Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Kirkland Lake Drinking Water System

2022 ANNUAL/SUMMARY REPORT

Prepared by the Ontario Clean Water Agency
on behalf of the Town of Kirkland Lake

TABLE OF CONTENTS

List of Figures

List of Appendices

INTRODUCTION

Municipalities throughout Ontario have been required to comply with Ontario Regulation 170/03 made under the *Safe Drinking Water Act* (SDWA) since June 2003. The Act was enacted following recommendations made by Commissioner O'Conner after the Walkerton Inquiry. The Act's purpose is to protect human health through the control and regulation of drinking water systems. O. Reg. 170/03 regulates drinking water testing, use of licensed laboratories, treatment requirements and reporting requirements.

Section 11 of Regulation 170/03 requires the owner to produce an Annual Report. This report must include the following:

1. Description of system & chemical(s) used
2. Summary of any adverse water quality reports and corrective actions
3. Summary of all required testing
4. Description of any major expenses incurred to install, repair or replace equipment

This annual report must be completed by February 28th of each year.

Schedule 22 of the regulation also requires a Summary Report which must be presented & accepted by Council by March 31st of each year for the preceding calendar year.

The report must list the requirements of the Act, its regulations, the system's Drinking Water Works Permit (DWWP), Municipal Drinking Water Licence (MDWL), Certificate of Approval (if applicable), and any regulatory requirements the system failed to meet during the reporting period. The report must also specify the duration of the failure, and for each failure referred to, describe the measures that were taken to correct the failure.

The *Safe Drinking Water Act* (2002) and the drinking water regulations can be viewed at the following website: http://www.e-laws.gov.on.ca.

To enable the Owner to assess the rated capacity of their system to meet existing and future planned water uses, the following information is also required in the report.

1. A summary of the quantities and flow rates of water supplied during the reporting period, including the monthly average and the maximum daily flows,

2. A comparison of the summary to the rated capacity and flow rates approved in the systems approval, drinking water works permit or municipal drinking water licence or a written agreement if the system is receiving all its water from another system under an agreement.

The reports have been prepared by the Ontario Clean Water Agency (OCWA) on behalf of the Owner and presented to council as the 2022 Annual/Summary Report.

Kirkland Lake Drinking Water System

Section 11

2022 Annual Report

Section 11 - ANNUAL REPORT

1.0 INTRODUCTION

Drinking-Water System Name:	**Kirkland Lake Drinking Water System**
Drinking-Water System No.:	220000308
Drinking-Water System Owner:	The Corporation of Town of Kirkland Lake
Drinking-Water System Category:	Large Municipal, Residential System
Period being reported:	January 1, 2022 to December 31, 2022

Does your Drinking Water System serve more than 10,000 people? No

Is your annual report available to the public at no charge on a web site on the Internet? Yes at http://www.kirklandlake.ca/

Location where the report required under O. Reg. 170/03 Schedule 22 will be available for inspection.

Town of Kirkland Lake, Department of Physical Services
1 Dunfield Road,
Kirkland Lake ON P2N 3P4

Drinking Water Systems that receive drinking water from the Kirkland Lake Drinking Water System

The Kirkland Lake Drinking Water System provides all drinking water to the communities of Kirkland Lake, Chaput Hughes and Swastika.

The Annual Report was not provided to any other Drinking Water System Owners.

The Ontario Clean Water Agency prepared the 2022 Annual/Summary Report on behalf of the Town of Kirkland Lake and provided a copy to the system owner. The Kirkland Lake Drinking Water System is a stand-alone system that does not receive water from or send water to another system.

Notification to system users that the Annual Report is available for viewing is accomplished through:

- Notice on the Town's website
- Notice on the Town's Facebook page
- Notice at the Town of Kirkland Lake Municipal Office

2.0 DESCRIPTION OF THE DRINKING WATER SYSTEM (DWS# 220000308)

The Kirkland Lake Drinking Water System is owned by the Corporation of the Town of Kirkland Lake and consists of a Class 3 conventional design water treatment plant (Lionel Sherratt water treatment plant) and a Class 2 water distribution system. The Ontario Clean Water Agency (OCWA) is the accredited operating authority and is designated as the Overall Responsible Operator for both the water treatment and water distribution facilities.

The Kirkland Lake Drinking Water System has an approved rated capacity of 22,500 m^3/day and provides a potable water supply to the Town of Kirkland Lake which includes the communities of Chaput Hughes and Swastika.

Raw Water Supply

The Lionel Sherratt water plant draws raw water from Gull Lake through a 146 m long, 710 mm diameter intake pipe. The pipe terminates in an intake chamber located approximately 10 m from the lake shoreline. A 750 mm diameter, 17 m long pipe connects the intake chamber and the water plant.

A traveling water screen is installed immediately inside the plant. The screen removes large floating debris from the water prior to treatment. The provision for a manual screen immediately downstream from the traveling screen offers back up screening in the event the traveling screen is out of service. The back-up screen consists of guide channels embedded in the walls of the wet well and several sections of screen frames. Following the screening, the raw water can be disinfected (pre-chlorination) prior to entering the wet well of the Low Lift Pumping Station. The raw water is also injected with soda ash, usually during the winter months to stabilize the water and aid in the coagulation and flocculation process which reduces the amount of iron and manganese passing through the system and into the distribution system. Soda ash is injected prior to the mechanical bar screen and operates pace-to-flow.

A chlorine dioxide pilot trial began at the water treatment plant in January 2018 to help reduce the amount of iron and manganese in the finished water leaving the plant. The process was permanently implemented in January 2019. Chlorine dioxide is injected into the bottom of the raw water wet well following the mechanical screens. It is flow paced to the raw water flow meter which is located on the common raw water header. Chlorine dioxide is generated and stored on site using a vendor supplied package generator system. The generator uses chlorine gas, which already exists on-site and 25% sodium chlorite solution which is stored in two (2) 1500 US gallon bulk tanks as feed chemicals which are drawn under partial vacuum into the generator. The generator is called to start on a low level signal in the day tank. The generator also uses a finished water supply line and a finished water booster pump to boost water pressure to a minimum of 60 psi. Upon fault condition, the generator will shut down.

Water Treatment

1. Coagulation / Flocculation / Sedimentation

The Low Lift Pumping Station (LLPS), equipped with five pumps, transfers water from the wet well (where water level corresponds to the water level in the lake) to the treatment processes. The raw water is continuously monitored by a 12" magnetic flow meter and flows by gravity through the treatment processes.

The first step of water treatment is coagulation; a process of destabilization and initial aggregation of colloidal and finely divided suspended matter by the addition of a floc-forming chemical. Raw water enters the treatment stage through an inlet chamber. Just prior to entering the chamber, a chemical coagulant, aluminum sulfate (alum), is injected into raw water and is rapidly agitated with a flash mixer.

The mixture then overflows into three (3) contact compartments – one per pre-treatment unit. In the compartments, the mixing weirs gently turn the mixture in order to promote coagulation. Just prior to leaving the mixing chambers, a flocculant, FloPam – an inorganic polymer, is added.

Flocculation in water treatment is an agglomeration of colloidal and finely divided suspended matter after coagulation by gentle agitation by either mechanical or hydraulic means, sometimes with an aid of chemical flocculant.

The mixture enters the bottom distribution piping of each Degremont Ultra-Pulsator clarifier via vacuum chambers. The vacuum in the chambers is created by the vacuum pumps, one per chamber. The purpose of the vacuum chambers is to create gentle movement of the sludge blanket in the clarifier for both flocculation and sludge removal.

Sedimentation is the process of subsidence and deposition of suspended matter, carried by water or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid to below the point at which it can transport the suspended material or floc.

The flow is distributed equally over the full area of the clarifiers through the distribution pipes in the bottom of the unit. The flow percolates through the sludge blanket. Upon exiting the sludge blanket, the water flows through a plate settler and then the tube settler. Clarified water is gathered by the collection pipes at the top of the units and transferred to channels that lead to the filters.

2. Filtration

Filtration is the process of passing a liquid through a filtering medium (consisting of granular material, sand and anthracite) for the removal of suspended or colloidal matter. There are four (4) dual media filters at the plant. Each filter is approximately 6.4 m x 4.3 m x 3m deep and rated to operate at a maximum rise rate of 9.0 m/hr or a maximum flow rate of 65.0 L/sec. The filter media consists of 450 mm of anthracite underlain by a 300 mm layer of silica sand. A concrete underdrain slab outfitted with strainer nozzles supports the filter media. During normal operation, the water flows into the filter from the filter channel via an inlet sluice gate and travels through the media in a downward pattern. The filtered water is collected in the underdrain area and transported by pipes to the clearwell, located under the ground slab of

the plant. The flow through each filter is measured by individual flow meters and is controlled by dedicated filter control valves. A headloss indicator monitors the filter media condition. The filtrate quality is continuously monitored by individual turbidimeters, and a particle analyzer.

