

2019 Annual Report

Marathon Drinking Water System



Prepared by Northern Waterworks Inc. on behalf of the Town of Marathon

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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 on the operation of the system over the previous calendar year (January 1 to December 31, 2019).

Section 11 of O. Reg. 170/03 requires the development and adequate 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 Marathon Municipal Office, on the Town of Marathon's website and on NWI'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* 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 O. Reg. 170/03.

System users and members of Council are strongly encouraged to 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

2.1 System Description

The Marathon Drinking Water System (DWS No. 220000255) must meet extensive treatment and testing requirements in order 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 approvals.

The Marathon Drinking Water System (DWS) is classified as a large municipal residential system and is composed of five (5) active groundwater wells (Wells 2, 3, 4, 5 & 6), the Industrial Park Booster Station (IPBS), the Penn Lake Heights Reservoir & Booster Station (PLRBS) and the Marathon water distribution system. As an operational subsystem, the Marathon water distribution system is owned and operated by the Corporation of the Town of Marathon. The active wells, reservoir and booster stations comprise the Marathon Well Supply System (treatment subsystem), which is owned by the Town of Marathon and is operated, maintained and managed by Northern Waterworks Inc. As a groundwater source, aquifer overburden and soil act as an effective filter that removes micro-organisms and other particles by straining and antagonistic effect to a level where the water supply may already be potable but disinfection is required as an additional health risk barrier.

The active groundwater Wells 2, 3, 4, 5 and 6 are located throughout the community of Marathon; Wells 1 and 7 were previously abandoned and decommissioned in 2002 and 2003, respectively. A single multi-stage vertical turbine pump at each active well is used to draw water from the aquifer. Each well also contains a disinfectant chemical feed system, where disinfectant is injected as groundwater is pumped from the well and directed to the chlorine contact loop. The contact loops are designed to provide the necessary amount of time required to achieve primary disinfection and they are the last treatment step prior to water entering the water distribution system.

The wells are cycled alternately to supply water to the distribution system and the reservoir. The PLRBS includes an in-ground storage reservoir that balances system pressure and provides water for emergency situations. The reservoir has a capacity of 4,950 m³ and is filled by all the active wells according to programmable set points. Booster pumps at the facility are used to supply water to and maintain system pressure in the Penn Lake Heights subdivision. The IPBS is located on Peninsula Road and is used to supply water to Industrial Park via booster pumps.

The Marathon water distribution system is comprised of various sized diameter water mains consisting of cast iron, ductile iron, high density polyethylene and PVC, totalling approximately 33 km in length and including over 200 fire hydrants. Secondary disinfection requirements in the water 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 2019 are summarized in **Table 1**.

Table 1: Major expenses incurred in 2019

Category	Description	Expense
Replace	PLRBS emergency generator automatic transfer switch controller ¹	\$18,576
Replace/Repair	IPBS automation upgrades ²	\$12,024
Replace	Well 6 building roof	\$10,000
Replace	Well 5 flow meter replacement and instrument calibration	\$6,034
Inventory	Assorted solenoid valves	\$4,216
Replace	Well 6 emergency generator automatic transfer switch controller	\$3,197
Inventory/Replace	Valve assemblies for sodium hypochlorite chemical systems ³	\$2,901
Maintenance	Flow meter calibration verifications	\$2,890
Maintenance	Backflow prevention device testing	\$2,705
Maintenance	Well 2 flow meter instrument calibration	\$1,865
Replace	Portable generator	\$1,864

1. This project at the Penn Lake Reservoir and Booster Station included ancillary costs associated with the work, such as the rental of a 100 kW portable diesel generator.
2. This project at the Industrial Park Booster Station involved replacing the existing programmable logic controller (PLC) and reprogramming the new PLC. Automation services at the facility also included resolving deficiencies with the variable frequency drive pump motor controllers.
3. Includes suction valve assemblies (6), discharge valve assemblies (6), air release valve assemblies (8) and injector valve assemblies (8).

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 (**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 2019

Treatment Chemical	Application	Locations
sodium hypochlorite	disinfectant	Wells 2, 3, 4, 5 & 6

3 WATER QUALITY

3.1 Overview

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 use technical water quality terms, some of which the reader may not be familiar with. It is recommended that the reader refer to the *Technical Support Document for Ontario Drinking Water Standards, Objectives, and Guidelines* available at the following website: <http://www.ontla.on.ca/library/repository/mon/14000/263450.pdf>. Within this document the reader will find information on provincial water quality standards, objectives and guidelines, rationale for monitoring, and a brief description of water quality parameters.

