



Utilities
Kingston

2017 ANNUAL REPORT ON DRINKING WATER QUALITY

JANUARY 1 TO DECEMBER.31 2017

SYDENHAM WATER TREATMENT PLANT

Drinking Water System Number: 260069290

Drinking Water System Owner: Township of South Frontenac

Drinking Water System Category: Large Municipal Residential

Drinking Water Quality

Utilities Kingston is proud to present this annual report on drinking water quality. This report has been prepared in accordance to Section 11 of Ontario Regulation 170 03. Regulation 170 03 sets requirements for public waterworks with regard to sampling and testing, levels of treatment, licensing of staff, and notification of authorities and the public about water quality. Free copies of this report and the Summary report prepared in accordance to Schedule 22 of Ontario Regulation 170 03, are available by public request at any City of Kingston offices, at our water plant locations and at www.utilitieskingston.com. Notices of availability are generally made through the local newspapers and radio. Further information on the Drinking Water Regulations can be found on the Ministry of the Environment web site at www.ene.gov.on.ca. For further information about this report or any questions regarding accessibility contact James Patenaude at jpatenaude@utilitieskingston.com, or call 613-546-1181 Ext 2 5 2 5

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1. Plant Description & Treatment Processes

Raw Water Source.

The source of water treated by this plant is Sydenham Lake. The intake is located 128m east of the treatment plant, at approximately 6m of water depth.

Zebra Mussel Control.

Pre-chlorination takes place at the mouth of the intake. This protects the intake from becoming encrusted with zebra mussels, which would restrict the flow of water through the intake.

Screening.

Two stationary screens located in the low lift pumping well remove any large debris such as weeds, fish, etc.

Low Lift Pumps.

These pumps lift the water from lake level to the main treatment building. There are three submersible pumps each with a capacity of 7.8 l/sec which pump the water into the main building for treatment.

Chemical Feed System

XL1900 (Polyaluminum Chloride) is added to the water as it enters the process building just prior to passing through the in-line mixer. The particles in the water will collide with the PACl particles as the water flows in a spiral motion through the mixer, and then join together to form larger particles called floc.

Filters.

Three pressure filtration tanks containing a ceramic filtration media remove the floc

formed from the addition of PACl and the particles present in the water. Water flows through the filters into two baffled clean water reservoirs called clear wells.

Backwash.

Filters are washed to remove the particulates they have collected over the previous 48 hrs. Clean water from the clear well is pumped backwards through the filter, and the filter is agitated by air scouring the filter media to break up any large particles.

Process Waste Management

Effluent water from the backwash process is directed to a backwash storage tank for further settling. The supernatant (the clear water at the top of the tank after settling) is directed back to Sydenham Lake and the settled sludge is mechanically removed and sent for further treatment.

GAC Contactors

During periods of high dissolved organic content in the source water, filter effluent water is directed to two pressure filtration tanks containing granular activated carbon (GAC). The GAC contactors assist in the removal of dissolved organics which react with chlorine to produce chlorination by-products. The GAC contactors are periodically backwashed to remove the particulates they have collected.

Primary Disinfection

Primary disinfection of the filtered water is achieved via UV light and free chlorine residual. 2 UV reactors (duty/standby) each using 12 low pressure high output lamps, provide the UV light disinfection. Free chlorine disinfection follows the UV process with the use of two chemical metering pumps



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(duty/standby) which provide sodium hypochlorite to an application point downstream of the UV reactors at the entrance to the detention piping.

Secondary Disinfection

Secondary disinfection is the maintenance of a disinfectant residual throughout the distribution system which is achieved with chloramines. Following the free chlorine disinfection process, ammonium sulphate is added with the use of two chemical metering pumps (duty/standby), at an approximate rate of 4:1 ratio (chlorine/ammonia), to react with the free chlorine residual to form chloramines. The application dosages of sodium hypochlorite and ammonium sulphate is adjusted to produce a sufficient in plant combined chlorine residual to ensure that minimum residuals are maintained in the distribution system.

