Attachment 'A'

The Ontario Ministry of the Environment, Conservation and Parks

Markham Distribution System

Drinking Water Inspection Report

February 03, 2021

Ministry of Environment, Conservation and Parks
Drinking Water and Environmental Compliance Division

Central Region

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Ontario

March 25th, 2021

City of Markham
101 Town Centre Blvd
Markham, On
L3R 9W3

Sent by Email: Theresa.lp@ontario.ca

Attention: Eddy Wu, Director, Environmental Services

RE: Markham Distribution System
Drinking Water Inspection Report # 1-NU8HS
File: SI YO MA TO 540A

Please find attached the Ministry of the Environment Conservation and Parks inspection report for the above facility. The report details the findings of the inspection conducted on February 03, 2021.

The Appendix section of the inspection includes the Stakeholder Appendix A with links to key reference and guidance materials available on the Ministry of the Environment Conservation and Parks (MECP) website. Appendix B contains the inspection rating record and an updated risk methodology memo. Appendix C includes information regarding HAA sampling procedures.

Please note the attached IRR methodology memo describing how the risk rating model has improved to better reflect the health related and administrative non-compliance found in an inspection report. IRR ratings are published (for the previous inspection year) in the Ministry's Chief Drinking Water Inspectors' Annual Report.

In the inspection report, any *"Actions Required"* are linked to incidents of non-compliance with regulatory requirements contained within the Act, a regulation, or site-specific approvals, licenses, permits, orders or instructions. Such violations could result in the issuance of mandatory abatement instruments including Orders, tickets, penalties, or referrals to the ministry's Investigations and Enforcement Branch.

"Recommended Actions" convey information that the owner or operating authority should consider implementing in order to advance efforts already in place to address such issues as emergency preparedness, the availability of information to consumers, and conformance with existing and emerging industrial standards. Please note that items which appear as recommended actions do not, in themselves, constitute violations.

Please note, you will find in the report that bullets are shown in bold print and are the consistent and standard responses to the information gathered during the inspection. Statements shown in regular font provide additional site-specific details.

Section 19 of the Safe Drinking Water Act (Standard of Care) creates a number of obligations for individuals who exercise decision-making authority over municipal drinking water systems. Please be aware that the Ministry has encouraged such individuals, particularly municipal councillors, to take steps to be better informed about the drinking water systems over which they have decision-making authority. These steps could include asking for a copy of this inspection report and a review of its findings. Further information about Section 19 can be found in *"Taking Care of Your Drinking Water: A guide for members of municipal council"* found under "Resources" on the Drinking Water Ontario website at https://www.ontario.ca/document/taking-care-your-drinking-water-guide-members-municipal-councils.

I would like to thank the City of Markham staff for the assistance afforded to me during this compliance assessment. If you have any questions or concerns please contact me or Demetra Koros, Water Supervisor, Central Region at 905-409-0496.

Yours truly,

Theresa Ip

Theresa Ip
Water Inspector
Drinking Water and Environmental Compliance Division
Ministry of the Environment Conservation and Parks
Phone: (905) 449-9562

ec:

Becky Hester, Manager of Environmental Health, York Region Health Department
Helena Frantzke, Water Quality Coordinator, City of Markham
Mario Puopolo, Waterworks Supervisor, City of Markham
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Don Ford, Senior Manager, Hydrogeology, Toronto and Region Conservation Authority
Demetra Koros, Water Supervisor, York-Durham District Office, MECP

Ontario

Ministry of the Environment, Conservation and Parks

MARKHAM DISTRIBUTION SYSTEM

Inspection Report

Site Number:	220004162
Inspection Number:	1-NU8HS
Date of Inspection:	Feb 03, 2021
Inspected By:	Theresa Ip

Ontario

Ministry of the Environment, Conservation and Parks
Drinking Water Inspection

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OWNER INFORMATION:

Company Name: MARKHAM, THE CORPORATION OF THE CITY OF
Street Number: 101 **Unit Identifier:**
Street Name: TOWN CENTRE Blvd N
City: MARKHAM
Province: ON **Postal Code:** L3R 9W3

CONTACT INFORMATION

Type: Main Contact **Name:** Helena Frantzke
Phone: (905) 477-7000 **Fax:** (905) 475-4732
Email: hfrantzke@markham.ca
Title: Compliance Coordinator

Type: Supervisor **Name:** Peter Solymos
Phone: (905) 477-7000 **Fax:**
Email: psolymos@markham.ca
Title: Supervisor, waterworks

INSPECTION DETAILS:

Site Name: MARKHAM DISTRIBUTION SYSTEM
Site Address: 101 TOWN CENTRE Boulevard North MARKHAM ON L3R 9W3
County/District: MARKHAM
MECP District/Area Office: York-Durham District
Health Unit: YORK REGION HEALTH SERVICES DEPARTMENT
Conservation Authority:
MNR Office:
Category: Large Municipal Residential
Site Number: 220004162
Inspection Type: Special Unannounced
Inspection Number: 1-NU8HS
Date of Inspection: Feb 03, 2021
Date of Previous Inspection: Jan 29, 2020