3. Disinfection (Chlorination)

Filtered water is disinfected following filtration. Chlorine solution is diffused into the water stream in the clearwell of the treatment building. The diffuser and a series of baffles promote complete mixing of chlorine with water. The chlorine solution is prepared on-site by mixing chlorine gas with water. A chlorinator controls the chlorine gas feed rate. There are two (2) chlorinators installed at the plant; one serves as a duty pre-chlorinator while the second is a duty post-chlorinator. Chlorine gas is mixed with water in the ejectors and is sent to diffusers as a chlorine solution. SCADA monitors the chlorinators which will generate alarms upon high and low vacuum levels or abnormal chlorine levels. Each chlorinator is rated to supply 67.0 kg per day of chlorine gas which, based on the plant rated capacity, equals to the maximum chlorine feed rate of up to 3.0 mg/L (3.0 ppm or parts per million) at each location. The gas is withdrawn at any given time from only one of the two one tonne cylinders that are located on the monitored weigh scale. The chlorine feed system will switch automatically to another cylinder when pressure in the duty cylinder drops below the pre-set value. If both cylinders approach low levels, SCADA will alarm the operator.

4. pH Adjustment

The pH adjustment process uses 40% sodium hydroxide (NaOH) to restore treated water to a neutral pH. Two metering pumps (1 duty and 1 standby) feed the NaOH to the clearwell of the treatment building at the point of exit to the pumping building. At this point, the treated water is continuously monitored for pH, free chlorine residual, flow and pressure before being pumped by four high lift pumps to the distribution system.

Process Waste Residuals Management

Filter backwash water and withdrawn sludge from the sedimentation tanks are directed to two wastewater tanks. The capacity of each tank is approximately 900 m^3. Wastewater is discharged to the sanitary sewer system.

Control System

Control System Supervisory Control and Data Acquisition (SCADA) is the method of control implemented for the Kirkland Lake Water Treatment System. All analyzing, monitoring and control module equipment information is routed through the SCADA system for operator monitoring and control. Control of equipment can be accomplished locally using the SCADA computer located at the Lionel Sherratt water treatment plant or remotely using operator computers and cell phones. Alarm capability and set point adjustment along with trend monitoring are also available through SCADA system controls.

Emergency Power

A 500 kW standby diesel generator equipped with an automatic transfer switch supplies power for essential plant operations during a power outage. Diesel fuel is stored in an underground fuel storage tank with an approximate volume of 4000 imperial gallons and in-plant fuel day tank with an approximate volume of 44.5 imperial gallons.

Distribution System and Elevated Storage Tank

The Kirkland Lake Drinking Water System is classified as a Large Municipal Residential Drinking Water System and provides water to approximately 9000 residents through 2740 residential service connections. Distribution piping typically ranges in size from 150 mm to 250 mm, and may consist of cast iron, ductile iron, or PVC, depending on the location and date of installation. Typical system pressure ranges from 55 P.S.I. to 70 P.S.I. The standpipe provides for storage for approximately 7,115 m^3 of water, helps stabilize water pressure in the distribution system and provides extra water in the case of an emergency. To ensure optimum chlorine residual in the distribution system there are two (2) chlorine booster stations, one at the Chaput Hughes Water Control Building/Standpipe and the other at the Swastika Water Control Building.

3.0 LIST OF WATER CHEMICALS USED OVER THE REPORTING PERIOD

The following chemicals were used in the treatment process at the Kirkland Lake Water Treatment Plant.

- Aluminum Sulphate (Alum) - Coagulation/Flocculation
- Sodium Carbonate (Soda Ash) - pH Adjustment/oxidation of iron and manganese
- FloPam FO 4240 PWG – Coagulant aid
- Sodium Hydroxide – pH adjustment
- Chlorine Gas – Primary disinfection
- Chlorine Dioxide (Sodium Chlorite and Chlorine Gas) – Oxidation of iron and manganese
- Sodium Hypochlorite – Booster chlorination at the Chaput Hughes standpipe and Swastika booster station.

All treatment chemicals meet AWWA and NSF/ANSI standards.

4.0 SIGNIFICANT EXPENSES INCURRED IN THE DRINKING WATER SYSTEM

OCWA is committed to maintaining the assets of the drinking water system and maintains a program of scheduled inspection and maintenance activities using a computerized Work Management System (WMS).

Significant expenses incurred in the drinking water system include:

- Replaced soda ash diffuser,
- Installed new eye wash station in lab area,

- Repaired filter No. 3 drainage tiles. Grout line filed with hydraulic cement to prevent break-through during air scour.
- Switched to new sodium hydroxide bulk tanks,
- Installed new inlet valves actuators on Filters No. 1, 2 ,3 and 4,
- Installed new filter backwash valve actuators on Filter No. 3 and 4,
- Replaced feed pump to total chlorine residual analyzer,
- Replaced feed pump to total chlorine analyzer,
- Rebuilt air compressor feeding all plant pneumatic valves,
- Installed backup alarm dialer inside the high lift RTU for high lift section of the plant,
- Installed new UPS in the high lift RTU to prevent PLC failure,
- Purchased new Hach bench top DR 1900 spectrophotometer,
- Replaced heater in chlorine tonner room,
- Replacement of the sump pump located in the further most basement of the water treatment plant was replaced to prevent flooding of the lower levels,
- SAI Global Quality and Environmental Management System (QEM) surveillance and re-accreditation audits. Accreditation achieved on August 1, 2022.

Distribution Work includes:

- Installation of approximately 150m of 300mm PVC water service across Hwy 66 to KL Gold #4 Mine Shaft coupled with valves & meter chamber (at this time there has been no meter installed)
- Installation of 450mm flow meter, valves and chamber at the base of the Chaput Hughes Standpipe
- Replacement of three 450mm valves at Miners Monument valve chamber,
- Repairs were made to the altitude valve located at the standpipe. The altitude valve needed to be completely disassembled and rebuilt using new gasket seals and indicator rod. the pilot valve also required refurbishing and all operating lines removed and cleaned of debris,
- Replaced bleeder valve at the Chaput Standpipe to prevent stagnant water from accumulating in and around beaver drive area.

5.0 DETAILS ON NOTICES OF ADVERSE TEST RESULTS AND OTHER PROBLEMS REPORTED TO & SUBMITTED TO THE SPILLS ACTION CENTER

Based on information kept on record by OCWA, four (4) adverse water quality incidents were reported to the Ministry's Spills Action Centre in 2022.

Date	*AWQI No.*	*Details*
January 17, 2022	157618	Category 2 watermain break with suspected sewage contamination - While digging to repair a water main break on Rowan Avenue, the bucket of the backhoe broke both a water main and a nearby sewer main. The local Health Unit was notified and a Boil Water Advisory (BWA) was issued for the affected area consisting of 30 houses. The main was isolated to conduct the repair and a disinfection and sampling plan was implemented. After the repair was complete, the area was flushed until a satisfactory free chlorine residual was achieved (1.44 mg/L). Two sets of 3 bacteriological samples were collected 24 hours apart (upstream, downstream and at a site near the break) on January 18th and 19th. Sample results indicated no total coliforms or *E.coli*. The BWA was lifted on January 20, 2022 at approximately 1:50 PM. Incident resolved on January 21, 2022
March 29, 2022	158083	A category 2 water main break at the corner of 61 Taylor Avenue resulted in a loss of pressure. After the repair was complete, a second blow-out occurred on the same line. The breaks affected approximately 40 homes. There was suspected contamination when a sewer pipe blew from increased pressure. The main was isolated to conduct the repairs. The local Health Unit was notified and a BWA was issued for the affected area. A disinfection and sampling plan was implemented. All tools, fittings and pipes were disinfected and chlorine pucks were added to both ends of the main. After the repair was complete, the area was flushed until a satisfactory free chlorine residual concentration was achieved (1.52 mg/L). Two sets of 3 bacteriological samples were collected 24 hours apart (upstream, downstream and at a site near the break) on March 30th and 31st. Sample results indicated no total coliforms or *E.coli*. The BWA was lifted on April 1st at approximately 2:40 PM. Incident resolved on April 4, 2022.
April 12, 2022	158194	A Category 2 watermain break at 30 Comfort Street resulted in a loss of pressure when approximately 36 feet of pipe had to be replaced. The pipe froze causing it to split. The local Health Unit was notified and a precautionary BWA was issued for 20 homes. After the repair was complete, the pressure was restored and the area was flushed until an acceptable free chlorine concentration of 0.88 mg/L was achieved. Two sets of 3 bacteriological samples were collected (upstream, downstream and at the site of the break) on April 13th and 14th. Sample results indicated no total coliforms or *E.coli* . The BWA was lifted on April 15, 2022 at 1:30 PM). OIC - Brian Owens Incident resolved on April 16, 2022.

Date	*AWQI No.*	*Details*
August 19, 2022	159599	The free chlorine residual at the standpipe fell below 0.05 mg/L. No alarm called out for an operator. The low chlorine occurred on August 17th from 21:23 to 22:12 hours and on August 18th from 04:35 to 08:58 hours. The chlorine residual reading on the analyzer was confirmed with a hand held unit on August 18th at 08:58 (0.05 mg/L free). It was discovered that the hypochlorite pump was air locked. The responding operator was able to release the air the pump restored proper operation. The residual increased to 1.27 mg/L at 08:59 hours. Corrective Actions - low chlorine was caused by an air locked pump which was addressed by the responding operator. The alarm dialer was tested on August 12th, 2022 and found to be functioning properly. The dialer was tested again on August 18th following the AWQI event and called out properly. A back up dialer (via phone line) was installed on August 19th to ensure this situation does not reoccur. The SCADA Integrator (Stroma) investigated the incident and believes there was a communication error that prevented the dialer from calling for an operator. Incident resolved on April 16, 2022.