Clear Wells.

Two baffled clear wells, each with a volume of 115 m³, provide storage of filtered water and allow for a sufficient amount of chlorine contact time with the water to ensure proper disinfection.

High Lift Pumps.

Three high lift pumps move treated water from the clear wells into the distribution system.

Standby Equipment.

A 130 kW standby diesel generator provides electricity to the water plant during power interruptions. The generator and standby equipment is tested regularly to ensure proper operation when required.

Elevated Tank.

The elevated tank has a storage capacity of 1019 m³ and provides pressure to the distribution system.

Distribution System.

There are approximately 6363 meters of water mains, and 47 fire hydrants in the system. Once all connections to the distribution system have been completed, the drinking water system will supply water to 274 customer connections.

2. Monetary expenses incurred during this reporting period

Under Section 11 of Ontario Reg. 170/03, a description of any major expenses incurred during this reporting period must be included in the annual report. The major expenses for this drinking water system are listed below.

- Leak detection was performed by Utilities Kingston underground infrastructure department in order to locate water leaks in the distribution system.
- Hydrant maintenance and repair, valve maintenance and operation programs were conducted on the distribution system in 2017.
- New air release pods were installed on each of the 3 pressure filters.
- Sleeves and bulbs were replaced on the UV reactors.



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-New rollers were installed on chlorine feed pumps as well as the associated chlorine feed lines.

-Extensive in-plant preventative maintenance was conducted, including building/installing new chemical injection points, dismantling and cleaning the inline mixer and performing an acid wash to enhance filter performance.

3. Notifications submitted in accordance to the Safe Drinking Water Act

Under Ontario Reg. 170/03, notifications were required for any instances where a sample result indicated that a parameter used to measure water quality exceeded a Maximum Acceptable Concentration (MAC). Once a notification is received from a laboratory or an observation of any other indicator of adverse water quality is made by operations personnel, corrective action as dictated by the regulations is initiated in an effort to confirm the initial result. If confirmed, further action may be recommended by the Medical Officer of Health. If not confirmed sampling will typically return to the normal schedule, or depending on the parameter, Utilities Kingston may choose to increase the sampling frequency to more closely monitor the parameter for a period of time.

- There were no incidents which required a notification during the 2017 reporting period.

4. Definition & Terms

TCU - True Colour Units

mg - milligram

N/A - Not Applicable

N/D - Non -Detectable

NTU - Nephelometric Turbidity Units - A measure of the amount of particles in water.

mg/l - Milligrams per litre. This is a measure of the concentration of a parameter in water, also called parts per million (ppm).

µg/L - Micrograms per litre, also called parts per billion.

ng/l - Nanograms per litre, parts per trillion.

Parameter-A substance that we sample and analyze for in the water.

AO - Aesthetic objective. AOs are not health related, but may affect the taste, odour, colour or clarity of the water

OG - Operational guideline. Set to ensure efficient treatment and distribution of water.

