KENORA AREA DRINKING WATER SYSTEM 2021 ANNUAL REPORT

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Contents

1.0 Background

This report has been written to meet to requirements of both Section 11 and Schedule 22 of Ontario Regulation 170/3: Drinking Water Systems (O. Reg. 170/03), under the Safe Drinking Water Act 2002 (SDWA). The purpose is to inform the public and Municipal Council on pertinent information.

Section 11 requires the following information be provided to the public:

- A brief description of the drinking water system, including a list of water treatment chemicals used by the system.
- A summary of all adverse water quality incidents reported to the Ministry of the Environment, Conservation and Parks (MECP) and the corrective actions taken.
- A summary of results from tests required under O. Reg. 170/03.
- A summary of major expenses incurred to install, repair or replace required equipment.

Schedule 22 requires the following information be provided to Municipal Council:

- A summary of incidents of regulatory non-compliance and the corrective actions taken.
- A summary of the quantities and flow rates of water supplied, with a comparison to the rated capacity and approved flow rates of the system.

This report is available free of charge to anyone who requests a copy. An electronic copy is available on the City of Kenora website, and anyone wanting to be provided a paper copy can make arrangements to pick one up from the Water Treatment Plant. Staff at the Water Treatment Plant can be contacted to assist in the interpretation of this report if required.

2.0 System Information

2.1 System Description

The Kenora Area Drinking Water System (DWS # 220001423) services the Kenora area, as well as providing water to two subsystems. Subsystems are located on Rocky Heights Road, and on Wauzhushk Onigum Nation.

The Kenora Area DWS distribution system is designated as Class 2, and is comprised of five booster stations, three standpipes and approximately 136 kilometers of watermains.

The Kenora Water Treatment Plant (WTP) is located adjacent to Lake of the Woods, and has a rated capacity of 25,270 cubic meters per day. It is a conventional filtration plant with an upflow clarifier and dual media sand/anthracite filters. Raw water flows by gravity into the lowlift chamber, where it is pumped up to the clarifier by lowlift pumps. Coagulation and flocculation is achieved using aluminum sulfate as a coagulant and the BASF polyelectrolyte LT-22S as a coagulant aid. After filtration, chlorine is added in the mixing chamber prior to the clearwell for primary disinfection. Fluoridation also occurs at this point. After CT has been met in the clearwell, highlift pumps direct the water to the distribution system. Prior to entering the system, trim chlorine is added to prepare the water for chloramination,

sodium hydroxide is added for pH adjustment, and ammonium sulfate is added to produce chloramines as a secondary disinfectant.

2.2 Chemicals Used in Treatment

There were no changes to the chemicals used in treatment in 2021.

Table 1: Chemicals Used in Treatment	
Chemical	Purpose
Chlorine Gas	Disinfection
Aluminum Sulfate	Coagulation
BASF LT-22S Polymer	Coagulant Aid
Sodium Hydroxide	pH, Alkalinity Adjustment
Sodium Silicofluoride	Fluoridation
Ammonium Sulfate	Chloramination

2.3 Summary of Significant Expenses Incurred

Table 2: Summary of Significant Expenses Incurred			
Project	Expense Type	Location	Value
2nd St S Watermain	Replacement	Distribution	$433,875
Park St Laneway Watermain	Replacement	Distribution	$289,785
WTP Backup Generator (partial progress)	Replacement	WTP	$237,046
Artillery Way and 9th St N Watermain	Replacement	Distribution	$205,156
12th Ave N Watermain	Replacement	Distribution	$150,129
7th Ave S Watermain	Replacement	Distribution	$150,023
Central Park Watermain	Replacement	Distribution	$114,855
WTP Reporting Software	Install	WTP	$21,046
WTP Online Fluoride Analyzer	Replacement	WTP	$7,592

3.0 Operational Parameters and Regulatory Sampling

3.1 Turbidity and Free Chlorine Monitoring for Primary Disinfection

Turbidity values and chlorine residuals used for the purpose of determining primary disinfection are continuously monitored with online analyzers. This data must be recorded at minimum intervals to satisfy the requirements of O. Reg. 170/03. Chlorine residual measurements must be recorded at least every five minutes, and turbidity values every fifteen minutes.

