

The Regional Municipality of Durham

Newcastle Drinking Water System 2023 Annual Report

Drinking Water System Number: 220004787

Municipal Drinking Water Licence Number: 003-109

Drinking Water System Owner: The Regional Municipality of Durham

Drinking Water System Category: Large Municipal Residential

This Annual Report for the calendar year 2023 is designed to inform you about your drinking water system. This report has been prepared to satisfy Section 11 of Ontario Regulation (O. Reg.) 170/03. O. Reg. 170/03 sets requirements for drinking water systems with regard to sampling and testing, levels of treatment, certification of staff, and notification of authorities and the public about water quality. Hard copies of this report and the Schedule 22 Summary Report are available at the Regional Municipality of Durham Headquarters office that is located at 605 Rossland Road East, Whitby. The annual report is also available on the [Region of Durham's website](http://www.durham.ca) at www.durham.ca. Further information regarding the Drinking Water Regulations can be found on the [Ministry of the Environment, Conservation and Parks website](http://www.ontario.ca/ministry-environment-conservation-parks) at www.ontario.ca/ministry-environment-conservation-parks.

Drinking Water System Process Description

General

Newcastle Drinking Water System provides potable water to consumers in the Communities of Newcastle and Newtonville in the Municipality of Clarington. Located in Newcastle, the water supply plant is a Class Two Water Treatment Plant with an approved capacity of 8,173 cubic metres per day (m³/d). Newcastle Water Treatment Plant feeds a Class One Distribution Subsystem and has a Class Two Trunk Distribution Subsystem as well as the private distribution system of Wilmot Creek. The treatment and distribution systems are owned and operated by the Regional Municipality of Durham.

The source water for the treatment process is drawn from Lake Ontario. The water supply system includes the following processes:

- Zebra mussel control (chlorine),
- Screening,
- Low lift pumping,
- Coagulation (polyaluminum chloride),
- Flocculation,
- Filtration,
- Residual Management,
- Ultraviolet (UV) disinfection,

- Disinfection (chlorine),
- High lift pumping, and
- Distribution System.

Raw Water Supply

Water is drawn from Lake Ontario through a 610 millimetre (mm) diameter intake pipe extending 1,070 metres (m) into the lake. The intake structure is located at a depth of approximately 10 m. The water is drawn into the raw water well by low lift pumps where screening takes place to remove large solids. Chlorine is also added at the raw water intake for zebra mussel control. The free chlorine residual and turbidity are continuously measured as the raw water enters the water supply plant.

Coagulation/Flocculation

The water flows through a travelling screen to remove large solids and continues towards the low lift pumps. Polyaluminum chloride (PAC) is added into a mechanical mixer upstream of the flocculation tanks. After rapid mixing, the water discharges into two flocculation tanks where flocculated particles are developed by slow mixing action.

Filtration

Particulate matter present in the raw water is captured by the coagulation filtration process and deposited on the top of the filters. The water supply plant has two filters to remove flocculated particles. Both filters are sand/anthracite dual media filters. Filter effluent turbidity and head loss are continuously monitored to indicate filter effectiveness. Filtered water passes through the filter under-drain into a clear well.

Residual Management

The backwash system consists of an air scour system and a two celled backwash wastewater holding tank that discharges the backwash water to the sanitary sewer.

Disinfection and High Lift Pumping

Disinfection is achieved by the addition of chlorine at multiple application points throughout the plant. In addition to chlorination, ultraviolet (UV) disinfection is applied to the filter effluent. Consistent disinfection is ensured by continuous online monitoring of the free chlorine residual and UV transmittance. The UV and chlorination systems will shut down the pumps when an alarm occurs. This process control ensures the water is properly disinfected. The high lift pumps deliver treated water to the distribution system.

Distribution System

The distribution system delivers the treated water through approximately 70.79 kilometres of watermains in two pressure zones, and includes an 1,817 cubic metre reservoir, a 900 cubic metre standpipe, and two booster stations. Additional chlorination is applied at the Newtonville Pumping Station.

