2020 Annual Performance & Summary Report Birr Drinking Water System

Date: January 5, 2020

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Introduction

The Municipality of Middlesex Centre is preparing a report summarizing system operation and water quality for every municipal drinking water system annually. The reports detail the latest water quality testing results, water quantity statistics and any adverse conditions that may have occurred for the previous year. They are available for review by the end of February on the Municipality of Middlesex Centre website at www.middlesexcentre.on.ca/services/residents/water or by contacting the Public Works & Engineering Department.

All efforts have been made to ensure the information presented in this report is accurate. If you have any questions or comments concerning the report please contact the Municipality of Middlesex Centre.

Table 1 – Plant Information

Drinking Water System	Birr Well Supply System
Drinking Water System Number	220005492
Drinking Water System Owner & Contact Information	Municipality of Middlesex Centre Small Municipal Residential System 10227 Ilderton Road, RR #2 Ilderton, Ontario N0M 2A0
Reporting Period	January 1, 2020 to December 31, 2020

Section A – System Description

The Birr Drinking Water System is owned by the Municipality of Middlesex Centre and operated by the Municipality of Middlesex Centre. The Birr Drinking Water System is a ground water supply system serving the Village of Birr that presently services 18 lots on Gwendolyn St with an estimated population of 53 residents. This system consists of one (1) drilled well, rated at 88m^3/day operating under the Permit to Take Water # 3415-A3JHTY. Raw well water is pumped from the well into a concrete reservoir. The water is disinfected using a sodium hypochlorite disinfection system, consisting of one storage tank and two chemical metering pumps (one duty and one standby) with a feed line discharging into the underground reservoir. Two submersible high lift pumps, then pump the water through a 150mm water main to the distribution system. The system operates under Municipal Drinking Water License Number 052-104 and Drinking Water Works Permit Number 052-204.

The system is maintained by licensed water system operators, who operate treatment and monitoring equipment and collect samples as specified by the Regulation. Alarms

automatically notify operators in the event of failure of critical operational requirements. The water treatment chemicals used on site is a 6% sodium hypochlorite solution.

Section B – Significant Modifications & Replacements

Modifications & Replacements	
No major upgraded were completed in 2020. There was one (1) Form 2 Record of Minor Modifications or Replacements to the Drinking Water System. The raw water pressure gauge piping from the upstream flange to the downstream ball valve was replaced.	$1,038

Section C – Microbiological Testing

(I) E. coli & Total Coliform

Bacteriological tests for E. coli and total coliforms are collected from the raw water at the facility and treated water from the distribution system. Raw water is collected monthly and the distribution water is collected on a bi-weekly schedule. Extra samples are taken after major repairs or maintenance work. Any E. coli or total coliform results above 0 in the treated distribution water must be reported to the Ministry of the Environment, Conservation and Parks (MECP) and Medical Officer of Health (MOH). Resamples and any other required actions are taken as quickly as possible. The results from the 2020 sampling program are shown on the table below. There were no adverse test results from 30 distribution water samples in this reporting period.

Table 2 – E. Coli & Total Coliform Samples

	Number of Samples	Range of E. coli Results Min – Max	Range of Total Coliform Results Min – Max
Raw	12	0	0
Distribution	27	0	0

(II) Heterotrophic Plate Count (HPC)

HPC analyses are required from the distribution water on a bi-weekly basis. HPC should be less than 500 colonies per 1 mL. Results over 500 colonies per 1 mL may indicate a change in water quality but it is not considered an indicator of unsafe water. The 2020 results are shown in the table below.

Table 3 – Heterotrophic Plate Count (HPC) Samples

Parameters	Number of Samples	Range of HPC Results Min-Max
Distribution	27	<10 - 10

Section D – Chemical Testing

The Safe Drinking Water Act requires periodic testing of the water for chemical parameters. The sampling frequency varies for different types and sizes of water systems. 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 be undertaken.

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

Table 4 – Quarterly Nitrate & Nitrite

Parameter & Sample Date	Result (mg/l)	MAC (mg/l)	Exceedance
Nitrate			
1st Quarter	0.017	10.0	No
2nd Quarter	0.014	10.0	No
3rd Quarter	0.014	10.0	No
4th Quarter	0.009	10.0	No
Nitrite			
1st Quarter	< 0.003	1.0	No
2nd Quarter	< 0.003	1.0	No
3rd Quarter	< 0.003	1.0	No
4th Quarter	< 0.003	1.0	No

Trihalomethanes (THM) and total Haloacetic Acids (HAA) are by-products of the disinfection process. The samples are required every 3 months from the distribution system.

