2016 ANNUAL REPORT ON DRINKING WATER QUALITY

JAN.1 – DEC. 31 2016

CANA WATER TREATMENT PLANT

Drinking Water System Number: 220006053
Drinking Water System Owner: City of Kingston
Drinking Water System Category: Small Municipal Residential

Drinking Water Quality

Utilities Kingston is proud to present this annual report on drinking water quality. This report has been prepared in accordance to Section 11 of Ontario Regulation 170/03. Regulation 170/03 sets requirements for public waterworks with regard to sampling and testing, levels of treatment, licensing of staff, and notification of authorities and the public about water quality. Free copies of this report and the Summary report prepared in accordance to Schedule 22 of Ontario Regulation 170/03, are available by public request at any City of Kingston offices, at our water plant locations and at *www.utilitieskingston.com*. Notices of availability are generally made through the local newspapers and radio. Further information on the Drinking Water Regulations can be found on the Ministry of the Environment web site at *www.ene.gov.on.ca*.

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Inside This Report

1. Plant Description & Treatment Processes

The Cana Well system was established in the early 1950's by a co-operative formed by homeowners living on Marian Crescent, Rochdale Crescent, and Cana Blvd. The system was operated privately by the co-operative, then by the Ministry of the Environment (MOE), until operation was assumed by the former Township of Pittsburgh. When the township amalgamated with the city of Kingston and Kingston Township in 1998, operation of the system passed into the care of Utilities Kingston. Staff from the Utilities Kingston Treatment Group operates the treatment system. The distribution system is maintained by the Utilities' Underground Infrastructure Department.

Raw Water Source and Low Lift Pumping

The raw water source is ground water pumped from a 150mm diameter by 18.6m deep well. A submersible pump, capable of pumping 75 L/min, discharges raw water, via a 75mm well pump header, through the pump house and into the chlorine contact tank. Well pump run cycles are controlled by the contact tank storage level transmitter. The raw water discharge line is equipped with a magnetic flow meter, conductivity / temperature sensor and a turbidimeter for capacity and quality measurement. A pressure transmitter located at the base of the well provides for monitoring of groundwater aquifer level for determination of draw down and recharge rates.

Primary Disinfection

Sodium hypochlorite is dosed to the raw water flowing through the well pump discharge line upstream of a 45,000L in ground reservoir (contact tank). The sodium hypochlorite solution used is diluted down to a 2-3% Cl_2 solution with de-ionized water. Two peristaltic pumps are used for hypochlorite delivery. Chlorinated water flows through the baffled contact tank with high lift pump operation. The level transmitter located within the tank provides for the determination of actual storage volumes and control of the raw water well pump.

Contact tank inlet and outlet free Cl_2 residuals and pH levels are continuously monitored. Control of the chlorination system is accomplished through the monitoring of chlorine contact tank inlet Cl_2 residuals and raw water flow measurement through a PID (Process/ Integral/ Derivative) control loop to ensure in-plant chemical disinfection CT values (contact time) are equal to or greater than the required level determined by the 'Procedure for Disinfection of Water in Ontario'.

High Lift Pumping and Distribution System Pressure Maintenance

Two submersible pumps, capable of pumping 92 L/min each, discharge treated water from the outlet of the chlorine contact tank to the distribution system. The discharge of the two high lift pumps is routed back inside the pump house where it is filtered through two cartridge filters (one lead, one standby) that are 5 microns in pore size. Two 450L pressure tanks are located directly downstream of the cartridge filters and maintain system pressure while the high lift pumps are off. High lift pump operation is controlled in a duty/standby rotation through a pressure transmitter that regulates high lift discharge pressure between 40 and 60psi. The treated water discharge line is equipped with a magnetic flow meter, turbidimeter and two

free chlorine/ pH analyzers (one designated as contact tank outlet Cl_2 and one as treated water Cl_2).

Secondary Disinfection (Trim Chlorination)

Sodium hypochlorite is used as a secondary disinfectant. Two peristaltic pumps draw hypochlorite solution from an adjacent tank and deliver it to the treated water discharge line. This system only operates if the contact tank outlet Cl_2 residual is below an operator adjustable set point. Control of the trim chlorination system is accomplished through the monitoring of chlorine contact tank outlet Cl_2 residuals and treated water flow measurement through a PID (Process/ Integral/ Derivative) control loop to ensure adequate distribution system free chlorine residuals.

