2020 Drinking Water Quality Report

Loyalist Township Utilities Division

DRINKING WATER SYSTEMS: 2

SERVED POPULATION: 13717

365 DAYS A YEAR SAFE DRINKING WATER

COMPLY WITH APPLICABLE LEGISLATION

MAINTAIN & CONTINUALLY IMPROVE THE QMS

Table of Contents

Availability of the Annual Summary Report

In light of Section 11 (7) and 11 (10) of Ontario Regulation 170/03, the notice of availability is generally done on-line through the Township's website and on the customers' bi-monthly water bill.

The annual report is available to the public by visiting the Township's web site at: https://www.loyalist.ca/en/living-in-loyalist/water-quality.aspx

Copies of the report can also be obtained, at no charge, from Loyalist Township office located at 263 Main Street, Odessa, ON, (613) 386-7351.

Any member of the public can also request to inspect, under Section 12 of Ontario Regulation 170/03, any sample results and reports prepared under Section 11 and Schedule 22 of Ontario Regulation 170/03, free of charge, during Loyalist Township regular office hours.

If you are a person with a disability and need Loyalist Township information in another format, please contact 613-386-7351 ext. 100 between 8:30 a.m. – 4:30 p.m. or e-mail info@loyalist.ca.

2020 Drinking Water Quality Report

Loyalist Township Utilities Division

1. Introduction

This annual summary report is prepared and submitted to our water customers who have their drinking water supplied by the **Fairfield** Drinking Water System, the **Bath** Drinking Water System and to the Council of Loyalist Township, in accordance with Section 11 and Schedule 22 of *Ontario Regulation 170/03*, as amended.

The report covers the period of January 1st to December 31st, 2020.

The quality of Loyalist Township's drinking water is continuously monitored and tested by advanced on-line instrumentation, Supervisory Control and Data Acquisition (SCADA) system and is operated and maintained by certified Township staff who have successfully completed rigorous training and testing to become certified Drinking Water treatment and Distribution System Operators.

Loyalist Township delivers safe & high quality drinking water

2. Executive Summary

The water delivered to the customers of the Bath and Fairfield drinking water systems (DWS) continues to meet all water quality standards.

In 2020, 1.387 million litres of potable water were delivered to the Fairfield water distribution system and 0.57 million litres to the Bath water distribution system. The maximum daily treated water volume was recorded at 70.3% of the Fairfield Water Treatment Plant's rated capacity and 38.4% for the Bath Water Treatment Plant.

All sampling required by the applicable acts, regulations, permits and licenses has been conducted in accordance with the legislation. All reports required by applicable acts, regulations, permits and licenses have been prepared and submitted in accordance with the legislation.

The Ministry of Environment, Conversation and Parks (MECP inspected both plants in 2020. The inspection rating for Fairfield and Bath was 100%. The filter effluent turbidity did not exceed the limits of the Ontario Drinking Water Quality Standard (ODWQS). All regulated physical, microbiological, inorganic and organic chemical parameters tested in 2020 were well below the limits and/or maximum allowable concentration (MAC).

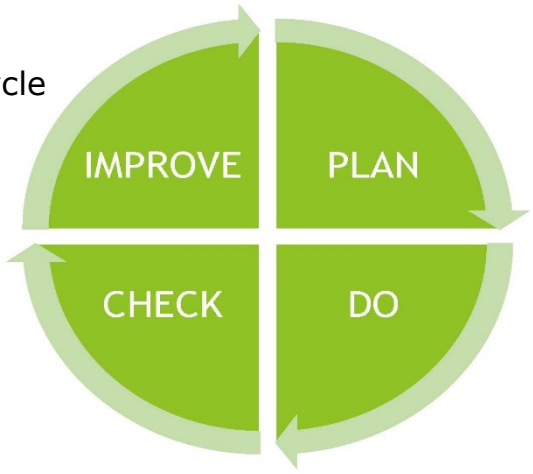
To the best of our knowledge, both drinking water systems are in compliance with all regulatory requirements of the Drinking Water Works Permit, Municipal Drinking Water License, Permit to Take Water, Safe Drinking Water Act and its regulations.

3. Quality Management System Policy

Municipal drinking water systems in Ontario must operate under a licensing program. One of the requirements of the Municipal Drinking Water License is to have a quality management system (QMS) in place that meets the minimum requirements of the Ontario Drinking Water Quality Management Standard.

Management systems are preventive and proactive in nature and focus on consistency and continuous improvement.

A QMS follows a cycle that includes **planning** what you are going to do, **do** what you planned, **check** what you did and **improve**.



Loyalist Township QMS Policy:
Loyalist Township is committed to comply with all applicable legislative and regulatory requirements, as it relates to drinking water quality, to supply our consumers with safe drinking water and is committed to the maintenance and continual improvement of the QMS.

LOYALIST IS COMMITTED TO:

comply with applicable legislation

supply safe drinking water

maintain and continually improve the QMS

4. Description of the Fairfield DWS

Drinking Water System Number:	220009229
Drinking Water System Name:	Fairfield Drinking Water System
Owner & Operator:	Corporation of Loyalist Township
Operating Authority Accreditation:	CERT-0127696
Drinking Water System Category	Large Municipal Residential
Drinking Water Works Permit:	158-201
Municipal Drinking Water License:	158-101
Design Capacity:	8,000 m^3 per day
Type of Filtration:	ultrafiltration
Commissioned in the Year:	2000
Original Design Period:	2000-2023
Permit to take Water:	6024-9LUKNX
Rate of Taking:	9,000 m^3 per day
Raw Water Source:	Lake Ontario
Population Served:	10,655

The Fairfield Water Treatment Plant currently serves the population of Amherstview, Odessa, Harewood, Brooklands and Taylor-Kidd Blvd / Loyalist East industrial parks.

The treatment facility consists of a membrane ultrafiltration system followed by chlorination for disinfection. A target (average) free chlorine residual of 1.1 to 1.2 mg/l at the effluent of the chlorine contact chamber is desired to maintain a free chlorine residual of 1 mg/l at the effluent of the treatment plant. Granular activated carbon adsorbers are used at certain times of the year to assist in the control of taste and odor as well as a raw water intake chlorination system for Zebra Mussel control.

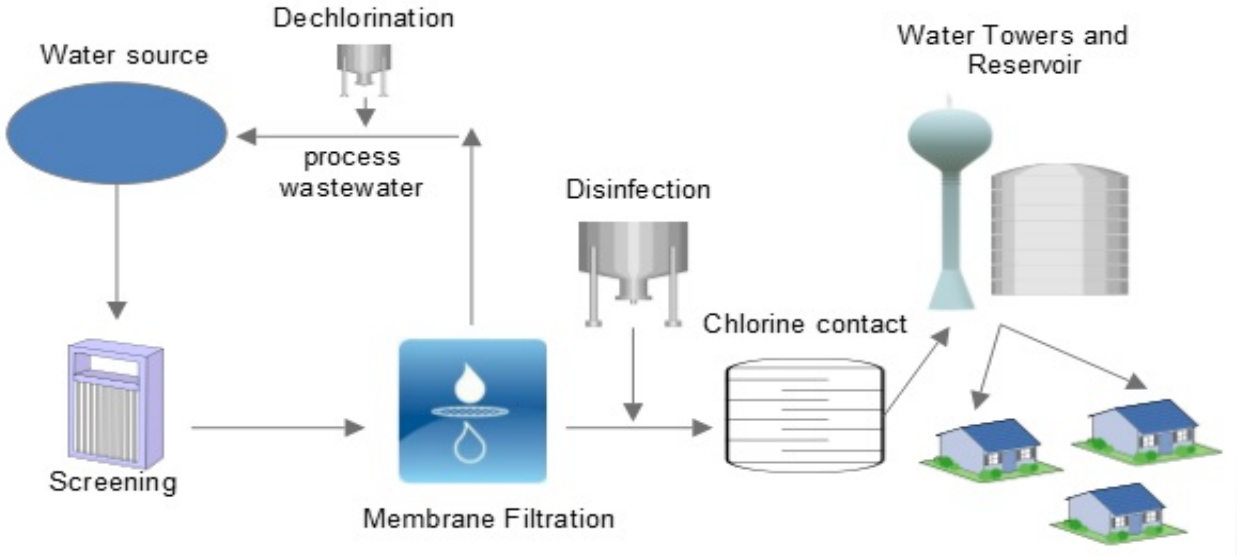
With the introduction of ultrafiltration technology, the Fairfield Water Treatment Plant is surpassing the Ministry of the Environment and Climate Change's minimum treatment guidelines for waterworks using a surface water source.