COMPONENTS DESCRIPTION

Site (Name): MOE DWS Mapping
Type: DWS Mapping Point **Sub Type:**

Site (Name): Markham Operation Office
Type: Other **Sub Type:** Other
Comments:
The Markham Distribution System is owned and operated by the City of Markham, and receives treated water from the City of Toronto and the Region of Peel. The trunk transmission lines, pumping stations, and water storage facilities located within the City of Markham are owned and operated by the Region of York. The Region of York

measures and monitors the distribution water flows and volumes directed to the City of Markham through the use of nineteen (19) flow meters located along the Richmond Hill, Vaughan, Stouffville, Toronto and Markham boundaries.

The Markham Distribution System provides potable water to approximately 350,000 residents of Markham and consists of approximately 1,092 km of watermains, 8,803 hydrants, 11,239 valves, and 83,116 service connections.

INSPECTION SUMMARY:

Introduction

- **The primary focus of this inspection is to confirm compliance with Ministry of the Environment, Conservation and Parks (MECP) legislation as well as evaluating conformance with ministry drinking water policies and guidelines during the inspection period.**

  This drinking water system is subject to the legislative requirements of the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation 170/03, "Drinking Water Systems" (O. Reg. 170/03). This inspection has been conducted pursuant to Section 81 of the SDWA.

  This report is based on an inspection of a "stand alone connected distribution system" and was conducted remotely. This type of system receives treated water from a separately owned "donor" system. This report contains elements required to assess key compliance and conformance issues associated with a "receiver" system. This report does not contain items associated with the inspection of the donor system, such as source waters, intakes/wells and treatment facilities.

  This inspection report does not suggest that all applicable legislation and regulations were evaluated. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

  Drinking Water Inspector Theresa Ip began an unannounced inspection of the Markham Distribution System on February 3, 2021. This report is based on a "detailed" inspection of the system and was conducted virtually as result of the declaration of emergency (O.Reg. 11/21: Stay-at-Home Order) made on January 12, 2021.

  The City of Markham (The City) owns and operates this drinking water system. The City receives treated water from the City of Toronto and the Region of Peel. York Region provides water storage and pressure boosting to the City and acts as a wholesaler of the water to the system. The City of Toronto, Region of Peel and York Region treatment and distribution systems were inspected separately from the Markham Distribution System.

  The inspection review period is from January 29, 2020 to February 3, 2021.

  The inspection included a compliance assessment of applicable Ministry of the Environment, Conservation and Parks (MECP) legislation, an inspection of the procedures used within the system and a review of records. Documents reviewed in association with this report included, but were not limited to:

  1) MECP Municipal Drinking Water Licence (the Licence) number 021-101; Issue 8, dated July 19, 2019;
  2) MECP Drinking Water Works Permit (the Permit) number 021-201; Issue 4, dated July 19, 2019; and
  3) Other documents maintained by the owner/ operating authority were also reviewed in conjunction with this report.

Treatment Processes

- **The owner had ensured that all equipment was installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit.**

  Schedule A of the Permit (DWWP #21-201) contains the following physical components:

  - watermains within the City of Markham - Markham Distribution System

- **The owner/operating authority was in compliance with the requirement to prepare Form 1 documents as required by their Drinking Water Works Permit during the inspection period.**

Treatment Processes

During the inspection review period, four (4) "Form 1 - Record of Watermains Authorized as a Future Alteration" forms were prepared and reviewed.

- **Where an activity has occurred that could introduce contamination, all parts of the drinking water system were disinfected in accordance with Schedule B, Condition 2.3 of the Drinking Water Works Permit.**

  Work Instruction (WI) Operations & Maintenance (O&M) 4.1.00 Revision 12.0, dated July 30, 2019 for Watermain Repairs and/or Modifications was provided for review during the inspection. Prior to the finalization of this Inspection Report, Revision 13.0, dated February 26, 2021 was finalized and provided for review. Revision 13.0 appears to satisfy the Watermain Disinfection Procedure.

  Log Breaks & Repairs Cut Sheets were provided for review. During the inspection review period, there was one (1) Category 2 watermain break and eleven (11) Category 1 watermain breaks.

- **The owner had evidence indicating that all chemicals and materials that come in contact with water within the drinking water system met the AWWA and ANSI standards in accordance with the Municipal Drinking Water Licence and Drinking Water Works Permit issued under Part V of the SDWA.**

  The standard operating procedures (SOP) regarding supplies, equipment and materials were provided for review. Distribution piping and pipe fittings of new watermains appear to meet the requirements of Condition 14 of Schedule B of the Licence.

