Annual Report

Madsen Drinking Water System

2025

Prepared by **Northern Waterworks Inc.**
on behalf of the **Municipality of Red Lake**

NORTHERN WATERWORKS INC.

RED LAKE
Opportunity...it's our Nature

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, 2025).

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 Red Lake Municipal Office and on the Municipality'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 Madsen Drinking Water System 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:	Madsen Drinking Water System
DWS Number:	210001479
DWS Category:	Small Municipal Residential
DWS Owner:	The Corporation of the Municipality of Red Lake
DWS Operating Authority:	Northern Waterworks Inc.
DWS Components:	• Raw water pumping station • Madsen Water Treatment Plant • Madsen water distribution system
Treatment Processes:	• Pre-oxidation • Chemical coagulation, flocculation and clarification • Dual media (rapid sand) filtration • Free chlorine disinfection • pH adjustment

Water production begins as pumps at the raw water pumping station transfer raw water from its source at Russett Lake to a storage reservoir located at the Madsen Water Treatment Plant. Upon transfer, potassium permanganate is added to the raw water to oxidize iron and manganese for precipitation and removal in downstream treatment processes. Pumps at the treatment facility then deliver the raw water from the storage reservoir directly to the package treatment units. Polyaluminum chloride (coagulant) is injected and rapidly mixed into the raw water immediately upstream from the two package treatment units, which each include a three-chambered flocculation basin, clarifier and filter.

To promote floc formation water is gently mixed as it passes through the flocculation basins. Polymer solution (flocculant) is also added to the water at this stage of treatment to form

larger and more stable floc aggregates. Process water then enters the clarifier where its velocity is reduced to allow for the separation and settling of floc. Supernatant overflows into the clarifier effluent launders and is directed to the filter unit; settled floc (sludge) is automatically removed from the bottom of the clarifier.

Impurities that were not captured and settled as floc in the clarifier are removed by passing water through a dual media filter composed of anthracite and silica sand on a layer of support gravel. Sodium hypochlorite (disinfectant) and sodium carbonate solution (pH/alkalinity adjustment) are added to the filtrate as it is directed from the filters to the treated water storage reservoir. The filters are periodically cleaned by using an air scour to agitate the entire media bed and reversing the flow of water through the filter using pumps.

Primary disinfection is achieved as disinfectant mixes with the water in the reservoir. Treated water is then delivered from the reservoir to the water distribution system using pumps. Secondary disinfection requirements in the distribution system are achieved by maintaining a free chlorine residual at all locations.

2.2 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 2). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

Table 2: Water treatment chemicals used in 2025

Treatment Chemical	Application
potassium permanganate	oxidizing agent
polyaluminum chloride	coagulant
polymer (Polyfloc CP1160P)	flocculant
sodium hypochlorite	disinfectant
sodium carbonate (soda ash)	pH/alkalinity adjustment

2.3 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 2025 are summarized in Table 3.

Table 3: Major expenses incurred in 2025

Category	Description	Expense
Maintenance	Generator repairs and servicing	$1,729
Maintenance	Flow meter calibration verifications	$2,000
Maintenance	Back flow verification	$500
Maintenance	Fire extinguisher testing	$273
Maintenance	Trans Canada Safety gas detector	$319
Maintenance	Digital Engineering restored communications between low lift pumphouse and plant	$6355

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 11 (Microbiological sampling and testing) of O. Reg. 170/03. In 2025, a total of 156 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.

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	53	0 to 2	1 to 579	---	---
Treated Water	53	absent	absent	53	0 to 5
Distribution	53	absent	absent	53	0 to 7
Distribution (nonroutine)	0	---	---	---	---

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 constitutes 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.

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)	68	NTU	0.38	1.68	0.84	n/a
Turbidity (Filter 1)	Continuous	NTU	0.030	0.390	0.098	>1.0
Turbidity (Filter 2)	Continuous	NTU	0.019	0.804	0.113	>1.0
Turbidity (Treated)	365	NTU	0.02	0.48	0.17	n/a
pH (Treated)	365	---	7.0	9.2	7.8	n/a
Alkalinity (Treated)	232	mg/L	55.3	84.5	55.3	n/a
Alum Residual (Treated)	234	mg/L	0.015	0.021	0.017	n/a
FCR[1] (Treated)[2]	Continuous	mg/L	1.10	3.08	1.81	n/a
FCR[1] (Distribution)[3]	365+	mg/L	1.10	3.08	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 distribution system. The free chlorine residual varies with water age and distribution system location, and 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 must meet certain performance criteria in order to claim removal credits for Cryptosporidium oocysts and Giardia cysts. 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 2023. One AWQIs pertaining to conventional filtration performance occurred during the reporting period due to a loss of continuous monitoring of filter effluent. Refer to section 5.2 Adverse Water Quality Incidents for more information.

