Township of
SEVERN

Water Supply and Distribution System

Severn Estates
2022 Summary Report

Contents

Overview and Background

Safe Drinking Water Act

Safe Drinking Water Act Ontario Regulation 170/03, Schedule 22-2, requires that owners of municipal drinking water systems prepare a Summary Report and present this report to the members of Municipal Council by March 31st of each year. The report is prepared for the previous calendar year and the following criteria must be included as per the regulation:

- List the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water license, and orders applicable to the system that were not met during the period covered by the report.
- For each requirement referred to in clause (a) that was not met specify the duration of the failure and the measures that were taken to correct the failure.
- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows.
- A comparison of the summary referred to in (c) to the rated capacity and flow rates approved by the system's certificate of approval, drinking water works permit or municipal drinking water license.

This Summary Report also serves as a comprehensive review of the systems performance as it relates to regulations and criteria that fall under the municipal drinking water licensing program.

Municipal Drinking Water Licensing Program

A Municipal Drinking Water License (MDWL) is required in Ontario to operate the drinking water system. The Municipal Drinking Water License (#148-103 Issue Number 3) was re-issued on May 20, 2021 and is valid until May 19, 2026. The reissuance was initiated by the Ministry of Environment, Conservation and Parks

(MECP) due to regulatory amendments that required timelines to be outlined in the MDWL. There are five requirements that must be achieved to obtain an MDWL:

- A valid Drinking Water Works Permit (#148-203 Issue Number 4)
- A valid Permit to Take Water for each source (#1184B6NK7B)
- An Operational Plan
- Must have an Accredited Operating Authority (C0124837-DWQ4-C0124835)
- A Financial Plan approved by Council

System and Process Description

The Corporation of the Township of Severn is the owner and operator of the Severn Estates Water Supply and Distribution System (DWS# 220005152). The system was initially constructed in 1971. In 2006, the treatment facility underwent a major overhaul with the addition of a below ground storage reservoir and new pump house. It currently has 25 service connections. It is classified as a Class 1 Water Treatment system and a Class 1 Water Distribution system.

Source Water

The Severn Estates Water Treatment and Distribution System obtains its raw water from a 150 mm diameter drilled well located inside the treatment plant at 4532 Trent Trail.

Raw Water Characteristics

The raw water is of low turbidity and is of acceptable ph. Due to the depth of the source water the temperature is relatively constant.

Water Treatment

The water enters from a well, located within the pump house, to a discharge header. Chlorine is added in the form of sodium hypochlorite. After chlorination,

water is directed to 450 L contact tanks to facilitate precipitation. It is then filtered using a twin train Kinetico macrolite filtration system and then discharged to a common header. It then flows into a 13.6 m^3, two (2) cell concrete underground storage reservoir.

Water is pumped to the distribution header, where it passes through a magnetic flow meter, via two vertical turbine high lift pumps to a common header. Pressure in the distribution system is maintained between 50 and 65 PSI by three 450L pressure tanks.

Online analyzers monitor and record raw and treated water flow rates, distribution pressure, treated water turbidity, free chlorine residual and ph. Level sensing probes record well level and reservoir level. The plant is also equipped with full SCADA control.

Standby power is provided to the building and all its equipment by a 16kW propane fueled generator.

Water Distribution

The distribution system is comprised 665 meters of 100mm and 50mm PVC water main. There are 2 sample stations and 3 blow-offs located throughout the system.

Regulatory Compliance

Regulations

All municipally owned and operated water systems are governed under the **Safe Drinking Water Act,** 2002, **Ontario Water Resources Act** (OWRA), and associated regulations. The following regulations, and associated standards and documents, are all applicable, and most relevant, to the compliant operation of the Township of Severn's Drinking Water system:

Ontario Regulation 170/03

This regulation includes requirements for:

- Sampling and analytical testing (microbiological and chemical)
- Adverse water quality incidents
- Corrective actions
- Continuous water quality monitoring

Ontario Regulation 169/03

This regulation includes requirements for:

- Water Quality Standards

Ontario Regulation 128/04

This regulation includes requirements for:

- Classifications of Drinking Water Systems
- Certifications and responsibilities of Operators
- Proper record keeping of the drinking water system

Wells Regulation 903

This regulation includes requirements for:

- Well maintenance
- Well specifications

Drinking Water Quality Management Standard (DWQMS)

This Standard specifies:

- Minimum requirements for the Quality Management System to allow for the accreditation of the Operating Authority

Municipal Drinking Water License

This document includes requirements for:

- Specific conditions / testing / monitoring
- Flow limits through the treatment system
- Regulatory relief conditions
- Operations and Maintenance manual criteria

Drinking Water Works Permit License

This document includes criteria for:

- Making alterations to the system

Non-Compliance and Adverse Water Quality Incidents

There were NO adverse water quality incidents in 2022.