6.0 MICROBIOLOGICAL TESTING PERFORMED DURING THE REPORTING PERIOD

Summary of Microbiological Data

Sample Type	# of Samples	Range of Total Coliform Results *(min to max)*	Range of *E.coli* Results *(min to max)*	# of HPC Samples	Range of HPC Results *(min to max)*
Raw (Gull Lake)	52	< 2 to 90/NDOGT&N	< 2 to 35/NDOGT&N	N/A	N/A
Treated (POE)	53	0 to 0	0 to 0	52	< 10 to 70
Distribution	260	0 to 0	0 to 0	104	< 10 to 80

Maximum Allowable Concentration (MAC) for *E. coli* = 0 Counts/100 mL
MAC for Total Coliforms = 0 Counts/100 mL
NDOGT = No Data, Overgrown with Target
NDOGN = No Data, Overgrown with Non-Target
"<" denotes less than the laboratory's method detection limit
">" denotes greater than the laboratory's method detection limit

Notes:

1. One microbiological sample is collected and tested each week from the raw and treated water supply. A total of five microbiological samples are collected and tested each week from the Kirkland Lake distribution system which includes one sample from the community of Swastika. At least 25% of the distribution samples must be tested for HPC bacteria.

Refer to *Appendix A* for a monthly summary of microbiological test results.

7.0 OPERATIONAL TESTING PERFORMED DURING THE REPORTING PERIOD

Continuous Monitoring in the Treatment Process

Parameter	# of Samples	Range of Results *(min to max)*	Unit of Measure	Standard
Turbidity (Filter 1)	8760	0.013 to 1.224*	NTU	≤ 1.0
Turbidity (Filter 2)	8760	0.001 to 2.169*	NTU	
Turbidity (Filter 3)	8760	0.000 to 1.558*	NTU	
Turbidity (Filter 4)	8760	0.000 to 2.191*	NTU	
Free Chlorine (POE)	8760	0.50 to 4.88	mg/L	CT**

Notes:

1. For continuous monitors, 8760 is used as the number of samples.
2. * Effective backwash procedures and automatic pump shut down features are in place to ensure that the effluent turbidity requirements as described in the Filter Performance Criteria are met all times. Turbidity exceedances occur when two (2) readings are above 1 NTU for 15 minutes or more in a 24 hour period. The water treatment filters automatically shut down if the filter effluent turbidity reaches 0.8 NTU. In 2022, all high turbidity results above 1.0 NTU were of short duration (less than 15 minutes) and occurred after backwashes, when clarifier sludge carried over during high flows and during underdrain break through. No reportable exceedances occurred in 2022.

    - *January 26* (Filter 4) - high turbidity over 1 NTU for a short duration (less than 15 minutes), causing the filter to shut down.
    - *February 13* (Filter 3) – high turbidity when third low lift started and ran for one minute from 17:01 to 17:02 hours and one of the other filters was backwashing. Filter shut down.
    - *February 19* (All 4 filters) - clarifier sludge carryover during high flows caused high turbidity results on all 4 filters. All filters shutdown. Manual de-sludge and backwashes performed on all filters. Chemical adjustments made.
    - *April 19* (Filters 2, 3 & 4) - high turbidity over 1 NU for less than 15 minutes causing filters to shutdown. Cleaned polymer line and turbidity dropped to normal operating levels.
    - *May 11* (Filters 2 & 3) - high turbidity for 1 minute (11:09 to 11:10 hours) after backwash. Filter shutdown.
    - *June 6* (Filter 3) - high turbidity from 11:19 to 11:21. Filter shut down.
    - *June 9* (Filters 3 & 4) - high turbidity from for one minute. Filter shut down.
    - *June 10* (Filter 2) - high turbidity caused filter to shutdown.
    - *December 28* (Filter 3) - high turbidity caused filter to shut down. Performed manual de-sludge and adjust polymer.

3. ** CT is the concentration of chlorine in the water times the time of contact that the chlorine has with the water. It is used to demonstrate the level of disinfection treatment in the water. CT calculations are performed by the plant's SCADA system and are monitored daily to ensure primary disinfection is achieved.

   The free chlorine residual level that triggers operators to investigate CT and confirm primary disinfection has been achieved changed from 0.80 mg/L to 1.17 mg/L in November 2022 to reflect the higher pH levels leaving the plant to reduce corrosion control in the distribution system.

Summary of Chlorine Residual Data in the Distribution System

Parameter	# of Samples	Range of Results *(min to max)*	Unit of Measure	Standard
Free Chlorine Residual	411	0.13 to 1.73	mg/L	0.05
Free Chlorine (Chaput Hughes Standpipe)	8760	0.000* to 5.00**	mg/L	0.05
Free Chlorine (Swastika Booster Station)	8760	0.190 to 4.74	mg/L	0.05

Notes:

1. A total of eight operational checks for chlorine residual in the distribution system were collected each week. Five (5) samples were tested one day and three (3) on a second day. The sample sets are collected at least 48-hours apart and samples collected on the same day are from different locations.

2. * Free Chlorine Residuals - zero values from June to August related to the following events;
   - June 22, 23, & 24: Standpipe was drained and put off-line for a flow meter install (work delayed to July)
   - July 11 to 27: Standpipe was off-line for the flow meter install and altitude valve maintenance
   - August 17 & 18: The free chlorine residual at the standpipe fell below 0.05 mg/L and no alarm called out for an operator (AWQI 159599).

3. ** The altitude valve at the standpipe failed on March 30th affecting the water pressure into the distribution system. The valve needed servicing before resuming normal cycling. The water treatment plant method of operation was set to continuous pressure mode to maintain pressure and prevent fluctuations. This mode of operation resulted in some high chlorine residual levels based on changes in distribution demand. The valve was repaired on July 12th, the standpipe was drained and cleaned on July 17th, disinfected on July 18th and put back into service on July 27th. Normal cycling of the standpipe was restored.

Refer to *Appendix B* for a monthly summary of the above chemical test results.

Summary of Nitrate & Nitrite Data *(sampled at the plant's point of entry into the distribution every quarter)*

Date of Sample	Nitrate Result Value	Nitrite Result Value	Unit of Measure	Exceedance
January 10	< 0.05	< 0.05	mg/L	No
April 11	0.1	< 0.01	mg/L	No
July 11	< 0.1	< 0.01	mg/L	No
October 11	< 0.1	< 0.01	mg/L	No

Maximum Allowable Concentration (MAC) for Nitrate = 10 mg/L
MAC for Nitrite = 1 mg/L

Summary of Total Trihalomethane Data *(sampled in the distribution system every quarter)*

Date of Sample	Result Value	Unit of Measure	Running Average	Exceedance
January 10	25	ug/L	40.43	No
April 11	30.9	ug/L		
July 11	55.1	ug/L		
October 11	50.7	ug/L		

Maximum Allowable Concentration (MAC) for Total Trihalomethanes = 100 ug/L (Four Quarter Running Average)

Summary of Total Haloacetic Acid Data *(sampled in the distribution system every quarter)*

Date of Sample	Result Value	Unit of Measure	Running Average	Exceedance
January 10	51	ug/L	60.75	No
April 11	22	ug/L		
July 11	91	ug/L		
October 11	79	ug/L		

Maximum Allowable Concentration (MAC) for Total Haloacetic Acids = 80 ug/L (Four Quarter Running Average)

Summary of Most Recent Lead Data

(applicable to the following drinking water systems; large municipal residential systems, small, municipal residential systems, and non-municipal year-round residential systems)

The Kirkland Lake Drinking Water System was eligible to follow the "Exemption from Plumbing Sampling" as described in section 15.1-5(9) and 15.1-5(10) of Schedule 15.1 of Ontario Regulation 170/03. The exemption applies to a drinking water system if, in two consecutive periods at reduced sampling, not more than 10% of all samples from plumbing exceed the maximum allowable concentration (MAC) of 10 ug/L for lead. As such, the system was required to test for total alkalinity and pH in three distribution sample collected during the periods of December 15 to April 15 (winter period) and June 15 to October 15 (summer period). This testing is required in every 12-month period with lead testing in every third 12-month period.

Lead samples were last collected in 2020 and October 2021 and results were well below the MAC. Two rounds of alkalinity and pH testing were carried out on March 7th and September 13th of 2022. Results are summarized in the table below.