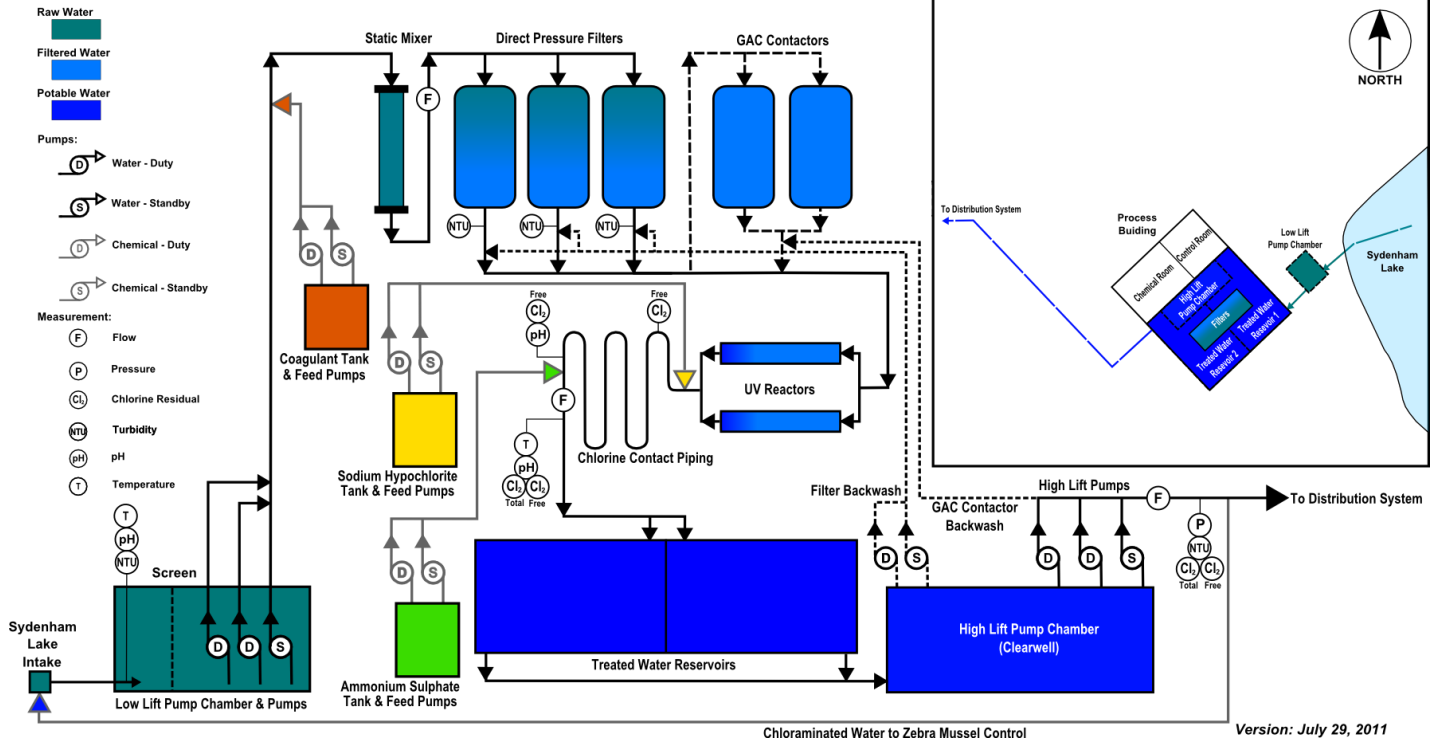
MAC - Maximum Acceptable Concentration. This is a health-related drinking water standard established for contaminants having known or suspected adverse health effects when above a certain concentration. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter.



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5. Flow Diagram

SYDENHAM WATER TREATMENT PLANT PROCESS FLOW





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6. Water Quality Test Results

Microbiological testing done under regulation 170 03, during this reporting period

| | MAC (E. Coli & Total Coliforms) | Number of Samples | Range of E. Coli or Fecal Results (min # - max #) | Range of Total Coliform Results (min # - max #) | Number of HPC Samples | Range of HPC Results (min # - max #) |
|---------------------|---------------------------------|-------------------|---|---|-----------------------|--------------------------------------|
| Raw | N/A | 52 | 0 - 160 | 0 – 950 | 0 | |
| Treated | * | 52 | 0 | 0 | 52 | <10 – 440 |
| Distribution System | * | 108 | 0 | 0 | 64 | <10 – 70 |