Table 5 – Quarterly Trihalomethane & Haloacetic Acid

Parameter & Sample Date	Result (mg/l)	Annual Rolling Average (mg/l)	MAC (mg/l)	Exceedance
Trihalomethane				
1st Quarter	0.050	0.050	0.100	No

Parameter & Sample Date	Result (mg/l)	Annual Rolling Average (mg/l)	MAC (mg/l)	Exceedance
2nd Quarter	0.053	0.051	0.100	No
3rd Quarter	0.063	0.056	0.100	No
4th Quarter	0.066	0.058	0.100	No
Haloacetic Acid (HAA)				
1st Quarter	0.040	0.035	0.08	No
2nd Quarter	0.035	0.035	0.08	No
3rd Quarter	0.051	0.040	0.08	No
4th Quarter	0.049	0.044	0.08	No

The following Table summarizes the most recent test results for Sodium and Fluoride. Samples collect and test at least one (1) water sample every 60 months (5 years) and report upon the results.

Table 6 – Sodium & Fluoride

Parameter	Sample Date	Result Value (mg/L)	MAC (mg/L)
Sodium	January 2, 2017	39.2*	20
Sodium	January 9, 2017	43.1*	20
Fluoride	January 2, 2017	1.34**	1.5

**Sodium levels between 20 – 200 mg/L must be reported every 5 years. The next samples are scheduled for collection in 2022.*
***Natural levels of fluoride between 1.5 – 2.4 mg/L must be reported every 5 years. The next samples for collection in 2022.*

The following Table summarizes the most recent results for the Lead Testing Program. Lead samples are twice per year, in the winter sample period and the summer sample period as outlined below. Alkalinity and pH are monitored twice per year in the distribution system to ensure water quality is consistent and does not facilitate leaching of lead into the water.

Table 7 – Lead Sampling

Parameter	Result Value	MAC	Exceedance
Winter Sample (Dec. 15 – April 15)			
Lead (ug/l)	0.05	10	No
Distribution Alkalinity (mg/l)	201	*30 - 500	No
Distribution pH	6.91	-	No
Summer Sample (June 15 – Oct. 15)			
Lead (ug/l)	0.34	10	No
Distribution Alkalinity	199	*30 – 500	No
Distribution pH	7.28	-	No

**Distribution alkalinity is an aesthetic objective / Operational Guideline with a range between 30 mg/l to 500 mg/l*

The following Table summarizes the most recent test results for Schedules 23 and 24.Testing is required every 5 years for secure groundwater wells.

Table 8 – Schedule 23 & 24

Parameter	Sample Date	Treated Water Value (ug/l)	Exceedance
Antimony	01/02/2017	ND	No
Arsenic	01/02/2017	ND	No
Barium	01/02/2017	502	No
Barium	01/27/2017	489	No
Barium	10/02/2017	484	No
Boron	01/02/2017	201	No
Cadmium	01/02/2017	0.012	No
Chromium	01/02/2017	0.58	No
Mercury	01/02/2017	ND	No
Selenium	01/02/2017	ND	No
Uranium	01/02/2017	0.023	No
Alachlor	01/02/2017	ND	No
Atrazine + N-dealkylatedmetobolites	01/02/2017	ND	No
Atrazine	01/02/2017	ND	No

