.

This Plant is equipped with a 1,200 GPM deep well turbine pump driven by a 150 HP electric motor. This well pumps to a packed tower aeration treatment system with the addition of calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment. The chemicals treated at this well are 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1,-DCE) 1,1,1-trichloroethane (TCA), dacthal (DCPA), dichlorodifluoromethane (Freon-12), and chlorodifluoromethane (Freon-22). These contaminants are generally removed to below the detection level before the water enter the distribution system.

Well No. 4 is housed inside a masonry building which contains its motor control center, chemical treatment, system recording charts, and monitoring equipment. Well No. 4 was last rehabilitated in 2015. The existing well screen was replaced, other modifications included pump and motor replacement. The well was shut down from 2014 through 2017 for the installation of the packed tower aeration treatment system. The well building was constructed in 1954 and has not undergone any major renovations to date.

Also located at the site is a 600 amp underground electric service serving the pump station and a 400 amp underground electric service serving the packed tower treatment site located across Diana's Trail that was installed as part of the packed tower aeration treatment project in 2014. There is also a natural gas generator located within the pump station and a second generator at the packed tower treatment site across Diana's Trail.

Well No. 4 is currently being impacted by VOCs, 1,4-dioxane and PFOA with the possibility of increased deteriorating water quality.

3.4 Plant No. 5

Plant No. 5 of the Roslyn Water District is located on Sycamore Drive. It is the location of Well No. 5 (NYSDEC No.: N-5852) which was constructed in 1957. Well No. 5 was drilled into the Magothy aquifer to a depth of 482 feet below grade with a capacity of 1.728 MGD. This well pumps directly to distribution with the addition of calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment.

The site also houses a 1,100 GPM booster pump, which pumps water from the low zone to the Birch Drive high zone. This pump is used as a backup for the Birch Drive Booster Station.

Also located on the site is an underground 1,000 gallon double-walled #2 fuel oil tank used for backup power fuel supply and building heating systems. The fuel tank was installed in 1989 giving the tank an age of 31 years. It should be noted that underground fuel storage tanks have a general life expectancy of 30 years. Noting that this is also a potable water supply facility, it is recommended that this tank be replaced in the immediate future. Tightness tests were completed on April 24, 2020 and the tank passed the criteria set forth by the U.S, EPA.

The well pump was last rehabilitated in 2012. The booster station was installed in 2015 and the pH/chlorine analyzer was replaced in the same year.

Well No. 5 is currently being impacted by PFOA and PFOS.

3.5 Plant No. 6

Plant No. 6 of the Roslyn Water District is located on Partridge Drive. It is the location of Well No.6 (NYSDEC No.: N-7104) which was constructed in 1962. Well No. 6 was drilled into the Magothy aquifer to a depth of 436 feet below grade with a capacity of. 1.728 MGD.

This site is equipped with a well pump that is driven by a 150 HP electric motor which was last rehabilitated in 2013. Well No. 6 pumps directly to distribution with the addition of calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment. Well No. 6 was last rehabilitated in 2013.

Also located on the site is an underground 1,000 gallon double-walled diesel fuel tank used for fuel supply to the on-site backup generator. The fuel tank was installed in 1989 giving the tank an age of 31 years. It should be noted that underground fuel storage tanks have a general life expectancy of 30 years. Noting that this is also a potable water supply facility, it is recommended that this tank be replaced in the immediate future. Tightness tests were completed on May 1, 2020 and the tank passed the criteria set forth by the U.S, EPA.

3.6 Plant No. 8

Plant No. 8 of the Roslyn Water District is located on the west side of Mineola Avenue just north of The Maples, in Roslyn, New York. It is the location of Well No. 8 (NYSDEC No.: N-8010) which was constructed in 1967. Well No. 8 was drilled into the Magothy aquifer to a depth of 448 feet below grade with a capacity of 1.728 MGD. The well is housed inside a masonry building which contains its discharge piping, chemical treatment, and pumps. The approximate grade elevation of the site is 220 feet above MSL. Plant No. 8 is located in FEMA flood map Zone X (Area of Minimal Flood Hazard). The site is approximately 1.14 acres, consisting of four structures: a well house, a GAC treatment building, packed tower aeration treatment building and an on-site generator for emergency power.

The site is equipped with a 1,200 GPM deep well turbine pump driven by a 100 HP electric motor. In addition to calcium hypochlorite for disinfection and 25% sodium hydroxide solution for pH adjustment and disinfection, this well is treated by packed tower aeration followed by granular activated carbon for the removal of organic contaminants: 1,2-dibromoethane (EDB), 1,1-dichloroethane (1,1-DCA), tetrachloroethene (PCE), trichloroethane (TCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene, dacthal (DCPA), dichlorodifluoromethane (Freon-12), chlorodifluoromethane (Freon-22), cis-1,2,-dichloroethane (cis-1,2-DCE), and methyl-ter-butyl ether (MTBE). These contaminants are generally removed to below the detection level before the water enters the distribution system.

Well No. 8 was last rehabilitated in 2015 when the existing well pump was replaced. The well building was constructed in 1967 and has not undergone any major renovations to date. Electric power to the site is fed from a transformer adjacent to Pump Station No. 8. A motor control center distributes power to the site. The site also contains a natural gas generator set as emergency power for the plant.

Well No. 8 is currently being impacted by VOCs and 1,4-dioxane with the possibility of increased deteriorating water quality.

4.0 GROUNDWATER QUALITY

Based on 2019 routine sampling data, the raw water from the District's active supply wells can be generally characterized as listed below. A partial summary of the physical characteristics is provided in Table 4-1.

1. Corrosive with a relatively low to neutral pH* in the range of 5.6 to 7.0. The water can be expected to be aggressive and will generally cause undesirable amounts of corrosion to ferrous iron and copper piping. If not properly treated, this can result in red or blue/green water complaints. The District presently uses caustic soda for pH adjustment with a resulting target pH of 7.5 to 8.0.

   *pH is a measure of hydrogen ion activity. If the pH is <7.0 the water is acidic; if the pH is >7.0, the water is alkaline.

2. Having dissolved iron levels below detectable levels of 0.02 mg/L at all wells except for Well Nos. 1 and 8. The peak iron detection at Well Nos. 1 and 8 were 0.15 and 0.027 mg/L, respectively. Generally, iron concentrations in excess of the 0.30 mg/L, secondary standards for aesthetics, will stain plumbing fixtures and laundered clothing. Presently, no wells in the District exceed the secondary standard for iron.

3. Well Nos. 1, 2, 3, 5, 6, and 7 are low in total (carbonate and non-carbonate) hardness with a range of 12.6 to 37.0 mg/L. This low range would characterize these wells as “soft”. Well Nos. 4 and 8 have a total hardness of 124 and 71.9 mg/L as $CaCO_3$, respectively, characterizing these wells as “moderately” hard” to “hard”

4. Low to moderate in total dissolved solids and chlorides with levels ranging from 36 to 209 mg/L, and 3.1 to 47.3 mg/L, respectively. These results are typical for a groundwater supply that is not impacted by saltwater intrusion.

5. Low to moderate in nitrate concentrations with levels ranging from 1.4 to 7.4 mg/L. Only one of the eight wells exhibit nitrate levels above 5.0 mg/L, based on 2019 data, with an overall average concentration of 3.95 mg/L from all wells.

6. Low in perchlorate with levels remaining below <1.0 mg/L in the raw water. Currently, there is no MCL established for perchlorate as it is not regulated by the EPA. NYS has established a secondary action level of 5.0 µg/L, which requires quarterly monitoring, and a primary action level of 18.0 µg/L, which requires either treatment for perchlorate removal or restricted use of a well. All detections have been below the 18.0 µg/L action level. The USEPA will set an MCL for perchlorate in the near future. However, since NYS has set action levels for perchlorate, it does have the authority to institute a State MCL, with which the District would have to comply.

