BRYSON & YATES
CONSULTING ENGINEERS, LLC

Jonathan A. Bryson, P.E., C.M.E.
President
Bret T. Yates
Vice President

307 Greentree Road
Sewell, New Jersey 08080
Phone 856-589-1400
Fax 856-582-7976

April 6, 2026
File No. 26051

Mrs. Wendy D. Mahoney, Executive Director
Monroe Municipal Utilities Authority
372 South Main Street
Williamstown, New Jersey 08094

RE: Annual Report on Operation of the System 2026
Monroe Municipal Utilities Authority
Monroe Township, Gloucester County, New Jersey

Dear Mrs. Mahoney:

In accordance with Paragraph 609 of the resolution authorizing the issuance of Revenue Bonds of the Monroe Municipal Utilities Authority, adopted June 8, 1960, we are presenting a report of our inspection including advice and recommendations for the repair, maintenance and operation of the system during the ensuing fiscal year.

This office conducted field inspections and meetings with Authority personnel to observe and assess the Authority's water distribution and sanitary sewer systems.

The following summarizes the analyses of the Authority systems:

I. POTABLE WATER SYSTEM

The potable water system consists of three primary elements: water storage facilities, water supply (wells and third party purchases), and the water distribution system. The Monroe Municipal Utilities Authority presently owns and operates six (6) water storage tanks, eight (8) water production wells, and nearly 165 miles of water mains that constitute the primary element of the distribution system. Each of these items is described in greater detail below.

A. Storage Facilities

1. **Existing Facilities**: The Monroe Municipal Utilities Authority storage facilities consist of three (3) elevated steel and three (3) concrete ground storage tanks. The table below summarizes the capacity and construction of those tanks.

Location	Storage Capacity (gallons)	Construction
Herbert Boulevard	300,000	Elevated Steel
Corkery Lane	1,000,000	Elevated Steel

Location	Storage Capacity (gallons)	Construction
Knights of Columbus	1,000,000	Elevated Steel
Black Horse Pike	2,000,000	Ground Storage - Concrete
Tuckahoe Road	2,000,000	Ground Storage - Concrete
Route 322	2,000,000	Ground Storage - Concrete
Total Storage =	**8,300,000**	

As stipulated in Section 7:19-6.7 of the New Jersey Department of Environmental Protection's Water Supply Allocation Rules, the usable storage requirements exclusive of fire flow requirements shall be 80% of one day's supply. (Type ii System) A summary of the water usage over the past fifteen (15) years is tabulated below.

Annual Water Usage

Year	Water from MMUA Wells	Water from Glassboro	Total Water Used	Average Daily Flow
2011	705,282,000	179,676,000	884,958,000	2,424,542
2012*	762,945,000	179,926,000	942,871,000	2,576,150
2013	672,945,000	179,598,000	852,381,000	2,335,290
2014	681,234,000	180,220,000	861,454,000	2,360,148
2015	757,356,000	176,293,000	933,649,000	2,557,942
2016*	762,713,000	180,038,000	942,751,000	2,575,822
2017	691,017,000	180,696,000	871,713,000	2,388,255
2018	691,206,000	179,580,000	870,786,000	2,385,715
2019	706,254,000	179,600,000	885,854,000	2,426,997
2020*	716,954,000	180,275,000	897,229,000	2,451,445
2021	721,653,000	179,580,000	901,233,000	2,469,132
2022	727,083,000	179,586,000	906,669,000	2,484,025
2023	757,845,000	180,149,000	937,994,000	2,569,847
2024*	783,377,000	180,072,000	963,449,000	2,632,374
2025	747,424,000	179,580,000	927,004,000	2,539,737

All values for water usage tabulated above are in gallons. The asterisk (*) next to the year indicates it was a leap year, with 366 days. For all other years, the average daily flow is based upon a 365-day year.

As shown in the table, the total daily water usage has increased each of the six (6) years prior to 2025, when there was a reduction. Although there was a reduction in total water demands over the past year, increases should be expected due to increases in land development. Currently, most development projects are residential subdivisions. There are several large residential developments presently under construction. From 2019 through 2024 the total number of domestic consumer units has increased by nearly 900 units. That trend continued through 2025. It is also worthy of note that for the first time since 2010 there were four months in 2024 in which the total monthly water demands exceeded 96 million gallons. That occurred during the critical usage months of June, July, and August as well as in September. Fortunately, the Authority was

able to meet all demands. There have been no emergency purchases of water from outside sources since the summer of 2007, when water demands exceeded 90 million gallons per month for six consecutive months. The 963+ million gallons of water used in 2024 was the most since 2007.

The average daily usage for a single-family home or equivalent unit has decreased noticeably over the past twenty years. Every year up to and including 2012, the average daily unit demand was over 200 gallons per day, with a high of over 245 gallons per day during 2006. The average daily demand has remained below 200 gallons per day every year since 2012. In 2025 the daily demand was 179 gallons per day. The reduction in per unit demands can be attributed to customer awareness and conservation measures implemented by the Authority.

As noted above, the total storage capacity of the Authority system is 8.3 million gallons. The New Jersey Department of Environmental Protection (NJDEP) guidelines specify the Authority system must provide a minimum storage capacity of eighty percent (80%) of the average daily demand. Based on the Authority's records tabulated above, the highest average daily demand over a one-year period within the last five years occurred in 2024, when the average daily demand was 2.63± million gallons. The required storage capacity shall be a minimum of 80% of 2.63 million gallons, which equates to approximately 2.10 million gallons. Therefore, the present 8.3 million-gallon storage capacity of the Authority system exceeds the minimum requirements.

