



**DESCRIPTION OF EXISTING WATER & SANITARY
MUNICIPAL UTILITY FACILITIES**

PREPARED FOR

CITY OF SALEM
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October 2020

Executive Summary

In the spring of 2020, the City authorized Remington & Vernick Engineers to prepare an evaluation of the existing water and sanitary facilities. The purpose of the study was to identify the current and long-term needs of the systems and to estimate the long-term cost of operation and maintenance of the systems. The evaluation was requested to provide a comprehensive, transparent overview of the systems as the City is trying to establish the long-term costs of the systems based upon the current debt service and future needs.

To develop a complete understanding of the existing systems and the City's current operations, the City invited Remington & Vernick staff to tour the existing water and sewer facilities, review past and current utility records, and interview utility personnel. Based upon the review of the existing system, it is our opinion that the existing above ground infrastructure requires significant rehabilitation. While investment has been made by the City over the past 20 years to upgrade the utility systems, additional work is still necessary to replace and improve aging and failing infrastructure in older sections of the existing utility systems.

During the system evaluation, it was noted that the Utility Department is proactive in their inspection and planned improvements of some of the critical elements of the system (i.e. pump stations and wells). However, sufficient funds are not available for the routine maintenance and necessary upgrades of the above grade and below grade infrastructure (i.e. water and sanitary sewer main). During inspection, equipment in the treatment facilities were not working and in need of repair. In addition, much of the City's below grade infrastructure dates back to the original installation of water and sewer infrastructure in the City, with much of the system dating back to the 1800s. This lack of historical investment is experienced in many older systems. Particularly with the below grade infrastructure which is "out of sight, out of mind". However, a proactive approach to replacement of the aging distribution and conveyance system is more cost effective than a reactive (repair) approach and enhances the condition and performance of the utility system.

Much of this report involves the discussion of the sustained maintenance of the City's water and sewer utility infrastructure. The contents of this report are the platform on which development of the water utility and sanitary utility improvement plan over the next 20 years is predicated. This is the improvement plan that the City should consider in their planning and annual budgets.

As is demonstrated in this report, the planned replacement of the below grade infrastructure is *conservative*. This conservative approach was selected to allow the City to budget for prioritized routine replacements while not replacing the infrastructure before the end of its useful life. As is clear in the report, the City has the ability to examine the progress of the 20-year plan on an annual basis and adjust the improvement budget to make sufficient improvements, as required, to maintain and modernize the utility infrastructure.

Based upon this analysis approach, it is estimated that annual Utility fees over the next 20 years should consist of, on average, the following:

<i>Annual Capital Improvement Costs (Above grade Infrastructure) =</i>	\$ 638,415
<i>Annual Water Distribution System Improvement Costs =</i>	\$ 187,500
<i>Annual Sanitary Conveyance System Improvement Costs =</i>	\$ 118,750

Estimated <i>Annual</i> Utility Capital Improvement Budget=	\$ 944,665**
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** Does not include the annual Operation Budget (salaries, statutory expenditures, etc.), additional Utility Staff or Debt Service.

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**DESCRIPTION OF EXISTING WATER & SANITARY MUNICIPAL UTILITY
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Section 1 - Introduction

The City of Salem (City) is located in Salem County, New Jersey. It covers approximately 2.8 square miles of area and has approximately 5,000 residents. The City owns and operates their own potable water supply, water treatment plant, water distribution system, a series of sanitary sewer lift stations, a sanitary sewer conveyance system, and a wastewater treatment plant.

In March 2020, the City authorized Remington & Vernick Engineers to tour their existing utility facilities, review current records, and interview utility personnel to prepare an evaluation of the existing utility facilities. Included in the evaluation of the system was an analysis of both above ground and below ground infrastructure. The condition of existing infrastructure based upon known age, recent improvements/upgrades, repair /emergency response records, operational/maintenance records, interviews with the operator and physical observations were utilized to evaluate the system.

The intent of the evaluation is to provide a summary of the City of Salem major utility facilities and present findings and recommended improvements regarding the physical condition, operation, and maintenance of these facilities. As noted in numerous sections of this report, the City utility is a mixture of newer facilities (Water Treatment Plant, Oak Street Pump Station, Magnolia Pump Station) with portions of the system that are much older and are approaching the end of their useful life.

The City has made minimal improvements to the below grade water and sanitary infrastructure through the years. As such, much of the City's original infrastructure, dating back to the 1880s, remains in place and in service. This includes older cast iron mains, which have now exceeded their expected service lives.

Accordingly, a number of the recommendations presented herein relate to the age as well as the current operation of much of the existing facilities. This report should serve as a mechanism to assess the current condition of the water and sewer systems. This report also provides an analysis of the existing utility infrastructure needs and improvements which are recommended for the City to maintain proper operation of the utility and plan for long term sustainability. It should be noted that the recommendations presented herein are the minimum improvements necessary to allow for the reliable operation and sustainability of the system. The improvements presented do not present a "perfect" system. Since estimated costs are provided for all outlined improvements, the City may use this report for preliminary budgeting and as a basis for rate review discussions to establish the short and long term financial impact of the improvements on the City residents.

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Section 2 - Water Supply, Treatment and Distribution

2.1. General Description

The existing water supply, treatment and distribution system consists of four (4) actively permitted water supply wells, one (1) water treatment plant, one (1) elevated water storage tank, one (1) standpipe, and the water distribution system. The age of the water system infrastructure ranges from 1880 to more recent improvements completed as recent as 2014.

The City provides water service to the residents of the City of Salem as well as portions of Quinton Township and Mannington Township. The City owns and operates the infrastructure in the outlying service area including the responsibility of responding to emergency calls. A copy of the most recent Water Service Map and infrastructure is included in Appendix A. It should be noted that at the time of this submission, the City did not have a formal GIS water system map other than the aerial provided in Appendix A.

2.2. Allocation Permit & Projected Water Demand

The City is currently operating under their Allocation Permit #5290 that became effective on December 1, 2015 and will expire on December 1, 2025. The diversion sources included in this permit are wells No. 2, 6, 7, and 8 and surface water intakes from Laurel Lake and Elkinton Pond. The City is limited to pump from all diversion sources at a total of 93 million gallons per month at a maximum rate of 5,160 gallons per minute with a maximum annual diversion of 900 million gallons per year. Total diversion from the wells are limited to 1000 gallons per minute, 36 million gallons per month, and 372 million gallons per year.

In 2015, the NJDEP increased the annual maximum well allocation for the City from 300 MGY to 372 MGY due to concerns with the surface water treatment system. It should be noted that none of the four (4) wells are located in the regional *Critical Area 2* as designated by the New Jersey Department of Environmental Protection (NJDEP).

Over the last few decades, the City has seen a decline in population and industry. Due to this decline, projected water demands are stagnant over the next 20 years. With the increase in the yearly well allocation, the City should be able to meet its demands with its wells only. Should an increase in demand occur in the future, the City will have additional allocation available from surface water sources. A copy of the current allocation permit is provided in Appendix B. As previously noted, this permit is due to expire in 2025.

2.3. Current Water Demand

As noted above, the current allocation permit will support current and projected demands in the City of Salem. Based upon the most current records provided by the NJDEP, the City has available allocation from its wells to meet its current peak demands as noted below.

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	Current Peak	Committed Peak	Total Peak	City Allocation Permit Limits
Daily Demand	1.018 MGD	0.00 MGD	1.018 MGD	3.00 MGD
Monthly Demand	31.551 MGM	0.00 MGM	31.551 MGM	93.0 MGM
Yearly Demand	328.728 MGY	0.00 MGY	328.728 MGY	900.0 MGY

Figures based upon NJDEP data last updated 11/26/2019

2.4. Typical Well Operation

All four (4) wells currently permitted in the City are transmitted to the Water Treatment Plant located at the intersection of Grieves Parkway and Route 49. There is a single point of entry into the plant prior to entering the treatment process. Prior to construction of the water treatment plant, the raw water from each well was treated at the well buildings before entering the distribution system.

The City typically runs all four (4) wells simultaneously during the night to fill the water tanks. The wells are only operated during the day to maintain system pressure as needed. Wells #2 and #8 are run at a reduced capacity to limit the amount of chlorides in the water.

The portion of the water treatment plant dedicated to the treatment of surface water is offline due to taste and odor concerns. The use of surface water would result in a substantial increase in capacity of the water treatment plant.

The City does not have any emergency interconnections and relies strictly on its own wells for supply during normal and emergency conditions.

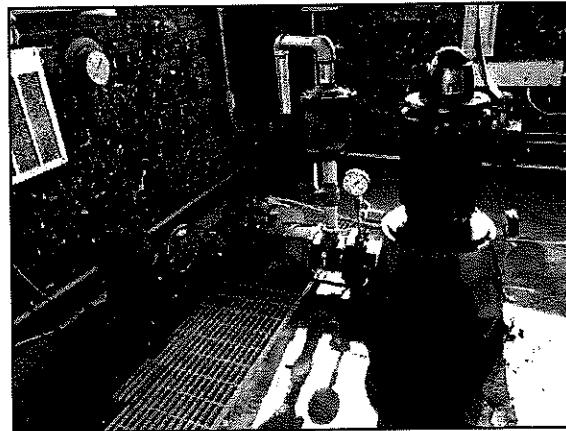
2.5. Water Utility Facilities

The following section provides technical information on the water supply, treatment and distribution systems, including observations of the facilities and information provided by the licensed operator. Anticipated future facility improvements focus on the physical conditions, site conditions, and equipment operation and maintenance including observations at the time of the facility tours.

In general, the water supply, treatment, and pumping facilities are noted to be a mixture of newer infrastructure and older infrastructure which is nearing the end of its useful life. Most of the recommended capital improvements are related to improving routine maintenance operations for sustainable operation of the system and planning for the replacement of aging infrastructure.

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2.5.1. Potable Well No. 2



Well No. 2

Site & Well Description

Well No. 2 is located on Grieves Parkway, near the Water Treatment Plant, toward Route 49. The well site is located in a commercial area between Grieves Parkway and an adjacent business. The well is located in a brick building surrounded by a security fence. Parking at the site is limited to the grass around the fencing and on the street.

Well No. 2 was originally installed in 1936 and is located in the Mt. Laurel-Wenonah aquifer. The well has a depth of 150 feet and is allocated for 500 GPM. Due to the age of the well, the original specific capacity of the well is unknown. Approximately eight years ago, the well was redeveloped and the pump was rehabilitated. In its current condition, the well is capable of 315 Gallons per Minute (GPM). However, the well is operated at a lower rate due to high levels of chlorides in the water.

Historically, the City does not inspect or replace the wells or well pumps on a routine basis. Work is done on an as needed basis and typically at failure. For long term capital improvement planning, the City should plan to replace the well in the next 10 years. The city should also plan for the redevelopment and pump replacement of the well at least every 10 years thereafter. This routine maintenance will add reliability to the system and will assist in limiting the unplanned failures which impact both operations and the utility budget.

The building was estimated to have been constructed following the well installation, approximately 80 years ago, with an addition constructed years later for the chemical treatment system required until the new Water Treatment Plant was installed. The brick building appeared to be in fair condition given its age. No apparent leaks were observed in the walls or ceiling. Consideration should be given to upgrades to the building within the next 10 years including roof and window upgrades.

The pump and piping are located inside the well building. The piping runs along the floor and then elbows below grade for the run to the Water Treatment Plant. The flow meter is located below grade, with removable grating in the floor for access. There is significant corrosion on the exterior of the piping and the bottom of the discharge head.

Electrical and Controls

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The electrical and control equipment appears to be older, but in operable condition, with no issues noted by the operator. The well pump motor which was replaced during the previous redevelopment work is rated for 20 HP and is premium efficient. The motor is controlled by a variable frequency drive (VFD), located in the well building. The control of the VFD and well pump is managed manually at the well building.

An on-site backup generator was manufactured in 2001 and was rated for 35 kW. The generator was located outside the building and appeared to be in fair condition for its age.

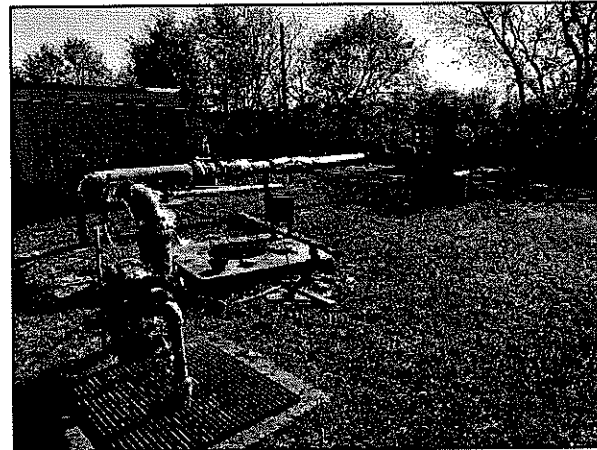
Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for Well No. 2 during the 20-year planning period:

- Well Replacement. The well is over 80 years old, has exceeded its expected service life and has lost capacity. The well should be scheduled for replacement in the next 10 years. At this time, upgrades to the building should be incorporated.
- Well Redevelopment and Pump Rebuild/Replacement (once every ten years)

2.5.2. Potable Well No.6

Site & Well Description



Well No. 6

Well No. 6 is located on Grieves Parkway, across the street from the Water Treatment Plant at the Public Works Facility. The site is grass covered with much of the piping exposed to the weather. This site has sufficient parking for utility and maintenance vehicles on the grass area around the well. The well is secured by a security fence at the front of the facility entrance.

Well No. 6 was originally installed in 2002 and is located in the Mt. Laurel-Wenonah aquifer. The well has a depth of 171 feet and is allocated for 250 GPM. The original specific capacity of the well was 3.33 while pumping 370 GPM. Approximately eight years ago, the well was redeveloped and the pump was rehabilitated. In its current condition, the well is capable of approximately 140 Gallons per Minute (GPM).

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Historically, the City does not inspect or replace the wells or well pumps on a routine basis. Work is done on an as needed basis. Due to the loss in capacity, the city should plan for the redevelopment and pump replacement of the well in the next few years and at least every 10 years thereafter.

The well building was estimated to have been constructed following the well installation, approximately 18 years ago, for the chemical treatment system required until the new Water Treatment Plant was installed. The well building is of wood construction, similar to a shed. The building appeared to be in fair condition given its age and is of limited use at this time for housing electrical equipment. Due to the type of construction, consideration shall be given to replacement of the building over the next 20 years.

The pump and piping are located behind the well building in a grass area. The piping runs above grade and then elbows below grade for the run to the Water Treatment Plant. The insulation on the piping is deteriorated and missing in some locations.

Electrical and Controls

The electrical and control equipment appears to be older, but in fair condition, with no issues noted by the operator. The well pump motor is rated for 50 HP and is premium efficient. The motor is controlled by a VFD controller, located in the well building. The control of the VFD and well pump is managed manually at the well building.

An on-site backup generator was manufactured in 2001 and was rated for 80 kW. The generator was located near the well and appeared to be in fair condition for its age.

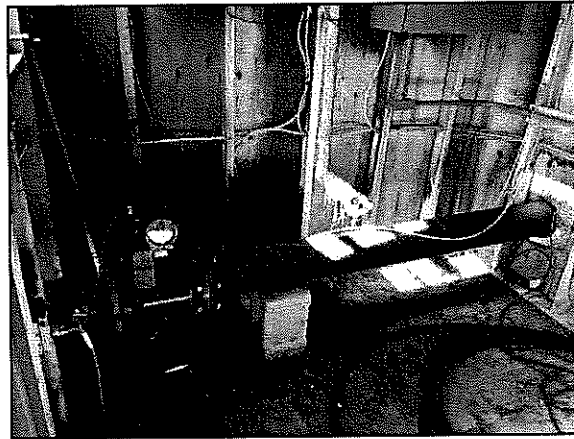
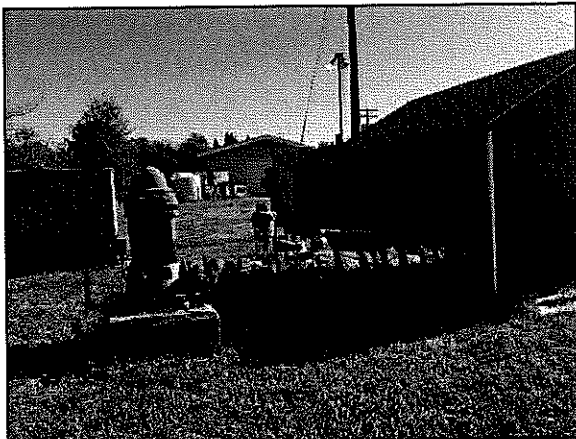
Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for Well No. 6 during the 20-year planning period:

- Install a site security fence around the well and piping.
- Well Redevelopment and Pump Rebuild/Replacement (once every ten years)

2.5.3. Potable Well No.7

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Well No. 7

Well No. 7 is located on Grieves Parkway, behind the Water Treatment Plant. The site is grass covered with much of the piping exposed to the weather. This site has sufficient parking for utility and maintenance vehicles behind the Water Treatment Plant and on the grass area around the well. The well is secured by a security fence around the Water Treatment Plant facility.

Well No. 7 was originally installed in 2002 and is located in the Mt. Laurel-Wenonah aquifer. The well has a depth of 165 feet and is allocated for 250 GPM. The original specific capacity of the well was 4.46 while pumping 324 GPM. Approximately eight years ago, the well was redeveloped and the pump was rehabilitated. In its current condition, the well is capable of approximately 70 Gallons per Minute (GPM).

Historically, the City does not inspect or replace the wells or well pumps on a routine basis. Work is done on an as needed basis. Due to the loss in capacity, the city should plan for the redevelopment and pump replacement of the well in the next few years and at least every 10 years thereafter.

The well building was estimated to have been constructed following the well installation, approximately 18 years ago, for the chemical treatment system required until the new Water Treatment Plant was installed. The well building is of wood construction, similar to a shed. The building appeared to be in fair condition given its age and is of limited use at this time for housing the flow meter along with some piping and electrical equipment.

The pump and most of the above grade piping are located behind the well building in a grass area. The piping runs above grade, through the well building, and then elbows below grade for the run to the Water Treatment Plant. The insulation on the piping had been replaced since the rehabilitation, but appeared to be of a lower insulating value than standard pipe insulation and should be replaced to protect the well piping.

Electrical and Controls

The electrical and control equipment appears to be older, but in fair condition, with no issues noted by the operator. The well pump motor is rated for 40 HP and is premium efficient. The motor is controlled by a VFD controller, located next to the well. The control of the VFD and well pump is managed manually at the well site.

An on-site backup generator was manufactured in 2003 and was rated for 60 kW. The generator was located near the well and appeared to be in fair condition for its age.

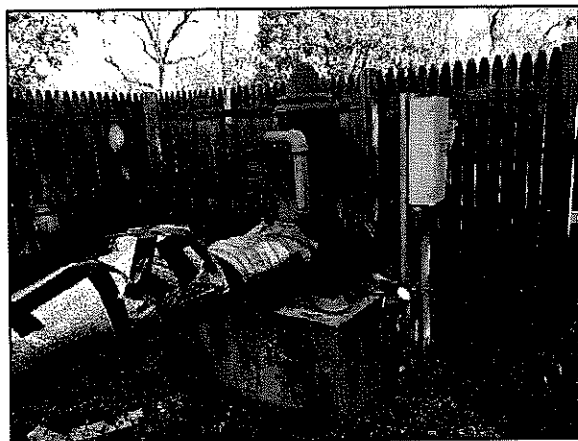
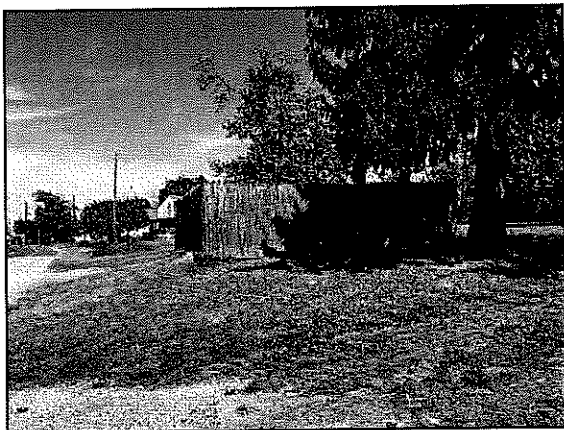
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Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for Well No. 7 during the 20-year planning period:

- Well Redevelopment and Pump Rebuild/Replacement in the next few years and at least once every ten years thereafter.