7. Elevated concentration of VOCs found in the raw water must continue to be addressed by the District. The VOCs are currently being removed by packed tower aeration and/or granular activated carbon adsorption at Well Nos. 1, 4 and 8. The predominant VOC compounds recently detected in the Water District’s raw water supply are tetrachloroethene (PCE), 1,1-dichloroethane (1,1,-DCA), dichlorodifluoromethane (Freon-12), chlorodifluoromethane (Freon-22), dacthal (DCPA), cir-1,2 dichloroethane (cis 1,2-DCE), trichloroethene (TCE), 1,2-dibromoethane (EDB), and 1,1,1-trichloroethane (1,1,1-TCA).

8. 1,4 – Dioxane was detected at seven well stations, including Well Nos. 1, 3, 4, 5, 6, 7, and 8. The concentrations ranged from 0.044 to 0.61 µg/L in 2019.

9. Perfluorooctanoic acid was detected in Well Nos. 1, 4, 7, and 8 with levels ranging from 2.1 to 5.0 ng/L.

4.1 Site Specific Water Quality

4.1.1 Plant No. 1

Plant No. 1 is comprised of eight wells. Plant No. 1 has been historically impacted by volatile organic compounds (VOCs), and 1,4-dioxane over the past seven years. The following table summarizes recent emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 1 (µg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 1	NA	0.2	0.2	0.26	0.12	0.15	0.10

Well No.1 water quality sampling over the past seven years reveals levels of 1,4-dioxane ranging from 0.10 to 0.26 µg/L. The peak concentration of 0.26 µg/L is below 50% of the MCL, which under Nassau County Department of Health Standards does not require engineering treatment design planning.

2019 PFAS at Plant No. 1 (ng/L)						
Well	**PFBS**	**PFHpA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 1	ND	ND	ND	ND	ND	ND

Legend:

PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

Well No. 1 did not have any detections of PFAS in 2019, however, in 2018, PFOA detection was found in Well No.1 at a concentration of 5.0 ng/L. The concentration of PFAO is 50% of the MCL. However, the concentration of PFOA in the treated water was below the detection limit, indicating that the existing GAC adsorption treatment is effective at removing PFOA.

4.1.2 Plant No. 3

Plant No. 3 is comprised of one well, Well No. 3. The following tables summarize recent emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 3 (µg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 3	NA	ND	ND	NA	ND	0.036	0.045

Well No. 3 water quality sampling over the past years reveals levels of 1,4-dioxane ranging form non-detect to 0.045 μg/L. The peak concentration of 0.045 μg/L is below 50% of the MCL, which under Nassau County Department of Health Standards does not require engineering treatment design planning.

2019 PFAS at Plant No. 3 (ng/L)						
Well	**PFBS**	**PFHpA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 3	ND	ND	ND	ND	ND	ND

Legend:
PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

In 2019 as well as 2018 PFAS concentrations were found below the detection limit.

4.1.3 Plant No. 4

Plant No. 4 is comprised of one well, Well No. 4. This well has been historically impacted by volatile organic compounds (VOCs), and 1,4-dioxane over the past seven years. The following tables summarize recent emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 4 (μg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 4	NA	O.O.S	O.O.S	O.O.S	0.45	0.53	0.61

Legend:
O.O.S. – Out of Service

Well No. 4 water quality sampling over the past years reveals levels of 1,4-dioxane ranging from 0.45 to 0.61 μg/L. The peak concentration of 0.61 μg/L is above 50% of the MCL, which under Nassau County Department of Health Standards requires engineering treatment design planning. The presence of 1,4-dioxane above 50% of the MCL in the treated water effluent shows that the existing packed tower aeration system is ineffective in removing 1,4-dioxane.

2019 PFAS at Plant No. 4 (ng/L)						
Well	**PFBS**	**PFHpA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 4	ND	ND	5.0	ND	2.3	ND

Legend:
PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

In 2019, PFOA detection was found in Well No. 4. The detection of PFOA is at 50% of the MCL. The remaining PFAS do not have a MCL at this time or were non-detect. The presence of PFOA above the MCL in the treated water effluent shows that the existing packed tower aeration system is ineffective in removing PFOA.

4.1.4 Plant No. 5

Plant No. 5 is comprised of one well, Well No. 5. The following tables summarize recent emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 5 (µg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 5	NA	ND	ND	NA	ND	0.066	0.065

Well No. 5 water quality sampling reveals levels of 1,4-dioxane ranging from non-detect to 0.066 µg/L. However, the peak concentration of 0.066 µg/L is below 50% of the MCL for 1,4-dioxane, which under Nassau County Department of Health Standards does not require engineering treatment design planning.

2019 PFAS at Plant No. 5 (ng/L)						
Well	**PFBS**	**PFHpA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 5	ND	ND	ND	ND	ND	ND

Legend:
PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

In 2019 all PFAS concentrations were found to be below the detection limit. However, in 2018 PFOA was found at concentrations of 2.3 ng/L and 6.8 ng/L, with the latter concentration exceeding 50% of the NYS

MCL, which under Nassau County Department of Health Standards requires engineering treatment design planning. All other PFAS compounds do not have a MCL at this time or were non-detect.

4.1.5 Plant No. 6

Plant No. 6 is comprised of one well, Well No. 6. The following tables summarize recent emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 6 (µg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 6	NA	ND	ND	NA	ND	ND	0.044

Well No. 6 water quality sampling reveals levels of 1,4-dioxane ranging from non-detect to 0.044 µg/L. However, the peak concentration of 0.044 µg/L is below 50% of the MCL for 1,4-dioxane, which under Nassau County Department of Health Standards does not require engineering treatment design planning.

2019 PFAS at Plant No. 6 (ng/L)						
Well	**PFBS**	**PFHpA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 6	ND	ND	ND	ND	ND	ND

Legend:
PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

In 2019 as well as 2018 PFAS concentrations were below the detection limit.

4.1.6 Plant No. 8

Plant No. 8 is comprised of one well, Well No. 8. This well has historically been impacted by VOCs, PFAS, and 1,4-dioxane. The following table summarizes emerging contaminants water quality data.

2013-2019 1,4-Dioxane Detection at Plant No. 8 (µg/L)							
Well	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Well No. 8	0.74	0.9	1.0	0.74	0.55	0.64	0.59

Well No.8 water quality sampling reveals levels of 1,4-dioxane ranging from 0.55 to 1.0 µg/L. The peak concentration of 1.0 µg/L is at the MCL for 1,4-dioxane. The presence of 1,4-dioxane at the MCL in the treated water effluent shows that the existing packed tower aeration and GAC adsorption systems are ineffective in removing 1,4-dioxane and therefore, under the Nassau County Department of Health standards, requires engineering treatment design planning.

2019 PFAS at Plant No. 8 (ng/L)							
Well	**PFBS**	**PFHpA**	**PFHxA**	**PFOA**	**PFNA**	**PFHxS**	**PFOS**
Well No. 8	ND	ND	2.5	3.9	3.4	3.3	3.4

Legend:

PFOA – Perfluorooctanoic acid
PFHpA – Perfluoroheptanoic acid
PFBS – Perfluorobutanesulfonic acid
PFHxA – Perfluorohexanoic acid
PFOS– Perfluorooctanesulfonic acid
PFNA – Perfluorononanoic acid
PFHxS – Perfluorohexanesulfonic acid

In 2019 PFOA and PFOS detections were found in Well No. 8. The concentrations detected for PFOA and PFOS are approaching 50% of the MCL. The remaining PFAS do not have a MCL at this time or were non-detect. However, the concentration of the PFAS compounds in the treated water are all below the detection limit, indicating that the existing GAC adsorption treatment is effective at removing PFAS.

