Annual Report

Ear Falls Drinking Water System

2022

Prepared by **Northern Waterworks Inc.**
on behalf of the **Township of Ear Falls**

NORTHERN WATERWORKS INC.

The Township of Ear Falls

Contents

1 Introduction

1.1 Annual Reporting Requirements

This consolidated Annual Report (the Report) has been prepared in accordance with both section 11 (Annual Reports) and Schedule 22 (Summary Reports for Municipalities) of Ontario Regulation 170/03 (Drinking Water Systems Regulation). This Report is intended to inform both the public and Municipal Council about the operation of the system over the previous calendar year (January 1 to December 31, 2022).

Section 11 of O. Reg. 170/03 requires the development and distribution to the public of an annual report summarizing water quality monitoring results, adverse water quality incidents, system expenses and chemicals used in the water treatment process.

Schedule 22 of O. Reg. 170/03 requires the development and distribution to Council of an annual report summarizing incidents of regulatory non-compliance and associated corrective actions, in addition to providing flow monitoring results for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned demand.

1.2 Report Availability

In accordance with section 11 of O. Reg. 170/03, this 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 at the Ear Falls Municipal Office and on the Township's website.

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of Municipal Council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's *Safe Drinking Water Act* (SDWA) also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. The examination of this Report is one of the methods by which municipal officials may fulfil the obligations required by section 19 of the SDWA.

System users and members of Council should contact a representative of NWI for assistance in interpreting this Report. Questions and comments may be directed to the local NWI Operations Manager or by email to compliance@nwi.ca.

2 System Overview & Expenses

2.1 System Description

The Ear Falls Drinking Water System (DWS) must meet extensive treatment and testing requirements to ensure that human health is protected. The operation and maintenance of the system is governed by Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements within system-specific environmental approvals. Important system information is summarized in Table 1.

Table 1: System information

Drinking-Water System Name:	Ear Falls Drinking Water System
DWS Number:	210000256
DWS Category:	Large Municipal Residential
DWS Owner:	The Corporation of the Township of Ear Falls
DWS Operating Authority:	Northern Waterworks Inc.
DWS Components:	• Raw water pumping station • Ear Falls Water Treatment Plant • Ear Falls water distribution system and standpipe
Treatment Processes:	• Chemical coagulation, flocculation, and clarification • Dual media (rapid sand) filtration • Free chlorine disinfection • pH adjustment

Water production begins as pumps located at the raw water pumping station transfer source water from the English River and through a short transmission line to the two circular solids contact clarifiers at the Ear Falls Water Treatment Plant. Polyaluminum chloride (coagulant) is injected and rapidly mixed into the raw water before it enters the flocculating centre chamber of the respective solids contact clarifiers. To promote floc formation, water is gently mixed in the flocculating chamber and polymer (flocculant) is added to form larger and more stable floc aggregates. Process water then enters the clarifier proper, where its velocity is reduced to allow for the separation and settling of floc. Process water flows outward and upward through a maintained floc layer until supernatant overflows into effluent launders and is directed to two two-compartment dual media high-rate gravity filters (designated as filters 1 through 4). Settled floc (sludge) is automatically removed from the bottom of the clarifier units.

Impurities that were not captured and settled as floc in the clarifier are removed by passing water through dual media filters composed of anthracite and silica sand. Sodium hypochlorite (disinfectant) and sodium hydroxide (pH adjustment) are added to the filtrate as it is directed to the treated water storage reservoir. The filters are periodically cleaned by reversing the flow of water through the unit.

Primary disinfection is achieved as sodium hypochlorite mixes with the water in the reservoir. Treated water is then delivered to the water distribution system and standpipe using pumps located at the treatment facility. Secondary disinfection requirements in the distribution system are achieved by maintaining a free chlorine residual at all locations.

2.2 System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. This Report also summarizes those expenses related to strengthening equipment inventories and to maintenance activities undertaken by subcontracted service providers. Major expenses incurred in 2022 are summarized in Table 2.