2.5.4. Potable Well No.8



Well No. 8

General Site / Well Description

Well No. 8 is located at the corner of Waterworks Road and Lake Road in Quinton Township, approximately 3 miles from the Water Treatment Plant, across the street from the Surface Water Pump Station. The well is secured by a wood security fence around the well and piping. Parking for Well No. 8 is available either on the street or on the grass area around the fence.

Well No. 8 was originally installed in 2014 and is located in the Mt. Laurel-Wenonah aquifer. The well has a depth of 283 feet and is allocated for 300 GPM. The original specific capacity of the well was 2.47 while pumping 302 GPM. In its current condition, the well is still capable of 300 Gallons per Minute (GPM).

Historically, the City does not inspect or replace the wells or well pumps on a routine basis. Work is done on an as needed basis. Due to the age of the well, the city should plan for the redevelopment and pump replacement of the well in the next five years and at least every 10 years thereafter.

The pump and all of the above grade piping are located in a grass area. The piping runs above grade and then elbows below grade for the run to the Water Treatment Plant. The well piping connects to the piping from the Surface Water Pump Station to the Water Treatment Plant. The insulation on the piping had been installed since the rehabilitation but appears to be of a lower insulating value than standard pipe insulation.

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The electrical and control equipment appears to be in good condition, having been installed during the well installation project. The well pump motor is rated for 30 HP and is premium efficient. The motor is controlled by a VFD controller, located inside the Surface Water Pump Station. The control of the VFD and well pump is managed by the SCADA system at the Water Treatment Plant.

Backup power is provided to the well pump through the generator at the Surface Water Pump Station.

Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for Well No. 8 during the 20-year planning period:

- Well Redevelopment and Pump Rebuild/Replacement in the next five years and at least once every ten years thereafter.

2.5.5. Potable Well No.9

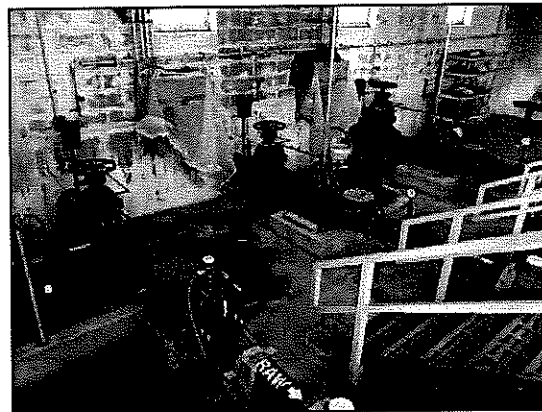
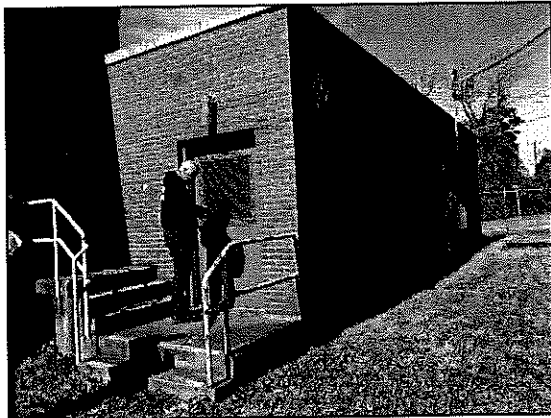
A new well is being constructed, which is scheduled for completion at the end of 2020. The well is located on Walnut Street, near the City of Salem High School. The well will be similar in depth to their other wells and is anticipated to supply approximately 250-300 GPM. The well site will contain a chemical building to chlorinate the water prior to entering the distribution system. The well will not pump directly to the Water Treatment Plant.

Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for Well No. 9 during the 20-year planning period:

- Well Redevelopment and Pump Rebuild/Replacement (once every ten years)

2.5.6. Surface Water Pump Station



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General Site / Well Description

The Surface Water Pump Station is located at the intersection of Waterworks Road and Lake road, next to Laurel Lake in Quinton Township. The pump station pumps water from the lake to the Water Treatment Plant. Parking is available on the street or inside the fence near the entrance to the building.

The pump station has three pumps available to pump water from Laurel Lake to the Water Treatment Plant. The pumps are rated for 800, 1200, and 1500 GPM. The pump motors are rated for 15, 30, and 30 HP, respectively. The pumps were installed during construction of the new Water Treatment Plant in 2012. The pumps appeared to be in good condition, however, they have not been operated in several years. The piping for all three pumps connected to the water main in the street, which conveyed the water to the Water Treatment Plant. The piping also appeared to be in good condition, with limited use.

Historically, the City does not inspect or replace the pumps on a routine basis. Work is done on an as needed basis. Due to the age of the pumps, the city should plan for the rehabilitation of the pumps if the city plans to treat surface water again.

The pump station building was estimated to have been constructed approximately 50 years ago. The building is constructed of CMU block walls with a brick veneer. The building was renovated in 2012 as part of the Water Treatment Plant project. The interior of the building was refinished with new platforms and stairways. The building appears to be in good condition for its age.

Electrical and Controls

The electrical and control equipment appears to be in good condition, having been installed approximately 8 years ago. The pumps operated on VFDs, which could be controlled from the Water Treatment Plant.

An on-site backup generator was installed during the rehabilitation of the pump station, approximately 8 years ago, and was rated for 100 kW. The generator was located just outside the pump station inside a security fence.

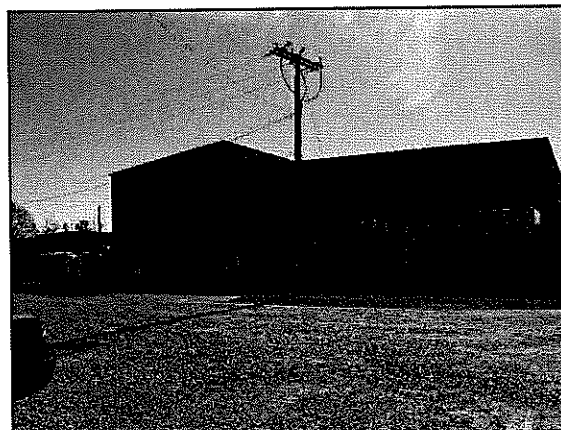
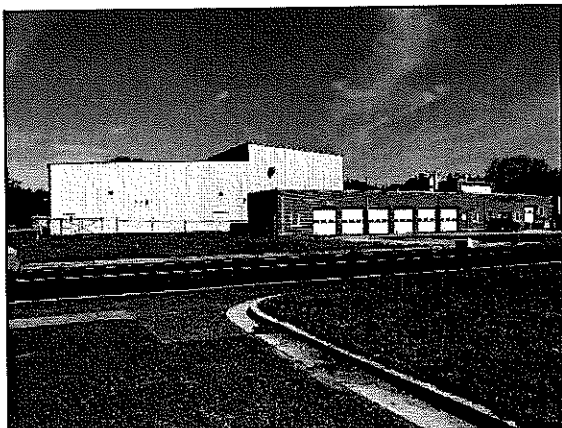
Long Term Capital Improvements

It is anticipated that the following improvements will be necessary for the Surface Water Pump Station during the 20-year planning period:

- Pump Rebuild/Replacement when restarting the surface water treatment system.

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2.5.7. Water Treatment Plant



Water Treatment Facility

Facility Background

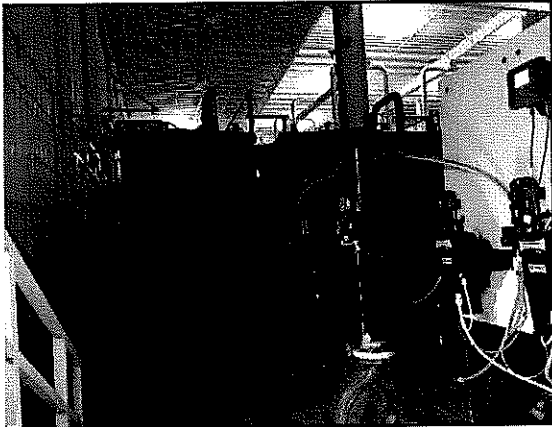
The Water Treatment Plant was constructed in 2012 for the treatment of both surface water and well water. Prior to its construction, the wells were treated at each well site and pumped directly to the water distribution system. The surface water had been pumped to the previous water treatment plant, located on the same site, and then pumped into the water distribution system. The new Water Treatment Plant is comprised of four membrane filters for ultrafiltration, diffused aerators for oxidation, two ultraviolet (UV) units for disinfection, addition of sodium hydroxide and sulfuric acid for pH adjustment, aluminum chlorohydrate for coagulation, powdered activated carbon for taste and odor, Klephos 300 for sequestration and sodium hypochlorite for post chlorination. A clearwell and set of high service pumps provide for the appropriate chlorine contact time and distribute the treated water. The plant is designed to treat 2 MGD.

The old water treatment facility, which is out of commission, but still on site, consists of the following:

- One original brick main treatment building with an addition and four (4) horizontal filters partially in the building
- Two (2) steel clarifier tanks
- One (1) masonry block garage
- Various structures used as part of former treatment process

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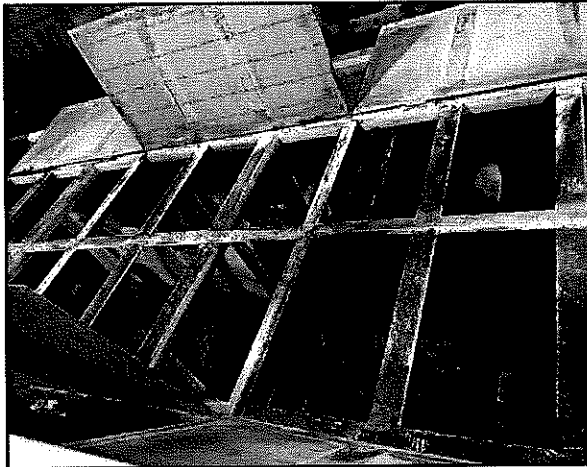
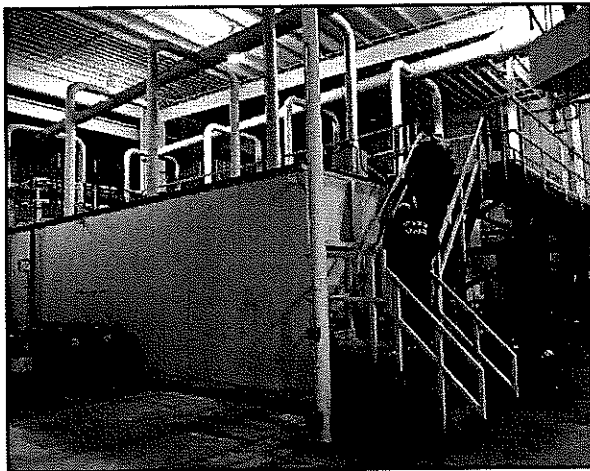
Membrane Filters



Membrane Filters

The WTP utilized four (4) membrane filters, manufactured by General Electric. The membrane filters were each rated for 528,000 GPD. The membrane filters have been in operation since 2012 and would require replacement in the next few years as they are nearing the end of their expected service life.

Pretreatment System



Aeration System

The pretreatment system consists of two (2) prefabricated Aeration, Rapid Mix and Flocculation Treatment Systems. The pretreatment systems were intended to remove iron and other contaminants from the raw water. One pretreatment system train was not functioning and was offline. This treatment train would require maintenance to be put back into operation. Return of this pretreatment train would increase the capacity of the plant and provide the necessary redundancy to the treatment system since this is the only treatment plant in the City.

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UV Disinfection

The WTP utilized an ultraviolet (UV) light system for disinfection. The UV system was installed on the discharge piping prior to entering the clearwell. The UV system continues to be used for disinfection purposes and no issues were reported with the UV system.

Plate Settlers

The membrane filters were used to further remove iron and other contaminants from the water supply. When cleaning of the membrane filters, accumulated waste was pumped to plate settling tanks. The waste sludge accumulated at the bottom of the tanks and was pumped to the sanitary sewer system. Decanted water was also pumped back to the front of the treatment system. There were no issues reported by the operator.

Clearwell and High Service Pumps

A concrete clearwell was constructed with the WTP for chlorine contact time and storage before pumping to the distribution system. The water storage volume of the clearwell is 14,500 gallons. The clearwell provides a minimum of 5 minutes of chlorine contact time as required. The high service pumps are rated for 2100 GPM and 150 HP. The pumps are controlled by VFDs located inside the WTP to control flow from the plant. The pumps and clearwell tank continue to be used and no issues were reported by the operator.

Emergency Generator

An emergency generator set was located behind the Water Treatment Plant. The generator was rated for 750 kW and was installed during construction of the WTP in 2012. The generator was capable of operating the Water Treatment Plant in the event of a loss of power. No issues with the generator were reported by Salem.

Water Treatment Plant Building

The City's water treatment facility is a recently constructed building and system. Construction of the new facility was completed in 2012. The main building has metal framing with a corrugated metal exterior, including siding and roofing. The metal building sits on a concrete foundation and floor with a few rows of CMU blocks above grade.

The building consisted of a large area containing all of the treatment equipment, plus small office and lab areas. All of the painted metal finishes appear to be in good condition, being only 8 years old. Little corrosion was visible on metal surfaces during our evaluation.

Future Requirements of Facility

In 2014, the City began receiving taste and odor complaints from its residents. The source of the taste and odor complaints was determined to be from use of the surface water treatment system, which was subsequently shut down. Surface water has not been pumped and treated at this facility since. As discussed earlier, the City can provide sufficient treated water through the use of its wells only, however, use of surface water will allow the City to depend less on the Wells and potentially distribute excess water

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to nearby communities. In order to use the surface water available, the plant should be retrofitted to address the taste and odor concerns from use of the surface water through the installation of additional filters or other equipment.

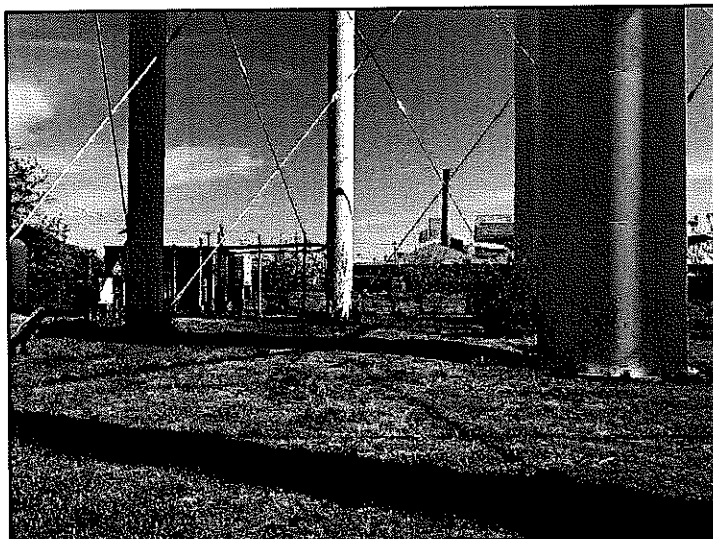
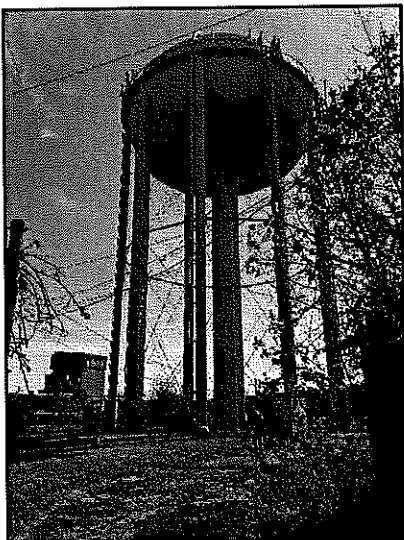
The costs to address the upgrades the plant to address odor complaints and utilize the surface water has not been included in this analysis.

Long Term Capital Costs – Water Treatment Plant

The following long term costs should be included in the 20-year capital planning period:

- Design and retrofitting of existing surface water treatment equipment
- Repairs to the pre-treatment system
- High Service Pump rebuild / replacement – each pump one time during the planning period

2.5.8. Elevated Water Storage Tank



1 MG Elevated Water Storage

General Site Description

The City has one (1) elevated water storage tank located at the 3rd Street and W Broadway. The 1 MG tank was originally constructed in 1967. The site is secured by a chain link fence with a barbed wire top rail. The overflow from the elevated storage tank discharges to the ground via the required air gap.

It was estimated that the tank interior and exterior was last painted approximately 20 years ago. The exterior paint appeared to be in fair condition, but some areas of corrosion were present. Based on the recommended maintenance schedule of repainting every 10-15 years, the interior and exterior of the tank should be scheduled for repainting as part of a capital improvement plan. It should be noted that since the painting, the storage tank has not been inspected.

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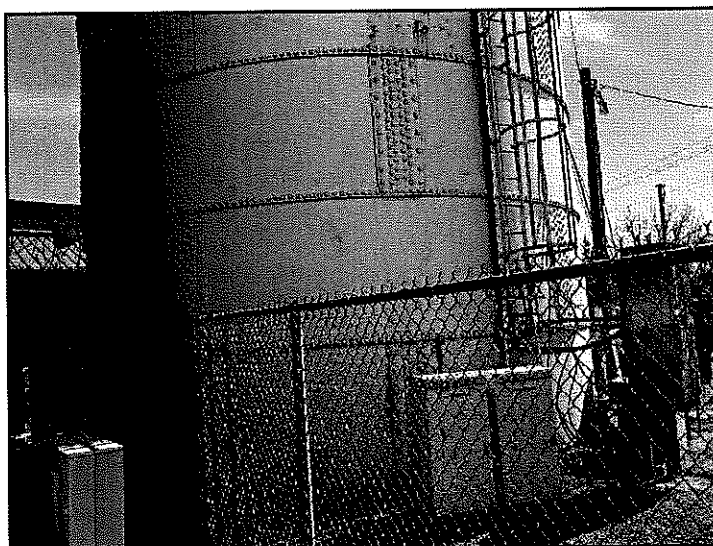
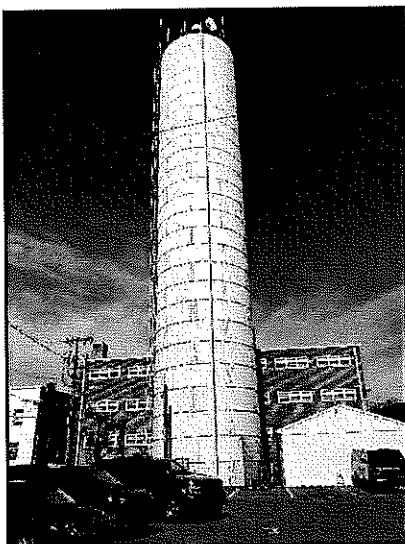
Once the tank has been painted, it is recommended that City begin a routine maintenance program for the tank. Specifically, it is recommended that the tank be visually inspected every year and the exterior should be washed every other year to assist in the long-term sustainment of the tank coating system.

Long Term Capital Improvements

It is recommended that the following improvements be made for the water tank over the 20 -year planning period:

- Blast and paint tank interior and exterior.

2.5.9. Standpipe



General Site Description

The City has one (1) standpipe located at the 3rd Street and W Broadway. The 1 MG tank was originally constructed in 1967. The site is secured by a chain link fence. The tank is currently unused, but serves as a cell phone tower.