Parameter	Sample Date	Treated Water Value (ug/l)	Exceedance
Densethyl atrazine	01/02/2017	ND	No
Azinphos-methyl	01/02/2017	ND	No
Benzene	01/02/2017	ND	No
Benzo(a)pyrene	01/02/2017	ND	No
Bromoxynil	01/02/2017	ND	No
Carbaryl	01/02/2017	ND	No
Carbofuran	01/02/2017	ND	No
Carbon Tetrachloride	01/02/2017	ND	No
Chlorpyrifos	01/02/2017	ND	No
Chlorpyrifos	01/02/2017	ND	No
Diazinon	01/02/2017	ND	No
Dicamba	01/02/2017	ND	No
1,2-Dichlorobenzene	01/02/2017	ND	No
1,4-Dichlorobenzene	01/02/2017	ND	No
1,2-Dichloroethane	01/02/2017	ND	No
1,1-Dichloroethylene (vinylidene chloride)	01/02/2017	ND	No
Dichloromethane	01/02/2017	ND	No
2-4 Dichlorophenol	01/02/2017	ND	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	01/02/2017	ND	No
Diclofop-methyl	01/02/2017	ND	No
Dimethoate	01/02/2017	ND	No
Diquat	01/02/2017	ND	No
Diuron	01/02/2017	ND	No
Glyphosate	01/02/2017	ND	No
Malathion	01/02/2017	ND	No
2-methyl-4chlorophenoxyacetic acid (MCPA)	01/02/2017	ND	No
Metolachlor	01/02/2017	ND	No
Metribuzin	01/02/2017	ND	No
Monochlorobenzene	01/02/2017	ND	No
Paraquat	01/02/2017	ND	No
Pentachlorophenol	01/02/2017	ND	No
Phorate	01/02/2017	ND	No
Picloram	01/02/2017	ND	No
Polychlorinated Biphenyls(PCB)	01/02/2017	ND	No

Parameter	Sample Date	Treated Water Value (ug/l)	Exceedance
Prometryne	01/02/2017	ND	No
Simazine	01/02/2017	ND	No
Terbufos	01/02/2017	ND	No
Tetrachloroethylene	01/02/2017	ND	No
2,3,4,6-Tetrachlorophenol	01/02/2017	ND	No
Triallate	01/02/2017	ND	No
Trichloroethylene	01/02/2017	ND	No

ND = Non-Detect

Section E – Operational Monitoring

(I) Chlorine Residual

Free chlorine levels of the treated water are monitored continuously at the discharge point of the Water Treatment Facility. In the distribution system, free chlorine is checked twice weekly at various locations throughout the distribution system. 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 and corrective action taken. There were no reportable incidents in 2020. A summary of the chlorine residual readings is provided in the table below.

Table 9 – Chlorine Residuals

Parameter	Number of Tests or Monitoring Frequency	Range of Results (Min – Max)
Chlorine residual in distribution (mg/l)	104	0.51 – 1.74
Chlorine residual after treatment (mg/L)	Continuous	0.24 – 2.30

(II) Turbidity

Turbidity of treated water is continuously monitored at the treatment facility, as a change in turbidity can indicate an operational problem. The turbidity of untreated water from the wells is checked monthly. Turbidity is measured in nephelometric turbidity units (NTU). Under Regulation 170/03 turbidity in groundwater is not reportable however, turbidity should be < 1 NTU at the treatment plant and < 5 NTU in the distribution system. A summary of the monitoring results for 2020 is provided in the table below.

Table 10 – Turbidity

Parameter	Number of Tests or Monitoring Frequency	Range of Results (Min – Max)
Turbidity after treatment (NTU)	Continuous	0.06 – 1.42

Section F – Water Quantity

Continuous monitoring of flowrates 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 2020 flows are provided below.

Table 11 – Rated Capacity

Flow Summary	Rated Capacity
Permit to Take Water Limit	82 m^3/d
Municipal Drinking Water License Limit	88.4 m^3/d

Table 12 – Monthly Raw Water Flows (m^3/day)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Rated Flow	m^3	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
Raw Average	m^3/d	6.22	6.0	6.3	7.5	10.0	11.5	11.7	9.9	8.0	7.5	7.2	6.6	8.2
Raw Max	m^3/d	15.6	9.7	9.6	10.8	18.0	20.1	25.7	22.0	11.5	17.7	13.9	11.6	15.5

Graph 1 – Monthly Flows (m^3/day)

