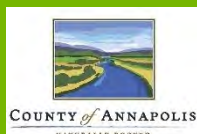






2023 Water System Assessment Report Granville Ferry

Final Report



230822.00 • September 2023

0	FINAL	BB	2023-09-13	ML
A	DRAFT	BB	2023-06-30	ML
Issue or Revision		Reviewed By:	Date	Issued By:
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September 13th, 2023

Jim Young, P.Eng.
Director of Municipal Operations
Municipality of the County of Annapolis
752 St. George Street
Annapolis Royal, NS B0S 1A0

Dear Mr. Young:

RE: *Granville Ferry Water System 2023 Water System Assessment Report*

Please find enclosed the 2023 System Assessment Report (SAR) for the Granville Ferry Water System completed by CBCL Limited (CBCL) on behalf of the Municipality of the County of Annapolis (MCA). This report includes the specific requirements of a SAR as outlined in the Nova Scotia Environment and Climate Change (NSECC) *Approval to Operate*.

Yours very truly,

CBCL Limited

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Project No: 230822.00

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1 Project

1.1 Introduction

The objective of this System Assessment Report (SAR) is to verify that the operation, supply, and distribution provided by this system complies with the environmental standards for safe drinking water as outlined in the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems* (June 2022). This report follows the Terms of Reference provided by the Nova Scotia Department of Environment and Climate Change (NSECC). In addition to verifying the required performance, this report will identify any sources of concern and provide appropriate recommendations.

The overall study area includes the source(s) and associated wellfield/watershed areas, along with pumping, treatment, distribution and storage infrastructure within the services areas; generally the communities of Granville Ferry, Lequille and a service area up to the Town of Annapolis Royal, which is supplied from the Granville Ferry system. The Municipality of the County of Annapolis (MCA) owns and operates the Granville Ferry Water System. Infrastructure included in the water system includes:

- ▶ Source water wellfield.
- ▶ Non-GUDI* source wells.
- ▶ Chlorination building.
- ▶ Transmission and distribution mains.
- ▶ Standpipe reservoir.

* GUDI= Groundwater under the direct influence of surface water.

1.2 Purpose

CBCL Limited (CBCL) has been engaged by MCA to complete the 2023 SAR to verify that the system meets the requirements to comply with the current standards outlined by NSECC. Previous SARs were completed in February 2004 and March 2013.

This report, prepared by CBCL, verifies that the system can:

- ▶ Meet current environmental standards, which are frequently updated and enhanced for public health protection.
- ▶ Meet the minimum requirements set out in the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*.
- ▶ Demonstrate performance with disinfection criteria.
- ▶ Demonstrate performance with turbidity criteria.

- ▶ Demonstrate that online equipment is in place and appropriately alarmed to continuously monitor chlorine residual, turbidity, and all parameters related to other primary disinfectants.
- ▶ Confirm that waste streams generated by treatment facilities are adequately managed.

This report is organised into the following four sections:

- 1 Characterization of the Water Source.
- 2 Treatment Processes, Facilities and Equipment.
- 3 Operations, Monitoring and Management.
- 4 Ability to Comply.

2 Characterization of the Water Source

This section of the SAR characterizes the source water for the system by reporting on the following:

- 1 Microbial Risks.
- 2 Chemical and Physical Risks.
- 3 Source Quantity.
- 4 Source Water Protection Plan (SWPP).

2.1 Source Water Description

The water system is supplied by two non-GUDI production wells (PW1 and PW3), which are located off Rifle Range Road, north of the community. The location of each well is shown on the Watershed Boundary Plan, presented in Appendix B. The area surrounding the wells is mostly undeveloped/forested, with a notable exception of a Canadian Forces Rifle Range which is along the access road to the wells, treatment and storage site. The production wells flow into a combined common pipe to a chlorination building where the water is dosed with sodium hypochlorite before flowing to a 910 m³ welded steel standpipe. The distribution system is fed by gravity from the standpipe. There is one test well (TW1) used for aquifer observation and one decommissioned well (PW2) located within the wellfield. Details for the production wells and observation well are summarized below in Table 2.1.