**Indicator of adverse water quality if detected*

Operational testing done under schedule 7, 8 or 9 of regulation 170/03 during this reporting period

| Parameter | MAC | Number of Samples | Range of Results (min # - max #) | Unit of Measure | Parameter Description |
|--|---------------------------|-------------------|----------------------------------|-----------------|--|
| Turbidity Raw Water | N/A | Continuous | 0.290 – 3.84* | NTU | Turbidity is a measure of particles in water. |
| Turbidity Treated Water | N/A | Continuous | 0.040 – 0.262* | NTU | Turbidity is a measure of particles in water. |
| Combined Chlorine Residual Treated Water | See parameter description | Continuous | 1.49 – 2.60* | mg/l | Recommended level of at least 1.00 mg/l in distribution system to maintain microbiological quality. 0.25 mg/l minimum. |
| Turbidity Filter#1 | 1.0 NTU for >15 min. | Continuous | 0.03 – 0.56 | NTU | Turbidity is a measure of particles in water. |
| Turbidity Filter#2 | 1.0 NTU for >15 min. | Continuous | 0.05 – 0.73 | NTU | Turbidity is a measure of particles in water. |



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| Parameter | MAC | Number of Samples | Range of Results (min # - max #) | Unit of Measure | Parameter Description |
|--|---------------------------|-------------------|--------------------------------------|-----------------|---|
| Turbidity Filter#3 | 1.0 NTU for >15 min. | Continuous | 0.04 – 0.65 | NTU | Turbidity is a measure of particles in water. |
| Chloramines Residual Distribution System | See parameter description | Continuous | 0.79 – 2.28 | mg/l | Recommended level of at least 1.0 mg/l combined chlorine in distribution system to maintain microbiological quality. 0.25 mg/l combined chlorine minimum. |

* Note: For these parameters the range of results is determined through in house lab testing.

Additional testing and sampling carried out in accordance with the requirements of the DWWP or MDWL

| Sample Location | MAC | Parameter | Number of Samples | Results Average | Unit of Measure | Parameter Description |
|------------------------------|-----|------------------------|-------------------|-----------------|-----------------|--|
| Backwash Wastewater Effluent | 15 | Total Suspended Solids | 12 | 6 | mg/l | A measure of the particulates collected in the filtration process. |

Summary of Raw water parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|-------------|-----|-------------------|---------------|-----------------|----------------|--|
| Microcystin | 1.5 | 20 | <0.15 – 0.193 | µg/L | No | Naturally occurring (released from blooms of blue-green algae) |



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Summary of treated water Schedule 23 inorganic parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|-----------|-------|-------------------|---------------|-----------------|----------------|---|
| Antimony | 0.006 | 1 | <0.0001 | mg/l | No | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder |
| Arsenic | 0.025 | 1 | 0.0003 | mg/l | No | Naturally occurring in surface waters / mine drainage |
| Barium | 1.0 | 1 | 0.054 | mg/l | No | Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes. |
| Boron | 5.0 | 1 | 0.030 | mg/l | No | Erosion of natural deposits, industrial waste effluents. |
| Cadmium | 0.005 | 1 | < 0.000014 | mg/l | No | Industrial discharge |
| Chromium | 0.05 | 1 | <0.002 | mg/l | No | Industrial residues |
| Mercury | 0.001 | 1 | <0.00002 | mg/l | No | Erosion of natural deposits, industrial discharges. |
| Selenium | 0.01 | 1 | < 0.001 | mg/l | No | Discharge from refineries, mines, chemical manufacture |
| Uranium | 0.02 | 1 | < 0.00005 | mg/l | No | Erosion of natural deposits. |

Summary of treated water Schedule 24 organic parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|-----------|-----|-------------------|---------------|-----------------|----------------|------------------------|
| Alachlor | 5 | 1 | <0.3 | µg/L | No | Agricultural herbicide |