The Authority system must also be adequate to maintain sufficient levels of water in the storage facilities during peak flow times. Based on historical data, the peak flow per day over the course of a month's time is generally in the range of 1.4 to 1.8 times the average daily flow. During the last five years the peak demand occurred in June 2024, when the average daily demand was 3.792 million gallons. The average daily flow throughout the 2024 calendar year was 2.632 million gallons. As such, the daily flow during the peak month was approximately 1.4± times the average daily. The ability of the Authority system to supply the storage facilities is described further below in the section on water supply.

2. Proposed Modifications and Additions (Storage Facilities)

The storage tanks are inspected on a periodic basis. The inspections include both interior and exterior inspection. Due to the special equipment and procedures required for internal inspections, the service of a consultant specializing in this kind of work is required. Interior inspections should be performed every three (3) to five (5) years.

Exterior inspections should be conducted annually, much of which can be conducted by Authority personnel. The portion involving working at heights requires special equipment and must be performed by a consultant.

The Monroe MUA presently has three elevated storage tanks in service, as further described below. A detailed inspection of each of the three tanks was conducted within the past several years by Tank Industry Consultants (TIC), a firm that specializes in water storage tank design, inspection, and evaluation. Based on those inspections as well as the age of the various facilities, both short-term and long-term maintenance projects are suggested. The following summarizes those recommendations.

- **1,000,000 Gallon Elevated Tank at the Knights of Columbus**: The water storage tank located on the property behind the Knights of Columbus along the Black Horse Pike has a widespread corrosion problem. As illustrated on the photograph in Figure 1 below, there is rust showing through on the storage bowl as well as the fluted column supporting the bowl. That photo was taken in October of 2025.

  The rust around the bowl is in a fairly advanced condition. It is characterized by large patches of rust that occupy approximately half of the surface area of the storage bowl. This condition has noticeably progressed from year-to-year.

  The corrosion of the supporting column is not as severe as that on the bowl but is nonetheless fairly widespread. As shown on the photograph below, the rust on the column is not as extensive as on the storage bowl. However, the corrosion on the column is not localized but rather is spread throughout the column around the entire perimeter at both high and low elevations. In addition to the visible rust on the exterior of the water storage tank, there is considerable rust at certain locations on the interior.

Figure 1: View looking in a southerly direction toward the Knights of Columbus Water Storage Tank from MMUA property. Note corrosion of the column and storage bowl.

Work is presently underway to clean, prepare and repaint this elevated storage tank. Repainting this tank is a priority with respect to maintenance of the Authority water storage

facilities. The photograph below shows the tank with the scaffolding in place prior to installation of the shroud to protect the surrounding area from paint particles during sandblasting and overspray during repainting.

Figure 2: View looking in an easterly direction toward the Knights of Columbus Water Storage Tank the adjacent "Grandview Mews" development presently under construction. Scaffolding has been erected to facilitate paint removal and repainting.

The color of tank after final painting will change from its current beige to a light blue color. However, all three tanks will be the same color when all work has been completed.

Funding for this project is provided through the New Jersey Infrastructure Bank (I-Bank).

- **1,000,000 Gallon Elevated Tank @ Corkery Lane**: As can be seen on the photograph in Figure 3 below, a significant amount of mold has developed on the bottom of the storage bowl of the elevated storage tank adjacent to Well 7 on Corkery Lane. The mold is extremely unsightly and, if left unattended, could potentially damage the tank coating. The amount of mold has slowly increased each year.

Funds have been approved through the I-Bank to clean and repaint this elevated water storage tank. Contract documents will be advertised for bids upon completion of the Knights of Columbus project described above.

Figure 3: View looking in a northeasterly direction toward the Corkery Lane Water Storage Tank showing dark mold on the bottom of the bowl.

300,000 Gallon Elevated Tank along Herbert Boulevard: The water storage tank located along Herbert Boulevard near the Brookdale residential development is in generally good condition. The Herbert Boulevard water storage tank is the smallest of the Authority's water storage facilities.

As may be seen on the photograph in Figure 4 below, the tank does exhibit some mold development on the lower half of the water storage bowl. As with the two larger water storage tanks, cleaning and repainting are planned for the near future. Funding from the I-Bank has also been approved for this project, which will be the last of three elevated storage tanks to be painted.

Figure 4: View looking in a northwesterly direction toward the water storage tank located along Herbert Boulevard.

- **2,000,000 Gallon Ground Storage Tank on the South Black Horse Pike**: The South Black Horse Pike Water Storage Facility was the first of three 2 million-gallon ground-mounted water storage tanks placed into service by the Monroe Municipal Utilities Authority. This tank was filled and put into service in early 2006. Construction is primarily reinforced concrete, as are all of the ground-mounted tanks. As shown in Figure 5 below, the tank is in excellent condition. There is minor discoloring at the base and edge of the roof due to mold, particularly on the northerly side of the structure. On a short-term basis, cleaning of the exterior of the tank is recommended to inhibit the continued spread of mold on the surface. The Authority does have the ground storage tanks pressure washed periodically to attend to that issue. However, it should be noted that this condition has not significantly changed over the past several years. On a long-term basis, it may be anticipated that preparation and repainting of the tank might be warranted in approximately 15 to 20 years.

Figure 5: View looking in a northerly direction toward the South Black Horse Pike Water Storage Facility.