3.2 Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be tested or continuously monitored include raw water turbidity and the free chlorine residuals associated with primary and secondary disinfection. A comprehensive monitoring program is employed that extends beyond these regulated operational parameters to include additional tests conducted on source and treated water samples. **Table 3** 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.

3.3 Microbiological Parameters

Microbiological analyses are performed on source, treated and distribution system water. 629 routine water samples were collected for microbiological analysis by an accredited laboratory in 2019, as required by Schedule 10 (Microbiological sampling and testing) of O. Reg. 170/03. These water 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 3: Results summary for operational parameters

Parameter (Location) ^{1,2}	Sample Method	No. of Samples	Units	Minimum Result	Maximum Result	Annual Average
Raw Water Turbidity (Well 2)	Grab	36	NTU	0.05	0.09	0.07
Raw Water Turbidity (Well 3)	Grab	52	NTU	0.06	0.09	0.07
Raw Water Turbidity (Well 4)	Grab	52	NTU	0.05	0.09	0.07
Raw Water Turbidity (Well 5)	Grab	44	NTU	0.05	0.09	0.07
Raw Water Turbidity (Well 6)	Grab	52	NTU	0.04	0.10	0.07
Treated Water pH (Well 2)	Grab	51	---	7.7	7.8	7.7
Treated Water pH (Well 3)	Grab	52	---	7.7	7.8	7.8
Treated Water pH (Well 4)	Grab	52	---	7.7	7.8	7.8
Treated Water pH (Well 5)	Grab	52	---	7.7	7.8	7.7
Treated Water pH (Well 6)	Grab	52	---	7.7	7.8	7.8
Treated Water FCR (Well 2)	Continuous		mg/L	0.25	2.44	1.39
Treated Water FCR (Well 3)	Continuous		mg/L	0.09	3.10	1.20
Treated Water FCR (Well 4)	Continuous		mg/L	0.16	1.69	1.21
Treated Water FCR (Well 5)	Continuous		mg/L	0.13	2.63	1.30
Treated Water FCR (Well 6)	Continuous		mg/L	0.02	1.77	1.35
Distribution Water FCR (IPBS)	Grab	365	mg/L	1.05	1.67	1.30
Distribution Water FCR (PLRBS)	Grab	365	mg/L	1.02	1.73	1.37
Distribution Water FCR (WWTP)	Grab	365	mg/L	0.76	2.06	1.23
Distribution Water FCR (Overall) ³	Grab	1,100+	mg/L	0.76	2.06	---

1. FCR = Free Chlorine Residual; IPBS = Industrial Park Booster Station; PLRBS = Penn Lake Reservoir & Booster Station; WWTP = Marathon Wastewater Treatment Plant.
2. Wells 2 & 5 were not in continuous production in 2019. Values reported for raw water turbidity and the treated water free chlorine residual for these sites correspond to periods of water production. When not in production, the Well 2 and Well 5 sites effectively function as a distribution sampling station. Values reported for treated water pH for these sites include all results in the calendar year irrespective of whether the well was in production.
3. Grab samples are collected and tested for free chlorine residual at various locations throughout the water distribution system. The free chlorine residual varies with water age and distribution system location, and for this reason an annual average cannot be provided. The values in the table pertain to the minimum and maximum result collected across all locations in the calendar year.

Table 4: Results summary for microbiological parameters

Sample Type (Location) ¹	No. of Samples	EC Results Range (MPN/100mL)	TC Results Range (MPN/100mL)	ODWQS ² (EC & TC)	# of HPC Samples	HPC Results Range (CFU/mL)
Raw Water (Well 2)	37	absent	absent	n/a	---	---
Raw Water (Well 2, nonroutine)	4	absent	0 - 1	n/a	---	---
Raw Water (Well 3)	52	absent	absent	n/a	---	---
Raw Water (Well 4)	52	absent	absent	n/a	---	---
Raw Water (Well 5)	43	absent	absent	n/a	---	---
Raw Water (Well 5, nonroutine)	2	absent	absent	n/a	---	---
Raw Water (Well 6)	52	absent	absent	n/a	---	---
Treated Water (Well 2)	37	absent	absent	not detectable	37	0 - 1
Treated Water (Well 3)	53	absent	absent	not detectable	52	0 - 1
Treated Water (Well 4)	52	absent	absent	not detectable	52	0 - 1
Treated Water (Well 5)	43	absent	absent	not detectable	43	0 - 1
Treated Water (Well 6)	52	absent	absent	not detectable	52	0 - 2
Distribution	156	absent	absent	not detectable	87	0 - 74
Distribution (nonroutine)	4	absent	absent	not detectable	---	---