Filtrate turbidity values must not exceed 1 Nephelometric Turbidity Unit (NTU), and must remain below 0.3 NTU 95% of the time or greater. The free chlorine residual measured as it exits the clearwell must never drop to a point where CT is no longer being met.

There were no occurrences in 2021 where primary disinfection was inadequate. Filter turbidities did not exceed 1 NTU at any time, and periods over 0.3 NTU were negligible. The clearwell chlorine residual never dropped below the low alarm setpoint of 0.60 mg/L, where CT effectiveness would need to be confirmed.

Table 3: Schedule 7 –Chlorine Residual Continuous Monitoring for Primary Disinfection			
Monitoring Location	Units	Minimum Value	Maximum Value
Clearwell Effluent	mg/L	0.86	1.88

Table 4: Schedule 7 – Filtrate Turbidity Continuous Monitoring for Primary Disinfection			
Monitoring Location	Units	Minimum Value	Maximum Value
Filter #1 Filtrate	NTU	0.023	0.994
Filter #2 Filtrate	NTU	0.021	0.526
Filter #3 Filtrate	NTU	0.023	0.318
Filter #4 Filtrate	NTU	0.023	0.742

3.2 Combined Chlorine Monitoring for Secondary Disinfection

Chlorine residuals are tested in the distribution system twice per week to ensure adequate secondary disinfection. Six samples are taken at the beginning of the week in conjunction with bacteriological samples, and three more samples are taken later in the week at least 48 hours after the first set, and at least 48 hours prior to the beginning of sampling the next week.

Chlorine residuals are also tested in the distribution system for non-routine occurrences such as watermain repairs, boil water advisories, and temporary/seasonal service lines.

A minimum of 0.25 mg/L of combined chlorine must be maintained at all points in the distribution system. Residuals must also remain under the 3.00 mg/L prescribed standard for chloramines. In 2021 there were no adverse events related to distribution chlorine levels.

Table 5: Schedule 7 - Distribution Chlorine Residual Sampling					
Sample Type	Samples Taken	Minimum Residual (mg/L)	Maximum Residual (mg/L)	Standard Limits (mg/L)	
Distribution	472	0.46	2.13	0.25	3.00
Dist. (non-routine)	136	0.35	2.14	0.25	3.00

3.3 Raw Water Monitoring

A raw water sample is collected weekly and tested for turbidity, pH and color. Changes in raw water quality can indicate to operators when adjustments to plant processes may be required.

Table 6: Schedule 7 - Raw Water Monitoring

Parameter	Samples Taken	Units	Minimum Value	Maximum Value
Turbidity	52	NTU	0.432	2.38
pH	52	N/A	7.15	8.33
Color	52	Units PtCo	9	29

3.4 Microbiological Sampling

Microbiological samples are taken weekly and are tested for E-coli and Total Coliform, as well as Heterotrophic Plate Count (HPC) in treated water and at least 25% of distribution samples. One sample is taken weekly from both the raw water entering the plant and the treated water leaving the plant, as well as six samples from the distribution system. Samples taken from the distribution system are spread out geographically so that they give an accurate representation of the entire system.

E-coli and Total Coliform should always be absent, and if they are present in any number this is reported to the MECP as an adverse event. In 2021, there were no incidences where total coliform or e-coli were detected in a distribution sample.

Table 7: Schedule 10 - Microbiological Sampling

Sample Type	Samples Taken	Results Range E-coli (CFU/100 ml)		Results Range Total Coliform (CFU/100 ml)		HPC Samples Tested	Results Range HPC (CFU/1 ml)	
Raw	50	0	71	0	866	N/A	N/A	
Treated	50	Absent		Absent		50	0	<10
Distribution	306	Absent		Absent		252	0	>300
Dist. (non-routine)	100	Absent		Absent		0	N/A	

3.5 Lead Sampling

Under Schedule 15.1 of O. Reg. 170/03 the City of Kenora meets the requirements for reduced sampling. Previous rounds of residential plumbing sampling indicated lead levels did not meet the threshold required for continued annual testing, so lead samples are currently taken from distribution locations every three years. Sampling requirements under 15.1 in 2021 included distribution lead sampling. No lead samples exceeded the prescribed standard in 2021.