Table 6: Filtration performance summary

Filter	Minimum Result	Maximum Result	Adverse Result
Filter 1	100%	100%	<95%
Filter 2	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)
18-Feb-2025	0.063	10	<0.010	1
14-May-2025	<0.020		<0.010	
18-Aug-2025	0.087		<0.010	
12-Nov-2025	0.044		<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 2025 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)	Quarterly Average (µg/L)
18-Feb-25	22.3	22.3
Q1 Regulatory Average (RAA)		58.6
14-May-25	47.1	47.1
Q2 Regulatory Average (RAA)		54.1
11-Aug-25	56.0	56.0
Q3 Regulatory Average (RAA)		47.5
12-Nov-25	45.1	45.1
Q4 Regulatory Average (RAA)		42.6
ODWQS Limit (RAA)		100

Table 9: Total HAA results		
Sample Date	Result (µg/L)	Quarterly Average (µg/L)
18-Feb-25	23.4	23.4
Q1 Regulatory Average (RAA)		36.1
14-May-25	26.9	26.9
Q2 Regulatory Average (RAA)		33.4
11-Aug-25	42.4	42.4
Q3 Regulatory Average (RAA)		30.4
12-Nov-25	23.3	23.3
Q4 Regulatory Average (RAA)		29.0
ODWQS Limit (RAA)		80

3.7 Lead Sampling

Based upon favourable lead sampling results in the community and in accordance with Schedule 15.1 (Lead) of O. Reg. 170/03, the Madsen Drinking Water System qualified for reduced lead sampling in the second half of 2017. Favourable results from reduced lead sampling conducted in 2019 and 2020 allowed the system to qualify for an exemption from sampling at plumbing locations. Two (2) distribution samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these distribution system samples must be analyzed for lead in every third 12-month period. Table 10 summarizes the results of lead sampling and related required tests.

Table 10: Distribution pH, alkalinity and lead sampling results				
Sample Date	Distribution Sample Location	Lead[1] (µg/L)	pH	Alkalinity (mg/L)
06-Sep-2022	Main Street Bleeder	<1.0	7.40	54.0
10-May-2023	Main Street Bleeder	<1.0	8.00	51.0
21-Aug-2023	Main Street Bleeder	lead analyses not required[2]	7.82	53.0
29-Feb-2024	Main Street Bleeder		7.48	51.2
10-Sep-2024	Main Street Bleeder		8.03	55.8
26-May-2025	Main Street Bleeder		8.01	46.6
27-Oct-2025	Beveridge Street Hydrant	1.2	7.86	NR

1. The Ontario Drinking Water Quality Standard for lead in drinking-water is 10 µg/L.
2. Lead will next be tested in distribution samples during the Winter 2025-26 sampling period.

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	11-Aug-2025	µg/L	<0.60	6
Arsenic	11-Aug-2025	µg/L	<1.0	10
Barium	11-Aug-2025	µg/L	<10	1000
Boron	11-Aug-2025	µg/L	<50	5000
Cadmium	11-Aug-2025	µg/L	<0.10	5
Chromium	11-Aug-2025	µg/L	<1.0	50
Fluoride	13-Feb-2023	mg/L	<0.020	1.5
Mercury	11-Aug-2025	µg/L	<0.100	1
Selenium	11-Aug-2025	µg/L	<1.0	50
Sodium	13-Feb-2023	mg/L	24.6	20
Uranium	11-Aug-2025	µg/L	<2.0	20

1. The parameter sodium is not considered a toxic element and is not associated with a Standard as prescribed in O. Reg. 169/03, although an exceedance of 20 mg/L requires reporting and corrective actions. The result in the table was not reported as an Adverse Water Quality Incident as there is already a Sodium advisory in place.

