









SERPENT RIVER
DRINKING WATER SYSTEM
WATERWORKS # 260005919

ANNUAL & SUMMARY
REPORTS 2018

Introduction

This Annual and Summary Report has been prepared in accordance with both Schedule 22 and Section 11 of Ontario Regulation 170/03. In this manner, the requirements by regulation for each report have been consolidated into a single document. This Report is intended to brief the ownership and consumers of the Serpent River Drinking Water System on the system's performance over the past calendar year January 1 to December 31, 2018.

This report encompasses all elements as required by O. Reg. 170/03. Each section explains what is required for the category Small Municipal Residential DWS (as it pertains to the Serpent River DWS) and how limits were met or if shortfalls were revealed. The last section contains a list of tables and definition of terms identified in this report.

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System Description

The Serpent River water treatment plant is rated as a Class 1 Water Treatment subsystem, and categorized under O. Reg. 170/03 as a Small Municipal Residential system. The treatment plant draws water from the Serpent River. Historical records show that the plant was downstream from mining activity that is no longer in production. Previous treatment included ion exchange filters that have since been replaced with slow sand filters.

The plant uses a slow sand filtration process and chlorination to achieve the primary treatment requirements. Two slow sand filters have the capacity to operate at a combined rate of 243m³/day. Alkalinity is adjusted by directing the filtered water through crushed dolomite limestone. Water is disinfected using sodium hypochlorite in the clear well. The chlorine residual is measured at the end of the treatment process, at the high lift discharge at the end of the clear well.

Water enters the distribution system from the 124m³ clear well. Pressure is maintained by six (6) hydro pneumatic tanks, also located at the water treatment plant. The distribution system is a mix of materials, the new parts of the system use PVC piping. Blow-off valves are located throughout the distribution system for flushing purposes.

Chemicals

Chemicals utilized at the Serpent River Treatment plant during 2018 include:

- Sodium Hypochlorite for primary and secondary disinfection

2018 Expenditures

During the year of 2018, expenses were incurred to maintain treatment and distribution functions:

- Sample pumps for filter turbidity meters
- Thermal overloads (sample pumps)
- Submersible well pump for THM control (volatiles reduction)
- H&S equipment, inspections and supplies
- New chlorination panel equipped with two chemical metering pumps with auto switchover
- 12 month surveillance audit for DWQMS

2018 Drinking Water System Changes

Form 1 – Record of Watermains Authorized as a Future Alteration

Form 2 – Record of Minor Modification or Replacements

- Sample pumps
- Chemical metering pumps and switchover panel

Form 3 – Record of addition, modification or replacement of equipment discharging a contaminant of concern to the atmosphere

Water Quality

Microbiological Sampling and Testing

Sampling is conducted weekly for the DWS at the frequencies and locations identified by Schedule 11 of O. Reg. 170/03 for Small Municipal Residential Systems.

Table 1: Microbiological sampling requirements

Location	Sample Analysis	# samples	Frequency
Raw	EC / TC	1 sample	monthly
Treated	N/A	0	-
Distribution	EC / TC/ HPC-25%	1 sample	bi-weekly

Serpent River’s raw water samples are collected from the raw water header. Treated samples are collected from a sample tap from the treated discharge header prior to distribution. Distribution samples are collected from the furthest point in the distribution system at the Firehall. Other locations may be sampled as required.

Table 1a: Microbiological Sample Results

Type	# samples	EC (range)	TC (range)	# samples	HPC (range)
Raw	16	0 - 31	0 - 60	-	-
Distribution	44	0	0	44	0 - 1150

Distribution samples are collected more frequent (weekly) than required by regulation.

Operational Checks and Testing

Operational testing is completed as per Schedules 6 & 7 of O. Reg. 170/03 for Small Municipal Residential Systems. These checks and testing are completed on site at the water treatment facility by licensed operators. Continuous monitoring analyzers (collecting 5 minute readings) are utilized for measurement of filter turbidity and chlorine residuals.