Table 2: Major expenses incurred in 2022

Category	Description	Expense
Replace	Videographic Chart Recorder	$10,298
Upgrade	Automation Improvements (SCADA/PLC)	$23,125
Replace	Filter Effluent Flow Meter (10")	$24,045
Replace	Sodium Hypochlorite Control Panel	$2,542
Replace	Unit Heaters	$7,683
Maintenance	Hydrant Repairs	$13,148
Maintenance	Concrete stair repairs	$3,000
Replace	Anthracite	$3,108
Replace	Treated Water Chlorine Analyzer	$15,835
Maintenance	Electrical Deficiency Testing	$14,980
Inventory	Chemical metering parts and repair kits	$1,991
Maintenance	Annual Safety Inspections	$881
Replace	HACH SC200 Controller for 1720E Turbidimeters	$7,857

2.3 Water Treatment Chemicals

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of all water treatment chemicals used by the system during the period covered by the report (summarized in Table 3). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

Table 3: Water treatment chemicals used in 2022

Treatment Chemical	Application
polyaluminum chloride (SternPAC)	coagulant
polymer (Norfloc 122)	flocculant
sodium hypochlorite	disinfectant
sodium hydroxide (50%)	pH/alkalinity adjustment

3 Water Quality

3.1 Overview

Water quality monitoring is conducted to determine and confirm that drinking water delivered to the consumer is safe and aesthetically pleasing. Monitoring is also required to assess compliance with legislation and to control the treatment process. In accordance with section 11 of O. Reg. 170/03, this Report must summarize the results of water quality tests required by regulations, approvals and orders. The following sections summarize the results of all required water quality tests and compare the results to applicable water quality standards.

3.2 Microbiological Parameters

Microbiological sampling and testing requirements are provided in Schedule 10 (Microbiological sampling and testing) of O. Reg. 170/03. In 2022, a total of 219 routine source, treated and distribution water samples were collected for microbiological analysis by an accredited laboratory. Samples were collected on a weekly basis and included tests for E. coli (EC), total coliforms (TC) and heterotrophic plate counts (HPC). Results from microbiological analyses are summarized in Table 4. All results were below the associated Ontario Drinking Water Quality Standards.

Table 4: Results summary for microbiological parameters

Sample Type	# of Samples	EC Results Range[1] (MPN/100mL)	TC Results Range[1] (MPN/100mL)	# of HPC Samples	HPC Results Range (CFU/mL)
Raw Water	52	0 to 3	0 to 649	---	---
Treated Water	52	absent	absent	48	0 to 10
Distribution	115	absent	absent	106	0 to 30

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameter in a treated or distribution sample is considered an exceedance.

3.3 Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be monitored include raw water turbidity, filtrate turbidity and the free chlorine residuals associated with primary and secondary disinfection. Table 5 summarizes water quality results for regulated and selected unregulated operational parameters. In accordance with Schedule 6 (Operational checks, sampling and testing – general) of O. Reg. 170/03, certain operational parameters are continuously monitored. No Adverse Water Quality Incidents (AWQIs) pertaining to operational parameters occurred during the reporting period.

Table 5: Results summary for operational parameters

Parameter (Sample Type)	Number of Samples	Units	Min. Result	Max. Result	Annual Avg.	Adverse Result
Turbidity (Raw Water)	233	NTU	1.19	9.1	3.54	n/a
Turbidity (Filter 1)	Continuous	NTU	0.020	0.287	0.049	>1.0
Turbidity (Filter 2)	Continuous	NTU	0.018	0.370	0.048	>1.0
Turbidity (Filter 3)	Continuous	NTU	0.021	0.290	0.043	>1.0
Turbidity (Filter 4)	Continuous	NTU	0.024	0.300	0.043	>1.0
Turbidity (Treated)	364	NTU	0.06	0.30	0.12	n/a
pH (Treated)	Continuous	---	7.0	9.6	7.8	n/a
Total Alkalinity (Treated)	227	mg/L	27.4	50.0	37.7	n/a
Aluminum Residual (Treated)	237	mg/L	0.005	0.020	0.012	n/a
FCR[1] (Treated)[2]	Continuous	mg/L	1.18	3.10	2.04	n/a
FCR[1] (Distribution)[3]	493	mg/L	0.80	2.46	n/a	<0.05