5.0 ANALYSIS OF WATER SUPPLY SYSTEM NEEDS

It is important to plan based on estimates of overall water supply that will be consistently available. In order to determine the base water supply availability for the District, a combination of accepted guidelines is used. One of these guidelines is the Recommended Standards for Water Works of the Great Lakes Upper Mississippi River Board of State Public Health & Environmental Managers, which is most often referred to as the Ten States Standards. The District must comply with the Ten States Standards for Water Works (TSSWW) since they are included as part of the New York State Sanitary Code Part 5, Drinking Water Standards.

Using TSSWW, the current and future supply and storage capacity needs of the District including average day, maximum day, peak hour, and maximum day plus fire flow statistics were reviewed and analyzed. Average daily demand represents the total yearly pumpage uniformly distributed or averaged over the entire calendar year. This statistic provides a basis of forecasting estimated revenues for budgetary purposes and is utilized in long-range water resources planning with respect to safe yield. Average day demand as it relates to system capacity assessment is used to establish the base need for minimum standby power pumping capacity during short-term regional electrical power outages. Maximum day pumpage statistics are reviewed to evaluate available supply well capacity with one major well out of service while peak hour and maximum day plus fire flow demand are used to analyze combined supply well and storage facility capacity requirements. Maximum day plus fire flow assumes a 3,500 gallons per minute (GPM) fire flow for a duration of six hours. 3,500 GPM is a practical upper fire flow limit most water suppliers should anticipate based on a 6–hour duration or 1.26 MG (reference AWWA Manual M31, 4th edition). Inadequate supply well and/or storage capacity under maximum day, peak hour, and maximum day plus fire flow demand conditions can result in system pressures that fall below normal operating requirements.

As shown in Table 2-5, the average day and maximum day pumpage rates for the District have not varied significantly since 2013. The generally flat trends in pumpage can be attributed to a relatively steady residential population, lack of commercial development within the District, and the District's water conservation efforts. This value can deviate from the norm as a function of weather conditions, such as extended heat waves without rain. When peak flows exceed the available pumping capacity, the deficit results in a drop in storage tank levels and, in turn, a decrease in system pressure. Therefore, maximizing tank levels is necessary to provide normal water pressure throughout the distribution system. Most importantly, stored water is required to meet maximum day plus fire flow demand, as established by the Insurance Services Office (ISO).

The sole source of groundwater replenishment for Long Island's aquifers is precipitation. The area in which the District is located receives a yearly average of 46 inches of precipitation. The United States Geological Survey and the New York State Department of Environmental Conservation estimate that about 50% of the average precipitation that falls on the land eventually percolates through the soil to the water table. The balance is returned to the atmosphere via evapotranspiration of plants, along with simple surface evaporation. Based on this estimate, 23 inches of this precipitation is returned to the atmosphere via evapotranspiration of plants, as well as surface evaporation. The remaining 23 inches enters the groundwater system to recharge the Glacial aquifer that, through vertical flow, migrates downward into the two underlying aquifers. This equates to a safe yield of water recharge into the aquifers under the Water District's boundaries, of approximately 2.04 billion gallons per year. As seen in Table 2-5, over the last 6 years, the District has withdrawn an average of 1.26 billion gallons per year, which is 38% less than the recharge to the aquifers beneath the District. Therefore, even in average rainfall years, there is a net increase in the water stored in the aquifer.

The recommendations in the TSSWW and AWWA call for a level of redundancy for supply wells and water storage capacity sufficient to meet maximum day flow plus fire flow with the largest facility out of service. This guideline is generally applicable to small water systems. Well Nos. 2, 3, 6, and 7 are not immediately expected to require additional wellhead treatment for emerging contaminants, however new regulations and/or new detections at these wells may change this necessity. Well No. 5 is anticipated to require treatment for PFOA and PFOS; however, the implementation period is expected to be fairly quick as GAC vessels can be installed without having to do pilot testing. These four wells achieve the maximum average day demand but do not meet the maximum day demand, the peak hour flow or the maximum day plus fire flow demand. To achieve the maximum day demand, two additional wells are needed. Well Nos. 1 and 5 can be utilized to meet this demand; however, Well Nos. 1 and 5 have exhibited varying concentrations of several VOCs over the years and have recently detected 1,4-dioxane at low concentrations. With the use of Well Nos. 1 and 5 the District is still unable to meet the peak hour or maximum day plus fire flow demand. The use of both Well Nos. 4 and 8 are required to meet the demand and provide the required redundancy. Both wells require additional treatment for 1,4-dioxane and/or PFAS. Should levels rise and treatment for 1,4-dioxane and PFAS is not implemented the District will not be able to meet these demands.

6.0 RECOMMENDED CAPITAL IMPROVEMENTS

Over the past ten years, the District has made significant financial investments to upgrade and maintain its current water supply, treatment, storage, and distribution system. The recommended capital improvement projects identified herein are centered around the District's current water quality, specifically 1,4-dioxane and PFAS. Based on the evaluation of the District's current water quality and water demands performed in this report, the following projects are necessary for the District to continue to provide adequate water supply that meets NYSDOH water quality regulations.

6.1 AOP Treatment at Plant No. 4

As discussed, Well No. 4 has been impacted by 1,4-dioxane and PFAS. The proposed improvements at this plant primarily include the construction of a new AOP/GAC system to treat the flow from the well. The AOP treatment system will utilize low pressure UV light and hydrogen peroxide to remove 1,4-dioxane. The GAC system will be used to quench hydrogen peroxide and remove PFAS.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-1. The overall cost opinion for a new AOP/GAC treatment system is $8,148,480.

6.2 Wellhead Treatment for Perfluorinated Compounds at Plant No. 5

As discussed, Well No. 5 has detected levels of PFAS over recent years. In 2018 PFOA was detected at 0.0068 μg/L. The PFOA detection exceeds 50% of the NYS MCL. The appropriate treatment for PFAS removal is GAC adsorption. The proposed improvements at this plant primarily includes the construction of a new GAC treatment system for the removal of PFAS.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-2. The overall cost opinion for a new GAC treatment system is $4,974,500.

6.3 AOP Treatment at Plant No. 8

As discussed, Well No.8 has detected levels of 1,4-dioxane and PFAS over recent years. The proposed improvements at this plant primarily include the construction of a new AOP system to treat the flow from the well. The AOP treatment system will utilize low pressure UV light and hydrogen peroxide to remove 1,4-dioxane. Plant No. 8 already contains a GAC system to remove PFAS and it can be used to quench hydrogen peroxide as well.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-3. The overall cost opinion for a new AOP treatment system is $3,816,200.

6.4 Fuel Oil Tank Replacement at Plant No. 1

As discussed, the existing 3,000 gallon underground fuel tank at Plant No. 1 is 23 years old. The recommended industry standard for useful life of an underground fuel storage tank is 30 years. Although this tank has not reached the end of its useful life, it is a buried tank on a potable water supply facility site. Therefore, it is still recommended that the existing tank be replaced with an aboveground tank.

This existing tank services three (3) separate on-site buildings for heat at the maintenance garage and administration building, and for emergency power to Pump Station No. 1. As part of this tank replacement, new smaller above ground tanks will be installed to better serve each of these buildings.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-4. The overall cost opinion for the fuel tank replacement is $325,389.