Control System

Supervisory Control and Data Acquisition (SCADA) is the method of control implemented at the Cana Well 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 at the SCADA panel in the pump house or remotely at the Kingston Central Water Treatment Plant. Alarm capability and set point adjustment along with trend monitoring are also available through SCADA system controls.

Standby Equipment

An 8000 Watt portable generator is maintained on site to provide a backup electrical supply in case of power outages. This generator is capable of powering the well pump and one of the high lift pumps simultaneously, as well as all the instrumentation and control equipment required to automatically operate the system. The operator can manually transfer to standby power once the generator is connected to the standby supply breaker switch, and after non-essential electrical loads are disabled.

Distribution

The distribution system was also originally installed by the co-operative, and was constructed from a variety of materials which were available to the co-operative at the time of construction. The entire distribution system was replaced in 2002, and 2003.

Treatment Plant staff attend the well on a regular basis to make system checks, take bacteriological samples, and to test chlorine residuals in both the treated water and in the distribution system. All operators are certified by the MOECC.

2. Monetary expenses incurred during this reporting period

Under Section 11 of Ontario Reg. 170/03, a description of any major expenses incurred during this reporting period must be included in the annual report. The major expenses for this drinking water system are listed below.

-Operational & preventative maintenance was conducted at the well house during 2016.

-Work conducted on the Cana Sewage Treatment Plant in 2016 will provide the Cana Water Treatment Plant with a direct connection to a new Diesel backup generator which will provide power in the event of future outages.

3. Notifications submitted in accordance to the Safe Drinking Water Act

Under Ontario Reg. 170/03, notifications were required for any instances where a sample result indicated that a parameter used to measure water quality exceeded a Maximum Acceptable Concentration (MAC). Once a notification is received from a laboratory or an observation of any other indicator of adverse water quality is made by operations personnel, corrective action as dictated by the regulations is initiated in an effort to confirm the initial result. If confirmed, further action may be recommended by the Medical Officer of Health. If not confirmed, sampling will typically return to the normal schedule, or depending on the parameter, Utilities Kingston may choose to increase the sampling frequency to more closely monitor the parameter for a period of time. The groundwater supply for the Cana Water Treatment System contains a sodium concentration greater than 20 mg\l which requires a notification to the Medical Officer of Health and to the Spills Action Center if a report under subsection 18 (1) of the Safe Drinking Water Act has not been made in respect of sodium in the preceding 57 months. This notification was last completed in April 2013.

There were NO incidents which required notification during this reporting period.

4. Definition & Terms

TCU - True Colour Units

mg - milligram

N/A - Not Applicable

N/D - Non -Detectable

NTU - Nephelometric Turbidity Units - A measure of the amount of particles in water.

mg/l - Milligrams per litre. This is a measure of the concentration of a parameter in water, also called parts per million (ppm).

µg/L - Micrograms per litre, also called parts per billion.

ng/l - Nanograms per litre, parts per trillion.