The distribution system uses elevated water storage located in Amherstview (1,100 m^3 capacity) and Odessa (900 m^3 capacity). The booster pumping station is on County Road # 6, north of Taylor Kidd Blvd, with a water reservoir (4,225 m^3 capacity) and chlorination booster capability to ensure the maintenance of

acceptable chlorine residual in the system. The Odessa water tower, located at the east end of Main Street, Odessa, is also equipped with chlorination booster capability. Chlorine residual in the water leaving each of the reservoirs is monitored continuously with free chlorine residual analyzers.

Chemicals used within the Fairfield Drinking Water System (DWS) for treatment/disinfection are chlorine gas (disinfection), sodium hypochlorite (disinfection) and sodium bisulphite (treatment of plant residue back to the raw water source). The chlorine gas and sodium hypochlorite used within the Fairfield DWS meet all applicable standards set in the Municipal Drinking Water License, in line with the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60. The plant is operated with automated pre-chlorination for Zebra Mussel control and disinfection.

Emergency power supply equipment is installed at the treatment plant and Booster Station to ensure safe drinking water is supplied to our customers even during power outages.



5. Description of the Bath DWS

Drinking Water System Number:	220002217
Drinking Water System Name:	Bath Drinking Water System
Owner & Operator:	Corporation of Loyalist Township
Operating Authority Accreditation:	CERT-0127696
Drinking Water System Category:	Large Municipal Residential
Drinking Water Works Permit:	158-202
Municipal Drinking Water License:	158-102
Design Capacity:	6,000 m^3/day (gross capacity) 5,650 m^3/day (net capacity Jan to Aug 2020) 5,450 m^3/day (capacity mobile filtration unit, Aug to Dec 2020)
Type of Filtration:	non-typical conventional (Jan to Aug 2020) Membrane filtration (Aug to Dec 2020)
Commissioned in the Year:	1997
Design Period:	1997-2040
Permit to Take Water:	4521-9LTHDP
Rate of Taking:	7,515 m^3 per day
Source of Water:	Lake Ontario
Population Served:	3,062

The Bath Drinking Water System currently serves the population of Bath and the Bath and Millhaven Correctional Services Canada Institutions (CSC).

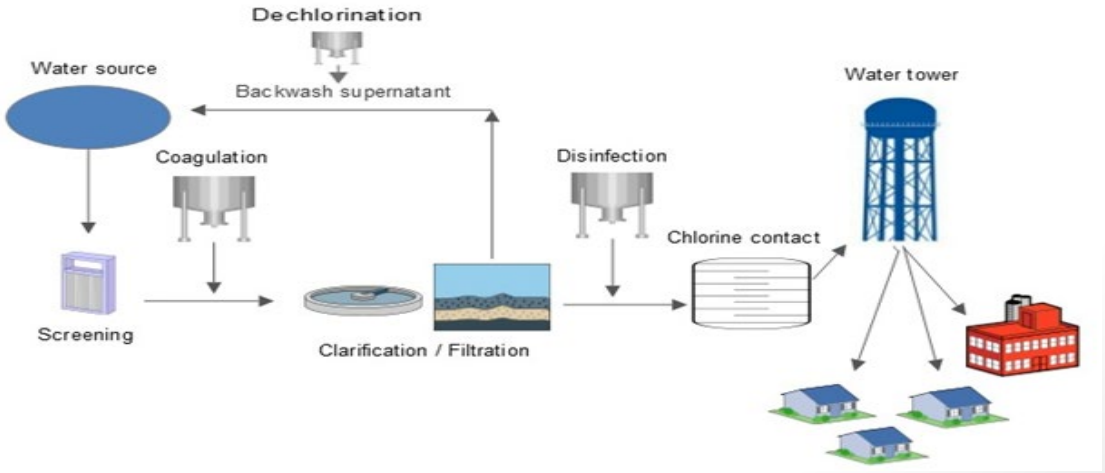
The Bath Water Treatment Plant consisted of coarse screens, a direct filtration package-plant using two multi-media filters (granular activated carbon, silica sand and gravel, see picture below). This plant has been upgraded to a membrane gravity filtration system to be able to handle sudden and sustained increases in raw water turbidity and incorporate full redundancy into the treatment system with a rated capacity of 6,000 m^3/day. The filters and coagulant addition were taken out of service in August 2020. During the construction and upgrade of the filtration

system from August to December 2020 a mobile ultrafiltration unit (MPAK) was used for the production of water. The Township's operators were diligent and worked hard during the commissioning of the mobile filtration unit to ensure that safe drinking water was delivered to the customers at all the time.

The plant is operated with automated pre-chlorination for Zebra Mussel control and disinfection. Emergency power supply equipment is installed at the treatment plant to ensure safe drinking water is supplied to our customers even during power outages. Turbidity of the filtered water and free chlorine residual in the water leaving the treatment facility are monitored continuously.

The distribution system has an elevated storage reservoir of 1,891 m^3 capacity located adjacent to the west side of the Millhaven Correctional property, in the east end of the Village. Chlorine residual in the water leaving the reservoir is monitored continuously with a free chlorine residual analyzer.

The facility far exceeds the Ministry of the Environment's minimum treatment guidelines for waterworks using a surface water source. Chemicals used for water treatment/disinfection within the Bath Drinking Water System (DWS) are chlorine gas (disinfection) and PAX XL54 (coagulation). They meet all applicable standards set in the Municipal Drinking Water License in line with the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60.



Fairfield DWS

Total Raw Water Taken in 2020

1,740,917 m^3

Maximum Daily Raw Water Volume Taken

7,084 m^3

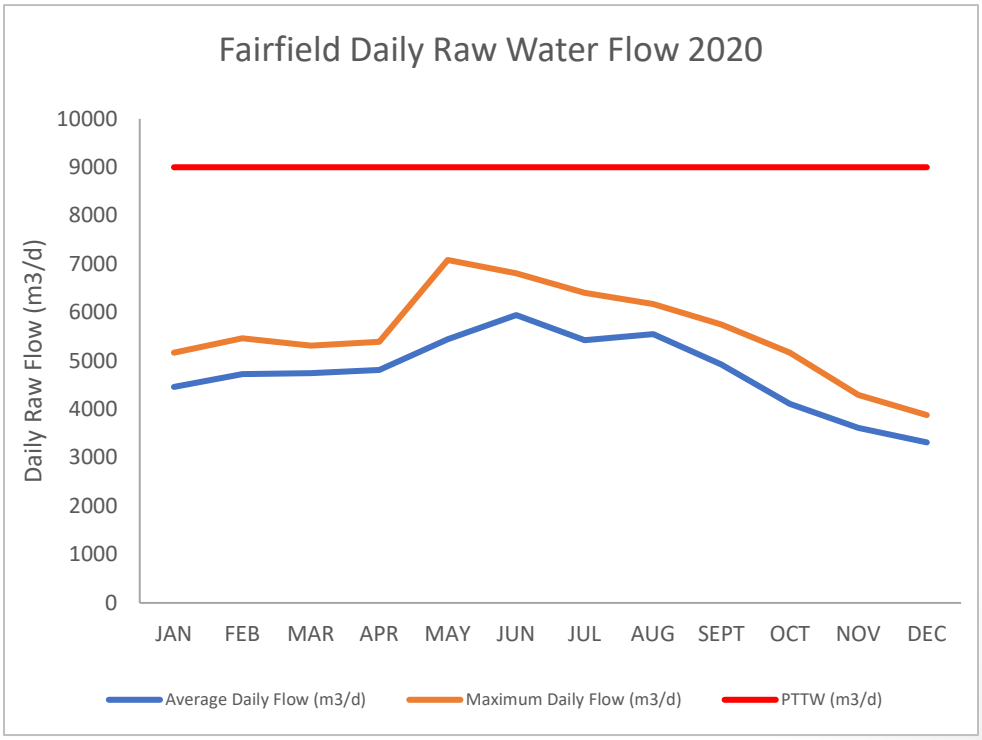
(78.7% of limit)