1. FCR = free chlorine residual.
2. There is no adverse result corresponding to the treated water free chlorine residual. However, an observation of adverse water quality occurs if the residual is low enough such that water has not been disinfected in accordance with the system's *Municipal Drinking Water Licence*.
3. Free chlorine residuals are tested at various locations in the water distribution system. The free chlorine residual varies with water age and distribution system location, and the values in the table pertain to the minimum and maximum results collected across all locations in the calendar year.

3.4 Conventional Filtration Performance

In accordance with the system's *Municipal Drinking Water Licence*, conventional filtration facilities must meet certain performance criteria in order to claim removal credits for Cryptosporidium oocysts, Giardia cysts and viruses. In addition to continuously monitoring filtrate turbidity and other requirements, filtrate turbidity must be less than or equal to 0.3 NTU in at least 95% of the measurements each month. Table 6 summarizes filtrate turbidity compliance against the <0.3 NTU/95% performance criterion. Minimum and maximum values in the table correspond to the proportion of time that filtered water turbidity was less than or equal to 0.3 NTU in a calendar month in 2022. No AWQIs pertaining to conventional filtration performance occurred during the reporting period.

Table 6: Filtration performance summary

Filter	Minimum Result	Maximum Result	Adverse Result
Filter 1	100%	100%	<95%
Filter 2	100%	100%	<95%
Filter 3	100%	100%	<95%
Filter 4	100%	100%	<95%

3.5 Nitrate & Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Nitrate and nitrite results are provided in Table 7. All results were below the Ontario Drinking Water Quality Standards.

Table 7: Nitrate and nitrite results

Sample Date	Nitrate		Nitrite	
	Result (mg/L)	ODWQS (mg/L)	Result (mg/L)	ODWQS (mg/L)
14-Feb-2022	0.048	10	<0.010	1
16-May-2022	0.073		<0.010	
15-Aug-2022	0.043		<0.010	
14-Nov-2022	<0.020		<0.010	

3.6 Trihalomethanes & Haloacetic Acids

Trihalomethanes (THMs) and haloacetic acids (HAAs) are sampled on a quarterly basis from a distribution system location that is likely to have an elevated potential for their formation, in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Total THM and HAA results are provided in Table 8 and Table 9, respectively. Compliance with the provincial standards for trihalomethane and haloacetic acid concentrations is determined by calculating a running annual average (RAA). The 2022 running annual averages for THMs and HAAs were below the respective Ontario Drinking Water Quality Standards.

Table 8: Total THM results

Sample Date	Result (µg/L)
14-Feb-2022	60.1
16-May-2022	56.3
15-Aug-2022	106.0
14-Nov-2022	82.0
Regulatory Average (RAA)	76.1
ODWQS (RAA)	100

Table 9: Total HAA results

Sample Date	Result (µg/L)
14-Feb-2022	57.8
16-May-2022	61.3
15-Aug-2022	86.7
14-Nov-2022	88.0
Regulatory Average (RAA)	73.5
ODWQS (RAA)	80

3.7 Lead Sampling

In 2010, a *Corrosion Control Plan* was required to be developed for the Ear Falls Drinking Water System following unfavourable results associated with the community lead sampling program. Corrosion control measures for the system were formally implemented on September 17, 2018, following the rehabilitation of the sodium hydroxide chemical feed system. Sodium hydroxide is now used to maintain water pH at a level that will minimize the release of lead from plumbing. Calculated across all plumbing samples, corrosion control has resulted in a 51% reduction in the 90th percentile lead concentration. The ODWQS sampling point exceedance rate has also been significantly reduced from 15.6% to 3.2% (i.e., 15.6% of plumbing samples collected prior to corrosion control exceeded the standard for lead in drinking-water).