Table 2.1: Summary of Granville Ferrys Wells

Well	Parameter	Value
PW1	UTM (Easting)	299482
	UTM (Northing)	4959045
	UTM (Zone)	20
	Well Total Depth (m)	76.2
	Casing Depth (m)	24.4
	Diameter (mm)	203
	Screen Description	Bedrock: 9.1 m; open hole
PW3	UTM (Easting)	299233
	UTM (Northing)	4958909
	UTM (Zone)	20
	Well Total Depth (m)	118.3

Well	Parameter	Value
	Casing Depth (m)	29.9
	Diameter (mm)	406/254/155
	Screen Description	Bedrock: 4 m Screen: 203 45.7-48.8 m; 51.9-58.1 m 63.1-66.3 m; 79.5-82.6 m
TW3 (Observation Well)	UTM (Easting)	299525
	UTM (Northing)	4958781
	UTM (Zone)	20
	Well Total Depth (m)	100
	Casing Depth (m)	15.2
	Diameter (mm)	155
	Screen Description	Bedrock: 7.8 m GPS based on the map dated October 4, 2004
PW2 (Decommissioned)	UTM (Easting)	299732
	UTM (Northing)	4958607
	UTM (Zone)	20
	Well Total Depth (m)	70.1
	Casing Depth (m)	N/A
	Diameter (mm)	155
	Screen Description	Open hole; well information based on the October 2004 report

2.1.1 Back-up Water Supplies

The back-up water supply for Granville Ferry consists of a lined open reservoir fed by springs at the base of the mountain. Prior to 1997, this was used as the primary source water for the system. The piping configuration of the back-up supply allows operators to chlorinate the water before it is introduced into the distribution network.

A limited SOP on usage of the backup supply indicates requirements and procedures to follow during times when the backup supply is used; however, it does not specifically address requirements for the Granville Ferry system and a switch to the original surface water supply. No provincially-issued documentation on the backup water supply as a municipal source was available – e.g. a Water Withdrawal Approval or Approval to Operate. As the Granville Ferry system is classified as a Water Distribution facility only, and not a Water Treatment facility it does not have the capabilities of providing appropriate treatment of source water sources. Therefore, if this source is used as an emergency backup it would result in a do not use advisory. In order to use this source as a backup with a boil water advisory, sampling would need to be done to provide a level of confidence that a boil water advisory would be sufficient to protect against potential contaminants.

It is advised that MCA do not use the pond as a backup water supply until sampling and testing can indicate that a boil water advisory is proven to be adequate in protecting against contaminants.

2.2 Microbial Risks

Treatment requirements for all Nova Scotia municipal water systems include the following:

- ▶ 3.0-log reduction in protozoa (e.g., *Cryptosporidium* oocysts and *Giardia* cysts).
- ▶ 4.0-log reduction in viruses.

Log reductions of microbial agents must be achieved by a combination of filtration and disinfection. Non-GUDI groundwater supplies are credited with 3.0-log reduction of protozoa by natural in-situ attenuation/filtration. As such, only a 4.0-log reduction of viruses by disinfection is required.

2.2.1 Surface Water Sources

There are no surface water sources utilized by the Granville Ferry system. The potential use of the system's original surface water source in a backup/emergency scenario is discussed above in Section 2.1.1.

2.2.2 Groundwater Sources

Under normal operating conditions, the system utilizes groundwater sources to provide raw water to the system. All the wells have been classified in accordance with the *Protocol for Determining Groundwater Under the Direct Influence of Surface Water (GUDI)*. Step 1 GUDI assessments for the PW1 and PW3 wells were completed in 2004. The Step 1 assessments classified each of these wells as non-GUDI. A Step 2 assessment is not required for either well as the reports concluded it was not necessary based on the protocols used during the Step 1 assessments. Nova Scotia Environment issued an Approval to Operate in 2018 reflecting the status of the production wells as non-GUDI.