6. Flow Summary

The Ministry of the Environment, Conservation and Parks (MECP) issues permits to take water (PTTW), allowing municipal drinking water systems to draw from a water source for water treatment and distribution purposes.

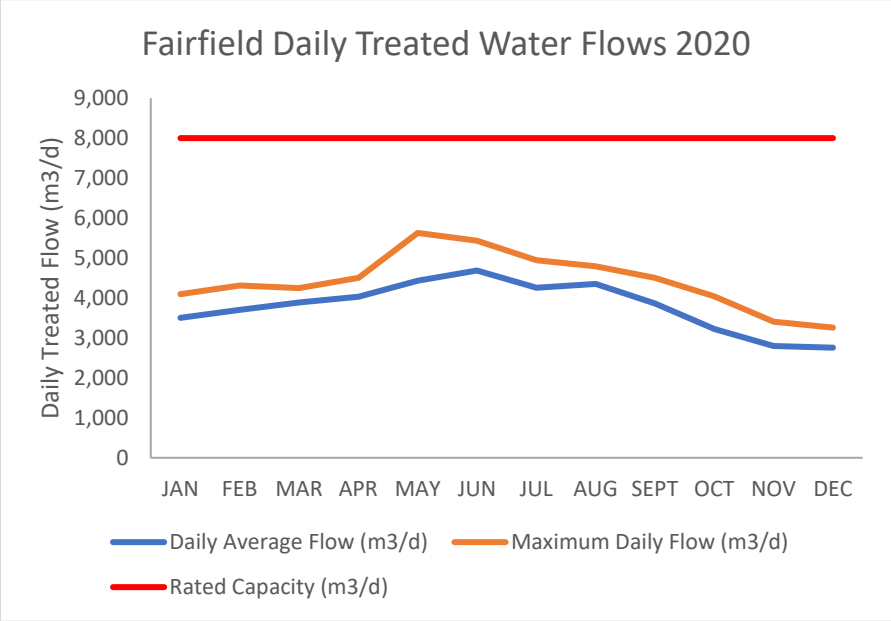
6.1 Fairfield DWS

The MECP issued Loyalist Township its most recent PTTW on July 15, 2014. The permit is valid for 10 years and allows the Township to draw a maximum of 9,000 m^3 of water per day from Lake Ontario for the Fairfield Water Treatment Plant.



Based on the current Municipal Drinking Water License, the water treatment plant's rated capacity (8,000 m3 per day) is assessed as being

the volume of water that flows from the treatment system to the distribution system or water demand. For 2020, the water demand reached 70.3% of the plant's rated capacity in the spring time. The lock down of the province / state of emergency of the Township due to the pandemic, major service leaks and watermain leaks as well as annual maintenance in the distribution system (flushing, tower turnovers) attributed to the high demand in the spring time 2020.



The uncommitted reserve capacity calculation performed in 2020 places the expansion of the Fairfield Water Treatment Plant at the year 2030, considering 125 Equivalent Residential Units (ERUs)/year with the current inventory of draft plan approved development.

This expansion date is subject to change forward or backwards based on size of development being approved, changes in limits of the service area, actual growth rate, water demand and water

Fairfield DWS

Total treated water sent to the distribution system in 2020

1,387,120 m^3

Maximum Daily Treated water Volume

5,627 m^3/day

(70.3% of rated capacity)

Bath DWS

Total Raw Water Taken in 2020

626,881 m^3

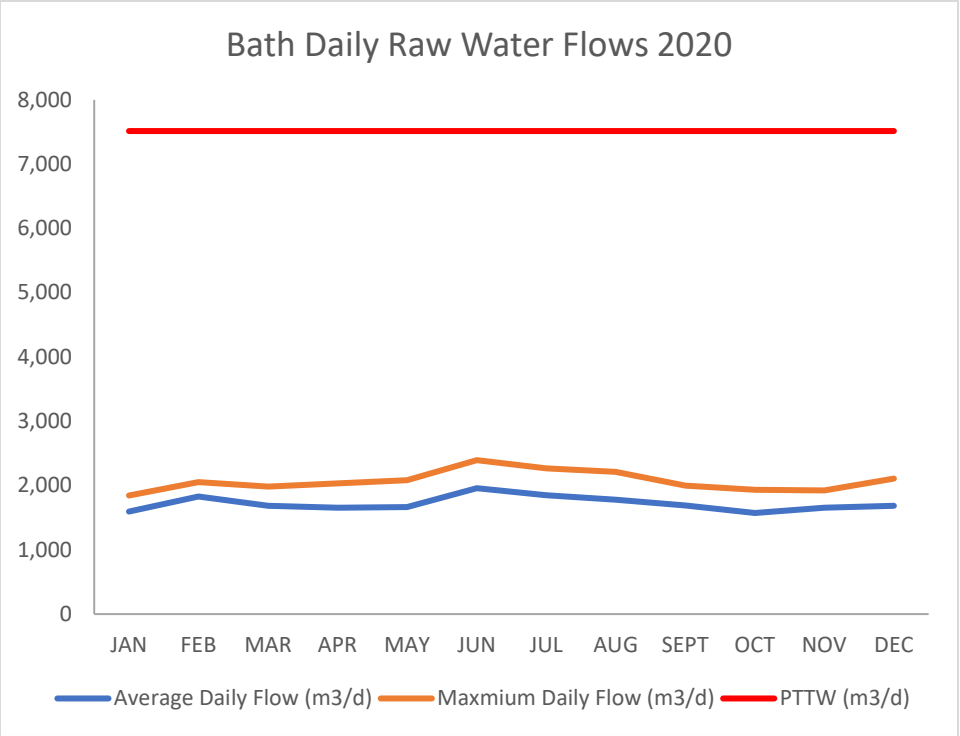
Maximum Daily Raw Water Volume Taken

2,395 m^3

(31.9% of the limit)