- **2,000,000 Gallon Ground Storage Tank on Tuckahoe Road**: The second 2 million-gallon ground-mounted water storage tank placed into service was the one along Tuckahoe Road near the high school. As shown in Figure 6b below, the tank is also in excellent condition. The tank was recently pressure washed, and the results are clearly evident.

Figure 6a: View looking in a southerly direction toward the Tuckahoe Road storage tank from near the bike path: Photo from 2025.

Figure 6b: View looking in a southerly direction toward the Tuckahoe Road storage tank from near the bike path: Photo from 2026.

- **2,000,000 Gallon Ground Storage Tank on Route 322**: The Route 322 storage tank was the last storage facility placed into service and is in the best overall condition of the three ground storage tanks. The photograph in Figure 7 below clearly illustrates the excellent condition of this water storage tank. There has been virtually no additional mold growth on this tank in recent years. The mold has remained confined to the upper and lower perimeters of the tank. No surface defects were observed beyond the discoloration due to the black mold.

Figure 7: View looking in a westerly direction toward the Route 322 Water Storage Facility.

B. Water Supply

1. **Existing Facilities**: The Monroe Municipal Utilities Authority presently has in service eight (8) production wells and two (2) aquifer storage recovery (ASR) wells. The wells are periodically rehabilitated to ensure they continually operate at acceptable levels. The Authority also has a contract in place with the Borough of Glassboro for the purchase of water on a daily basis. The contract with Glassboro calls for water to be supplied at a constant rate throughout the year. The Authority purchases 492,000 gallons per day from Glassboro.

   In addition to the contract with Glassboro, the Authority has contracts with the Borough of Clayton and Washington Township to provide for water to be purchased on an emergency basis only. Those contracts are mutually beneficial agreements that would also allow the sale of water to those municipalities on an emergency basis. None of the three municipalities have found it necessary to procure water under emergency conditions within the past fifteen years. The last time the Monroe MUA purchased water on an emergency basis was May 2007, when 3.3 million gallons were purchased from Washington Township. The agreement with the Borough of Glassboro was not in place at that time.

   The table below summarizes the current Authority-owned sources of water available to supply the MMUA water distribution system. The pumping rates indicated reflect the parameters specified in the current Water Allocation Permit issued to the Authority by the New Jersey Department of Environmental Protection on November 8, 2017. This permit is valid until November 30, 2027,

at which time it expires. An application for renewal of the permit must be submitted to the NJDEP in advance of the expiration date for the continued diversion of water from the ground sources.

Well No.	Location	Depth	Pumping Rate (gpm)	Operation Date	HP	Maintenance & Inspection	Elevation
5	Water Street	160’	500	1967	40	Annually	165.28
6	Lake Avenue	146.25’	400	1970	30	Annually	144.25
7	Corkery Lane	143’	800	1979	60	Annually	151.81
8	Black Horse Pike	144.50’	400	1989		Annually	153.09
9	Route 555	150’	300	1994	30	Annually	160.00
10	Route 555	150’	300	1994	30	Annually	155.00
11	(ASR) Corkery Lane	964’	1,500	2000	250	Annually	145.00
12	Coles Mill Road	370’	425	2008	60	Annually	128.37
13	Jackson Road	407’	226	2013		Annually	97.3
14	(ASR) Black Horse Pike	820’	1,700	2008	250	Annually	152.0
	TOTAL	**=**	**6,551**				

Well Nos. 1 and 2 are not production wells but are affiliated with wastewater pump stations for maintenance purposes. Therefore, they are not included in this table. Well No. 3, which also served a pump station, was decommissioned in 2018. Well No. 4 was removed from service and decommissioned in the fall of 1991. Well Nos. 11 and 14 are Aquifer Storage and Recovery (ASR) wells. An ASR well is one in which potable water is injected into the well for later recovery and use. Water is normally injected during the time of year when demands are at a minimum. If needed during high demand times, the water may be pumped out for use in the water distribution system.

An analysis of the capacity of the water supply system to accommodate future flows is performed on an annual basis in support of the application for renewal of the Authority’s Master Permit for the water distribution system. In accordance with NJDEP requirements, this analysis includes an evaluation of the water usage for the most recent 5-year period. The pumping system must be adequate for a maximum pumping period for 18 hours, with the largest pump out of service.

[6,551 gpm – 1,700 (largest unit)] x 1,440 min./day x 75% = 5,239,080 gallons per day.

That rate of water supply must be adequate to meet the demands based on peak usage within the past five (5) years. The peak demand month during the most recent 5-year period was June 2024, when the average daily water usage was 3,791,630 gallons per day. The Authority water supply system is presently able to meet those demands in compliance with the NJDEP requirements.

To date the Authority has been able to meet demands without the use of the ASR wells. The total permitted capacity of the regular production wells is 4.825 million gallons per day, which equates to 3,350 gallons per minute with all wells running concurrently. It should be noted that use of the ASR wells is presently not permitted by the NJDEP due to high nickel count in the water

samples. Clean samples for several consecutive months are required before use would be permissible.

The highest average daily demand over a one-year period within the past ten years occurred in 2024, when the average daily demand was 2.632 million gallons, which is less than the available pumping capacity with the largest unit out of the service. However, the average daily demands during the months of peak usage are typically 1.4 to 1.6 times the overall daily average demand throughout the entire year. This equates to a daily demand of up to about 4.00 million gallons per day, which highlights the need to continue to monitor usage. Furthermore, peak demand rates on a day-to-day basis during hot and dry summer months are typically on a much greater magnitude. As such, it is imperative to maintain the well discharge capacities at their permitted rates to the maximum extent possible.