Table 2.2: Drinking Water Production Well GUDI Classification

Well Name	Classification	GUDI Protocol
PW1	Non-GUDI	Step 1
PW3	Non-GUDI	Step 1

During the site visit conducted on June 7, 2023, the wells were in good operating order and there were no obvious changes in the surrounding area that would warrant re-classification of the wells.

2.3 Chemical & Physical Risks

Routine monitoring for general chemical and physical water quality parameters is conducted as per the requirement outlined in the *Approval to Operate*.

2.3.1 Disinfection By-Products

Trihalomethanes (THMs) and Haloacetic Acids (HAAs) levels are currently monitored on a quarterly basis at three different locations within the distribution system. The sample locations are as follows:

- ▶ Site A: 5123 Granville Road.
- ▶ Site B: 4663 Highway #1.
- ▶ Site C: 5483 Granville Road.

The extremities of the distribution system are most likely to have the longest residence times and will consequently have the highest concentrations of Disinfection By-Products (DBPs). Sites B and C were selected due to the long retention times at the distal ends of the system. Site A represents the middle of the distribution system.

The DBP sample locations appear to be appropriate to represent the areas with the highest potential for THMs and HAAs. The locations of the DBP sampling points are presented in on the Water Distribution Map in Appendix C.

2.3.1.1 Trihalomethanes

THM sampling results for 2022 are provided in Table A.2 (Appendix A). The *Approval to Operate* indicates that treated water is required to be monitored for THMs quarterly. In 2022, THM levels observed in the distribution system were always less than the Locational Running Annual Average (LRAA) maximum of 100 µg/L.

THM results in 2022 were very low, or below the detection limit, in all samples. MCA could request a reduction in sampling locations and frequency from quarterly to annually since the LRAA is less than 0.01 mg/L, based on 2022 quarterly samples.

2.3.1.2 Haloacetic Acids

HAA sampling results for 2022 are provided in Table A.2 (Appendix A). The *Approval to Operate* indicates that treated water is required to be monitored for HAAs quarterly. In 2022, HAA levels observed in the distribution system were always less than the LRAA maximum of 80 µg/L.

HAA results in 2022 sampling were all below the detection limit. MCA could request a reduction in sampling locations and frequency from quarterly to annually since the LRAA is less than 0.01 mg/L, based on 2022 quarterly samples.

2.3.1.3 Other Disinfectant By-Products

Other DBPs listed in the NSECC Approval to Operate include Bromate and Chlorate, if sodium hypochlorite is stored for more than three months. The water treatment system utilizes sodium hypochlorite for primary and secondary disinfection. Operators confirmed

that sodium hypochlorite is not stored for more than one month and, therefore, testing for Bromate and Chlorate has not been required.

2.3.2 Lead & Corrosion Control

The *Approval to Operate* requires MCA to minimize corrosion to the distribution system and residential plumbing. Minimizing the corrosion of the drinking water helps to protect distribution infrastructure and to minimize the release of lead and copper into the drinking water through contact with plumbing materials.

2.3.2.1 Lead & Copper

MCA has established a Lead Sampling Program for use in the distribution system. The purpose of this program is to implement consistent sampling of lead in residential buildings to assess public exposure, as well as to evaluate the Municipality's Corrosion Control Program.

The Lead Sampling Program outlines the sample locations and provides the following sections:

- ▶ Collecting Samples for Lead and Copper.
 - Sample Protocol and Number of Samples.
 - Sample Information.
- ▶ Notification and Investigation Procedures.
- ▶ Public Information and Communication Plan.
- ▶ Taking Action.

The *Guidelines for Canadian Drinking Water Quality (GCDWQ)* sets a Maximum Acceptable Concentration (MAC) of 0.005 mg/L for total lead. According to the *Approval to Operate*, the minimum number of sample locations is determined by the current serviced population. Table 2.3 displays the ranges for the minimum number of sample locations required based on the number of customers serviced.