It was estimated that the tank interior and exterior was last painted approximately 20 years ago. The exterior paint appeared to be in fair condition, but some areas of corrosion were present. Based on the recommended maintenance schedule of repainting every 10-15 years, the interior and exterior of the tank should be scheduled for repainting as part of a capital improvement plan. It should be noted that since the painting, the storage tank has not been inspected.

Once the tank has been painted, it is recommended that City begin a routine maintenance program for the tank. Specifically, it is recommended that the tank be visually inspected every year and the exterior should be washed every other year to assist in the long-term sustainment of the tank coating system. In

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lieu of painting the tank, the City may consider installation of a cellular tower and demolition of the existing standpipe. This will be contingent upon the current cell carrier contract that the City is currently operating under.

Long Term Capital Improvements

It is recommended that the following improvements be made for the water tank over the 20-year planning period:

- Blast and paint tank exterior (if alternate means of cellular support cannot be obtained);

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Section 3 - Utility Water Distribution System

3.1. Water Distribution System Evaluation & Capital Improvements Plan

3.1.1. Existing Water Distribution System

The water distribution system consists of approximately 21 miles of water main. Included in Appendix A is the latest water system map and is shown above. The water main infrastructure has not been mapped in GIS format. As part of the Water Quality Accountability Act (WQAA), the City is responsible for mapping water infrastructure in GIS format.

As shown on the Water System Map, the water infrastructure consists primarily of 4" to 12" water main. Most of the residential areas are branched and served by 6" or 4" diameter water main.

In accordance with NJDEP regulations, a water system with an average daily demand of 1 million gallons per day or greater is required to install a minimum 8" diameter pipe for new water main construction or for water main replacement projects; the exception being short dead-end sections of the water main. The City of Salem Utility system does not fall into this regulatory category. Instead, the 6" diameter water main is acceptable for a system the size of City of Salem's current system. It should be noted that this requirement is to ensure adequate system flow is available not only to supply customer demands but also for sufficient firefighting capabilities.

Due to aging infrastructure piping throughout the Country, there has been much discussion in recent years regarding the anticipated lifespan of our underground utility piping. As a result, lifespan years have been assigned to certain types of pipe material and construction time periods. Examples of the material lifespans are:

- Asbestos Cement Pipe (AC or Transite) – 70 year lifespan ⁽¹⁾
- Ductile Iron Pipe – 100 year lifespan ⁽²⁾
- Cast Iron Pipe – 70 year lifespan⁽³⁾
- Concrete Pipe – 50-75 year lifespan⁽⁴⁾

Sources:

- ⁽¹⁾ Chrysotile Institute
- ⁽²⁾ Ductile Iron Pipe Research Association
- ⁽³⁾ National Association of Corrosion Engineers (NACE)
- ⁽⁴⁾ WaterWorld

It should be noted that each of the above references clearly states that prediction of the lifespan of a below grade utility is estimated and that site specific factors such as installation methodologies, local soil characteristics, local water characteristics, water hammer, electrolysis outside of the buried pipe, etc. can all have an impact on the anticipated lifespan of a pipe. In addition, it should be noted that much of the pipe throughout the Country has already surpassed its theoretical life expectancy but is still in the ground and functioning.

There has also been much discussion on how to plan for the systematic upgrade of utility piping to prevent the leaks, loss of water pressure, reduced water quality, and even collapse of a distribution system. This "underground" portion of a utility system typically goes unimproved and improvements are

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typically reactive rather than proactive. However, this reactive approach may not only create more costly repairs, but may also negatively impact budgets and capital improvement schedules to re-allocate funds. This reactive approach not only creates an impact to the customer but results in a loss of water, unplanned re-allocation of limited staffing to handle the emergency conditions, and elevated costs for emergency repairs.

Therefore, proper planning and allocation of resources for the distribution system infrastructure improvements needs to be implemented into any Long-Term Capital Improvement Plan. However, a balanced approach of gradual improvements must also be incorporated so as not to create an undo financial burden to the customer, particularly with the variability in piping lifespans due to their localized site specific conditions. In addition, it should be noted that this is a planning mechanism to allow the City to begin the budgetary allocation for the strategic improvements to the water distribution system. The planning of water distribution improvements must be an on-going evolutionary process. The utility policy and replacement criteria may change from year to year based on changes to field observations and availability of funds but the basic principle and process should remain the same.

Therefore, when examining the City of Salem water distribution system and improvements to incorporate into their Long-Term Capital Improvement Plan, the following was considered:

- The size and material of the water main;
- The number and location of water main and/or water service calls or failures;
- Locations within the system with pressure issues including residual pressures during fire flow estimates (if any);
- Locations within the system with reduced water quality (if any);
- Water losses in a system or unaccounted for water usage (potentially indicating undetected leaks);
- Success of the Hydrant Flushing/Inspection Program;
- Success of the Valve Exercising/Maintenance Program;
- Water Service Connection / Rehabilitation Program.

The above considerations are summarized as follows:

Size and Material of Water Main

Based upon the existing water system mapping, the breakdown of the existing main by diameter is estimated as follows:

Pipe Diameter	Approx. % of System
12+'' Diameter	50%
8'' Diameter	20%
6'' Diameter	20%
4'' Diameter	10%

As indicated by the table, approximately 10% of the water main is smaller than 6'' diameter; the minimum recommended size for distribution and fire suppression requirements based upon the City's current daily demand. For planning purposes, the initial focus should be on the areas where there is smaller diameter water main.

In addition, the material type of the existing water main should be considered. While the above does not

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denote the type of material for each size diameter, the City is a mixture of mostly cast iron and ductile iron pipe. Taking into account the age, size, material construction, and historic areas of the system with issues, the City should begin prioritizing the replacement of the water distribution system.

Specifically, over the next 20 years, the City should plan for the necessary replacement of all 4" water main and begin to focus on the oldest remaining mains in the system where failures are occurring or there are complaints of water quality.

Location of Water Main / Service Calls

The City does not maintain records of the location of their service calls. Few leaks were from water mains as most leaks occur in service connections. The property owner is responsible for repairs to the entire length of services from the main to the residence.

System Pressures

The City has noted that there are no areas of the system with significantly reduced pressures., however some areas with 4" mains will some loss of pressure. Systemically, the pressures average 50-55 psi.

Areas of System with Reduced Water Quality

The City has not received any recent complaints of reduced water quality from customers of the water distribution system.

Unaccounted for Water

With respect to unaccounted for water, physical loss from the distribution system can be attributed to several factors including unauthorized consumption, administrative errors, data handling errors, metering inaccuracies or failures, fire suppression activities, and hydrant flushing, among other potential sources of loss. Some portion of unaccounted for water may also be attributed to system leaks. Monitoring the unaccounted for water and rectifying the causing issues can help identify potential leaks to reduce waste and lost revenue.

According to the DRPA water audit, the City has reported estimated water losses of approximately 15% from all sources.

Hydrant Flushing / Inspection Program

The Utility has an existing hydrant-flushing program that requires the flushing of hydrants twice per year in an effort to reduce incidences of rusty water. Typical hydrant programs incorporate flushing operations twice per year. The City should continue with the hydrant flushing program currently in place.

Valve Exercising / Maintenance Program

At this time, the City has begun a valve-exercising program. The City has completed exercising of the largest system valves, those that are 12" and larger, to satisfy the Water Quality Accountability Act (WQAA). The WQAA also requires exercising of all valves smaller than 12" every four (4) years. The City has not completed any valve exercising program for the smaller valves, which is required to be completed by October 2021. The condition of those valves is currently unknown.

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Valves are a critical component of a water distribution system. Lack of ability to isolate a portion of the system when needed causes operational and service issues and can be costly to rectify (i.e. wet tap, line stop installations). Proper inspection, operation, and maintenance of the valve portion of the distribution system cannot be neglected.

Incorporated into the proposed water main replacement section is the inclusion of the valve replacements. Since the water main replacement schedule is targeted to the older main with noted issues, upon implementation of the recommended system upgrades, the older valves would be replaced simultaneously.

Water Service Connections

The City does not provide any repairs to service connections. The City is responsible for just the water mains, and the responsibility for the entire length of the services are by the property owner. Based upon information provided by the City, few new water service connections are expected each year.

3.1.2. Emergency Interconnections

The City does not have any emergency interconnections with either public or private purveyors that are adjacent to the City limits. The City should consider an interconnection with an adjacent water system to add another layer of redundancy to the existing system. If a catastrophic failure of the water treatment system were to occur, the City currently has no alternative means to provide its customer with drinking water. The ability to use the surface water treatment system would provide some redundancy of the system.

3.1.3. Water Meters

The City contains a mixture of water meters either located inside the property or curbside. The City does not have a meter replacement program in place. All failed meter will be repaired or replaced by the City. However, a long-term replacement program has not been established for all meters. Larger meters, serving commercial or industrial accounts, were all replaced in the last year. Approximately 10 years ago, a portion of the residential meters were replaced, but most meters within the City are much older.

A limited evaluation of the meter reading process determined the following:

- The bills for residential use are prepared and processed on a semi-annual basis;
- Bills for larger meters are processed monthly;
- Due to concerns with accuracy and readings, all meters are billed at the minimum value;
- One City employee is responsible for meter readings;
- Meters located inside residences are often not read on a regular basis.

All facilities are currently metered including municipal buildings.

Since the meters are the source of revenue for the utility and allow the City to sustain the utility, accurate and effective metering is essential. As meters age, there is a tendency for accuracy to diminish; typically, in favor of the consumer.

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It is recommended that the City initiate a meter replacement program. Currently, some of the meters are radio read and the remaining are touch read. It is recommended that the City plan for the replacement of all existing residential meters with radio read meters. This replacement will allow the City to both maintain accurate accounting of the water usage and reduce the labor requirement to obtain readings. In addition, accurate readings will enable billing based on actual water usage as opposed to just the minimum value.

3.1.4. Existing Water Rates

The City last raised both the water and sewer rates from 2014 through 2016. The rate increases were necessary due to an increase in the debt service and a gradual reduction in utility revenue. The reduced revenue is attributed to a decrease in users. Specifically, over the last 10 years, the City of Salem has seen a 25% reduction in its population.

The water rates were increased from a semi-annual fee of \$218.00 prior to June 2014 to \$330.10. In addition, a semi-annual metering fee increased from \$95.00 to \$143.85 over the same time period, which included usage of 15,000 gallons. The overage fee for residential customers increased from \$4.34 to \$6.57 per 1000 gallons. Rates have not changed since 2016.

3.1.5. Water Utility Personnel

The utility has five (5) employees dedicated to the operation of the water system, including an administrative employee. In addition to operation of the Water Treatment Plant, the Water Utility personnel responsibilities include all service calls, meter readings, hydrant maintenance, some main repairs, and well operations.

3.1.6. Special Considerations

In July 2017, both the NJ State Senate and Assembly unanimously passed the Water Quality Accountability Act. The Act (NJSA 58:31-1 et seq.) became effective on October 19, 2017. The specifics of the Act include the following:

Water Valves

- Inspect each main stem valve and replace/repair each not operating or non-functional (i.e. not holding) valve;
- Routine inspection of the valves will be required as follows:

Valve Type	Inspection Frequency
12-inches or more	Every two years
Under 12-inches	Every four years
Service connection or customer shut-off valves	Not Applicable

- Identify the geographical location of all valves using GPS technology.

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Fire Hydrants

- Test *each* fire hydrant in the system a minimum of once per year;
- Develop plan for flushing *every* hydrant in the system and every dead-end main in the system;
- Prepare records of each hydrant inspections, testing and flushing and maintain for a minimum of six (6) years;
- All fire hydrants shall be marked with the fire hydrant owner's initials or emblem;
- Identify the geographical location of all hydrants using GPS technology.

Infrastructure Investment

- Within **18 months** of the effective date of this Act, each purveyor shall prepare and implement an Asset Management Plan designed to routinely inspect, maintain, repair and *renew* it infrastructure consistent with industry standards (AWWA);
- Develop a detailed engineering analysis of the Asset Condition and Service Life;
- Each purveyor shall dedicate funds on an annual basis to address and remediate the highest priority project shown on the Asset Management Plan.
- Once every **three (3) years**, provide the NJDEP and BPU (as applicable) with the Asset Management Plans, improvements made, costs of the improvements made including upcoming improvements.
- **Plan and implement a minimum replacement cycle of water mains taking the total length of the system and dividing by 150. For the City, this would equate to a required annual dedication of funds for the replacement of approximately 750 LF water main. (see below for Act language)**

C.58:31-7.a.

Each water purveyor shall dedicate funds on an annual basis to address and remediate the highest priority projects as determined by its asset management plan. All asset management plans and system condition reports shall be certified to by the licensed operator or professional engineer of the public water system and the responsible corporate officer of the public water system, if privately held, executive director, if an authority, or mayor or chief executive officer of the municipality, if municipally owned, as applicable. The replacement cycle shall be determined by dividing the miles of water main located in the public water system by 150 or other appropriate demonstration set forth in the certified asset management plan prepared pursuant to this section.

Cyber Risk Management

- Within **120 days** after the effective date of the Act, each water purveyor that has an internet-connected control system shall complete a plan for protecting the water system;
- The plan shall include a risk assessment and implement appropriate controls to mitigate identified risks to the public water system, maintain situational awareness of cybers threats and exercise a cyber incident response plan;
- Within **60 days** after developing the cyber program, each water purveyor shall join the New Jersey Cybersecurity and Communications Integration Cell.

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Violations

Three (3) NOVs for any reason or two (2) NOVs for exceedance of maximum contaminant level within a 12-month period will require the purveyor to submit a mitigation plan as prepared by licensed operator

3.1.7. Long Term Capital Improvements

As detailed throughout this section, the City should start planning for the systematic replacement of its older distribution system mains. It is recognized that pre-mature replacement of infrastructure could be viewed as wasted money. Accordingly, the ideal approach is proactive asset management which balances system sustainability and reliability with affordability.

Therefore, the following is recommended for planning and budgetary purposes:

- Planning and budgeting for the long term replacement of 4” and oldest water mains; biased towards operator noted issues/breaks including the replacement of valves, fire hydrants and services at the same time. As required by the WQAA, the City should be planning for the replacement of 750 LF of water main each year. However, the Capital Improvement Plan includes 1500 LF of piping replacement every other year to increase efficiency while also meeting the requirements. Please note that this is a conservative planned replacement of the water main.
- Begin a valve exercising program for the smaller valves. This will assist in identification of valves which no longer function and need to be replaced as a priority. Begin replacement of the valves to allow better control of the system;
- Fire Hydrant Replacement Program to be completed simultaneously with water main replacements.
- GIS mapping of water distribution system including water mains, valves, and fire hydrants.

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Section 4 - Wastewater Pumping and Treatment Systems

The existing wastewater collection and pumping system consists of three (3) sanitary lift stations, the associated force main, and gravity sewer mains. The City owns and operates a Wastewater Treatment Plant for the treatment of the sanitary sewerage.

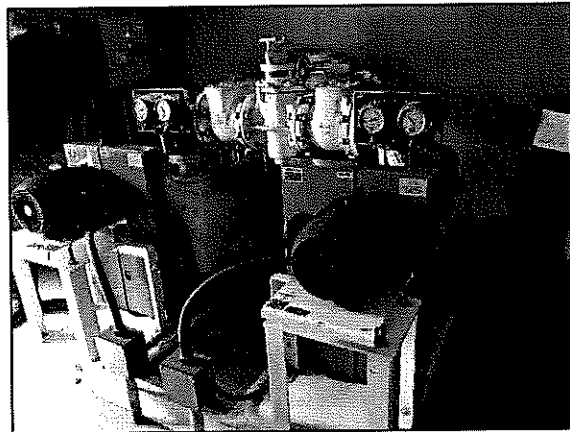
This section summarizes the wastewater pumping and collection system, including recent improvements and scheduled work. Recommendations for facility improvements focus on physical conditions, site conditions, and equipment operation and maintenance.

4.1. Lift Stations

4.1.1. Oak Street Lift Station



Lift station layout



General Site Description

The Oak Street Lift Station (L.S.) is located along Oak Street near its intersection with Grieves Parkway. The lift station is located in a residential area of the City. The lift station installation was completed in 2011 as a replacement to the existing lift station at the site.

The lift station consists of a wet well and pump building. Two suction lift pumps were contained in the building for pumping out of the wet well. The pumps were manufactured by Gorman Rupp and were rated for 7.5 HP. A grinder was located on the discharge into the wet well to prevent clogging of the pumps. A grass area in front of the wet well and lift station provided access to the site. No security fencing was installed around the lift station, but the wet well and pump building were secured via locking doors.

As a general rule of thumb, sanitary sewer pumps typically require repair or replacement approximately every 10 years. The condition of the pumps and their associated operation can be examined during the planning period to determine how they are operating and if they should be scheduled for repair or replacement. However, for budgeting / planning purposes, the City should account for the repair or replacement of each pump at least twice over the planning period.

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As noted previously, the lift station is a concrete wet well and pump building. Adjacent to the wet well is an emergency generator on a concrete pad.

The pump building is a single-wythe CMU wall structure on a concrete slab foundation with an A-frame shingle roof and vinyl gable siding and soffits. The building is in good condition; being only 9 years old.

A manually operated davit crane is provided on top of the wet well for grinder removal and appears to be in good condition.

Electrical and Controls

Incoming electrical service, fed from the utility pole in front of the site, is 120/240 volt, three phase. Electrical and control panels for the site are located within the pump building. Site lighting is provided by lights mounted to the pump building.

The on-site backup generator was installed in 2011 at the same time as the station and is rated for 40 kW. The City maintains the generators at the site and they are operated on a regular basis. No issues were reported with the generator.

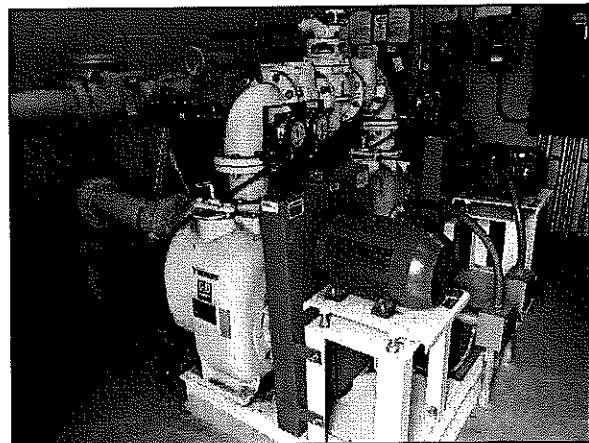
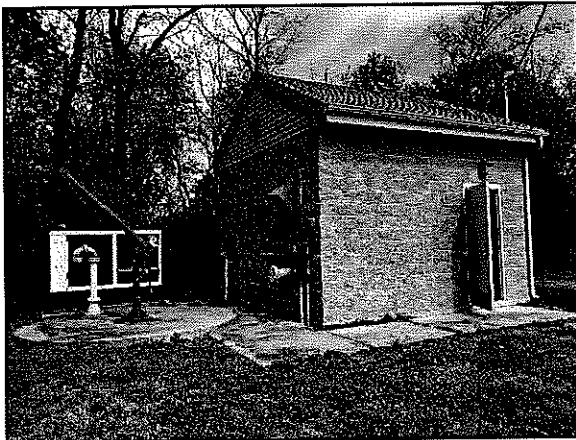
Currently, there is no SCADA control for any of the lift stations. Instead, an auto dialer contacts personnel should there be an alarm. For the long-term operation of the lift stations, the City should consider the expansion of the SCADA system to include the sanitary facilities. This will allow the operations staff to review the operations of the stations to confirm equipment operations. SCADA remote monitoring is particularly useful during emergencies.

Long Term Capital Improvement Plan

The following work should be considered for the long-term maintenance and operation of the system:

- Repair or replace pumps (estimated 2 times during planning period);
- Consideration of existing SCADA expansion to include sanitary facilities.

4.1.2. Magnolia Street Lift Station



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General Site Description

The Magnolia Street Lift Station (L.S.) is located along Magnolia Street near its intersection with Yorke Street. The lift station is located in a residential area of the City. The lift station installation was completed in 2011 as a replacement to the existing lift station at the site. The lift station replacement was part of the Oak Street Pump Station replacement project and was completed at the same time. The pump stations are nearly identical.