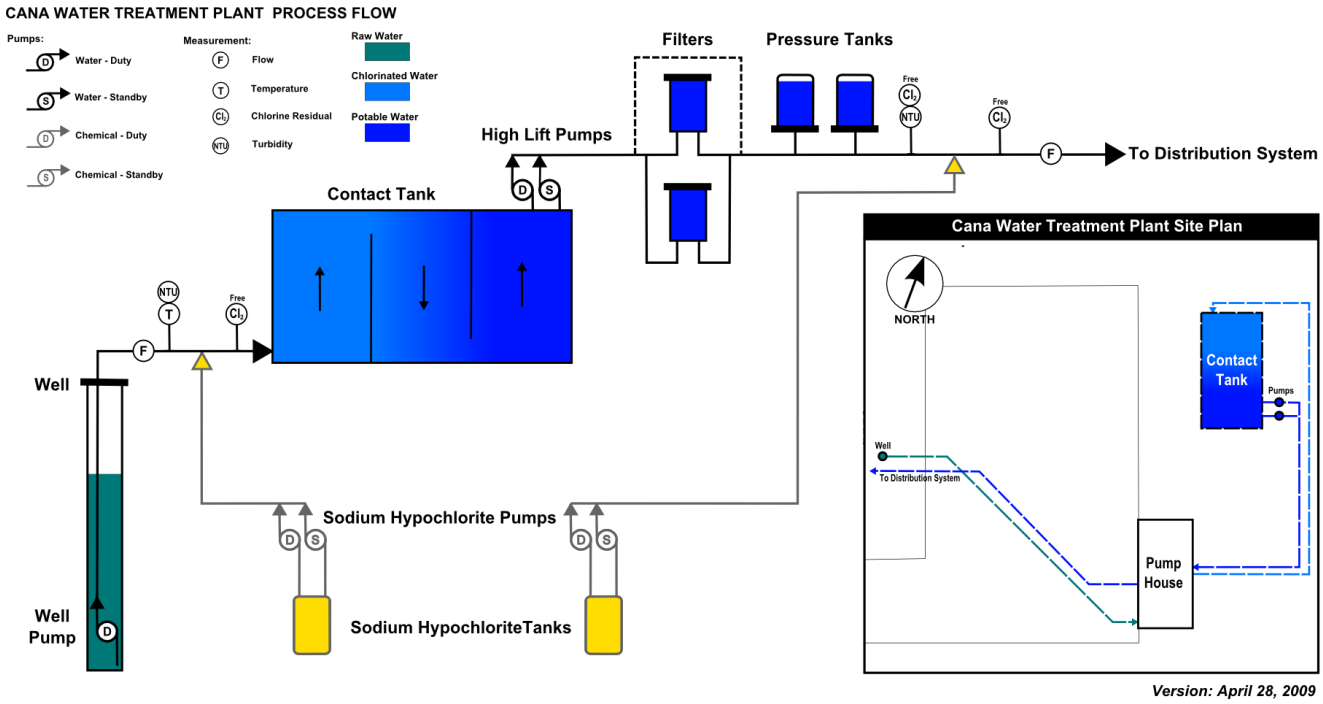
Parameter-A substance that we sample and analyze for in the water.

AO - Aesthetic objective. AOs are not health related, but may affect the taste, odour, colour or clarity of the water

OG - Operational guideline. Set to ensure efficient treatment and distribution of water.

MAC - Maximum Acceptable Concentration. This is a health-related drinking water standard established for contaminants having known or suspected adverse health effects when above a certain concentration. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter.

5. Flow Diagram



Paraquat	10	1	<1	µg/L	No	Agricultural/ Aquatic herbicide
Pentachlorophenol	60	1	<0.1	µg/L	No	Pesticide/ wood preservative residue
Phorate	2	1	<0.3	µg/L	No	Agricultural insecticide
Picloram	190	1	<5	µg/L	No	Industrial herbicide
Polychlorinated Biphenyls(PCB)	3	1	<0.05	µg/L	No	Residue from various industrial uses
Prometryne	1	1	<0.1	µg/L	No	Agricultural herbicide
Simazine	10	1	<0.5	µg/L	No	Agricultural herbicide or its residue
Terbufos	1	1	<0.3	µg/L	No	Agricultural insecticide
2,3,4,6-Tetrachlorophenol	100	1	<0.1	µg/L	No	Wood preservative
Total Kjeldahl Nitrogen	N/A	1	<0.1	mg/l	No	Indicator of organic contamination or the potential for taste and odour problems.
Total Trihalomethanes (NOTE: show latest annual average)	100	1	13.3	µg/L	No	By-product of chlorination. * The MAC for THMs of 100 µg/L is based on a running annual average.
Triallate	230	1	<10	µg/L	No	Agricultural herbicide
2,4,6-Trichlorophenol	5	1	<0.1	µg/L	No	Pesticide manufacturing
Trifluralin	45	1	<0.5	µg/L	No	Agricultural herbicide

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Summary of additional treated water testing analyzed by accredited laboratories during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Colour	5	12	<2	TCU	No	Typically the result of organic matter in surface waters.
Conductivity	N/A	1	1,280	Us/cm	No	A measure of ability of water to carry an electric current due to the presence of ions.