DWQMS and Municipal Drinking Water Licensing Program

Third Party Audit and Accreditation

On an annual basis, a third-party accreditation authority conducts an audit to determine whether the Quality Management System conforms to the requirements of the Ontario Ministry of the Environment's Drinking Water Quality Management Standard (DWQMS).

On December 20 and 21, 2022, NSF International completed a satellite audit with no non-conformances noted.

Internal Audit

As per the DWQMS, an internal audit is to be conducted once per year.
August 30 to September 1, 2022, an internal audit was conducted by Aet Group Inc.
The findings were included during Management Review.

Management Review

As per the DWQMS, an annual Management Review is to be conducted and findings conveyed to the Owner. Management Review was conducted September 7, 2022. The review included findings from the internal audit, MECP inspections and other prescribed items.

Annual Operations Summary

System Improvements and Maintenance

The following maintenance and improvements were carried out in 2022 to provide the highest possible drinking water quality:

- Water distribution system was directionally flushed to maintain the drinking water quality.
- Over 25% of the main valves in the distribution system were exercised to ensure their reliability.
- Standby generator was tested under load monthly to ensure reliability.
- All critical alarms were tested monthly to ensure reliability.
- Drinking water quality was tested at the water treatment plant and in the distribution system weekly.
- Filter media replaced.
- One new contact tank installed.
- New turbidity analyzer installed.
- New generator installed.

Microbiological Testing

E. Coli and Total Coliform

Bacteriological samples, to be tested for E. Coli and Total Coliforms, are taken weekly from the raw and treated water at the facility and from the distribution system. Extra samples are taken after major repairs or maintenance work as per Regulation 170/03. E. Coli or Total Coliform results above 0 in treated water must be reported to the MECP and MOH. Resamples and other required actions are undertaken as quickly as possible.

The results are from the 2022 sampling program are shown on the table below.

Type of Water	Number of Samples	Range of E-Coli Results (cfu/100ml) (Min – Max) MAC=0	Range of Total Coliform Results (cfu/100ml) (Min – Max) MAC=0
Raw	54	0 - 0	0 – 1
Treated	107	0 - 0	0 - 0

Heterotrophic Plate Count (HPC)

HPC analyses are completed weekly from the distribution water for large systems. HPC should be less than 500 colonies (cfu) per 1mL. Results over 500 colonies (cfu) per 1 mL may indicate a change in water quality but it is not considered an indicator of unsafe water.

The results from the 2022 sampling program are shown on the table below.

Type of Water	Number of Samples	Range of HPC Results (cfu/1ml) (Min – Max)
Distribution	103	0 - 12

Chlorine Residual and Turbidity

Free chlorine levels of the treated water are monitored continuously at the discharge point of the treatment facility. In the distribution system, free chlorine is checked twice weekly at various locations. As a target, free chlorine residual within the distribution system should be above 0.20 mg/L. A free chlorine level lower than 0.05 mg/L must be reported to the MECP and corrective action taken. There were no reportable incidents in 2022. The results from the 2022 sampling program are shown on the table below.

Turbidity of treated water is continuously monitored at the treatment facility, as a change in turbidity can indicate an operational problem. Turbidity of the wells are checked monthly. Turbidity is measured in Nephelometric Turbidity Units (NTU).

The results from the 2022 sampling program are shown on the table below.

Parameter	Number of Tests	Range of Results (Min – Max) Average
Chlorine residual in distribution (mg/L)	104	(0.95 – 1.83) 1.45
Chlorine residual after treatment (mg/L)	CONTINUOUS	(1.15 – 1.99) 1.57
Turbidity after treatment (NTU)	CONTINUOUS	(0.05 – 1.99) 0.21

Chemical Testing

The Safe Drinking Water Act requires periodic testing of the water for different chemical parameters. The latest results are provided below. The sampling frequency varies for different types and sizes of water systems and chemical parameters. If the concentration of a parameter is above half of the Maximum Allowable Concentration (MAC) under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by the Regulation. Where concerns regarding a parameter exist, the MECP can also require additional sampling. Information on the health effects and allowable limits of components in drinking water may be found on the MECP web page.