The lift station consists of a wet well and pump building. Two suction lift pumps were contained in the building for pumping out of the wet well. The pumps were manufactured by Gorman Rupp and were rated for 10 HP. A grinder was located on the discharge into the wet well to prevent clogging of the pumps. A grass area in front of the wet well and lift station provided access to the site. No security fencing was installed around the lift station, but the wet well and pump building were secured via locking doors.

As a general rule of thumb, sanitary sewer pumps typically require repair or replacement approximately every 10 years. The condition of the pumps and their associated operation can be examined during the planning period to determine how they are operating and if they should be scheduled for repair or replacement. However, for budgeting / planning purposes, the City should account for the repair or replacement of each pump at least twice over the planning period.

The pump building is a single-wythe CMU wall structure on a concrete slab foundation with an A-frame shingle roof and vinyl gable siding and soffits. The building is in good condition; being only 9 years old.

A manually operated davit crane is provided on top to the wet well for grinder removal and appears to be in good condition.

Electrical and Controls

Incoming electrical service, fed from the utility pole in front of the site, is 120/240 volt, three phase. Electrical and control panels for the site are located within the pump building. Site lighting is provided by lights mounted to the pump building.

The on-site backup generator was installed in 2011 at the same time as the station and is rated for 40 kW. The City maintains the generators at the site and they are operated on a regular basis. No issues were reported with the generator.

Currently, there is no SCADA control for any of the lift stations. Instead, an auto dialer contacts personnel should there be an alarm. For the long-term operation of the lift stations, the City should consider the expansion of the SCADA system to include the sanitary facilities. This will allow the operations staff to review the operations of the stations to confirm equipment operations. SCADA remote monitoring is particularly useful during emergencies.

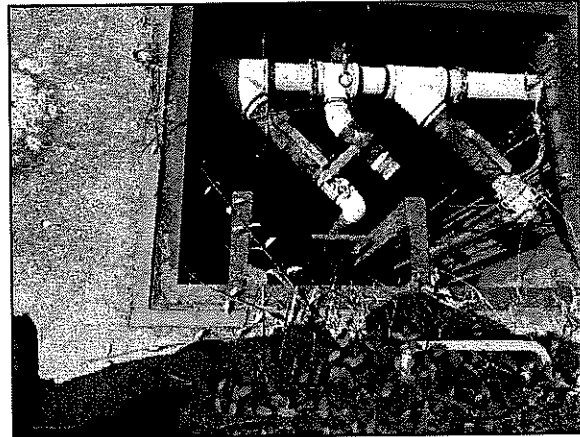
Long Term Capital Improvement Plan

The following work should be considered for the long-term maintenance and operation of the system:

- Repair or replace pumps (estimated 2 times during planning period);
- Consideration of existing SCADA expansion to include sanitary facilities.

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4.1.3. Walnut Street Lift Station



Lift station layout

General Site Description

The Walnut Street Lift Station (L.S.) is located along Magnolia Street near the Salem High School. The lift station serves the adjacent high school. The age of the lift station was estimated at 40 years.

The lift station contains a dry well and wet well system. However, a renovation to the station discontinued the use of the wet well and converted the dry well portion to a submersible lift station setup. Two submersible lift pumps were connected to the force main via flexible piping. No information was provided regarding the capacity or size of the lift pumps. Security fencing was installed around the lift station with a locking gate. Grass and a driveway surrounded the site for access.

As a general rule of thumb, sanitary sewer pump stations typically require replacement approximately every 40 years. Based on the condition of the pumps and station, the City should account for the replacement of the pump station during the planning period.

Electrical and Controls

Incoming electrical service, fed from the utility pole next to the site, is 120/240 volt, three phase. Electrical and control panels for the site are located next to the wet well in a weatherproof enclosure.

The on-site backup generator was estimated to be 10 years old and is rated for 20 kW. The City maintains the generators at the site and they are operated on a regular basis. No issues were reported with the generator.

Currently, there is no SCADA control for any of the lift stations. Instead, an auto dialer contacts personnel should there be an alarm. For the long-term operation of the lift stations, the City should consider the expansion of the SCADA system to include the sanitary facilities. This will allow the operations staff to review the operations of the stations to confirm equipment operations. SCADA remote monitoring is particularly useful during emergencies.

DESCRIPTION OF EXISTING WATER & SANITARY MUNICIPAL UTILITY FACILITIES

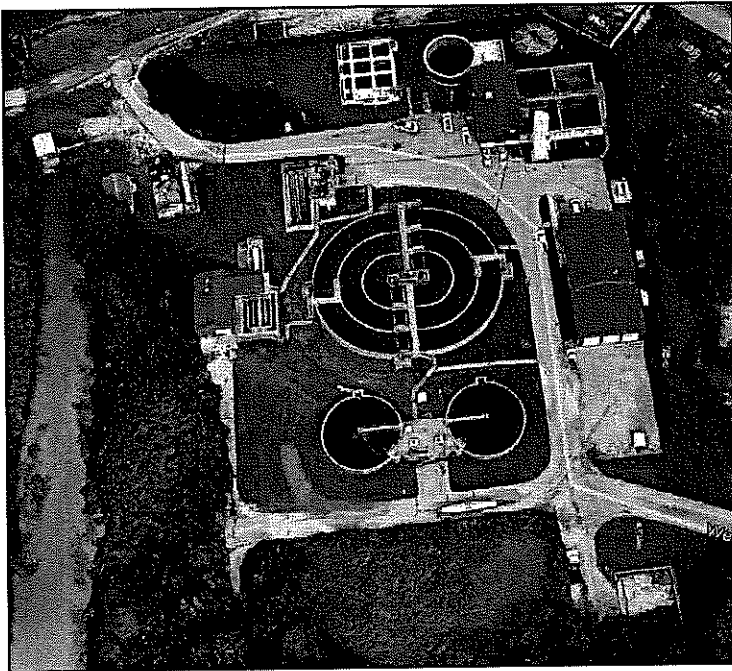
EVALUATION & CAPITAL IMPROVEMENT PLAN

Long Term Capital Improvement Plan

The following work should be considered for the long-term maintenance and operation of the system:

- Replacement of Pump Station
- Consideration of existing SCADA expansion to include sanitary facilities.

4.1.4. Wastewater Treatment Plant



General Wastewater Treatment Plant Description

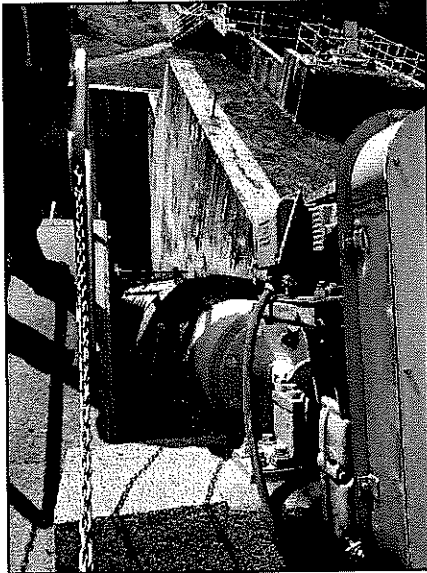
The Water Treatment Plant was near the intersection of Grieves Parkway and West Front Street. The Wastewater Treatment Plant is permitted for up to 1.4 MGD. The age of most of the major treatment components are estimated to be 40 years old.

The treatment system consists of the following:

- Screw Pumps with screen system
- Orbal Tank
- Clarifiers
- Digester Tanks
- Effluent Tank

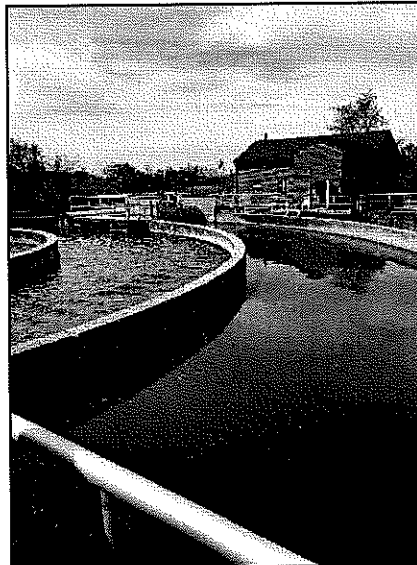
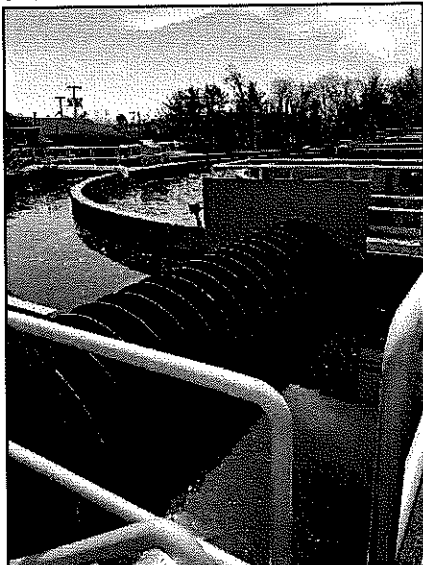
**DESCRIPTION OF EXISTING WATER & SANITARY MUNICIPAL UTILITY
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Screw Pumps and Screen



Three screw pumps were used to lift the influent flow into a screen system before entering the orbal tanks. Two of the screw pumps were operating during the site visit, however, the rotating screen system had been out of operation for some time. The City should have the screen system repaired to limit the amount of excess debris in the orbal tank.

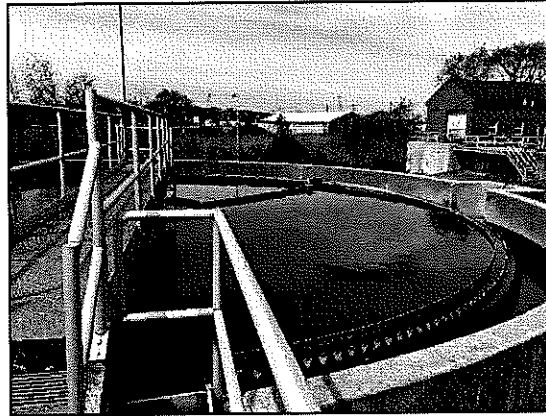
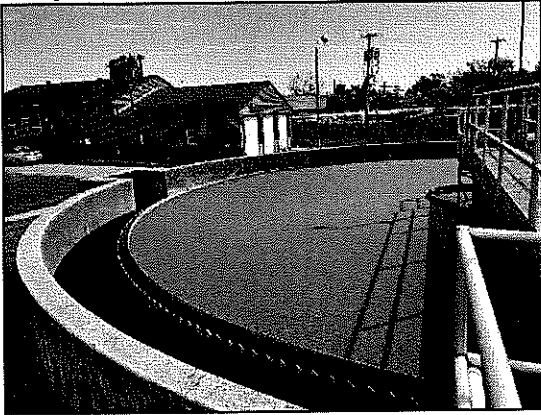
Orbal Tank



The orbal tank contained three separate rings. Approximately half of the disks in the tanks were out of operation due to mechanical failures. The City should plan to repair the malfunctioning disks to maintain sufficient treatment.

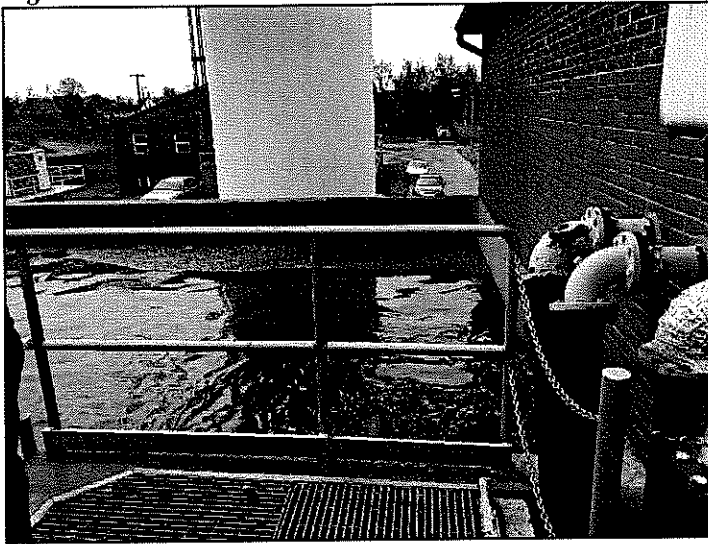
**DESCRIPTION OF EXISTING WATER & SANITARY MUNICIPAL UTILITY
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Clarifiers



The orbal tanks flowed into the clarifier tanks. The rake arm system in one tank was out of operation and the tank was covered in algae. The second clarifier appeared to be operating as intended. The City should plan to repair the rake arm system to maintain sufficient treatment.

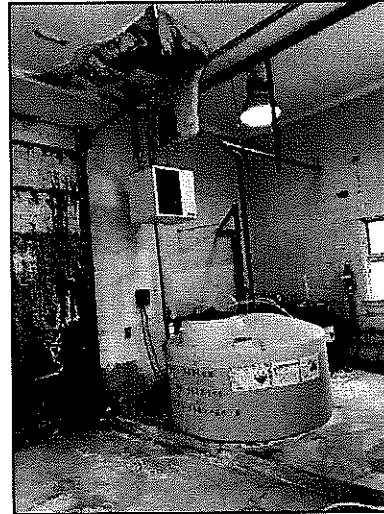
Digesters



The digester tanks were only partially operational at the time of the evaluation. Sections of air piping in some tanks had corroded and broken off into the tanks. In addition, several air compressors were inoperable at that time. The belt filter press, located inside the attached building, was operational, but is in need of maintenance.

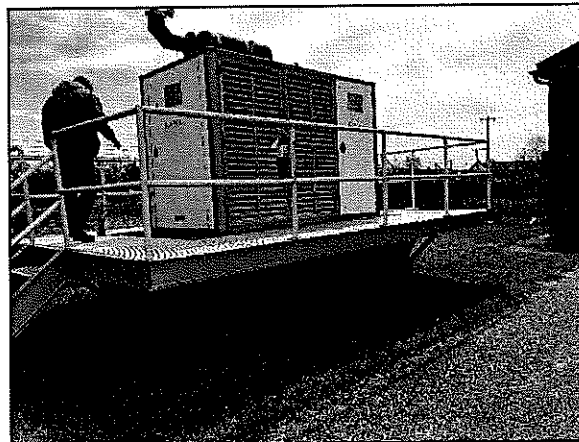
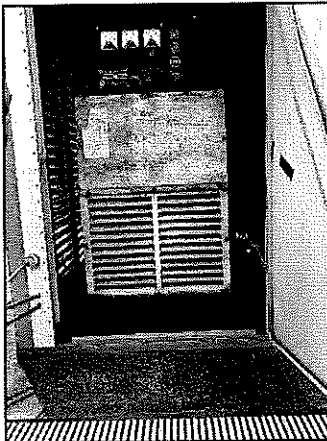
**DESCRIPTION OF EXISTING WATER & SANITARY MUNICIPAL UTILITY
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Effluent Tank



Treated wastewater is chlorinated and dechlorinated at an effluent tank prior to discharging into the Delaware River. Tanks containing sodium hypochlorite and sodium bisulfite are located inside the building adjacent to the tank. No issues were reported with the chemical feed pumps. Metal components inside the building were corroded from exposure to the chemicals. Corroded materials should be painted or replaced as needed to prevent further corrosion.

Electrical and Controls



The on-site backup generator was estimated to be 40 years old and is rated for 350 kW. The City maintains the generator at the plant and is operated on a regular basis. The operator has noted issues with the generator in the recent past. The generator has exceeded its expected service life and should be replaced in the near future to maintain power at the plant in the event of a power loss.

The controls system appears to be outdated with limited functionality for control and monitoring of the various treatment processes and lift stations. The control system should be updated to a SCADA control system to enable monitoring of the lift stations and treatment systems.

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Water Treatment Plant Buildings

The age of the Wastewater Treatment Plant is estimated at 40 years old. Tanks used for the treatment of the wastewater are generally constructed of cast-in-place concrete. Buildings are constructed of CMU block walls with a brick veneer. Those structures appear to be in fair condition given their age. However, maintenance of those structures, such as painting or repointing of the brick, should be completed during the planning cycle to prevent additional damage to the structures.

Long Term Capital Costs – Wastewater Treatment Plant

The following long term costs should be included in the 20-year capital planning period:

- Repair of treatment plant equipment – orbal disks, air compressors, screens, belt filter press, digester tank piping to improve treatment processes.
- Replacement of emergency generator
- Control System upgrades
- Building Maintenance and Roof Replacements

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Section 5 - Wastewater Collection System

5.1. Existing Wastewater Collection System

Similar to the water distribution system, the wastewater collection system is a mixture of newer and older components. The existing sanitary system estimated at 15 miles of gravity main and approximately 2 miles of force main associated with the lift stations.

The City has a map of the collection system, however, the map is not in a GIS format. In addition, the map denotes only the major infrastructure (i.e. gravity mains and force mains) and does not locate manholes, sanitary laterals or lift stations. A copy of the most recent Sanitary Sewer Service Map and infrastructure is included in Appendix B.

The City does not own any of the sanitary laterals from the main to the residences. The City is responsible only for main repairs and property owners are responsible for the sewer lateral up to the main. The City also accepts flow from Quinton Township and maintains the lift stations pumping from the Township into the City.

In general, The City does not have specific areas of concern related to sewer main breaks or clogs. Most of the calls from residents are due to backups requiring cleaning of the sewer main.

As with the water distribution system, there has been much discussion in recent years regarding the anticipated lifespan of the City's underground utility piping. There has also been much discussion on how to plan for the systematic upgrade of utility piping to prevent the leaks, backups and even collapse of portions of the collection system. As with the water distribution system, this "underground" portion of a sanitary system typically goes unimproved and improvements have historically been reactive rather than proactive.

Therefore, proper planning and allocation of resources for the sanitary collection system must also be implemented into any Long Term Capital Improvement Plan. When examining the City of Salem wastewater collection system and improvements to incorporate into their Long Term Capital Improvement Plan, the following was considered:

- The size and material of the sanitary main;
- The number and location of sanitary backups or failures;
- Locations within the system with pipes at capacity;
- Success of Inflow & Infiltration Program;
- Success of routine jetting/cleaning of sanitary collection system
- Success of Sanitary Televising Program;
- Lateral Service Connection / Rehabilitation Program.

The above considerations are summarized as follows:

5.1.1. Size and Material of Sanitary Main

The majority of the sanitary collection system is 6" and 8" pipe. The age and materials used in the system is mostly unknown at this time. Without system modeling of the conveyance system, it appears that the

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sanitary piping may be, in general, sized for the flow capacities of a system the size of the City. In addition, utility personnel did not report any areas of continued backups, even during wet weather events.

5.1.2. Number and Location of Sanitary Backups or Failure

The City does not keep a log of system failures or backups but estimates about 5 backups a month requiring a repair crew. The sewer backups are generally due to a clogged portion of pipe and requires jetting by an outside contractor. There is no routine jetting program, so jetting of the gravity mains is only completed on an as needed basis. The City does not currently own a jet-vac truck, so this work is performed by outside contractors under an emergency basis.

5.1.3. Locations within the system with pipes flowing at capacity

The City has a map of the conveyance system, however, no sizes or materials are indicated. In addition, a model of the system does not exist. It may be helpful to develop a model of the existing sanitary system to establish carrying capacities of each sanitary service area. This model would not have to be elaborate in nature and can be a desk top exercise based upon current system mapping and zoning. Completing this analysis will allow the City to establish areas of anticipated capacity issues for further investigation prior to making any upgrades.

5.1.4. Success of Inflow & Infiltration Program

The City has not completed any Infiltration and Inflow studies recently. An I&I study should be completed to identify areas of inflow (i.e. illegal sump pump connections) as well as areas of infiltration (i.e. leaks into the joints of the collection system). Systematic identification of these areas allows for the prioritization of improvement areas in the collection system.