Table 8: Distribution Lead Sampling

Samples Taken	Sample Date	Units	Result Range		Standard Limit
4	Jan 25, 2021	µg/L	<1.0	<1.0	10
4	Jul 07, 2021	µg/L	<1.0	<1.0	10

3.6 Organic Parameters

Sampling occurs annually for the organic parameters listed in Schedule 24 or O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No organic parameters exceeded the prescribed standard in 2021.

Table 9: Schedule 24 - Pesticides

Parameter	Sample Date	Units	Result	Standard Limit
Alachlor	Jan 11, 2021	µg/L	<0.225	5
Atrazine + N-dealkylated metabolites	Jan 11, 2021	µg/L	<0.5	5
Azinphos-methyl	Jan 11, 2021	µg/L	<0.169	20
Carbaryl	Jan 11, 2021	µg/L	<1	90
Carbofuran	Jan 11, 2021	µg/L	<2	90
Chlorpyrifos	Jan 11, 2021	µg/L	<0.169	90
Diazinon	Jan 11, 2021	µg/L	<0.169	20
2,4-Dichlorophenol	Jan 11, 2021	µg/L	<0.2	900
Diclofop-methyl	Jan 07, 2021	µg/L	<0.109	9
Dimethoate	Jan 11, 2021	µg/L	<0.169	20
Diquat	Jan 11, 2021	µg/L	<0.2	70
Diuron	Jan 11, 2021	µg/L	<6	150
Malathion	Jan 11, 2021	µg/L	<0.169	190
Metolachlor	Jan 11, 2021	µg/L	<0.112	50
Metribuzin	Jan 11, 2021	µg/L	<0.112	80
Paraquat	Jan 11, 2021	µg/L	<0.2	10
Pentachlorophenol	Jan 11, 2021	µg/L	<0.3	60
Phorate	Jan 11, 2021	µg/L	<0.112	2
Prometryne	Jan 11, 2021	µg/L	<0.0562	1
Simazine	Jan 11, 2021	µg/L	<0.169	10
Terbufos	Jan 11, 2021	µg/L	<0.112	1
2,3,4,6-Tetrachlorophenol	Jan 11, 2021	µg/L	<0.3	100
Triallate	Jan 11, 2021	µg/L	<0.112	230
2,4,6-Trichlorophenol	Jan 11, 2021	µg/L	<0.2	5
Trifluralin	Jan 11, 2021	µg/L	<0.112	45

Table 10: Schedule 24 – Herbicides

Parameter	Sample Date	Units	Result	Standard Limit
Bromoxynil	Jan 11, 2021	µg/L	<0.0872	5
Dicamba	Jan 11, 2021	µg/L	<0.0763	120
2,4-Dichlorophenoxyacetic acid (2,4-D)	Jan 11, 2021	µg/L	<0.327	100
Glyphosate	Jan 11, 2021	µg/L	<20	280
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	Jan 11, 2021	µg/L	<5.45	100
Picloram	Jan 11, 2021	µg/L	<0.0763	190

Table 11: Schedule 24 - Volatile Organic Compounds (VOCs)				
Parameter	Sample Date	Units	Result	Standard Limit
Benzene	Jan 11, 2021	µg/L	<0.2	1
Carbon Tetrachloride	Jan 11, 2021	µg/L	<0.2	2
1,2-Dichlorobenzene	Jan 11, 2021	µg/L	<0.5	200
1,4-Dichlorobenzene	Jan 11, 2021	µg/L	<0.5	5
1,2-Dichloroethane	Jan 11, 2021	µg/L	<0.5	5
1,1-Dichloroethylene (vinylidene chloride)	Jan 11, 2021	µg/L	<0.5	14
Dichloromethane	Jan 11, 2021	µg/L	<5	50
Monochlorobenzene	Jan 11, 2021	µg/L	<0.5	80
Tetrachloroethylene (perchloroethylene)	Jan 11, 2021	µg/L	<0.5	10
Trichloroethylene	Jan 11, 2021	µg/L	<0.5	5
Vinyl Chloride	Jan 11, 2021	µg/L	<0.1	1

