Drinking Water System

2018 - *Annual Report*

322 Water Street
Deseronto, Ontario
K0K 1X0

Prepared: February 2019

Executive Summary

Major upgrading of the Town of Deseronto Water Treatment Plant was underway during 2018. A full replacement of the treatment process and refurbishment of the building and control systems is scheduled for completion in June of 2019. The new treatment process utilizes coagulation / flocculation and dissolved air flotation, followed by conventional sand / GAC filtration, and chlorine disinfection. The upgrades eliminate historic capacity limitations, making the process capable of processing the permitted 2,946 m^3/d of raw water.

During 2018, treated water pumped to the community increased by approximately 8 percent when compared to 2017. The 2018 maximum day flow of 1632 m^3/d occurred in October as the result of distribution system breaks. The 2018 maximum day flow represents approximately 55 percent of the design capacity while the average day flow represented approximately 42 percent of design capacity.

Water samples collected throughout the process at varying frequencies are tested for approximately 70 different parameters to evaluate treatment efficiency and to ensure finished water quality. All samples met the requirements of the Ontario Drinking Water Quality Standards.

Filtration performance deteriorated during November and December due to poor performance of new process equipment however treatment and disinfection remained effective based on process monitoring trends and bacteriological testing results. A design deficiency causing the poor process performance was corrected in January 2019.

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Key Words & Terms

m^3 /d	cubic metres per day, ($1m^3$ = 1000 litres)
mg/L	milligrams per litre, (1 part in 1,000,000)
μg/L	micrograms per litre, (1 part in 1,000,000,000)
ACU	apparent colour measurement units (standard unit to quantify colour in water)
NTU	nephelometric turbidity units (standard unit to quantify turbidity in water)
MAC	maximum acceptable concentration
IMAC	interim maximum acceptable concentration
AO	aesthetic objective (non-health related)

Coagulation / Flocculation refer to the water treatment chemical processes that convert small particles of suspended solids into larger, more settleable or floatable clumps.

Disinfection refers to the process that destroys disease-causing organisms in water, usually by the addition of chlorine.

Escherichia Coli (E. Coli) refers to a subgroup of fecal coliform bacteria that reside in the digestive systems of warm blooded animals. The presence of *E. Coli* in drinking water is a strong indicator of fecal contamination. *E. Coli* is rapidly destroyed by chlorine.

Heterotrophic Plate Count (HPC) is a microbial test method that quantifies levels of heterotrophic bacteria. Most bacteria, including those common in drinking water systems, are heterotrophs. Increases in the density of HPC bacteria in the distribution system are usually the result of bacterial re-growth which is influenced by the quality of the water entering the system, temperature, flow (i.e. stagnation), presence of a disinfectant residual, construction materials, and the availability of nutrients for growth. HPC in drinking water are not considered a direct health threat.

Inorganic refers to non-carbon based substances. Common inorganic substances in water include metals, minerals, nutrients, and salts.

ODWQS refers to the Ontario Drinking Water Quality Standards. The ODWQS define the standards, objectives, and guidelines to be followed for the provision of a safe and aesthetically acceptable drinking water supply.

Ontario Regulation 170/03 or O.Reg.170/03 refers to the Drinking Water Systems Regulation as amended.

Ontario Regulation 169/03 or O.Reg.169/03 refers to the ODWQS Regulation as amended.

Organic refers to a large group of carbon-based chemical compounds including all animal and vegetable matter plus many synthetic compounds such as pesticides and industrial solvents.

Raw Water is defined as surface (lakes, rivers) or ground water (wells) available as a source of drinking water that has not received any treatment.

Dissolved Air Flotation (DAF) refers to the treatment process that involves the use of microbubbles released from air saturated water to float flocculated suspended material to the surface of a flotation tank for removal by skimming.

Total Coliform Bacteria are a group of commonly occurring, mostly harmless bacteria that live in soil and water as well as the gut of animals. Their presence in a water sample may be indicative of inadequate filtration and/or inadequate disinfection.

Turbidity refers to a physical characteristic of water that causes a cloudy appearance. Turbidity is caused by the presence of suspended matter. The substances that cause turbidity can be a source of disease causing organisms, and can shield potentially pathogenic organisms from disinfection.

THM's / HAA's refer to trihalomethanes and haloacetic acid compounds which are disinfection by-products formed when chlorine combines with organic substances in the water supply. Elevated concentrations are carcinogenic.

Introduction

The 2018 Annual Report for the Deseronto Water Treatment Plant summarizes treated water quality and process operating data with reference to the requirements of Ontario Regulation 170/03 (O. Reg. 170/03), Ontario Regulation 169/03 (O. Reg. 169/03), Municipal Drinking Water Licence 154-101, Drinking Water Works Permit 154-201, and Permit to Take Water 6262-98DPFG. This report consolidates the reporting requirements specified as "Annual Report" in O.Reg.170/03, Sec. 11, and "Summary Reports for Municipalities" in O.Reg.170/03, Schedule 22.

- Section 1 of the report provides a description of the water treatment process.
- Section 2 summarizes reports to the Ministry of the Environment, Conservation and Parks (MECP) under Subsection 18(1) of the Safe Drinking Water Act (notices of adverse water quality) or Schedule 16, Section 16-4 of O. Reg.170/03 (notice of inadequate disinfection).
- Section 3 summarizes process data including: accredited laboratory and "in-house" water quality laboratory testing, process flow measurement, and treatment process chemicals.
- Maintenance and upgrading projects carried out during 2018 are discussed in Section 4.

Copies of the Annual Drinking Water Report are available to the public free of charge from Deseronto Town Hall at 331 Main Street in Deseronto. Reports are also available on-line at https://www.deseronto.ca/residents/waterwaste-water/ .

Additional information on drinking water standards in Ontario is available from the MECP at: https://www.ontario.ca/page/drinking-water .

The Town of Deseronto is an accredited operating authority, conforming to the Ontario Drinking Water Quality Management Standard.

DWQMS Policy: The Town of Deseronto is committed to the supply of safe, reliable municipal drinking water and to abiding by all applicable legislation and regulations. That commitment is sustained by our dedication to the implementation, maintenance, and continual improvement of a Quality Management System that conforms to the Ontario Drinking Water Quality Management Standard.

1 - Description of the Deseronto Water Treatment Process

1.1 Origins and Types of Raw Water Contaminants

As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up substances resulting from the presence of animals or from human activity. The types of contaminants that may be present in raw water include:

- Microbiological contaminants, such as pathogens, may come from septic systems, livestock, sewage treatment plants, and wildlife. Microbiological quality is the most important component of drinking water quality because of its ability to cause acute illness in consumers.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Organic contaminants can be naturally occurring, but most organic compounds of concern are man-made. Pesticides and herbicides are included in this group and may originate from a variety of sources such as agriculture, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the Ontario Ministry of the Environment, Parks and Conservation (MECP) prescribes treatment, monitoring, and reporting standards that apply to all drinking water systems in the Province.

The following describes the Deseronto treatment process and the monitoring that takes place to ensure the safety of our drinking water.

1.2 Raw Water Supply

Water is drawn from the Bay of Quinte through a 400 mm diameter intake pipe, extending 490 m off-shore, submerged to a depth of approximately 6 m. Coarse screens at the intake crib and at the inlet to the low lift pumping station prevent large debris from passing into the treatment process. Following the screens, raw water flows by gravity into a tank at the low lift pumping station from where it is pumped to the treatment process.