Treatment Process Monitoring

- **The secondary disinfectant residual was measured as required for the distribution system.**

  The Markham Distribution System serves a population of 349,007, according to the current drinking water system profile. The system is classified as a large municipal residential drinking water system and the owner and operating authority for the system must ensure that at least seven distribution samples are taken each week and are tested immediately for free and total chlorine residual.

  Distribution chlorine residuals are measured by two continuous on-line analyzers recording results every 2 minutes. In addition, operation staff collect grab samples each week using a hand-held unit when conducting microbiological sampling, weekly dead end hydrant flushing, and when there are watermain breaks.

  Free and Total chlorine residual test results are recorded in the dead end flushing logs, Work Order log sheets and logbooks.

- **Operators were examining continuous monitoring test results and they were examining the results within 72 hours of the test.**

  A report is generated every Monday morning, and on Wednesday and Friday afternoons and provided to all the Overall Responsible Operators (OROs) for review. Daily residual activity logs are also generated and reviewed each day.

- **Samples for chlorine residual analysis were tested using an acceptable portable device.**

  During the inspection, an operator completed Work Order No. 765789 to demonstrate the verification of the chlorine analyzer at 8100 Warden Avenue. The ORO assisting with the inspection confirmed that the chlorine residual analysis was performed with an electronic direct read-out colourimetric chlorine analyzer. The read-out on the device was shown during the inspection along with the readings on the on-line analyzers.

- **All continuous monitoring equipment utilized for sampling and testing required by O. Reg.170/03, or Municipal Drinking Water Licence or Drinking Water Works Permit or order, were equipped with alarms or shut-off mechanisms that satisfy the standards described in Schedule 6.**

Treatment Process Monitoring

The minimum chlorine residual required to achieve disinfection at the Markham Distribution System is 0.25 mg/L.

The minimum chlorine alarm (low-low) is set at 0.25 mg/L and the low chlorine alarm is set at 0.40 mg/L. The maximum chlorine alarm (high-high) is set to 3.00 mg/L and the high alarm is set to 2.10 mg/L.

If there is a continuous chlorine analyzer failure, an alarm will be sent to the SCADA standby phone. The SCADA standby operator will access the SCADA laptop or SCADA computer located in the Mezzanine office and notify a Supervisor of the findings.

- **Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and recording data with the prescribed format.**

  Secondary disinfectant residual is measured by two on-line analyzers and recorded continuously every 2 minutes.

  The date and time are recorded with every test result.

- **All continuous analysers were calibrated, maintained, and operated, in accordance with the manufacturer's instructions or the regulation.**

  The accuracy of the continuous on-line chlorine analyzer are verified by the operation staff every Monday, Wednesday and Friday through the collection of grab samples and comparison of the test results to the analyzer readings.

  During the inspection, an Operator demonstrated chlorine analyzer verification with total and free chlorine grab samples.

  The test results of the verification checks, the time of the verification and any required adjustments to the on-line analyzer were recorded in the log sheets and/or work Orders.

  In addition, the online chlorine analyzers are calibrated yearly by Hach. Calibration records reviewed show that the analyzers were last conducted on July 21, 2020.

Distribution System

- **The owner had up-to-date documents describing the distribution components as required.**

  Water Distribution System Mapping, dated September 2020, was provided for review during the inspection.

- **There is a backflow prevention program, policy and/or bylaw in place.**

  The City of Markham has By-Law #2012-27 that sets out a backflow prevention program that applies to all existing and future properties and any property that may be hazardous or detrimental to the drinking water system. The by-law further prohibits cross connections and requires a cross connection survey report of the plumbing system of properties to which the by-law applies.

- **The owner had implemented a program for the flushing of watermains as per industry standards.**

  WI O&M 3.2.01 Flushing of Dead-End Watermains, Revision 5.0, dated January 4, 2019 was provided for review during the inspection and describes weekly activity related to dead-end watermain flushing.

- **Records confirmed that disinfectant residuals were routinely checked at the extremities and "dead ends" of the distribution system.**

  Chlorine residual records for tests conducted using hand-held devices during the inspection review period were provided for review and indicated that chlorine residuals are routinely checked during dead-end watermain flushing

Distribution System

activities.

- **A program was in place for inspecting and exercising valves.**

  WI O&M 4.2.05 Main Line Valve Inspection, Revision 3.0, dated August 14, 2017 was provided for review during the inspection and describes valve inspection procedures to ensure that in the even of an emergency, valves are operational with minimal delay or damage. All valves in the system are exercised and inspected within a 4 year cycle.

  WI O&M 4.3.02 Valve Inspection & Exercising and Data Collection, Revision 1.0, dated January 26, 2010 was provided for review during the inspection and describes the procedures to ensure that in the event of an emergency, valves can be operated with minimal delay or damage.

- **There was a program in place for inspecting and operating hydrants.**

  WI O&M 4.2.01.01 Hydrant Inspection (Winter), Revision 3.0, dated August 14, 2017 was provided for review during the inspection and describes annual hydrant maintenance to prevent hydrants from freezing and to minimize internal leakage. This is conducted annually from September to March.