Table 2.3: Minimum Number of Sample Locations

Number of People Served	Number of Sample Locations (Annual)
≤500	5
501-3,300	10
3,301-10,000	20
10,001-100,000	30
>100,000	50

As of 2022, the Granville Ferry system serves approximately 300 people within MCA's jurisdiction; therefore, five locations are required to comply with the Approval. MCA sampled a total of five locations in 2022. 1L Random Daytime Samples (RDT) were collected from the kitchen of residences and sent to a third-party lab for analysis. Sample locations, dates, and results for 2022 are provided in Table 2.4.

Table 2.4: Lead & Copper Sampling Locations & Results

Sample Date	Sample Location	Lead Results (µg/L)	Copper Results (µg/L)
06-June-22	5534 Granville Rd.	<0.5	4
06-June-22	5352 Granville Rd.	<0.5	14
06-June-22	35 North St.	<0.5	5
06-June-22	5375 Granville Rd.	<0.5	16
06-June-22	67 North St.	<0.5	13

Results from the 2022 Lead Sampling Program indicated lead and copper concentrations did not exceed the MAC limits at any of the five dwellings. Laboratory certificates for lead and copper sampling are included in Appendix D. **Sampling methodology recommended by Health Canada has been updated to include four consecutive 1-L RDT samples, this should be incorporated into future lead sampling.**

2.3.2.2 Corrosion Control

The current *Approval to Operate* (Schedule A) includes requirements to monitor and minimize corrosion within the distribution system. Regular sampling for various corrosion control parameters is conducted on a quarterly basis in the distribution system. Sampling parameters include the following:

- ▶ pH.
- ▶ Alkalinity.
- ▶ Conductivity.
- ▶ Temperature
- ▶ Chlorine residual.

The sampling location and frequency outlined in the *Approval to Operate* indicates that a total of three sampling sites are required (one leaving the system and two in the distribution system). These parameters are not being monitored at the plant and, therefore, is not in compliance with the current *Approval to Operate*.

An impressed current is used for cathodic protection. The system is inspected monthly to check the voltage and to reset/test the cathodic protection system. The tank is also physically inspected and monitored for any signs of corrosion. The system uses PVC pipe to minimize corrosion. This pipe material is primarily used for all watermain repairs, replacements, and renewals. PVC does not corrode and lessens the extent of required corrosion control for the system.

Currently no comprehensive document outlining the Corrosion Control Plan has been developed. No sampling results for the parameters identified in the Approval to Operate and the Annual Sampling Plan were available for review. A Corrosion Control Plan should be developed and should include a sampling plan, action limits for corrosion monitoring parameters, and description of follow-up actions. If water is

deemed non-corrosive from sampling results, a request to NSECC for a reduction in sampling frequency can be made.

2.3.3 Guidelines for Canadian Drinking Water Quality

All parameters with associated MACs listed in the *GCDWQ* are required to be analyzed from a raw and treated water sample every five years. The most recent rounds of *GCDWQ* compliance sampling were completed on the following dates:

- ▶ Sample Date #1: August 30, 2016.
- ▶ Sample Date #2: July 27, 2021.
- ▶ Sample Date #3: 2026 (scheduled).

Results from the last round of sampling, as required by NSECC, are provided in Appendix E. The next round of sampling will be completed in 2026 to meet the minimum requirements of one sampling event every five years.

Raw water samples are taken from the combined flow common pipe and treated water is sampled leaving the water system. All treated and raw water samples were in compliance with the NSECC sampling requirements for the health-related parameters of the *GCDWQ* in 2022. There were no distinguishable trends for any of the water quality parameters.

The *GCDWQ* requires that treated and raw water samples from each individual well are analyzed. In 2026, MCA should ensure that treated water and raw water from each of the individual wells are sampled.

