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SEVERN

Water Supply and Distribution System

Severn Estates 2021 Summary Report

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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 in order 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 m³, 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 & 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 2021.

DWQMS & 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 3 and 4, 2021, 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. November 3 and 4, 2021 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 Reviews were conducted August 16, 2021 and December 16, 2021. 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 2021 to provide the highest possible drinking water quality:

- The 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.
- The 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.
- Three new pressure tanks installed.
- Paved new driveway for maintenance access.

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 2021 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	52	0 - 0	0 - 4
Treated	96	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 1 mL. 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 2021 sampling program are shown on the table below.

Type of Water	Number of Samples	Range of HPC Results (cfu/1ml) (Min - Max)
Distribution	48	0 - 100

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 2021. The results from the 2021 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 2021 sampling program are shown on the table below.

Parameter	Number of Tests	Range of Results (Min - Max) Average
Chlorine residual in distribution (mg/L)	103	(0.99 - 1.74) 1.37
Chlorine residual after treatment (mg/L)	CONTINUOUS	(1.04 - 1.96) 1.44
Turbidity after treatment (NTU)	CONTINUOUS	(0.10 - 0.71) 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 ($\mu\text{g/L}$): 1 mg/L is equal to 1000 $\mu\text{g/L}$. 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	0.026 - 0.043	0.036	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	2021	70	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	2021	24.05	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	2021	48.5	20	0.01
Fluoride	2021	0.13	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	2021	167 - 168 mg/L	3	30 - 500 mg/L
Distribution pH	2021	7.1 - 7.7	3	6.5 - 8.5
Distribution Lead 2021	2021	0.11 - 0.83 µg/L	3	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. 28 2021	0.6	6	0.6
Arsenic	Oct. 28, 2021	0.2	10	0.2
Barium	Oct. 28, 2021	264	1000	0.02
Boron	Oct. 28, 2021	81	5000	2
Cadmium	Oct. 28, 2021	0.003	5	0.003
Chromium	Oct. 28, 2021	0.23	50	0.08
Mercury	Oct. 27, 2021	0.01	1	0.01
Selenium	Oct. 28, 2021	0.04	50	0.04
Uranium	Oct. 28, 2021	0.329	20	0.002
Benzene	Oct. 26, 2021	0.32	1	0.32
Carbon tetrachloride	Oct. 26, 2021	0.17	2	0.17
1,2-Dichlorobenzene	Oct. 26, 2021	0.41	200	0.41
1,4-Dichlorobenzene	Oct. 26, 2021	0.36	5	0.36
1,1-Dichloroethylene	Oct. 26, 2021	0.33	14	0.33
1,2-Dichloroethane	Oct. 26, 2021	0.35	5	0.35
Dichloromethane	Oct. 26, 2021	0.35	50	0.35
Monochlorobenzene	Oct. 26, 2021	0.3	80	0.3
Tetrachloroethylene	Oct. 26, 2021	0.35	10	0.35
Trichloroethylene	Oct. 26, 2021	0.44	5	0.44
Vinyl Chloride	Oct. 26, 2021	0.17	1	0.17
Diquat	Nov. 2, 2021	<1	70	1
Paraquat	Nov. 2, 2021	<1	10	1
Glyphosate	Nov. 1, 2021	<1	280	1
PCBs	Oct. 29, 2021	0.04	3	0.04
Benzo(a)pyrene	Oct. 28, 2021	0.004	0.01	0.004
Alachlor	Oct. 28, 2021	0.02	5	0.02
Atrazine+N-daelkylated metabolites	Oct. 28, 2021	0.01	5	0.01
Atrazine	Oct. 28, 2021	0.01	--	0.01
Desethyl atrazine	Oct. 28, 2021	0.01	--	0.01



Parameter	Sample Dates	Result Value	MAC	MDL
Azinphos-methyl	Oct. 28, 2021	0.05	20	0.05
Antimony	Oct. 28, 2021	0.6	6	.6
Carbaryl	Oct. 28, 2021	0.05	90	0.05
Chlorpyrifos	Oct. 28, 2021	0.02	90	0.02
Carbofuron	Oct. 28, 2021	0.01	90	0.01
Diazinon	Oct. 28, 2021	0.02	20	0.02
Dimethoate	Oct. 28, 2021	0.06	20	.06
Diuron	Oct. 28, 2021	0.03	150	0.03
Malathion	Oct. 28, 2021	0.02	190	0.02
Metolachlor	Oct. 28, 2021	0.01	50	0.01
Metribuzin	Oct. 28, 2021	0.02	80	0.02
Phorate	Oct. 28, 2021	0.01	2	0.01
Prometryne	Oct. 28, 2021	0.03	1	0.03
Simazine	Oct. 28, 2021	0.01	10	0.01
Terbufos	Oct. 28, 2021	0.01	1	0.01
Triallate	Oct. 28, 2021	0.01	230	0.01
Trifluralin	Oct. 28, 2021	0.02	45	0.02
2,4-dichlorophenoxyacetic acid	Nov. 2 2021	0.19	100	0.19
Bromoxynil	Nov. 2 2021	0.33	5	0.33
Dicamba	Nov. 2 2021	0.20	120	0.20
Dichlofop-methyl	Nov. 2 2021	0.40	9	0.40
MCPA	Nov. 2 2021	.00012	.1	.00012
Picloram	Nov. 2 2021	1	190	1
2,4-dichlorophenol	Nov. 2 2021	0.15	900	0.15
2,4,6-trichlorophenol	Nov. 2 2021	.25	5	.25
2,3,4,6-trichlorophenol	Nov. 2 2021	0.20	5	0.20
Pentachlorophenol	Nov. 2 2021	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 period. A summary of the 2021 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
2021 Average Daily Flow	11 m ³ /day
2021 Maximum Daily Flow	20 m ³ /day
2021 Total Amount of Water Supplied	4085 m ³

