



2023 Annual Drinking Water System Summary Report

Embro Drinking Water System

1. GENERAL INFORMATION

Oxford County (the County) prepares a report summarizing system operation and water quality for every municipal drinking water system annually. The reports detail information required for Annual Reports and Summary Reports under Ontario Regulation (O. Reg.) 170/03 of the *Safe Drinking Water Act* including 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 County website at www.oxfordcounty.ca/drinkingwater or by contacting the Public Works 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 County at the address and phone number listed below or by email at water@oxfordcounty.ca.

Drinking Water System:	Embro Drinking Water System
Drinking Water System Number:	220000665
Reporting Period:	January 1, 2023 – December 31, 2023

Drinking Water System Owner & Contact Information:
Oxford County Public Works Department - Water Services
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1.1 System Description

The Embro Drinking Water System (DWS) is a large municipal residential water system as defined by O. Reg. 170/03 and serves a population of approximately 996. The system consists of two well sources which are secure groundwater wells. The water is treated by filtration to remove iron and sodium hypochlorite for disinfection.

In 2023, approximately 4,100 L of sodium hypochlorite was used in the water treatment process. The chemical is certified to meet standards set by the Standards Council of Canada or American National Standards Institute.

The treatment facility houses two MD-80 filters, pumps, treatment equipment and a 350 m³ reservoir. A standby generator is available to run the facility in the event of a power failure. The system is maintained by licensed water system operators, who operate treatment and monitoring equipment and collect samples as specified by O. Reg. 170/03. Alarms automatically notify operators in the event of failure of critical operational requirements. The Embro DWS does not supply drinking water to any other drinking water systems.

1.2 Major Expenses

Planning for major drinking water system expenses is included within Oxford County's Water Services Master Plan and managed according to our Asset Management and Capital Replacement Program.

The Embro Drinking Water System is one of 14 water systems that have revenues and expenses pooled for economy of scale purposes. The systems are combined into the Township Water financial system and in 2023 had an operating and maintenance expenditures of approximately \$4,100,000.

In addition to regular operational and maintenance expenditures, Capital Improvement Projects for the Townships systems totaled \$4,100,000 for improvements to water treatment systems and replacement of distribution mains in the Township System.

Township Capital Improvement Projects included:

- \$413,000 repair and maintenance on wells, water pump stations, and water treatment facilities;
- \$70,000 for facilities improvements; and
- \$50,000 distribution replacements.

Capital Improvement projects for all systems included:

- \$390,000 to develop Countywide SCADA Master Plan for all water systems;
- \$70,000 to develop Countywide Water Servicing Master Plan for all water systems; and
- \$38,000 to develop the County Development Charges Technical Study.

2. MICROBIOLOGICAL TESTING

2.1 E.coli and Total Coliform

Bacteriological tests for *E.coli* and *total coliforms* are required 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. Any *E.coli* or *total coliform* results above the Maximum Allowable Concentration (MAC) of 0 colonies per 100 mL in treated water samples must be reported to the Ministry of 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 annual sampling program are shown on the table below. There was one adverse test result from 211 treated water samples taken in 2023. The corrective action for which is summarized in section 6.2.

Source	Number of Samples	Range of <i>E. coli</i> Min - Max MAC = 0 (colonies / 100 mL)	Range of Total Coliform Min - Max MAC = 0 (colonies / 100 mL)
Raw	104	0	0 - 4
Treated	52	0	0
Distribution	159	0	0 - 16

2.2 Heterotrophic Plate Count (HPC)

HPC analyses are required from the treated and distribution water. The tests are required weekly for treated water and for 25% of the required distribution system bacteriological samples. 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. Annual results are shown in the following table.

Source	Number of Samples	Range of HPC Min - Max (colonies / mL)
Treated	52	0 - 5
Distribution	45	0 - 98

3. CHEMICAL TESTING

The *Safe Drinking Water Act* requires periodic testing of the water for approximately 60 different chemical parameters. The latest results for all parameters are provided in Appendix 'A'. 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 MAC under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by O. Reg. 170/03. Where concerns

regarding a parameter exist, the MECP can also require additional sampling be undertaken.

Information on the health effects and allowable limits of components in drinking water may be found on the MECP web page through the link provided in Appendix 'A'. Additional information on common chemical parameters specific to the Embro Drinking Water System is provided below.