Understanding Chemical Test Results

Tables below are shown with concentrations units of either milligrams per litre (mg/L) or micrograms per litre (µg/L): 1 mg/L is equal to 1000 µg/L. The Maximum Acceptable Concentration (MAC) is the highest amount of a parameter that is acceptable in municipal drinking water and can be found in the MECP Drinking Water Standards. The Method Detection Limit (MDL) is the lowest amount to which the laboratory can confidently measure. A result of "ND" stands for "Not Detected" and means that the concentration of the chemical is lower than the laboratory's equipment is capable of measuring.

Nitrate and Nitrite samples are required every 3 months in normal operation.

Parameter	Result Range Min-Max (mg/L)	Average	MAC (mg/L)	MDL (mg/L)
Nitrite	0.003 - 0.003	0.003	1	0.003
Nitrate	0.009 - 0.041	0.025	10	0.006

A Trihalomethane (THM) sample is required every 3 months from the distribution system

Parameter	Annual	Result (Avg.)	MAC (µg/L)	MDL (µg/L)
THM	2022	69.50	100	0.37

A Haloacetic Acid (HAA) sample is required every 3 months from the distribution system.

Parameter	Annual	Result (Avg.)	MAC (µg/L)	MDL (µg/L)
HAA	2022	24.38	80	5.3

Summary of the most recent sodium and fluoride results.

Parameter	Sample Date	Result (mg/L)	MAC (mg/L)	MDL (mg/L)
Sodium	2022	45.2	20	0.01
Fluoride	2022	0.16	1.5	0.06

Summary of the most recent lead testing results.

Parameter	Sample Date	Result Range (Min – Max)	Number of samples	Acceptable Level
Distribution Alkalinity	2022	128 – 182 mg/L	2	30 - 500 mg/L
Distribution pH	2022	6.9 - 7.0	2	6.5 - 8.5
Distribution Lead 2022	2022	0.23 – 2.18 µg/L	2	10 µg/L

Summary of the most recent Schedule 23/24 testing as per Regulation 170/03

*All results are measured in µg/L unless otherwise stated.

Parameter	Sample Dates	Result Value	MAC	MDL
Antimony	Oct. 24, 2022	0.6	6	0.6
Arsenic	Oct. 24, 2022	0.2	10	0.2
Barium	Oct. 24, 2022	273	1000	0.02
Boron	Oct. 24, 2022	97	5000	2
Cadmium	Oct. 24, 2022	0.003	5	0.003
Chromium	Oct. 24, 2022	0.22	50	0.08
Mercury	Oct. 24, 2022	0.01	1	0.01
Selenium	Oct. 24, 2022	0.04	50	0.04
Uranium	Oct. 24, 2022	0.355	20	0.002
Benzene	Oct. 24, 2022	0.32	1	0.32
Carbon tetrachloride	Oct. 24, 2022	0.17	2	0.17
1,2-Dichlorobenzene	Oct. 24, 2022	0.41	200	0.41
1,4-Dichlorobenzene	Oct. 24, 2022	0.36	5	0.36
1,1-Dichloroethylene	Oct. 24, 2022	0.33	14	0.33
1,2-Dichloroethane	Oct. 24, 2022	0.35	5	0.35
Dichloromethane	Oct. 24, 2022	0.35	50	0.35
Monochlorobenzene	Oct. 24, 2022	0.3	80	0.3
Tetrachloroethylene	Oct. 24, 2022	0.35	10	0.35
Trichloroethylene	Oct. 24, 2022	0.44	5	0.44
Vinyl Chloride	Oct. 24, 2022	0.17	1	0.17
Diquat	Oct. 24, 2022	<1	70	1