Table 2: Monthly Filter Turbidity Results

Month	Filter A		Filter B		Monthly Filter Efficiency
	Avg (NTU)	Range (NTU)	Avg (NTU)	Range (NTU)	
January	0.223	0.013 - 0.554	0.089	0.069 - 0.349	100
February	0.134	0.071 - 0.384	0.089	0.075 - 0.162	100
March	0.105	0.077 - 0.421	0.098	0.080 - 0.278	100
April	0.148	0.020 - 0.420	0.136	0.081 - 0.641	100
May	0.096	0.010 - 0.297	0.149	0.103 - 0.305	100
June	0.067	0.055 - 0.424	0.094	0.071 - 0.160	100
July	0.068	0.010 - 0.900	0.122	0.085 - 0.382	100
August	0.058	0.042 - 0.750	0.095	0.017 - 0.704	100
September	0.061	0.030 - 0.645	0.069	0.016 - 0.802	99.9
October	0.076	0.010 - 0.304	Filter offline		100
November	0.109	0.067 - 0.194	Filter offline		100
December	0.113	0.064 - 0.435	Filter offline		100

Filter Efficiency is monitored by tracking the turbidity readings above and below 1.0 NTU during filter run time. Serpent River maintained filter compliance each month above 95%, the required limit for slow sand filtration to achieve necessary filtration credits for primary disinfection.

Table 3: Chlorine Residuals

Month	Average Chlorine Residual (mg/L)	Chlorine Residual Range (mg/L)
January	1.51	1.16 - 2.04
February	1.54	0.85 - 2.11
March	1.54	1.09 - 2.28
April	1.50	0.69 - 2.18
May	1.70	1.04 - 2.35
June	1.62	0.56 - 3.11
July	1.55	0.75 - 2.00
August	1.69	0.65 - 2.58
September	1.75	0.48 - 4.70
October	1.49	0.95 - 1.93
November	1.36	0.76 - 2.14
December	1.69	0.00 - 5.00*

Chlorine residuals are continuously monitored and data is recorded on 5 minute intervals.

*AWQI reported on Dec. 24th for chlorine analyzer malfunction

Chemical Sampling and Testing

Schedule 13 of O. Reg. 170/03 outlines chemical sampling regiments for Small Municipal Residential systems. Schedules 23 (inorganics) and 24 (organics) are collected every 60 months as well as sodium and fluoride. This system requires quarterly sampling for Nitrites/Nitrates and THM’s. Schedule 15.1 outlines the requirements for semi-annual lead testing (two periods per year).

Serpent River’s lead sampling follows the reduced sampling requirements every third year. The maximum acceptable concentration for lead in drinking water is 10µg/L. This applies to water at the point of consumption since lead is only present as a result of corrosion of lead solder, brass containing lead fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings. Sample results revealed zero exceedances during year 2016, sampling relief extends to 2019.

Table 4: Schedule 23 - Inorganics

Parameter	Sample Date	Result Value (µg/L)	Units	ODWS
Antimony	01-Apr-14	<0.6	µg/L	6
Arsenic	01-Apr-14	<1.0	µg/L	25
Barium	01-Apr-14	17.0	µg/L	1000
Boron	01-Apr-14	<50	µg/L	5000
Cadmium	01-Apr-14	<0.10	µg/L	5
Chromium	01-Apr-14	<1.0	µg/L	50
Fluoride	01-Apr-14	0.03	mg/L	1.5
Mercury	01-Apr-14	<0.10	µg/L	1
Selenium	01-Apr-14	<1.0	µg/L	10
Sodium	01-Apr-14	8.47	mg/L	20
Uranium	01-Apr-14	<2.0	µg/L	20

All results for inorganic parameters are within the maximum acceptable concentrations (MAC) of the Ontario Drinking Water Quality Standards as defined in O. Reg. 169/03.

Table 5: Nitrite/ Nitrate Results

Date	ODWS	28-Mar-18	7-Jun-18	12-Sep-18	23-11-18
Unit	mg/L	mg/L	mg/L	mg/L	mg/L
Nitrite	1.0	<0.010	<0.010	<0.010	<0.010
Nitrate	10	0.244	0.198	0.121	0.164

All quarterly results for Nitrites and Nitrates are well below ODWS.

Table 5a: THM/HAA Results

Date	ODWS	Q1	Q2	Q3	Q4	RAA
Unit	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
THM	100	62.3	80.5	43.9	73.5	65.1
HAA	80	146	144	64.7	159	128.4

ODWS established a MAC of 80 for HAAs effective January 1, 2020.