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| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|--------------------------------------|------|-------------------|---------------|-----------------|----------------|--|
| Atrazine + N-dealkylated metabolites | 5 | 1 | <0.5 | µg/L | No | Agricultural herbicide |
| Azinphos-methyl | 20 | 1 | <1 | µg/L | No | Insecticide |
| Benzene | 5 | 1 | <0.5 | µg/L | No | Discharge from plastics manufacturing, leaking fuel tanks |
| Benzo(a)pyrene | 0.01 | 1 | <0.005 | µg/L | No | Formed from the incomplete burning of organic matter. |
| Bromoxynil | 5 | 1 | <0.3 | µg/L | No | Agricultural herbicide |
| Carbaryl | 90 | 1 | <3 | µg/L | No | Agricultural/Forestry/ Household insecticide |
| Carbofuran | 90 | 1 | <3 | µg/L | No | Agricultural insecticide |
| Carbon Tetrachloride | 5 | 1 | <0.2 | µg/L | No | Discharge from chemical and industrial activities |
| Chlorpyrifos | 90 | 1 | <0.5 | µg/L | No | Agricultural/ Household insecticide |
| Diazinon | 20 | 1 | <1 | µg/L | No | Agricultural/ Livestock Operation/ Residential insecticide |
| Dicamba | 120 | 1 | <5 | µg/L | No | Agricultural herbicide |
| 1,2-Dichlorobenzene | 200 | 1 | <0.1 | µg/L | No | Discharge from industrial chemical factories |
| 1,4-Dichlorobenzene | 5 | 1 | <0.2 | µg/L | No | Discharge from industrial chemical factories |
| 1,2-Dichloroethane | 5 | 1 | <0.1 | µg/L | No | Discharge from industrial chemical factories |



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| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|---|-----|-------------------|---------------|-----------------|----------------|--|
| 1,1-Dichloroethylene (vinylidene chloride) | 14 | 1 | <0.1 | µg/L | No | Discharge from industrial chemical factories |
| Dichloromethane | 50 | 1 | <0.3 | µg/L | No | Discharge from pharmaceutical and chemical factories |
| 2-4 Dichlorophenol | 900 | 1 | <0.1 | µg/L | No | Industrial contamination/ reaction with chlorine |
| 2,4-Dichlorophenoxy acetic acid (2,4-D) | 100 | 1 | <5 | µg/L | No | Agricultural/ Residential herbicide |
| Diclofop-methyl | 9 | 1 | <0.5 | µg/L | No | Agricultural herbicide |
| Dimethoate | 20 | 1 | <1 | µg/L | No | Agricultural/ Livestock Operation/ Forestry insecticide |
| Diquat | 70 | 1 | <5 | µg/L | No | Agricultural/ Aquatic herbicide |
| Diuron | 150 | 1 | <5 | µg/L | No | Agricultural/ Industrial/ herbicide |
| Glyphosate | 280 | 1 | <25 | µg/L | No | Agricultural/Forestry/ Household herbicide |
| Malathion | 190 | 1 | <5 | µg/L | No | Fruit & Vegetable / pest control insecticide |
| 2-methyl-4-chlorophenoxyacetic acid (MCPA) | 0.1 | 1 | < 0.00012 | mg/L | No | Leaching and/or runoff from agricultural and other uses |
| Metolachlor | 50 | 1 | <3 | µg/L | No | Agricultural herbicide |
| Metribuzin | 80 | 1 | <3 | µg/L | No | Agricultural herbicide |



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| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|--------------------------------|-----|-------------------|---------------|-----------------|----------------|--|
| Monochlorobenzene | 80 | 1 | <0.2 | µg/L | No | Discharge from industrial and agricultural chemical factories and dry cleaning facilities |
| Paraquat | 10 | 1 | <1 | µg/L | No | Agricultural/ Aquatic herbicide |
| Pentachlorophenol | 60 | 1 | <0.1 | µg/L | No | Pesticide/ wood preservative residue |
| Phorate | 2 | 1 | <0.3 | µg/L | No | Agricultural insecticide |
| Picloram | 190 | 1 | <5 | µg/L | No | Industrial herbicide |
| Polychlorinated Biphenyls(PCB) | 3 | 1 | <0.05 | µg/L | No | Residue from various industrial uses |
| Prometryne | 1 | 1 | <0.1 | µg/L | No | Agricultural herbicide |
| Simazine | 10 | 1 | <0.5 | µg/L | No | Agricultural herbicide or its residue |
| Terbufos | 1 | 1 | <0.3 | µg/L | No | Agricultural insecticide |
| Tetrachloroethylene | 30 | 1 | <0.2 | µg/L | No | Leaching from PVC pipes; discharge from factories, dry cleaners and auto shops (metal degreaser) |
| 2,3,4,6-Tetrachlorophenol | 100 | 1 | <0.1 | µg/L | No | Wood preservative |
| Triallate | 230 | 1 | <10 | µg/L | No | Agricultural herbicide |
| Trichloroethylene | 5 | 1 | <0.1 | µg/L | No | Discharge from metal degreasing sites and other factories |
| 2,4,6-Trichlorophenol | 5 | 1 | <0.1 | µg/L | No | Pesticide manufacturing |
| Trifluralin | 45 | 1 | <0.5 | µg/L | No | Agricultural herbicide |