Summary of Lead Data *(sampled in the distribution system)*

Date of Sample	# of Samples	Field pH *(min to max)*	Field Temperature (°C) *(min to max)*	Alkalinity (mg/L) *(min to max)*	Lead (ug/L) *(min to max)*
March 7	3	6.95 to 7.08	7.2 to 8.1	42 to 45	N/A
September 13	3	6.83 to 6.95	16.5 to 19.1	30 to 31	N/A

Note: Next lead sampling scheduled for 2023

Most Recent Schedule 23 Inorganic Data Tested at the Water Treatment Plant

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Antimony	< 0.5	ug/L	6	No	No
Arsenic	< 1.0	ug/L	10	No	No
Barium	36	ug/L	1000	No	No
Boron	< 2.0	ug/L	5000	No	No
Cadmium	< 0.1	ug/L	5	No	No
Chromium	< 1.0	ug/L	50	No	No
Mercury	< 0.1	ug/L	1	No	No
Selenium	< 0.2	ug/L	50	No	No
Uranium	< 1.0	ug/L	20	No	No

Note: Sample required every 12 months (sample date = *October 11, 2022)*

Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Alachlor	< 0.229	ug/L	5	No	No
Atrazine + N-dealkylated metobolites	< 0.5	ug/L	5	No	No
Azinphos-methyl	< 0.172	ug/L	20	No	No
Benzene	< 0.1	ug/L	1	No	No

Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Benzo(a)pyrene	< 0.01	ug/L	0.01	No	No
Bromoxynil	< 0.0938	ug/L	5	No	No
Carbaryl	< 3	ug/L	90	No	No
Carbofuran	< 5	ug/L	90	No	No
Carbon Tetrachloride	< 0.2	ug/L	2	No	No
Chlorpyrifos	< 0.172	ug/L	90	No	No
Diazinon	< 0.172	ug/L	20	No	No
Dicamba	0.52	ug/L	120	No	No
1,2-Dichlorobenzene	< 0.2	ug/L	200	No	No
1,4-Dichlorobenzene	< 0.3	ug/L	5	No	No
1,2-Dichloroethane	< 0.2	ug/L	5	No	No
1,1-Dichloroethylene (vinylidene chloride)	< 0.3	ug/L	14	No	No
Dichloromethane	< 1	ug/L	50	No	No
2-4 Dichlorophenol	< 0.2	ug/L	900	No	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	< 0.352	ug/L	100	No	No
Diclofop-methyl	< 0.117	ug/L	9	No	No
Dimethoate	< 0.172	ug/L	20	No	No
Diquat	< 0.2	ug/L	70	No	No
Diuron	< 20	ug/L	150	No	No
Glyphosate	< 20	ug/L	280	No	No
Malathion	< 0.172	ug/L	190	No	No
Metolachlor	< 0.114	ug/L	50	No	No
Metribuzin	< 0.114	ug/L	80	No	No
Monochlorobenzene	< 0.5	ug/L	80	No	No
Paraquat	0.2	ug/L	10	No	No
Polychlorinated Biphenyls (PCB)	< 0.06	ug/L	3	No	No
Pentachlorophenol	< 0.3	ug/L	60	No	No
Phorate	< 0.114	ug/L	2	No	No
Picloram	1.52	ug/L	190	No	No
Prometryne	< 0.0572	ug/L	1	No	No
Simazine	< 0.172	ug/L	10	No	No
Terbufos	< 0.114	ug/L	1	No	No
Tetrachloroethylene	< 0.3	ug/L	10	No	No
2,3,4,6-Tetrachlorophenol	< 0.3	ug/L	100	No	No
Triallate	< 0.114	ug/L	230	No	No
Trichloroethylene	< 0.2	ug/L	5	No	No
2,4,6-Trichlorophenol	< 0.2	ug/L	5	No	No
2-methyl-4-chlorophenoxyacetic acid (MCPA)	< 5.86	ug/L	100	No	No
Trifluralin	< 0.114	ug/L	45	No	No

Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Vinyl Chloride	< 0.1	ug/L	1	No	No

Note: Sample required every 12 months (sample date = *October 11, 2022)*

Inorganic or Organic Test Results that Exceeded Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards.

No inorganic or organic parameter(s) listed in Schedule 23 and 24 of Ontario Regulation 170/03 exceeded half the standard found in Schedule 2 of the Ontario Drinking Water Standard (O. Reg. 169/03) during the reporting period.

Most Recent Sodium Data Sampled at the Water Treatment Plant

Date of Sample	No. of Samples	Result Value	Unit of Measure	Standard	Exceedance
October 6, 2020	1	20.2	mg/L	20	Yes
October 9, 2020 (resample)	1	22.8	mg/L	20	Yes

Note: Sample required every 60 months. Next sampling scheduled for October 2025

The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. It is required that the local Medical Officer of Health be notified when the concentration exceeds 20 mg/L so that persons on sodium restricted diets can be notified by their physicians. Sodium exceedances are only reported every five years. The adverse sodium result was reported to SAC and the Timiskaming Health Unit on October 9, 2020 as required under Schedule 16 of O. Reg. 170/03 (AWQI# 15214).

Most Recent Fluoride Data Sampled at the Water Treatment Plant

Date of Sample	No. of Samples	Result Value	Unit of Measure	Standard	Exceedance
October 6, 2020	1	< 0.05	mg/L	1.5	No

Note: Sample required every 60 months. Next sampling scheduled for October 2025

Additional Testing Performed in Accordance with an Approval, Order or Legal Instrument

Chlorate and Chlorite

Condition 5 (5.1) of Schedule C to Municipal Drinking Water Licence (MDWL) #214-101 issued on March 9, 2021 requires sampling, testing and monitoring of chlorate and chlorite. The samples are to be collected each quarter from the final treated water and not exceed the maximum allowable concentrations (MAC) of 1.0 mg/L.

Summary of Chlorate & Chlorite Data *(sampled from the final treated water every quarter)*

Date of Sample	Chlorate Result Value	Chlorite Result Value	Unit of Measure	Exceedance
January 10	0.15	0.28	mg/L	No
April 11	0.14	0.44	mg/L	No
July 11	0.10	0.21	mg/L	No
October 11	0.12	0.52	mg/L	No

Maximum Allowable Concentration (MAC) for Chlorate = 1 mg/L
MAC for Chlorite = 1 mg/L

Microcystins

Condition 6.0 (6.1) of Schedule C to Municipal Drinking Water Licence (MDWL) #214-101 issued on March 9, 2021 requires the development of a Harmful Algae Bloom (HAB) monitoring, reporting and sampling plan by September 9, 2021. The plan must be implemented during the harmful algae bloom season, during but not limited to the warm seasonal period between June 1st and October 31st of each year, or as otherwise directed by the Medical Officer of Health. A Plan was developed for the Kirkland Lake Drinking Water System in May 2021 and is implemented during the summer seasons. The Plan includes: visual monitoring of the HAB monitoring area at least once per week, weekly sampling and testing of the raw and treated water for microcystins if a bloom is suspected or confirmed, reporting to the Health Unit and the Ministry's Spills Actions Center if microcystins are detected in either the raw or treated samples or if a suspected bloom is observed.

No incidents of suspected and/or confirmed blue green algae blooms occurred in the source water; Gull Lake, during the monitoring period.

Kirkland Lake Drinking Water System

Schedule 22

2022 SUMMARY REPORT

FOR MUNICIPALITIES

Schedule 22 - SUMMARY REPORTS FOR MUNICIPALITIES

1.0 INTRODUCTION

Drinking-Water System Name:	**Kirkland Lake Drinking Water System**
Municipal Drinking Water Licence (MDWL) No.:	214-101-5 (issued March 9, 2021)
Drinking Water Work Permit (DWWP) No.:	214-201-5 (issued March 9, 2021)
Permit to Take Water (PTTW) No.:	5882-APGJY8 (issued July 25, 2017)
Period being reported:	January 1, 2022 to December 31, 2022

2.0 REQUIREMENTS THE SYSTEM FAILED TO MEET

According to information kept on record by OCWA, the Kirkland Lake Drinking Water System failed to meet the following requirements during the 2022 reporting period:

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
Schedule 1, s. 1-2(2)2 of O. Reg. 170/03 MDWL #214-101, Issue #5	As per Sch. 1 of O. Reg. 170/03 and MDWL #214-101, Issue #5, all equipment/components listed shall be used to achieve pathogen log removal or obtain inactivation credits for primary disinfection required. When an alarm is implemented on clearwell levels, free treated water chlorine residual or flow rates to ensure proper disinfection, operators are to acknowledge the alarm and perform manual CT calculations the same day of the alarm (also as per OCWA's CT Standard Operating Procedure Issued Jan. 15, 2015). Up to December 2021, the operating authority manually calculated CT whenever the triggers for the CT SOP were alarmed to ensure that CT was met. As of Dec. 2021, operators recorded the lowest CT value trended on the SCADA system daily which replaced the manual CT checks. In addition, the operating authority also did monthly CT "Worst Case Scenario" calculations with values from different days (ex. Dec. 2021 "Worst Case Scenario" numbers used were temperature from Dec. 1, pH from Dec. 31, Free	January 2022 to November 2022	A meeting was held on November 24th with the SPCM, PCT, SOM and Team Lead to discuss this non-compliance. A – The current SOP will be followed until training on the revised CT SOP is completed with all staff on December 9th. 1. The alarm for the clearwell level will be changed to 5.0m from 2.0m 2. The CT calculation (Real-time spreadsheet) was reviewed and is accurate. No revisions required. 3. The CT SOP was reviewed and revised to to add pH as a CT trigger. Adjusted free chlorine trigger from 0.8 to 1.17 mg/L Clarified how to review the CT information, where and how to record the data and when to use the Real Time CT Spreadsheet. Also included instructions on recording false data and reporting adverse CT results. Adjusted free chlorine system target. Change in response to increased treated water pH for	Complete