Based on well pumping totals and flow into the Wastewater Treatment Plant, it is estimated that the plant receives approximately 500,000 gallons a day on average via infiltration and inflow. Reducing the amount of I&I in the system would ease the strain on the treatment system and conveyance capacity.

5.1.5. Success of Routine Jetting / Cleaning of Sanitary System

As noted previously, the City does not own their own jetting equipment and, therefore, the City does not practice routine jetting. Instead, jetting is completed on an as needed basis.

Jetting is particularly important in areas of heavy grease (i.e. commercial or restaurant areas). The jetting or cleaning of the sewer mains will prevent the buildup of grease, rags, and debris from collecting in an area. Each of these conditions contributes to backups and overflows.

5.1.6. Success of Sanitary Televising Program

The City currently does not have a routine or scheduled televising program. There is no log of the current condition of the existing sanitary sewer main to assist with replacement planning. It is recommended that the City consider allocating funds to annually televising sections of the conveyance system. This will

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allow the targeted replacement or lining of the most dilapidated portions of the conveyance system. In addition to televising, joint grouting can be scheduled at the same time to eliminate areas of significant I&I where appropriate as a less costly temporary fix versus lining or replacement.

This work is a recommendation for maintenance of the sanitary sewer collection system and has been included in the 20-year Capital Improvement Plan so that proper planning for replacements can be expedited.

5.2. Collection System Long Term Capital Improvements

Many of the City's original sewer sections remain in their original form. These older areas of the system are significant sources of infiltration.

Again, it is recognized that pre-mature replacement of infrastructure is an inefficient use of resources. It is our opinion that the City needs to obtain additional information regarding the condition of its existing conveyance system to better prioritize any future lining and replacement projects. It is also our opinion that the City should begin budgeting for the replacement of the sanitary main once replacement areas have been prioritized.

Therefore, the following is recommended for planning and budgetary purposes:

- Planning and budgeting for the televising of major collection branches located within the City. This will allow for problems to be prioritized prior to investing money in their upgrade and/or replacement. The televising would also examine the joints of the existing sanitary sewer main and allow the City to identify areas of potential infiltration and areas of potential inflow (sump pump connections, etc.);
- Complete an analysis of the system to establish areas, if any, that may be at or near their carrying capacity. This analysis will also allow for the planning of slip lining and other appropriate upgrades to the conveyance system.
- Planning and budgeting for systematic lining or replacement of the critical areas of the collection system. For estimation purposes, the City should include replacement or lining of at least 10% of the collection system over the 20-year analysis period. This would equate to addressing approximately 475 feet of sanitary pipe each year over the next 20 years. The Capital Improvement Plan includes 950 LF of piping replacement every other year to increase efficiency while also performing the required replacements. As with the water main replacement schedule, it should be noted that this replacement schedule is **not** aggressive. However, it will allow the City to begin allocating funds to address the older areas of the infrastructure while also providing funding for current issues for operations.
- GIS Mapping of the sanitary sewer system including piping and manholes.
- Purchase of a jet-vac truck to begin cleaning program and reduce costs for emergency work by outside contractors.
- Cleaning & CCTV ¼ of the system per year; spread out over the 20 year period to assist in the prioritization of sanitary replacements

5.3. Water and Sanitary Utility Staffing

The Water and Sewer Departments each have (5) employees dedicated to their respective systems. Utility

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personnel responsibilities include all service calls, hydrant maintenance, water and sewer main repairs, checking on the pump stations, etc. Given the magnitude of the infrastructure and the daily operational requirements, consideration should be given to re-examining addition of staff.

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Section 6 - Utility 20 Year Capital Improvements Plan

For planning purposes, this evaluation includes a 20-Year Utility Capital Improvement Plan. This list is presented in **Appendix D** herein and details proposed projects from 2021 through 2040. Please note that the list is loosely outlined by facility and priority of projects may shift based upon emergencies or changes in the component conditions. In addition, the costs associated with each project represent a projection of typical estimated construction costs and may or may not reflect the entire scope of the required work once the specific elements are identified during the preliminary design phase. The provided list should not be utilized by the City for bonding purposes but should be utilized as a planning and organizational tool to understand the scope and scale of the recommended work.

It should be noted that much of the work outlined in the 20-Year Utility Capital Improvement Plan is to bring the above grade infrastructure (i.e. pump stations, WWTP, WTP) into consistent and reliable working condition. The replacement schedule for the below grade infrastructure (i.e. water main and sanitary main) is very conservative and is outlined to address small diameter water main and aging infrastructure. A conservative approach was selected to allow the City to begin planning for the maintenance and strategic upgrade the infrastructure while providing minimal impact to the residents of Salem and customers of the utility system.

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Section 7 - Regulatory Actions

The following is a comprehensive list of violations incurred by the Water Utility. MCL violations are indicated by the Violation Name "MCL (TCR), Monthly," and indicate that the City's water tested over the maximum contaminant limit for the indicated analyte. As seen in the chart, there have been no MCL violations in recent years. Additionally, violations in recent years are related to exceeding reporting deadlines and not to the quality of the water.

Action Level #	Action Level Status	Analyte	Action Level Type	Action Level Exceedance		Monitoring Period	Sample Point ID	Determination Date
				Violation Name	Group Violations			
Violation #	Violation Status	Analyte Group	Violation Type	Violation Name	Monitoring Period	Sample Point ID	Determination Date	
2049-7032	V	STAGE 2 THM-HAAS	27	MONITORING, ROUTINE (DBP) MAJOR	102019	05	04/15/2019	
1015-8729	V	VOCs FEDERAL	03	MONITORING, ROUTINE MAJOR	VR 201401	TP001003	10/30/2014	
1990-21	V	VOC PHASE2AS	03	MONITORING, ROUTINE MAJOR	101995	TP001002	05/30/1998	
Individual Violations								
2020-13725	V	P. COLI	40	REPORT SAMPLE RESULT FAIL MONITOR RTRC		05	02/12/2020	
2020-13754	V	E. COLI	5A	MONITORING, ROUTINE, HIGH (RTRC)	1A12520	05	02/12/2020	
2019-13753	V	1,1-DINAPOMETHYLCHLOROPROPANE	03	MONITORING, ROUTINE MAJOR	202018	TP001009	07/23/2018	
2019-13752	V	1,2,3-TRICHLOROPROPANE	03	MONITORING, ROUTINE MAJOR	202019	TP001009	07/23/2019	
2019-13751	V	ETHYLENE DIBROMIDE	03	MONITORING, ROUTINE MAJOR	202019	TP001009	07/23/2019	
2019-13750	V	LEAD & COPPER RULE	60	LEAD CONSUMER NOTICE (LCR)			07/10/2019	
2019-13747	V	TOTAL HALOACETIC ACIDS (HAAS)	37	MONITORING, ROUTINE (DBP) MINOR	202018	05	04/16/2018	
2017-13716	V	CHLORINE	30	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	SEP2016	TP002003	10/27/2016	
2016-13745	V	CONSUMER CONFIDENCE RULE	71	CCR REPORT			08/24/2018	
2015-13732	V	PH	40	PH MCL	SY200101	TP001052	01/03/2005	
2015-13734	V	COPICOM (TCR)	24	MONITORING (TCR), ROUTINE MINOR	RUN2004		03/31/2005	
2012-13621	V	CHLORINE	27	MONITORING, ROUTINE (DBP), MAJOR	MAY2002	TP001002	04/27/2002	
2012-13622	V	CHLORINE	27	MONITORING, ROUTINE (DBP), MAJOR	MAY2002	TP001002	04/27/2002	
2012-13623	V	RESWTR	30	MONITORING, ROUTINE (RESWTR), MAJOR	MAY2002	TP001002	04/27/2002	
2012-13624	V	RESWTR	30	MONITORING, ROUTINE (RESWTR), MAJOR	MAY2002	TP001002	04/27/2002	
1997-2097	V	TURBIDITY	30	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	DEC95	TP001002	01/27/1997	
1997-2097	V	TURBIDITY	30	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	DEC96	TP001002	11/20/1996	
1997-2097	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	SEP96	TP001002	10/23/1996	
1996-2786	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	AK98	TP001002	09/29/1998	
1985-2654	V	THM	03	MONITORING, ROUTINE MAJOR	20185		08/20/1986	
1986-2550	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	MAY95	TP001002	07/09/1996	
1986-2550	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	MAY95	TP001002	07/09/1996	
1986-2706	V	THM	03	MONITORING, ROUTINE MAJOR	VR199504	TP001003	03/05/1995	
1986-2706	V	NITRATE	03	MONITORING, ROUTINE MAJOR	40795	TP001002	05/24/1996	
1986-2706	V	THM	02	MCL AVERAGE	VR199501	TP001002	03/05/1995	
1986-2706	V	THM	02	MCL AVERAGE	VR199410	TP001002	03/04/1995	
1986-2028	V	THM	07	MCL AVERAGE	DEC93	TP001002	01/20/1994	
1986-1934	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	DEC93	TP001002	11/20/1993	
1986-1934	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	NOV93	TP001002	11/20/1993	
1986-1934	V	TURBIDITY	36	MONITORING, RTR/RPT MAJOR (SWTR-FILTER)	OCT93	TP001002	11/20/1993	
1986-1936	V	NITRATE	03	MONITORING, ROUTINE MAJOR	30193	TP001002	11/20/1993	
1984-1474	V	NITRATE	03	MONITORING, ROUTINE MAJOR	20194	TP001002	08/27/1994	
1984-1474	V	NITRATE	03	MONITORING, ROUTINE MAJOR	11104	TP001002	08/27/1994	
1984-1074	V	THM	03	MCL AVERAGE	VR199304	TP001002	05/18/1994	
1984-1074	V	THM	03	MCL AVERAGE	JAN94	TP001002	03/02/1994	
1984-1074	V	TURBIDITY	41	SINGLE COMB. FILTER EFFLUENT (SWTR)	DEC93	TP001002	01/27/1994	
1984-954	V	TURBIDITY	41	SINGLE COMB. FILTER EFFLUENT (SWTR)	DEC93	TP001002	11/08/1993	
1984-794	V	NITRATE	03	MONITORING, ROUTINE MAJOR	30193	TP001002	05/20/1993	
1984-693	V	NITRATE	03	MONITORING, ROUTINE MAJOR	10193	TP001002	04/23/1989	
1880-284	V	THM	02	MCL AVERAGE	VR198007	TP001002	04/23/1989	
1069-168	V	THM	03	MONITORING, ROUTINE MAJOR			04/23/1989	



Appendix A
City of Salem Water Service Map





Appendix B
City of Salem Water Allocation Permit



State of New Jersey

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mail Code 401-04Q
Division of Water Supply & Geoscience
New Jersey Geological and Water Survey Element
Bureau of Water Allocation & Well Permitting
401 E. State Street - P.O. Box 420
Trenton, New Jersey 08625-0420
Tel #: (609) 984-6831 - Fax #: (609) 633-1231
<http://www.nj.gov/dep/watersupply/>

BOB MARTIN
COMMISSIONER

November 13, 2015

Salem City Water Dept
19 S Front Street
Salem, NJ 08079
Attn: Frederick J. Mucci III

Dear Mr. Mucci:

Re: **Water Allocation Permit - Modification**
Program Interest ID/ Permit No. 5290
Activity No. WAP140001

Enclosed is a permit issued pursuant to the Water Supply Management Act, N.J.S.A. 58:1A-1 et seq. This permit becomes effective on December 1, 2015 and is to divert water from 4 wells and 2 intakes in the following Municipalities and County:

MUNICIPALITY	COUNTY
Quinton Twp	Salem
Salem City	Salem

In response to the comments received on the Draft Staff Report and Draft Permit Requirements, the requested changes have been made to the Staff Report and Permit Requirements. The surface water and overall allocations have been retained at your request. The capacities of Laurel Lake and Elkinton Pond, and the peak use of surface water for "flushing" have been noted in the final staff report. In addition, future water conservation plans will need to demonstrate a reduction in unaccounted for water in response to the updated water conservation plan submitted October 30, 2015.

5290 is your Program Interest ID and WAP140001 is your Permit Activity Number, and will appear on all forms and correspondence from the Bureau of Water Allocation & Well Permitting. Reference your Program Interest ID and Activity No. in all correspondence.

Be advised that as you are responsible for complying with the terms and conditions of the enclosed permit you should review them thoroughly. Failure to comply with any or all of the terms and conditions could result in penalties and/or revocation of the permit.

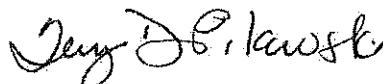
Within 20 calendar days following your receipt of this permit you may submit a request for an adjudicatory hearing to contest the conditions of this permit. Regulations regarding the format and requirements for requesting an adjudicatory hearing may be found in N.J.A.C. 7:19-2.13.

To request a hearing, the permittee must complete the enclosed Tracking Form and supply all the information specified in Part III of the Tracking Form. A copy of the completed, signed and dated Tracking Form, together with all of the information required by Part III of the Tracking Form, including attachments where specified, must be submitted to:

1. Janis Hoagland, Director
New Jersey Department of Environmental Protection
Office of Legal Affairs
P.O. Box 402
Trenton, New Jersey 08625

2. Terry D. Pilawski, Chief
New Jersey Department of Environmental Protection
Mail Code 401-04Q
Division of Water Supply & Geoscience
Bureau of Water Allocation & Well Permitting
P.O. Box 420
Trenton, New Jersey 08625-0420

Very truly yours,



Terry D. Pilawski, Chief
Bureau of Water Allocation & Well Permitting

Enclosure

Certified Mail No.: 7014-2870-0001-6015-4435

C: Bureau of Water Allocation & Well Permitting
Southern Bureau of Water Compliance & Enforcement
William Muszynski, Delaware River Basin Commission
Barbara Ware, BWAWP



State of New Jersey
 Department of Environmental Protection
 Bureau of Water Allocation
 PO Box 426, Trenton, New Jersey 08625-0426



Water Allocation Permit

The New Jersey Department of Environmental Protection grants this permit* in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to further conditions and stipulations enumerated in the supporting documents.

Program Interest ID/ Permit Number: 5290 Activity Number: WAP140001	Issuance Date: 11/13/2015	Effective Date: 12/01/2015	Expiration Date: 11/30/2025
Name and Address of Applicant SALEM CITY WATER DEPT 19 S Front Street Salem, NJ 08079	Location of Activity/Facility Salem City and Quinton Twp Salem County		
	Type of Permit Water Allocation Permit - Modification	Statute(s) N.J.S.A. 58:1A-1	

This permit grants permission to divert water from the approved sources in the attached permit inventory, in the following municipalities, for the following water uses:

MUNICIPALITY Quinton Twp Salem City	COUNTY Salem Salem	Water Uses: Public Community Supply
--	---------------------------------	--

This permit is subject to the attached Conditions.

Approved by the authority of:
 Bob Martin, Commissioner
 Department of Environmental Protection

Terry D. Pilawski
 Terry D. Pilawski, Chief
 Bureau of Water Allocation & Well Permitting

11/13/15
 Date

* Permit means Certification, Approval, Registration, Equivalency, etc.

November 12, 2015

STAFF REPORT

In the matter of
Salem City Water Department

Application No. 5290 to modify permit to divert water from one new well, No. 8, three existing wells Nos. 2, 6 and 7, and two surface water sources, Laurel Lake and Elkinton Pond in the City of Salem and the Township of Quinton, Salem County.

In compliance with the provisions of N.J.S.A. 58:1A-1 et seq., Salem City Water Department, 19 South Front Street, Salem, New Jersey 08079, filed an application with the Department of Environmental Protection on August 1, 2014 to divert a maximum of 93 million gallons of water during any month (MGM) and 900 million gallons of water per year (MGY) at a maximum rate of 5,160 gallons per minute (GPM) from existing and new Well Nos. 2, 6, 7 and 8; 150, 171, 165, and 283 feet deep screened in the Mt. Laurel-Wenonah aquifer and from Laurel Lake and Elkinton Pond. On August 17, 2015 Salem City Water Department submitted an amended application to increase the annual groundwater allocation limit from 300 MGY to 372 MGY with no increase in the monthly groundwater allocation of 36 MGM or overall allocation from all sources.

This request represents a new diversion request for the addition of Well No. 8 at 300 GPM and an increase in the groundwater allocation limit from 300 MGY to 372 MGY. An increase in the overall allocation of 93 MGM and 900 MGY from all sources was not requested.

Diversion is for the purpose of public water supply and serves the following communities: City of Salem and sections of Mannington and Quinton Townships.

Public notice was required due to the addition of Well No. 8 (E201504160) and the increase in the yearly groundwater allocation limit.

No requests for a hearing were filed upon the notice published on September 29, 2015 in South Jersey Times.

Background/Findings of Fact

1. Water is requested to be diverted under this modified permit for public community supply from the following sources at the maximum rates specified below:

Groundwater

Well Permit No.	Well Name or Designation	Pump Capacity (GPM)	Depth (feet)	Aquifer
5000000042	2	500	150	Mt. Laurel-Wenonah
3000014867	6	250	171	Mt. Laurel-Wenonah
3000015191	7	250	165	Mt. Laurel-Wenonah
E201504160	8	300	283	Mt. Laurel-Wenonah

Surface Water

Intake No.	Source	Pump Capacity (GPM)
Intake 1	Laurel Lake	3000
Intake 2	Elkinton Pond	4160

2. This application request is for a modification of an allocation granted by the following:

Permit No.	Date Issued	Source of Water	Diversion Amount	
			(MGM)	(MGY)
5290	07/02/2014	Well 8 emergency approval	93	900
5290	04/12/2005	3 wells, Lake Laurel, Elkinton Pond	93	900
5290	02/05/2003	2 wells, one common intake	93	300
5290	09/04/2001	2 wells, one common intake	93	300
5290	11/26/1994	2 wells, one common intake	93	300
5290	02/26/1988	2 wells, Lake Laurel, Elkinton Pond	93	300
1573	11/15/1971	2 wells, Lake Laurel, Elkinton	93	-

Permit No.	Date Issued	Source of Water	Diversion Amount	
			(MGM)	(MGY)
		Pond		
1069	06/16/1961	Well	93	-
653	12/01/1947	Well	93	-
455	05/13/1936	Well	62	-

3. The following information is available for the applicant's diversion sources:

Well No.:	2*	6	7	8
Well Permit No.:	5000000042	3000014867	3000015191	E201504160
Date Constructed:	1936	03/29/2002	05/31/2002	06/13/2014
Depth (feet):	150	171	165	283
Pump Capacity (GPM):	500	250	250	300
Site Elevation:	6	8.7	10	6.7
<u>Static Water Level:</u>				
Date (when constructed):	*	08/20/2001	01/14/2002	06/13/2014
Level (feet):	*	21	20.4	13.75
Date (recent):	09/2014	09/2014	09/2014	-
Level (feet):	16	16	16	-
<u>Chloride Data:</u>				
Date (historic):	3/1994	7/2001	11/2001	05/13/2014**
Concentration (mg/l):	6.3	67	58.7	31.3
Date (recent):	12/05/2014	12/05/2014	12/05/2014	12/05/2014
Concentration (mg/l):	16.5	110	116	17
<u>Well Test Data:</u> (from well records)				
Test Date:	*	11/08/2001	05/31/2002	06/13/2014
Yield (GPM):	*	370	324	302
Drawdown (feet):	*	111	72.6	122.25
Static Level (feet):	*	21	20.4	13.75
Pumping Time (hours):	*	24	72	-
Specific Capacity: (GPM/ft drawdown)	*	3.33	4.46	2.47

* No well record received

** Average of 2 chloride samples taken at lower zone (270 feet) and upper zone (205 feet).

4. Laurel Lake has a drainage area of 1.4 square miles. Elkinton Pond has a drainage area of 7.8 square miles. The volume of the lake is 25,122,000 gallons and the volume of the pond is 46,414,000 gallons. Elkinton Pond water is pumped into a small man-made canal at 4160 GPM during dry periods and delivered by gravity to Laurel Lake when the water level in the lake lowers. Water is then pumped from Laurel Lake at a rate of up to 3000 GPM to a raw water supply line to the treatment plant.