The Ear Falls DWS currently adheres to the lead monitoring program outlined in its *Municipal Drinking Water Licence*, which requires the collection of treated water samples on a quarterly basis and distribution and plumbing samples on an annual basis. Table 10 summarizes the results of community lead sampling conducted in 2022. All distribution and plumbing samples were collected on August 29, 2022. Treated water and distribution sampling results were below the Ontario Drinking Water Quality Standard for lead in drinking water; two (2) plumbing sample exceeded the standard for lead (10 µg/L).

Table 10: Lead sampling results summary

Sample Type	No. of Sampling Points	No. of Samples	Min. Result (µg/L)	Max. Result (µg/L)	ODWQS (µg/L)	No. of Sampling Point Exceedances	No. of Sample Exceedances
Treated	1	4	<1.0		10	0	0
Distribution	4	4	<1.0			0	0
Plumbing[1]	12	24	<1.0	10.8		2	2

1. In accordance with the sampling protocol outlined in Schedule 15.1 of O. Reg. 170/03, two samples are collected and analyzed for lead at each sampling point for plumbing samples.

3.8 Inorganic & Organic Parameters

Most inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 23 (Inorganic parameters) of O. Reg. 170/03. The inorganic parameters sodium and fluoride are sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in Table 11. All results were below the associated Ontario Drinking Water Quality Standards.

Table 11: Inorganic parameter sampling results

Parameter	Most Recent Sample Date	Units	Result	ODWQS
Antimony	15-Aug-2022	µg/L	<0.60	6
Arsenic	15-Aug-2022	µg/L	<1.0	10
Barium	15-Aug-2022	µg/L	<10	1000
Boron	15-Aug-2022	µg/L	<50	5000
Cadmium	15-Aug-2022	µg/L	<0.10	5
Chromium	15-Aug-2022	µg/L	<1.0	50
Fluoride	14-Feb-2022	mg/L	<0.020	1.5
Mercury	15-Aug-2022	µg/L	<0.10	1
Selenium	15-Aug-2022	µg/L	<1.0	50
Sodium	14-Feb-2022	mg/L	8.29	20
Uranium	15-Aug-2022	µg/L	<2.0	20

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 24 (Organic parameters) of O. Reg. 170/03. These parameters include various organic acids, pesticides, herbicides, PCBs, volatile organics and other chemicals. Sampling for all organic parameters was most recently conducted on August 15, 2022, and results are provided in Table 12. All results were below the associated Ontario Drinking Water Quality Standards.

Table 12: Organic parameter sampling results					
Parameter	Result (µg/L)	ODWQS (µg/L)	Parameter	Result (µg/L)	ODWQS (µg/L)
Alachlor	<0.10	5	Diuron	<1.0	150
Atrazine & Metabolites	<0.20	5	Glyphosate	<5.0	280
Azinphos-methyl	<0.10	20	Malathion	<0.10	190
Benzene	<0.50	1	MCPA	<0.20	100
Benzo(a)pyrene	<0.005	0.01	Metolachlor	<0.10	50
Bromoxynil	<0.20	5	Metribuzin	<0.10	80
Carbaryl	<0.20	90	Monochlorobenzene	<0.50	80
Carbofuran	<0.20	90	Paraquat	<1.0	10
Carbon Tetrachloride	<0.20	2	Pentachlorophenol	<0.50	60
Chlorpyrifos	<0.10	90	Phorate	<0.10	2
Diazinon	<0.10	20	Picloram	<0.20	190
Dicamba	<0.20	120	Total PCBs	<0.035	3
1,2-Dichlorobenzene	<0.50	200	Prometryne	<0.10	1
1,4-Dichlorobenzene	<0.50	5	Simazine	<0.10	10
1,2-Dichloroethane	<0.50	5	Terbufos	<0.20	1
1,1-Dichloroethylene	<0.50	14	Tetrachloroethylene	<0.50	10
Dichloromethane	<5.0	50	2,3,4,6-Tetrachlorophenol	<0.50	100
2,4-Dichlorophenol	<0.30	900	Triallate	<0.10	230
2,4-D	<0.20	100	Trichloroethylene	<0.50	5
Diclofop-methyl	<0.20	9	2,4,6-Trichlorophenol	<0.50	5
Dimethoate	<0.10	20	Trifluralin	<0.10	45
Diquat	<1.0	70	Vinyl Chloride	<0.20	1