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| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|----------------|-----|-------------------|---------------|-----------------|----------------|--|
| Vinyl Chloride | 2 | 1 | <0.2 | µg/L | No | Leaching from PVC pipes; discharge from plastics factories |

Summary of other regulatory treated water parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|-----------|-----|-------------------|---------------|-----------------|----------------|--|
| Fluoride | 1.5 | 1 | 0.1 | mg/l | No | Naturally occurring. |
| Nitrite | 1 | 4 | <0.1 | mg/l | No | A natural component of water at this level. |
| Nitrate | 10 | 4 | <0.1 – 0.2 | mg/l | No | Runoff from fertilizer use, erosion of natural deposits |
| Sodium | 20 | 1 | 11.9 | mg/l | No | Occurs naturally in the earth's crust. *Notification is required every 60 months if greater than 20 mg/l. |

Summary of additional treated water parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | MAC Exceedance | Parameter Description |
|-------------|-----|-------------------|---------------|-----------------|----------------|--|
| Microcystin | 1.5 | 20 | <0.15 | µg/L | No | Naturally occurring (released from blooms of blue-green algae) |



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Summary of regulatory distribution drinking water parameters tested during this reporting period

| Parameter | MAC | Number of Samples | Result Value | Unit of Measure | Exceedance | Parameter Description |
|------------------------------------|--------------------------|-------------------|-------------------|-----------------|------------|---|
| Alkalinity (as CaCO ₃) | N/A | 8 | 116 – 123 | mg/l | No | A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate. |
| Total Haloacetic acids | 0.08 (Annual avg.) | 4 | 0.025 | mg/L | No | By-product of drinking water disinfection with chlorine. Based on a running annual average |
| Lead | 0.01 | 2 | .00005- .00009 | mg/l | No | Internal corrosion of household plumbing, erosion of natural deposits. |
| pH | 6.5–8.5 OG | 8 | 7.00 - 8.05 | | No | An indicator of the acidity of water. |
| Total Trihalomethanes | 100 (Annual avg.) | 4 | 0.032 | µg/L | No | By-product of chlorination. * The MAC for THMs of 100 µg/L is based on a running annual average. |

Summary of raw water testing analyzed by in house laboratory during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | Exceedance | Parameter Description |
|------------------|-----|-------------------|---------------|-----------------|------------|--|
| UV Transmittance | N/A | 116 | 69.6 – 82.8 | % | No | UV transmittance is a measure of the percentage of transmittance of UV light |



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Summary of treated water testing analyzed by in house laboratory during this reporting period

| Parameter | MAC | Number of Samples | Results Range | Unit of Measure | Exceedance | Parameter Description |
|------------------|-----|-------------------|---------------|-----------------|------------|--|
| Aluminum | 0.1 | 113 | 0.0008 – 0.09 | mg/l | No | May be naturally present or a residual from the coagulation process. |
| Free Ammonia | N/A | 118 | 0.04 – 0.41 | mg/l | No | Residual from the addition of Ammonium Sulphate for the secondary disinfection process |
| Monochloramines | 3.0 | 118 | 1.01 – 2.48 | mg/L. | No | Chloramines are produced when ammonia is added to chlorinated water during the disinfection process. |
| UV Transmittance | N/A | 116 | 82.5 – 94.7 | % | No | UV transmittance is a measure of the percentage of transmittance of UV light |