Parameter	Sample Dates	Result Value	MAC	MDL
Paraquat	Oct. 24, 2022	<1	10	1
Glyphosate	Oct. 24, 2022	<1	280	1
PCBs	Oct. 24, 2022	0.04	3	0.04
Benzo(a)pyrene	Oct. 24, 2022	0.004	0.01	0.004
Alachlor	Oct. 24, 2022	0.02	5	0.02
Atrazine+N-daelkylated metabolites	Oct. 24, 2022	0.01	5	0.01
Atrazine	Oct. 24, 2022	0.02	--	0.01
Desethyl atrazine	Oct. 24, 2022	0.01	--	0.01
Azinphos-methyl	Oct. 24, 2022	0.05	20	0.05
Antimony	Oct. 24, 2022	0.6	6	.6
Carbaryl	Oct. 24, 2022	0.05	90	0.05
Chlorpyrifos	Oct. 24, 2022	0.02	90	0.02
Carbofuron	Oct. 24, 2022	0.01	90	0.01
Diazinon	Oct. 24, 2022	0.02	20	0.02
Dimethoate	Oct. 24, 2022	0.06	20	.06
Diuron	Oct. 24, 2022	0.03	150	0.03
Malathion	Oct. 24, 2022	0.02	190	0.02
Metolachlor	Oct. 24, 2022	0.01	50	0.01
Metribuzin	Oct. 24, 2022	0.02	80	0.02
Phorate	Oct. 24, 2022	0.01	2	0.01
Prometryne	Oct. 24, 2022	0.03	1	0.03
Simazine	Oct. 24, 2022	0.01	10	0.01
Terbufos	Oct. 24, 2022	0.01	1	0.01
Triallate	Oct. 24, 2022	0.01	230	0.01
Trifluralin	Oct. 24, 2022	0.02	45	0.02
2,4-dichlorophenoxyacetic acid	Oct. 24, 2022	0.19	100	0.19
Bromoxynil	Oct. 24, 2022	0.33	5	0.33
Dicamba	Oct. 24, 2022	0.20	120	0.20
Dichlofop-methyl	Oct. 24, 2022	0.40	9	0.40
MCPA	Oct. 24, 2022	.00012	.1	.00012
Picloram	Oct. 24, 2022	1	190	1

Parameter	Sample Dates	Result Value	MAC	MDL
2,4-dichlorophenol	Oct. 24, 2022	0.15	900	0.15
2,4,6-trichlorophenol	Oct. 24, 2022	.25	5	.25
Pentachlorophenol	Oct. 24, 2022	0.15	100	0.15

Water Quantity

Continuous monitoring of flow rates from supply wells into the treatment system and from the facility into the distribution system is required by Regulation 170/03. The Municipal Drinking Water License and Permit to Take Water issued by the MECP regulate the amount of water that can be utilized over a given time. A summary of the 2022 flows is provided in the tables below.

Flow Summary	Quantity
Permit to Take Water Limit	185.7 m^3/day
Municipal Drinking Water License Limit	109 m^3/day
2022 Average Daily Flow	12 m^3/day
2022 Maximum Daily Flow	21 m^3/day
2022 Total Amount of Water Supplied	4481 m^3