4 Water Production

4.1 Overview

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must include certain information for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned uses. Specifically, this Report must include a summary of the quantities and flow rates of the water supplied during the reporting period, including monthly average and maximum daily flows. The Report must also include a comparison of flow monitoring results to the rated capacity and flow rates approved in the system's *Municipal Drinking Water Licence*.

4.2 Flow Monitoring Results

Throughout the reporting period the Ear Falls Drinking Water System operated within its rated capacity and supplied a total of 260,969 m^3 of treated water. On an average day in 2022, 715 m^3 of treated water was supplied to the community, which represents 16% of the rated capacity of the Ear Falls Water Treatment Plant (4,550 m^3/day). The maximum daily flow in 2022 was 1,931 m^3/day, which represents 42% of the rated capacity of the treatment facility. Flow monitoring results are summarized in Figure 1 and Table 13.

Figure 1: 2022 average and maximum daily treated water flows

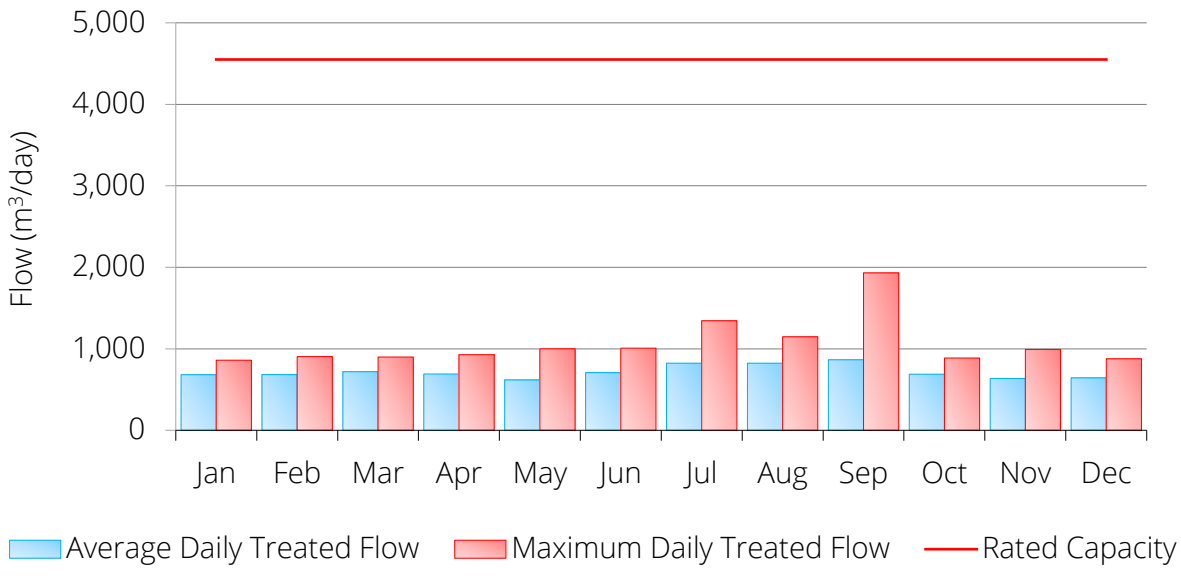

Table 13: 2022 water production summary

Month	Total Volumes (m^3)		Daily Flows (m^3/day)		Capacity Assessments[1]	
	Raw Water	Treated Water	Average - Treated Water	Maximum - Treated Water	Average - Treated Water	Maximum - Treated Water
Jan	22,386	21,137	682	860	15%	19%
Feb	20,188	19,130	683	904	15%	20%
Mar	23,861	22,275	719	899	16%	20%
Apr	21,867	20,721	691	927	15%	20%
May	20,180	19,153	618	1,000	14%	22%
Jun	22,334	21,211	707	1,008	16%	22%
Jul	26,336	25,526	823	1,344	18%	30%
Aug	26,716	25,523	823	1,147	18%	25%
Sep	27,246	25,950	865	1,931	19%	42%
Oct	22,517	21,335	688	887	15%	19%
Nov	20,361	19,082	636	992	14%	22%
Dec	21,295	19,926	643	877	14%	19%
Total	275,287	260,969	---	---	---	---
Average	22,941	21,747	715	---	16%	---

1. Capacity assessments compare the average and maximum daily treated water flows to the rated capacity of the treatment facility.

4.3 Recent Historical Flows

Table 14 summarizes recent historical flow monitoring results. There were significant reductions in the volumes of source water withdrawn and treated water supplied in 2021 and 2022 when compared to 2020, and the annual average daily 715 m^3/day) was a 9-year low. The reductions in flows are attributable to the completion of a distribution system leak detection survey in the second half of 2020.