5(a). A review of quarterly diversion reports indicates the following total water use:

Year	Annual Use (mg)	Maximum Monthly Use (mg)	Average Monthly Use (mg)	Existing Allocation	
				(MGM)	(MGY)
2014	335.534	30.002 (July)	27.961	93	900
2013	317.378	28.919 (Aug.)	26.448	93	900
2012	341.397 (1)	48.057 (July) (1)	28.450	93	900
2011	335.477 (1)	44.172 (June) (1)	27.956	93	900
2010	288.383	29.245 (Aug.)	24.032	93	900
2009	272.207	25.3 (Oct.)	22.684	93	900

(1) Peak use accounts for flushing of algae, majority of surface water used in summer did not enter the distribution system.

5(b). A review of quarterly diversion reports indicates the following water use from the Wenonah-Mt. Laurel sources:

Year	Annual Use (mg)	Maximum Monthly Use (mg)	Average Monthly Use (mg)	Existing Allocation	
				(MGM)	(MGY)
2014	309.739*	29.753 (July)	25.812	36	300
2013	251.420	25.783 (Oct.)	20.952	36	300
2012	188.632	21.382 (Aug.)	15.719	36	300
2011	242.302	22.698 (July)	20.192	36	300
2010	240.875	23.921 (Aug.)	20.073	36	300
2009	231.155	21.493 (Oct.)	19.263	36	300

* Exceedance of Wenonah-Mt. Laurel aquifer allocation limits.

5(c). A review of quarterly diversion reports indicates the following water use from the surface water sources:

Year	Annual Use (mg)	Maximum Monthly Use (mg)	Average Monthly Use (mg)	Existing Allocation	
				(MGM)	(MGY)
2014	25.795	6.61 (Jan.)	3.685 (1)	93	900
2013	65.958	10.253 (Mar.)	5.497	93	900
2012	152.765 (2)	27 (July) (2)	12.730	93	900
2011	93.175 (2)	24 (June) (2)	7.765	93	900
2010	47.508	5.324 (Aug.)	3.959	93	900
2009	41.052	3.929 (Sept.)	3.421	93	900

(1) Surface water sources were only used for 7 months (January-July) in 2014.

(2) Peak use accounts for flushing of algae, majority of surface water used in summer did not enter the distribution system.

6. The population served is approximately 6,199, which represents an average monthly consumption of 97.87 gpcd, and a peak monthly consumption of 102.19 gpcd based upon 2014 water use data, with a 66 percent residential use component.
7. The applicant's diversion sources are located within: Planning Area 20 – Salem River as designated by the New Jersey State Water Supply Master Plan, the southwest Drought Region, and the Maurice, Salem and Cohansey Watershed Management Area No. 17.

The diversion is in the Delaware River Basin and is subject to the requirements of DRBC. The applicant has approval from the Commission under Docket No D-2002-46 CP for the existing wells and surface water intakes, but should contact the Commission to add Well 8 to the docket.

8. A site inspection was last conducted on December 19, 2003. The following information was obtained during this inspection:

	Well/Intake Condition	Pump House Condition	Pump Type/ Horse Power	Air Line and Gage	Able to Measure Static Water Level By Tape	Meter Type	Meter Reading
Well 2	Good	Good	Turbine/20 HP	Yes	8.82	Flow	379494
Well 6	Good	Good	Turbine/50	Yes	15.00	Flow	344216

	Well/Intake Condition	Pump House Condition	Pump Type/ Horse Power	Air Line and Gage	Able to Measure Static Water Level By Tape	Meter Type	Meter Reading
			HP				
Well 7	Good	Good	Turbine/40 HP	Yes	83.44**	Flow	131563
Well 8*	-	-	Submersible/ 30 HP	Yes	Yes	Flow	-
Intake 1 Laurel Lake	Good	Good	Turbine	N/A	N/A	Flow	NT
Intake 2 Elkinton Pond	-	-	Turbine	N/A	N/A	Flow	NT

* Well 8 not installed at time of last inspection

** Pumping level

The sources are located as follows:

Source Name	Location
Well 2	Corner of Route 49 and Grieves Parkway, Salem City
Well 6	580 feet southeast of Route 49 and Grieves Parkway, Salem City
Well 7	685 feet southwest of Route 49 and Grieves Parkway, Salem City
Well 8	Corner of Waterworks Road and Lake Road, Quinton Township
Intake 1	Corner of Waterworks Road and Lake Road, Quinton Township
Intake 2	650 feet southwest of Waterworks Road and Elkinton Road, Quinton Township

9. Flow meters for all diversion sources have been calibrated within the past 5 years. The most recent date of calibration for wells 2, 6, 7, and Elkinton Pond is December 19, 2013. The most recent date of calibration for Laurel Lake is September 15, 2011. The most recent date of calibration for Well 8 is June 2, 2014.
10. The following wells have been abandoned, decommissioned, are inactive or unused:

Well No.	Well Permit No.	Depth (feet)	Status
OBS-1	3000015342	162	Observation
1	N/A	136	Decommissioned 1962
3	3000000822	147	Unknown
4 (Smith St.)	N/A	124	Decommissioned 09/03/2003
5	3000000877	168	Decommissioned 06/28/2002
6	3000000699	103	Decommissioned 01/08/2004

11. The applicant is currently not in compliance with all permit conditions. The allocation limit for the Wenonah-Mt. Laurel aquifer group was exceeded in 2014 (the annual allocation limit was 300 MGY) when 309.739 million gallons were diverted. In addition, Staff Analysis and Conclusion No. 8 in the Staff Report issued in support of the Water Allocation Permit modification set effective on 05/01/2005 states that due to increasing chloride levels observed in well 2 and other wells completed in the Wenonah Mt. Laurel aquifer, Salem City was to begin reducing the diversion from Well 2 and increasing quantities withdrawn from surface water supplies to augment the lost capacity of the well diversion. This has not occurred. Salem City's use of Well 2 has more than doubled since 2005 while surface water use has essentially ceased. Despite these trends, chloride concentrations in Well 2 have remained relatively constant albeit elevated (in the low to mid 100's ppm range).
12. Water, after use, is discharged to Salem City Wastewater Treatment Plant for treatment and discharge to the Salem River under Permit No. NJ0024856. The treatment works are not under a sewer connection ban or other restriction imposed by NJDEP.
13. The system has no interconnections with adjacent systems.
14. The applicant has no agreements for the sale or purchase of water.
15. The system is 100 percent metered.
16. The applicant has indicated that their unaccounted-for-water is 12.5 percent in 2012, 16.9 percent in 2013, and 36.3 percent in 2104. The applicant indicated that aging infrastructure and leaks in abandoned buildings are contributing to this problem.
17. The water system has storage capacity of 1.48 MG, as compared with a 2014 average water demand of 1.128 MGD.
18. The applicant submitted a Water Conservation Plan on October 30, 2015. Water use restrictions have been in place since June 16, 2014, and will need to remain in effect until surface water diversion and treatment issues are resolved. Due to increasing unaccounted for water over the past several years, future water conservation plans will need to address this situation. Salem City has instituted a comprehensive leak detection program in an effort to locate and repair water leaks.
19. There are 347 subsurface diversions within 1 mile of Well 8. Most of these wells are domestic wells

and non-public community supply wells screened in the Kirkwood, Vincentown, and Wenonah-Mt. Laurel aquifers. The applicant will need to assess which of the small capacity wells are screened in the Wenonah-Mount Laurel aquifer within the radius of influence and determine if these wells will be impacted by the use of Well 8. The City of Salem would be responsible for any future adverse impacts to these wells by their diversion sources and provide corrective actions as necessary.

20. Public water supply wells regulated by the Water Allocation Permit program, within a 5-mile radius of well 8 include the following:

Well Owner	No. Of Wells	Depth (feet)	Aquifer	Capacity (GPM)	Distance (feet)
Salem City Water Dept.	3	157-171	WML	1,000	15,000
Leisure Arms Complex	3	265-300	WML	210	18,162
Wild Oaks Country Club	1	250	WML	7	8,620

21. According to the DEP GEOWEB Known Contaminated Sites data layer, and OPRA On-line Report web page information, potential pollution sites within twice the radius of influence, up to one mile, of the diversion include:

Name of Source	Distance (feet)	(Formation) Aquifer Affected	Lead Agency
NJ DOT RTE 49 SECTION 3J & 4C PROJECT (UST)	2,390	Surficial	LSRP
Quinton Mobil/Riggins Inc.	1,149	Surficial	LSRP
Bindra Investment LLC	1,310	Surficial	LSRP
Salem Street Department	546	Surficial	LSRP
Ernie Davis Property	3,035	Surficial	LSRP

22. The applicant has indicated that the new diversion source is not located in a freshwater wetlands or transition area per N.J.A.C. 7:19-2.2(f)6.
23. At the point of diversion, the water quality classification is SE(saline waters of estuaries)1 (C2).
24. The estimated consumptive use of water is 90 percent, which is equivalent to 1.02 mgd.

Staff Analysis and Conclusions

1. A 72-hour constant rate test (300 GPM) was conducted June 10-13, 2014. Two observation wells were used during the test and this was followed by a 72-hour recovery test. Well No. 8 was the production well and is completed in the Mt. Laurel-Wenonah aquifer. Water level readings were collected in monitoring wells 1 and 2.

Results of the aquifer test are as follows:

Well No.	Q (GPM)	Depth (feet)	Distance (feet)	Direction	Drawdown (feet)
Well 8	300	283	0	-	122.01
MW-1	0	320	163	east	44.88
MW-2	0	310	400	south	30.02

The applicant's consultant using the AQTESOLV hydrologic software program ran two analytical solutions using the confined aquifer solution (Papadopoulos-Cooper) and a leaky aquifer solution with aquitard storage (Hantush) and determined that the aquifer exhibited leaky confined characteristics. Transmissivity was determined to be 600 to 650 ft²/day, while a Radius of Influence of 4,000 feet for a zero-foot drawdown was calculated.

Using time vs. drawdown data from the aquifer test observation wells the New Jersey Geological & Water Survey determined the following values: a Transmissivity of 644 ft²/day, a Storativity of 1.638 e-4, leakage to be 5.428 e-5 day⁻¹ and a Radius of Influence for a one foot drawdown of 8,300 feet more accurately represent the aquifer's observed response to the test.

2. The applicant's current water use is reasonable. However, due to issues regarding the surface water treatment plant, the groundwater annual limit was exceeded in 2014. The applicant amended this application to request an increase the Wenonah-Mount Laurel groundwater annual limit from 300 MGY to 372 MGY. This permit will be implemented in phases where the initial phase will grant the annual increase in the groundwater annual allocation limit until such time as the surface water treatment plant is operational. At that time, the final phase of the permit shall be put into effect which will set the annual groundwater allocation limit back to 300 MGY. In addition, the applicant should be required to reduce the unaccounted-for water from 36 percent to below 15 percent in accordance with N.J.A.C. 7:19-6.4 et seq.

3. Demand projections provided by the applicant indicate that their ten year demands will be 93 MGM, and 900 MGY which is equivalent to the current overall allocation limits. Analysis of this in conjunction with historical use shows that these numbers may be excessive. A comparison of the ratio of the maximum monthly use (July 2012) to annual use (2012) for the applicant indicates that an annual allocation of 730 MGY, which is based on the surface water treatment plant design capacity of 2 million gallons per day (MGD) (with the capability to be expanded to 3 MGD), should be sufficient to meet their current needs. In addition, the applicant has recently been relying mainly on groundwater which is limited to 36 MGM and 300 MGY. The applicant has exceeded the 300 MGY limit in 2014 and at the present rate is in danger of exceeding the monthly and yearly limit in 2015 based on first quarter 2015 diversion. The requested increase in groundwater allocation, to be in effect until the surface water treatment plant is operation, will reduce the risk of exceeding the groundwater allocation limit in the immediate future. The applicant has indicated that the surface water treatment plant is not presently treating surface water due to technical issues with the plant operation and taste and odor complaints. The applicant will need to employ conservation measures

and ensure that the groundwater diversion limits are not exceeded. The City of Salem Water Department should also investigate alternate water sources, temporary treatment options, and backup well(s). Due to economic potential associated with the unused allocation, the current allocation should not be reduced to allow for water supply needs associated with the return of large, water intensive industry.

4. Public community water supply systems are in the public interest because they are generally safer and more reliable than individual domestic wells that are not subject to the same testing, monitoring and standards as a public community supply well. Historically the Department has viewed local governmental approval of a project as signifying that it is in the public interest. Therefore the proposed diversion is considered to be in the public interest in accordance with N.J.A.C. 7:19-2.2(f)1.
5. Natural replenishment of ground water is probably occurring because there has only been a minimal static change in the water level in the past 11 years of diversion at the site and the observed fluctuations do not follow a continual decreasing trend. According to New Jersey Geological & Water Survey vertical leakage from the overlying Vincentown Formation provides recharge water to the diversion wells at a steady rate.

The applicant has indicated that approval of the use of Well No. 8 completed in the Mt. Laurel-Wenonah aquifer would not exceed the natural replenishment or safe yield (water available continuously during projected future conditions, without creating undesirable effects) of the water resource or threaten to exhaust such waters, or render them unfit for use. The applicant intended to use Well 8 to supplement the use of surface water during peak months to offset taste and odor issues. The Bureau's analysis of the application in conjunction with the NJG&WS review of the aquifer test confirms this.

Therefore, approval of this application at the recommended rates is in accordance with N.J.A.C. 7:19-2.2(f)2.

6. There are no large capacity wells within the proposed diversion radius of influence.

According to the applicant's consultant there are a number of small capacity private wells located within a mile of the proposed diversion.

Many domestic wells are located within the ROI. Some of these wells are shallow, located within Kirkwood and Vincentown aquifers; Wells 8 pumpage will not affect water levels and wells in the Kirkwood and Vincentown aquifers; there would be no impact. However, some domestic wells utilize water from Wenonah-Mount-Laurel aquifer. These wells might be affected by Well No.8 pumpage based on distance from pumping Well 8. During the pumping test, Well No. 8's pumpage of 307 GPM affected a domestic well located approximately 600 feet to the east of Well 8. The well is constructed in the Wenonah-Mount-Laurel aquifer and uses a shallow suction pump to provide water to the house. The City of Salem Water Department addressed the issue immediately by connecting the affected home to its public system via hose; they later drilled a new 4-inch well with submersible pump for this property. It is possible that other domestic wells within approximately 1000 feet or more may be affected by Well 8 pumpage in the future. The City of Salem Water Department will

need to address any adverse impacts by connecting impacted users to the public water system or installing or deepening the impacted domestic wells.

There are potential impacts to domestic and public non-community wells in the Wenonah-Mount-Laurel aquifer within 1000-2000 feet due to Well 8's radius of influence and its resulting well interference. Well interference would be worst-case at an existing well with a suction well pump as discussed above. A contingency plan shall be put into place to remedy any other well interference issues.

Therefore, the proposed diversion is just and equitable to the other ground water users as it does not adversely affect other existing withdrawals, in accordance with N.J.A.C. 7:19-2.2(f)3.

Minimum passing flow requirements for the diversions are not required as the waters of Alloway Creek downstream of Laurel Lake and Elkinton Pond are tidal.

Therefore, approval of this application at the recommended rates is in accordance with N.J.A.C. 7:19-2.2(f)3.

7. Analysis of applicant's chloride data indicates that chloride concentrations of Well 2 range from 19.95 to 187 mg/l in 2004 in the Wenonah-Mt. Laurel aquifer at this location. Well 6 has shown decreasing chloride concentration since 2003. Well 7 has fluctuating levels with a maximum chloride level of 275 mg/l in June 2012 and a sodium level of 70.9 mg/l both of which exceed Safe Drinking Water maximum limits of 250 mg/L and 50 mg/L respectively. Elevated chloride concentrations are a consideration in the Wenonah-Mt. Laurel aquifer at this location. The increasing trends in levels in the local area trigger concerns that the diversion sources are becoming saline and approaching Safe Drinking Water maximum limits.

Salt-water intrusion may occur because chloride concentrations have consistently been above 100 mg/l since 2003 for Well 2. To prevent increasing levels, the applicant shall continue reducing the diversion from Well 2 and increasing quantities withdrawn from surface water supply once the surface water treatment plant is operational, supplemented with Wells 6,7, and 8 to augment the lost capacity of the well diversion.

Therefore, approval of this application at the recommended rates is in accordance with N.J.A.C. 7:19-2.2(f)4.

Due to the potential for elevated chloride and sodium concentrations in the Wenonah-Mount Laurel Aquifer in the region the applicant should continue to submit data on chloride and sodium concentrations, and calculate annual rolling averages of the chloride sampling results. The permittee shall sample, analyze and compile the results of the chloride samples obtained from the specified wells in the monitoring requirements in the permit. Sampling shall begin with the next required sampling month after the effective date of the permit (March, June, September or December). The permittee shall calculate, for each well, the annual average as a rolling calculation of the previous quarterly samples collected during the months of March, June, September and December. The annual average for each well shall be recalculated upon receipt of the next quarterly sample result. The calculated annual average, and trend analysis, for each well shall be reported to the Bureau within

thirty (30) days of Salem City Water Department's receipt of the sample results. Should the result of the rolling annual average for any well equal or exceed 200 mg/L, or if any one sample equals or exceeds 250 mg/L the permittee shall notify the Bureau in writing detailing the sampling results and actions taken to comply with all drinking water standards and stabilize chloride levels, including the timeframe of such actions. In addition, specific conductance so that significant changes can be identified and corrective action initiated.

8. Based upon the information provided by the applicant the diversion is not expected to contribute to the spread of groundwater pollution. There are five known contaminated sites within 1 mile of the diversion. These sites are primarily underground storage tanks and former gasoline stations and contamination is in the surficial layer and water table aquifer. These sites are currently active under LSRP oversight. According to the applicant's consultant, the diversion is not expected to contribute to the spread of groundwater pollution because the sites are located in the surficial aquifer. These sites exhibit surface contamination and to date has not had any adverse effect on the applicant's diversion sources.

NJG&WS determined that the sites will not impact the ground-water quality at the well No.8 site, because Well No.8 is screened in a leaky confined aquifer in the interval between 180-280 feet below land surface. The Wenonah Mount Laurel aquifer is protected by two confining units (Kirkwood Formation, and Hornerstown-Navesink Formations).

Therefore, the proposed diversion will not spread ground water contamination nor interfere with any groundwater remediation in accordance with N.J.A.C. 7:19-2.2(f)4.

9. The Bureau of Freshwater Wetlands has been notified of the proposed diversion since the new diversion source is located in a freshwater wetlands or transition area. The applicant has not indicated that the new diversion source is located in a freshwater wetlands or transition area per N.J.A.C. 7:19-2.2(f) 6. However, there are wetlands within 65 feet of the proposed diversion. The confining clay layer between the surficial aquifer and the Wenonah-Mt. Laurel aquifer and that the proposed well is located farther away from wetland area should reduce the potential for any impacts on the water table and associated wetlands from the proposed diversion. The Bureau of Freshwater Wetlands has been notified of the proposed diversion.
10. The proposed diversion is located within Planning Area 20 – Salem River of the New Jersey Statewide Water Supply Plan, August 1996 (NJSWSP). According to the NJSWSP, in Area 20, there are concerns of monitoring supply to meet demands, baseflow reduction, evaluation of surface water impacts during low flow periods and future supply to Planning Area 21. The NJSWSP ground-water supply management recommendations state that examination of stipulated surface water withdrawals (issue of lack of safe yield), ground water investigations to provide baseline data and shallow aquifer systems, a coastal plain study (feasibility) to provide data on optimal use of confined aquifers and the establishment of a Water Resource Council to manage resources. Therefore, this application is in accordance with N.J.A.C. 7:19-2.2(h).
11. The proposed well is intended to supplement the surface water source and relieve usage of Well 2 in which chloride concentrations are increasing.