3.1 Sodium

Sodium levels in drinking water are tested once every five years. The aesthetic objective is 200 mg/L meaning at levels less than this, sodium will not impair the taste of the water. The latest test results are provided in Appendix 'A'.

When sodium levels are above 20 mg/L the MECP and MOH are notified. Southwestern Public Health maintains an information page on sodium in drinking water at <https://www.swpublichealth.ca/en/partners-and-professionals/advisories-alerts-and-information.aspx#2024> in order to help people on sodium restricted diets control their sodium intake.

3.2 Hardness

This is an aesthetic parameter that may affect the appearance of the water but is not related to health. Well water commonly has high levels of hardness and other minerals from being in contact with underground rock formations. Many households have water softeners to help reduce white calcium deposits and improve the efficiency of soaps. This information is included here to help set the water softener at the level recommended by the manufacturer. Samples for hardness are collected at a minimum every three years from raw water. The Hardness for the Embro Drinking Water System was tested in 2022 and ranged from 521 - 574 mg/L (30 - 34 grains/gallon).

3.3 Additional Testing Required by MECP

Under O. Reg. 170/03, additional quarterly sampling is required when a parameter listed in Schedule 23 or 24 exceeds half of the MAC. Based on the latest test results no additional testing is required under O. Reg. 170/03.

No additional testing requirements are listed in the Municipal Drinking Water Licence.

4. OPERATIONAL MONITORING

4.1 Chlorine Residual

Free chlorine levels of the treated water are continuously monitored at the discharge point of the Water Treatment Facility and in 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.

A summary of the chlorine residual readings is provided in the table below. There were no reportable incidents in 2023.

4.2 Turbidity

Turbidity of treated water is continuously monitored at the treatment facility as a change in turbidity can indicate an operational problem. As a minimum, turbidity for each well is required to be tested monthly. Turbidity is measured in nephelometric turbidity units (NTU). Under O.Reg. 170/03 turbidity in groundwater from a secure well or a well with effective in-situ filtration is not reportable however turbidity should be < 1 NTU at the treatment plant and < 5 NTU in the distribution system. A summary of the annual monitoring results is provided in the following table.

<i>Parameter</i>	<i>Number of Tests or Monitoring Frequency</i>	<i>Range of Results (Min – Max) and Average</i>
Chlorine residual after treatment (mg/L)	Continuous	(1.04 – 2.10) 1.46
Chlorine residual in distribution (mg/L)	Continuous	(0.98 – 1.73) 1.32
Well 1A turbidity before treatment (NTU)	52	(0.11 – 1.37) 0.39
Well 3 turbidity before treatment (NTU)	52	(0.06 – 3.80) 0.98
Turbidity after treatment (NTU)	Continuous	(0.03 – 4) 0.08

5. WATER QUANTITY

Continuous monitoring of flow rates from supply wells into the treatment system and from the Water Treatment Facility into the distribution system is required by O.Reg. 170/03. The Permit to Take Water (PTTW) and Municipal Drinking Water License (MDWL) issued by the MECP regulate the amount of water that can be utilized over a given time period. Terms used to evaluate capacity and current values for the Embro DWS are provided in the following table.

<i>Capacity Term</i>	<i>Description</i>	<i>Capacity (m³/day)</i>
Supply Capacity	The limiting capacity of either the PTTW or MDWL.	916
Dynamic Supply Capacity	Accounts for any current constraints on the water supply (such as offline wells, reduced well capacity, water quality considerations).	916
Firm Capacity	Firm Capacity is defined as the removal of the highest producing well in an emergency or operational / maintenance situation with the ability to transport a maximum of 100 m ³ /day to maintain system integrity if appropriate.	916
Dynamic Firm Capacity	Considers the removal of the largest production well and other current system constraints. Trucked in water may be considered for some systems.	916

This system is comprised of two supply wells of equal capacity. The PTTW restricts the operation to only one well operating at a time. In this case, all capacity considerations for the system are the same and trucked water is not considered under firm capacity scenarios.

A summary comparing flows in 2023 to current capacities is provided in the table below and presented graphically in Appendix 'B'.