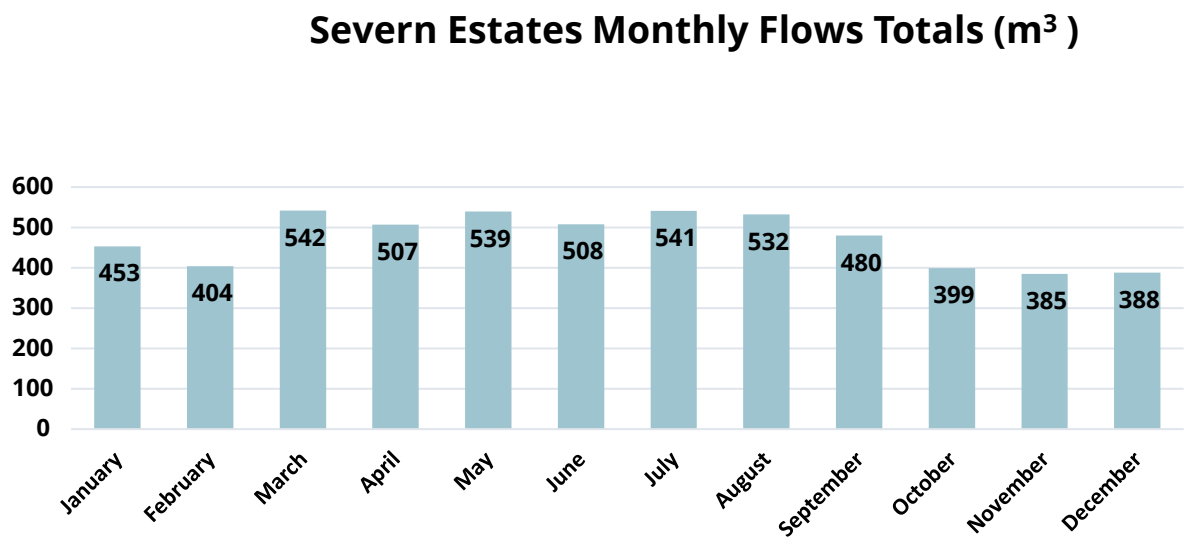
Summary of Raw Water Flows

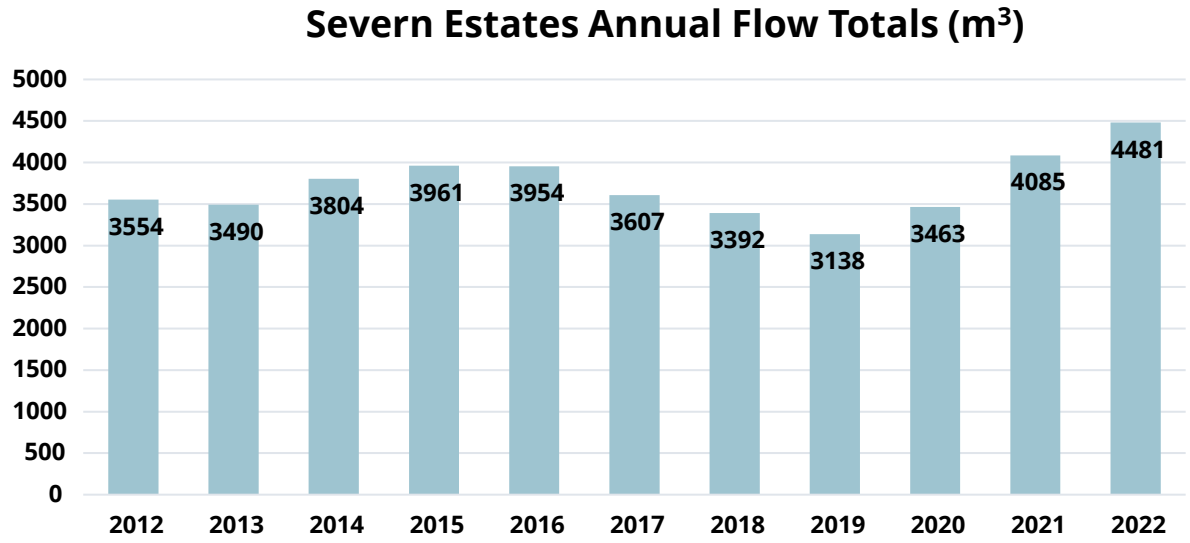
Month	Monthly Total (m^3)
January	453
February	404
March	542
April	507
May	539
June	508
July	541
August	532
September	480
October	399
November	385
December	388
TOTAL	**5680**

Summary of Distribution Flows

Month	Monthly Total (m^3)	Average Daily Flow (m^3/day)	Minimum Daily Flow (m^3/day)	Maximum Daily Flow (m^3/day)
January	362	12	8	14
February	316	11	9	13
March	431	14	10	17
April	397	13	6	17
May	416	13	10	17
June	406	14	9	20
July	444	14	9	21
August	411	13	9	16
September	376	13	7	20
October	324	10	9	14
November	298	10	7	14
December	301	10	8	11
Total	**4481**			

Flow Charts


Severn Estates Monthly Flows Totals (m³)
600
500
400
300
200
100
0
453
404
542
507
539
508
541
532
480
399
385
388
January
February
March
April
May
June
July
August
September
October
November
December


Severn Estates Annual Flow Totals (m³)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
3554
3490
3804
3961
3954
3607
3392
3138
3463
4085
4481
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

Appendix A

Common Acronyms

Regulatory and Compliance

MECP	Ministry of Environment, Conservation and Parks *(formerly Ministry of the Environment)*
DWQMS	Drinking Water Quality Management System
QMS	Quality Management System
PTTW	Permit to Take Water
MDWL	Municipal Drinking Water License
DWWP	Drinking Water Works Permit
C of A	Certificate of Approval
DWS	Drinking Water System
AWQI	Adverse Water Quality Incident
BWA	Boil Water Advisory
ORO	Overall Responsible Operator
OIC	Operator in Charge
OFI	Opportunity for Improvement
BMP	Best Management Practices

Parameters and Measurements

ppm	parts per million
mg/L	milligrams per litre
µg/L	micrograms per litre
mj/cm^2	millijoule per square centimeter
psi	pounds per square inch
w/m^2	watt per square meter
THM	Trihalomethane
HAA	Haloacetic Acid
UV	Ultra Violet
CCP	Critical Control Point

Facilities and Training/Licensing

OWWCO	Ontario Water Wastewater Certification Office
WCWC	Walkerton Clean Water Centre
OIT	Operator in Training
WTP	Water Treatment Plant
CEU	Credited Education Units

Other

GAC	Granular Activated Carbon
VFD	Variable Frequency Drive
HL	High Lift (pump)
SCADA	Supervisory Control and Data Acquisition
LL	Low Lift (pump)