There is no need to develop an alternate source at this time. However, the applicant's allocation is based primarily on surface water. The operation of the surface water treatment plant and the technical issues preventing the treatment of surface water must be resolved or the applicant risks not having enough groundwater to meet their demands. The increase in groundwater diversion is being granted for a limited time period. Water use restrictions should remain in place until the surface water treatment issues are resolved.

Summary

The Department has completed its review of this application pursuant to N.J.A.C. 7:19-1 et seq. The review of this application reveals that it does not have any adverse impacts and meets, based upon the information certified to in the application, the statutory requirements of N.J.S.A. 58:1A-1 et seq.

Therefore, based upon a review of the information submitted with the application, existing water allocation files, and the attached New Jersey Geological and Water Survey review of the application, the following conclusions have been reached regarding this application:

- Well 8 (E201504160) should be added to the permit as a diversion source with a maximum diversion rate of 300 GPM.
- The surface water and overall allocation limits should be carried forward.
- Maximum diversion rates should be carried forward.
- The existing monthly allocation for groundwater of 36 MGM should be carried forward.
- The annual allocation limit for groundwater from the Wenonah-Mount Laurel aquifer should be increased from 300 MGY to 372 MGY as requested.
- Water conservation measures and water usage restrictions shall be implemented to insure the Wenonah-Mt. Laurel allocation limits are not exceeded. This includes implementing a plan to reduce unaccounted-for water through water conservation planning.
- Quarterly monitoring in the last month of the quarter (March, June, September, and December) of chloride and sodium concentrations, specific conductance, and monthly monitoring of static water levels shall be submitted for all groundwater sources. Annual rolling averages for chloride concentrations shall be calculated and the Bureau notified in writing if any well annual rolling average equals or exceeds 200 mg/L or if any well sample equals or exceeds 250 mg/L as specified in permit requirements.
- Static water levels in three monitoring wells (MW-1, MW-2, and OBS-7) shall be measured (in feet mean sea level) in the last month of the quarter (March, June, September, and December) and submitted. The measuring point shall be surveyed to within +/- feet mean sea level.

Therefore this application should be approved in accordance with the following recommendations as the applicant has satisfied the requirements of N.J.A.C. 7:19-2.2 et seq.

References

In addition to the historical information on file at the Bureau of Water Allocation & Well Permitting and the application submitted, the following information sources were also utilized to establish the recommendations contained within this Staff Report:

- Johnson, Steve. January 16, 2004. Memorandum Report to Bureau of Allocation: Review and Comments of Hydrogeologic and Engineers Report to Accompany the City of Salem Water Department's Application to Modify Existing Diversion Permit No. 5290 for New Well No. 7.
- LaCombe, Pierre J., Rosman, Robert 2001. Water Levels in, Extent of Freshwater In, and Water Withdrawal from Ten Confined Aquifers, New Jersey and Delaware Coastal Plain, 1998. Water-Resources Investigations Report 00-4143. Washington, D.C. United States Government Printing Office.
- DePaul, V.T., and Rosman, Robert, 2015, Water-level conditions in the confined aquifers of the New Jersey Coastal Plain, 2008: U.S. Geological Survey Scientific Investigations Report 2013-5232, 107 p., 9 pl., <http://dx.doi.org/10.3133/sir20135232>.
- dePaul, Vincent T., Rosman, Robert, LaCombe, Pierre J. 2009. Water-level conditions in selected confined aquifers of the New Jersey and Delaware Coastal Plain, 2003. Scientific Investigations Report 2008-5145. Washington, D.C. United States Government Printing Office.
- Schaefer, F.L. 1983. Distribution of Chloride Concentrations in the Principal Aquifers in the New Jersey Coastal Plain, 1977-81. Water Resources Investigation Report 83-4061. Washington, D.C. United States Government Printing Office.
- Stroiteleva, Yelena. Memorandum Report to Bureau of Allocation & Well Permitting: Review and Comments of Aquifer Test of Well 8 and Technical Report review for Salem City Water Department's Modification of its Water Allocation Permit Number 5290. January 20, 2015.
- Zapeczka, Otto S. 1989. The Hydrogeologic Framework of the New Jersey Coastal Plain. U.S. Geological Survey Professional Paper 1404-B. Washington, D.C. United States Government Printing Office.
- March 1, 2001. The New Jersey State Development and Redevelopment Plan. New Jersey State Planning Commission, Trenton, New Jersey.
- August 1996. Water for the 21st Century: Vital Resource, New Jersey Statewide Water Supply Plan. New Jersey Department of Environmental Protection – Office of Environmental Planning, Trenton, New Jersey.

Recommendations

Issuance of the permit major modification with renewal is recommended with an expiration date of 10 years from the effective date and is subject to the attached permit requirements:

Date: November 12, 2015

Barbara A. Ware
Barbara A. Ware

11/16/15
11/13/15
11/13/15
MEM

Bureau of Water Allocation & Well Permitting

**SALEM CITY WATER DEPT
5290**

Water Allocation Permit : WAP140001

Permit Inventory

Water Diversion Sources - Water may be diverted under this permit from the following sources:

Source Designation (Well Permit No. or Intake No.)	Description	Subject Item ID
INTAKE 1	LAUREL LAKE (CORRECTED)	WSIN0000075171
INTAKE 2	ELKINTON POND	WSIN0000788420
3000014867	WELL 6	WSWL0000067214
5000000042	WELL 2	WSWL0000070418
3000015191	WELL 7	WSWL0000138949
E201504160	WELL 8	WSWL0001070905

Remaining Subject Items (monitoring wells, wells to be sealed, etc) - The following items are present but are not approved diversion sources:

Source Designation	Source Description	Subject Item ID
3000015342	OBS-7	WSWL0000232503
E201403183	MW-2	WSWL0001064908
E201403182	MW-1	WSWL0001064909

Group Subject Items - The following items are grouped sources for the purpose of setting permit requirements outlined in this document:

Group Designation	Group Description	Group Subject Item ID	Group Members
SALEM CITY WATER DEPT	5290 WA PERMIT - ALL DIVERSION SOURCES	WSWA0000075170	MT. LAUREL-WENONAH AQUIFER SOURCES, WELLS 2, 6, 7 & 8 (WARG078592) SURFACE WATER SOURCES, LAUREL LAKE & ELKINTON POND (WARG758367)
MT. LAUREL-WENONAH AQUIFER SOURCES	WELLS 2, 6, 7 & 8	WARG0000078592	3000014867, WELL 6 (WSWL067214) 5000000042, WELL 2 (WSWL070418) 3000015191, WELL 7 (WSWL138949) E201504160, WELL 8 (WSWL1070905)
SURFACE WATER SOURCES	LAUREL LAKE & ELKINTON POND	WARG00000758367	INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN075171)

**SALEM CITY WATER DEPT
5290**

Water Allocation Permit : WAP140001

Group Subject Items - The following items are grouped sources for the purpose of setting permit requirements outlined in this document:

Group Designation	Group Description	Group Subject Item ID	Group Members
SURFACE WATER SOURCES	LAUREL LAKE & ELKINTON POND	WARG0000758367	INTAKE 2, ELKINTON POND (WSIN788420)
WENONAH MT LAUREL MONITORING WELLS	OBS-7, MW-1, & MW-2	WARG0001110329	3000015342, OBS-7 (WSWL232503)
			E201403183, MW-2 (WSWL1064908)
			E201403182, MW-1 (WSWL1064909)

SALEM CITY WATER DEPT

5290

Water Allocation Permit : WAP140001

Permit Requirements

Limit Requirements

The following limits apply and are the maximum permitted allocation:

Initial Permit Phase from 12/01/2015 -

Subject Item	Parameter	Limit
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Maximum Diversion Rate	<= 5160 Gallons Per Minute. [N.J.A.C. 7:19- 2]
	Water Diverted	<= 93 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 900 Million Gallons Per Year. [N.J.A.C. 7:19- 2]
MT. LAUREL-WENONAH AQUIFER SOURCES, WELLS 2, 6, 7 & 8 (WARG78592)	Maximum Diversion Rate	<= 1000 Gallons Per Minute. [N.J.A.C. 7:19- 2]
	Water Diverted	<= 36 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 372 Million Gallons Per Year. [N.J.A.C. 7:19- 2]
SURFACE WATER SOURCES, LAUREL LAKE & ELKINTON POND (WARG758367)	Maximum Diversion Rate	<= 4160 Gallons Per Minute. [N.J.A.C. 7:19- 2]
	Water Diverted	<= 93 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 900 Million Gallons Per Year. [N.J.A.C. 7:19- 2]

Final Permit Phase

Subject Item	Parameter	Limit
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Maximum Diversion Rate	<= 5160 Gallons Per Minute. [N.J.A.C. 7:19- 2]
	Water Diverted	<= 93 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 900 Million Gallons Per Year. [N.J.A.C. 7:19- 2]
MT. LAUREL-WENONAH AQUIFER SOURCES, WELLS 2, 6, 7 & 8 (WARG78592)	Maximum Diversion Rate	<= 1000 Gallons Per Minute. [N.J.A.C. 7:19- 2]
	Water Diverted	<= 36 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 300 Million Gallons Per Year. [N.J.A.C. 7:19- 2]
SURFACE WATER SOURCES, LAUREL LAKE & ELKINTON POND (WARG758367)	Maximum Diversion Rate	<= 4160 Gallons Per Minute. [N.J.A.C. 7:19- 2]

SALEM CITY WATER DEPT

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Water Allocation Permit : WAP140001

Limit Requirements

The following limits apply and are the maximum permitted allocation:

Final Permit Phase

Subject Item	Parameter	Limit
	Water Diverted	<= 93 Million Gallons Per Month. [N.J.A.C. 7:19- 2]
		<= 900 Million Gallons Per Year. [N.J.A.C. 7:19- 2]

Other Limit Requirements

Initial Permit Phase from 12/01/2015 -

Subject Item	Parameter	Limit
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	Rated Pump Capacity	<= 3000 Gallons Per Minute. [N.J.A.C. 7:19- 2]
INTAKE 2, ELKINTON POND (WSIN788420)	Rated Pump Capacity	<= 4160 Gallons Per Minute. [N.J.A.C. 7:19- 2]
3000014867, WELL 6 (WSWL67214)	Rated Pump Capacity	<= 250 Gallons Per Minute. [N.J.A.C. 7:19- 2]
5000000042, WELL 2 (WSWL70418)	Rated Pump Capacity	<= 500 Gallons Per Minute. [N.J.A.C. 7:19- 2]
3000015191, WELL 7 (WSWL138949)	Rated Pump Capacity	<= 250 Gallons Per Minute. [N.J.A.C. 7:19- 2]
E201504160, WELL 8 (WSWL1070905)	Rated Pump Capacity	<= 300 Gallons Per Minute. [N.J.A.C. 7:19- 2]

Final Permit Phase

Subject Item	Parameter	Limit
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	Rated Pump Capacity	<= 3000 Gallons Per Minute. [N.J.A.C. 7:19- 2]
INTAKE 2, ELKINTON POND (WSIN788420)	Rated Pump Capacity	<= 4160 Gallons Per Minute. [N.J.A.C. 7:19- 2]
3000014867, WELL 6 (WSWL67214)	Rated Pump Capacity	<= 250 Gallons Per Minute. [N.J.A.C. 7:19- 2]
5000000042, WELL 2 (WSWL70418)	Rated Pump Capacity	<= 500 Gallons Per Minute. [N.J.A.C. 7:19- 2]
3000015191, WELL 7 (WSWL138949)	Rated Pump Capacity	<= 250 Gallons Per Minute. [N.J.A.C. 7:19- 2]
E201504160, WELL 8 (WSWL1070905)	Rated Pump Capacity	<= 300 Gallons Per Minute. [N.J.A.C. 7:19- 2]

SALEM CITY WATER DEPT

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Water Allocation Permit : WAP140001

Monitoring Requirements

Initial Permit Phase from 12/01/2015 -

Subject Item	Requirement	Frequency	Monitored Parameter	Monitoring Method
3000014867, WELL 6 (WSWL67214)	Static water levels for each well indicated shall be monitored. [N.J.A.C. 7:19- 2]	Each Month	Static Water Level	Airline, Tape, or Gage
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	The monthly diversion from each source indicated shall be monitored. The metered diversion shall then be corrected by subtracting the Elkinton Pond water placed into the lake each month. The total CORRECTED monthly diversion must be recorded and reported as water diverted. (Note: If the supplementing diversion exceeds or is equal to the lake diversion, the lake diversion should be reported as zero.) [N.J.A.C. 7:19- 2]	Each Month	Water Diverted	Meter
INTAKE 2, ELKINTON POND (WSIN788420)	The monthly diversion from each source indicated shall be monitored. [N.J.A.C. 7:19- 2]	Each Month	Water Diverted	Meter
3000014867, WELL 6 (WSWL67214)				
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for chloride concentration. [N.J.A.C. 7:19- 2]	Quarterly in Mar; June; Sept; Dec	Chloride	Total sample
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for sodium concentration. [N.J.A.C. 7:19- 2]	Quarterly in Mar; June; Sept; Dec	Sodium	Total sample

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Water Allocation Permit : WAP140001

Monitoring Requirements

Initial Permit Phase from 12/01/2015 -

Subject Item	Requirement	Frequency	Monitored Parameter	Monitoring Method
5000000042, WELL 2 (WSWL70418)	A raw water sample from each well indicated shall be analyzed for sodium concentration. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Sodium	Total sample
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for specific conductance. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Specific conductance	Total sample
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000015342, OBS-7 (WSWL232503)	Static water levels for each well indicated shall be monitored. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Static Water Level	Airline, Tape, or Gage
E201403183, MW-2 (WSWL1064908)				
E201403182, MW-1 (WSWL1064909)				

Final Permit Phase

Subject Item	Requirement	Frequency	Monitored Parameter	Monitoring Method
3000014867, WELL 6 (WSWL67214)	Static water levels for each well indicated shall be monitored. [N.J.A.C. 7:19-2]	Each Month	Static Water Level	Airline, Tape, or Gage
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				

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Water Allocation Permit : WAP140001

Monitoring Requirements

Final Permit Phase

Subject Item	Requirement	Frequency	Monitored Parameter	Monitoring Method
E201504160, WELL 8 (WSWL1070905)	Static water levels for each well indicated shall be monitored. [N.J.A.C. 7:19- 2]	Each Month	Static Water Level	Airline, Tape, or Gage
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	The monthly diversion from each source indicated shall be monitored. The metered diversion shall then be corrected by subtracting the Elkinton Pond water placed into the lake each month. The total CORRECTED monthly diversion must be recorded and reported as water diverted. (Note: If the supplementing diversion exceeds or is equal to the lake diversion, the lake diversion should be reported as zero.) [N.J.A.C. 7:19- 2]	Each Month	Water Diverted	Meter
INTAKE 2, ELKINTON POND (WSIN788420)	The monthly diversion from each source indicated shall be monitored. [N.J.A.C. 7:19- 2]	Each Month	Water Diverted	Meter
3000014867, WELL 6 (WSWL67214)				
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for chloride concentration. [N.J.A.C. 7:19- 2]	Quarterly in Mar; June; Sept; Dec	Chloride	Total sample
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for sodium concentration. [N.J.A.C. 7:19- 2]	Quarterly in Mar; June; Sept; Dec	Sodium	Total sample
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				

SALEM CITY WATER DEPT

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Water Allocation Permit : WAP140001

Monitoring Requirements

Final Permit Phase

Subject Item	Requirement	Frequency	Monitored Parameter	Monitoring Method
E201504160, WELL 8 (WSWL1070905)	A raw water sample from each well indicated shall be analyzed for sodium concentration. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Sodium	Total sample
3000014867, WELL 6 (WSWL67214)	A raw water sample from each well indicated shall be analyzed for specific conductance. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Specific conductance	Total sample
5000000042, WELL 2 (WSWL70418)				
3000015191, WELL 7 (WSWL138949)				
E201504160, WELL 8 (WSWL1070905)				
3000015342, OBS-7 (WSWL232503)	Static water levels for each well indicated shall be monitored. [N.J.A.C. 7:19-2]	Quarterly in Mar; June; Sept; Dec	Static Water Level	Airline, Tape, or Gage
E201403183, MW-2 (WSWL1064908)				
E201403182, MW-1 (WSWL1064909)				

Record Keeping Requirements

Initial Permit Phase from 12/01/2015 -

Subject Item	Requirement	Frequency	Monitored Parameter	Record Keeping Method
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	A log book of month end meter readings for each diversion source shall be maintained on site. [N.J.A.C. 7:19-2]	Each Month	Meter Reading	Log Book

SALEM CITY WATER DEPT

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Water Allocation Permit : WAP140001

Record Keeping Requirements

Final Permit Phase

Subject Item	Requirement	Frequency	Monitored Parameter	Record Keeping Method
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	A log book of month end meter readings for each diversion source shall be maintained on site. [N.J.A.C. 7:19- 2]	Each Month	Meter Reading	Log Book

Submittal/Action Requirements

Initial Permit Phase from 12/01/2015 -

Applicable Subject Items	Submittal/Action Type	Requirement
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	Submit Public Quarterly Report	The required monitoring results shall be recorded on the form provided by the Department. The completed form shall be submitted within 30 days after the end of each quarter. [N.J.A.C. 7:19- 2]
INTAKE 2, ELKINTON POND (WSIN788420)		
3000014867, WELL 6 (WSWL67214)		
5000000042, WELL 2 (WSWL70418)		
3000015191, WELL 7 (WSWL138949)		
3000015342, OBS-7 (WSWL232503)		
E201403183, MW-2 (WSWL1064908)		
E201403182, MW-1 (WSWL1064909)		
E201504160, WELL 8 (WSWL1070905)		

SALEM CITY WATER DEPT

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Water Allocation Permit : WAP140001

Submittal/Action Requirements

Initial Permit Phase from 12/01/2015 -

Applicable Subject Items	Submittal/Action Type	Requirement
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Submit Water Conservation and Drought Management Plan	The permittee shall continue to implement, to the satisfaction of the Department, a water conservation and drought management program. Water use restrictions shall remain in place until the surface water treatment plant is fully operational. The program shall encourage water conservation in all types of use within the area served by the permittee, including actions taken pursuant to this program and the impact thereof. The plan shall also include measures taken by the permittee to reduce the unaccounted-for water to a maximum of 15 percent. The reduction in unaccounted-for water shall be achieved within two years of the effective date of this permit. An update to the water conservation and drought management plan shall be submitted. Submit according to the following schedule: On or before October 31, 2017 and then prior to October 31, every other year thereafter. [N.J.A.C. 7:19-2]
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Submit Renewal Application	A renewal application shall be submitted three months prior to the expiration date. [N.J.A.C. 7:19-2]

Final Permit Phase

Applicable Subject Items	Submittal/Action Type	Requirement
INTAKE 1, LAUREL LAKE (CORRECTED) (WSIN75171)	Submit Public Quarterly Report	The required monitoring results shall be recorded on the form provided by the Department. The completed form shall be submitted within 30 days after the end of each quarter. [N.J.A.C. 7:19-2]
INTAKE 2, ELKINTON POND (WSIN788420)		
3000014867, WELL 6 (WSWL67214)		
5000000042, WELL 2 (WSWL70418)		
3000015191, WELL 7 (WSWL138949)		
3000015342, OBS-7 (WSWL232503)		
E201403183, MW-2 (WSWL1064908)		

**SALEM CITY WATER DEPT
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Water Allocation Permit : WAP140001

Submittal/Action Requirements

Final Permit Phase

Applicable Subject Items	Submittal/Action Type	Requirement
E201403182, MW-1 (WSWL1064909)	Submit Public Quarterly Report	The required monitoring results shall be recorded on the form provided by the Department. The completed form shall be submitted within 30 days after the end of each quarter. [N.J.A.C. 7:19- 2]
E201504160, WELL 8 (WSWL1070905)		
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Submit Water Conservation and Drought Management Plan	The permittee shall continue to implement, to the satisfaction of the Department, a water conservation and drought management program. Water use restrictions shall remain in place until the surface water treatment plant is fully operational. The program shall encourage water conservation in all types of use within the area served by the permittee, including actions taken pursuant to this program and the impact thereof. The plan shall also include measures taken by the permittee to reduce the unaccounted-for water to a maximum of 15 percent. The reduction in unaccounted-for water shall be achieved within two years of the effective date of this permit. An update to the water conservation and drought management plan shall be submitted. Submit according to the following schedule: On or before October 31, 2017 and then prior to October 31, every other year thereafter. [N.J.A.C. 7:19- 2]
SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)	Submit Renewal Application	A renewal application shall be submitted three months prior to the expiration date. [N.J.A.C. 7:19- 2]