<i>Flow Summary</i>	<i>Supply Capacity (m³/day)</i>	<i>Dynamic Supply Capacity (m³/day)</i>	<i>Max Daily Flow (m³/day)</i>	<i>Average Daily Flow (m³/day)</i>	<i>Average Monthly Flow (m³/month)</i>	<i>Total Yearly Flow (m³/year)</i>
Embro Water Treatment Facility	916	916	467	254	7,714	92,564

6.1 Non-Compliance Findings

The annual MECP inspection took place in June 2023. There were no non-compliance findings and the 2023 Inspection Report Rating was 100%.

6.2 Adverse Results

Any adverse bacteriological or chemical results or observations of operational conditions that may indicate adverse water quality are reported as required and corrective actions are taken. There was one adverse water quality result in 2023.

- A bacteriological sample result taken from the distribution system on December 9, 2023 was found to have total coliforms of 16 CFU/100 mL. The result was reported to the MECP and MOH. Resamples were collected at the site and from an upstream and downstream location. All re-samples were determined to be acceptable by ODWS.

APPENDIX A: SUMMARY OF CHEMICAL RESULTS

UNDERSTANDING CHEMICAL TEST RESULTS

The following tables summarize the laboratory results of the chemical testing the County is required to complete. Different types of parameters are required to be tested for at different frequencies as noted below. Explanations on the health impacts of these parameters can be found in the MECP document PSIB 4449e01 titled “Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines” available at https://cvc.ca/wp-content/uploads/2011/03/std01_079707.pdf.

Results are shown as concentrations with 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. In the event that some samples results are ND, and other results are above the MDL, the value of the MDL will be used in place of the ND where an average result must be calculated. Where all collected samples are ND the average sample result will be assumed to be ND.

Nitrate and nitrite samples are required every three months in normal operation.

<i>Parameter</i>	<i>Number of Tests</i>	<i>Result Range Min – Max (mg/L)</i>	<i>Average Result (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Nitrite	4	ND – 0.016	ND	1.0	0.003
Nitrate	4	0.017 – 0.018	0.018	10.0	0.006

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

<i>Parameter</i>	<i>Annual Average</i>	<i>Result Value (µg/L)</i>	<i>MAC (µg/L)</i>	<i>MDL (µg/L)</i>
Trihalomethane (THM)	2023	20.3	100	0.37
Haloacetic Acids (HAA)	2023	8.1	80	5.3

The following table summarizes the most recent test results for sodium and fluoride. Testing and reporting any adverse results is required every five years.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Sodium	May 21, 2019	20.2	20*	0.01
Fluoride	August 16, 2021	1.26	1.5**	0.06

*Sodium levels between 20 – 200 mg/L must be reported every five years.

**Natural levels of fluoride between 1.5 – 2.4 mg/L must be reported every five years.

The following table summarizes the most recent results for the Lead Testing Program. Lead samples are taken every three years. Levels of 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.

<i>Parameter</i>	<i>Result Range (Min - Max)</i>	<i>Number of Samples</i>	<i>Acceptable Level</i>
Distribution Alkalinity 2023	205 – 209 mg/L	4	30 – 500 mg/L
Distribution pH 2023	7.07 – 7.70	4	6.5 – 8.5
Distribution Lead 2021	0.13 – 1.19 µg/L	4	10 µg/L MAC

The following table summarizes the most recent test results for Schedule 23 parameters. Testing is required every 3 years for secure groundwater wells in large systems.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (µg/L)</i>	<i>MAC (µg/L)</i>	<i>MDL (µg/L)</i>
Antimony	May 30, 2022	ND	6	0.6
Arsenic	May 30, 2022	ND	10	0.2
Barium	May 30, 2022	59.7	1000	0.02
Boron	May 30, 2022	87	5000	2
Cadmium	May 30, 2022	ND	5	0.003
Chromium	May 30, 2022	0.15	50	0.08
Mercury	May 30, 2022	ND	1	0.01
Selenium	May 30, 2022	ND	50	0.04
Uranium	May 30, 2022	0.031	20	0.002