1. Wells 2 & 5 were not in continuous production in 2019.
2. 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.

3.4 Nitrate & Nitrite

Treated water is tested at each production well 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 5**. All results were below the Ontario Drinking Water Quality Standards.

Table 5 Nitrate and nitrite results

Sample Date	Sample Location	Nitrate Result (mg/L)	Nitrite Result (mg/L)
12-Feb-2019	Well 3	0.689	<0.010
	Well 4	0.475	<0.010
	Well 5	0.908	<0.010
	Well 6	1.32	<0.010
23-May-2019	Well 2	0.657	<0.010
	Well 3	0.624	<0.010
	Well 4	0.401	0.019
	Well 5	0.788	<0.010
	Well 6	0.822	<0.010
15-Aug-2019	Well 2	0.856	<0.010
	Well 3	0.565	<0.010
	Well 4	0.548	0.010
	Well 5	0.899	<0.010
	Well 6	0.875	<0.010
19-Nov-2019	Well 2	0.984	<0.010
	Well 3	0.667	<0.010
	Well 4	0.465	<0.010
	Well 6	0.847	<0.010
ODWQS		10	1

3.5 Trihalomethanes & Haloacetic Acids

Trihalomethanes (THMs) and haloacetic acids (HAAs) are required to be 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 6** and **Table 7**, respectively.

Compliance with the provincial standard for trihalomethane concentrations is determined by calculating a running annual average (with a Maximum Acceptable Concentration of 0.100 mg/L or 100 µg/L). A new provincial standard for haloacetic acids, also expressed as a running annual average with a Maximum Acceptable Concentration of 0.080 mg/L or 80 µg/L, came into effect on January 1, 2020. The 2019 running annual averages for THMs and HAAs were below the respective Ontario Drinking Water Quality Standards.

Table 6: Total THM results

Sample Date	Result (µg/L)
12-Feb-19	6.3
23-May-19	7.7
15-Aug-19	10.6
19-Nov-19	10.3
Regulatory Average	8.7
ODWQS (RAA)	100

Table 7: Total HAA results

Sample Date	Result (µg/L)
12-Feb-19	4.2
23-May-19	4.1
15-Aug-19	6.0
19-Nov-19	4.4
Regulatory Average	4.7
ODWQS (RAA)	80

3.6 Lead Sampling

Based upon favourable sampling results and a lack of lead exceedances in drinking-water in the community, the Marathon DWS previously qualified for reduced lead sampling and ultimately became exempt from sampling at plumbing locations in accordance with Schedule 15.1 (Lead) of O.Reg. 170/03. Six (6) 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 after the plumbing sample exemption was activated. **Table 8** summarizes the results of community lead sampling and related required tests.

Table 8: Distribution pH, alkalinity and lead sampling results

Sample Date	Sample Location	pH	Alkalinity ¹ (mg/L)	Lead Result ² (µg/L)
12-Mar-19	Hydrant 19	7.02	164	Lead analyses not required in 2019 ³
12-Mar-19	Hydrant 56	7.46	156	
12-Mar-19	Hydrant 115	7.74	161	
10-Jul-19	Hydrant 19	6.94	181	
10-Jul-19	Hydrant 56	7.41	183	
10-Jul-19	Hydrant 115	7.62	187	

1. The parameter water hardness is correlated with total alkalinity. Water hardness in Marathon ranges from 150 mg/L to 210 mg/L and is classified as 'hard' or 'very hard' water.
2. The Ontario Drinking Water Quality Standard for lead in drinking-water is 10 µg/L.
3. Lead will next be tested in distribution samples during the sampling period corresponding to December 15, 2020 to April 15, 2021, and again during the period corresponding to June 15, 2021 to October 15, 2021. Lead was most recently tested in 2018, and results for all six (6) samples were less than the lower analytical detection limit (<1.0 µg/L).