6.5 Fuel Oil Tank Replacement at Plant No. 5

As discussed, the existing 1,000 gallon underground fuel tank at Plant No. 5 is 31 years old. The recommended industry standard for useful life of an underground fuel storage tank is 30 years. Given the age of the tank and the fact that the existing tank is buried in a potable water supply facility site, the existing tank is recommended to be replaced with an aboveground fuel tank.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-5. The overall cost opinion for the fuel tank replacement is $198,708.

6.6 Fuel Oil Tank Replacement at Plant No. 6

As discussed, the existing 1,000 gallon underground fuel tank at Plant No. 6 is 31 years old. The recommended industry standard for useful life of an underground fuel oil storage tank is 30 years. Given the age of the tank and the fact that the existing tank is buried on a potable water supply facility site, the existing tank is recommended to be replaced with an above ground fuel tank.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-6. The overall cost opinion for the fuel tank replacement is $149,700.

6.7 New Generator at Plant No. 3

As discussed, currently there is no backup power for Well No. 3 as the generator was removed from the plant site in 2005. However, Well No. 3 is a critical facility to the District based upon its geographic location on the east site of the District. Based on its location it has the ability to supply water to two of the District's water storage tanks located at Birch Drive and Tara Drive (Plant No. 7). Therefore, it is recommended that a new natural gas generator be installed at Plant No. 3.

The preliminary summary of work and cost opinion for this capital improvement project is included in Table 6-7. The overall cost opinion for the new generator is $655,750.

6.8 Additional Related Capital Improvements for Emergency Contaminant Treatment

As detailed within this report, the District currently treats VOCs at three (3) of their existing wells, 1,4-dioxane has been detected at seven (7) of their wells with immediate treatment being required at two (2) of those wells and PFAS has been detected at four (4) of their wells, with new treatment being required at three (3) of those wells. With water quality potentially continuing to decline, new contaminants requiring treatment, and related future unknown contaminants potentially requiring treatment, the District needs to anticipate the need for future water quality treatment systems, and/or replacing/upgrading existing infrastructure.

The District will continue to prioritize projects as new information becomes available. Should new needs arise, the District may need to reprioritize and allocate funding accordingly to address such situations.

The preliminary summary of work and cost opinion for these capital improvements is included in Table 6-8. The overall cost opinion for these various projects is estimated to be $15,000,000.

7.0 FUNDING FOR CAPITAL IMPROVEMENTS

As previously shown in this report, seven (7) of the District's eight (8) wells have shown detections of the emerging contaminants 1,4-dioxane and/or perfluorooctanoic acid and perfluorooctane sulfonate. In addition, degrading water quality could also require treatment for VOCs, iron removal and/or nitrate removal otherwise not required at this given time.

Noting that the District does not have sufficient backup capacity should one (1) or more existing pumping facilities be required to be taken off-line due to contamination requiring new and/or additional treatment, it is imperative for the District to secure the monies required for this treatment now. Doing so will allow the District to immediately proceed with the necessary work to implement any necessary treatment thus permitting the District to proceed without the necessity of going through another bond process in the next five (5) years which would further limit the District's ability to continue to provide the highest quality water supply to its residents.

A summary of the costs for each capital improvement project and the total cost is shown in Table 7-1. Under this capital improvement plan, H2M recommends that the District petition the Town of North Hempstead for improvement bond financing in the amount of $33,268,727. The monies secured under the 2020 bond will pay for the projects described within this report. The District has applied for a NYS Water infrastructure Improvement Act (WIIA) grant for the Plant No. 4 AOP/GAC system for a total amount of $7,474,000. As previously discussed, the projects anticipated under the 2020 bonding are of high importance to maintain the District's ability to provide a high-quality water supply to its residents, including the ability to comply with the State's implementation of its emerging contaminants regulation.

8.0 FINANCIAL ANALYSIS / IMPLEMENTATION CONSIDERATIONS

The Roslyn Water District's budget for calendar year 2020 is based on expenditures of $5,423,252. The District's water budget includes the following sources of revenues: water sales, unmetered water sales, water service charges, and other unclassified revenue and taxes. It is anticipated that thirty-five percent (35%) of the revenue will be raised through water sales. The next major source of revenue is taxes, which accounts for forty-eight percent (48%). The balance, seventeen percent (17%), will be raised through unmetered water sales, water service charges, and other unclassified revenue.

Previously, the Roslyn Water District has successfully implemented major improvements utilizing a combination of capital funds raised through bonds and accumulated cash reserves through cost savings and surplus water sales with only minor increases in water rates. The capital cost associated with the proposed bond issue has been estimated at $33,268,727.

We have reviewed the revenue sources for five (5) other Water Districts that are within the Town of North Hempstead. In Table 8-1, we have compared the Roslyn Water District to the Albertson Water District, Carle Place Water District, Garden City Water District, Port Washington Water District and Manhasset-Lakeville Water District. As indicated, these five Districts raise between 25 and 69 percent of their revenue from taxes (and direct assessments) and between 19 to 69 percent of their revenue from water sales. Compared to the five (5) Water Districts the Roslyn Water District is currently receiving among the lowest percentages of its revenue from water rates and among the middle percentage from taxes.

Typically, capital improvements are paid through taxes since they benefit current and future residents. Similarly, operating costs are paid through water rates since they are for costs associated with supporting today's operations. Since the capital improvements currently being considered would benefit the current residents of the District and will also benefit those residents that will reside within the District in the future, the costs associated with the capital improvements should be paid through taxes. The current 2020 District average tax rate is $20.57 per $100 Assessed Valuation (AV).

We have prepared a fixed payment bond retirement schedule based on the existing Assessed Valuation of the District ($) increasing annually at the rate of 0.5% over the twenty-year bond schedule. We have utilized an interest rate of 3 percent, as indicated in Table 8-2. This would result in an average annual tax increase of $17.87 per $100 AV during the bond payment period.

9.0 CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

- The implementation of the new regulations for 1,4-dioxane and PFAS will significantly impact the District's ability to deliver a sufficient quantity of water to meet average day and maximum day demands for the summer pumping season.

- To meet the current and future demands, the District must install treatment at several of its existing treatment facilities to maintain the facilities' viability.

- In order to maintain aging infrastructure and help minimize a fuel spill into the groundwater supply it is recommended that the below ground fuel tanks indicated in this report are replaced with aboveground tanks.

- Due to ever changing water quality, strict water quality requirements, aging infrastructure and unanticipated future water treatment, additional bond financing should be considered at this time such that potential implementation can be addressed in a timely fashion.

RECOMMENDATIONS

- A petition for improvement bond financing should be made to the Town of North Hempstead to provide for implementation of this overall plan. The plan should be implemented as soon as possible given the new NYS regulations that has been added to the State Register, so the District has adequate water supply capacity. The issuance of the bond by the Town of North Hempstead will provide the financial support necessary to deploy these improvements in an expeditious manner to serve the District's customers.

- Prepare a proposed meter rate for increased costs for operating treatment plants. Prepare a tax schedule necessary to amortize the debt for these projects should this bond be passed (included herein).