The Authority must also consider the possibility of a well being out of service for an extended period of time. If this were to occur during the highest demand summer months, the daily water demands could potentially exceed the volume of water available from the ASR wells. The amount of water available for use from the ASR wells is based directly on the volume recharged to the aquifer during the winter months. Typically, 11 to 12 million gallons are recharged each year. In the 20+ years since the ASR wells were drilled, there have been no instances in which withdrawal of water from the ASR wells approached the maximum allowable volume. If this were to happen, it would be necessary to purchase water to meet the additional demands.

2. Modifications and Additions (Water Supply)

- As described herein, the Authority has been able to supply the water demands throughout the Township of Monroe. All regular production wells are generally operating at satisfactory levels, and the wells are adequately supplemented by the purchase of water from the Borough of Glassboro. However, land development projects have increased in recent years, particularly with respect to residential development. After a couple of low usage years, the annual water demands have risen each year since the 2018 calendar year, with the exception of 2025 when there was a slight reduction. A continued increase in water demands should be anticipated resulting from the accumulation of the additional number of occupied residences as land development continues.

  Additional sources of potable water should be investigated as may be needed to supply future demands resultant from the continued development of land. Potential sources to be investigated include additional production wells and interconnections with other water purveyors. Authority-owned production wells would be the preferred method, as it would be under the control of the Authority without contractual requirements relating to specific flow rates. However, it is uncertain whether or not drilling any additional wells would be permitted by the New Jersey Department of Environmental Protection. Meeting with the NJDEP would be recommended to discuss the feasibility of drilling an additional production well. The Executive Director has expressed interest in setting up a meeting with the NJDEP with that in mind. With consideration to the overall time taken to obtain a permit from the State, if that is a possibility, such a meeting should be arranged within a reasonably short time frame.

An additional interconnection should also be explored. There are two potential interconnections near the northwesterly section of Monroe Township: either to the distribution system serving Gloucester Township or that serving Winslow Township. Both receive water from Aqua New Jersey. Therefore, a meeting with Aqua should lead to a determination regarding the availability of water and the ability to convey water to an interconnection point.

C. **Distribution System**

1. **Existing Facilities**: The water distribution system of the Authority is a mix of old and relatively new lines. The center of town is the oldest section with the newer lines on the fringes of the town and progressing outward. Significant items regarding the distribution system are as follows:

   - The Authority has emergency interconnections with Washington Township, Clayton (2), and Glassboro.

   - The Authority utilizes an internal water master plan to coordinate development of the distribution system to provide a system capable of providing services to its users.

   - The Authority should continue to require adequate-sized mains to be looped in all areas of the Township. This approach facilitates satisfactory pressure and flow rates throughout the Authority service area and maximizes fire flow capabilities as needed under emergency conditions. New water mains along County roads and other collectors are typically at least twelve inches (12") in diameter. Water mains in residential neighborhoods are 8-inch mains, minimum, except along short cul-de-sacs, where they might be 6-inch mains.

     In addition to require water systems serving new developments to be looped, the Authority should strive to construct water main extensions to provide loops where some elements of the system presently terminate at dead-end mains. This has been an ongoing process in recent years, with the New Brooklyn Road – Radix Road water main extension the most recently completed.

2. Proposed Modification and Additions (Distribution System)

- The Authority's Water Master Permit application for 2026 will be submitted to the NJDEP during the late spring or early summer. The permit is an annual permit and must be applied for each year. The Authority has applied for and received this permit each year since the initial application was filed in December 2007. The dates of actual issuance of the permits by the NJDEP have varied over time. The initial permits were issued during the month of June. However, the annual permits were released at later dates in each of the past several years, with the most recent permit issue date being September 5, 2025, with an effective date of September 16th. The NJDEP has given no indication of a reason for the "sliding" permit issue dates. Application for permit renewal should be submitted ninety (90) days before the expiration date.

- Water Meter Replacement: The Authority has been replacing existing water meters with meters that are readable through cell phone applications. The new units will be mechanical meters with cellular communications. The cellular communication aspect will enable up-to-the minute readings by the Authority as well as by consumers, so that they can be well-

informed regarding their water usage. Replacement is being phased over several years, with older units being replaced first.

- Lead Service Line Replacement: The State of New Jersey enacted legislation requiring the replacement of all lead service lines by July 2031. The law describes a service line as being from the water main to the building. The definition of a lead service line includes galvanized service lines, on the basis that galvanizing materials are presumed to include lead.

- Sicklerville Road Water Main Replacement: The Authority is planning to replace the existing 6-inch transite water main presently in place along Sicklerville Road (County Route 536 Spur) from the Black Horse Pike to Radix Road. The new water main will be 12-inch ductile iron pipe. This project is consistent with ongoing Authority policies of replacing all transite pipe with ductile iron pipe. It will also provide greater flow capacity by upgrading to a larger pipe. A contract was awarded on April 2nd for construction of the new water main. This will be completed during the spring of 2026 in advance of the planned road resurfacing project by Gloucester County.

- Green Meadows Water Main Replacement: The Green Meadows development is one of the older developments, and the water mains were constructed with cast iron pipe. The Authority water distribution system is subject to occasional water main breaks, and most of these occur in areas where the mains are cast iron pipe. Replacement of those mains with ductile iron pipe would effectively eliminate most of the main breaks in the system. In addition, the entire Green Meadows development is supplied by 6-inch water mains, whereas 8-inch mains are typically standard with modern developments except along short cul-de-sacs.