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
	Chlorine from Dec. 13, Flow rate from Dec. 3 and clearwell levels from Dec. 7). NOTE: The Ministry did not find evidence of improperly treated water being directed to consumers during the inspection period. The issues with the new monitoring method are: 1 - Daily CT SCADA values that were recorded by the operators, were recorded the following day. 2 - There are no alarms or call outs for the current CT calculation on SCADA and, even though Free Chlorine is alarmed to call out operators when it drops below 0.80 mg/L, the other two triggering parameters in OCWA's SOP (Clearwell levels and flow rates) do not have appropriate alarms or call outs at the SOP's threshold to calculate CT. This is a violation of O. Reg. 170/03 - Schedule 1, s. 1-2 (2) 2 of O. Reg. 170/03 where it states that: 2. The water treatment equipment is operated in accordance with the Ministry's Procedure for Disinfection of Drinking Water in Ontario. The current practice of recording CT values the next day while not having CT alarmed may lead to unobserved, improperly treated water distributed to users at times throughout the month. Failure to identify and report such adverse water quality incidents to the Timiskaming Health Unit at the time they are occurring prevents the Health Unit from assessing the risk and determining further action such as the issuance of a BWA. It also prevents operators from taking immediate action to restore disinfection.		corrosion control in distribution system. 4. Training on the CT calculation and revised CT SOP was completed December 9th. Alarm set points, CT SOP and training records were provided to MECP Inspector, Rachel Hamelin on December 13, 2022	

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
MDWL #214-101, Issue #5, under Sch. C - Section 4.1 O. Reg. 170/03 Sch. 1, s.1-2 (2) 2	As per MDWL #214-101, Issue #5, under Sch. C - Section 4.1, any measuring instrumentation that forms part of the monitoring system for CT shall be checked and where necessary calibrated at least once every 12 months during which the DWS is in operation. Upon review of the data provided, it was noted that the level indicator for the clearwell had not been calibrated for over 2 years. This indicator is a vital piece of monitoring equipment for calculating CT and must be properly maintained to ensure that primary disinfection is achieved. This is a violation of O. Reg. 170/03 Sch. 1, s. 1-2 (2) 2 (refer to above for wording of this Section).	Discovered: October 4, 2022	Lead/Senior Instrumentation Tech. left OCWA and the new Instrumentation Technicians were not trained to perform this annual check. November 25 - The Instrumentation Technicians have been made aware of the requirement as outlined in Schedule C of the MDWL and will conduct a verification before December 14th December 6 – verification of the high lift and filter clear well level indicators were completed. An annual preventative work order was created in Maximo to be generated every August 1st. Calibrations reports provided to MECP Inspector, Rachel Hamelin on December 13, 2022	Complete
Section 6-5(1)5 and 6-5(1.1) of Schedule 6 of O. Reg. 170/03	Records did not confirm that the water treatment equipment which provides chlorination or chloramination for secondary disinfection purposes was operated so that at all times and all locations in the distribution system the chlorine residual was never less than 0.05 mg/l free or 0.25 mg/l combined. On August 17 and August 18, 2022, the hypo pump air locked and caused low chlorinated water below 0.05mg/L to be discharged to the distribution for a total duration of 5 hours and 12 minutes.	August 17 & August 18	Installation of a new SCADA system resulted in some alarm failure issues. OCWA's Instrumentation Technician's have installed back-up systems to prevent further issues.	Complete
Section 6-5(1)5 and 6-5 (1.1) of Schedule 6 of O. Reg. 170/03	On August 17-18, 2022, the low chlorine alarm for the water tower at the Chaput Hughes Booster Station failed to alarm and call out an operator, resulting in water with free chlorine residual below 0.05 mg/L to be discharged to the distribution for a duration of 49 minutes on August 17, 2022 and 4 hours and 23 minutes	August 17 & August 18	Installation of a new SCADA system resulted in some alarm failure issues. OCWA's Instrumentation Technician's have installed back-up systems to prevent further issues.	Complete

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
	on August 18, 2022. The SCADA Integrator technician (Stroma) investigated the incident and believed there was a communication error that prevented the dialer from calling out. The alarm dialer was tested on August 12, 2022 and worked properly. The dialer was tested on August 18, 2022 following the AWQI and the dialer called out properly. This is a violation of the continuous monitoring alarm requirement of section 6-5(1)5 and 6-5(1.1) of Schedule 6 of O. Reg. 170/03. Subsection 6-5(1) 5 requires the continuous monitoring equipment to be designed and operated such that: I. The continuous monitoring equipment must have a feature that ensures no water is directed to users when equipment malfunctions, loses power or a test result is above or below the alarm standard for that parameter. ii. If the equipment malfunctions, loses power or is above or below the alarm standard, a person who is qualified to examine test results takes appropriate action before water is again directed to users of the system. Or; (1.1) The continuous monitoring equipment must cause an alarm to signal immediately at the following locations if the equipment malfunctions, loses power or a test results is above or below the alarm standard; i. The location where the equipment conducts tests ii. A location where a person is present.			
O. Reg. 128/04 , s. 27 (2), s.27 (4) and s. 27 (5):	Logbooks were not properly maintained and/or did not contain the required information. Upon reviewing the e-log (electronic logbook), it has been noted that	Related to entries in; November 2021, January	The ERIS e-logbook app has created some technical challenges for operators making there entries after each shift. Updates to the app have	Complete

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
	numerous entries in November 2021 (along with a few instances in January 2022 and June 2022) were entered 4-13 days after the actions were completed (such as calibrations or alarm acknowledgement). Also noted in the facility round sheets were some issues that are contrary to Reg. 128/04, s. 27 (2), s. 27 (4) and s. 27 (5): January 2022 facility round sheet: -Entries for the SCADA Data review sheet were not made in chronological order May 2022 facility round sheet: -Operator notes were crossed out by different operators -Free Chlorine residual entry made in pen on May 13 was crossed out in pencil and a different value was written with no explanation. June 2022 facility round sheet: -Entries for the SCADA Data review sheet were not made in chronological order -Free chlorine residual for treated water on June 9, 2022 was crossed out by another operator and a different value written with no explanation. Failure to properly document events in a logbook is a violation of Reg. 128/04 , s. 27 (2), s.27 (4) and s. 27 (5):	2022, May 2022, June 2022,	improved entries. New staff require additional training on document requirements. Recent training was done on September 23rd and October 7th. A third session was done with all operators on December 9th. Training information provided to MECP Inspector, Rachel Hamelin on December 13, 2022	
Section 6-5(1) 10(l) of Schedule 6 of O. Reg. 170/03	All continuous analysers were not calibrated, maintained, and operated, in accordance with the manufacturer's instructions or the regulation. A review of the information provided for the inspection period including round sheets, logbook entries and continuous trends indicate that calibrations were not properly done on 37 separate occasions at the Kirkland Lake WTP chlorine analyzer along with the Chaput Hughes	37 occurrences found from; December 8, 2021 to July 20, 2022	Operators received training on how to properly check and verify on-line analyzers using their hand-held unit. Training records were submitted to MECP Water Inspector Rachel Hamlin on September 9th.	Complete

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
	Booster Station and the Swastika Booster Station. The following are examples found where calibration checks were done improperly: Kirkland Lake WTP Free Chlorine Analyzer (26 instances of improper calibrations), examples are: -December 8, 2021, operator took a handheld residual of 1.98 mg/L, calibrated online analyzer to 1.92 mg/L. -April 10, 2022, operator took a handheld residual of 1.41 mg/L, calibrated online analyzer to 0.95 mg/L. -June 16, 2022, operator took a handheld residual of 1.65 mg/L, calibrated online analyzer to 1.75 mg/L. Swastika Booster Station (2 instances of improper calibrations) -November 3, 2021, operator took handheld residual of 1.06 mg/L, calibrated online analyzer to 0.96 mg/L. -June 22, 2022, operator took handheld residual of 0.78 mg/L, calibrated online analyzer to 0.80 mg/L. Chaput Hughes Booster Station (7 instances of improper calibrations) -May 2, 5, 6, 31 should have had calibrations done to the online analyzer -July 18, 2022, operator took a handheld residual of 1.07 mg/L, calibrated online analyzer to 1.04 mg/L. -July 19, 2022, operator took a handheld residual of 1.13 mg/L, calibrated online analyzer to 1.17 mg/L. -July 20, 2022, operator took handheld residual of 0.97 mg/L, calibrated online analyzer to 1.01 mg/L.			