Text Requirements

All Phases

SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)

1. All groundwater well samples shall be collected in accordance with the Department of Environmental Protection Field Sampling Procedures Manual, August 2005, Chapter 6.9 Groundwater Sampling Procedures. To properly determine the formation water chemistry, the purging of standing or stagnant borehole water shall be done by pumping several volumes of water until the sampling water is stabilized. [N.J.A.C. 7:19- 2]
2. The permittee shall sample, analyze and compile the results of the chloride samples obtained from the specified wells in the monitoring requirements in the permit. Sampling shall begin with the next required sampling month (March, June, September or December) following the effective date of the permit. The permittee shall calculate, for each well, the annual average as a rolling calculation of the previous quarterly samples collected during the months of March, June, September and December. The annual average, for each well, shall be recalculated upon receipt of the next quarterly sample result. The calculated annual average, and trend analysis, for each well shall be reported to the Bureau within thirty (30) days of Salem City Water Department's receipt of the sample results. Should the result of the rolling annual average for any well equal or exceed 200 mg/L, or if any one sample equals or exceeds 250 mg/L the permittee shall notify the Bureau in writing detailing the sampling results and actions taken to comply with all drinking water standards and stabilize chloride levels, including the timeframe of such actions. [N.J.A.C. 7:19- 2]

SALEM CITY WATER DEPT
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Water Allocation Permit : WAP140001

Text Requirements

All Phases

SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)

3. This permit shall be issued with an initial and final phase. The initial phase shall include a temporary increase in groundwater allocation from the Wenonah-Mount Laurel aquifer from 300 million gallons per year (MGY) to 372 MGY due to the surface water treatment plant not operating efficiently to treat surface water. When the surface water treatment plant becomes fully operational, Salem City Water Department shall notify the Bureau of Water Allocation & Well Permitting in writing and the final phase of the permit will go into effect. The final phase will remove the temporary increase in groundwater allocation and revert back to the 300 MGY limit. [N.J.A.C. 7:19- 2]
4. Water may be diverted under this modified permit for public community supply. However, water shall not be used to serve non-potable, consumptive purposes for new projects that are greater than 50 percent non-potable and greater than 50 consumptive, where, as determined by the Department, alternate water sources, including but not limited to reclaimed water for beneficial use, are feasible to serve the non-potable, consumptive needs of the project. [N.J.A.C. 7:19- 2]
5. Water may be diverted under this permit only from the approved diversion sources at the maximum rates specified. [N.J.A.C. 7:19- 1]
6. A major modification of this permit may be required in order to request the approval of any additional diversion sources or an increase in the pumping capacity. [N.J.A.C. 7:19- 2]
7. All diversion sources shall be metered with a totalizing flow meter. [N.J.A.C. 7:19- 2]
8. At a minimum, each diversion source flow meter shall be calibrated at least once every five years. [N.J.A.C. 7:19- 2]
9. Each flow meter shall be calibrated to within five percent accuracy. [N.J.A.C. 7:19- 2]
10. All wells shall be equipped with a metal tag showing the well permit numbers (source designation) as listed in the allocation permit inventory or have the well permit numbers painted on the casings. [N.J.A.C. 7:19- 2]
11. The pumping equipment capacity shall not be increased without prior approval from the Bureau of Water Allocation and Well Permitting. [N.J.A.C. 7:19- 1]
12. Any well not intended for use shall be decommissioned in accordance with N.J.A.C. 7:9D-3.1 et seq. [N.J.A.C. 7: 9D- 3]
13. Any required chemical analysis shall be performed by a New Jersey Certified Laboratory. [N.J.A.C. 7:19- 2]
14. Wells shall be constructed so that static water level (depth to water) can be determined at any time. [N.J.A.C. 7:19- 2]
15. Static water level shall be measured and reported as depth to water, in feet, from ground surface. [N.J.A.C. 7:19- 2]
16. For pumping wells, static water level (depth to water) shall be taken when the well pump has been shut down for a recovery period of at least 12 hours. If the well cannot be shut down for the required period, it must be noted on an addendum to the Quarterly Monitoring Report form. Please note on the addendum the number of hours the well was shut down or that the reading is a pumping level. [N.J.A.C. 7:19- 2]
17. All new services shall be metered in accordance with all applicable laws, regulations or codes including, but not limited to, the Water Supply Management Act and the Delaware River Basin Commission Rules. [N.J.A.C. 7:19- 6]
18. All existing services shall be metered. [N.J.A.C. 7:19- 6]
19. Water charges for each service connection shall be based in part on metered usage. [N.J.A.C. 7:19- 6]
20. The monthly quantity of water transferred and delivered to/received from interconnections shall be reported as part of the water system monitoring on separate forms provided by the Department. [N.J.A.C. 7:19- 2]
21. The Department may modify, suspend or terminate this permit, after due process, for violations of permit conditions, N.J.S.A. 58:1A-1, N.J.A.C. 7:19-1 et seq., any orders issued by the Department, or when in the public interest. [N.J.A.C. 7:19- 2]

SALEM CITY WATER DEPT
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Water Allocation Permit : WAP140001

Text Requirements

All Phases

SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)

22. The permittee shall investigate to the Department's satisfaction complaints by users of wells or surface water supplies within the zone of influence of its diversion to determine what impact the diversion has had on such wells or surface water supplies. A report on these investigations shall be forwarded to the Bureau of Water Allocation and Well Permitting. Any well or surface water supply which becomes damaged, dry, has reduced capacity, reduced water quality or is otherwise rendered unusable as a water source as a result of the permittee's diversions shall be repaired or replaced at the expense of the permittee. Work shall be in accordance with all State, County and Municipal construction standards for potable water. After reviewing all applicable investigational reports the Department of Environmental Protection will make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and will determine how to resolve any problems resulting from the diversion. [N.J.A.C. 7:19- 2]
23. This permit is issued for a limited period, and is not subject to automatic renewal. [N.J.A.C. 7:19- 2]
24. The permittee is subject to such fees as may be prescribed by the regulations. [N.J.A.C. 7:19- 3]
25. The permittee shall have the right to apply at any time for modification of this permit by submission of the appropriate application forms. [N.J.A.C. 7:19- 2]
26. The permittee may informally discuss the terms and conditions of this permit at any time with the Bureau of Water Allocation and Well Permitting. [N.J.A.C. 7:19- 2]
27. Approval of this application is subject to the granting of any approval by the Delaware River Basin Commission which may be required under the provisions of the Delaware River Basin Compact. [N.J.A.C. 7:19- 2]
28. The permittee shall obtain approval from the Bureau of Water System Engineering before using the diversion for public water supply. [N.J.A.C. 7:19- 2]
29. In addition to the specific management requirements cited above, and when so directed by the Department, the permittee shall comply with applicable portions of the Water Supply Management Rules (N.J.A.C. 7:19-6 et seq. and N.J.A.C. 7:19-8 et seq.) to include the determination of dependable yield; unaccounted-for water; rehabilitation; system pressure and storage; interconnections; and operation of interconnections. [N.J.A.C. 7:19- 6]
30. If the permittee violates any condition of this permit, the permittee is subject to administrative penalties up to \$25,000 per day per offense as specified. [N.J.S.A. 58: 1A-16]
31. The issuance of this permit shall not be deemed to affect in any way action by the Department of Environmental Protection of the State of New Jersey on any future application. [N.J.A.C. 7:19- 2]
32. No change in plans or specifications shall be made except with the prior written permission of the Department of Environmental Protection of the State of New Jersey. [N.J.A.C. 7:19- 2]
33. The granting of this permit shall not be construed to in any way affect the title or ownership of property, and shall not make the Department of Environmental Protection or the State a party in any suit or question of ownership of property. [N.J.A.C. 7:19- 2]
34. This permit does not waive the obtaining of Federal or other State or local government consent when necessary. This permit is not valid and no work shall be undertaken until such time as all other required approvals and permits have been obtained. [N.J.A.C. 7:19- 2]
35. A copy of this permit shall be kept at the facility site, and shall be exhibited upon request of any authorized Department representative. [N.J.A.C. 7:19- 2]
36. The Department has the right to enter and inspect any site, building, or equipment, or any portion thereof, owned or operated by the permittee, at any time, in order to ascertain compliance or noncompliance with N.J.S.A. 58:1A-1 et seq., 58:4A-4.1 et seq., 58:12A-1 et seq., these rules, or any other agreement or order issued or entered into pursuant thereto. Such right shall include, but not be limited to, the right to require the testing of any equipment at the facility, to sketch or photograph any portion of the site, building or equipment, to copy or photograph any document or records necessary to determine such compliance or noncompliance, and to interview any employees or representative of the owner, operator, or permittee. Such right shall be absolute and shall not be conditioned upon any action by the Department, except the presentation of appropriate credentials as requested and compliance with appropriate standard safety procedures. [N.J.A.C. 7:19- 2]

SALEM CITY WATER DEPT
5290

Water Allocation Permit : WAP140001

Text Requirements

All Phases

SALEM CITY WATER DEPT, 5290 WA PERMIT - ALL DIVERSION SOURCES (WSWA75170)

37. This permit may be transferred, with the consent of the Department, but only for the identical use of the waters. [N.J.A.C. 7:19- 2]
38. If the authorized diversion privileges are not currently diverted, subject to contract, or reasonably required for a demonstrated future need, they shall revert back to the State upon renewal or modification of the permit. [N.J.A.C. 7:19- 2]
39. The permittee shall protect each source from vandalism, tampering, and contamination at all times. [N.J.A.C. 7:19- 2]
40. This permit shall expire as indicated on the permit approval cover page. [N.J.A.C. 7:19- 2]

**Administrative Hearing Request Checklist
And Tracking Form for Permits**

1. Permit Being Appealed:

Title and Type of Permit

Issuance Date of Permit

Permit Number

2. Person Requesting Hearing:

Name/Company

Name of Attorney (if applicable)

Address

Address of Attorney

3. The following information must be included with the request:

- a. The date the permittee received the final permit;
- b. A copy of permit with a list of all permit conditions and issues contested;
- c. The legal and factual questions at issue;
- d. A statement as to whether or not the permittee raised each legal and factual issues during the public comment period of the permit;
- e. Suggested revised or alternative permit conditions;
- f. An estimate of the time required for the hearing;
- g. A request, if necessary, for a barrier-free hearing location for physically disabled persons;
- h. A clear indication of any willingness to negotiate a settlement with the Department prior to the Department's processing of the hearing request to the Office of Administrative Law; and
- i. This form, completed with all of the information listed above, signed, and dated, including attachments, to:
 - i. Office of Legal Affairs
ATTENTION: Adjudicatory Hearing Requests
Department of Environmental Protection
401 East State Street
P.O. Box 402
Trenton, New Jersey 08625-0402
 - ii. Terry D. Pilawski, Chief
Mail Code 401-04Q
Division of Water Supply & Geoscience
Bureau of Water Allocation & Well Permitting
P.O. Box 420
Trenton, New Jersey 08625
 - iii. All co-permittees (w/attachments)

4. Signature: _____ Date: _____

Appendix C
City of Salem Sanitary Sewer Service Map

REVISIONS

NO.	DATE	DESCRIPTION

TOWNSHIP OF MANNINGTON
COUNTY OF SALEM

TOWNSHIP OF QUINTON
COUNTY OF SALEM

TOWNSHIP OF LOWER
ALLOWAYS CREEK
COUNTY OF SALEM

TOWNSHIP OF ELSINBORO
COUNTY OF SALEM

TOWNSHIP OF MANNINGTON
COUNTY OF SALEM

TOWNSHIP OF PENNSYLVANIA
COUNTY OF SALEM

TOWNSHIP OF ELSINBORO
COUNTY OF SALEM

LEGEND

- LOT-LINE
- RIGHT-OF-WAY
- MUNICIPAL BOUNDARY LINE
- WATERWAY LINES
- SEWER LINES
- TREATMENT PLANT
- PUMP STATION
- MANHOLE
- OTHER

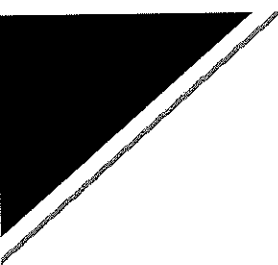
SOURCE
TAX PARCEL STREET, WATERWAY, & MUNICIPAL BOUNDARY DATA OBTAINED FROM SALEM COUNTY
IN HIGH RESOLUTION ORTHOPHOTOGRAPHY OBTAINED FROM NRSI
SEWER UTILITY DATA DERIVED FROM OVERALL MAP COMPILED BY CITY OF SALEM PUBLIC WORKS DEPARTMENT, DATED 8-4-2009
ALL PORTIONS ARE BASED ON THE FOLLOWING:
-NAD 83 STATE PLANE COORDINATE SYSTEM
-ENGLISH FEET UNITS

**WASTEWATER COLLECTION SYSTEM
CITY OF SALEM**

SALEM COUNTY NEW JERSEY
SCALE: 1" = 400' DATE: 8-18-2009

CHARLES E. ADAMSON & VERNICK ENGINEERS
REGISTERED PROFESSIONAL ENGINEERS
200 WEST MAINWAY EAST, SUITE 200
SALEM, NEW JERSEY 08146
TEL: 908-355-3333 FAX: 908-355-3332





Appendix D
City of Salem Utility
20-Year Capital Improvements Plan

(ESTIMATE) PROPOSED 20 YEAR CAPITAL IMPROVEMENT PLAN (2021-2040)

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 1 - 2021	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
EQUIPMENT REPAIRS AT WWTP INCLUDING ORBAL DISKS, AIR COMPRESSORS, DIGESTER TANK PIPING, SCREEN, AND BELT FILTER PRESS, PURCHASE OF JET-VAC TRUCK, SCADA SYSTEM UPGRADES	\$3,000,000.00
GIS MAPPING AND VALVE EXERCISING	\$75,000.00
CONTINGENCY - 10%	\$345,000.00
INFLATION - 2%	\$75,900.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$696,762.00
TOTAL CAPITAL IMPROVEMENT COSTS - 2021	\$4,567,662.00

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 2 - 2022	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
CLEANING AND TELEVISIONING OF SANITARY SEWER PIPING	\$100,000.00
WATER METER REPLACEMENT PROGRAM (2000 METERS)	\$1,300,000.00
CONTINGENCY - 10%	\$163,750.00
INFLATION - 4.04%	\$72,770.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$337,323.69
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2022	\$2,211,344.19

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 3 - 2023	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WATER TREATMENT PLANT UPGRADES FOR SURFACE WATER TREATMENT INCLUDING NEW MEMBRANES AND ADDITIONAL EQUIPMENT TO ADDRESS TASTE AND ODOR CONCERNS; MAINTENANCE OF UNUSED/NON FUNCTIONING EQUIPMENT	\$3,500,000.00
CONTINGENCY - 10%	\$387,500.00
INFLATION - 6.12%	\$260,899.10
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$814,211.84
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2023	\$5,337,610.94

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 4 - 2024	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
WELL #7 REHABILITATION	\$75,000.00
PAINTING OF WATER TOWER	\$400,000.00
CCTV 1/4 SYSTEM OR 19,800 LF	\$39,600.00
CONTINGENCY - 10%	\$75,210.00
INFLATION - 8.24%	\$68,196.95
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$161,191.25
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2024	\$1,056,698.20

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 5 - 2025	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #6 REHABILITATION & SITE SECURITY FENCE	\$85,000.00
REPLACEMENT OF WALNUT STREET LIFT STATION	\$400,000.00
CCTV 1/4 SYSTEM OR 19,800 LF	\$39,600.00
CONTINGENCY - 10%	\$89,960.00
INFLATION - 10.41%	\$102,994.20
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$196,659.76
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2025	\$1,289,213.96

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 6 - 2026	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
PAINTING OF STANDPIPE	\$400,000.00
REPLACEMENT OF WALNUT STREET LIFT STATION	\$400,000.00
CCTV 1/4 SYSTEM OR 19,800 LF	\$39,600.00
CONTINGENCY - 10%	\$107,710.00
INFLATION - 12.62%	\$149,478.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$240,171.93
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2026	\$1,574,460.43

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 7 - 2027	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #2 UPGRADES	\$300,000.00
CCTV SYSTEM OR 19,800 LF	\$39,600.00
CONTINGENCY - 10%	\$71,460.00
INFLATION - 14.87%	\$116,875.86
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$162,528.45
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2027	\$1,065,464.31

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 8 - 2028	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
WASTEWATER TREATMENT PLANT GENERATOR REPLACEMENT	\$250,000.00
CONTINGENCY - 10%	\$48,750.00
INFLATION - 17.17%	\$92,052.34
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$113,094.42
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2028	\$741,396.76

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 9 - 2029	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #8 REHABILITATION	\$75,000.00
CCTV SYSTEM OR 19,800 LF	\$39,600.00
CONTINGENCY - 10%	\$48,960.00
INFLATION - 19.51%	\$105,069.05
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$115,853.23
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2029	\$759,482.28

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 10 - 2030	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
REHABILITATION OF HIGH SERVICE PUMPS	\$50,000.00
CONTINGENCY - 10%	\$28,750.00
INFLATION - 21.9%	\$69,256.99
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$69,391.26
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2030	\$454,898.24

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 11 - 2031	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #9 REHABILITATION	\$75,000.00
CONTINGENCY - 10%	\$45,000.00
INFLATION - 24.34%	\$120,470.28
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$110,784.65
TOTAL CAPITAL IMPROVEMENT COSTS - 2031	\$726,254.93

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 12 - 2032	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
CONTINGENCY - 10%	\$23,750.00
INFLATION - 26.82%	\$70,078.17
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$59,639.07
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2032	\$390,967.24

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 13 - 2033	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #7 REHABILITATION	\$75,000.00
CONTINGENCY - 10%	\$45,000.00
INFLATION - 29.36%	\$145,335.28
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$115,260.35
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2033	\$755,595.63

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 14 - 2034	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
WWTP BUILDING MAINTENANCE / ROOF UPGRADES	\$110,000.00
CONTINGENCY - 10%	\$34,750.00
INFLATION - 31.95%	\$122,120.76
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$90,786.74
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2034	\$595,157.49

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 15 - 2035	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #6 REHABILITATION & BUILDING REPLACEMENT	\$85,000.00
CONTINGENCY - 10%	\$46,000.00
INFLATION - 34.59%	\$175,009.38
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$122,581.69
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2035	\$803,591.07

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 16 - 2036	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
CONTINGENCY - 10%	\$23,750.00
INFLATION - 37.28%	\$97,390.27
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$64,555.25
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2036	\$423,195.51

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 17 - 2037	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #2 REHABILITATION	\$75,000.00
CONTINGENCY - 10%	\$45,000.00
INFLATION - 40.02%	\$198,119.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$124,761.51
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2037	\$817,881.01

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 18 - 2038	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
CONTINGENCY - 10%	\$23,750.00
INFLATION - 42.82%	\$111,879.33
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$67,163.28
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2038	\$440,292.61

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 19 - 2039	
1500 LF OF WATER MAIN REPLACEMENT	\$375,000.00
WELL #8 REHABILITATION	\$75,000.00
CONTINGENCY - 10%	\$45,000.00
INFLATION - 45.68%	\$226,121.53
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$129,801.88
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2039	\$850,923.41

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 20 - 2040	
950 LF OF SEWER MAIN REPLACEMENT	\$237,500.00
CONTINGENCY - 10%	\$23,750.00
INFLATION - 48.59%	\$126,953.76
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	\$69,876.68
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2040	\$458,080.43