TABLES

TABLE 2-1
ROSLYN WATER DISTRICT
EXISTING WATER SUPPLY WELLS

Water District Well No.	NYSDEC No.	Plant Location	Year Drilled	Pressure Zone	Terminal Depth (Feet)	Formation	Authorized Capacity (GPM)	Effective Capacity (GPM)	Power
1*	N-1870	West Shore Road	1911	Low	260	Magothy	1,100	1,100	DD
	N-1871		1911	Low	260	Magothy			
	N-1872		1911	Low	260	Magothy			
	N-1873		1911	Low	260	Magothy			
	N-1874		1925	Low	260	Magothy			
	N-1875		1925	Low	260	Magothy			
	N-1876		1930	Low	260	Magothy			
	N-1877		1930	Low	555	Lloyd			
2	N-2400	Locust Lane	1948	Low	444	Magothy	1,000	980	NONE
3	N-4265	Glen Cove Road	1954	Low	490	Magothy	1,200	1,100	NONE
4~	N-4623	Diana's Trail	1955	Low	503	Magothy	1,200	1,000	GS (NG)
5	N-5852	Sycamore Drive	1956	Low	482	Magothy	1,200	1,000	GS (D)
6	N-7104	Partridge Drive	1962	Low	436	Magothy	1,200	1,100	GS (D)
7	N-7873	End of Tara Drive	1966	Low	530	Magothy	1,200	1,100	DD
8*~	N-8010	Willis Avenue	1967	Low	448	Magothy	1,200	1,200	GS (NG)

GPM - Gallons Per Minute
MGD - Million Gallons Per Day
* - Granular Activated Carbon (GAC) system on well
~ - Packed Tower Aeration (PTA) system on well

GS - Generator Set
D - Diesel
NG - Natural Gas
DD - Direct Drive - Diesel Engine

NOTES **:**
(1) Depth of well is measured from the ground surface at the well

TABLE 2-2
ROSLYN WATER DISTRICT
EXISTING STORAGE FACILITIES

TANK NO.	PLANT NO.	LOCATION	STYLE	CAPACITY [MG]	RANGE [FEET]	OVERFLOW ELEVATION [FEET]
1	4	Diana's Trail	Standpipe	1.0	65	343
2	Separate Site	Birch Drive	Ground Storage	3.0	40	343
3	7	Tara Drive	Standpipe	2.0	72	343
			Total	**6.0**		

TABLE 2-3
ROSLYN WATER DISTRICT
EXISTING DISTRIBUTION SYSTEM

MAIN SIZE	FOOTAGE	MILES
6"	284,865	53.95
8"	126,403	23.94
10"	76,322	14.45
12"	51,266	9.71
14"	1,427	0.27
16"	7,890	1.49
20"	1,633	0.31
Totals:	**549,806**	**104.12**

TABLE 2-4
ROSLYN WATER DISTRICT
EXISTING INTERCONNECTIONS

SUPPLIER	HIGH WATER LEVEL [FEET]	LOCATION	SIZE [INCHES]
Port Washington Water	360'	Wood Valley Lane (metered)	6
		Maple Drive (metered)	8
		Harbor Park Drive	12
		The Spur (metered)	6
Glenwood Water	267'	Glenwood Road (metered)	6
		Motts Cove Road (metered)	6
Jericho Water District	402'	Addison Lane	6
Village of Old Westbury Water	320'	Tara Drive (metered)	8
		Glen Cove Road	6
Albertson Water	312'	Oxford Street & Manor Avenue (metered)	6

TABLE 2-5
ROSLYN WATER DISTRICT
TOTAL CONSUMPTIVE WATER USE
2013 - 2019

YEAR	ANNUAL PUMPAGE (MG)(1)	AVERAGE DAY [MGD](1)	MAXIMUM DAY [MGD](1)	MAXIMUM DAY PLUS 3,500 gpm FIRE FLOW (MGD)(2)
2013	1,298.97	3.56	7.95	9.21
2014	1,166.31	3.20	6.35	7.61
2015	1,294.87	3.55	7.07	8.33
2016	1,312.48	3.59	7.22	8.48
2017	1,250.13	3.43	7.01	8.27
2018	1,262.93	3.46	7.16	8.42
2019	1,215.82	3.33	6.62	7.88
AVERAGE	**1,257.36**	**3.45**	**7.05**	**8.31**

***NOTES*:**
(1) Based on District's records or estimated based on historical trends
(2) 3,500 GPM for six hours (1.26 MG) is a practical upper fire flow limit most water suppliers should anticipate (AWWA Manual M31).
(3) Peak hour demands are greater than the maximum day plus fire flow. The design peak hour was established in the 2013-2018 Master Plan at 24.03 MGD for 2023.

TABLE 4-1
ROSLYN WATER DISTRICT
SUMMARY OF PHYSICAL RAW WATER QUALITY PARAMETERS

WELL NO.	pH	IRON (mg/l)	TOTAL HARDNESS (mg/l)	TOTAL DISSOLVED SOLIDS (mg/l)	CHLORIDE (mg/l)	NITRATE (mg/l)	PERCHLORATE (µg/l)	1,4- DIOXANE (µg/l)	PERFLUOROOCTANOIC ACID (µg/l)
1	6.0	0.15	18	54	5.7	2.90	ND	0.1	0.005*
2	5.7	ND	18.5	85.0	6.6	4.3	ND	ND	ND
3	5.6	ND	12.6	36	5.0	4.5	ND	0.045	ND
4	7.0	ND	124	209	45.4	4.8	ND	0.61	0.005
5	6.1	ND	37	83	11.4	3.8	ND	0.065	ND
6	6.35	ND	12.7	40	3.1	1.4	ND	0.044	ND
7	6	ND	23.8	55	8.9	2.50	ND	0.085	0.0021
8	6.5	0.027	71.9	136	47.3	7.40	ND	0.59	0.0039

***Notes* :**

Data based upon 2019 sampling before treatment

*Data based upon 2018 sampling before treatment

TABLE 6-1
ROSYLN WATER DISTRICT
AOP TREATMENT & MISC. IMPROVEMENTS AT PLANT NO. 4
SUMMARY OF ESTIMATED CAPITAL COSTS
Total System Flow = 1,100 gpm

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$100,000
2.	AOP Treatment Equipment and Installation (Including Peroxide System)	$715,000
3.	GAC Treatment System	$765,000
4.	Site Work	$675,000
5.	Drainage Work	$1,000,000
6.	Interior Piping and Accessories	$375,000
7.	New Masonry AOP/GAC Treatment Building	$1,353,480
8.	Relocation of Gas Service	$100,000
9.	HVAC and Plumbing for New Treatment Building	$125,000
10.	New MCC	$350,000
11.	Instrumentation, Control & Integration	$100,000
12.	Electrical Work (Power, Controls, and Lighting) for New AOP Treatment Building	$175,000
13.	New 250 kW Generator	$475,000
14.	Cash Allowances	$100,000
	Construction Subtotal:	**$6,408,480**
Engineering Design, Permitting, Construction and Startup Services		$1,090,000
Legal		$10,000
Contingencies (10%)		$640,000
Estimated Project Cost (Rounded):		**$8,148,480**

TABLE 6-2
ROSYLN WATER DISTRICT
GAC TREATMENT & MISC. IMPROVEMENTS AT PLANT NO. 5
SUMMARY OF ESTIMATED CAPITAL COSTS
Total System Flow = 1,200 gpm

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$225,000
2.	Testing and Contingency Allowances	$75,000
3.	Granular Activated Carbon Vessels	$465,000
4.	Granular Activated Carbon	$195,000
5.	Site Piping Modifications and New Site Valves	$120,000
6.	New GAC/Chemical Treatment Building and Foundation, Masonry Construction	$1,000,000
7.	Mechanical HVAC and Plumbing for New GAC Building	$115,000
8.	Site Work - Drainage, Curbs Sidewalks Paving Seeding, etc.	$480,000
9.	Mechanical Piping, Valves, and Accessories	$350,000
10	Relocation of Chemical Injection Systems	$80,000
11	Instrumentation, Controls & Integration, and Building Monitoring	$85,000
12.	New Chemical Analyzers	$70,000
13.	Electrical Site Work	$65,000
14.	Electrical Work in New GAC Building	$110,000
15.	Demolition of Existing Caustic Tank	$18,000
16.	Demolition of Existing Chemical Feed Systems	$16,000
17.	New Caustic Tank and Chemical Feed System	$87,500
18.	New CL2 Chemical Feed Systems	$67,250
	Construction Subtotal:	**$3,623,750**
Engineering, Permits, Design & Construction Administration, and Inspection		$616,000
Legal		$10,000
Contingencies (20%)		$724,750
Estimated Project Cost (Rounded):		**$4,974,500**