Summary of distribution drinking water inorganic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Alkalinity (as $CaCO_3$)	N/A	4	338 – 357	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Aluminum	0.1 OG	1	0.03	mg/l	No	May be naturally present or a residual from the coagulation process.
Barium	1.0	1	0.192	mg/l	No	Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes.
Boron	5.0	1	0.075	mg/l	No	Erosion of natural deposits, industrial waste effluents.
Calcium	N/A	1	102	mg/l	No	Naturally occurring.
Chromium	0.05	1	<0.002	mg/l	No	Industrial residues
Copper	1 OG	1	0.022	mg/l	No	Domestic plumbing (Aesthetic objective)
Cyanide	0.2	1	<0.005	mg/L	No	Cyanide is used in the metal plating and refining industry, industrial effluents are

						potential sources of cyanide contamination
Fluoride	1.5	2	0.4	mg/l	No	Naturally occurring.
Hardness	100 OG	1	453	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
Iron	0.3 AO	1	<0.005	mg/l	No	Leaching from natural deposits and plumbing materials, industrial wastes. (Aesthetic objective)
Lead	0.01	1	<0.00118	mg/l	No	Internal corrosion of household plumbing, erosion of natural deposits.
Manganese	0.05 AO	1	0.010	mg/l	No	Erosion of natural deposits.
Sodium	20	1	79.7	mg/l	No	Occurs naturally in the earth's crust.
Zinc	5	1	0.006	mg/l	No	An inorganic constituent that may cause tastes.

Summary of distribution drinking water organic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Benzene	5	1	<0.5	µg/L	No	Discharge from plastics manufacturing, leaking fuel tanks
Benzo(a)pyrene	0.01	1	<0.005	µg/L	No	Formed from the incomplete burning of organic matter.
Carbon Tetrachloride	5	1	<0.2	µg/L	No	Discharge from chemical and industrial activities
Chlorobenzene	80	1	<0.2	µg/L	No	Discharge from industrial and agricultural chemical factories and dry cleaning facilities

1,1-Dichloroethylene (vinylidene chloride)	14	1	<0.1	µg/L	No	Discharge from industrial chemical factories
1,2-Dichlorobenzene	200	1	<0.1	µg/L	No	Discharge from industrial chemical factories
1,2-Dichloroethane	5	1	<0.1	µg/L	No	Discharge from industrial chemical factories
1,4-Dichlorobenzene	5	1	<0.2	µg/L	No	Discharge from industrial chemical factories
Dichloromethane	50	1	<0.3	µg/L	No	Discharge from pharmaceutical and chemical factories
Dioxin & Furan (TEQ)	0.000000015	1	0	mg/l	No	Dioxins are formed in combustion of chlorine containing materials such as scrap tires and industrial processes such as bleached paper manufacturing
Nitrilotriacetic acid / NTA	N/A	1	< 0.03	mg/l	No	Used in laundry detergents
N-Nitrosodimethylamine / NDMA	0.000009	1	< 0.0000008	mg/L	No	Rarely used industrially but has been used as an antioxidant, and an additive for lubricants
Total Trihalomethanes (NOTE: show latest annual average)	100	4	18.73	µg/L	No	By-product of chlorination. * The MAC for THMs of 100 µg/L is based on a running annual average.
Trichloroethylene	5	1	<0.1	µg/L	No	Discharge from metal degreasing sites and other factories
Vinyl Chloride	2	1	<0.2	µg/L	No	Leaching from PVC pipes; discharge from plastics factories

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Summary of additional distribution drinking water analyzed by accredited laboratories during this reporting period

Parameter	MAC	Number of Samples	Result Value	Unit of Measure	Exceedance	Parameter Description
Gross Alpha	0.5	1	0.21	Bq/L	No	Decay of natural deposits.
Gross Beta	0.5	1	0.15	Bq/L	No	Decay of natural deposits.
pH	6.5–8.5 OG	4	7.66 – 7.72		No	An indicator of the acidity of water.
Total Haloacetic acids	0.08	4	< 5.3	mg/L	No	By-product of drinking water disinfection with chlorine
Tritium	7000	1	<15	Bq/L	No	Decay of natural & man made deposits.

Summary of raw water testing analyzed by in house laboratory during this reporting period

Parameter	MAC	Number of Samples	Average Results	Unit of Measure	Exceedance	Parameter Description
Alkalinity	N/A	8	334	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Turbidity	N/A	41	0.194	NTU	No	Turbidity is a measure of particles in water.
Hardness	N/A	9	468	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
pH	N/A	41	7.38		No	An indicator of the acidity of water.

Summary of treated water testing analyzed by in house laboratory during this reporting period

Parameter	MAC	Number of Samples	Average Results	Unit of Measure	Exceedance	Parameter Description
Alkalinity	N/A	9	330	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Turbidity	N/A	41	0.317	NTU	No	Turbidity is a measure of particles in water.
Hardness	100 OG	8	483	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
pH	6.5–8.5 OG	40	7.40		No	An indicator of the acidity of water.