Table 12: Schedule 24 - Other Organic Parameters					
Parameter	Parameter Type	Sample Date	Units	Result	Standard Limit
Benzo(a)pyrene	Polycyclic aromatic hydrocarbon	Jan 11, 2021	µg/L	<0.009	0.01
Total PCBs	Polychlorinated biphenyl	Jan 11, 2021	µg/L	<0.06	3

3.7 Inorganic Parameters

Sampling occurs annually for the inorganic parameters listed in Schedule 23 or O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No inorganic parameters exceeded the prescribed standard in 2021.

Table 13: Schedule 23 – Inorganics				
Parameter	Sample Date	Units	Result	Standard Limit
Antimony	Jan 11, 2021	µg/L	0.7	6
Arsenic	Jan 11, 2021	µg/L	<1	10
Barium	Jan 11, 2021	µg/L	3	1000
Boron	Jan 11, 2021	µg/L	6	5000
Cadmium	Jan 11, 2021	µg/L	<0.1	5
Chromium	Jan 11, 2021	µg/L	1	50
Mercury	Jan 11, 2021	µg/L	<0.1	1
Selenium	Jan 11, 2021	µg/L	0.3	50
Sodium	Jan 11, 2021	mg/L	11.8	20
Uranium	Jan 11, 2021	µg/L	<1	20

3.8 Nitrate and Nitrite

Sampling occurs quarterly for nitrate and nitrite, and samples are collected from the treated water leaving the Water Treatment Plant. Nitrate and nitrite did not exceed the prescribed standards in 2021.

Table 14: Nitrate and Nitrite

Parameter	Sample Date	Units	Result	Standard Limit
Nitrate	Jan 11, 2021	mg/L	<0.05	10
	Apr 06, 2021	mg/L	<0.020	10
	Jul 12, 2021	mg/L	<0.020	10
	Oct 21, 2021	mg/L	<0.020	10
Nitrite	Jan 11, 2021	mg/L	<0.05	1
	Apr 06, 2021	mg/L	<0.010	1
	Jul 12, 2021	mg/L	<0.010	1
	Oct 21, 2021	mg/L	<0.010	1

3.9 Trihalomethanes

Sampling occurs quarterly for THMs, and samples are collected from the furthest point in the distribution system. THMs did not exceed the prescribed standards in 2021.

Table 15: Trihalomethane (THMs)

Sample Date	Units	Results	Running Annual Average	Standard Limit
Jan 11, 2021	µg/L	21.7	38.4	100
Apr 06, 2021	µg/L	31.9		
Jul 12, 2021	µg/L	49.8		
Oct 04, 2021	µg/L	50.2		

3.10 Haloacetic Acids

Sampling occurs quarterly for HAAs, and samples are collected from a mid-point in the distribution system. HAAs did not exceed the prescribed standards in 2021.

Table 16: Haloacetic Acids (HAAs)

Sample Date	Units	Results	Running Annual Average	Standard Limit
Jan 11, 2021	µg/L	45	32.8	80
Apr 06, 2021	µg/L	27.2		
Jul 12, 2021	µg/L	38.9		
Oct 04, 2021	µg/L	20.2		

3.11 N-Nitrosodimethylamine (NDMA)

A renewal of the City's Municipal Drinking Water License (MDWL) came with an additional requirement to sample for NDMA. Sampling occurs quarterly, and samples are collected from the furthest point in the distribution system. Initial samples came back above the prescribed standard limit, as detailed in Section 4.0 Adverse Water Quality Incidents and Corrective Actions Taken. Follow-up sampling indicated a laboratory error, and further samples did not exceed the prescribed standards in 2021.