- Forest Hills Water Main Replacement: Similar to Green Meadows, Forest Hills is supplied through 6-inch cast iron water mains. Furthermore, there are approximately 600± homes in the Forest Hills development. Accordingly, replacement with larger ductile iron mains would be beneficial from both a total water supply perspective as well as a reduction in maintenance concerns.

- The following projects should be considered for construction as funding becomes available.

    - Cross Keys Area – Part 1: The existing water distribution system includes a 12-inch main that runs south along Berlin – Cross Keys Road, terminating at the Nationwide Pump Station. It serves existing homes along Berlin – Cross Keys Road as well as the Sunny Estates residential development. The water source for that main is a 12-inch main that runs along the easterly side of the Black Horse Pike. The main along the State highway also serves as the sole source of water for Sam's Club and the commercial and residential development behind Sam's Club along Berlin – Cross Keys Road

      The water distribution system serving the above-referenced properties should be looped, so that water can be supplied from more than one direction. This may be accomplished by extending the 12-inch main along Berlin – Cross Keys Road from its present terminus at the Nationwide Pump Station to the Cross Keys intersection and thence along Tuckahoe Road to a connection point at Well 9, just north of Roun Avenue. This would entail construction of approximately 5,500± linear feet of 12-inch water main. It would serve to

create a loop for a significant section of the Authority water distribution system as well as provide public water service for existing homes along Tuckahoe Road.

- Cross Keys Area – Part 2: Upon completion of the water main described above, water service could be provided to additional existing homes in the Cross Keys area. This could be effectuated by constructing a water main from the Cross Keys intersection east along Main Street to Cross Keys Avenue. The water main would then be extended along Cross Keys Avenue to a connection point where it intersects Tuckahoe Road, thereby creating a loop. Future extension to provide service to homes in the residential neighborhood adjacent to the Cross Keys Airport would also be feasible.

- Cross Keys Area – Part 3: The final section of Cross Keys that is presently without municipal water service is the area from Cross Keys Avenue to the Comfort Road entrance to the Hamilton Greene development. Extension of a water main along that route would enable those services to be provided for homes along Main Street as well as completing an additional loop in the water distribution system. The actual connection point would be on easterly side of Main Street about 150± feet north of Comfort Road.

- Roun Avenue: This extension would provide water service to existing homes where there is little likelihood that future service would be provided by neighboring land development. It would involve approximately 4,600 feet of 8-inch water main to be constructed from Tuckahoe Road along Roun Avenue, Arch Avenue and New Street to a second connection point along Route 322. This would also serve to provide another loop in the system.

- Black Horse Pike: In order to complete the 12-inch main on the southwesterly side of the Pike from the Knights of Columbus tank to the Township line at Washington Township, it is proposed to extend a 12-inch main from the terminus at approximately the Cross Keys Animal Hospital to the water main serving Colonial Estates. This would be a 2,100± water main extension.

- Herbert Boulevard Water Main Loop: A plan is presently in place for the extension of a 12-inch water main from the existing terminus on Herbert Boulevard along Herbert to Prosser Avenue and thence along Prosser Avenue to Lillian Drive. This water main is planned for construction as part of the Barclay Glen South development. Construction of that development is presently underway.

- There are several projects presently under construction that will have an impact upon the extension of mains throughout the system. These projects include Whitehall Gardens, Malaga Meadows, The Greens, and Blaze Mill. An additional large development is proposed known as Smithfield. The Smithfield property fronts along Glassboro – Cross Keys Road opposite Fazzio's. There will be two entrances from that road as well as one from Glassboro Road (U.S. Route 322). The Smithfield development will include water main construction along both of those roads and will complete another loop of the Authority water distribution system.

- The Authority intends to replace older mains within the system with their in-house forces as time and funding permits. The mains with transite pipe should be the first priority for water main replacement. Secondary to transite pipe would be the replacement of cast iron water mains with cement-lined ductile iron pipe. Authority personnel have replaced some of the

transite pipe in the Flozella Gardens development as well as in other, older sections of the Township. This is an ongoing process that will continue until all older pipe has been replaced.

II. SANITARY SEWER FACILITIES

The sanitary sewer system also consists of three primary elements: the gravity wastewater collection/conveyance network, wastewater pumping stations, and the force mains (pressure pipes) corresponding to each respective pump station.

The gravity sewer system includes sewer mains and manholes located along streets as well as service laterals and cleanouts. The Monroe MUA currently owns and maintains over 125 miles of gravity sewer mains.

A. Pump Stations

There are two types of pump stations presently owned and operated by the Monroe Municipal Utilities Authority. Some of the older lift stations were constructed as "wet well/dry well" stations, also known as "dry pit" stations. The newer pump stations are all "submersible" stations.

As the graphic illustrates in Figure 8 below, there are two separate chambers in this type of pump station. The liquid wastewater flows into the wet well, keeping it separated from the pumping chamber. The pumps and force main valves are positioned in the dry well with a suction pipe from each pump leading to the wet well.

Service on the pumps, valves, and/or anything else within a wet well/dry well station requires compliance with the applicable sections of OSHA's Code of Federal Regulations for Confined Spaces. This includes training for and application of safe entry measures.