1.3 Coagulation / Flocculation / Dissolved Air Floatation

Raw water pumped to the treatment plant first enters the dissolved air floatation (DAF) treatment units (2). DAF equipment includes two saturation tanks, duplex air compressor and tank, recirculation pumps (3), two-stage flocculation tanks (2), floatation tanks (2), float skimmer mechanisms (2), and float discharge hopper (2). The DAF units are operated in a parallel configuration.

Coagulants are injected into the raw water immediately upstream from the two-stage flocculation tanks. Coagulants are chemicals that cause the gathering together of small colloidal and suspended material present in the raw water (measured as turbidity) to form more stable and distinct particles. Rapid mixing of the primary coagulant with the raw water occurs as the raw water passes through a static mixer. The raw water then enters the flocculation tanks where polymer is added and gentle mixing takes place to promote the formation of sticky flock particles (flocculation). At the downstream end of the flocculation tanks, flow passes under a baffle to the DAF reaction zone and floatation tank. In the reaction zone a steady flow of air saturated water is distributed through a nozzle header, recycled from the effluent end of the floatation tank. Microscopic bubbles are released from the air saturated stream which adhere to the particles formed in the flocculation tanks and floats them to the surface of the floatation tank. The accumulated material on the surface of the floatation tank is referred to as float. The float is skimmed from the surface of the floatation tank and directed to a waste holding tank. The clear water below the float passes under a baffle, over a weir and on to the filtration process.

1.4 Filtration

The Deseronto WTP has three parallel gravity dual media filters, utilizing sand and granular activated carbon (GAC) media. Residual particulate matter carried over from the floatation process is trapped primarily in the sand portion of the filter. The GAC is effective in removing organic compounds, many of which are responsible for unpleasant taste and odour sometimes experienced during the warmer months. Filtered water passes through under-drain nozzles, located at the bottom of the filter media. The under-drain nozzles are designed to allow the passage of water while retaining the filter media.

Turbidity, a measure of the cloudiness of water, is measured continuously in the effluent from each filter to monitor the effectiveness of the filtration process. If the turbidity rises above a set-point value, the plant automatically shuts off and an alarm warns staff that corrective actions are needed.

Accumulated debris on the filter media must be periodically removed by backwashing. During backwashing, a filter is isolated from the treatment process while water is forced in a reverse direction through the media. Compressed air is also introduced to agitate the media surface, loosening accumulated debris. The backwash flow flushes the accumulated debris to a waste holding tank.

1.5 Chlorination / Disinfection

Chlorine is typically added to the process in two locations; the raw water to control the accumulation of zebra mussels and other biological growth; and to the treated water for disinfection.

The addition of chlorine to the raw water is considered a pre-treatment measure and is referred to as pre-chlorination. Pre-chlorination can be applied at the intake crib (normal point of application) or into the low lift pump discharge header.

The intake crib was last inspected and cleaned in June of 2016. The inspection report confirmed successful operation of the zebra-mussel control system.

The second point of chlorine addition occurs at the treatment plant, immediately downstream from the dual media filters and GAC contactors, and is referred to as post-chlorination. Post-chlorination disinfects the treated water, ensuring that any remaining, potentially pathogenic organisms are inactivated prior to entering the distribution system.

Sufficient chlorine is added at the treatment plant to maintain a residual concentration throughout the distribution system. Maintaining chlorine residual throughout the distribution system is referred to as secondary disinfection. Secondary disinfection is a regulated requirement which is necessary to prevent the growth of micro-organisms in the distribution system.

1.6 Elevated Storage Tank

Treated water is pumped from the clearwells into the distribution system. The treated water storage standpipe is connected to the distribution system grid. The 1135 m^3 standpipe provides relatively constant system pressure and a reserve volume of water for community fire protection.

1.7 Process Waste Residual Treatment:

Waste residuals generated through the treatment process, including filter backwash, settled flock removed from the reactor clarifier, and float skimmed from the DAF are directed to the waste holding tank. Wastewater from the holding tank is either pumped to the waste clarifier for treatment, or directly to the municipal wastewater treatment plant. The waste clarifier separates the waste stream solids by gravity sedimentation. The settled solids are pumped to the municipal wastewater treatment plant, and the treated overflow from the top of the clarifier is discharged to the Bay of Quinte.

1.8 Multiple Barriers to Microbiological Pathogens:

Potentially pathogenic organisms are removed from the raw water source by the following processes:

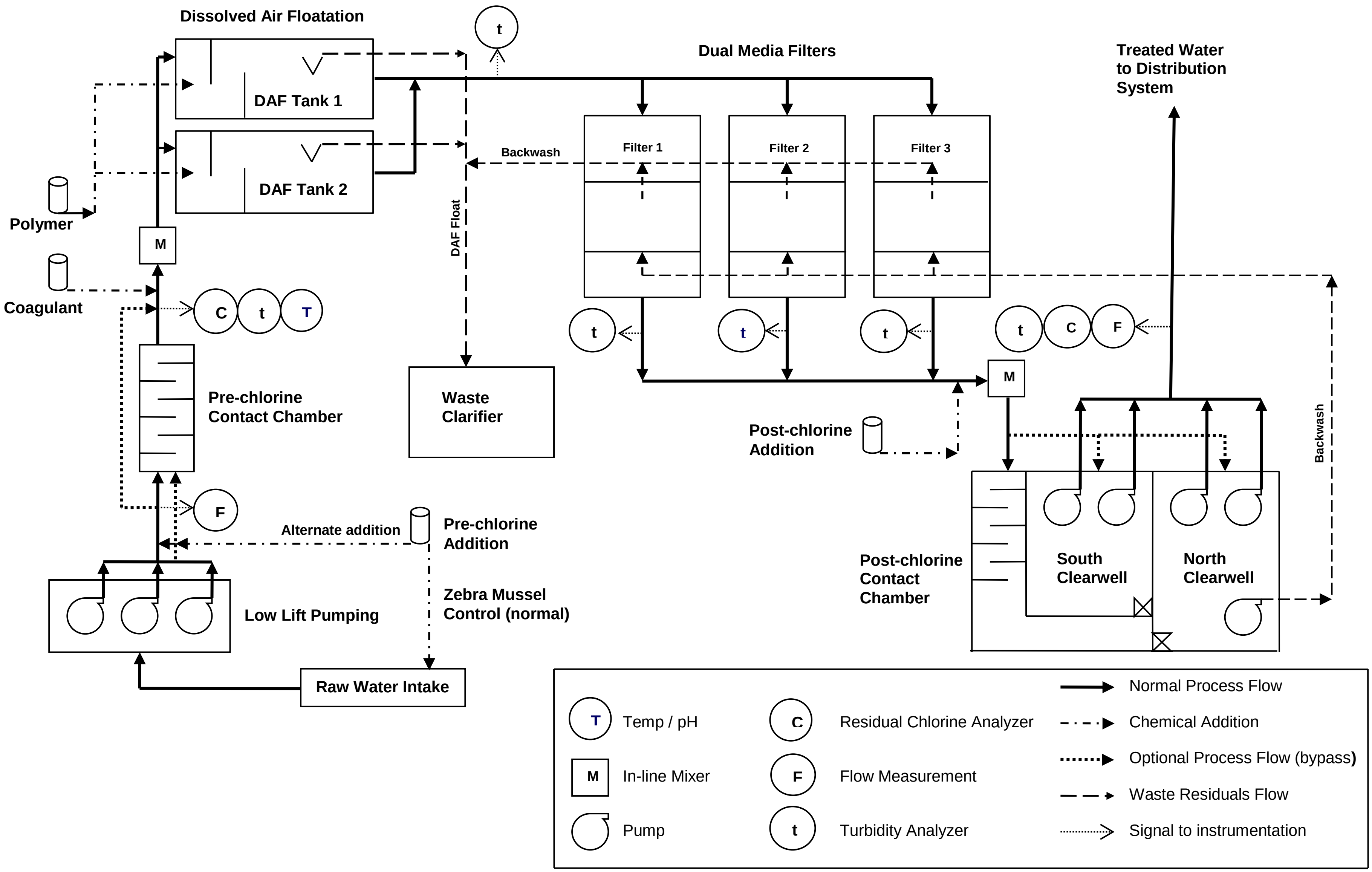
- pre-chlorination
- flocculation / dissolved air flotation
- filtration
- post-chlorination
- distribution system chlorine residual (secondary disinfection)