3.7 Inorganic Parameters

Most inorganic parameters are sampled every three (3) years in treated water from each production well 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 from each production well in accordance with Schedules 13 and 23 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in **Table 9**. All results were below the associated Ontario Drinking Water Quality Standards.

3.8 Organic Parameters

Organic parameters are sampled every three (3) years in treated water from each production well 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 and other organic chemicals. The most recent organic parameter sampling results are provided in **Table 10**. All results were below the associated Ontario Drinking Water Quality Standards.

Table 9: Inorganic parameter sampling results

Parameter (Units)	Sample Location	Well 2	Well 3	Well 4	Well 5	Well 6
	Sample Date ODWQS	23-Apr-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019
Antimony (µg/L)	6	<0.60	<0.60	<0.60	<0.60	<0.60
Arsenic (µg/L)	10	<1.0	<1.0	<1.0	<1.0	<1.0
Barium (µg/L)	1000	17	22	20	21	20
Boron (µg/L)	5000	<50	<50	<50	<50	<50
Cadmium (µg/L)	5	<0.10	<0.10	<0.10	<0.10	<0.10
Chromium (µg/L)	50	<1.0	<1.0	<1.0	<1.0	<1.0
Mercury (µg/L)	1	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium (µg/L)	50	<1.0	<1.0	<1.0	<1.0	<1.0
Uranium (µg/L)	20	<2.0	<2.0	<2.0	<2.0	<2.0
Fluoride (mg/L)	1.5	0.090	0.092	0.092	0.078	0.157
Sodium (mg/L)	20 ¹	15.0	14.4	17.6	15.1	20.1 ²

1. The parameter sodium is not associated with a water quality standard as prescribed in O. Reg. 169/03, although an exceedance of 20 mg/L is associated with reporting requirements and corrective actions.
2. This sodium result for Well 6 is associated with Adverse Water Quality Incident No. 144802. Refer to the *Compliance* section of this report for more information.

Table 10: Organic parameter sampling results

Parameter (Units)	Sample Location	Well 2	Well 3	Well 4	Well 5	Well 6
	Sample Date ODWQS	23-Apr-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019
Alachlor (µg/L)	5	<0.10	<0.10	<0.10	<0.10	<0.10
Atrazine & Metabolites (µg/L)	5	<0.20	<0.20	<0.20	<0.20	<0.20
Azinphos-methyl (µg/L)	20	<0.10	<0.10	<0.10	<0.10	<0.10
Benzene (µg/L)	1	<0.50	<0.50	<0.50	<0.50	<0.50
Benzo(a)pyrene (µg/L)	0.01	<0.0050	<0.010	<0.010	<0.010	<0.010
Bromoxynil (µg/L)	5	<0.20	<0.20	<0.20	<0.20	<0.20
Carbaryl (µg/L)	90	<0.20	<0.20	<0.20	<0.20	<0.20
Carbofuran (µg/L)	90	<0.20	<0.20	<0.20	<0.20	<0.20
Carbon Tetrachloride (µg/L)	2	<0.20	<0.20	<0.20	<0.20	<0.20
Chlorpyrifos (µg/L)	90	<0.10	<0.10	<0.10	<0.10	<0.10
Diazinon (µg/L)	20	<0.10	<0.10	<0.10	<0.10	<0.10
Dicamba (µg/L)	120	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene (µg/L)	200	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene (µg/L)	5	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane (µg/L)	5	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene (µg/L)	14	<0.50	<0.50	<0.50	<0.50	<0.50
Dichloromethane (µg/L)	50	<5.0	<5.0	<5.0	<5.0	<5.0
2,4 -Dichlorophenol (µg/L)	900	<0.30	<0.30	<0.30	<0.30	<0.30
2,4-D (µg/L)	100	<0.20	<0.20	<0.20	<0.20	<0.20
Diclofop-methyl (µg/L)	9	<0.20	<0.20	<0.20	<0.20	<0.20
Dimethoate (µg/L)	20	<0.10	<0.10	<0.10	<0.10	<0.10
Diquat (µg/L)	70	<1.0	<1.0	<1.0	<1.0	<1.0