  WI O&M 4.2.01.02 Annual Hydrant Inspection (Spring), Revision 2.0, dated April 14, 2011 was provided for review during the inspection and describes annual hydrant inspections to maintain fire fighting readiness. This work begins each year in April.

- **There was a by-law or policy in place limiting access to hydrants.**

  City of Markham By-Law #2012-242 prohibits the operation or taking of water from any City owned hydrant without lawful authority.

- **The owner was able to maintain proper pressures in the distribution system and pressure was monitored to alert the operator of conditions which may lead to loss of pressure below the value under which the system is designed to operate.**

  Watermain break logs and water pressure/ flow inquiries were reviewed. At the time of the inspection, it was noted that the City is made aware of pressure fluctuations by complaints or inquires from business owners and the public. During regular business hours, the Supervisor dispatches an operator to respond. During the afterhours, an on-call operator is dispatched directly.

  The City also works with the upper tier municipality of York Region (the Region) to identify pressure issues as the Region monitors pressure at the reservoir. The Region also monitors pressure at revenue meter locations on the transmission lines at the jurisdiction boundaries. Water to Markham flows through the revenue meters.

  Please see the section below entitled "SUMMARY OF RECOMMENDATIONS AND BEST PRACTICE ISSUES".

Operations Manuals

- **Operators and maintenance personnel had ready access to operations and maintenance manuals.**

  Operators access the Operations and Maintenance Manual electronically on tablets through the Intelex program. Each operator has a unique password to access the program.

- **The operations and maintenance manuals contained plans, drawings and process descriptions sufficient for the safe and efficient operation of the system.**

- **The operations and maintenance manuals met the requirements of the Drinking Water Works Permit and Municipal Drinking Water Licence issued under Part V of the SDWA.**

Operations Manuals

Section 16.2 of the Municipal Drinking Water Licence states that the operations and maintenance manual shall include at a minimum:

16.2.1 The requirements of this licence and associated procedures;
16.2.2 The requirements of the drinking water works permit for the drinking water system;
16.2.3 A description of the processes used to achieve secondary disinfection within the drinking water system;
16.2.4 Procedures for monitoring and recording the in-process parameters necessary for the control of any treatment subsystem and for assessing the performance of the drinking water system;
16.2.5 Procedures for the operation and maintenance of monitoring equipment;
16.2.6 Contingency plans and procedures for the provision of adequate equipment and material to deal with emergencies, upset conditions and equipment breakdown;
16.2.7 Procedures for dealing with complaints related to the drinking water system, including the recording of the nature of the complaint and any investigation and corrective action taken in respect of the complaint;

The City of Markham QMS Representative maintains all controlled electronic documents. The electronic documents are available to all operators. To ensure all controlled documents are up-to-date, each document undergoes an annual review.

The system maintains an electronic document management system (Intelex) that contain information for the operation and maintenance of water. All operators have access to this.

System Level Documents, Standard Operating Procedures and Work Instructions were provided for review and meet the requirements of Section 16.2 of Schedule B of the Licence.

Logbooks

- **Records or other record keeping mechanisms confirmed that operational testing not performed by continuous monitoring equipment was being done by a certified operator, water quality analyst, or person who suffices the requirements of O. Reg. 170/03 7-5.**

  Records of combined chlorine residuals taken using hand-held devices during the inspection review period were provided for review and indicate that operational checks and tests for combined chlorine residual in the distribution system that was not performed by the continuous chlorine analyzers were conducted by certified operators.

- **For every required operational test and every required sample, a record was made of the date, time, location, name of the person conducting the test and result of the test.**

  Records, logs and chain of custody forms were reviewed and show that distribution system chlorine residuals measured by hand-held instruments were recorded along with the operator's name.

  All operators working at the City of Markham Distribution System are appropriately certified to conduct operational tests.

- **Logs or other record keeping mechanisms were available for at least five (5) years.**

  The System has a storage facility and record-keeping system to keep track of logs and other records for at least five (5) years. The record-keeping procedure is detailed in the System Level Document 5b - Control of Records, dated February 18, 2020.

Security

- **The owner had provided security measures to protect components of the drinking water system.**

Security

City of Markham has an automated water station located at 555 Miller Avenue. Pre-paid water access fob keys can be purchased. Commercial water suppliers or contractors can hook up to the water station 24 hours a day.

Backflow Prevention Bylaw 2012-27 is in place, the city reduces the chance of water contamination through backflow incidents at cross connections.

Bulk water can also be used from a fire hydrant if a permit is obtained (Water Bylaw 2019-53 was reviewed).