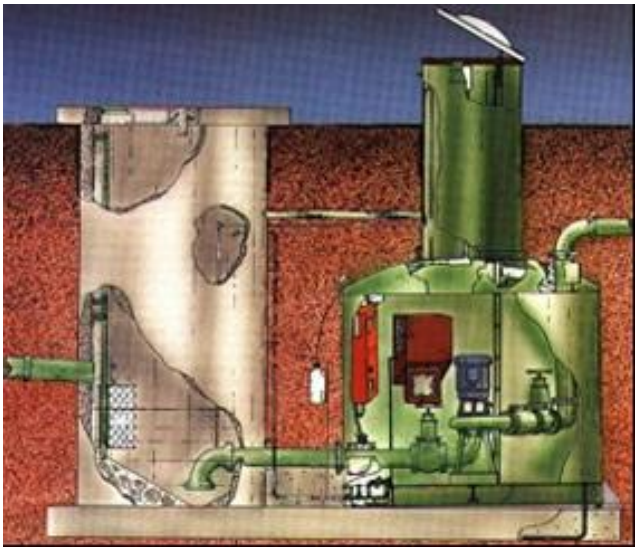

Figure 8: Graphic showing wet well to the left and dry well to the right with a manway leading to the surface with a hinged lid.

The Authority presently has one (1) wet well/dry well station remaining in its inventory: the Forest Hills Pump Station. The Chelsea Farms Pump Station was also a wet well/dry well station, but it was

replaced with the new Mink Lane Pump Station that was constructed as part of the Oak Manor residential development. The Chelsea Farms Pump Station will be dismantled this year.

The rest of the Authority pump stations are submersible stations. The graphic in Figure 9 shows the pumps situated at the bottom of the wet well with the force main valves located in a separate chamber.

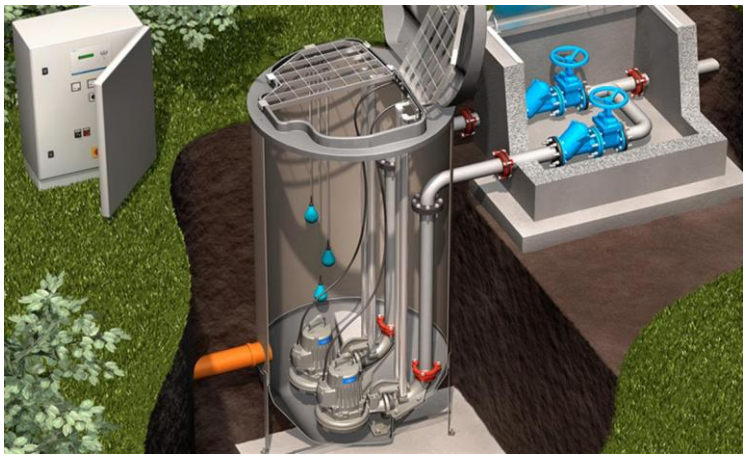

Figure 9: Graphic showing wet well to the left and valve chamber to the right. Pumps are at the bottom of the wet well; removable is through hatches at the top.

The submersible pump stations are equipped with either a jib crane or a lifting davit for removal of the pumps when servicing or replacement is necessary. Each pump has guide rails that facilitate removal and repositioning of the pump with the cable from the davit or crane. This enables maintenance without the need for confined space entry.

1. **Existing Facilities**

The Authority has, within its operation, the following pump stations:

1. Equalization Tank (901)
2. Black Horse Pike (902)
3. Briarwood (903)
4. Forest Drive (904)
5. Kimberly West (905)
6. Mink Lane (906)
7. Ettore Drive (907)
8. Twelve Oaks (908)
9. Melva Lane (909)
10. Blue Bell Farms (910)
11. Lake Avenue (911)
12. Scotland Run (912)
13. North Shore Pumping Station (913)
14. Lake Avenue South (914)
15. Williamsburg Village (915)
16. Deschler Farms (916)
17. The Ridings (917)

18. Tweed Farms (918)
19. Nationwide (919)
20. Preserves (920)
21. Arbours (921)
22. Saddlebrook Chase (922)
23. Carriage Glen (923)
24. Savona (924)
25. Chestnut Greene (925)
26. Scotland Commons (926)
27. Federal Hill (927)
28. Stirling Glen (928)

A brief description of each wastewater pump station is provided below. Examples of both types of pump station shown in the respective photos of the stations.

a. (901) Equalization Tank Pump Station pumps to a 14-inch and 18-inch force main system owned and maintained by the Gloucester County Utilities Authority (GCUA). The force mains discharge the wastewater to elements of the GCUA gravity interceptor system that conveys it to the treatment plant in West Deptford. It has been in service for nearly 50 years.

b. (902) Black Horse Pike Pump Station pumps to a gravity main in the Black Horse Pike south of Jefferson Avenue, which flows to the Equalization Tank. This station receives a large portion of the township's total flow.

c. (903) Briarwood Pump Station pumps to a gravity main in Forest Drive at Aspen Road, which flows into Forest Hills Pumping Station.

d. (904) Forest Hills Pump Station pumps to a gravity main in the Black Horse Pike at Corkery Lane, which flows to the Equalization Tank. This is a typical wet well/dry well pump station.

   The replacement of this station with a new submersible pumping station has been under consideration for several years. This might require a transfer of land under the Green Acres program, because the existing pump station lot abuts municipal open space property that is regulated under the administrative codes of that program. Funding for the construction of the new pump station will be through I-Bank.

e. (905) Kimberly West Pump Station pumps to a gravity main at the Equalization Tank. This pump station was originally constructed as a wet well/dry well station, and there were several modifications over the years. It was replaced with a new submersible pump station several years ago. The new pump station is in compliance with all current Authority standards and requirements. In addition, it was designed with allowances for future expansion as needed to accommodate additional land development within its wastewater collection area. Authority personnel completed the installation of the electrical control equipment and emergency generator to render the station completely functional.

f. (906) Mink Lane Pump Station pumps to a gravity main in Sicklerville Road at Radix Road, which flows to the Black Horse Pike Pump Station. This pump station was constructed within the past year and replaces the Chelsea Farms Pump Station, which was one of the oldest pump stations operated by the Authority. The Chelsea Farms was a wet well/dry well station, as

shown in Figure 10a below. The access manway to the dry well is clearly visible in the center of the photograph. Note the lack of a permanently mounted lifting davit for removal of the pumps and equipment from the dry well.