Table 6: Schedule 24 – Organics

Parameter	Date	Result	Unit	ODWS
Alachlor	01-Apr-14	<0.10	µg/L	5
Aldicarb	01-Apr-14	<1.0	µg/L	9
Aldrin + Dieldrin	01-Apr-14	<0.04	µg/L	0.7
Atrazine + N-dealkylated metabolites	01-Apr-14	<0.20	µg/L	5
Azinphos-methyl	01-Apr-14	<0.10	µg/L	20
Bendiocarb	01-Apr-14	<0.20	µg/L	40
Benzene	01-Apr-14	<0.50	µg/L	5
Benzo(a)pyrene	01-Apr-14	<0.010	µg/L	0.01
Bromoxynil	01-Apr-14	<0.20	µg/L	5
Carbaryl	01-Apr-14	<0.20	µg/L	90
Carbofuran	01-Apr-14	<0.20	µg/L	90
Carbon Tetrachloride	01-Apr-14	<0.50	µg/L	5
Chlordane (Total)	01-Apr-14	<0.30	µg/L	7
Chlorpyrifos	01-Apr-14	<0.10	µg/L	90
Cyanazine	01-Apr-14	<0.10	µg/L	10
Diazinon	01-Apr-14	<0.10	µg/L	20
Dicamba	01-Apr-14	<0.20	µg/L	120
1,2-Dichlorobenzene	01-Apr-14	<0.50	µg/L	200
1,4-Dichlorobenzene	01-Apr-14	<0.50	µg/L	5
Dichlorodiphenyltrichloroethane (DDT) + metabolites	01-Apr-14	<0.40	µg/L	30
1,2-Dichloroethane	01-Apr-14	<0.50	µg/L	5
1,1-Dichloroethylene (vinylidene chloride)	01-Apr-14	<0.50	µg/L	14
Dichloromethane	01-Apr-14	<5.0	µg/L	50
2,4-Dichlorophenol	01-Apr-14	<0.30	µg/L	900
2,4-Dichlorophenoxy acetic acid	01-Apr-14	<0.20	µg/L	100
Diclofop-methyl	01-Apr-14	<0.20	µg/L	9
Dimethoate	01-Apr-14	<0.10	µg/L	20
Dinoseb	01-Apr-14	<0.20	µg/L	10

Parameter	Date	Result	Unit	ODWS
Diquat	01-Apr-14	< 1.0	µg/L	70
Diuron	01-Apr-14	< 5.0	µg/L	150
Glyphosate	01-Apr-14	< 0.20	µg/L	280
Heptachlor + Heptachlor Epoxide	01-Apr-14	< 0.10	µg/L	3
Lindane (Total)	01-Apr-14	< 0.10	µg/L	4
Malathion	01-Apr-14	< 0.10	µg/L	190
Methoxychlor	01-Apr-14	< 0.10	µg/L	900
Metolachlor	01-Apr-14	< 0.10	µg/L	50
Metribuzin	01-Apr-14	< 0.50	µg/L	80
Monochlorobenzene	01-Apr-14	< 1.0	µg/L	80
Paraquat	01-Apr-14	< 0.10	µg/L	10
Parathion	01-Apr-14	< 0.50	µg/L	50
Pentachlorophenol	01-Apr-14	< 0.50	µg/L	60
Phorate	01-Apr-14	< 0.10	µg/L	2
Picloram	01-Apr-14	< 0.20	µg/L	190
Polychlorinated Byphenols (PCB)	01-Apr-14	< 0.035	µg/L	3
Prometryne	01-Apr-14	< 0.10	µg/L	1
Simazine	01-Apr-14	< 0.10	µg/L	10
Temephos	01-Apr-14	< 0.10	µg/L	280
Terbufos	01-Apr-14	< 0.20	µg/L	1
Tetrachloroethylene	01-Apr-14	< 0.50	µg/L	30
2,3,4,6-Tetrachlorophenol	01-Apr-14	< 0.50	µg/L	100
Triallate	01-Apr-14	< 0.10	µg/L	230
Trichloroethylene	01-Apr-14	< 0.50	µg/L	5
2,4,6-Trichlorophenol	01-Apr-14	< 0.50	µg/L	5
2,4,5-Trichlorophenoxy acetic acid	01-Apr-14	< 0.20	µg/L	280
Trifluralin	01-Apr-14	< 0.10	µg/L	45
Vinyl Chloride	01-Apr-14	<0.20	µg/L	2

All results for the required organic sampling of schedule 24 are below the MAC. Parameters exceeding half MAC are noted in Table 6a.

Table 6a: Organics - Sampling exceeding half MAC

Date of Sample	Parameter	Result Value
19-Mar-2018	THM	62.3
4-Jun-2018	THM	80.5
23-Nov-2018	THM	73.5

Lead Sampling: The maximum acceptable concentration for lead in drinking water is 10µg/L. This applies to water at the point of consumption since lead is only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings.

Table 7: Community Lead Sampling Results

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Number of Exceedances
Plumbing	n/a		
Distribution	n/a		

Lead samples are collected during the two prescribed periods each year (Dec 15 – Mar15 and June 15- Oct 15).

Sample results revealed zero exceedances during year 2016, thus relief on sampling is in effect until 2019.