Consumer Relations

- **The owner and/or operating authority undertook efforts to promote water conservation and reduce water losses in their system.**

  Usage reports from the fire department, estimated volume for dead end flushing and other activities comprise tracking of unaccounted water. A consultant was also hired to conduct leak detection on hydrants and valves in district metering areas to estimate leaks in certain areas. Using the information from the consultants leak detection exercise, the City is able to consider the potential for a replacement program or pressure modulation as part of efforts reduce water losses in the system.

Certification and Training

- **The overall responsible operator had been designated for each subsystem.**

  The System Level Document (SLD) 11, Revision 8.0, dated March 16, 2020 for Personnel Coverage sets out the procedure and process for ensuring sufficient personnel are available to perform the operation and maintenance activities required by the Waterworks Department. This document designates the Operations and Maintenance Manager as the Overall Responsible Operator (ORO) while the Waterworks Supervisors are assigned as standby ORO on a rotational basis.

- **Operators-in-charge had been designated for all subsystems which comprised the drinking water system.**

  SLD 11, Revision 8.0, dated March 16, 2020 for Personnel Coverage further designates Waterworks Operators Class 1 and higher as Operator-in-Charge (OICs) during regular business hours and afterhours.

- **All operators possessed the required certification.**

  A review of certification records provided by the City and the Operator Listing Report on the Ontario Water Wastewater Certification Office (OWWCO) website confirm that all operators possess valid certification.

- **An adequately licenced operator was designated to act in place of the overall responsible operator when the overall responsible operator was unable to actr**

  Standby Lists for 2020 and 2021 showing staff coverage on a rotational basis were provided for review, along with a copy of the Waterworks Standby Form demonstrating which staff are on standby and how calls are to be made to the standby staff. This includes coverage for OROs and OICs.

Water Quality Monitoring

- **All microbiological water quality monitoring requirements for distribution samples were being met.**

  The City of Markham Distribution System serves an estimated population of 349,007 people; therefore, 134 samples are required to be obtained monthly as a minimum requirement from within the distribution system. These samples are required to be tested for E. Coli (EC) and total coliforms (TC); and at least 25 percent of the samples are required to be tested for general bacteria populations expressed as colony counts on a heterotrophic plate count (HPC).

Water Quality Monitoring

- **All haloacetic acid water quality monitoring requirements prescribed by legislation are being conducted within the required frequency and at the required location.**

  As of January 1, 2020, the Ontario standard for haloacetic acid (HAA) is 80 ug/L, expressed as a Running Annual Average (RAA) of quarterly testing results.

  A review of sample results for the inspection period indicate that HAAs were sampled on February 11, 2020; May 26, 2020; August 25, 2020; and November 26, 2020.

  The lab reporting limit for HAAs is <5.3 ug/L. Lab results reviewed indicate that sample results were always less than 5.3 ug/L.

  The RAA for the City of Markham is 5.3 ug/L.

  The HAA sampling was taken at various locations in the distribution system.

- **All trihalomethane water quality monitoring requirements prescribed by legislation were conducted within the required frequency and at the required location.**

  Section 13-6 of Schedule 13 of O.Reg. 170/03 requires the owner and operating authority for the system to ensure that at least one water sample is collected every three months from points in the distribution system likely to have an elevated potential for the formation of trihalomethanes (THMs).

  As of January 1, 2016, the Ontario standard for THMs is 100 ug/L, expressed as a Running Annual Average (RAA) of quarterly testing results.

  A review of the sample results for the inspection period indicate that THMs were sampled for on February 11, 2020 (average 12.92 ug/L); May 26, 2020 (average 12.17 ug/L); August 25, 2020 (average 9.3 ug/L); and November 26, 2020 (average 11.17 ug/L).

  Twelve (12) THM samples each quarter were confirmed to be sampled at a variety of locations throughout the distribution system that included locations nearer to the point of entry to the distribution system, the middle and the end.

  The RAA is 11.39 ug/L.

- **The owner ensured that water samples were taken at the prescribed location.**

  A review of the Regulatory Sampling Schedule, chain of custody forms, 2020 and 2021 Sampling Station Maps, and Water Distribution Map, dated September 2020 indicate that samples are being taken at the appropriate locations.

- **All water quality monitoring requirements imposed by the MDWL or DWWP issued under Part V of the SDWA were being met.**

  In addition to other sampling, testing and monitoring, Condition 1 of Schedule C of MDWL 021-101 Issue 8 dated July 22, 2019 requires the following:

  Quarterly samples of Nitrosodimethylamine to be taken from the farthest point in the distribution system.

  The highest sample recorded result is 0.0031 ug/L. The Ministry standard is 0.009 ug/L.

  Additionally, Schedule D of MDWL 021-101 Issue 8 dated July 22, 2019 provides regulatory relief for lead sampling.

Water Quality Monitoring

In place of regulatory requirements as per Schedule 15.1 of O.Reg. 170/03, the owner is required to collect and test for lead at ten (10) sampling points in the distribution system, including Alkalinity and pH each year during each sampling period.