1.9 Laboratory Testing:

Ontario Regulation 170/03 dictates the sampling and monitoring requirements for the Deseronto facilities. Water quality is tested routinely throughout the treatment process and at the extremities of the distribution system. Analytical testing is conducted by an accredited laboratory.

1.10 Alarms and Staffing:

The Deseronto Water Treatment Plant is staffed during daytime hours on week days, and is visited on weekends and holidays for routine system checks. During off-hours, process irregularities or building security breaches are detected by the plant alarm system and relayed to an on-call operator 24 hours per day, 7 days per week.


Dissolved Air Floatation
DAF Tank 1
DAF Tank 2
Polymer
Coagulant
M
C
t
T
Pre-chlorine Contact Chamber
F
Alternate addition
Pre-chlorine Addition
Low Lift Pumping
Zebra Mussel Control (normal)
Raw Water Intake
t
DAF Float
Backwash
Waste Clarifier
Dual Media Filters
Filter 1
Filter 2
Filter 3
t
t
t
t
C
F
M
Post-chlorine Addition
Treated Water to Distribution System
Post-chlorine Contact Chamber
South Clearwell
North Clearwell
Backwash
T
Temp / pH
M
In-line Mixer
Pump
C
Residual Chlorine Analyzer
F
Flow Measurement
t
Turbidity Analyzer
Normal Process Flow
Chemical Addition
Optional Process Flow (bypass)
Waste Residuals Flow
Signal to instrumentation

2 – Reports of Adverse Water and Other Deficiencies

In December 2018 a precautionary report was filed with the MECP and local Health Unit explaining that during the month of November, the filtration process failed to meet the 95th percentile rule. The 95th percentile rule states that in any month, 95 percent of all filter turbidity measurements from all filters in service must be 0.3 NTU or less to demonstrate optimal filter performance. The 95th percentile calculated for November was 0.4 NTU. (The compliance limit for filter turbidity is 1.0 NTU.) Failing to meet the 95th percentile rule may be an indicator of inadequate disinfection.

Additional analysis of operating data for November indicated that sufficient disinfection was achieved for the month of November without credit for the filtration process. It is important to note also that additional turbidity removal occurred downstream from the filters at the granular activated carbon contactors prior to the application of disinfectant. Treated water turbidity measured downstream of the primary disinfection process was typically less than 0.1 NTU throughout November, averaging 0.08 NTU.

Poor performance of the recently installed dissolved air flotation (DAF) process (upstream from the filters) was the cause of the elevated filter turbidity. A design flaw in the DAF process was identified and corrected in January of 2019.

There were no other indications of potential adverse water quality in 2018.

3 – Flow Measurement and Analytical Testing

3.1 Raw and Treated Water Flow

Raw water is pumped to the treatment facility from the Bay of Quinte in accordance with the terms and conditions of Permit to Take Water 6262-98DPFG (expires June 1, 2023). During 2018, the permitted maximum day flow of 2946 m^3/d and maximum instantaneous flow of 2050 L/min were not exceeded. Raw water flow to the treatment process averaged 1248 m3/d, with a maximum day flow of 1698 m^3 recorded on October 29th.

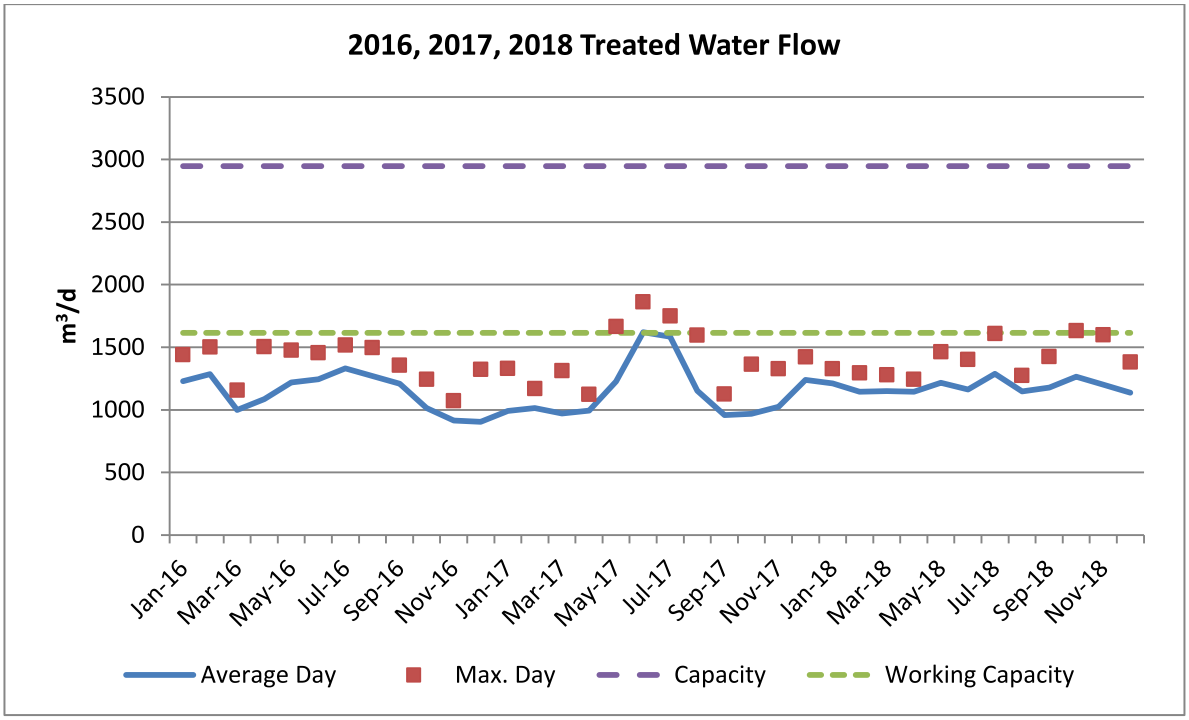
Raw and treated water flow data for 2018 are summarized in Table 1.