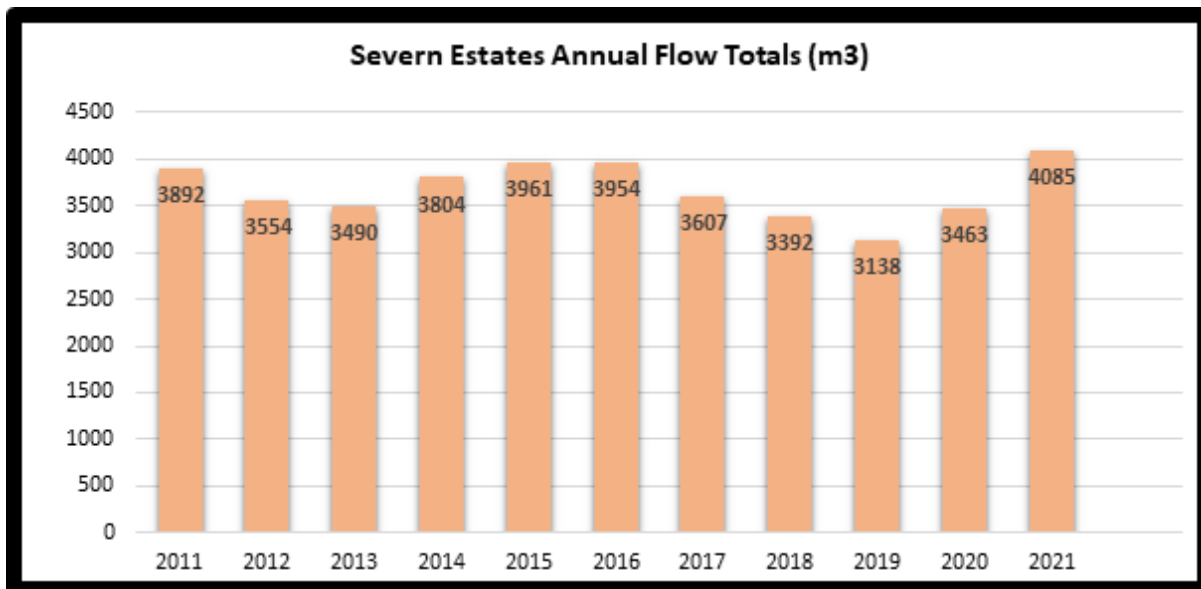
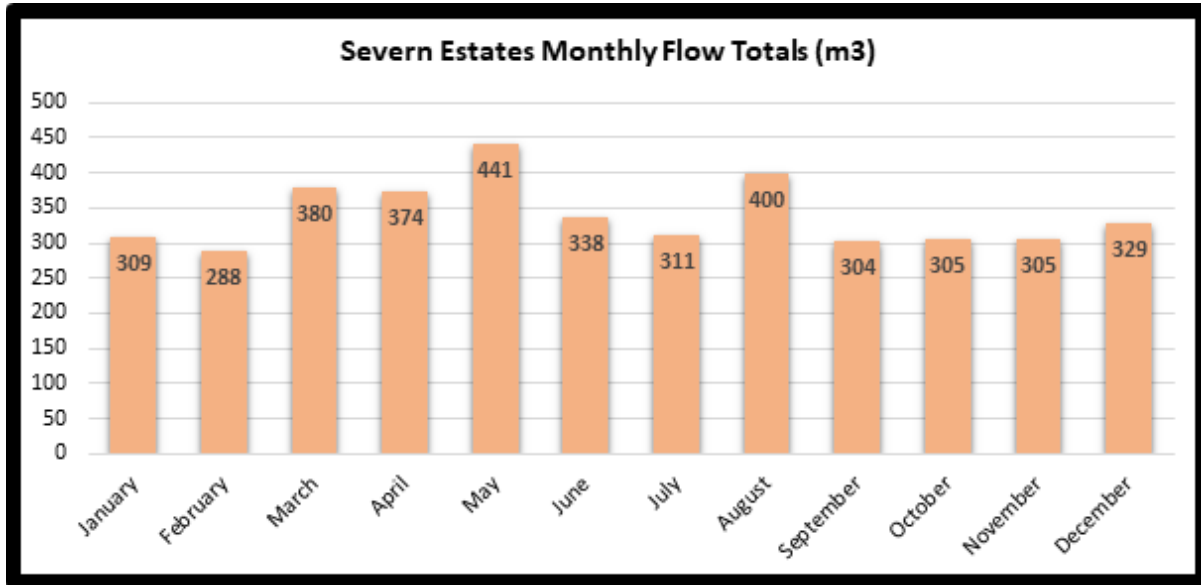
Summary of Raw Water Flows

Month	Monthly Total (m ³)
January	398
February	359
March	468
April	463
May	548
June	445
July	399
August	512
September	396
October	407
November	391
December	434
TOTAL	5220

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	309	10	6	14
February	288	10	7	13
March	380	12	7	15
April	374	12	7	16
May	441	14	7	20
June	338	11	9	14
July	311	10	7	13
August	400	13	8	20
September	304	10	6	13
October	305	10	6	12
November	305	10	7	13
December	329	11	7	14
Total	4085			

Flow Charts



Appendix A

Common Acronyms

Regulatory and Compliance

MECP	Ministry of Environment, Conservation and Parks (<i>formerly Ministry of the Environment</i>)
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/cm²	millijoule per square centimeter
psi	pounds per square inch
w/m²	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)