This is in effect for the December 15, 2019 to April 15, 2020; June 15, 2020 to October 15, 2020; and December 15, 2020 to April 15, 2021 sampling periods.

Data reviewed during the inspection period confirmed that the System sampled and tested as per the Licence on March 11, 2020 and July 21, 2020.

- **All sampling requirements for lead prescribed by schedule 15.1 of O. Reg. 170/03 were being met.**

  The System has relief from regulatory requirements for lead sampling as required by Schedule 15.1 of O.Reg. 170/03. Tables one (1), two (2), and three (3) of Schedule D of the Licence, outlines the lead sampling requirements for the System.

  The owner/operator is required to collect lead samples from ten (10) locations in the distribution system between the dates of:
  December 15, 2017 to April 15, 2018;
  June 15, 2018 to October 15, 2018;
  December 15, 2018 to April 15, 2019;
  June 15, 2019 to October 15, 2019;
  December 15, 2019 to April 15, 2020;
  June 15, 2020 to October 15, 2020; and,
  December 15, 2020 to April 15, 2021.

  At the time of the inspection, lead sample results show that the required amount of lead samples were collected according to sampling procedures on the following dates:
  March 11, 2020; and,
  July 21, 2020.

- **Records confirmed that chlorine residual tests were being conducted at the same time and at the same location that microbiological samples were obtained.**

  A review of chain of custody forms confirms this.

- **The owner indicated that the required records are kept and will be kept for the required time period.**

  It was confirmed with the Water Quality Coordinator and in the System Level Document 5b - Control of Records, dated February 18, 2020 that required records are kept for the required time period as prescribed in Section 13(1)-(3) of O.Reg. 170/03.

Water Quality Assessment

- **Records did not show that all water sample results taken during the inspection review period did not exceed the values of tables 1, 2 and 3 of the Ontario Drinking Water Quality Standards (O.Reg. 169/03).**

  During the inspection review period, there were eleven (11) adverse water quality test results. Eight (8) test results indicated a presence of Total coliforms or a result of more than 0 Total coliform colonies. Two (2) test results indicated a non-detect overgrown result for possible Total coliforms and one (1) test result indicated a non-detect overgrown result where Total coliforms or E. coli could not be distinguished. The Ontario Drinking Water Quality Standard for Total coliforms and E. coli is non-detectable.

  Resamples were collected and corrective actions were taken for all adverse test results until results met the Ontario

Water Quality Assessment

Drinking Water Quality Standards for microbiological parameters.

Reporting & Corrective Actions

- **Corrective actions (as per Schedule 17) had been taken to address adverse conditions, including any other steps that were directed by the Medical Officer of Health.**

  A review of Section 2A - Written Notice by Drinking Water System and Section 2B - Notice of Issue Resolution paperwork submitted by the System to the Ministry indicates that corrective actions were taken as per Schedule 17 of O.Reg. 170/03, and as directed by the Medical Officer of Health.

- **All required notifications of adverse water quality incidents were immediately provided as per O. Reg. 170/03 16-6.**

  A review of Section 1 - Written Notice by Licensed Laboratory and Section 2A - Written Notice by Drinking Water System paper submitted by the System and lab to the Ministry indicates that verbal notifications were provided as per Schedule 16-6 of O.Reg. 170/03.

- **All required written notices of adverse water quality incidents were provided as per O. Reg. 170/03 16-7.**

  A review of Section 2A - Written Notice by Drinking Water System paper submitted by the System to the Ministry indicates that all required written notices of adverse water quality incidents were provided as per Schedule 16-7 of O.Reg. 170/03.

- **In instances where written notice of issue resolution was required by regulation, the notice was provided as per O. Reg. 170/03 16-9.**

  A review of Section 2B - Notice of Issue Resolution paperwork submitted by the System to the Ministry indicates that written notice of issue resolution was provided as per Schedule 16-9 of O.Reg. 170/03.

- **Where required continuous monitoring equipment used for the monitoring of chlorine residual and/or turbidity triggered an alarm or an automatic shut-off, a qualified person responded in a timely manner and took appropriate actions.**

  The chlorine analyzer alarm report, logbook entries, and a current staff signature page; which includes the operator's name, call number, initials and signature, were provided for review. The information provided indicates that where an there was an event triggering an alarm, the alarm was acknowledged and a certified operator responded in a timely manner.

- **Summary Reports for municipal council were completed on time, included the required content, and were distributed in accordance with the regulatory requirements.**

  Confirmation of the 2019 Annual Water Quality Report being presented to Council on March 30, 2020 was provided for review.

- **All changes to the system registration information were provided within ten (10) days of the change.**

  On January 25, 2021, the Water Quality Coordinator submitted an updated Drinking Water System Profile Information form to the Ministry to update on population and information for key contacts at the City.