Table 1 – Raw and Treated Water Flow

Month	Raw Water				Treated Water			
	Minimum Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)	Average Daily Flow (m^3/d)	Total Monthly Flow (m^3)	Minimum Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)	Average Daily Flow (m^3/d)	Total Monthly Flow (m^3)
January	1126	1418	1278	39607	1095	1327	1212	37575
February	1050	1310	1216	34049	1009	1295	1145	32068
March	1104	1341	1219	37777	1045	1279	1149	35633
April	1082	1330	1213	36392	1017	1243	1144	34314
May	1072	1541	1278	39609	1020	1464	1217	37714
June	1129	1493	1252	37553	1029	1402	1163	34903
July	1125	1642	1338	41467	1066	1610	1287	39894
August	739	1605	1174	36409	991	1273	1147	35556
September	988	1423	1180	35386	989	1425	1179	35359
October	940	1698	1270	39379	1023	1632	1265	39221
November	1019	1612	1292	38762	955	1600	1202	36073
December	1032	1605	1267	39279	1011	1382	1137	35253
Year Avg.			1248				1187	
Year Total				455669				433565
Year Max./Min.	739	1698			955	1632		
Permitted Capacity						**2946**		
Permit to Take Water		**2946**						

Treated water production averaged 1187 m^3/d, which is approximately 8 percent greater than the 2017 average day flow. The maximum day treated water flow recorded during 2018 was 1632 m^3/d, representing 55 percent of the permitted plant capacity of 2946 m^3/d. Treated water average and maximum day flows for each month of 2016, 2017, and 2018 are shown in the chart below.

Limitations to treated water production were experienced on the original process at the reactor clarifier and at the filters, particularly during backwash cycles. The working capacity of the original system is depicted on the chart at approximately 1600 m^3/day. Upgrades to the process which commenced in 2018 and are schedule for completion in 2019 will eliminate those bottlenecks and restore the process to the original design capacity of 2946 m^3/d.



Maximum treated water demand was observed in July, October, and November of 2018. The cause is attributed to leaks detected on customer service pipes and distribution mains. During 2018, 2 service leaks and 2 main breaks were repaired. Repair or PM replacement of ten customer service valves was also completed in 2018.

Locations of service leaks and main breaks can go undetected for extended periods of time as they often start slow and become worse over time. System leaks are typically located when water is observed on the surface of the ground or when customers report low pressure or noise from their service lines. Leaking water doesn't easily surface due to the drainage provided by the fractured limestone geology underlying the Town. Undetected service breaks impose a significant burden on plant capacity. Single service leaks can waste as much as 20 percent of an average day of production.

The raw and treated water flow meters are calibrated annually by a qualified technician.

3.2 Temperature, Colour, Alkalinity, pH, and Hardness

Temperature, colour, alkalinity, and pH are measured in raw and treated water typically twice each week and are summarized for 2018 in Table 2. All are related to the operation of the coagulation and flocculation processes. Temperature and pH are also related to the effectiveness of the disinfection process. Hardness is a measure of dissolved minerals in water and is also included in Table 2. At elevated levels, hardness can create scaling on pipes, plumbing fixtures, and appliances.

Table 2 – Temperature, pH, Alkalinity, Hardness, and Colour

Month	Raw Water				Treated Water				
	Temp. (C)	pH	Alkalinity (mg/L $CaCO_3$)	Colour (ACU)	Temp. (C)	pH	Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L)	Colour (ACU)
January	3.8	7.5	116	39	3.3	7.0	95	121	0
February	4.1	7.5	100	15	3.4	7.1	91	129	0
March	5.4	7.6	112	35	4.3	7.1	92	114	0
April	7.2	7.6	89	45	6.5	7.0	82	109	0
May	15.9	7.6	110	37	15.6	6.9	92	105	0
June	19.5	7.6	90	23	19.3	6.9	81	112	0
July	24.0	8.2	88	43	23.6	7.1	70	114	0
August	24.9	8.3	114	73	25.3	7.1	86	112	0
September	22.0	8.3	88	70	22.5	6.9	76	105	0
October	13.7	8.2	117	51	14.1	7.1	88	104	0
November	6.3	8.1	101	50	6.6	7.2	90	117	0
December	3.7	7.9	113	41	3.4	7.1	91	120	0
Annual Avg.	12.5	7.9	103	44	12.3	7.0	86	113	0.0
Aesthetic Obj.					<15	6.5 - 8.5	30 - 500	80 - 100	5

Notes: -Aesthetic Obj. - refers to non-health related objectives from the ODWQS

-Expressed as monthly arithmetic mean values calculated from daily pH and temp (all others 2 samples/wk.)

Temperature: The data show that the raw water supply varies significantly in temperature over the course of the year. Raw and treated water temperatures measured daily ranged from approximately 4 C to 25 C. Temperature extremes can present challenges to the treatment process as some chemical coagulants react less quickly in cold water. At the other extreme, warm water promotes the growth of plants and algae in the raw water source, requiring higher chemical dosages and the potential for increased frequency of filter backwashing for effective treatment.

Colour: Colour develops in raw water sources most often from the decay of naturally occurring organic matter. The resulting colloidal and dissolved organic compounds react with coagulant chemicals and tend to increase dosage requirements. At the treatment plant, colour is removed by chemical oxidation during pre-chlorination, in the coagulation / sedimentation process, and through the granular activated carbon contactors.

Monthly average raw water colour measurements ranged from 15 ACU to 73 ACU. Effective removal was achieved through the treatment process as colour did not exceed the aesthetic objective of 5 NTU in any treated water samples collected during 2018.

pH: pH has an impact on the performance of coagulants and on the effectiveness of the disinfection process. Both raw and treated water pH values remained relatively stable and within an acceptable range, averaging 7.9 and 7.0 respectively.

Alkalinity: Closely related to pH, alkalinity is a measurement of the acid buffering capacity of water. (The higher the alkalinity, the more acid that can be added before a change in pH occurs.) Several substances naturally present in raw water are measured as alkalinity, the majority of which are carbonate compounds. Coagulants, when added to water, combine with the alkalinity to produce insoluble metal hydroxides (floc particles) that play an important role in the sedimentation process. The primary coagulant used in the process is acidic and therefore decreases alkalinity. If too much natural alkalinity is consumed by the coagulant, there may be insufficient alkalinity remaining for optimal floc formation. Therefore, if a noticeable drop in pH (and alkalinity) is occurring, it may be necessary to lower the coagulant dosage to conserve alkalinity, or alter the process by adding alkalinity to the incoming raw water.

Raw and treated water alkalinities were relatively consistent through 2018 averaging 103 mg/L and 86 mg/L, respectively. All treated water alkalinity measurements were within the ODWQS recommended operational range.

Hardness: Hard water can cause scaling in pipes and fixtures while water that is low in hardness tends to be corrosive. According to the ODWQS, the ideal range is between 80 and 100 mg/L.

Testing of treated water from the Deseronto process indicated moderate hardness (marginal potential for scaling), averaging 113 mg/L. Hardness in water is not a health concern, but rather an aesthetic characteristic.

3.3 Turbidity

Turbidity refers to a physical characteristic of water that causes a cloudy appearance. Turbidity is caused by the presence of suspended matter. It is of concern in treated water as it may include disease causing organisms, or material that can shield pathogens from disinfection. Adequate removal of turbidity through the treatment process is therefore necessary to ensure the effectiveness of the disinfection process.

Table 3 is a summary of turbidity measured in raw water as it enters the plant, effluent discharged from each filter, and in treated water prior to entering the distribution system.