2.3.4 Guidelines for Monitoring Public Drinking Water Supplies

The *Nova Scotia Treatment Standards for Municipal Drinking Water Systems* requires that municipal water utilities monitor water quality for the parameters listed in the *Guidelines for Monitoring Public Drinking Water Supplies (GMPDWS)*. As per the *Approval to Operate*, the *GMPDWS* samples are collected and tested every two years at an accredited water quality laboratory. The last round of sampling results for raw and treated water from September 2021 are provided in Appendix F. There were no distinguishable water quality trends.

As per the last round of sampling completed in September 2021, all parameters appear to be within the guidelines. As a result, the system is in compliance with the requirements of the *GMPDWS*. The next round of compliance testing is scheduled to occur in 2023.

In 2019, Health Canada added a health-based maximum for total manganese of 120 µg/L. NSECC updated the *GMPDWS* to reflect this change and requires monitoring of total manganese in raw, treated, and distribution system samples. As per the *Approval to Operate*, raw water is to be sampled twice per year, during the spring and fall for manganese. Samples were taken in July 2022 and were below the health-based maximum.

Raw water samples for manganese testing should be taken twice per year in the spring and fall, and distribution system samples should be taken quarterly to comply with the Approval to Operate.

2.3.5 Source Water Protection Plan for Monitoring

The Granville Ferry Source Water Protection Advisory Committee approved a SWPP in October 2018 which included a monitoring program. A list of the parameters, sample locations, and the associated sampling schedule is provided in Table 2.5.

Table 2.5: Granville Ferry’s Monitoring Stations & Sampling Schedule

Parameter	Locations	
	Well 1	Well 3
Turbidity	Weekly	Weekly
Chlorine Residual	Weekly or Continuous	Weekly or Continuous
pH (Field)	Daily grab or Continuous	Daily grab or Continuous
Total Coliforms and <i>E. coli</i>	Weekly	Weekly
Total THMs	Quarterly	Quarterly
Bromodichloromethane	Quarterly	Quarterly
HAAs	Quarterly	Quarterly
Parameters outlined in the <i>GMPDWS</i> (NSECC), including fluoride, arsenic, antimony, and lead	Every two years	Every two years
Parameters with MAC in <i>GCDWQ</i> (Health Canada), including Volatile Organic Compounds	Every five years	Every five years

The SWPP also indicates that MCA will request water quality results from DND collected at the Granville Ferry Rifle Range from monitoring well MW1591 to assess potential changes in groundwater quality upgradient of the MCA production wells, and the SWPAC will meet with DND on an annual basis to review land uses within the 25-year capture zone of the production wells. The planned sampling and review listed in the SWPP appear to be adequate to provide MCA with sufficient data and information needed to evaluate the effectiveness of the SWPP. The sampling network provides a strong early warning system for potential contamination or changes in source water quality; however, there is no information that activities described in the 2018 SWPP have been acted on.

The monitoring program has not fully been implemented within the communities annual sampling plan. All parameters listed should be tested at each individual well head following the outlined schedule. Bromodichloromethane has been removed from the Health Canada GCDWQ as a separate parameter of concern from Total THMs and should be removed from the SWPP sampling schedule.

2.3.6 Cyanobacteria

A monitoring and protection program against the risk of cyanobacteria is not required as the entire water supply for the system consists of non-GUDI groundwater sources.

2.4 Filter Backwash Water

The system does not operate any filtration units; therefore, no filter backwash water is produced at any point in the system.

2.5 Source Quantity

Water withdrawal permits are issued by NSECC in order to document the allowable withdrawals from a water source. The Water Withdrawal Approval Number is 2022-2978962-00 with an expiry date of September 21, 2032. The document is attached in Appendix H. The Approval authorizes the withdrawal rates listed in Table 2.6.