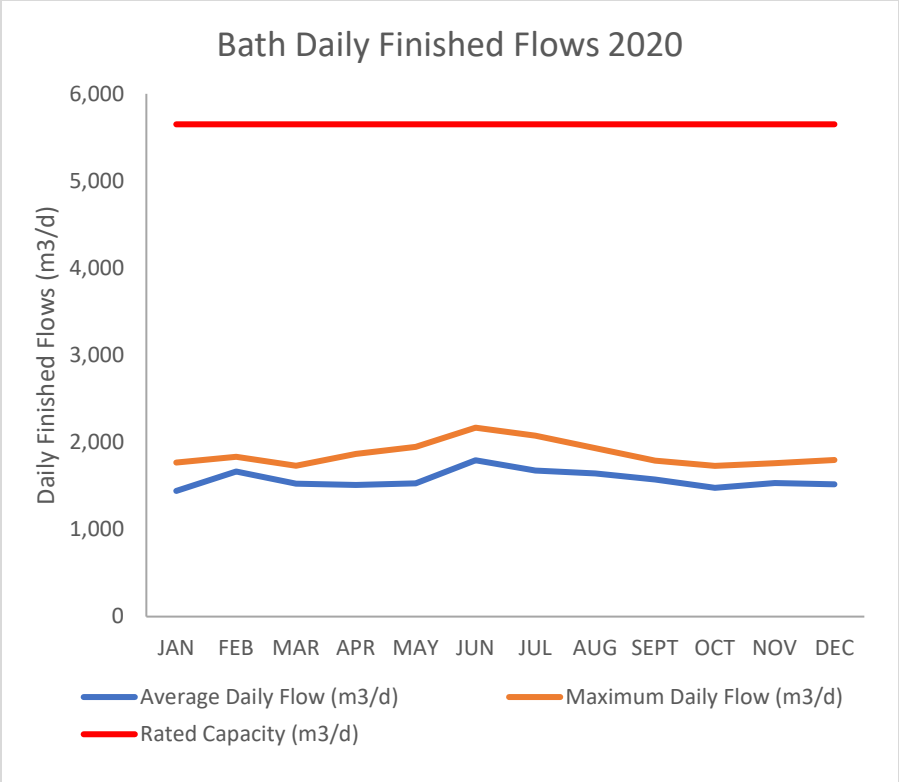
6.2 Bath DWS

The most recent PTTW for this system was issued on July 18, 2014. The permit is valid for 10 years and allows the Township to draw a maximum of 7,515 m^3 of water per day from Lake Ontario for the Bath Water Treatment Plant.



Based on the Municipal Drinking Water License, the water treatment plant's rated capacity (5,650 m^3 per day 4540 m^3 per day for the mobile unit respective) is assessed as being the volume of water that flows from the treatment system to the distribution system or water demand.

For 2020, the water demand reached 38.4% of the plant's rated capacity (5,650 m^3 per day).



It should be noted that all of the existing capacity of the Bath Water System has been allocated through front end funding agreements to developers and Correctional Services Canada (CSC), leaving no room for further allocation.

If new build levels continue at the current approximate rate of 30 ERUs/year the expected expansion would occur beyond 2056.

This expansion date is subject to change forward or backwards based on timing of development being completed and water demand trending.

Bath DWS

Total treated water sent to the distribution system in 2020

574,246 m^3

Maximum Daily Treated Water Volume

2,168 m^3/day

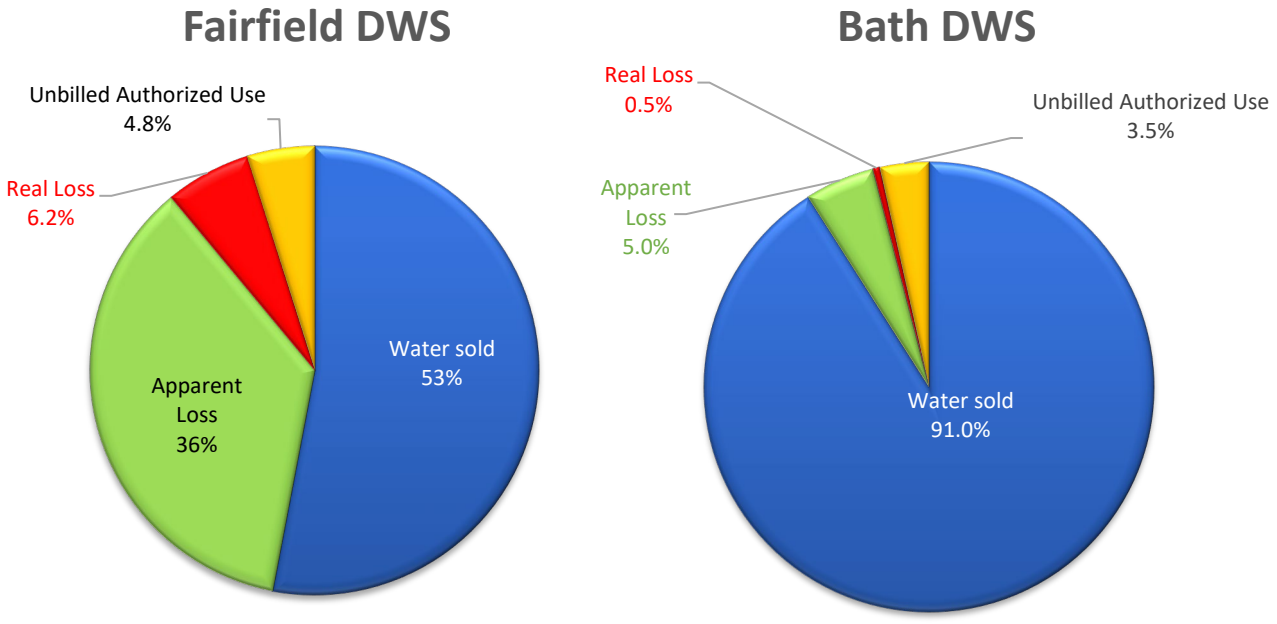
(39.9% of rated capacity)

6.3 Water Losses

With regards to water losses, the MECP Design Guideline for Drinking Water Systems refers to "unaccounted for water" when considering rated capacity. Their policy requires system owners to consider unaccounted for water to the level of 15% of the average daily demand.

For 2020, 47% of water sent to the Fairfield water distribution system and 9% for the Bath water distribution system is water for which no revenue was generated. Not all is considered unaccounted for. Thirty-six percent of water produced in Fairfield and 5% produced for Bath is apparent water lost.

The real waterloss increased in Fairfield from 5.7% in 2019 to 6.2% in 2020. Major leaks would be repaired in the fall of 2020.



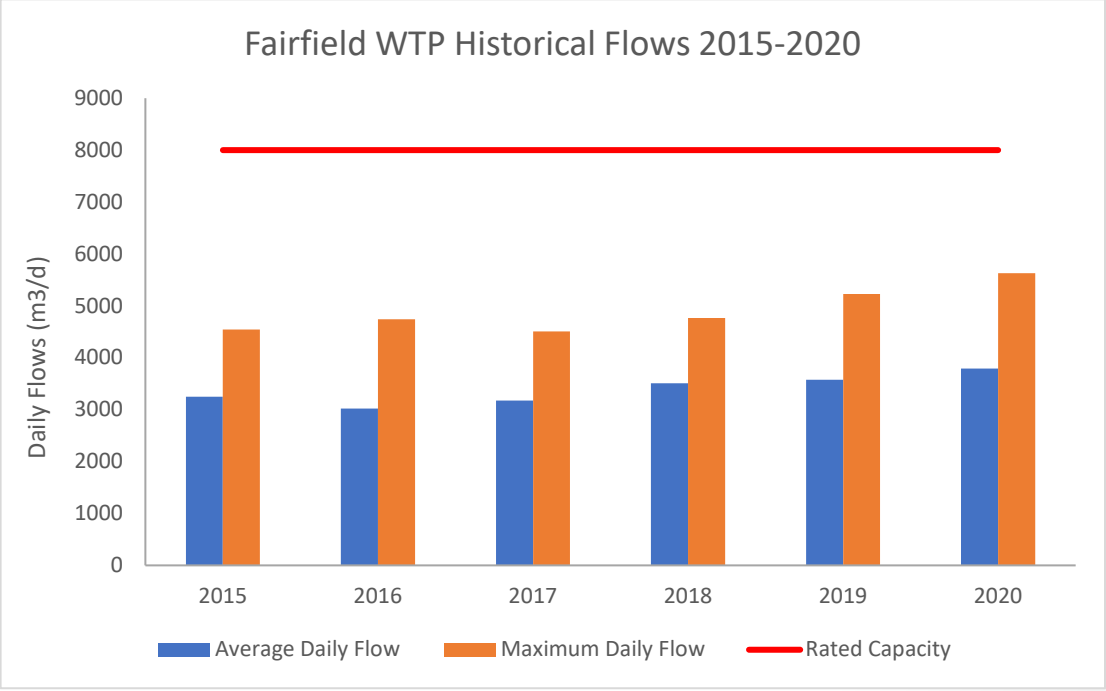
Non-revenue water (NRW) is generally categorized as **unbilled authorized consumption** (water use inside the treatment facilities, distribution system flushing, water used for construction activities, fire training / fire fighting purposes and water used for recreation purposes), **real water losses** (watermain breaks and

leaks) and **apparent water losses** (unauthorized consumption / theft, unknown water usage and metering / data inaccuracies).