Table 3 – Raw, Filtered, and Treated Water Turbidity

Month	Raw Water Turbidity			Dual Media Filter #1			Dual Media Filter #2			Treated Water Turbidity		
	Min	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	0.44	1.30	0.84	0.05	0.36	0.09	0.05	0.51	0.10	0.06	0.41	0.07
February	0.49	1.93	0.94	0.05	0.41	0.10	0.05	0.39	0.11	0.06	0.64	0.07
March	0.46	2.74	0.94	0.04	0.29	0.07	0.05	0.46	0.08	0.05	0.11	0.06
April	0.88	4.28	2.53	0.04	0.21	0.05	0.05	0.16	0.06	0.06	0.18	0.06
May	1.03	1.94	1.50	0.04	0.20	0.05	0.02	0.44	0.05	0.06	0.10	0.07
June	1.22	3.03	1.85	0.03	0.42	0.05	0.03	0.52	0.06	0.05	0.18	0.07
July	1.71	5.55	3.21	0.02	0.23	0.04	0.02	0.26	0.06	0.05	0.22	0.06
August	3.92	13.70	6.73	0.03	0.61	0.05	0.01	0.42	0.06	0.05	0.41	0.06
September	5.47	16.70	8.66	0.03	0.39	0.05	0.01	0.41	0.05	0.04	0.20	0.06
October	1.48	9.00	4.35	0.03	0.58	0.07	0.04	0.33	0.06	0.05	0.63	0.06
November	1.47	3.87	2.47	0.04	0.87	0.19	0.04	0.81	0.19	0.04	0.47	0.08
December	1.01	5.00	2.26	0.01	0.79	0.13	0.05	0.82	0.20	0.05	0.62	0.09
Avg.			3.02			0.08			0.09			0.07
Max./Min.	0.44	16.70		0.01	0.87		0.01	0.82		0.04	0.64	
ODWS MAC					**1.0**			**1.0**				

Notes:

Raw values are averages of grab samples collected typically 2X/wk and measured using Hach 2100P portable turbidity meter

Dual media filters and treated turbidity values are continuous measurements recorded every 5 minutes

Raw (untreated) water turbidity, based on monthly averages of bench top measurements during 2018, indicated a source water of moderately variable clarity, averaging 3.0 NTU and ranging from

0.4 NTU to 16.7 NTU.

Filtered water turbidity, measured continuously in the effluent from filters 1 and 2 averaged 0.08 NTU and 0.09 NTU respectively. Maximum values were 0.87 NTU for filter 1 and 0.82 NTU for filter 2. With the exception of November and December, when poor DAF process performance resulted in relatively elevated filter turbidity, quality was comparable to that observed in the previous year. Filter turbidity measurements consistently met the requirements of the Ontario Drinking Water Quality Standards.

The rules for disinfecting drinking water require that at least 95 percent of filtered water turbidity measurements in a given month are less than 0.3 NTU. Calculations confirmed that the rule was satisfied during each month of 2018 except November when the 95th percentile value was 0.4 NTU. It is important to note that additional turbidity removal occurred downstream from the filters at the granular activated carbon contactors. Treated water turbidity was typically less than 0.1 NTU throughout November, averaging 0.08 NTU.

Process alarms are installed at various stages of treatment to alert staff to abnormally high turbidity well in advance of significant process failure or the compliance limit. In the event that turbidity exceeds an alarm set point, the low lift pumps automatically shut off, halting the treatment process until the abnormal operating condition is corrected.

Accuracy of the raw, process, and treated water continuous monitoring instruments is verified at least twice weekly using portable bench top instrumentation. Both continuous and bench top measurement instruments are routinely maintained and calibrated in accordance with manufacturer recommendations.

3.4 Disinfection and Bacteriological Testing

Disinfection of the water supply protects public health by ensuring the inactivation of potentially harmful micro-organisms that may have passed through the treatment process or entered the distribution system by other means. A minimum free residual of 0.2 mg/L, maintained throughout the distribution system, is recommended in the *Procedure for Disinfecting Drinking Water in Ontario.* Less than 0.05 mg/L free residual is considered an adverse condition and may pose a potential threat to public health. Additionally, the *Guideline* requires that treated water must be mixed with the disinfectant and held for a minimum period of time before distributing to customers. This is referred to as CT which is calculated as the product of the disinfectant concentration and the amount of time the water is exposed to the disinfectant. CT is directly related to the rate of pathogen inactivation.

Chlorine residuals are monitored continuously in raw water (upstream from the treatment process) and in treated water. The treated water analyzer is equipped with alarms that alert the operators to process abnormalities and will shut down the process to prevent improperly disinfected water from entering the distribution system.

Disinfectant residuals and bacteriological results are summarized in Tables 4a, 4b, and 4c. Chlorine residual measurement instruments are routinely calibrated and maintained by operations staff according to manufacturer specifications.

Table 4a – Treated Water Disinfection and Bacteriological Analytical Data

Month	Treated Water								
	Free Cl_2 Residual			Total Cl_2 Residual			Total Coliforms	E. Coli	Heterotrophic Plate Count
	Min (mg/L)	Max (mg/L)	Avg (mg/L)	Min (mg/L)	Max (mg/L)	Avg (mg/L)	(org./100mL)	(org./100mL)	(org./1mL)
January	0.99	1.80	1.47	1.27	1.82	1.59	0	0	<10 - 10
February	1.10	1.95	1.54	1.43	2.00	1.68	0	0	<10 - 10
March	1.26	1.98	1.70	1.62	2.20	1.86	0	0	<10
April	1.19	1.98	1.68	1.52	2.06	1.77	0	0	<10
May	0.59	2.11	1.50	1.21	1.99	1.60	0	0	<10
June	0.95	3.04	1.56	1.20	2.02	1.58	0	0	<10 - 10
July	0.75	2.32	1.51	1.18	2.09	1.58	0	0	<10 - 10
August	0.76	2.40	1.56	1.38	2.20	1.68	0	0	<10
September	0.97	2.21	1.60	1.31	2.01	1.64	0	0	<10 - 60
October	0.93	2.15	1.55	1.34	2.20	1.72	0	0	<10 - 20
November	1.02	3.12	1.65	1.55	2.20	1.86	0	0	<10 - 30
December	1.39	2.66	1.71	1.64	2.19	1.91	0	0	<10
# of samples	continuous			365	365	365	52	52	52
Annual Min/Max/Avg	0.59	3.12	1.59	1.18	2.20	1.70			

Notes:
-total chlorine residual values are derived from bench-top analysis of grab samples collected daily
-free chlorine residual values represent on-line continuous measurements recorded every 5 minutes.

Free chlorine residual measured in treated water at the plant averaged 1.59 mg/L, which is consistent with the average observed in 2017. It is important to note that chlorine residual typically declines in proportion to the distance from the point of application. Relatively high chlorine residuals are required leaving the plant to ensure that the guideline minimum residual of 0.2 mg/L is maintained throughout the distribution system. Testing of approximately 150 grab samples collected from sample stations located at the distant extremes of the distribution system as well as continuous monitoring data from one remote location indicate that the minimum free chlorine residual measured in the distribution system during 2018 was 0.22 mg/L.