Major Monetary expenses (above \$10,000)

Under Section 11 of O. Reg. 170/03, a description of any major expenses incurred during this reporting period to install, repair or replace required equipment must be included in the annual report. The details of major expenses for this drinking water system are as follows:

SCADA software, licensing, programming and server upgrades - \$80,927

Newcastle Water Supply Plant expansion and ultraviolet light disinfection upgrades - \$17,387,779

Tables

For a description of terms and abbreviations in all tables, refer to the glossary at the end of the report.

Newcastle Drinking Water System (DWS) Table 1

Summary of all Adverse Water Quality Incidents in 2022 Reported to Spills Action Centre in Accordance with Schedule 16-3 and 16-4 of O. Reg. 170/03.

No adverse water quality incidents occurred in 2022.

Incident Date	Parameter	Result	Corrective Action	Corrective Action Date
April 21, 2023	Lead (Pb)	0.270 mg/L	Replaced hydrant components, flushed, resampled. Results met ODWQS.	April 21, 2023

Newcastle DWS Table 2

Microbiological Membrane Filtration (MF) Testing Under Schedule 10 of O. Reg. 170/03.

Type of Sample	Number of Samples	Range of <i>Escherichia coli</i> MF Colony Forming Units per 100 Millilitres	Range of Total Coliforms MF Colony Forming Units per 100 Millilitres
Raw	199	Non-Detect (ND)-2	ND-560
Treated	4	ND	ND
Distribution	12	ND	ND

Newcastle DWS Table 3

Microbiological Presence Absence (P/A) Testing Under Schedule 10 of O. Reg. 170/03.

Type of Sample	Number of Samples	<i>Escherichia coli</i> P/A per 100 Millilitres	Total Coliforms P/A per 100 Millilitres
Treated	199	Absence (A)	A
Distribution	311	A	A

Newcastle DWS Table 4

Microbiological Heterotrophic Plate Count (HPC) Testing Under Schedule 10 of O. Reg. 170/03.

Type of Sample	Number of Samples	Range of HPC Samples Colony Forming Units per Millilitre
Treated	203	Non-Detect (ND) - 21
Distribution	165	ND - 210

Newcastle DWS Table 5

Operational Testing Under Schedule 7 of O. Reg. 170/03.

Test	Number of Samples	Range of Results	Unit of Measure	Parameter Description
Turbidity - Filter Effluent	Continuous	0.01 – 0.30	Nephelometric Turbidity Units (NTU)	Turbidity is a measure of particles in water.
Free Chlorine - Plant	Continuous	1.45 - 3.50*	Milligram per Litre (mg/L)	Must be sufficient to ensure disinfection has been achieved.
Free Chlorine - Distribution	Continuous	0.57 – 3.65*	mg/L	Recommended level of at least 0.20 mg/L in the distribution system to maintain secondary disinfection, 0.05 mg/L is the minimum required.

*Results include all analyzers and grab samples.

Newcastle DWS Table 6

Summary of Additional Testing and Sampling Carried Out in Accordance with the Requirement of an Approval, Order or Other Legal Instrument.

Type of Sample	Parameter	Date Sampled	Result	MAC	Unit of Measure
Raw Water	Gross Beta	January - December	0.088 - 0.136	Not Applicable (N/A)	Becquerels per Litre (Bq/L)
Raw Water	Tritium	January - December	0.9 – 19.2	7,000*	Bq/L
Raw Water	Microcystin (Total)	June - October	Non-detect (ND)	1.5	Microgram per Litre (ug/L)
Treated Water	Microcystin (Total)	June - October	ND	1.5	ug/L

*Tritium does not have a Maximum Acceptable Concentration (MAC) for raw water. Treated water MAC of 7,000 Bq/L is provided as a guideline for interpretation of results only.