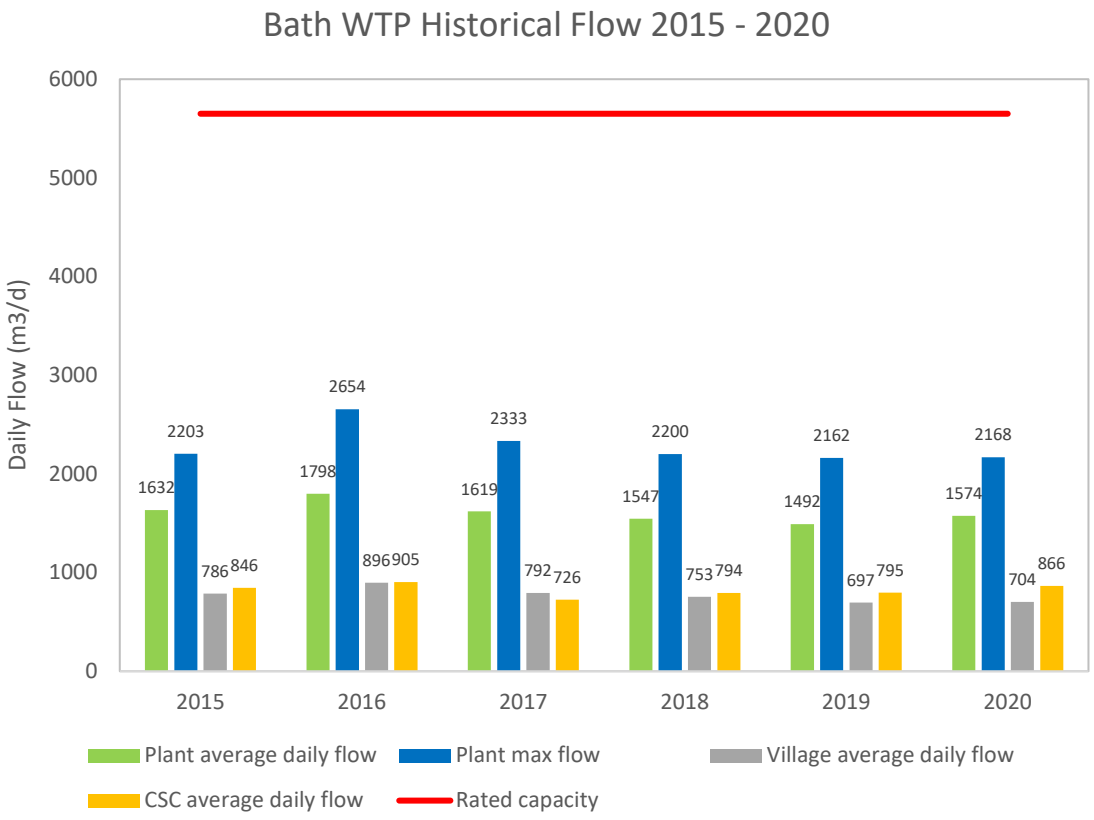
6.4 Historical trends

Historical trending indicates that total water consumption (annual average daily flow) has not changed significantly over the years for the Fairfield DWS although development and population continues to grow. The increase in flow demand expected with a population growth is balanced with household water usage efficiencies and a reduction in water losses achieved by replacing older watermains.

As expected, the fluctuation of the maximum daily flow is very much a function of precipitation and major events in the distribution system, above average precipitation (2014), drought conditions (2016) and lots of precipitation (2017 and 2019) brought a significant volume of lost water. Watermain breaks, leaks, major construction activities and unmetered temporary water services lead to additional flow increases between 2018 to 2020.



For Bath, trending indicates that water consumption (annual average daily flow) has increased slightly from 2019 but is very much influenced by water demand from CSC and the number of high turbidity events affecting treatment filter performance.



7. Waterworks Upgrade and Major Maintenance

In 2020 the following upgrades and maintenance activities took place:

Fairfield DWS:

- Lakeside Ponds Phase 2 and Industrial Park Development
- Preventive Maintenance
- Maintenance of the exhaust fans in membrane room
- Replacement of actuators and valves
- Replacement of compression fitting on Odessa Water Tower CL2 injection tubing
- Replacement of E&H tank level transmitter on subtrain B
- Replacement of pressure tank air gauges
- Installation of new UPS at Fairfield Water Tower
- Replacement of chemical injection lance at Booster Station
- Replacement of valve in distribution system (Bridge St and South St intersection)
- Watermain and waterservice repairs in the distribution system
- Amherstview Tower inspection
- Booster Station Reservoir anode replacement and Booster Station Reservoir inspection
- Radio communications upgrade Amherstview Tower, Booster Station, Odessa Tower

Bath DWS:

- Preventive Maintenance
- Maintenance on Filter 4200
- Replacement of the submersible raw water sample pump with non-submersible version
- Upgrade of the filter system to a membrane gravity filtration and installation/operation of a mobile filtration system between August to December

8. Regulatory Sampling Requirements

Regulatory samples are analyzed by laboratories that are accredited to conduct these specific analyses. As regulated, operational checks, testing and sampling are also conducted by certified operators and/or continuous analyzers.

8.1 Sampling Locations

Samples are collected at the following locations on a set schedule, as required by the regulation and more frequently if required operationally:

- Raw water
- Each filter effluent
- Treated water (point where water enters the distribution system)
- Process water discharge to water source
- Distribution system (point with maximum residency time)
- Distribution system (routine microbiological and lead sampling locations)
- Distribution system (water towers and water reservoir)

8.2 Equipment Calibration

All testing instruments are calibrated regularly as per manufacturer's specifications. Although not required to do so, the Township retains a third-party instrumentation service provider to conduct annual servicing on the majority of our laboratory equipment, as a quality control measure.

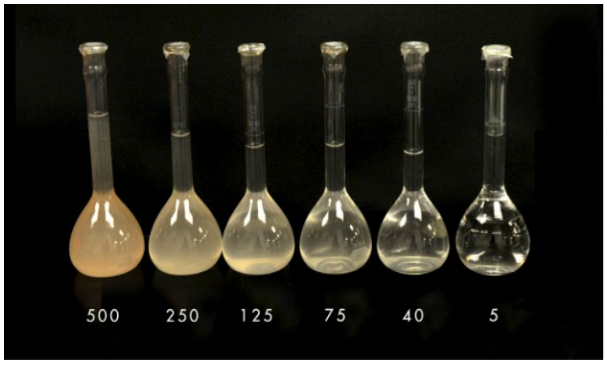
8.3 Turbidity and Free Chlorine Residual Sampling

Sampling for turbidity and free chlorine residual is required by **Schedule 7** of *O.Reg. 170/03*. Continuous free chlorine residual and turbidity analyzers are installed throughout the treatment plant and continuous free chlorine analyzers are installed in the water distribution system at the Amherstview, Bath and Odessa water towers as well as at the Odessa water booster station, all in accordance with the requirements of the Drinking Water Works Permit.