Table 14: Recent historical water production summary

Year	Total Volumes (m^3)		Daily Flows (m^3/day)		Annual % Change	
	Raw Water	Treated Water	Average – Treated	Maximum – Treated	Raw Water	Treated Water
2014	400,171	373,727	1,024	2,088	---	---
2015	363,524	359,631	985	1,602	-9.2%	-3.8%
2016	361,276	353,791	967	1,498	-0.6%	-1.6%
2017	415,125	394,183	1,080	1,781	+14.9%	+11.4%
2018	463,410	454,171	1,244	1,992	+11.6%	+15.2%
2019	475,858	457,590	1,254	1,738	+2.7%	+0.8%
2020	487,069	449,988	1,229	2,081	+2.4%	-1.7%
2021	332,904	314,978	863	2,311	-31.7%	-30.0%
2022	275,287	260,969	715	1,931	-17.3%	-17.1%

5 Compliance

5.1 Overview

Northern Waterworks Inc. and the Township of Ear Falls employ an operational strategy that is committed to achieving the following goals:

- Providing a safe and reliable supply of drinking water to the community of Ear Falls;
- Meeting or exceeding all applicable legislative and regulatory requirements; and,
- Maintaining and continually improving the operation and maintenance of the system.

The following sections will summarize incidents of adverse water quality and regulatory noncompliance that occurred during the reporting period. NWI is committed to employing timely and effective corrective actions to prevent the recurrence of identified incidents of adverse water quality and noncompliance.

5.2 Adverse Water Quality Incidents

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this Report must summarize any reports made to the Ministry under subsection 18(1) (Duty to report adverse test results) of *the Act* or section 16-4 (Duty to report other observations) of Schedule 16 of O. Reg. 170/03. Additionally, this Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report. No adverse water quality incidents occurred during the reporting period.

5.3 Regulatory Compliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Report must list any requirements of the *Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report (i.e., an incident of regulatory noncompliance). Additionally, this Report must specify the duration of the failure and the measures that were taken to correct the failure.

The most recent inspection by Ontario's Ministry of the Environment, Conservation and Parks was initiated on May 17, 2022. The final inspection rating was 100% and there were no findings during this inspection.