Table 17: N-Nitrosodimethylamine (NDMA)

Sample Date	Units	Results	Standard Limit
Apr 06, 2021	ng/L	16.2	9
Jul 12, 2021	ng/L	2.2	
Oct 04, 2021	ng/L	<0.8	

4.0 Adverse Water Quality Incidents and Corrective Actions Taken

Schedule 16 of O. Reg. 170/03 requires that any adverse sample results or observations are reported to the MECP and the local Medical Officer of Health. The City of Kenora had four Adverse Water Quality Incidents (AWQIs) in 2021. Three of these incidents were related to what were later determined to be erroneous lab results, and one was a data recording issue which was reported as a precaution and was later determined not to be an adverse event.

4.1 AWQI #1

On April 23rd, Results from the first NDMA sample taken in the system from Sewer Lift #961 on April 6th showed a result of 16.2 ng/L, exceeding the prescribed standard of 9 ng/L. Resamples were taken from Sewer Lift # 961, as well as upstream at Zone 3 booster station. Resample duplicates were also sent to a second laboratory to confirm the accuracy of the first laboratory's results.

4.2 AWQI's #2 and #3

On June 1st, NDMA resample results from the original lab came back showing both locations exceeding the prescribed standard of 9 ng/L. Sewer Lift #961 was 50.4 ng/L, and Zone 3 booster was 24.9 ng/L. The duplicate samples sent to the second lab showed results of 5.7 ng/L and 3.8 ng/L respectively, which is below prescribed standard. At this point there was a strong suspicion of laboratory error. Resamples were taken again in conjunction with the MECP Drinking Water Inspector to see if results from the second lab would be similar to results from the MECP laboratory. Lab results from the second lab and MECP lab for Sewer Lift #961 were 3.2 ng/L and 2.6 ng/L respectively, and Zone 3 booster were 2.0 ng/L and 1.3 ng/L. Since resample results from the second lab closely matched results from the MECP lab, it is probable that results from the original lab were inaccurate. A Notice of Resolution was submitted to the MECP on July 8th.

4.3 AWQI #4

On September 11th, an operator arrived for their shift at the Water Treatment Plant and found the three SCADA monitors to be black and unresponsive. At the time it was unclear whether there was any loss of data so the incident was reported as an adverse. After the report had been made, it was confirmed that the SCADA computer had been running properly in the background and there was no loss of data and no loss of alarm function while the monitors were off. A Notice of Resolution was submitted to the MECP on September 11th. This was a precautionary report which is not likely to be reflected as a non-compliance during the next MECP inspection.

5.0 Regulatory Compliance

An MECP Inspection of the DWS took place on June 15th. The final inspection rating was 90.87%. Three non-compliances were identified in the Inspection Report. Two of the three non-compliances are related to one incident which was immediately reported to the local MECP inspector and resolved prior to the Inspection.

5.1 Non-Compliance #1

Non-Compliance: All changes to the system registration information were not provided within ten days of the change. This includes information pertaining to the "24/7 Contact", "Owner Contact" and "Op. Authority Contact".

Summary of Events Leading to Non Compliance: After filling the Water and Wastewater Manager position on March 15th, a Drinking Water System Profile Information form was not submitted to the MECP indicating the change within the required ten day time period.

Corrective Actions Taken: An updated Drinking Water System Profile Information form was submitted to the MECP on June 24th. No further action is required.

5.2 Non-Compliance #2 and #3

Non-Compliance #1: All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or Municipal Drinking Water License or Drinking Water Works Permit or order, were not equipped with alarms or shut-off mechanisms that satisfy the standards described in Schedule 6.

Non-Compliance #2: Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was not performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and/or was not recording data with the prescribed format.