Readings from these analyzers are trended by the Supervisory Control and Data Acquisition (SCADA) system at each water treatment plant and reports of minimum, maximum and average values during a 24-hour period are printed and reviewed by a certified operator on a daily basis.

Turbidity is defined as the cloudiness of the water caused by suspended matter and is an important measure of filter performance. Its measurement is expressed in Nephelometric Turbidity Unit (NTU). Water becomes "cloudier" as the NTU's increase.

Turbidity in the water interferes greatly with the disinfection process, as the particles causing high



Filter effluent turbidity met the criteria as per ODWQS at all times in 2020

turbidity can shield or entrap disease-causing organisms, making it difficult for the disinfectant to reach and destroy.

The filter performance criteria for membrane filtration (Fairfield) is ≤ 0.1 NTU in 99% of all turbidity readings taken over the course of one month. For conventional filtration (Bath) the filter performance criteria is ≤ 0.3 NTU in 95% of all turbidity measurements taken within one month. The filter performance criteria for the mobile filtration unit in Bath (operated from the end of July to the end of December) is ≤ 0.1 NTU in 99% of all turbidity readings in a month.

Turbidity higher than 1 NTU at the filter effluent for a duration of 15 minutes is an indicator of "adverse water quality".

Filter Turbidity Results 2020					
	Samples	Limit	Unit	Average	min/max
Fairfield					
Train 1	continuous	1*	NTU	0.02	0.01 / 0.16
Train 2	continuous			0.02	0.01 / 0.13
Train 1	continuous	99**	%	100	100
Train 2	continuous			100	100
Bath					
Filter 4100***	continuous	1*	NTU	0.05	0.01 / 1.35
Filter 4200***	continuous			0.05	0.02 / 2.00
Filter 4100	continuous	95**	%	99.9	98.5 / 100
Filter 4200	continuous			99.9	87.8 / 100
MPAK***	continuous	1*	NTU	0.02	0.01 / 0.74
MPAK***	continuous	99**	%	99.8	98.6 / 100

* max for longer than 15 minutes
** Percentile
*** Filter 4100 and Filter 4200 in operation from January 1st to August 17th 2020; MPAK: mobile membrane filtration system operated from August 10th to December 31st, 2020.

In Fairfield, proper disinfection was achieved at all times in 2020 with no turbidity spikes over 1 NTU occurring.

In Bath, high raw water turbidity events were affecting the plants operation in January and causing filter turbidity spikes for a few minutes over 1 NTU. Filter turbidity also spiked for a few minutes over 1 NTU in February 2020 when the plant was starting up. The

turbidity spiked only for a couple of minutes after start up of the mobile filtration unit (MPAK), none of the spikes were over 1 NTU.

The limits and percentiles were met at all times at both drinking water plants.

Free chlorine residual is the concentration of residual chlorine that is the most effective at killing or inactivating disease-causing organisms in water. Its measurement is expressed in milligram per liter (mg/l).

For both water treatment plants, the minimum free chlorine residual required in treated water to confirm proper disinfection has been achieved. In 2020, the minimum FCR was 0.85 mg/l at the Fairfield water treatment plant und 0.96 mg/l at the Bath water treatment plant.

2020 Free Chlorine Residual Results					
	Samples	Limit	Unit	Average	min
Fairfield					
FCR (treated)	continuous daily grab	0.8*	mg/l	1.52	0.85
FCR (distribution)	continuous daily grab	0.05		1.28	0.4
Bath					
FCR (treated)	continuous daily grab	0.9*	mg/l	1.51	0.96
FCR (distribution)	continuous daily grab	0.05		1.16	0.4

*min FCR to meet CT at worst case scenario

The recommended minimum concentration in the distribution system to protect from bacterial re-growth and biofilm formation is 0.2 mg/l. The minimum concentration in the Fairfield and Bath distributions over the course of the year was 0.4 mg/l. In 2020, proper disinfection was achieved at Fairfield and Bath at all times.

Free chlorine residuals were well above the minimum criteria. The treated **water** was **well disinfected**!

8.4 Microbiological sampling

Microbiological sampling of raw, treated and distribution water is required by **Schedule 10** of *O.Reg. 170/03*.

Organisms such as bacteria may come from storm water, sewage plants, livestock operations, septic systems and wildlife. Most present little or no health concerns for humans. The indicator tests include total coliforms, Escherichia coliforms (E. coli), and heterotrophic plate count (HPC).

The presence of any total coliforms or E. coli in water leaving a treatment plant (following the disinfection process) signifies inadequate treatment and an increased risk to public health.

2020 Microbiological Results					
	Number of Samples	E. coli	T. coliforms	Number of Samples	HPC
		CFU/100 mL min – max			counts/mL min - max
Fairfield DWS					
Raw	53	0 - 30	2 – 880	n/a	n/a
Treated	55	0	0	53	<10 - 20
Distribution	447	0	0	159	<10-240
Bath DWS					
Raw	54	0 - 240	3 – 2,120	n/a	n/a
Treated	63	0	0	59	<10 - 50
Distribution	159	0	0	53	<10 - 20

In 2020 the total coliform count as well as E.coli in the treated water at both water treatment plants and in the distribution systems were always below the limit of O CFU/100 mL.

Heterotrophic plate count (HPC) results give an indication of overall water quality in drinking water systems. While a gradual change in results can indicate a change in overall water quality or a problem such as bacteria regrowth in the distribution system, a sudden high result is more an indication of sampling point contamination, issue with sample preparation for analysis or with the analysis itself.

HPC results of 20 count/ml or less in the treated and distribution water can be expected. Occasional higher results are possible but as a guideline, each result should be less than 500 count/ml. All sample results were well below the guideline.

8.5 Quarterly Chemical Sampling

Quarterly sampling and testing for nitrates and nitrites in a treated water sample, haloacetic acids and trihalomethanes in distribution samples is required by **Schedule 13** *O.Reg. 170/03*.

Nitrate is present in the water as a result of decay of plant or animal material, the use of agriculture fertilizer, sewage and treated wastewater contamination or geological formations containing soluble nitrogen compounds. There is a risk for infants to suffer from blood related problems if the nitrate concentration is higher than 50 mg/L in drinking water. Nitrite may occur in groundwater but with chlorination it's rapidly oxidized to Nitrate.

Trihalomethanes (THMs) and haloacetic acids (HAAs) are by-products of disinfection (DBP) and are formed when chlorine reacts with organic matter naturally present in water. The level of THMs and HAAs in treated water depends on numerous factors including total organic carbon, temperature, pH, chlorination dose and residency time in the distribution system.

For THMs, the maximum acceptable concentration (MAC) is 100 µg/l based on a four-quarter moving average.

All samples collected as per Schedule 13 of *O.Reg. 170/03* **met the standards** prescribed in the ODWQS

2020 Nitrate, Nitrite, THM, HAA - Schedule 13				
	Samples	ODWQS	Unit	Average Concentration
Fairfield DWS (distribution)				
Nitrate (N)	4	10	mg/L	0.3
Nitrite (N)	4	1	mg/L	<0.1
THM – 5 Main Street	4	100	µg/L	48.0
HAA – 5 Main Street	4	80	µg/L	37.2
Bath DWS (distribution)				
Nitrate (N)	5	10	mg/L	0.2
Nitrite (N)	5	1	mg/L	<0.1
THM - Main St – Hydrant 534	4	100	µg/L	43.8
HAA - Bath STP	4	80	µg/L	24.9

The standard for HAAs has been established at 80 µg/l (four-quarter moving average, RAA) and came into effect on January 1st, 2020. At all sampling points in the distribution system in Fairfield and Bath, the running annual average for HAA was well below the established value of 80 µg/l.