The pump station was designed solely to handle the wastewater from the Chelsea Farms development and had no surplus capacity to receive additional flows from new development. It was positioned on the corner of a residential lot. Decommissioning of the Chelsea Farms Pump Station will include restoration of the site, so the property parcel can be consolidated with the adjacent residential lot.

Figure 10a: View looking toward the Chelsea Farms Pump Station from the Frederick Street.

Figure 10b: View looking toward new Mink Lane Pump Station from Acorn Lane.

The new Mink Lane Pump Station is a submersible unit, complying with all current MMUA design standards. A view of the new station taken from the street is shown in Figure 10b.

g. (907) Ettore Drive Pump Station pumps to a gravity main in Ettore Drive at Harvard Place, which flows to the Black Horse Pike Pump Station. Ettore Drive is another old, prefabricated pump station that should be scheduled for future replacement.

h. (908) Twelve Oaks Pump Station pumps into the County force main on Tuckahoe Road. This is a triplex (3 pumps) pump station originally designed for the Twelve Oaks and Willowoods developments. However, the wastewater flow to the pump station has increased with the addition of flows from several new residential developments that have been constructed since the completion of Willowoods. They include Federal Hill, the Reserve at Twelve Oaks, Woodview, and Holly Oak Estates that will contribute flows to this station. Studies have shown that any additional development that would contribute wastewater to this pump station would be cause for significant upgrades to the station.

i. (909) Melva Lane Pumping Station pumps to the same GCUA force main system as the Equalization Tank Pump Station (#901). This pump station was designed and constructed to ensure the liquid levels in the equalization tank remain at acceptable elevations. The pumps in

this station have a larger pumping capacity than #901 and are capable of pumping the liquid levels down as needed during times of high flow.

j. (910) Blue Bell Farms Pumping Station pumps to a gravity main in Thackery Lane at Blue Bell Road which flows to the Equalization Tank.

k. (911) Lake Avenue Pumping Station pumps to a gravity main in Kent Road at Pine Street, which flows to the Black Horse Pike Pump Station.

Figure 11: View looking toward the Lake Avenue Pump Station from the rear of the site. Note the jib crane positioned over the wet well.

l. (912) Scotland Run Pumping Station pumps directly into the GCUA force main at Tuckahoe Road. This station was upgraded in 2009 to a submersible type station with new pumps, davit, and generator.

m. (913) North Shore Pumping Station pumps to a gravity main in North Shore Drive, which flows to Lake Avenue South Pumping Station.

n. (914) Lake Avenue South Pumping Station pumps to a gravity main in the Black Horse Pike at Malaga Road, which flows to the Equalization Tank. The Authority upgraded this station in 2011 by replacing the pumps, and general upgrades.

o. (915) Williamsburg Village Pumping Station pumps into a gravity main in Concord Drive near the Black Horse Pike, which flows to the Equalization Tank.

p. (916) Deschler Farms Pumping Station pumps directly into the GCUA force at a point along the bike path main east of Whispering Woods Drive.

The Deschler Farms Pump Station was originally constructed to accept the wastewater from the residential developments in its immediate vicinity. Those developments include Hunter Woods, Tall Oaks, Wild Spring, and The Neighborhoode at Fried Mill (in Clayton). Several other developments have since been constructed that contribute additional flows to the station; including The Ridings, Serenity Woods, and Justin Commons (aka The Willows). Further development is proposed within its contributory area, such as the Blaze Mill Phases 1 - 5 residential subdivision, which is presently under construction. Additional contributory flow will be generated by Blaze Mill Phases 6 – 12. Work on Phases 6 – 12 has not commenced yet. A study completed for that development indicated that the pump station can accommodate the additional flows without upgrades. The pump station must be re-analyzed each time new developments are proposed to ensure adequate capacity. The responsibility for any upgrades would be with the developers.

The Authority has awarded a contract for repairs within the wet well and valve chamber of the Deschler Farms Pump Station.

q. (917) The Ridings Pumping Station – This project is located on Fries Mill Road and Stanger Avenue, opposite Hunter Woods. This station pumps into the gravity main on Fries Mill Road, from whence it flows to the Deschler Farms Pumping Station.

r. (918) Tweed Farms Pumping Station pumps along Andrew Road, Jones Lane and New Brooklyn Road to a manhole in Walnut Street

s. (919) Nationwide Pumping Station pumps to the new GCUA equalization tank site on Fries Mill Road. Since the equalization tank is not presently in operation, the connection was modified to flow directly into the GCUA force main system. This station will have major upgrades completed as part of the Barclay Glen South apartment complex that is presently under construction. All costs associated with the pump station upgrades shall be borne by the developer. A performance bond for those upgrades is presently in place.

t. (920) The Preserves Pumping Station is located at the Preserves subdivision and services the adjacent area. This pump station ultimately discharges into the Kimberly West Pump Station.

u. (921) The Arbours Pumping Station is a pump station within the Arbours Subdivision, along Blue Bell Road.