Table 10 Continued: Organic parameter sampling results

Parameter (Units)	Sample Location	Well 2	Well 3	Well 4	Well 5	Well 6
		Sample Date				
ODWQS		23-Apr-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019	12-Feb-2019
Diuron (µg/L)	150	<1.0	<1.0	<1.0	<1.0	<1.0
Glyphosate (µg/L)	280	<5.0	<5.0	<5.0	<5.0	<5.0
Malathion (µg/L)	190	<0.10	<0.10	<0.10	<0.10	<0.10
MCPA (µg/L)	100	<0.20	<0.20	<0.20	<0.20	<0.20
Metolachlor (µg/L)	50	<0.10	<0.10	<0.10	<0.10	<0.10
Metribuzin (µg/L)	80	<0.10	<0.10	<0.10	<0.10	<0.10
Monochlorobenzene (µg/L)	80	<0.50	<0.50	<0.50	<0.50	<0.50
Paraquat (µg/L)	10	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol (µg/L)	60	<0.50	<0.50	<0.50	<0.50	<0.50
Phorate (µg/L)	2	<0.10	<0.10	<0.10	<0.10	<0.10
Picloram (µg/L)	190	<0.20	<0.20	<0.20	<0.20	<0.20
Total PCBs (µg/L)	3	<0.035	<0.035	<0.035	<0.035	<0.035
Prometryne (µg/L)	1	<0.10	<0.10	<0.10	<0.10	<0.10
Simazine (µg/L)	10	<0.10	<0.10	<0.10	<0.10	<0.10
Terbufos (µg/L)	1	<0.20	<0.20	<0.20	<0.20	<0.20
Tetrachloroethylene (µg/L)	10	<0.50	<0.50	<0.50	<0.50	<0.50
2,3,4,6-Tetrachlorophenol (µg/L)	100	<0.50	<0.50	<0.50	<0.50	<0.50
Triallate (µg/L)	230	<0.10	<0.10	<0.10	<0.10	<0.10
Trichloroethylene (µg/L)	5	<0.50	<0.50	<0.50	<0.50	<0.50
2,4,6-Trichlorophenol (µg/L)	5	<0.50	<0.50	<0.50	<0.50	<0.50
Trifluralin (µg/L)	45	<0.10	<0.10	<0.10	<0.10	<0.10
Vinyl Chloride (µg/L)	1	<0.20	<0.20	<0.20	<0.20	<0.20

4 FLOW MONITORING

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 2019 Flow Monitoring Results

Throughout the reporting period the Marathon DWS operated within its rated capacity and supplied a total of 1,353,743 m³ of treated water. On an average day in 2019 3,709 m³ of treated water was supplied to the community, which represents 34% of the rated capacity of the system (10,968.64 m³/day). The maximum daily flow in 2019 was 6,564 m³/day, which represents 60% of the rated capacity of the system. Flow monitoring results are summarized in Figure 1 and Table 11.