In 2018, the Ministry has required that after building a running annual average, the sampling point for the future should be chosen at the locations where the highest concentration had been determined.

The sampling results from 2019 indicated that the highest HAA concentrations were located at 5 Main Street, Odessa and at Bath STP. According to the Ministry Guidelines, 2020, samples were taken in the Fairfield distribution system at 5 Main Street sampling hydrant and in the Bath distribution system at the Bath STP.

All Nitrate, Nitrite, HAA and THM concentrations are well below the established limits in 2020.

8.6 Annual Inorganic and Organic Sampling

Yearly sampling of specific inorganic and organic parameters in a treated water sample is required by **Schedules 23 and 24** of *O.Reg. 170/03*.

If the result for a parameter listed in these schedules exceeds half of the standard prescribed by the ODWQS, then the frequency of testing for that parameter must be increased to quarterly.

The results for the inorganic and organic parameters are summarized in the tables below.

All inorganic and organic parameters were well below the limit and all parameters were far below of the half of the standard prescribed by the ODWQS.

All parameters listed in schedule 23 & 24 **met the ODWQS**

2020 Annual Inorganic Results – Schedule 23			
	ODWQS	Fairfield DWS	Bath DWS
Parameter	**µg/L**		
Antimony	6	0.1	0.3
Arsenic	10	0.7	0.6
Barium	1000	24	24
Boron	5000	19	21
Cadmium	5	<0.015	<0.015
Chromium	5	<2	<2
Mercury	1	<0.02	<0.02
Selenium	50	<1	<1
Uranium	20	0.29	0.17

2020 Annual Organic Results - Schedule 24			
	ODWQS	Fairfield DWS	Bath DWS
Parameter	**µg/L**		
Alachlor	5	<0.3	<0.3
Atrazine & Metabolites	5	<0.5	<0.5
Azinphos-methyl	20	<1	<1
Benzene	1	<0.5	<0.5
Benzo(a)pyrene	0.01	<0.005	<0.005
Bromoxynil	5	<0.5	<0.5
Carbaryl	90	<3	<3
Carbofuran	90	<1	<1
Carbon Tetrachloride	2	<0.2	<0.2
Chlorpyrifos	9	<0.5	<0.5
Diazinon	2	<1	<1
Dicamba	120	<10	<10
1,2-Dichlorobenzene	200	<0.5	<0.5
1,4-Dichlorobenzene	5	<0.5	<0.5
1,2-Dichloroethane	5	<0.5	<0.5
1,1-Dichloroethylene	14	<0.5	<0.5
Dichloromethane	50	<5	<5
2,4-Dichlorophenol	900	<0.1	<0.1
2,4-Dichlorophenoxy-aceticacid (2,4-D)	100	<10	<10
Diclofop-methyl	9	<0.9	<0.9
Dimethoate	20	<1	<1
Diquat	70	<5	<5
Diuron	150	<5	<5
Glyphosate	280	<25	<25
Malathion	190	<5	<5
MCPA	100	<10	<10
Metolachlor	50	<3	<3
Metribuzin	80	<3	<3
Monochlorobenzene	80	<0.5	<0.5
Paraquat	10	<1	<1
Pentachlorophenol	60	<0.1	<0.1
Phorate	2	<0.3	<0.3
Picloram	190	<15	<15
PCBs	3	<0.05	<0.05
Prometryne	1	<0.1	<0.1
Simazine	10	<0.5	<0.5
Terbufos	1	<0.5	<0.5
Tetrachloroethylene	10	<0.5	<0.5
2,3,4,6-Tetrachlorophenol	100	<0.1	<0.1
Triallate	230	<10	<10
2,4,6-Trichlorophenol	5	<0.1	<0.1
Trichloroethylene	5	<0.5	<0.5
Triflualin	45	<0.5	<0.5
Vinylchlorid	1	<0.2	<0.2

8.7 Fluoride and Sodium Sampling

Once every 5 years sodium and fluoride must be tested in one treated water sample. The last sampling was done in January 2018. The results are summarized in the table below and treated water in both systems is meeting the requirements of the ODWQS.

The next samples for Fluoride and Sodium will be taken in 2023.

2018 Fluoride & Sodium Results			
	ODWQS	Fairfield DWS	Bath DWS
Parameter	**mg/L**		
Fluoride	1.5	0.2	<0.1
Sodium	-	14.5	13.3

8.8 Distribution System Lead Sampling

Semi-annual sampling in the distribution system for pH and alkalinity is a requirement of **Schedule 15.1** *O.Reg. 170/03*. The Fairfield and Bath Drinking Water Systems have qualified for reduced sampling of lead in residential plumbing and the distribution system. This is because samples collected from previous years indicated that lead concentrations did not pose a risk to public health, based on the ODWQS.

The requirement for reduced sampling is based on the population served. To determine the amount of sampling locations for the Fairfield DWS in 2020, published population figures for the year 2019 were taken (served population in 2019: 10,655). Based on this amount, samples were collected at four different locations in the Fairfield distribution system.
Bath grew to 3,062 and sampling remained at two locations for the Bath DWS.

Exempted from sampling lead in private plumbing based on a community wide lead sampling

All samples were analyzed for lead, pH and alkalinity. In the following table the parameters and the average of the sampling results are listed.

2020 Lead Sampling - Schedule 15.1					
	ODWQS AO/OG	Unit	Dates	Fairfield DWS	Bath DWS
Sample number per date				4	2
Lead	10	µg/L	1.13.20	0.13	0.05
			9.29.20	0.22	0.08
pH	6.5-8.5	-	1.13.20	8.0	8.4
			9.29.20	7.9	8.3
Alkalinity	30-500	mg/L	1.13.20	88.3	92
			9.29.20	85.3	84

All lead samples met the criteria of the ODWQS. The pH and alkalinity of the sample taken in 2020 were within the range of the objectives and guidelines.

9. General Water Quality Parameter

Testing for Hardness, Dissolved Organic Carbon (DOC), Conductivity, Total Kjeldahl Nitrogen (TKN), Ammonia/Ammonium, Colour and temperature on raw and finished water is also conducted on a daily or quaterly basis at Bath and Fairfield. The type of samples and frequency of sampling are set taking into account recommendations from the Engineer's Report, operational experience and specific treatment needs.

Test results are summarized in the table below for 2020.

The "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines – June 2006" provides operational guidelines and aesthetic objectives of certain parameters in drinking water and are provided below for comparison purposes.

2020 General Water Quality Parameter (Annual Average)							
				Bath DWS		Fairfield DWS	
Parameter	Units	AO	OG	Raw Water	Treated Water	Raw Water	Treated Water
Hardness	mg/L CaCO3	-	80-100	125	124	124	125
Alkalinity	mg/L		30-500	90	86	-	88
DOC	mg/L	5	-	2.9	2.4	2.9	2.6
Conductivity	umho/cm	-	-	299	298	-	-
TKN	mg/L	-	-	0.3	0.1	0.2	0.1
Ammonia/ Ammonium	mg/L	-	-	0.02	0.01	0.01	0.01
Colour	TCU	5	-	14	0	1	0
Temperature	°C	<15	-	11.3	11.9	11.7	12.5

All listed parameter are, with the exeption of hardness, below the operational guidelines and aesthetic objectives. Water hardness is defined by the amount of dissolved calcium and magnesium in water. Hard water (121 – 180 mg $CaCO_3$/L) is high in dissolved minerals and has a tendency to form scale deposits. This does not mean that it poses a health risk. It only means that more soap or detergent is needed to clean things. Hard water has benefits as well: humans need minerals to stay healthy and drinking water could contribute to calcium and magnesium in the diet. In Ontario the hardness from surface sources ranges from 3.7 to 296 mg/L.