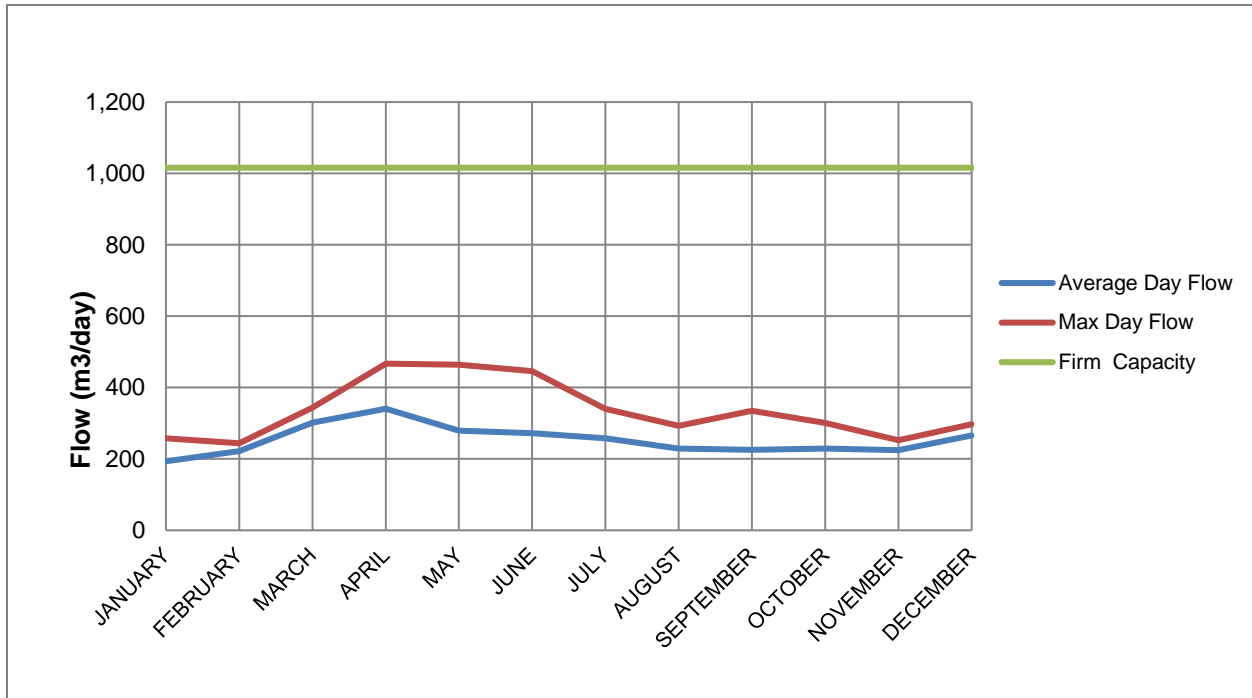
The following table summarizes the most recent test results for Schedule 24 parameters. Testing is required every three years for secure groundwater wells in large systems.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result (µg/L)</i>	<i>MAC (µg/L)</i>	<i>MDL (µg/L)</i>
Alachlor	June 7, 2021	ND	5	0.02
Atrazine + N-dealkylatedmetabolites	June 7, 2021	ND	5	0.01
Azinphos-methyl	June 7, 2021	ND	20	0.05
Benzene	June 7, 2021	ND	1	0.32
Benzo(a)pyrene	June 7, 2021	ND	0.01	0.004
Bromoxynil	June 7, 2021	ND	5	0.33
Carbaryl	June 7, 2021	ND	90	0.05
Carbofuran	June 7, 2021	ND	90	0.01
Carbon Tetrachloride	June 7, 2021	ND	2	0.17
Chlorpyrifos	June 7, 2021	ND	90	0.02
Diazinon	June 7, 2021	ND	20	0.02
Dicamba	June 7, 2021	ND	120	0.20
1,2-Dichlorobenzene	June 7, 2021	ND	200	0.41
1,4-Dichlorobenzene	June 7, 2021	ND	5	0.36
1,2-Dichloroethane	June 7, 2021	ND	5	0.35
1,1-Dichloroethylene (vinylidene chloride)	June 7, 2021	ND	14	0.33
Dichloromethane	June 7, 2021	ND	50	0.35
2-4 Dichlorophenol	June 7, 2021	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	June 7, 2021	ND	100	0.19