Figure 1: 2019 average and maximum daily treated water flows

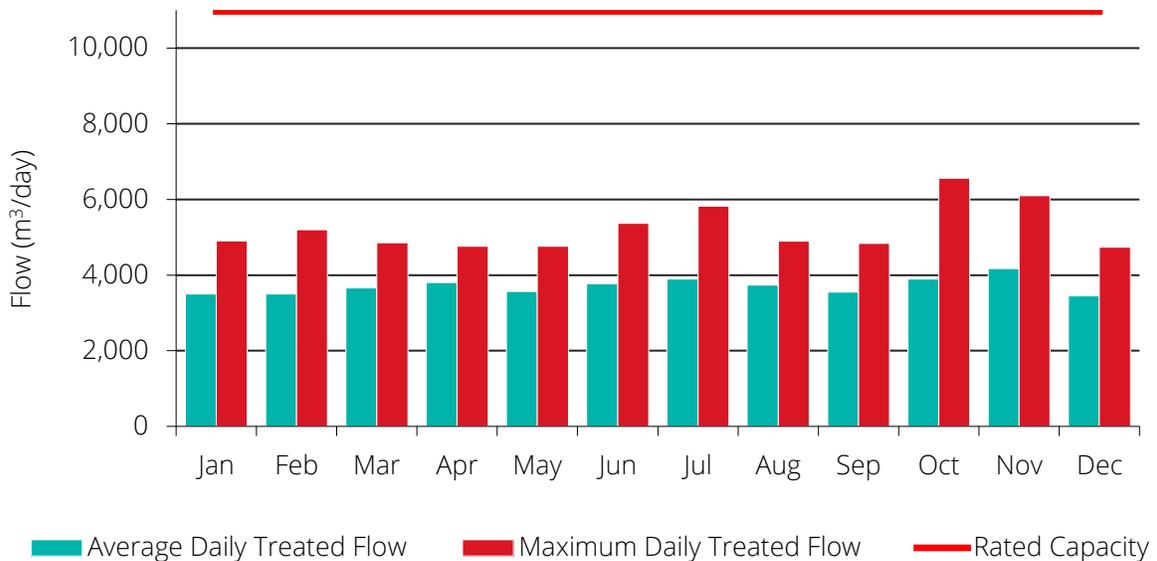


Table 11: 2019 flow monitoring results summary

Month	Total Volumes ¹ (m ³)		Daily Flows (m ³ /day)		Capacity Assessments ²	
	Raw Water	Treated Water	Average - Treated Water	Maximum - Treated Water	Average - Treated Water	Maximum - Treated Water
Jan	108,621	108,569	3,502	4,901	32%	45%
Feb	98,076	98,039	3,501	5,202	32%	47%
Mar	113,502	113,463	3,660	4,851	33%	44%
Apr	114,242	114,179	3,806	4,761	35%	43%
May	110,600	110,532	3,566	4,765	33%	43%
Jun	113,118	113,053	3,768	5,369	34%	49%
Jul	120,785	120,723	3,894	5,824	36%	53%
Aug	115,949	115,888	3,738	4,893	34%	45%
Sep	106,581	106,520	3,551	4,835	32%	44%
Oct	120,845	120,778	3,896	6,564	36%	60%
Nov	125,273	125,202	4,173	6,099	38%	56%
Dec	106,857	106,797	3,445	4,736	31%	43%
Total	1,354,449	1,353,743	---	---	---	---
Average	112,871	112,812	3,709	---	34%	---

1. The difference between raw water and treated water volumes corresponds to the amount of water that is automatically directed to waste at the beginning of a well production cycle. In 2019, this difference accounted for approximately 0.05% of the total amount of withdrawn groundwater.
2. Capacity assessments compare average and maximum daily treated water flows to the combined rated capacity of the system (10,968.64 m³/day), as provided within the *Municipal Drinking Water Licence*.

Throughout the reporting period Wells 2, 3, 4, 5 and 6 contributed approximately 7%, 14%, 31%, 23% and 25% to overall water production, respectively. Wells 3, 4 & 6 were in continuous production during the reporting period. With the exception of Well 3, all treatment stations operated within their respective capacity limits. **Table 12** summarizes flow monitoring results by location.

Table 12: 2019 total volumes, daily flows, and capacity assessments – results by location

Location	Total Volumes (m ³)		Daily Flows (m ³ /day)		Capacity Assessments		
	Treated Water	% of Total	Rated Capacity	Average - Treated Water	Maximum - Treated Water	Average - Treated Water	Maximum - Treated Water
Well 2	98,879	7%	1,962.28	271	1,779	14%	91%
Well 3	192,400	14%	1,662.36	527	1,778	32%	107% ¹
Well 4	415,843	31%	2,289.60	1,139	1,500	50%	66%
Well 5	311,363	23%	2,289.60	853	1,647	37%	72%
Well 6	335,258	25%	2,764.80	919	2,494	33%	90%
All Wells	1,353,743	100%	10,968.64	3,709	6,564	34%	60%

1. Well 3 exceeded its rated capacity on one (1) occasion in 2019 on January 22. As per the system's *Municipal Drinking Water Licence*, a treatment subsystem may be operated temporarily above its rated capacity for the purposes of fighting a large fire or for the maintenance of the drinking water system, provided that the water meets all regulatory requirements. The exceedance in the table pertained to drinking water system maintenance.