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 organic parameters was conducted on August 11 & 18, 2025, 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	<0.050	5	Diuron	<0.050	150
Atrazine & Metabolites	<0.14	5	Glyphosate	<1.0	280
Azinphos-methyl	<0.10	20	Malathion	<0.025	190
Benzene	<0.50	1	MCPA	<0.0002	100
Benzo(a)pyrene	<0.0050	0.01	Metolachlor	<0.025	50
Bromoxynil	<0.200	5	Metribuzin	<0.10	80
Carbaryl	<0.050	90	Monochlorobenzene	<0.50	80
Carbofuran	<0.025	90	Paraquat	<1.0	10
Carbon Tetrachloride	<0.20	2	Pentachlorophenol	<0.50	60
Chlorpyrifos	<0.10	90	Phorate	<0.25	2
Diazinon	<0.025	20	Picloram	<0.10	190
Dicamba	<0.10	120	Total PCBs	<0.030	3
1,2-Dichlorobenzene	<0.50	200	Prometryne	<0.025	1
1,4-Dichlorobenzene	<0.50	5	Simazine	<0.10	10
1,2-Dichloroethane	<0.50	5	Terbufos	<0.50	1
1,1-Dichloroethylene	<0.50	14	Tetrachloroethylene	<0.50	10
Dichloromethane	<1.0	50	2,3,4,6-Tetrachlorophenol	<0.50	100
2,4-Dichlorophenol	<0.20	900	Triallate	<0.10	230
2,4-D	<0.050	100	Trichloroethylene	<0.50	5
Diclofop-methyl	<0.10	9	2,4,6-Trichlorophenol	<0.20	5
Dimethoate	<0.050	20	Trifluralin	<0.10	45
Diquat	<1.0	70	Vinyl Chloride	<0.20	1

3.10 Harmful Algal Bloom Monitoring

Starting in 2022 a requirement was added to the Municipal Drinking Water License to monitor for Harmful Algae Blooms. If a bloom is identified or suspected, then microcystin testing must be undertaken. According to the HAB plan sampling must continue for three (3) weeks of no microcystin identified. There were zero (0) reported or suspected blooms during the standard monitoring period in 2025.

There were also no suspected or occurring HABs outside the standard period of June 1 to October 31. Historic sample results have consistently identified no microcystin in raw or treated water when algal blooms are observed. Table 12 provides a summary of suspected or occurring HABs in Madsen since monitoring began.

Table 12: Recent historical algal bloom summary

Year	Suspected	Harmful Algal Blooms
2022	0	0
2023	0	0
2024	0	0
2025	0	0

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 Madsen Drinking Water System operated within its rated capacity and supplied a total of 66,665 m^3 of treated water. On an average day in 2025, 183 m^3 of treated water was supplied to the community, which represents 27% of the rated capacity of the Madsen Water Treatment Plant (691 m^3/day). The maximum daily flow in 2025 was 285 m^3/day, which represents 41% of the rated capacity of the treatment facility. Flow monitoring results are summarized in Figure 1 and Table 13. The capacity assessments provided in the table compare the average and maximum daily flows to the rated capacity of the facility.