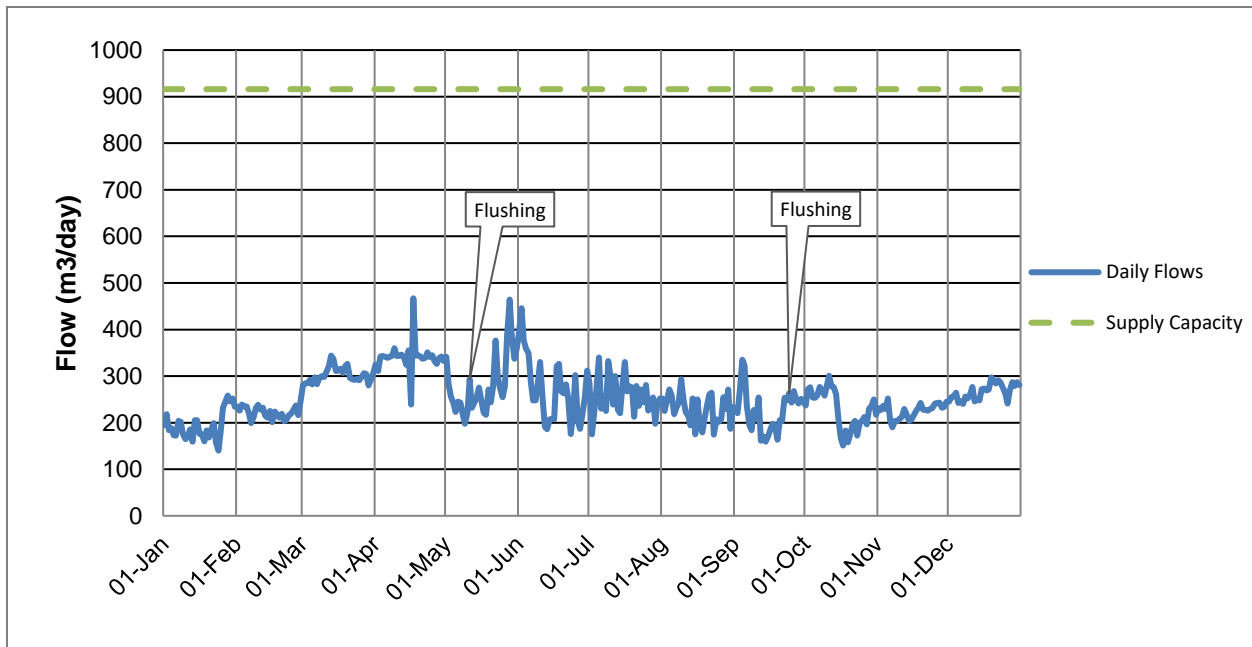
<i>Parameter</i>	<i>Sample Date</i>	<i>Result (µg/L)</i>	<i>MAC (µg/L)</i>	<i>MDL (µg/L)</i>
Diclofop-methyl	June 7, 2021	ND	9	0.40
Dimethoate	June 7, 2021	ND	20	0.06
Diquat	June 7, 2021	ND	70	1
Diuron	June 7, 2021	ND	150	0.03
Glyphosate	June 7, 2021	ND	280	1
Malathion	June 7, 2021	ND	190	0.02
2-methyl-4chlorophenoxyacetic acid (MCPA)	June 7, 2021	ND	100	0.12
Metolachlor	June 7, 2021	ND	50	0.01
Metribuzin	June 7, 2021	ND	80	0.02
Monochlorobenzene	June 7, 2021	ND	80	0.30
Paraquat	June 7, 2021	ND	10	1
Pentachlorophenol	June 7, 2021	ND	60	0.15
Phorate	June 7, 2021	ND	2	0.01
Picloram	June 7, 2021	ND	190	1
Polychlorinated Biphenyls(PCB)	June 7, 2021	ND	3	0.04
Prometryne	June 7, 2021	ND	1	0.03
Simazine	June 7, 2021	ND	10	0.01
Terbufos	June 7, 2021	ND	1	0.01
Tetrachloroethylene	June 7, 2021	ND	10	0.35
2,3,4,6-Tetrachlorophenol	June 7, 2021	ND	100	0.20
Triallate	June 7, 2021	ND	230	0.01
Trichloroethylene	June 7, 2021	ND	5	0.44
2,4,6-Trichlorophenol	June 7, 2021	ND	5	0.25
Trifluralin	June 7, 2021	ND	45	0.02
Vinyl Chloride	June 7, 2021	ND	1	0.17

APPENDIX 'B': WATER QUANTITY SUMMARY

2023 Average vs Maximum Daily Flow Rates



2023 Daily Flow



In 2023, the Embro Supply Capacity, Dynamic Supply Capacity, and Firm Capacity were the same.

2023 Total Production by Well