Table 4b – Distribution Water Disinfection and Bacteriological Data

Month	Distribution Water					
	Distribution Free Cl_2			Total Coliforms	E. Coli	HPC
	Min (mg/L)	Max (mg/L)	Avg (mg/L)	(org./100mL)	(org./100mL)	(org./1mL)
January	0.64	2.01	1.28	0	0	<10 - 10
February	0.76	2.05	1.50	0	0	<10
March	0.97	2.06	1.53	0	0	<10
April	0.87	1.76	1.36	0	0	<10 - 20
May	0.50	2.48	1.41	0	0	<10 - 10
June	0.57	3.28	1.45	0	0	<10
July	0.37	2.42	1.45	0	0	<10
August	0.22	2.95	1.60	0	0	<10 - 10
September	0.47	2.17	1.36	0	0	<10 - 10
October	0.57	2.70	1.65	0	0	<10 - 10
November	1.09	2.43	1.74	0	0	<10 - 40
December	1.18	2.28	1.76	0	0	<10
# of samples	continuous			155	155	52
Annual Min/Max/Avg	0.22	3.28	1.51			

Notes:

Reported average and maximum free chlorine residual values represent continuous measurements recorded every 5 minutes

Reported minimum free chlorine residual values represent continuous measurements and analysis of grab samples collected from 3 locations each week

Samples for bacteriological testing are collected typically from 3 of 4 dedicated sample hydrants once each week

Verification of the disinfection process is demonstrated by testing treated water samples for indicators of bacteriological contamination. Throughout 2018 over 200 water samples were collected at the water treatment plant and from various locations in the distribution system. There were no indications of adverse water quality measured in any sample collected in 2018.

Raw water (untreated source water from the Bay of Quinte is chlorinated at the intake crib to control the growth of zebra mussels and to prevent other growth in the intake pipe prior to entering the treatment process. Chlorine residual in raw water is continuously measured immediately upstream from the treatment process to verify dosage. Grab samples of raw water are also collected daily and tested for free and total chlorine residual.

An underwater inspection and cleaning of the intake crib conducted in June 2016 indicated successful operation of the pre-chlorination / zebra mussel control system. The intake crib is inspected and cleaned at a frequency of every three to five years.

The bacteriological quality of raw water is routinely tested to detect changes in source water quality. Bacteriological quality tends to deteriorate when water temperature is warm due to increased rate of growth, and during heavy rainfall events when surface contaminants are washed into the source water. Raw water bacteriological results and chlorine residuals were relatively consistent with those observed in 2017.

Table 4c – Raw Water Pre-chlorination and Bacteriological Data

Month	Raw Water			Pre-chlorinated Raw Water					
	Total Coliforms (org./100mL)	E. Coli (org./100mL)	HPC (org./1mL)	Free Cl_2 Residual Min (mg/L)	Free Cl_2 Residual Max (mg/L)	Free Cl_2 Residual Avg (mg/L)	Total Cl_2 Residual Min (mg/L)	Total Cl_2 Residual Max (mg/L)	Total Cl_2 Residual Avg (mg/L)
January	0 - 97	0	>2000	0.01	0.24	0.12	0.06	0.37	0.25
February	0 - 1	0	20	0.02	0.19	0.07	0.19	0.26	0.22
March	0	0	40	0.02	0.17	0.10	0.03	0.26	0.17
April	0	0	80	0.01	0.10	0.04	0.09	0.23	0.16
May	0 - 17	0	500-550	0.01	0.10	0.05	0.09	0.19	0.14
June	0 - OG	0 - OG	250	0.02	0.05	0.04	0.09	0.29	0.16
July	0 - 86	0 - 1	>2000	0.02	0.11	0.06	0.02	0.11	0.06
August	25 - OG	0 - OG	>2000	0.05	0.21	0.11	0.05	0.21	0.11
September	0 - 27	0 - 6	>2000	0.04	0.23	0.11	0.04	0.23	0.11
October	1 - 6	0	1800	0.01	0.13	0.07	0.01	0.13	0.07
November	9 - 74	0	560	0.02	0.12	0.06	0.02	0.12	0.06
December	0 - 74	0 - 2	100	0.01	0.24	0.08	0.02	0.24	0.08
# of samples	52	52	13	365					
Min/Max/Avg				0.01	0.24	0.08	0.01	0.37	0.13
Range	0 - OG	0 - OG	20 - >2000						

Notes:

Reported free and total chlorine residuals are measured in daily grab samples

3.5 Process Chemical Addition:

Three chemicals are used in the treatment process including a poly-aluminum chloride blend, anionic polymer, and chlorine. Table 5 summarizes the use of those chemicals during 2017.

Table 5 – Treatment Process Chemical Use and Aluminum Residual

Month	Coagulant			Polymer		Pre Chlorine Gas		Post Chlorine Gas	
	Monthly Usage (L)	Average Dosage (mg/L)	Treated Water Al residual (ug/L)	Monthly Usage (L)	Average Dosage (mg/L)	Monthly Usage (kg)	Average Dosage (mg/L)	Monthly Usage (kg)	Average Dosage (mg/L)
January	2230	21.8	0.008	3286	0.17	25.4	0.64	109.9	2.94
February	1666	19.0	0.014	3311	0.19	19.0	0.56	112.3	3.52
March	2157	22.1	0.016	3357	0.18	19.1	0.51	108.9	3.06
April	2229	23.8	0.016	3483	0.19	19.5	0.54	98.8	2.88
May	2467	24.1	0.017	3624	0.18	35.4	0.90	95.9	2.54
June	3670	37.7	0.027	3916	0.21	26.3	0.70	85.2	2.43
July	5434	50.6	0.030	2522	0.12	23.1	0.56	106.7	2.69
August	4458	47.3	0.040	1487	0.08	19.1	0.53	105.4	2.96
September	5106	56.0	0.024	1178	0.07	17.2	0.49	97.2	2.76
October	4002	40.1	0.015	1698	0.06	20.9	0.53	98.5	2.52
November	4179	41.6	0.020	2014	0.07	15.9	0.41	86.7	2.43
December	6304	62.1	0.039	3646	0.19	21.3	0.55	95.5	2.71
Average	3658	37.2	0.022	2794	0.14	21.8	0.58	100.1	2.79
Year Total	43902			33522		262.1		1201.0	

The average dosage of coagulant during 2018 was 37 mg/L (expressed as mg active ingredient/L), increased by approximately 23 percent when compared to that observed in 2017 (30 mg/L). The increased dosage is attributed to the poor performance of the new DAF process during the first 6 months of operation.

Polymer dosage was approximately 12 percent lower than observed in 2017 averaging 0.14 mg/L.

Dissolved aluminum is measured in the treated water due to the necessary addition of aluminum-based coagulant in the treatment process. Optimized process control is recommended to reduce residual aluminum to under the operational guideline of 0.100 mg/L. High residual aluminum can cause scaling of the pipes in the distribution system, interference with certain industrial processes, and re-flocculation in the distribution system. Aluminum residuals measured in treated water samples collected during 2018 averaged 0.022 mg/L showing a significant increase in the average observed the previous year (0.014 mg/L). The increase is likely attributable to the higher average coagulant dosage. Aluminum residual measurements did not exceed the ODWQS operational guideline. Monthly average treated water aluminum residuals are summarized in Table 5.

The total mass of chlorine used in the treatment process increased by approximately 4 percent when compared to 2017. Dosage of treated water distributed to customers remained relatively unchanged from 2017.