Figure 1: 2025 average and maximum daily treated water flows

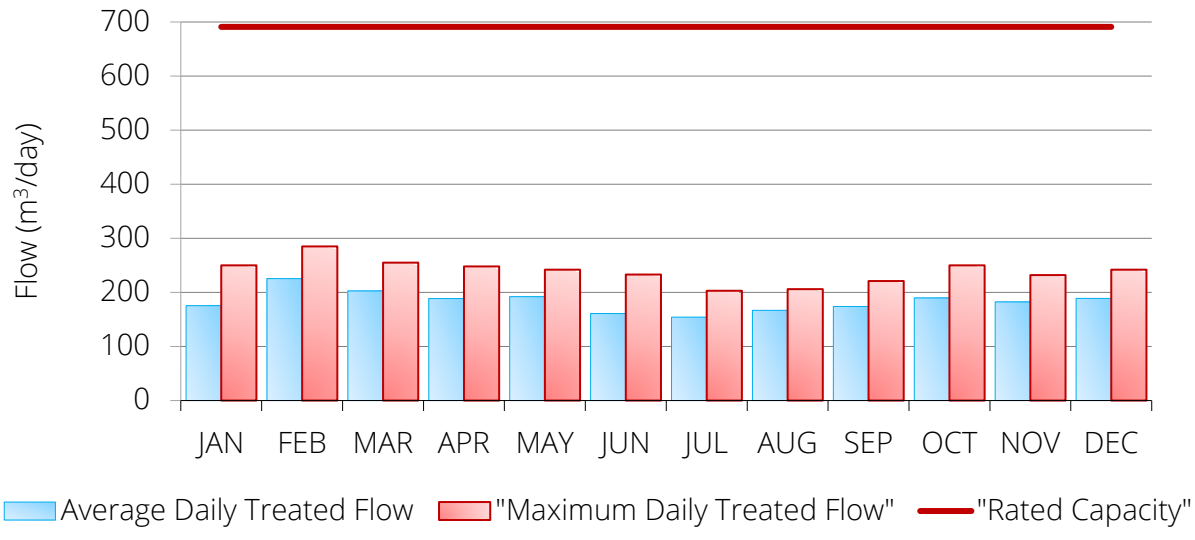
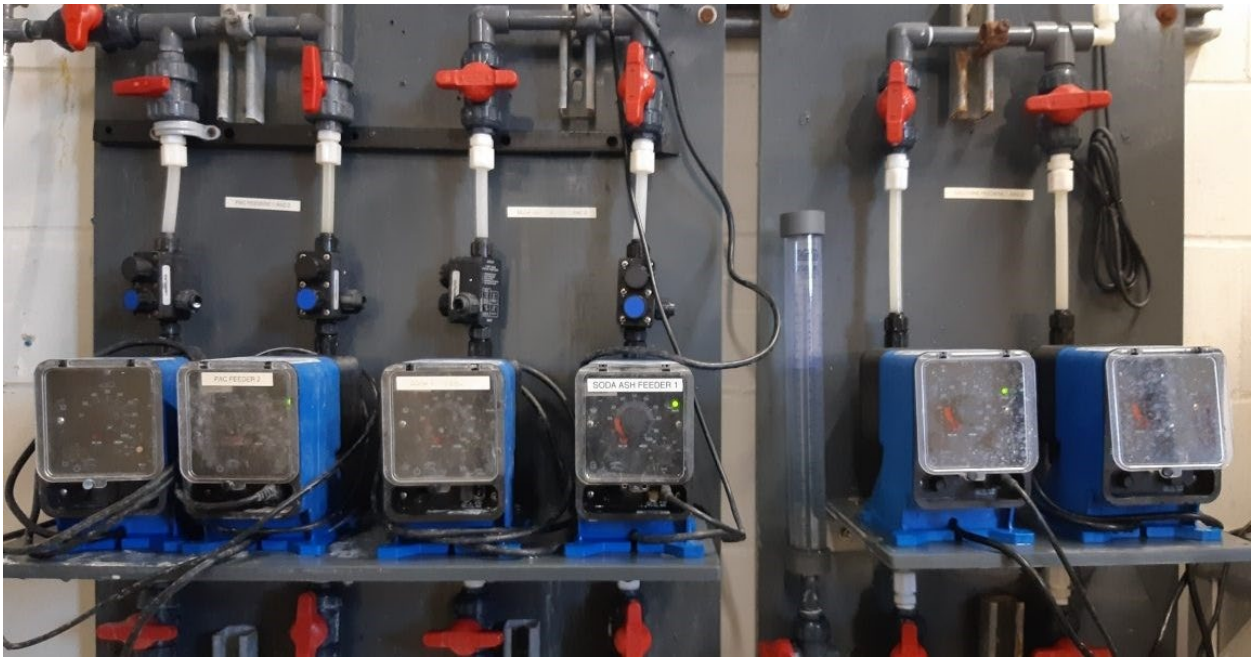


Table 13: 2025 water production summary

Month	Total Volumes (m^3)		Daily Flows (m^3/day)		Capacity Assessments	
	Raw Water	Treated Water	Average - Treated	Maximum - Treated	Average - Treated	Maximum - Treated
Jan	6,074	5,439	175	250	25%	36%
Feb	6,861	6,313	225	285	33%	41%
Mar	6,915	6,282	203	255	29%	37%
Apr	6,290	5,659	189	248	27%	36%
May	6,692	5,955	192	242	28%	35%
Jun	5,347	4,828	161	233	23%	34%
Jul	5,243	4,783	154	203	22%	29%
Aug	5,764	5,172	167	206	24%	30%
Sep	5,911	5,218	174	221	25%	32%
Oct	6,629	5,880	190	250	27%	36%
Nov	6,312	5,470	182	232	26%	34%
Dec	6,539	5,666	189	242	27%	35%
Total	74,579	66,665	---	MAX:	---	MAX:
Average	6,215	5,555	183	285	27%	41%