TABLE 6-3
ROSYLN WATER DISTRICT
AOP TREATMENT & MISC. IMPROVEMENTS AT PLANT NO. 8
SUMMARY OF ESTIMATED CAPITAL COSTS
Total System Flow = 1,200 gpm

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$175,000
2.	AOP Treatment Equipment and Installation (Including Peroxide System)	$1,466,600
3.	Site Work (Including Retaining Wall and Modified Containment Pad for Hydrogen Peroxide Tank)	$350,000
4.	Interior Piping and Accessories	$10,000
5.	New Masonry AOP Treatment Building	$620,000
6.	HVAC and Plumbing for New Treatment Building	$100,000
7.	Exterior Piping	$75,000
8.	Instrumentation, Control & Integration	$100,000
9.	Electrical Work (Power, Controls, and Lighting) for New AOP Treatment Building	$50,000
10.	Electrical Service Work	$50,000
	Construction Subtotal:	**$2,996,600**
Engineering Design, Construction and Startup Services		$510,000
Legal		$10,000
Contingencies (10%)		$299,600
Estimated Project Cost (Rounded):		**$3,816,200**

TABLE 6-4
ROSYLN WATER DISTRICT
FUEL OIL TANK REPLACEMENT AT PLANT NO. 1
SUMMARY OF ESTIMATED CAPITAL COSTS

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$48,000
2.	Site Demolitions	$10,000
3.	Remove & Dispose of 3,000 Gallon Buried Fuel Tank	$16,250
4.	Remove & Dispose of Remaining Fuel (1,000 Gallons)	$2,500
5.	Remove & Dispose of Remaining Fuel Sludge (4 Drums)	$1,950
6.	Soil Removals (10 Cubic Yards)	$1,950
7.	Clean Fill (10 Cubic Yard)	$900
8.	Restoration of Removals	$37,500
9.	Well House No. 1 Building Modifications for New Fuel Tank	$25,389
10	New 1,000 Gallon Double Wall Fuel Tank at Well House No. 1	$34,500
11	New Well House No. 1 Fuel Tank Plumbing	$10,750
12.	(2) New 275 Gallon Double Wall Fuel Tanks at Admin. Building/Garage	$18,225
13.	New Admin. Building/Garage Fuel Tank Plumbing Work and Monitoring Equipment	$10,750
14.	(2) New 275 Gallon Double Wall Fuel Tanks at the New Garage	$18,225
15.	New Garage Fuel Tank Plumbing Work and Monitoring Equipment	$11,500
	Construction Subtotal:	**$248,389**
Engineering, Permits, Design & Construction Administration, and Inspection		$42,200
Legal		$10,000
Contingencies (10%)		$24,800
Estimated Project Cost (Rounded):		**$325,389**

TABLE 6-5
ROSYLN WATER DISTRICT
FUEL OIL TANK REPLACEMENT AT PLANT NO. 5
SUMMARY OF ESTIMATED CAPITAL COSTS

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$9,500
2.	Site Demolitions	$5,250
3.	Remove & Dispose of 1,000 Gallon Buried Fuel Tank	$13,500
4.	Remove & Dispose of Remaining Fuel (300 Gallons)	$675
5.	Remove & Dispose of Remaining Fuel Sludge (2 Drums)	$900
6.	Soil Removals (10 Cubic Yards)	$1,950
7.	Clean Fill (10 Cubic Yard)	$900
8.	Restoration of Removals	$15,000
9.	New Site Work	$37,500
10.	New 1,000 Gallon Double Wall Fuel Tank	$28,713
11.	New Fuel Tank Plumbing and Monitoring Equipment	$34,750
	Construction Subtotal:	**$148,638**
Engineering Design, Construction and Startup Services		$25,270
Legal		$10,000
Contingencies (10%)		$14,800
Estimated Project Cost (Rounded):		**$198,708**

TABLE 6-6
ROSYLN WATER DISTRICT
FUEL OIL TANK REPLACEMENT AT PLANT NO. 6
SUMMARY OF ESTIMATED CAPITAL COSTS

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$9,700
2.	Site Demolitions	$3,100
3.	Remove & Dispose of 1,000 Gallon Buried Fuel Tank	$13,500
4.	Remove & Dispose of Remaining Fuel (300 Gallons)	$675
5.	Remove & Dispose of Remaining Fuel Sludge (2 Drums)	$900
6.	Soil Removals (10 Cubic Yards)	$1,950
7.	Clean Fill (10 Cubic Yard)	$900
8.	Restoration of Removals	$15,000
9.	New 1,000 Gallon Double Wall Fuel Tank	$29,525
10.	New Fuel Tank Plumbing and Monitoring Equipment	$34,750
	Construction Subtotal:	**$110,000**
Engineering Design, Construction and Startup Services		$18,700
Legal		$10,000
Contingencies (10%)		$11,000
Estimated Project Cost (Rounded):		**$149,700**

TABLE 6-7
ROSYLN WATER DISTRICT
NEW GENERATOR AT PLANT NO. 3
SUMMARY OF ESTIMATED CAPITAL COSTS

ITEM		ESTIMATED COST (2022)
1.	Mobilization/Demobilization, Supervision, Bonds & Insurances	$41,000
2.	New 300 kW Natural Gas Generator	$218,500
3.	Rigging	$7,500
4.	Concrete Foundation	$38,000
5.	Electrical Work	$65,000
6.	Automatic Transfer Switch	$47,500
7.	SCADA Integrations	$15,000
8.	New Gas Service	$50,000
9.	Cash Allowances	$30,000
	Construction Subtotal:	**$512,500**
Engineering Design, Construction and Startup Services		$87,000
Legal		$5,000
Contingencies (10%)		$51,250
Estimated Project Cost (Rounded):		**$655,750**

TABLE 6-8
ROSYLN WATER DISTRICT
ADDITIONAL RELATED CAPITAL IMPROVEMENTS FOR EMERGENCY CONTAMINANT TREATMEN
SUMMARY OF ESTIMATED CAPITAL COSTS

ITEM		ESTIMATED COST (2022)
1.	AOP Treatment at Plant Nos. 1, 2, 3, 5, 6 or 7	$5,000,000
2.	VOC Treatment at Plant Nos. 2, 3, 6 or 7	$2,350,000
3.	PFAS Treatment at Plant Nos. 2, 3, 6 or 7	$1,750,000
4.	Nitrate Treatment at Plant Nos. 1, 2, 4 or 8	$2,400,000
5.	Water Main and Distribution System Upgrades	$250,000
	Construction Subtotal:	**$11,750,000**
Engineering Design, Permitting, Construction and Startup and Legal Services		$2,350,000
Contingencies		$900,000
Estimated Project Cost (Rounded):		**$15,000,000**

TABLE 7-1
ROSLYN WATER DISTRICT
PRELIMINARY CAPITAL COST OPINION SUMMARY

RECOMMENDED IMPROVEMENTS	CAPITAL COST (2022)
AOP Treatment and Well Improvements - Plant No. 4	$8,148,480
GAC Treatment for PFAS - Plant No. 5	$4,974,500
AOP Treatment and Well Improvements - Plant No. 8	$3,816,200
Fuel Oil Tank Replacement - Plant No. 1	$325,389
Fuel Oil Tank Replacement - Plant No. 5	$198,708
Fuel Oil Tank Replacement - Plant No. 6	$149,700
New Generator at Plant No. 3	$655,750
Additional Related Capital Improvements	$15,000,000
TOTAL CAPITAL COST	**$33,268,727**