Newcastle DWS Table 7

Summary of Treated Water Chemical Parameter Testing Under Schedules 13 and 23 of O. Reg. 170/03.

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources*
Antimony	14	Non-Detect (ND) – 0.0006	0.006	Milligram per Litre (mg/L)	No	Fire retardants, ceramics, electronics, solder.
Arsenic	14	ND - 0.0006	0.01	mg/L	No	Mining.
Barium	2	0.0177 - 0.023	1.0	mg/L	No	Metal refineries, oil drilling.
Boron	2	0.0555 - 0.023	5.0	mg/L	No	Industrial.
Cadmium	14	ND	0.005	mg/L	No	Industrial.
Chromium	14	ND – 0.0009	0.05	mg/L	No	Industrial.
Total Haloacetic acids - Distribution (annual average)	12	37.9	80	Microgram per Litre (ug/L)	No	By-product of chlorination of drinking water.
Mercury	2	ND	0.001	mg/L	No	Industrial.

Newcastle DWS Table 7 Continued

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources*
Selenium	14	ND	0.05	mg/L	No	Refineries, mines, chemical manufacturing.
Sodium	12	13.9 – 26.7	Not Applicable* *	mg/L	No	Storm water runoff including road salt.
Total Trihalomethanes - Distribution (annual average)	12	64.9	100	ug/L	No	By-product of chlorination of drinking water.
Uranium	2	ND – 0.0002	0.02	mg/L	No	Power generation.
Fluoride	12	0.08 - 0.1	1.5	mg/L	No	Mining.
Nitrite	12	ND	1.0	mg/L	No	Agriculture runoff, landfill leachate and animal waste.
Nitrate	12	ND – 0.59	10.0	mg/L	No	Fertilizer.

* Parameters may occur naturally in the environment.

** Sodium does not have a Maximum Acceptable Concentration (MAC); only an aesthetic objective of 200 mg/L. Sodium results exceeding 20 mg/L are to be reported to the Medical Officer of Health as per Schedule 16-3 (8) of O. Reg. 170/03 if it has not been reported in the preceding 57 months.

Newcastle DWS Table 8

Summary of Lead Testing Under Schedule 15.1 of O. Reg. 170/03.

No lead samples from plumbing were required in 2022.

Location Type	Number of Samples	Range of Lead Results Milligram per Litre	MAC	Number of Exceedances	pH	Alkalinity Milligram per Litre
Plumbing	Not Required (N/R)	N/R	0.01	N/R	N/R	N/R
Distribution	8	Non-Detect (ND) – 0.270	0.01	1	7.7 – 7.9	89.4 – 98.5

Newcastle DWS Table 9

Summary of Treated Water Organic Parameter Testing Under Schedule 24 of O. Reg. 170/03.

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources
Alachlor	2	Non-Detect (ND)	5	Microgram per Litre (ug/L)	No	Agricultural herbicide.
Atrazine + N-dealkylated metabolites	2	ND	5	ug/L	No	Agricultural herbicide.
Azinphos-methyl	2	ND	20	ug/L	No	Insecticide.
Benzene	2	ND	1	ug/L	No	Plastics manufacturing, leaking fuel tanks.
Benzo(a)pyrene	2	ND	0.01	ug/L	No	Formed from the incomplete burning of organic matter.
Bromoxynil	2	ND	5	ug/L	No	Agricultural herbicide.
Carbaryl	3*	ND	90	ug/L	No	Agricultural, forestry, household insecticide.