4.3 Recent Historical Flows

Table 14 summarizes recent historical flow monitoring results for the Madsen Drinking Water System. There was a significant increase in the volumes of source water withdrawn and treated water supplied in 2025 when compared to 2024. As a small system, average daily flows and annual total volumes in Madsen can be disproportionately affected by events such as a significant watermain break or a heavy user. The new West Red Lake Mine Camp service connection began providing water to the camp in February 2025. Total annual volumes of treated water supplied in the near future may be expected to be between 25,000 m^3 and 65,000 m^3, which represents approximately 10% to 26% of the rated capacity of the Madsen Water Treatment Plant

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
2010	37,619	29,256	80	179	-20.8%	-22.1%
2011	32,282	26,739	73	234	-14.2%	-8.6%
2012	50,859	43,989	120	324	+57.5%	+64.5%
2013	40,656	32,605	89	211	-20.1%	-25.9%
2014	36,440	29,334	80	264	-10.4%	-10.0%
2015	40,124	33,852	93	323	+10.1%	+15.4%
2016	60,597	47,244	129	436	+51.0%	+39.6%
2017	72,569	57,113	156	305	+19.8%	+20.9%
2018	38,325	30,958	85	190	-47.2%	-45.8%
2019	45,910	37,036	101	212	+19.8%	+19.6%
2020	41,770	35,132	96	348	-9.0%	-5.1%
2021	53,624	45,450	125	308	+28.4%	+29.4%
2022	55,066	46,221	127	257	+2.7%	+1.7%
2023	71,886	62,303	171	342	30.5%	34.8%
2024	61,236	53,310	146	340	-14.8%	-14.4%
2025	74,579	66,665	183	285	21.8%	25.1%

5 Compliance

5.1 Overview

Northern Waterworks Inc. and the Municipality of Red Lake 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 Madsen,
- 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. 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 on July 3, 2025, and the report was received on August 1, 2025. The final inspection rating was 95.07% and two (2) incidents of regulatory noncompliance were identified.

- Noncompliance item no. 1

A low chlorine alarm set point change was not recorded in the logbook and therefore, other operators were not aware of the alarm set point change. On May 23, 2025, and again on May 24, 2025, the chlorine residual dropped below the minimum alarm standard of 1.21 mg/L and an alarm was not triggered. On May 30, 2025, an operator returned the low chlorine alarm set point to 1.30 mg/L and performed chlorine contact time (CT) calculations. These events did not result in a concern with the safety of the drinking water. It was determined that primary disinfection was achieved during the low chlorine events and that the events were caused by a highlift pump change over.
Prior to this inspection, NWI compliance staff identified and flagged this issue of noncompliance with the Ministry. On June 26, 2025, NWI added a column in their operational spreadsheets for the purpose of daily verification that the low chlorine alarm set point is 1.21 mg/L or higher. The Ministry had no further corrective actions.

- Noncompliance item no. 2

During the inspection review period, operators have failed to return the chlorine alarm set point to 1.30 mg/L. The current worst case scenario CT calculation for Madsen states that the free chlorine residual required to achieve primary disinfection is 1.31 mg/L and that the minimum free chlorine residual regulatory alarm standard is 1.21mg/L. Typically, (and at the time of the inspection) the low chlorine alarm is set to 1.30 mg/L. Occasionally, low chlorine

alarms occur at the WTP during highlift pump change overs. This is due to a gradual consumption of the available free chlorine in the idle highlift pump, resulting in a drop in chlorine residual when the idle highlift pump is activated.

In response to these alarms, and following a CT calculation to ensure primary disinfection, it has become a common practice for operators to inhibit the alarm by adjusting the alarm set point to 1.00 mg/L, to prevent nuisance alarms while they wait for the chlorine residual to return to normal levels. Typically, operators return the low chlorine alarm set point to 1.30 mg/L as soon as chlorine residuals return to normal.

Operators shall not adjust the low chlorine alarm set point to below the minimum alarm standard of 1.21 mg/L, for any reason until NWI has reassessed the worst-case scenario CT calculation for accuracy and submitted those findings to MECP for review and approval.