10. Municipal Drinking Water License Sampling Requirements

According to section C.5.2 of the license for each of the DWS backwash/wastewater, samples of the treatment plant at the point of discharge to Lake Ontario must be taken.

For the Fairfield WTP, free chlorine residual in the discharge must be sampled monthly. The residual must remain below 0.05 mg/l (as an annual average).

For the Bath WTP, suspended solids concentration must be sampled monthly and remain below 25 mg/l (as an annual average). Since 2019 the decant has been dechlorinated by adding thiosulfate pucks to comply with the Fisheries Act. With the installation and start up of the mobile filtration unit in July 2020, Bath WTP started

discharging the wastewater to the sewer system instead of the lake to ensure compliance with the applicable act and licence. As a result, suspended solids were not tested for during this time.

Residue Management 2020 (January 1st – Dec 31st)							
System	Parameter	Limit	Unit	Required sampling	Samples	Annual Average	min - max
Fairfield	FCR*	0.05***	mg/l	1/month	52	0.02	0 – 0.05
Bath	SS**	25***	mg/l	1/month	31	5.14	0 – 22

*FCR: Free Chlorine Residual

**SS: Suspended Solids

*** Limit as annual average

Operationally each respective parameter is tested several times each month. The residues of both plants are well below the limits.

According to section C 6.0 of the license the owner of a drinking water system shall develop and implement a Harmful Algal Bloom monitoring, reporting and sampling plan for each plant. "Harmful Algal Bloom" is an overgrowth of aquatic algal bacteria that produce or have the potential to produce toxins in the surrounding water. Such bacteria are harmful to people and animals and include microcystins produced by cyanobacterial blooms.

To meet the requirements of the Municipal Drinking Water License raw and finished water for both drinking water systems was sampled monthly during the seasonal warm period (June to September 2020) for Microcystin L-R.

Visual monitoring for harmful algal blooms at/near the source water intake(s) was also conducted 3 times per week from the beginning of June to the end of September 2020 with no observations reported.

The following table lists the results for Microcsytin total from 2020. All measurements were below the quantification limit and well below

the drinking water quality standard. A value of 1.5 µg/L in treated water would be deemed an indicator of adverse water quality.

2020 Microcystins (Total) Results				
	Number of Samples	ODWQS (µg/L)	Fairfield DWS	Bath DWS
			(µg/L)	
Raw Water	4	1.5	<0.15	<0.15
Finished Water	4	1.5	<0.15	<0.15

11. Adverse Water Quality Indicator Notifications

There were no incidents of adverse water quality indication for the Bath or Fairfield Drinking Water Systems in 2020 and therefore, reporting in accordance with *Ontario Regulation 170/03* under the Safe Drinking Water Act was not required.

12. Non-Compliance Incidents

Under Schedule 22 of O.Reg 170/03 any incidents of non-compliance with the SDWA, its regulations, DWWP, MDWL or any orders applicable to the system have to be reported. The Township applied for regulatory relief for certain requirements (i.e. reporting, an extension of sampling and notification timelines for minor modifications, additions, etc.) to avoid any incidents of non-compliance within the drinking water systems caused by the pandemic. The relief was granted by the MECP in April 2020 and extended until Dec 2020. Staff had not to report any non-compliance in 2020.

13. Definitions and Terms

Adverse Water Quality
Presence of specific parameters in the drinking water identified as indicator of adverse water quality (potential health effects); listed in Schedule 16 of O.Reg. 170/03

Aesthetic Objective (AO)
Aspects of drinking water quality (namely taste, odour, color, clarity, iron, manganese) that are perceivable by the senses

Inorganic parameters
Substances which are naturally occurring or a result of urban storm runoff, industrial or domestic wastewater discharge, mining or agriculture. Examples are salt, metals, carbonates, nitrate, nitrite. Some may be a result of treatment and distribution of water (for example, lead from old solder in pipes)

Maximum Acceptable Concentration (MAC)
This is a health-related 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.

Operational Guidelines (OG)
For parameters, which may affect the treatment, disinfection and distribution of the water, are operational guidelines set. Examples are alkalinity, hardness and pH.

Organic parameters
Substances which contain a carbon atom are organic compounds, with few exceptions as i.e. carbonates. These includes fats, proteins, sugars, hummin acids, etc. Most of them are present naturally in our environment. Some of them are potentially hazardous for the environment and of concern for the drinking water. These mostly synthetic produced organics include pesticides and their metabolites, VOCs, THM, HAA, PCBs, etc. They originate from industrial discharges, urban and agricultural storm runoff, air

deposition, from treatment of drinking water (for example, chlorination by-products such as trihalomethanes and haloacetic acid) or other sources.

14. Acts and Regulations

In addition to meeting permits and license requirements issued for the Drinking Water Systems, all acts and regulations made with regards to operating, licensing of facilities, licensing of operators, quality standards must also be met. A summary of pertinent legislation is as follows:

- *Safe Drinking Water Act*, 2002
  - Drinking Water Systems O.Reg. 170/03
  - Licensing of Municipal Drinking Water Systems O.Reg. 188/07
  - Certification of Drinking Water Operators O.Reg. 128/04
  - Ontario Drinking Water Quality Standards O.Reg. 169/03
  - Drinking Water Testing Services O.Reg. 248/03
  - Financial Plans O.Reg. 453/07
  - Procedure for Disinfection of Drinking Water in Ontario
  - Watermain Disinfection Procedure

- *Ontario Water Resources Act*, 1990
  - Water Taking O.Reg. 387/04
  - Charges for Industrial and Commercial Water Users O.Reg. 450/07

- *Environmental Protection Act* and its regulations
- *Fisheries Act, 1985* and its regulations
- Several other MECP guidelines and protocols

15. References

Technical Support Document for Ontario Drinking Water Standards, Objectives and Guideline, Ministry of Environment, PIBS 4449e01 revised June 2006

Entry level drinking water operator course manual, Ministry of Environment, 3rd Edition (revised 02-2010)

Canadian Association for Laboratory Accreditation (www.caeal.ca)

Canadian Water and Wastewater Association (www.cwwa.ca)

e-Laws (www.e-laws.gov.on.ca)

Environment Canada (https://www.canada.ca/en/environment-climate-change/services/water-overview.html)

Health Canada (www.hc-sc.gc.ca)

MECP (www.ontario.ca/page/drinking-water)

Ontario Municipal Water Association (www.omwa.org)

Ontario Water and Wastewater Certification Office (www.owwco.ca)

Ontario Waterworks Association (www.owwa.com)

Walkerton Clean Water Centre (www.wcwc.ca)

16. Key Contacts

For further information on this report or a related topic or if there are any questions regarding the information contained in this report, please contact:

Ms. M.J. Merritt, P.Eng.
Director of Economic Growth and Community Development Services
(613) 386-7351 ext. 137
(613) 386-3833 fax
E-mail: mmerritt@loyalist.ca

Ms. Sheila Buck
Utilities Manager
(613) 386-7351 ext. 139
(613) 386-3833 fax
E-mail: sbuck@loyalist.ca

Ms. Birgit Piberhofer, P.Eng
Utilities Compliance Supervisor
(613) 386-7351 ext. 152
(613) 386-3833 fax
E-mail: bpiberhofer@loyalist.ca

Involved Utilities Team 2020: A. Beaudry, A. Bouwma, M. Davey, K. Duivesteyn, R. Gurnsey, K. Jackson, S. Lemare, B. Litchfield, J. MacDonald, S. MacDonald, M. Naboznak, B. Nieman, D. Olive, D. Smith, J. Taylor

General inquiries

Customer Service Assistant

613-386-7351

extension 116

info@loyalist.ca

www.loyalist.ca