Drinking Water Legislation	Requirement(s) the System Failed to Meet	Duration	Corrective Action(s)	Status
	Failure to ensure that the treated continuous free chlorine analyzer was calibrated correctly is a violation of Section 6-5(1) 10(l) of Schedule 6 of O. Reg. 170/03 which requires that the continuous monitoring equipment must be checked and calibrated as often as necessary to ensure that the test results are within the following margin of error of 0.05 mg/L, if the concentrations usually measured by the equipment are less than or equal to 1.0 mg/L, and proportionally higher if the concentrations usually measured are greater than 1.0 mg/L.			

It should also be mentioned that, four (4) adverse water quality incidents were reported to the Ministry's Spills Action Center during the reporting period. Refer to Section 5.0 – *Details on Notices of Adverse Test Results and Other Problems Reported to & Submitted to the Spills Actions Center* on page 7 of this report for details.

3.0 SUMMARY OF FLOWS AND COMPARISON TO REGULATORY LIMITS

Flow Monitoring

MDWL No. 214-101 requires the owner to install a sufficient number of flow measuring devices to permit the continuous measurement and recording of:

- the flow rate and daily volume of treated water that flows from the treatment subsystem
  the distribution system (treated water flow from the high lift pump facilities), and
- the flow rate and daily volume of water that flows into the treatment subsystem (raw water flow from the low lift pump facilities).

The flow monitoring equipment identified in the MDWL is present and operating as required. These flow meters are calibrated on an annual basis as specified in the manufacturers' instructions.

Water Usage

The following water usage tables summarize the quantities and flow rates of water taken and produced during the 2022 reporting period, including total monthly volumes, average monthly volumes, maximum monthly volumes, and maximum flow rates.

Raw Water

2022 - Monthly Summary of Water Takings from the Source (Gull Lake)

Regulated by by Permit to Take Water (PTTW) #5882-APGJY8 (issued July 25, 2017)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m^3)	313994	324409	382834	316046	309429	287701	315517	311562	292276	303364	278347	286069	3721549
Average Volume (m^3/d)	10129	11586	12349	10535	9982	9590	10178	10050	9743	9786	9278	9228	10196
Maximum Volume (m^3/d)	11137	13874	14721	12894	10858	10860	13820	11669	10652	11181	10446	10002	14721
PTTW - Maximum Allowable Volume (m^3/day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
Maximum Flow Rate (L/min)	13189	13457	13481	15538	9202	9475	14068	12845	12898	12901	13039	9215	15538
PTTW - Maximum Allowable Flow Rate (L/min)	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625

The system's Permit to Take Water allows the Municipality to withdraw a maximum volume of 22,500 cubic meters from Gull Lake each day. A review of the raw water flow data indicates that the system did not exceed the maximum allowable volume or maximum flow rate during the reporting period.

Treated Water

2022 - Monthly Summary of Treated Water Supplied to the Distribution System

Regulated Municipal Drinking Water Licence (MDWL) #214-101 - Issue 4, dated February 5, 2020

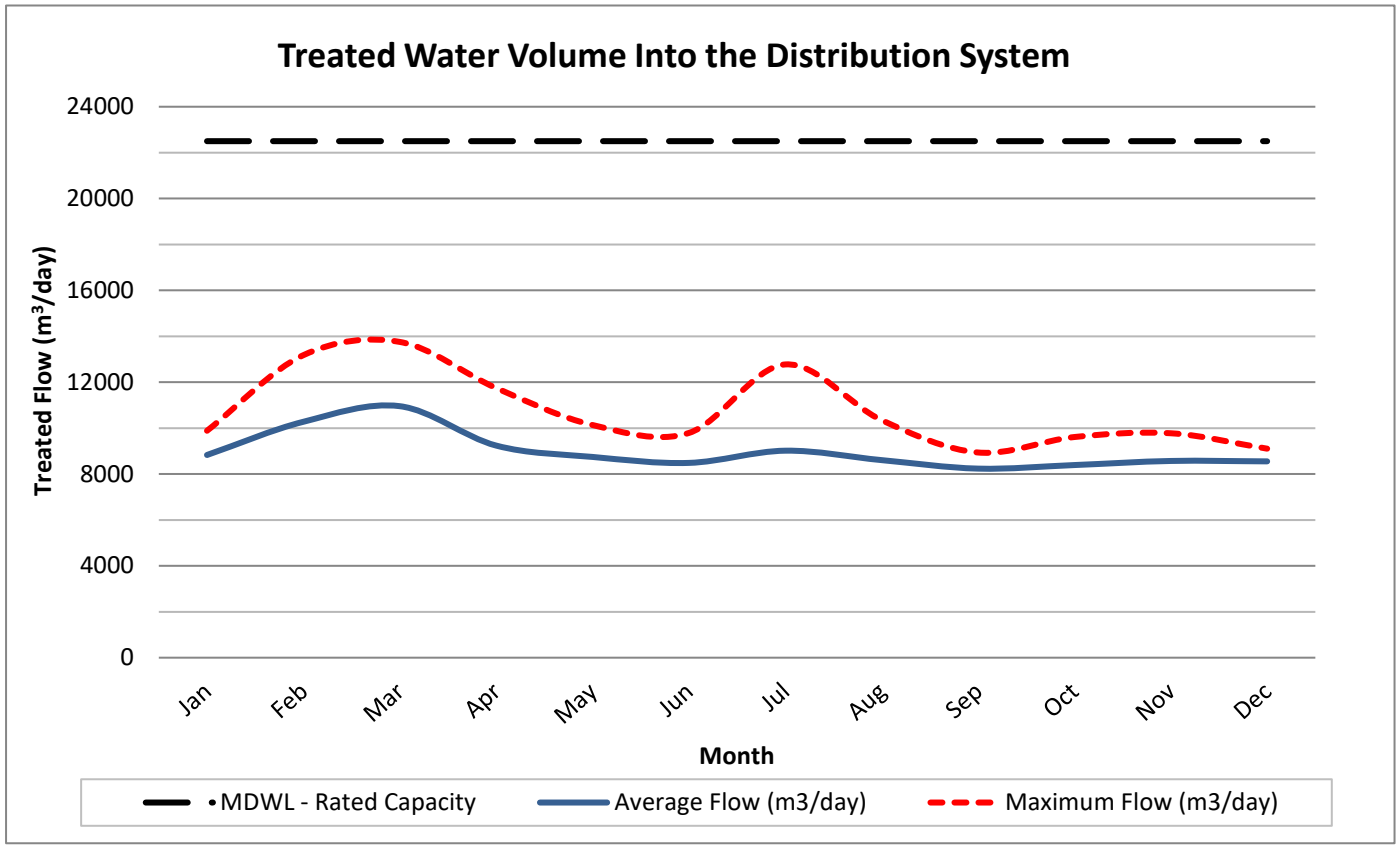
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m^3)	273716	287736	339624	277191	271092	254545	279518	266776	247073	260121	257076	265093	3279561
Average Volume (m^3/d)	8830	10276	10956	9240	8745	8485	9017	8606	8236	8391	8569	8551	8985
Maximum Volume (m^3/d)	9885	13178	13755	11748	10135	9789	12774	10346	8938	9612	9776	9104	13755
MDWL/C of A - Rated Capacity (m^3/day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500

Schedule C, Section 1.0 (1.1) of MDWL No. 214-101 states that the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed 22,500 m^3/day. The Kirkland Lake DWS complied with this limit having a recorded maximum volume of 13,755 m^3/day on March 8th. This represents 61.1% of the rated capacity.

Figure 1 compares the average and maximum flow rates into the distribution system to the rated capacity of the system identified in the MDWL.

Figure 1: 2022 - Comparison of Treated Water Flows to the Rated Capacity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Flow (m^3/day)	8830	10276	10956	9240	8745	8485	9017	8606	8236	8391	8569	8551
Maximum Flow (m^3/day)	9885	13178	13755	11748	10135	9789	12774	10346	8938	9612	9776	9104
MDWL - Rated Capacity	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
% Rated Capacity	44	59	61	52	45	44	57	46	40	43	43	40



Summary of System Performance

The following information is provided to enable the Owner to assess the capability of the system to meet existing and future water usage needs.