Summary of Events Leading to Non-Compliances: On December 22nd 2020, during the morning trending review an operator noticed that the clearwell effluent analyzer had been flat-lining since 10:11 am the previous day. Further inspection showed that the analyzer was in error mode and continued to display the value of its last taken reading. The operator cycled the power to the analyzer which cleared the

error and the analyzer began to read properly again. Further investigation found that the analyzer's error mode setting was set to "hold outputs" rather than "transfer". When in error mode and set to "hold outputs", the output of the controller will remain at its last known reading, and will not alarm or initiate a shutdown in the event of a low chlorine residual. It will also not allow for the recording of accurate trending data, which has a minimum required recording interval of five minutes. The error mode should have been set to "transfer", in which case an error would cause the controller to output a reading of 0 mg/L. This would give an immediate alarm and initiate an automatic plant shutdown.

Corrective Actions Taken: The error mode setting was returned to "transfer" and the Drinking Water Inspector was contacted. A review of trending data from the influent chlorine analyzer, trim chlorine analyzer and chlorinator actuator signals strongly suggested that primary disinfection was maintained throughout this period, so it was determined in conjunction with the Drinking Water Inspector that an AWQI was not required. It is suspected some settings may have been changed or restored to default when a warrantied circuit board was changed on the analyzer. Operators did not anticipate this effect and it went unnoticed. The required action by the MECP in the Inspection Report was to create a new SOP which details the steps for operators to verify this setting after any non-routine maintenance is conducted on this analyzer. This SOP was submitted to the MECP on August 3rd. No further action is required.

6.0 Flow Data

6.1 Effluent Flow Data

In 2021 the Kenora WTP pumped a total of 2,236,875 cubic meters (m^3) of water to the distribution system. The highest daily flow took place in July, with a total of 9,547 m^3 being pumped on the 12th. This is 38% of the plants rated capacity of 25,270 m^3/day.

Table 18: Effluent Flow Values for 2021

Month	Total Monthly Flow (m^3)	Average Daily Flow (m^3)	Maximum Daily Flow (m^3)
January	177,942	5,851	6,874
February	172,055	6,259	7,044
March	191,577	6,290	7,302
April	170,671	5,793	6,693
May	182,406	5,996	7,269
June	186,911	6,345	8,246
July	207,246	6,803	9,547
August	200,348	6,576	7,657
September	185,362	6,293	7,117
October	192,743	6,341	7,477
November	183,639	6,227	7,338
December	185,975	5,999	6,964

6.2 Influent Flow Data

In 2021 the Kenora WTP pumped a total of 2,516,784 m^3 of raw water from Lake of the Woods. The highest daily flow took place in July, with a total of 10,031 m^3 being pumped on the 12th. This is 39% of the plants water taking limit of 26,000 m^3/day as set out in the Permit to Take Water (PTTW). The highest instantaneous rate at which water was taken from Lake of the Woods was 22,731 m^3/day, which occurred on July 14th. This is 87% of the limit of 26,000 m^3/day set out in the PTTW.

Table 19: Influent Flow Values for 2021

Month	Total Monthly Flow (m^3)	Average Daily Flow (m^3)	Maximum Daily Flow (m^3)
January	198,250	6,365	7,655
February	190,901	6,818	7,519
March	213,429	6,885	8,032
April	191,228	6,374	7,266
May	204,878	6,609	7,829
June	208,322	6,944	8,935
July	232,933	7,514	10,031
August	223,516	7,210	8,380
September	208,388	6,946	7,794
October	223,390	7,206	8,112
November	215,243	7,175	8,767
December	206,306	6,655	7,663

6.3 Historic Flow Data

Total effluent flow has remained relatively stable, with a slight decrease noticeable in 2016. There is no expectation of significant greater demand on the system in the near future.

Table 20: Historic Effluent Flow Values

Year	Total Effluent Flow (m^3)	Average Daily Flow (m^3)	Annual Change	2021 Comparison
2013	2,435,713	6,673	N/A	109%
2014	2,621,655	7,183	+7.6%	117%
2015	2,452,926	6,720	-6.4%	110%
2016	2,066,260	5,661	-15.8%	92%
2017	2,151,431	5,894	+4.1%	96%
2018	2,247,301	6,157	+4.5%	100%
2019	2,229,036	6,107	-0.8%	100%
2020	2,182,328	5,979	-2.1%	98%
2021	2,236,875	6,128	+2.5%	N/A