3.6 Other Organic and Inorganic Testing:

Analyses of approximately 70 additional organic and inorganic parameters in the treated water are required at various frequencies. The majority of those substances, listed as Schedules 23 and 24 in O.Reg.170/03, must be tested at least annually. Testing for nitrite, nitrate, THMs, and HAAs is required quarterly, while sodium and fluoride must be tested once every five years. The results of those analyses are summarized in Tables 6 and 7.

Concentrations of most tested substances were either below the analytical method detection limits (either not present or in trace levels too low to quantify) or well below the maximum acceptable concentrations listed in the ODWQS.

The 4-quarter average concentrations of THMs and HAAs (by-products of the disinfection process) in 2018 remained below the ODWQS maximum acceptable concentrations.

Table 6 – Schedule 23, Fluoride, Sodium, Nitrite, and Nitrate

Parameter	Limit mg/L	Limit Type	Date Sampled	# of samples	Treated Maximum Conc. mg/L	Limit Exceeded?
Antimony	0.006	IMAC	16-Jan-18	1	<0.0001	no
Arsenic	0.025	IMAC	16-Jan-18	1	0.0002	no
Barium	1	MAC	16-Jan-18	1	0.029	no
Boron	5	IMAC	16-Jan-18	1	<0.005	no
Cadmium	0.005	MAC	16-Jan-18	1	<0.00002	no
Chromium	0.05	MAC	16-Jan-18	1	0.002	no
Fluoride	1.5	MAC	20-Jan-15	1	0.1	no
Mercury	0.001	MAC	16-Jan-18	1	<0.00002	no
Selenium	0.01	MAC	16-Jan-18	1	<0.001	no
Sodium	200	AO	20-Jan-15	1	9.4	no
Uranium	0.02	MAC	16-Jan-18	1	<0.00005	no

NOTES:

Nitrate and nitrite values are maximum concentrations measured in quarterly samples.

MAC - ODWS maximum acceptable concentration

IMAC - ODWS interim maximum acceptable concentration

AO - ODWS aesthetic objective

Quarterly Nitrate / Nitrite Results (mg/L)

	Q1	Q2	Q3	Q4	Maximum	MAC
Date	Jan 16th	Apr 17th	Jul 17th	Oct 03rd		
Nitrate	0.3	0.3	<0.1	<0.1	0.3	10.0
Nitrite	<0.1	<0.1	<0.1	<0.1	<0.1	1.0

Table 7 – Schedule 24 Parameter Concentration Data

Parameter	Units	ODWS		Date Sampled	# of sples	Result	Limit Exceeded
		Limit	Type				
Alachlor	µg/L	5	IMAC	16-Jan-18	1	<0.3	no
Atrazine + Metabolites	µg/L	5	IMAC	16-Jan-18	1	<0.5	no
Azinphos-methyl	µg/L	20	MAC	16-Jan-18	1	<1	no
Benzene	µg/L	5	MAC	16-Jan-18	1	<0.5	no
Benzo(a)pyrene	µg/L	0.01	MAC	16-Jan-18	1	<0.005	no
Bromoxynil	µg/L	5	IMAC	16-Jan-18	1	<0.3	no
Carbaryl	µg/L	90	MAC	16-Jan-18	1	<3	no
Carbofuran	µg/L	90	MAC	16-Jan-18	1	<1	no
Carbon tetrachloride	µg/L	5	MAC	16-Jan-18	1	<0.2	no
Chlorpyrifos	µg/L	90	MAC	16-Jan-18	1	<0.5	no
Diazinon	µg/L	20	MAC	16-Jan-18	1	<1	no
Dicamba	µg/L	120	MAC	16-Jan-18	1	<5	no
1,2-dichlorobenzene	µg/L	200/3	MAC/AO	16-Jan-18	1	<0.1	no
1,4-dichlorobenzene	µg/L	5/1	MAC/AO	16-Jan-18	1	<0.2	no
1,2-dichloroethane	µg/L	5	IMAC	16-Jan-18	1	<0.1	no
1,1-dichloroethene	µg/L	14	MAC	16-Jan-18	1	<0.1	no
Dichloromethane	µg/L	50	MAC	16-Jan-18	1	<0.3	no
2,4-dichlorophenol	µg/L	900/0.3	MAC/AO	16-Jan-18	1	<0.1	no
2,4-dichlorophenoxy acetic acid	µg/L	100	IMAC	16-Jan-18	1	<5	no
Diclofop-methyl	µg/L	9	MAC	16-Jan-18	1	<0.5	no
Dimethoate	µg/L	20	IMAC	16-Jan-18	1	<1	no
Diquat	µg/L	70	MAC	16-Jan-18	1	<5	no
Diuron	µg/L	150	MAC	16-Jan-18	1	<5	no
Glyphosate	µg/L	280	IMAC	16-Jan-18	1	<25	no
Malathion	µg/L	190	MAC	16-Jan-18	1	<5	no
MCPA	µg/L	100	MAC	16-Jan-18	1	<10	no
Metolachlor	µg/L	50	IMAC	16-Jan-18	1	<3	no
Metribuzin	µg/L	80	MAC	16-Jan-18	1	<3	no
Monochlorobenzene	µg/L	80/30	MAC/AO	16-Jan-18	1	<0.2	no
Paraquat	µg/L	10	IMAC	16-Jan-18	1	<1	no
Pentachlorophenol	µg/L	60, 30	MAC/AO	16-Jan-18	1	<0.1	no
Phorate	µg/L	2	IMAC	16-Jan-18	1	<0.3	no
Picloram	µg/L	190	IMAC	16-Jan-18	1	<5	no
Polychlorinated Biphenyls (PCB's)	µg/L	3	IMAC	16-Jan-18	1	<0.05	no
Prometryne	µg/L	1	IMAC	16-Jan-18	1	<0.1	no
Simazine	µg/L	10	IMAC	16-Jan-18	1	<0.5	no
Terbufos	µg/L	1	IMAC	16-Jan-18	1	<0.3	no
Tetrachloroethylene	µg/L	30	MAC	16-Jan-18	1	<0.2	no
2,3,4,6-Tetrachlorophenol	µg/L	100/1	MAC/AO	16-Jan-18	1	<0.1	no

Table 7 – Schedule 24 Parameter Data (2)

Parameter	Units	ODWS		Date Sampled	# of samples	Result	Limit Exceeded
		Limit	Type				
Triallate	µg/L	230	MAC	16-Jan-18	1	<10	no
Trichloroethylene	µg/L	50	MAC	16-Jan-18	1	<0.1	no
2,4,6-Trichlorophenol	µg/L	5, 2	MAC, AO	16-Jan-18	1	<0.1	no
Trifluralin	µg/L	45	IMAC	16-Jan-18	1	<0.5	no
Vinyl Chloride	µg/L	2	MAC	16-Jan-18	1	<0.2	no

NOTES:
Samples for THM & HAA analysis collected from distribution sample hydrant
THM and HAA MAC is based on 4-quarter running average

Quarterly THM Results (µg/L)

	Q1	Q2	Q3	Q4		
Date	Jan 16th	Apr 17th	Jul 17th	Oct 09th	Average	MAC
Bromodichloromethane	6.3	4.0	4.7	9.7	6.7	
Bromoform	<0.1	<0.1	<0.1	<0.1	<0.1	
Chloroform	40.2	64.4	46.7	85.1	53.8	
Dibromochloromethane	<0.3	<0.1	1.0	0.5	0.7	
Total THMs	46.8	68.4	51.4	95.3	61.1	100