4.3 Recent Historical Flows

Table 13 summarizes recent historical flow monitoring results for the Marathon Drinking Water System. There were slight increases in the amounts of source water withdrawn and treated water supplied in 2019 when compared to 2018. System flows have increased for six (6) consecutive years and average daily flows have approximately doubled since 2013. Total annual volumes of treated water supplied in the near future may be expected to be between 1,200,000 m³ and 1,800,000 m³, which represents approximately 30% to 45% of the rated capacity of the system.

Table 13: Recent historical flow monitoring results

Year	Total Annual Treated Water Volumes (m ³)						Annual % Change
	Well 2	Well 3	Well 4	Well 5	Well 6	All Wells	
2013	127,933	125,120	150,560	145,715	123,256	672,584	---
2014	166,272	147,011	229,080	253,109	85,861	881,333	+31.0%
2015	187,933	234,863	277,281	289,556	113,690	1,103,323	+25.2%
2016	204,114	227,848	288,739	310,427	106,411	1,137,539	+3.1%
2017	97,027	244,123	332,163	335,481	153,259	1,162,053	+2.2%
2018	54	268,496	412,159	414,888	212,743	1,308,340	+12.6%
2019	98,879	192,400	415,843	311,363	335,258	1,353,743	+3.5%

5 COMPLIANCE

5.1 Overview

Northern Waterworks Inc. and the Town of Marathon employ an operational strategy that is committed to achieving the following goals:

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

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

5.2 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.

No incidents of regulatory noncompliance were identified during the most recent inspection initiated on May 28, 2019 by Ontario's Ministry of the Environment, Conservation and Parks.

5.3 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.

There were four (4) adverse water quality incidents during the reporting period for the Marathon Drinking Water System:

- **AWQI No. 144802 (February 15, 2019)**

NWI received notice from the licensed laboratory that a routine treated water sample collected from Well 6 on February 12, 2019 yielded a sodium result of 20.1 mg/L. This result exceeded the regulatory reporting limit of 20 mg/L. The issue was reported to the Ministry's Spills Action Centre and to the Thunder Bay District Health Unit on February 15, 2019.

Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03 and included collecting a water sample from the same location as the sample that gave rise to the corrective action. This sample was collected from Well 6 on February 19 and yielded a sodium concentration of 19.6 mg/L. No additional corrective actions were indicated and the *Notice of Issue Resolution* was provided on February 25, 2019.

- **AWQI No. 144981 (March 13, 2019)**

An operational indicator of adverse water quality occurred following a sustained loss of distribution system pressure originating at the Industrial Park Booster Station. A power interruption at the substation resulted in a pump fault and corresponding pressure loss in the Industrial Park area. The issue was reported to the Ministry's Spills Action Centre and to the Thunder Bay District Health Unit on March 13, 2019.

Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03 and included restoring distribution system pressure, issuing a precautionary Boil Water Advisory, flushing watermains and collecting microbiological samples on March 13 and March 14. All samples tested absent for E. coli and total coliform parameters and the Boil Water Advisory was subsequently rescinded. Upgrades to automation systems were also completed at the facility in order to prevent incident recurrence. The *Notice of Issue Resolution* was provided on March 18, 2019.

- **AWQI No. 145222 (April 18, 2019)**

An operational indicator of adverse water quality occurred such that the free chlorine residual at Well 6 dropped to 0.02 mg/L and primary disinfection was compromised at the facility. The low residual was caused by a sodium hypochlorite chemical feed system component failure. The automatic shutdown of the well pump and a back flush procedure were initiated as the residual dropped below the low residual alarm set point (0.70 mg/L). The issue was reported to the Ministry's Spills Action Centre and to the Thunder Bay District Health Unit on April 18, 2019.

Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03 and included cleaning and replacing chemical feed system components, back flushing the well for over 10 hours, restoring the disinfectant residual and placing Well 6 back into production. The *Notice of Issue Resolution* was provided on April 20, 2019.

- **AWQI No. 145426 (May 16, 2019)**

An operational indicator of adverse water quality occurred following a reduction in distribution system pressure originating at the Penn Lake Reservoir & Booster Station. A power interruption at the substation resulted in a pump fault and reduced pressure in the Penn Lake Heights subdivision. The issue was reported to the Ministry's Spills Action Centre and to the Thunder Bay District Health Unit on May 16, 2019.

Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03 and included restoring distribution system pressure by resolving the pump fault condition. No other corrective actions were indicated due to the short duration of the event. The *Notice of Issue Resolution* was provided on May 21, 2019.