TABLE 8-1
ROSLYN WATER DISTRICT
COMPARISON OF REVENUE SOURCES
RLWD VS SELECTED WATER DISTRICTS
WITHIN THE TOWN OF NORTH HEMPSTEAD
BASED ON APPROVED 2020 BUDGETS
(% OF REVENUE SOURCE)

REVENUE SOURCE	ALWD	CPWD	GCPK	PWWD	MLWD	RLWD
Sales of water	40%	19%	30%	69%	53%	35%
Hydrant rental	0%	0%	0%	0%	0%	0%
Unmetered water sales	3%	2%	1%	0%	1%	2%
Water service charges	1%	0%	0%	0%	0%	1%
Interest & penalties on water rents	1%	0%	1%	0%	0%	0%
Interest income	0%	0%	0%	0%	0%	0%
Interest income/(Repair reserve)	0%	0%	0%	0%	0%	0%
Rental of real property	0%	0%	5%	0%	2%	0%
Sale of equipment & property	0%	0%	0%	1%	0%	0%
Sale of scrap	0%	0%	0%	0%	0%	0%
Refunds of prior year's expenses	0%	0%	0%	0%	0%	0%
Other unclassified revenue	0%	6%	2%	2%	0%	4%
Pilot	4%	3%	0%	0%	2%	0%
Water services for other communities	0%	0%	0%	0%	4%	0%
Other compensation of loss	0%	0%	0%	0%	2%	0%
Appropriated fund balance	0%	0%	0%	2%	0%	8%
Appropriated capital reserves	0%	0%	0%	0%	0%	0%
Raised by taxation	51%	69%	60%	25%	34%	48%
Year Average	100%	100%	100%	100%	100%	100%

Albertson Water District	*ALWD*
Carl Place Water District	*CPWD*
Garden City Park Water District	*GCPK*
Manhasset-Lakeville Water District	*MLWD*
Port Washington Water District	*PWWD*
Roslyn Water District	*RLWD*

TABLE 8-2
ROSLYN WATER DISTRICT
ESTIMATED PRINCIPAL/INTEREST PAYMENTS & TAX RATE INCREASE
FOR RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

BOND ISSUE = $33,268,727
INT. RATE = 3%

2020 BUDGET TOTAL
TAXABLE VALUATION: $11,941,296

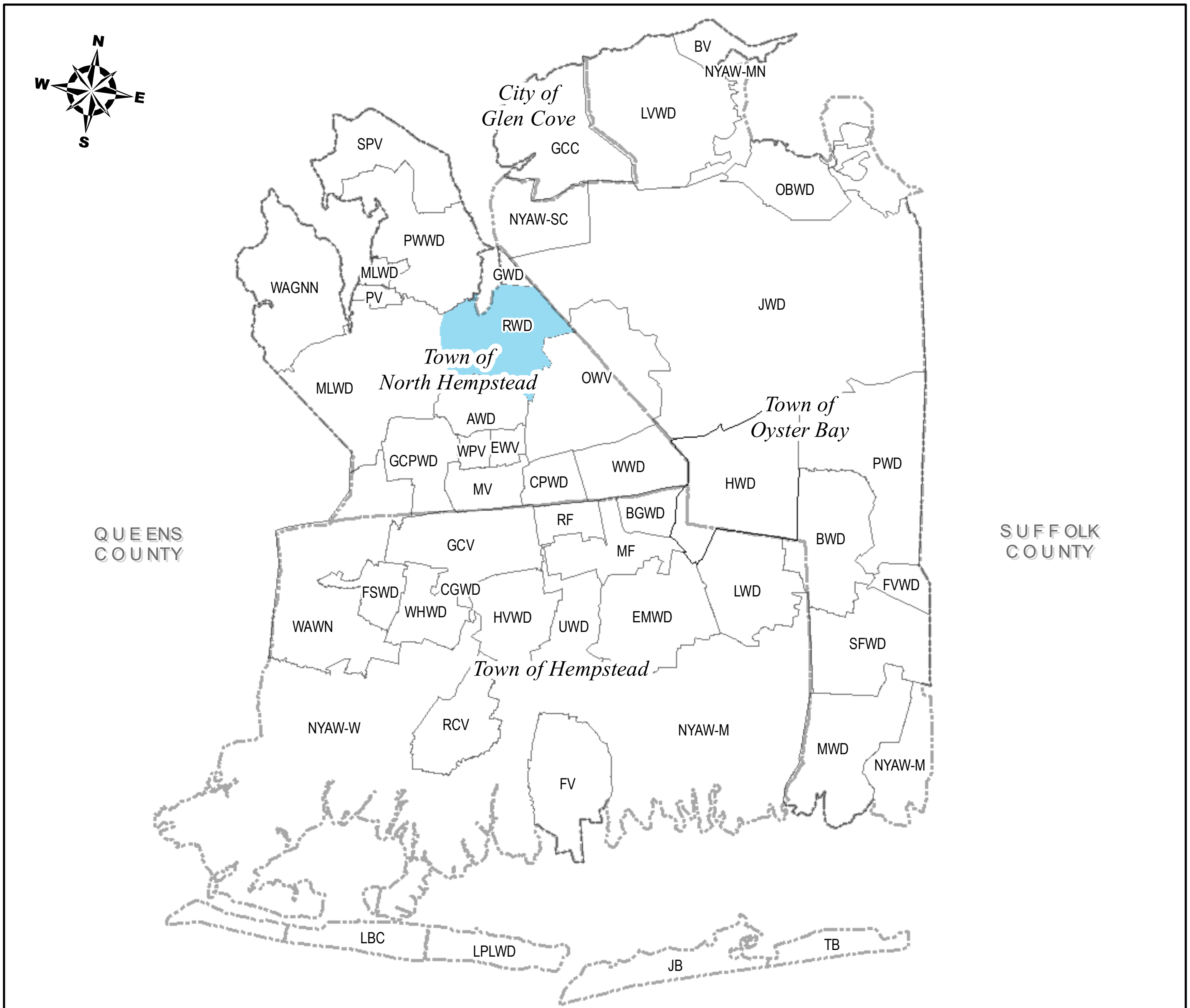
YEAR	OUTSTANDING DEBT ($)	PRINCIPAL ($)	INTEREST ($)	TOTAL PAYMENTS ($)	ASSESSMENT ($)	TAX RATE * PER $100 AV ($)
2021	$33,268,727	$1,238,119	$998,062	$2,236,181	$11,941,296	$18.73
2022	$32,030,608	$1,275,263	$960,918	$2,236,181	$12,001,002	$18.63
2023	$30,755,345	$1,313,521	$922,660	$2,236,181	$12,061,007	$18.54
2024	$29,441,824	$1,352,926	$883,255	$2,236,181	$12,121,313	$18.45
2025	$28,088,898	$1,393,514	$842,667	$2,236,181	$12,181,919	$18.36
2026	$26,695,384	$1,435,320	$800,862	$2,236,181	$12,242,829	$18.27
2027	$25,260,064	$1,478,379	$757,802	$2,236,181	$12,304,043	$18.17
2028	$23,781,685	$1,522,730	$713,451	$2,236,181	$12,365,563	$18.08
2029	$22,258,955	$1,568,412	$667,769	$2,236,181	$12,427,391	$17.99
2030	$20,690,542	$1,615,465	$620,716	$2,236,181	$12,489,528	$17.90
2031	$19,075,078	$1,663,929	$572,252	$2,236,181	$12,551,975	$17.82
2032	$17,411,149	$1,713,847	$522,334	$2,236,181	$12,614,735	$17.73
2033	$15,697,302	$1,765,262	$470,919	$2,236,181	$12,677,809	$17.64
2034	$13,932,041	$1,818,220	$417,961	$2,236,181	$12,741,198	$17.55
2035	$12,113,821	$1,872,766	$363,415	$2,236,181	$12,804,904	$17.46
2036	$10,241,054	$1,928,949	$307,232	$2,236,181	$12,868,929	$17.38
2037	$8,312,105	$1,986,818	$249,363	$2,236,181	$12,933,273	$17.29
2038	$6,325,287	$2,046,422	$189,759	$2,236,181	$12,997,940	$17.20
2039	$4,278,865	$2,107,815	$128,366	$2,236,181	$13,062,929	$17.12
2040	$2,171,050	$2,171,050	$65,131	$2,236,181	$13,128,244	$17.03
2041	$0	$0	$0	$0		

Average Tax Rate over 20 years $17.87 /$100 A.V.