Rated Capacity of the Plant (MDWL)	22,500 m^3/day	
Average Daily Flow for 2022	8,985 m^3/day	39.9 % of the rated capacity
Maximum Daily Flow for 2022	13,755 m^3/day	61.1 % of the rated capacity
Total Treated Water Produced in 2022	3,279,561 m^3	

Historical Flows

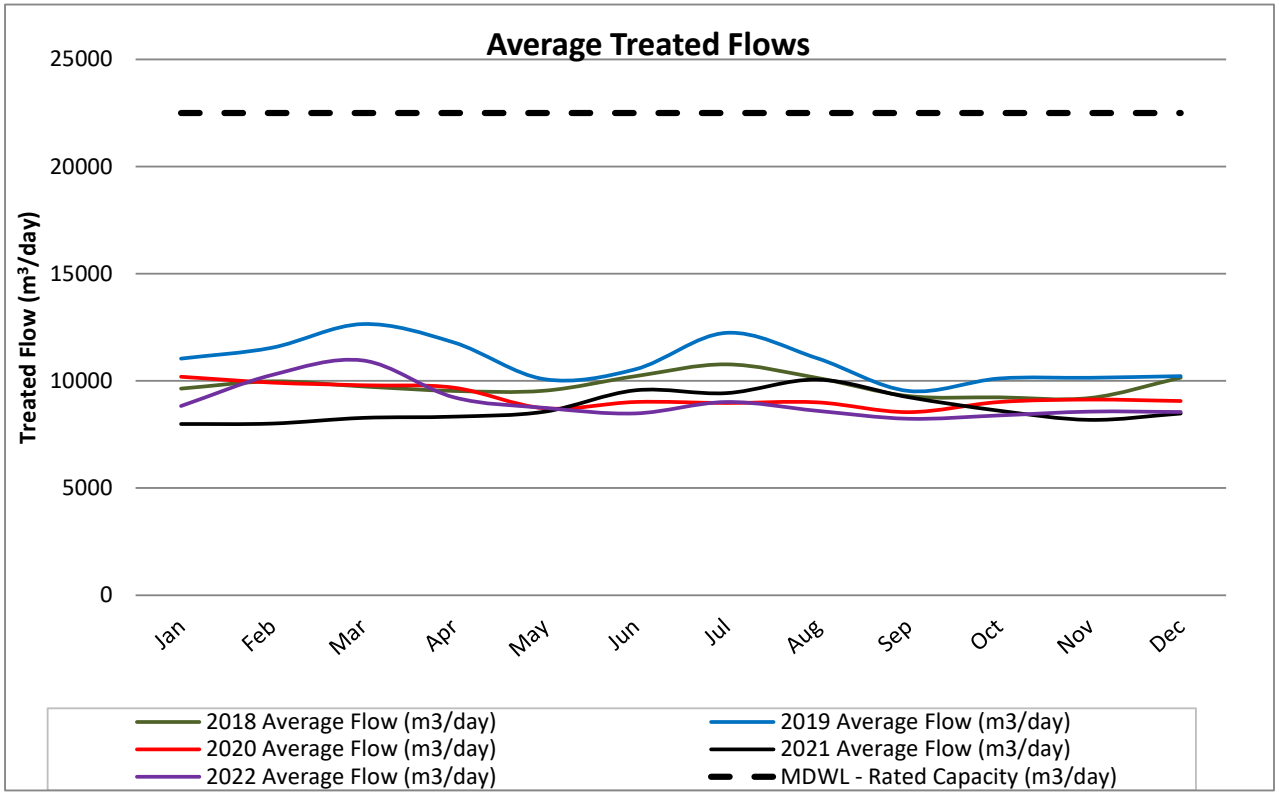
Kirkland Lake (Lionel Sherratt) Water Treatment Plant – Historical Flow Comparison

Year	**Maximum Treated Flow** (m^3/d)	**Average Daily Treated Flow** (m^3/d)	**Average Day % of Rated Capacity** (22,500 m^3/d)
2022	**13,755**	**8,985**	**39.9%**
2021	12,008	8,734	38.8%
2020	13,092	9,256	41.1%
2019	15,485	10,916	48.5%
2018	14,506	9,789	43.5%
2017	13,021	9,355	41.6%

Figure 2 compares the average treated water flows from 2018 to 2022.

Figure 2: Kirkland Lake (Lionel Sherratt) Water Treatment System - Average Treated Water Flows from 2018 to 2022

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018 Average Flow (m^3/day)	9642	9981	9743	9533	9545	10222	10774	10141	9298	9236	9204	10153
2019 Average Flow (m^3/day)	11042	11550	12653	11799	10081	10544	12244	11059	9535	10113	10147	10225
2020 Average Flow (m^3/day)	10195	9923	9798	9687	8723	9018	8971	9001	8544	9016	9131	9063
2021 Average Flow (m^3/day)	7990	8011	8276	8334	8565	9563	9431	10062	9245	8612	8183	8480
2022 Average Flow (m^3/day)	8830	10277	10956	9240	8745	8485	9017	8606	8236	8391	8569	8551
MDWL - Rated Capacity (m^3/day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500



CONCLUSION

The water quality data collected in 2022 demonstrates that the Kirkland Lake drinking water system provided high quality drinking water to its users.

The system was able to operate in accordance with the terms and conditions of the Permit to Take Water and in accordance with the rated capacity of the licence while meeting the community's demand for water use.

All Adverse Water Quality Incidents were reported to the Ministry's Spills Action Center and the corrective actions were completed as required and any non-compliances that were identified were resolved as soon as possible.

APPENDIX A

Monthly Summary of Microbiological Test Results

KIRKLAND LAKE DRINKING WATER SYSTEM
2022 SUMMARY OF MICROBIOLOGICAL TEST RESULTS

Facility Works Number: 220000308
Facility Owner: Municipality: Town of Kirkland Lake
Facility Classification: Class 3 Water Treatment

RAW WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
Gull Lake / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	32	36	30	70	18/NDOGN	10/NDOGN	35/NDOGT	90	45/NDOGT	35/NDOGT	42	58/NDOGT			90/NDOGN/T	
Mean Lab	18.8	< 10.5	13.5	29.5	< 11.333	8	22.5	34.4	30	27	32	39.333		< 23.256		
Min Lab	4	< 2	2	12	< 2	6	10	10	15	16	10	30				< 2
Gull Lake / E. Coli: EC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	< 2	< 2	< 2	< 2	< 2	4	5	35	20	< 5	< 5	< 2			35	
Mean Lab	< 2	< 2	< 2	< 2	< 2	< 2.667	5	< 13	< 10	< 3	< 2.75	< 2		< 4.163		
Min Lab	< 2	< 2	< 2	< 2	< 2	< 2	5	< 5	< 5	< 2	< 2	< 2				< 2

TREATED WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
Treated Water (POE) / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	6	4	5	4	4	53			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Treated Water (POE) / E. Coli: EC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	6	4	5	4	4	53			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
Treated Water (POE) / HPC - cfu/mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	< 20	< 30	< 10	< 10	20	< 10	< 10	< 30	70	< 20	< 30	< 50			70	
Mean Lab	< 12	< 15	< 10	< 10	< 12	< 10	< 10	< 14	< 30	< 12	< 15	< 20		< 14.038		
Min Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10				< 10

DISTRIBUTION WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
KL-3 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-3 / E. Coli - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-3 / HPC - cfu/mL																
Count Lab	2	3	1	2	2	1	3	2	2	2	1	2	23			
Max Lab	< 10	20	40	< 10	< 10	< 10	10	60	< 10	< 40	30	< 10			60	
Mean Lab	< 10	< 16.667	40	< 10	< 10	< 10	< 10	< 35	< 10	< 25	30	< 10		< 16.522		
Min Lab	< 10	< 10	40	< 10	< 10	< 10	< 10	< 10	< 10	< 10	30	< 10				< 10
KL-4 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-4 / E. Coli - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-4 / HPC - cfu/mL																
Count Lab	2	1	2	2	2	2	3	2	2	1	3	1	23			
Max Lab	< 10	10	20	< 10	< 10	< 10	10	20	< 10	< 10	< 10	< 10			20	
Mean Lab	< 10	10	< 15	< 10	< 10	< 10	< 10	< 15	< 10	< 10	< 10	< 10		< 10.87		
Min Lab	< 10	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10				< 10
KL-5 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-5 / E. Coli - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-5 / HPC - cfu/mL																
Count Lab	2	1	1	2	1	3	0	2	2	1	2	2	19			
Max Lab	< 10	< 10	< 10	< 10	< 10	60		10	< 10	20	< 10	< 20			60	
Mean Lab	< 10	< 10	< 10	< 10	< 10	26.667		10	< 10	20	< 10	< 15		< 13.684		
Min Lab	< 10	< 10	< 10	< 10	< 10	10		10	< 10	20	< 10	< 10				< 10
KL-6 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-6 / E. Coli - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-6 / HPC - cfu/mL																
Count Lab	2	1	2	1	2	1	1	2	1	3	1	1	18			
Max Lab	< 10	< 10	< 10	10	20	< 10	< 10	< 10	< 10	< 40	< 10	< 10			40	
Mean Lab	< 10	< 10	< 10	10	15	< 10	< 10	< 10	< 10	< 20	< 10	< 10		< 12.222		
Min Lab	< 10	< 10	< 10	10	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10				< 10
KL-7 / Total Coliform: TC - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-7 / E. Coli - cfu/100mL																
Count Lab	5	4	4	4	5	4	4	5	4	5	4	4	52			
Max Lab	0	0	0	0	0	0	0	0	0	0	0	0			0	
Mean Lab	0	0	0	0	0	0	0	0	0	0	0	0		0		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-7 / HPC - cfu/mL																
Count Lab	2	2	2	1	3	1	1	2	1	3	1	2	21			
Max Lab	< 10	< 80	< 10	< 10	30	20	< 10	< 10	10	< 20	< 10	< 10			80	
Mean Lab	< 10	< 45	< 10	< 10	16.667	20	< 10	< 10	10	< 13.333	< 10	< 10		< 15.238		
Min Lab	< 10	< 10	< 10	< 10	10	20	< 10	< 10	10	< 10	< 10	< 10				< 10