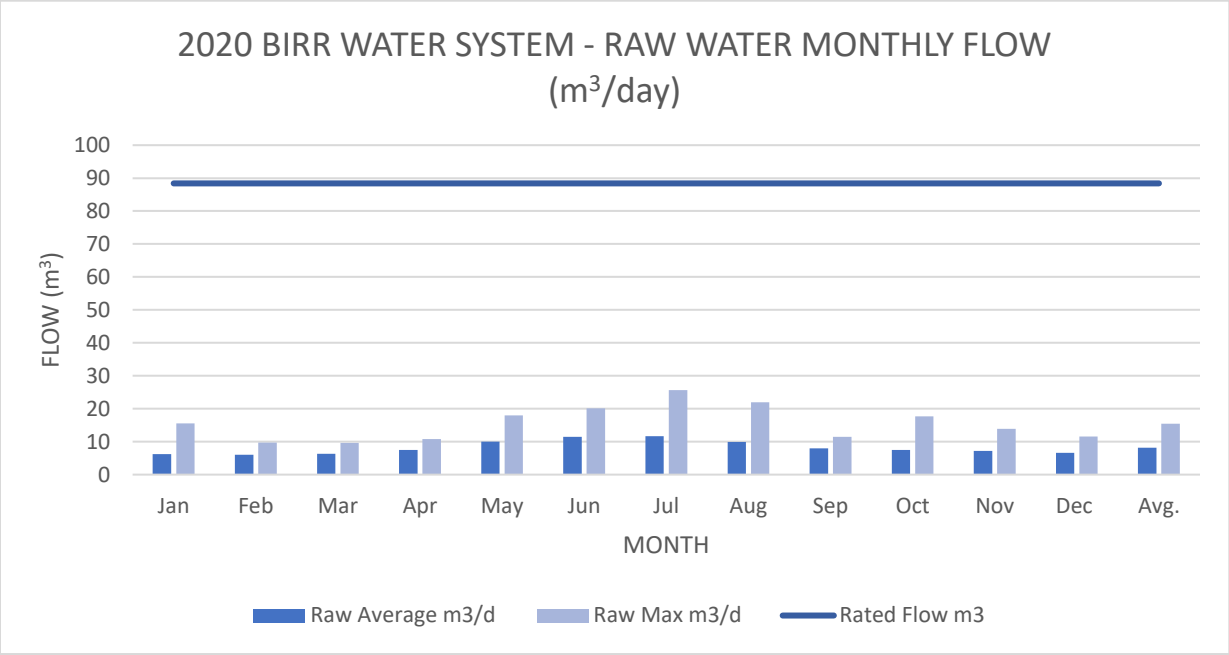
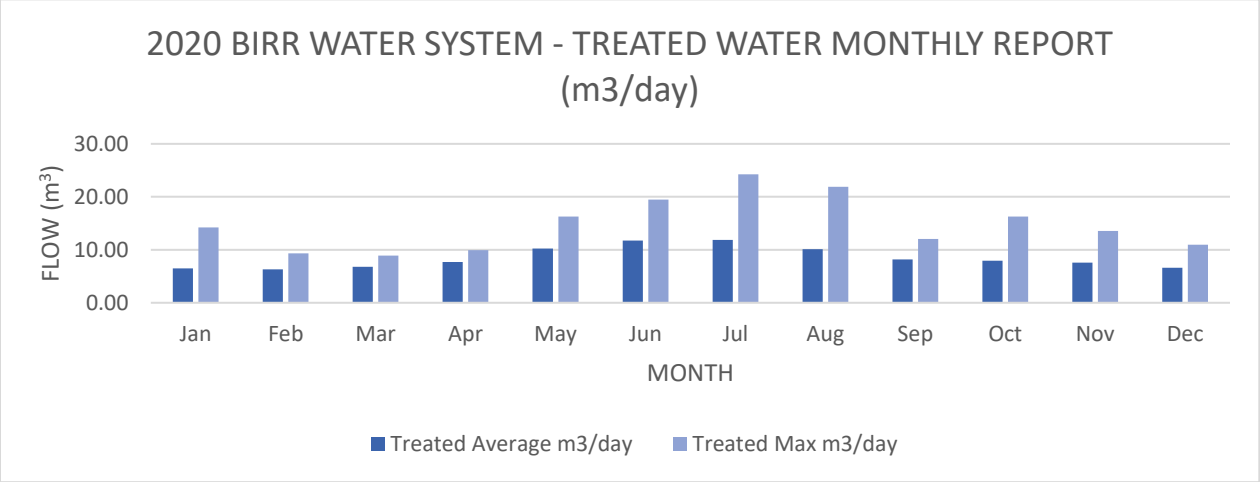


Table 13 – Treated Water Monthly Flow Summary

	Flow Summary
2020 Average Daily Treated Water Flow	8.5 m^3/d
2020 Maximum Daily Treated Water Flow	14.8 m^3/d
2020 Average Monthly Treated Water Flow	257.9 m^3
2020 Total Amount of Treated Water Supplied	3,095 m^3

Graph 2 – Monthly Treated Flows (m^3/day)



(I) Rated capacity assessment

The table below illustrates the water supplied to the distribution system and the capacity of the system.