Other Inspection Findings

- **The following issues were also noted during the inspection:**

  Watermain break logs and water pressure/ flow inquiries were reviewed. At the time of the inspection, it was noted that the City is made aware of pressure fluctuations by complaints or inquires from business owners and the public. During regular business hours, the Supervisor dispatches an operator to respond. During the afterhours, an on-call operator is dispatched directly.

Other Inspection Findings

The City also works with the upper tier municipality of York Region (the Region) to identify pressure issues as the Region monitors pressure at the reservoir. The Region monitors pressure at revenue meter locations on the transmission lines at the jurisdiction boundaries. Water to Markham flows through the revenue meters.

NON-COMPLIANCE WITH REGULATORY REQUIREMENTS AND ACTIONS REQUIRED

This section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues. Further details pertaining to these items can be found in the body of the inspection report.

Not Applicable

SUMMARY OF RECOMMENDATIONS AND BEST PRACTICE ISSUES

This section provides a summary of all recommendations and best practice issues identified during the inspection period. Details pertaining to these items can be found in the body of the inspection report. In the interest of continuous improvement in the interim, it is recommended that owners and operators develop an awareness of the following issues and consider measures to address them.

1. **The following issues were also noted during the inspection:**
   Watermain break logs and water pressure/ flow inquiries were reviewed. At the time of the inspection, it was noted that the City is made aware of pressure fluctuations by complaints or inquires from business owners and the public. During regular business hours, the Supervisor dispatches an operator to respond. During the afterhours, an on-call operator is dispatched directly.

   The City also works with the upper tier municipality of York Region (the Region) to identify pressure issues as the Region monitors pressure at the reservoir. The Region monitors pressure at revenue meter locations on the transmission lines at the jurisdiction boundaries. Water to Markham flows through the revenue meters.

   Recommendation:

   It is recommended that the City create a standard operating procedure (SOP) that can capture the water pressure flow complaint and inquiry processes.

SIGNATURES

Inspected By:

Theresa Ip

Signature: (Provincial Officer)

Theresa Ip

Reviewed & Approved By:

Demetra Koros

Signature: (Supervisor)

D Koros

Review & Approval Date:

March 25, 2021

Note: This inspection does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they apply or may apply to this facility. It is, and remains, the responsibility of the owner and/or operating authority to ensure compliance with all applicable legislative and regulatory requirements.

Ontario

APPENDIX A

STAKEHOLDER APPENDIX

March 2019

Key Reference and Guidance Material for Municipal Residential Drinking Water Systems

Many useful materials are available to help you operate your drinking water system. Below is a list of key materials owners and operators of municipal residential drinking water systems frequently use.

To access these materials online click on their titles in the table below or use your web browser to search for their titles. Contact the Ministry if you need assistance or have questions at 1-866-793-2588 or waterforms@ontario.ca.

For more information on Ontario's drinking water visit www.ontario.ca/drinkingwater

PUBLICATION TITLE	PUBLICATION NUMBER
FORMS: Drinking Water System Profile Information Laboratory Services Notification Adverse Test Result Notification	
Taking Care of Your Drinking Water: A Guide for Members of Municipal Councils	
Procedure for Disinfection of Drinking Water in Ontario	
Strategies for Minimizing the Disinfection Products Trihalomethanes and Haloacetic Acids	
Filtration Processes Technical Bulletin	
Ultraviolet Disinfection Technical Bulletin	
Guide for Applying for Drinking Water Works Permit Amendments, & License Amendments	
Certification Guide for Operators and Water Quality Analysts	
Guide to Drinking Water Operator Training Requirements	
Community Sampling and Testing for Lead: Standard and Reduced Sampling and Eligibility for Exemption	
Drinking Water System Contact List	
Ontario's Drinking Water Quality Management Standard - Pocket Guide	
Watermain Disinfection Procedure	
List of Licensed Laboratories	

PIBS 8990b01

Ontario

Ontario

APPENDIX B

INSPECTION RATING RECORD

Ministry of the Environment - Inspection Summary Rating Record (Reporting Year - 2020-2021)

DWS Name:	MARKHAM DISTRIBUTION SYSTEM
DWS Number:	220004162
DWS Owner:	Markham, The Corporation Of The City Of
Municipal Location:	Markham
Regulation:	O.REG 170/03
Category:	Large Municipal Residential System
Type Of Inspection:	Standalone
Inspection Date:	February 3, 2021
Ministry Office:	York-Durham District

Maximum Question Rating: 404

Inspection Module	Non-Compliance Rating
Treatment Processes	0 / 47
Distribution System	0 / 4
Operations Manuals	0 / 42
Logbooks	0 / 22
Certification and Training	0 / 35
Water Quality Monitoring	0 / 71
Reporting & Corrective Actions	0 / 84
Treatment Process Monitoring	0 / 99
TOTAL	**0 / 404**

Inspection Risk Rating	**0.00%**

FINAL INSPECTION RATING:	**100.00%**

Inspection Rating Record Generated On 23-MAR-21 (Inspection ID: 1-NU8HS).