Quarterly HAA Results (µg/L)

	Q1	Q2	Q3	Q4		
Date	Jan 16th	Apr 17th	Jul 17th	Oct 09th	Average	MAC
Chloroacetic Acid	<4.7	<4.7	<4.7	<4.7	<4.7	
Bromoacetic Acid	<2.9	<2.9	<2.9	<2.9	<2.9	
Dichloroacetic Acid	45.3	27.2	18.8	15.0	26.6	
Dibromoacetic Acid	<2.0	<2.0	<2.0	<2.0	<2.0	
Trichloroacetic Acid	67.1	43.1	18.4	17.3	36.5	
Total HAAs	112	70.3	37.2	32.3	63.0	80

3.7 Distribution System Lead Testing

Lead can be present in drinking water systems as the result of corrosion of lead solder, lead in brass fittings/fixtures, or lead pipes in plumbing or building service lines. Although most of those sources of lead have been eliminated from modern construction materials, elevated concentrations are periodically detected in water samples collected in older neighborhoods where lead service lines still exist. As a result, in 2007 the Province imposed mandatory lead testing at all municipal drinking water systems. This precautionary testing was primarily focused on protecting the health of the vulnerable population which, in the case of lead contamination, is young children (<6 yr) and pregnant women. While drinking water is a minor contributor to blood lead levels, municipal lead testing helps identify potential sources of contamination and will provide opportunities to further improve the high quality of public water supplies.

From 2008 through 2010, a total of 120 samples were collected from residential and non-residential plumbing. Of those, only 6 exceeded the standard. Additional testing at the sites where the standard was exceeded clearly indicated that minimal lead remained in the water after flushing for as little as several seconds.

Residential lead testing was not required during 2011 and 2012 as past results from the Deseronto system demonstrated a very low health risk.

The lead sampling program resumed at a reduced rate in 2013, with results from all tested locations well below the ODWQS maximum acceptable concentration.

Based on the favorable past results, residential lead sampling is no longer required unless significant changes in other water characteristics are observed; specifically pH and alkalinity. Testing of pH and alkalinity in the distribution system continues to be a semi-annual requirement while lead in the distribution system must be measured once every three years. Analytical data for distribution system lead, pH, and alkalinity from 2013 to 2017 are provided in Table 8.

Table 8 – Distribution Lead, pH, and Alkalinity

	West Sample Hydrant			North Sample Hydrant			East Sample Hydrant		
Sample Date	Lead mg/L	pH	Alkalinity mg/L	Lead mg/L	pH	Alkalinity mg/L	Lead mg/L	pH	Alkalinity mg/L
25-Feb-2013	0.00031	7.0	92	0.00050	7.0	92			
25-Sep-2013	0.00079	6.8	67	0.00092	6.8	67			
14-Jan-2014		6.9	86					6.9	86
12-Aug-2014		6.9	82					7.0	82
20-Jan-2015		7.0	94					7.0	96
07-Jul-2015		6.8	90					6.7	91
26-Jan-2016	0.00044	7.1	97				0.00032	7.1	97
26-Jul-2016	0.00067	6.6	82				0.00034	6.8	84
10-Jan-2017		7.4	89					7.3	89
11-Jul-2017		7.2	83					7.2	83
23-Jan-2018		7.3	91					7.3	91
17-Jul-2018		6.4	72					6.8	73
Limit / Objective	**0.01**	6.5 – 8.5	30 - 500	**0.01**	6.5 – 8.5	30 - 500	**0.01**	6.5 – 8.5	30 - 500

3.9 Microcystin Testing

Blooms of blue-green algae are common in the Bay of Quinte during warm summer and early fall months. When blue-green algae decays it releases toxic compounds called microcystins.

To monitor for microcystins in Deseronto drinking water, samples of both raw and treated water are sampled and tested weekly from June to October. Measureable concentrations of microcystins in the raw untreated Bay water are seasonally common but are typically below the drinking water standard of 1.5 µg/L as microcystin-LR. During 2018 the maximum concentration of microcystin-LR measured in untreated water was 0.24 µg/L. That result is similar to the maximum observed in 2017 (0.23 µg/L).

Microcystins are removed through the Deseronto treatment process by oxidation (chlorine) and by adsorption in the granular activated carbon filter media. The treatment process has been effective in removing microcystins from the raw water as it was not detected in any treated water sample collected in 2018.

3.10 Waste Clarifier Performance Monitoring

The waste clarifier treats the waste generated from the water treatment process including filter backwash, and sludge from the former sedimentation process. Treated effluent from the waste clarifier is discharged to the Bay of Quinte. The waste clarifier was taken out of service in early July to accommodate the upgrade construction. While out of service, all waste was pumped directly to the raw sewage wet well at the wastewater treatment plant.

Effluent from the waste clarifier, when in operation, is sampled at least once per month and tested for total suspended solids (TSS). The annual average concentration of TSS was less than 4 mg/L which is well below the maximum permitted average concentration of 25 mg/L. Flow to the waste clarifier during 2018 did not exceed the design capacity of 350 m^3/d. Performance data for the waste clarifier is provided in Table 9.

Table 9 – Waste Clarifier Performance Data

Month	Avg. Flow (m^3/d)	Max. Flow (m^3/d)	TSS (mg/L)
January	151.4	158.1	<3
February	160.8	165.1	4
March	153.7	157.7	3
April	132.9	133.4	<3
May	126.3	129.8	<3
June	104.9	107.3	<3
July	124.1	128.1	<3
August	o/s	o/s	o/s
September	o/s	o/s	o/s
October	o/s	o/s	o/s
November	o/s	o/s	o/s
December	o/s	o/s	o/s
Maximum		165.1	4
Average	135.3		<4
DWWP Limit			**25**

where:
Avg. Flow - Average daily flow for each month.
Max. Flow - Maximum day flow measured each month.
TSS - total suspended solids
DWWP TSS limit based on annual average of monthly sples

4 – System Maintenance and Improvements

Major upgrading of the water treatment plant commenced in May 2018 with an anticipated completion date of June 2019. The upgrades include:

- new low lift pumps and controls,
- replacement of the reactor clarifier with twin dissolved air flotation processes,
- replacement of 2 dual media filters and 2 granular activated carbon contactors with 3 conventional sand filters incorporating a granular activated carbon media cap, complete with backwash pump, air scour blower and piping and pressure controls for back-up backwash from the distribution system,
- replacement of motors and controls on 2 of 4 high lift pumps,
- replacement of the stainless steel pipe header from the high lift pumps to the distribution system, complete with a new in-plant isolation valve,
- new SCADA process control system,
- replacement of the low lift and treatment plant chlorine disinfection systems with associated monitoring instrumentation and controls,
- new lighting, and HVAC systems,
- refurbishment of the office, control room, lab, and lunch/meeting rooms,
- new MCC with automatic transfer switch to the emergency power generator,
- structural reinforcement, insulation, windows, doors, and cladding of the WTP building

The upgrades will address design deficiencies, remove existing capacity bottlenecks, and improve the overall efficiency and reliability of the treated water supply for the Town and neighbouring Mohawks of the Bay of Quinte (MBQ).

This project is 2/3^{rds} funded by the Federal and Provincial governments under the Small Communities Fund. The remaining third is funded by the Town (65%) and the MBQ (35%), proportional to the capacity allocated to each community.