System Capability Assessment Comparison of Treated Water Rates: Birr Well Supply System				
Month	Total Flow (m^3)	Monthly Raw Average Flow (m^3/day)	Max Raw Flow (m^3/day)	Max Flow / Rated Capacity (%)
January	192.7	6.2	14.2	16%
February	167.9	6.0	9.35	11%
March	195.5	6.3	8.92	10%
April	224.7	7.5	9.95	11%
May	309.8	10.0	16.3	18%
June	345.9	11.5	19.4	22%
July	363.2	11.7	24.2	27%
August	307.9	9.9	21.9	25%
September	239.4	8.0	12.0	14%
October	232.7	7.5	16.3	18%
November	216.7	7.2	13.5	15%
December	204.6	6.6	10.9	12%
Average Flow	**250.1**	**8.2**	**14.8**	**17%**
Maximum Flow	**363.2**	**11.7**	**24.2**	
Rated Capacity	**88.4 (m^3/day)**			

Section G – Non-Compliance Findings & Adverse Results

Non-compliance issues are typically identified by either the Operating Authority or the MECP Drinking Water Inspectors. All non-compliance issues are investigated, corrective actions taken and documented using the Municipalities Drinking Water Quality Management System (DWQMS) procedures.

(I) Non-Compliance Findings

The MECP conducted an announced routine inspection of the Birr Drinking Water System on August 12, 2020. The MECP inspector identified two (2) non-compliances with the regulatory requirements.

1. The secondary disinfectant residual was not measured as required for the distribution system. According to the documentation provided for review, the Operating Authority typically collects at least two samples per week for free chlorine residual testing. Generally stated, these samples are collected according to the requirements prescribed by Ontario Regulation 170/03 – Schedule 7-2 (5)

where one sample is collected on one day in a week and another sample is collected later in the same week, at least 48 hours from when the first sample was collected. It should be noted however, that during the week from June 30, 2019 to July 6, 2019, only one free chlorine residual reading was taken from the distribution system instead of the prescribed two samples as noted above. The Action(s) Required from herein, the Owner / Operating Authority shall ensure that free chlorine residual testing from the distribution system is completed as prescribed by the minimum requirements of Ontario Regulation 170/03 – Schedule 7-2 (5) where one sample is collected on one day in a week and another sample is collected later in the same week, at least 48 hours from when the first sample was collected. Compliance with this requirement will be assessed during the next inspection of the water system.

2. All microbiological water quality monitoring requirements for distribution samples prescribed by legislation were not being met. Ontario Regulation 170/03 – Schedule 11-2 stipulates that distribution water samples are required to be collected for testing every two weeks within the frequency prescribed by Ontario Regulation 170/03 – Schedule 6 1.1 (2). Testing of the samples collected from the distribution system must include E. coli, total coliforms and general bacteria population expressed as colony counts on a heterotrophic plate count. Over the course of the inspection period, distribution samples for microbiological testing were generally collected for testing every two weeks which meets with the requirements of Ontario Regulation 170/03 – Schedule 11-2. However, it should be noted that the distribution sample collected on December 30, 2019 did not include the general bacteria population expressed as colony counts on a heterotrophic plate count test (i.e. HPC test). Action(s) Required from herein, the Owner / Operating Authority shall ensure that microbiological samples collected from the distribution system include E. coli, total coliforms and, if section 1-5 of Schedule 1 or subsection 2-5 (1) of Schedule 2 applies to the system, general bacteria population expressed as colony counts on a heterotrophic plate count, as prescribed by Ontario Regulation 170/03 - Schedule 11-2. Compliance with this requirement shall be assessed during the next inspection of the water system.

(II) Summary or Reporting Test Results and Other Problems (Schedule 16)

There were no reportable Adverse Water Quality Indicator (AWQI) during the 2020 reporting period.