Newcastle DWS Table 9 continued

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources
Carbofuran	2	Non-Detect (ND)	90	ug/L	No	Agricultural insecticide.
Carbon Tetrachloride	2	ND	2	ug/L	No	Chemical and industrial activities.
Chlorpyrifos	2	ND	90	ug/L	No	Agricultural, household insecticide.
Diazinon	2	ND	20	ug/L	No	Agricultural, livestock, operation, residential insecticide.
Dicamba	2	ND	120	ug/L	No	Agricultural herbicide
1,2-Dichlorobenzene	2	ND	200	Microgram per Litre (ug/L)	No	Chemical and industrial factories.
1,4-Dichlorobenzene	2	ND	5	ug/L	No	Chemical and industrial factories.
1,2-Dichloroethane	2	ND	5	ug/L	No	Industrial chemical factories.
1,1-Dichloroethylene (vinylidene chloride)	2	ND	14	ug/L	No	Industrial chemical factories.
Dichloromethane	2	ND	50	ug/L	No	Pharmaceutical and chemical factories.
2,4-Dichlorophenol	2	ND	900	ug/L	No	Industrial contamination, reaction with chlorine.
2,4-Dichlorophenoxy acetic acid (2,4-D)	2	ND	100	ug/L	No	Agricultural, residential herbicide.
Diclofop-methyl	2	ND	9	ug/L	No	Agricultural herbicide.

Newcastle DWS Table 9 continued

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources
Dimethoate	2	Non-Detect (ND)	20	ug/L	No	Agricultural, livestock, operation, residential insecticide.
Diquat	2	ND	70	ug/L	No	Agricultural, aquatic herbicide.
Diuron	2	ND	150	ug/L	No	Agricultural, industrial herbicide.
Glyphosate	2	ND	280	ug/L	No	Agricultural, forestry, household herbicide.
Malathion	2	ND	190	ug/L	No	Pest control insecticide.
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	2	ND	100	Microgram per Litre (ug/L)	No	Agricultural herbicide.
Metolachlor	2	ND	50	ug/L	No	Agricultural herbicide.
Metribuzin	2	ND	80	ug/L	No	Agricultural herbicide.
Monochlorobenzene	2	ND	80	ug/L	No	Industrial and agricultural chemical factories and dry cleaning facilities.
Paraquat	2	ND	10	ug/L	No	Agricultural, aquatic herbicide.
Pentachlorophenol	2	ND	60	ug/L	No	Pesticide, wood preservative residue.
Phorate	2	ND	2	ug/L	No	Agricultural insecticide.

Newcastle DWS Table 9 continued

Parameter	Number of Samples	Results Range	MAC	Unit of Measure	MAC Exceedance	Potential Sources
Picloram	2	Non-Detect (ND)	190	ug/L	No	Industrial herbicide.
Polychlorinated Biphenyls(PCB)	2	ND	3	ug/L	No	Residue from various industrial uses.
Prometryne	2	ND	1	ug/L	No	Agricultural herbicide.
Simazine	2	ND	10	ug/L	No	Agricultural herbicide.
Terbufos	2	ND	1	ug/L	No	Agricultural insecticide.
Tetrachloroethylene (perchloroethylene)	2	ND	10	Microgram per Litre (ug/L)	No	Leaching from PVC pipes; discharge from factories; dry cleaners and auto shops (metal degreaser).
2,3,4,6 - Tetrachlorophenol	2	ND	100	ug/L	No	Wood preservative.
Triallate	2	ND	230	ug/L	No	Agricultural herbicide.
Trichloroethylene	2	ND	5	Microgram per Litre (ug/L)	No	Metal degreasing sites and other factories.
2,4,6-Trichlorophenol	2	ND	5	ug/L	No	Pesticide manufacturing.
Trifluralin	2	ND	45	ug/L	No	Agricultural herbicide.
Vinyl Chloride	2	ND	1	ug/L	No	Leaching from PVC pipes; discharge from plastics factories.

Newcastle DWS Table 10

Inorganic or Organic Parameter(s) that Exceed Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards.

Parameter	Result	MAC	Unit of Measure	Date of Sample
Trihalomethane - Distribution (annual average)	64.9	100	Microgram per Litre (ug/L)	Annual average
Lead	0.270	0.010	mg/L	April 21, 2023