NOTES:
NDOGT = No Data, Overgrown with Target
NDOGN = No Data, Overgrown with Non-Target

APPENDIX B

Monthly Summary of Operational Data

KIRKLAND LAKE DRINKING WATER SYSTEM
2022 SUMMARY OF OPERATIONAL RESULTS

Facility Works Number: 220000308
Facility Owner: Municipality: Town of Kirkland Lake
Facility Classification: Class 3 Water Treatment

FILTERED WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
Filter 1 / Turbidity (1 NTU) - NTU																
Max OL	0.818	1.224	0.49	0.659	0.462	0.197	0.36	0.197	0.214	0.314	0.176	0.699			1.224	
Mean OL	0.105	0.085	0.073	0.092	0.074	0.099	0.107	0.092	0.098	0.102	0.053	0.058		0.086		
Min OL	0.048	0.013	0.046	0.052	0.049	0.055	0.059	0.058	0.054	0.053	0.027	0.024				0.013
Filter 2 / Turbidity (1.0 NTU) - NTU																
Max OL	0.5	1.726	0.8	2.169	1.034	1.22	0.262	0.224	0.279	0.661	0.555	0.48			2.169	
Mean OL	0.063	0.069	0.066	0.081	0.054	0.099	0.084	0.08	0.095	0.106	0.071	0.123		0.083		
Min OL	0.006	0.001	0.033	0.033	0.028	0.037	0.043	0.043	0.043	0.038	0.031	0.035				0.001
Filter 3 / Turbidity (1.0 NTU) - NTU																
Max OL	0.690	1.305	0.806	1.558	1.208	1.171	0.328	0.477	0.473	0.957	0.548	1.110			1.558	
Mean OL	0.077	0.084	0.083	0.099	0.071	0.112	0.092	0.094	0.107	0.107	0.080	0.131		0.095		
Min OL	0.000	0.048	0.000	0.051	0.045	0.058	0.061	0.000	0.057	0.000	0.042	0.046				0.000
Filter 4 / Turbidity (1.0 NTU) - NTU																
Max OL	1.139	2.191	0.870	1.181	0.425	1.240	0.360	0.200	0.412	0.358	0.268	0.886			2.191	
Mean OL	0.101	0.155	0.046	0.075	0.041	0.066	0.083	0.083	0.106	0.114	0.089	0.080		0.087		
Min OL	0.000	0.018	0.000	0.020	0.015	0.034	0.045	0.000	0.038	0.000	0.035	0.032				0.000

TREATED WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
Treated Water (POE) / Cl Residual: Free (0.80 mg/L) - mg/L																
Max OL	2.793	2.540	2.891	2.632	3.497	3.326	2.347	2.396	2.386	2.826	3.584	4.876			4.876	
Mean OL	1.648	1.455	1.592	1.601	1.540	1.443	1.434	1.415	1.438	1.400	1.517	1.613		1.508		
Min OL	1.240	0.960	0.890	0.890	0.560	0.760	0.800	0.850	0.960	1.350	0.801	0.500				0.500

DISTRIBUTION WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
KL-3 / Cl Residual: Free - mg/L																
Count IH	9	8	9	8	8	9	8	9	9	9	8	9	103			
Max IH	1.33	1.50	1.54	1.43	1.36	1.35	1.24	0.96	1.02	1.32	1.27	1.55			1.55	
Mean IH	1.08	1.14	1.28	1.03	1.10	0.96	0.78	0.78	0.74	0.84	1.09	1.08		0.99		
Min IH	0.80	0.81	0.92	0.76	0.87	0.61	0.48	0.55	0.48	0.57	0.91	0.68				0.48
KL-4 / Cl Residual: Free - mg/L																
Count IH	9	8	9	8	8	9	8	9	9	9	8	9	103			
Max IH	1.40	1.36	1.63	1.56	1.45	1.04	0.95	1.06	1.49	1.30	1.37	1.45			1.63	
Mean IH	0.94	1.18	1.24	1.16	1.29	0.78	0.74	0.86	0.84	0.94	1.16	0.89		1.00		
Min IH	0.54	1.04	0.86	0.88	1.09	0.45	0.51	0.54	0.58	0.47	0.85	0.45				0.45
KL-5 / Cl Residual: Free - mg/L																
Count IH	9	8	9	8	8	9	8	9	9	9	8	9	103			
Max IH	1.72	1.47	1.4	1.59	1.62	1.06	1.24	1.47	1.5	1.2	1.29	1.17			1.72	
Mean IH	1.267	1.146	1.209	1.159	1.299	0.706	0.683	0.627	0.969	0.814	0.859	0.943		0.971		
Min IH	1.09	0.71	0.91	0.78	1.02	0.35	0.36	0.13	0.52	0.13	0.44	0.63				0.13
KL-6 / Cl Residual: Free - mg/L																
Count IH	5	4	4	4	4	4	4	5	4	5	4	4	51			
Max IH	1.63	1.34	1.64	1.59	1.68	0.96	1.11	1.19	1.23	0.92	1.17	1.65			1.68	
Mean IH	1.25	1.18	1.35	1.08	1.17	0.63	0.83	0.97	1.03	0.69	1.06	0.97		1.01		
Min IH	0.91	0.90	1.16	0.69	0.75	0.45	0.53	0.64	0.73	0.42	0.91	0.60				0.42
KL-7 / Cl Residual: Free - mg/L																
Count IH	5	4	4	4	4	4	4	5	4	5	4	4	51			
Max IH	1.54	1.31	1.68	1.65	1.73	0.58	0.65	0.77	1.13	1.01	0.89	1.00			1.73	
Mean IH	1.41	1.17	1.51	1.08	1.46	0.47	0.55	0.59	0.79	0.73	0.71	0.85		0.94		
Min IH	1.18	1.05	1.30	0.63	0.98	0.36	0.46	0.48	0.41	0.50	0.46	0.76				0.36

DISTRIBUTION WATER	01/2022	02/2022	03/2022	04/2022	05/2022	06/2022	07/2022	08/2022	09/2022	10/2022	11/2022	12/2022	Total	Avg	Max	Min
Swastika Booster Station / Cl Residual: Free (0.05 mg/L) - mg/L																
Max OL	1.57	1.63	2.58	3.90	4.74	1.02	0.87	1.86	1.25	1.28	1.55	2.08			4.74	
Mean OL	1.09	1.12	1.15	1.02	1.08	0.74	0.62	0.60	0.63	0.74	0.82	0.90		0.88		
Min OL	0.35	0.67	0.19	0.47	0.63	0.49	0.26	0.21	0.28	0.36	0.43	0.39				0.19
Chaput Hughes Standpipe / Cl Residual: Free (0.05 mg/L) - mg/L																
Max OL	4.42	3.74	5.00	5.00	5.00	5.00	4.64	3.11	2.68	2.82	2.26	1.98			5.00	
Mean OL	1.21	1.25	1.28	1.19	1.05	0.81	0.61	0.91	1.02	0.94	0.86	1.01		1.01		
Min OL	0.71	0.72	0.19	0.57	0.38	0.00	0.00	0.00	0.14	0.44	0.44	0.18				0.00

NOTES:

1. Turbidity exceedances occur when two (2) readings are above 1 NTU for 15 minutes or more in a 24 hour period. The filters at the Kirkland Lake water treatment plant automatically shut down if the filter effluent turbidity reaches 0.8 NTU. High turbidity results of 1.0 NTU were measured for a short duration as the filter shutdown and occurred after backwashes, when clarifier sludge carried over during high flows and during underdrain break throughs. No reportable exceedances occurred in 2022.

2. CT is the concentration of chlorine in the water times the time of contact that the chlorine has with the water. It is used to demonstrate the level of disinfection treatment in the water. CT calculations are reviewed using the plant's SCADA system if the free chlorine residual level drops below 0.80 mg/L to ensure primary disinfection is achieved. The free chlorine residual level that triggers operators to investigate CT and confirm primary disinfection has been achieved changed from 0.80 mg/L to 1.17 mg/L in November 2022 to reflect the higher pH levels leaving the plant to reduce corrosion control in the distribution system.

3. Chaput Highes Standpipe; Free Chlorine Residuals (Min OL) zero values from June to August related to the following events;
- June 22, 23, & 24: Standpipe was drained and put off-line for a flow meter install (which was delayed to July)
- July 11 to 27: Standpipe was off-line for the flow meter install and altitude valve maintenance
- August 17 & 18: The free chlorine residual at the standpipe fell below 0.05 mg/L and no alarm called out for an operator (AWQI 159599).

4. Chaput Highes Standpipe; Free Chlorine Residuals (Max OL) 5.0 mg/L from March to June when the altitude valve at the standpipe failed on March 30th affecting the water pressure into the distribution system. The valve needed servicing before resuming normal cycling. The Water Treatment Plant mode of operation was set to continuous pressure mode to maintain pressure and prevent fluctuations. This mode of operation resulted in some high chlorine residual levels based on changes in distribution demand. Normal cycling of the standpipe resumed after the valve was repaired, the standpipe cleaned and disinfected on July 27, 2022.