Ministry of the Environment - Detailed Inspection Rating Record (Reporting Year - 2020-2021)

DWS Name:	MARKHAM DISTRIBUTION SYSTEM
DWS Number:	220004162
DWS Owner:	Markham, The Corporation Of The City Of
Municipal Location:	Markham
Regulation:	O.REG 170/03
Category:	Large Municipal Residential System
Type Of Inspection:	Standalone
Inspection Date:	February 3, 2021
Ministry Office:	York-Durham District

Maximum Question Rating: 404

Inspection Risk Rating	**0.00%**
FINAL INSPECTION RATING:	**100.00%**

Inspection Rating Record Generated On 23-MAR-21 (Inspection ID: 1-NU8HS).

Ontario

APPENDIX C
HALOACETIC ACIDS (HAAs)

Ministry of the Environment,
Conservation and Parks

Compliance, Promotion
and Support Branch

2nd floor
40 St. Clair Ave West
Toronto ON M4V 1M2

ministère de l'Environnement, de
la Protection de la nature et des
Parcs

Direction de la promotion de la
conformité
et du soutien

2ième étage
40, avenue St. Clair Ouest
Toronto (Ontario) M4V 1M2

Ontario

August 1st, 2018

RE: Haloacetic Acids (HAAs) Sampling Concerns

Non-Municipal Year Round Residential Drinking Water System Owners/Operators,

The purpose of this document is to clarify ministry guidance for HAAs sampling. HAAs are disinfection by-products (DBPs) that are formed when dissolved organic matter reacts with chlorine which is added for the purpose of disinfection. Detailed information on HAAs can be found in "Health Canada (2008) Guidelines for Canadian Drinking Water Quality: Guideline Technical Document — Haloacetic Acids".

HAAs are a collection of several different compounds. The haloacetic acids most commonly found in drinking water are monochloroacetic acid (MCA), dichloroacetic acid (DCA), trichloroacetic acid (TCA), monobromoacetic acid (MBA) and dibromoacetic acid (DBA). Total HAAs is the sum of these five haloacetic acids. The HAAs most commonly found in the distribution system of drinking water systems are TCA and DCA. However the presence of bromide ions can result in the formation of MBA and DBA.

Sampling Points for HAAs

The ministry has recognized that more than one sampling location may be needed to characterize the HAAs levels throughout a distribution system. HAA concentrations can vary within and between distribution systems and so monitoring samples should be taken at points in the "middle" of the distribution system (i.e. an average water age, post re-chlorination). In light of the recently introduced HAAs standard of 80 µg/L, which will come in to force on January 1, 2020, the following guidance should be used in developing your monitoring program:

1. As a general rule, all samples described below should be obtained from a sampling point where the free (combined) chlorine residual concentration is maintained over 0.2 mg/L (1.0 mg/L) respectively.
2. First year of sampling: A system's established THM sampling point may be appropriate provided the chlorine concentrations are as described in item 1. If the residual is below the concentrations listed, use a nearby sampling point that meets the recommended residual.
3. Second year of sampling: obtain the sample from another point in the distribution system.
4. Third year of sampling:
    a. If neither of the running annual averages for HAAs calculated (after year one and two) were higher than one-half of the standard (40 µg/L), the sampling point used in the first year of sampling can be used for compliance in future years.
    b. If one of the running annual averages is over 40 µg/L, a third sampling point should be chosen using the same criteria as the second year. Subsequent sampling should be conducted from the point which had the highest individual sample result.

The outlined sampling plan is intended to be flexible and recognizes that sampling for HAAs has been required since 2017. The purpose of this plan is for an operator to understand their distribution system. It will also determine if there is an issue so any steps necessary can be taken to resolve the issue prior to the standard for HAAs coming into effect to avoid adverse water quality incidents for your system.

Factors influencing the creation of HAAs

The levels of DBPs formed depend on many water quality parameters and operating conditions. In the case of HAAs, higher precursor concentrations (synthetic and natural organic matter, bromide ion) in the raw water, chlorine dose, chlorination pH, water temperature and the residence time will influence the type (THMs, HAAs, etc.) and the levels of DBPs formed. Studies found that surface water sources are more likely to produce higher HAAs than ground water sources.

HAAs concentrations are found to be higher in the distribution system, usually just after the chlorination process. Health Canada studies performed in 2002 and 2003 indicated that concentration of HAAs peaked in the distribution system closer to the chlorine addition point and decreased in the extremities of the system. Furthermore, the location of peak HAA values in a distribution system tends to change throughout the year, it is likely to be closer to the chlorine addition point in the summer and fall and further away from the point in the winter and spring. Precipitation and runoff events can also affect DBPs.

Questions can be directed to: drinking.water@ontario.ca.

Scott McCharles on behalf of Cammy Mack
Director, Compliance, Promotion and Support Branch
Ministry of the Environment, Conservation and Parks