* Estimated tax rates are based on a twenty-year $31,155,700 bond at 3 percent interest and a 0.5% annual increase in Assessed Valuation starting at $11,941,296

** The average annual tax increase for an average home of $1,000,000 is $446.68.

FIGURES



KEY TO NASSAU COUNTY PUBLIC WATER SUPPLIERS

AWD	ALBERTSON W.D.	GCPWD	GARDEN CITY PARK W.D.	MLWD	MANHASSET-LAKEVILLE W.D.	RCV	ROCKVILLE CENTRE (V)
BGWD	BOWLING GREEN W.D.	GCV	GARDEN CITY (V)	MNE	MILL NECK ESTATES	RF	ROOSEVELT FIELD
BV	BAYVILLE (V)	GWD	GLENWOOD W.D.	MV	MINEOLA (V)	RWD	ROSLYN W.D.
BWD	BETHPAGE W.D.	HVWD	HEMPSTEAD (V)	MWD	MASSAPEQUA W.D.	SFWD	SOUTH FARMINGDALE W.D.
CGWD	CATHEDRAL GARDENS W.D.	HWD	HICKSVILLE W.D.	NYAW-M	NY AMERICAN WATER (EAST) - MERRICK	SPV	SANDS POINT (V)
CPWD	CARLE PLACE W.D.	JB	JONES BEACH W.S.	NYAW-SC	NY AMERICAN WATER (EAST) - SEA CLIFF	UWD	UNIONDALE W.D.
EMWD	EAST MEADOW W.D.	JWD	JERICHO W.D.	NYAW-W	NY AMERICAN WATER - WEST	WAGNN	W.A. OF GREAT NECK NORTH
EWV	EAST WILLISTON (V)	LBC	CITY OF LONG BEACH	OBWD	OYSTER BAY W.D.	WAWN	W.A. OF WESTERN NASSAU
FSWD	FRANKLIN SQUARE W.D.	LPLWD	LIDO POINT LOOKOUT W.D.	OWV	OLD WESTBURY (V)	WHWD	WEST HEMPSTEAD W.D.
FV	FREEPORT (V)	LVWD	LOCUST VALLEY W.D.	PV	PLANDOME (V)	WPV	WILLISTON PARK (V)
FVWD	FARMINGDALE (V)	LWD	LEVITTOWN W.D.	PWD	PLAINVIEW W.D.	WWD	WESTBURY W.D.
GCC	CITY OF GLEN COVE	MF	MITCHEL FIELD	PWWD	PORT WASHINGTON W.D.		

FIGURE 2-1
ROSLYN WATER DISTRICT LOCATION MAP

SCALE: 1" = 20,000'±

H2M architects + engineers

Document Path: X:\RLWD (Roslyn Water District) - 10835\RLWD2004 - Bond Report\01-Reports\Figures\Location map.mxd

PROJECT LOCATION

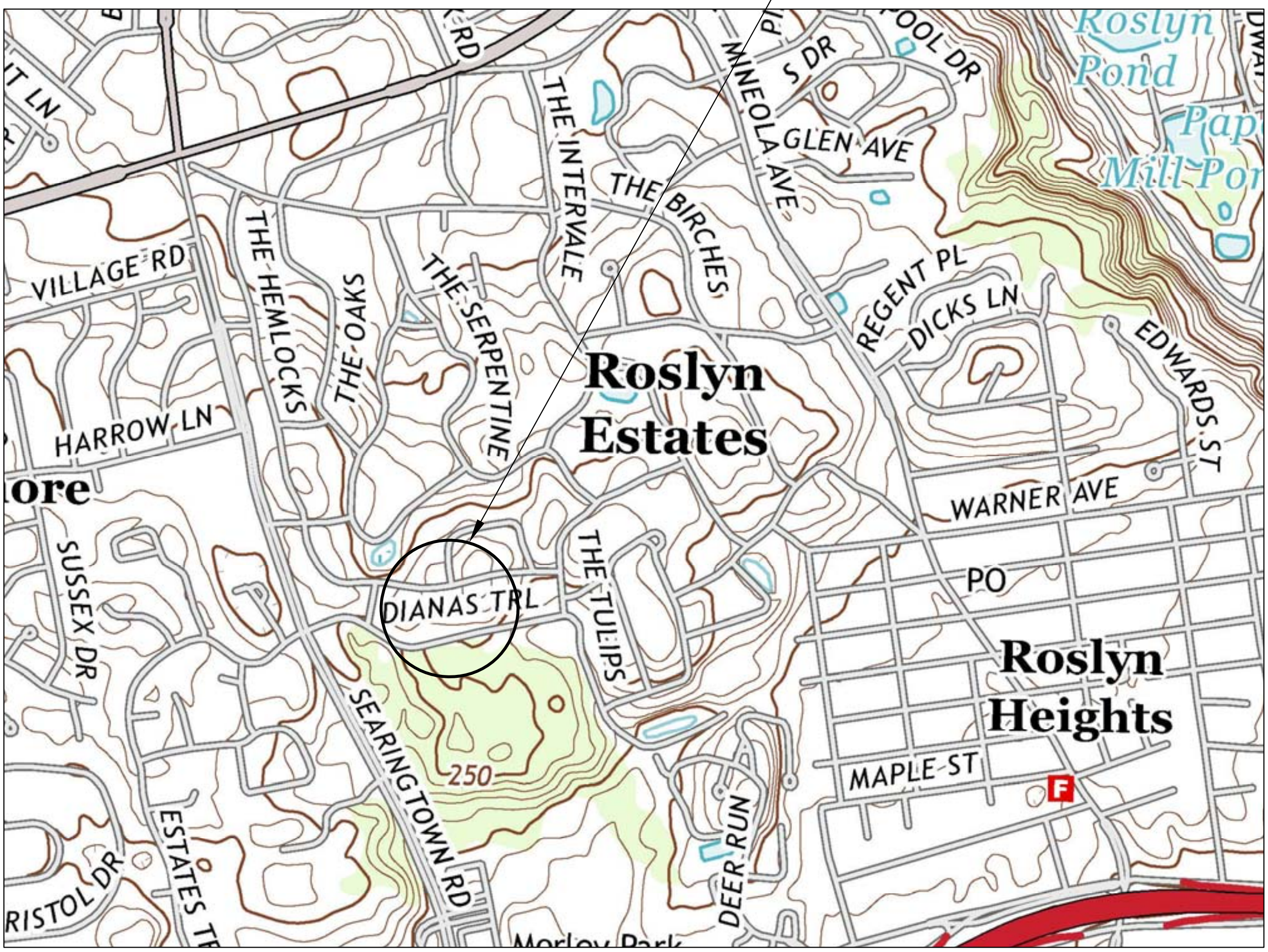


Figure 2-2 : Plant Location Map

SCALE: NTS

N

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