Compliance

Adverse Water Quality Incidents

During 2018, the Serpent River DWS reported three incidents of adverse water quality.

Table 8: Adverse Water Quality Incidents

Date	Incident Reported
22-Sep-2018	Loss of data (due power outage)
25-Sep-2018	Filter Turbidity exceeding 1NTU
24-Dec-2018	Chlorine Analyzer malfunction

Annual Drinking Water System Inspection

The annual DWS inspection took place on September 26, 2018 by MECP Drinking Water inspector Parise Drolet. One non-conformance was identified. **The DWS received a final inspection rating of 95.5 %**

The following table identifies any non-compliance with requirement of the Act, the regulations, the system’s approval, drinking water works permit, municipal drinking water license and any orders applicable to the system that were not met at any time during the period covered by the report

Table 9: Non-compliances identified during Annual DWS Inspection

Non-compliance	All microbiological water quality monitoring requirements for distribution samples were not being met
Action	Sampling schedule reviewed and established
Corrective Actions	No further action required

Flows

The Permit to Take Water authorizes the municipality to draw water from the Serpent River at a rate not to exceed 243m³/d.

Municipal Drinking Water Licence: 282-101 specifies a maximum intake capacity of 366m³/d.

The max flow rate reported was 169.4m³/d, 46 % of the rated capacity.

The Serpent River WTP treated and distributed a total of 9016 m³ during the year of 2018. The average day treated flow demand was 25m³/d, and maximum day flow was 112m³/d on July 9, 2018.

Chart 1: 5 Year Flow Comparison

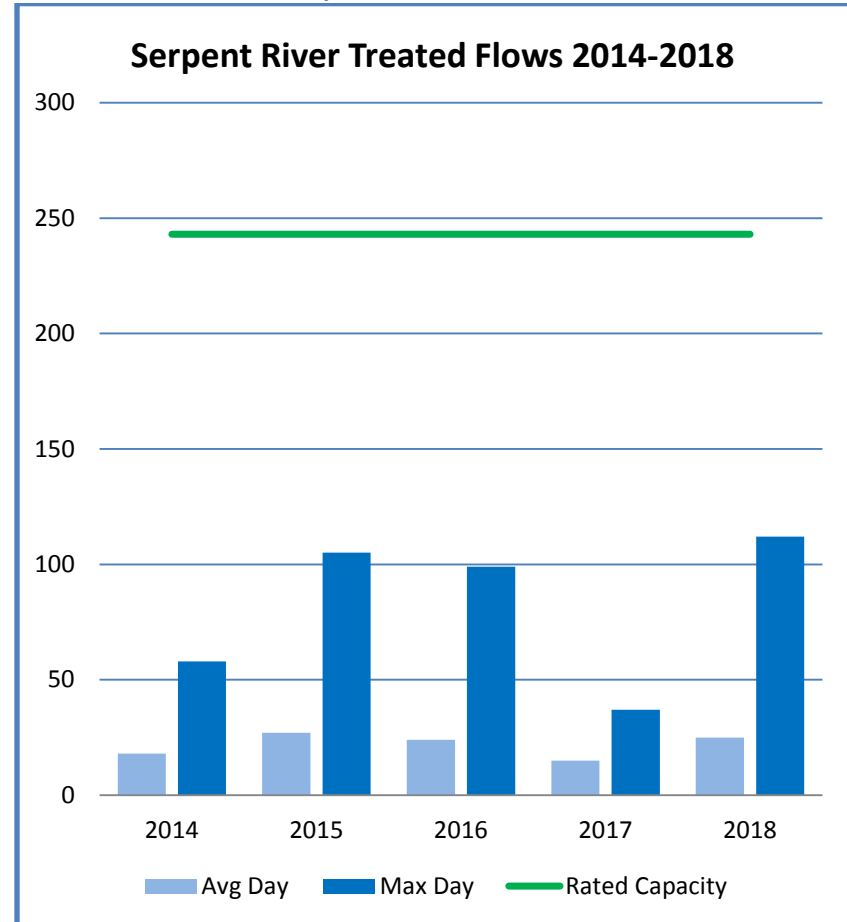
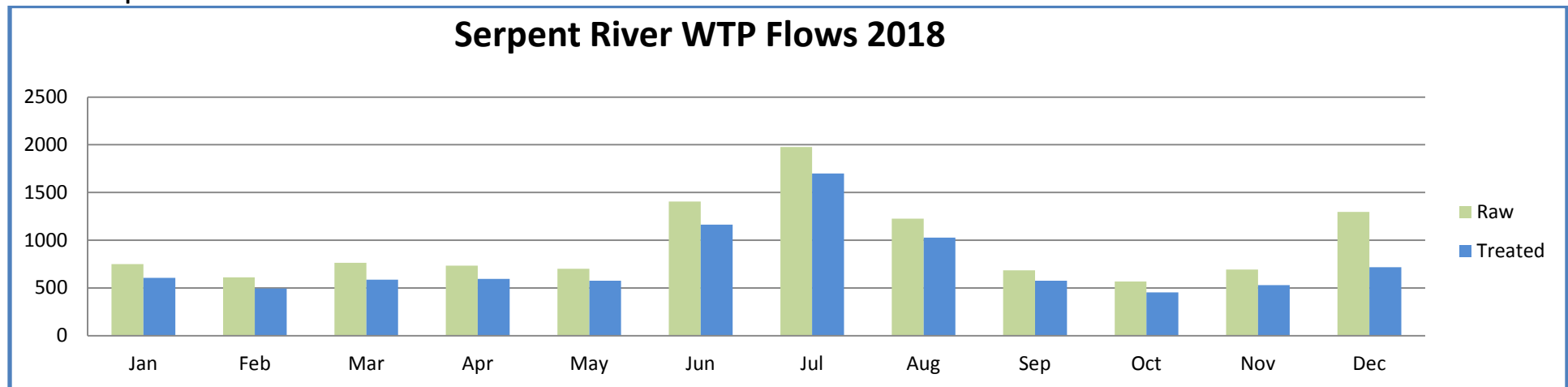