Figure 12: View looking toward the Arbours Pump Station from the southeasterly corner of the pump station lot.

v. (922) Saddlebrook Chase Pumping Station pumps into a manhole on Radix Road.

w. (923) Carriage Glen Pumping Station pumps along Malaga Road to a manhole at the Black Horse Pike. This station pumps via force main under the Black Horse Pike.

x. (924) Savona Pumping Station pumps into a manhole at Corkery Lane and Black Horse Pike.

y. (925) Chestnut Greene (Corkery Lane Estates) Pumping Station pumps into a manhole within the project, which ultimately discharges to the Blue Bell Road, pump station.

z. (926) Scotland Commons Pumping Station - This is a subregional station, constructed at a depth to service the adjacent watershed, as per the Authority pump station master plan. The force main extends along Route 322 to a connection point at a manhole in Whispering Woods Drive.

aa. (927) Federal Hill - This is a relatively new station with submersible pumps. The force main runs along Tuckahoe Road to its connection point at a manhole in Twelve Oaks Drive.

bb. (928) Stirling Glen – This is the Authority's newest pump station and placed into service in July 2016. The force main runs from the cul-de-sac at the rear of the site to a connection with the existing Nationwide force main where it crosses Castlebay Drive; the entrance street to Stirling Glen.

2. **Proposed Pump Station Modifications and Additions**

The following summarizes the proposed replacements and/or modifications for existing Authority pump stations. If a given pump station is not included in this list, no upgrades and/or improvements are proposed at this time.

- 904 Forest Hills Pump Station: This station is scheduled for replacement as funds became available through I-Bank. A submersible pump station will be constructed to replace the existing wet well/dry well station.

- 916 Deschler Farms Pump Station has been in operation for approximately 35 years. It has been determined that replacement of the pumps is warranted and should be completed on a short-term basis.

B. **Collection System**

1. **Existing System**

- The Authority Collection System is in good condition, although there are areas that are considered high maintenance areas. Those areas can be identified by Authority personnel utilizing the video camera system purchased with that purpose in mind. Holiday City has been identified as an area of concern.

- Infiltration and inflow are an ongoing concern with all wastewater collection systems. They result in extraneous flows in the sewer system that cause additional costs for conveyance and treatment. Accordingly, they should be minimized to the maximum extent practicable.

  "Infiltration" occurs when groundwater enters a sewer system through broken pipes, defective pipe joints, or illegal connections of foundation drains. "Inflow" is surface runoff from storm events that enters a sewer system through manhole covers, exposed broken pipe and defective pipe joints, cross connections between storm sewers and sanitary sewers, and illegal connection of roof leaders, cellar drains, yard drains, or catch basins.

  Excessive infiltration and inflow result in increased costs for conveyance and treatment of wastewater, particularly with the Gloucester County Utilities Authority (GCUA). The GCUA bills the Authority based on metered flows that enter their system. Consequently, a decrease in I/I flow would correspond to a reduction in billing and payments to the GCUA.

2. Sewer System Rehabilitation

- Elements of the gravity sewer system may be rehabilitated using cured in place pipe (CIPP), which is a method of sealing the pipe against infiltration of groundwater without requiring excavation of the pipe. This approach reduces the overall costs of rehabilitation, because it eliminates the expense of restoration, particularly in paved streets. It is particularly useful in areas where the sewer pipe ten feet or greater in depth.

- Video inspection of the Holiday City gravity collection system has revealed areas where infiltration is significant. Replacement of segments of the sewer system would be warranted to ensure the best long-term solution to correct the infiltration problem.

CAPITAL PROJECT COST SUMMARY

The following summarizes capital projects that should be considered within the time frames noted. Except where noted, the estimated costs indicated are based on the premise that the project will be advertised for construction bids by private utility contractors.

Water System Projects

Project	1 – 5 Years	5 - 10 Years	10+ Years
Knights of Columbus Water Storage Tank Painting	$1,000,000±		
Corkery Lane Water Storage Tank Painting	$1,500,000±		
Herbert Boulevard Water Storage Tank Painting	$750,000		
Black Horse Pike Water Storage Tank Interior Cleaning	$50,000		
Tuckahoe Road Water Storage Tank Interior Cleaning	$50,000		
Route 322 Water Storage Tank Interior Cleaning	$50,000		
Roun Avenue Water Main Loop		$250,000	
Water Main Replacement	$1,000,000	$500,000	$500,000
Black Horse Pike Water Main Loop			$500,000
Lead Service Line Replacement	$200,000	$100,000	$100,000
Wells 12 & 13 Upgrades	$250,000	$2,000,000	
Green Meadows Water Main Replacement		$750,000	
Forest Hills Water Main Replacement		$750,000	
Aqua New Jersey Interconnect		$1,000,000	
New Production Well		$2,000,000	

Sanitary Sewer Projects

Project	1 – 5 Years	5 - 10 Years	10+ Years
Forest Hills Pump Station Replacement	$1,500,000		
Carriage Glen Pump Station – Upgrade Pumps and Generator		$100,000	
Sanitary Sewer Rehabilitation	$50,000	$50,000	$50,000
Holiday City Inspection/Rehab	$200,000	$100,000	$100,000
Deschler Farms Pump Station Rehabilitation	$200,000		

IV. **CONCLUSION**

Based upon my review in concert with Authority operations staff, I believe the Authority's physical systems to be in good condition. The proposed improvements described herein were determined based partly on the age of certain elements of the system and partly on needs created by the expansion of land development and the corresponding increase in demands on the system. If you have any questions, please do not hesitate to contact this office.

Very truly yours,

BRYSON & YATES, LLC

James A. Spratt., P.E., C.M.E.
Authority Engineer

JAS/