Table 10: Raw and Treated water Flows 2018

2018	Raw Water Flows					Treated Water Flows			
	Raw Water (m ³)	Minimum Day (m ³ /d)	Maximum Day (m ³ /d)	Average Day (m ³ /d)	% Max. Flow Day of PTTW	Treated Water (m ³)	Minimum Day (m ³ /d)	Maximum Day (m ³ /d)	Average Day (m ³ /d)
January	750.0	0.0	58.0	24.2	23.9	604.7	13.9	40.7	19.5
February	610.5	0.0	53.7	21.8	22.1	493.1	13.9	23.0	17.6
March	763.7	0.0	169.4	24.6	69.7	586.2	12.9	73.0	18.9
April	733.4	0.0	56.3	24.5	23.2	594.1	14.1	25.8	19.8
May	701.2	0.0	60.6	22.6	24.9	576.0	13.7	32.2	18.6
June	1,404.1	0.0	94.3	46.8	38.8	1,163.6	16.5	78.2	38.8
July	1,975.9	0.0	167.5	63.7	68.9	1,697.9	16.3	112.4	54.8
August	1,225.1	0.0	93.0	39.5	38.3	1,027.8	10.6	58.9	33.2
September	685.3	0.0	91.9	22.8	37.8	574.4	7.3	59.7	19.15
October	567.3	0.0	39.3	18.3	16.2	452.7	11.8	18.6	14.6
November	691.5	0.0	41.6	23.1	17.1	528.8	12.8	25.4	17.6
December	1,297.1	0.0	83.7	43.2	34.4	716.3	19.9	26.5	23.9

Chart 2: Serpent River WTP Flows 2018



Report Endorsement

Report Availability

Section 11 of O. Reg. 170/03 defines that this Annual Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public on the Township Office.

Township of the North Shore
1385 Hwy 17, P.O. Box 108,
Algoma Mills, ON
P0R 1A0

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of the municipal council. Section 19 (Standard of care, municipal drinking-water system) of Ontario’s Safe Drinking Water Act also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system.

Report Endorsement

This Summary report for The Serpent River Drinking Water System for the period of January 1st to December 31st 2018 has been prepared in accordance to Schedule 22 of O. Reg. 170/03. The report has been reviewed and accepted by the Township of North Shore council.

Date

Tables, Definition of Terms

Appendix A: List of Tables/ Charts

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Table 3:	Treated Chlorine Residuals
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Appendix B: Definition of Terms

Acronym	Definition
AWQI	Adverse water quality incident
DWS	Drinking water system
EC	E. Coli
HAA	Haloacetic acids
HPC	Heterotrophic plate count
MAC	Maximum Acceptable Concentration
m³	Cubic metres
m³/d	Cubic metres per day
mg/L	Milligram per litre (part per million)
ML	Megalitre (1000 m ³)
NTU	Nephelometric turbidity unit
ODWS	Ontario Drinking Water Standards
O. Reg. 170/03	Ontario Regulation 170/03
PTTW	Permit to take water
SCADA	Supervisory control and data acquisition
TC	Total coliforms
THM	Trihalomethane
µg/L	Microgram per litre (part per billion)
WTP	Water treatment plant