Table 2.6: Approved Withdrawal Rates for Granville Ferry's Production Wells

Production Well	Maximum Pumping Rate	Average Pumping Rate Over 30 Days	30 Day Withdrawal Volume (L)	Annual Withdrawal Volume (L)
	(L/day)	(L/day)	L	L
PW1	753,120	753,120	22,593,600	274,888,800
PW3	1,059,840	686,880	20,606,400	250,711,200
Total Wellfield	1,440,000	1,060,000	31,800,000	386,900,000

Raw water withdrawal is monitored at a single flowmeter at the outlet of the of the system. As such, the current configuration of flow monitoring does not meet the requirements of the *Approval to Operate*. The withdrawal data cannot be separated for the two source wells and the combined monthly withdrawal data for 2022 is presented in Table 2.7. The total average pumping rate of the combined wells is likely well represented by the flowmeter totals, but the actual maximum daily pumping rate is likely lower than the maximum daily rate recorded on the single flowmeter (where flow out from the tower may be exceptionally high on a given day due to water main breaks, flushing, firefighting, etc.) and is not fully supplemented with flow from the source wells. The available flow data from 2022 is presented below.

Table 2.7: Granville Ferry Water Supply Combined Monthly Withdrawal 2022

Month	Monthly Maximum Daily Rate (m ³ /day)	Monthly Average Daily Rate (m ³ /day)	Monthly Withdrawal Volume (m ³)	Annual Withdrawal Volume (m ³)
Approved Limits	1,440	1,060	31,800	386,900
January	547	422	13,084	

February	590	441	12,342	
March	576	443	13,739	
April	485	406	12,179	
May	544	477	14,786	
June	555	469	14,067	
July	620	516	15,983	
August	668	518	16,054	
September	579	474	14,232	
October	798	485	15,025	
November	529	439	13,177	
December	521	450	13,948	
				168,616

In 2022, the combined average daily rate of withdrawal of the system was 462 m³/day, with a maximum combined rate of withdrawal of 798 m³/day occurring in October. In 2022, the system used 44% of its allotted average yearly withdrawal rate, and 55% of the maximum rate of withdrawal.

This data solely reflects the combined flow for the system and does not represent data from an individual well. As a result, it cannot be verified if PW1 and PW3 were in compliance with authorized withdrawal limits as per their *Water Withdrawal Approval* based on the data provided. However, there was no month in 2022 where the 30-d average flow rate exceeded the allowable 30-d average daily pumping rate for each well. Only in October did the maximum daily pumping rate (798 m³) exceed the lower of the two PW maximums (PW1: 753 m³); it is likely that the actual flow in to the total from either or both wells combined was lower than this volume.

MCA should install and connect flowmeters to SCADA at the outlet of both source wells, or install a single combined raw water flowmeter to meet the conditions of the *Approval to Operate*. The new flowmeters should be provided with programming to allow for the collection of flow data from the combined flowmeter to be separated by active well. This would allow for accurate individual well flows to be reported for daily, monthly, and annual total volumes.

2.5.1 Demand Growth

The population served by the Granville Ferry system is approx. 800, including the population serviced by the Town of Annapolis Royal using water supplied by the Granville Ferry system. Given that the annual usage is less than 50% of the installed supply pumping capacity, demand growth is expected to be met by the current system for the foreseeable future.

2.6 Source Water Protection Plan

Raw water is supplied from non-GUDI wells located within the municipal boundaries of the Granville Ferry. During the development of the SWPP, a hydrogeologist was engaged to complete an assessment of the hydrogeological setting of the protected water area around the wellheads. The assessment resulted in a map containing four travel time zones, which represent the predicted average time for water in the aquifer, along with any contaminants in the water, to travel from the zone to the well. The four zones are as follows:

- ▶ Well Site Control Zone – 0-90 days travel time (60 m radius of wellhead).
- ▶ Zone A – 90 days to 2 years travel time.
- ▶ Zone B – 2-5 years travel time.
- ▶ Zone C – 5–25-year travel time.

The Granville Ferry Source Water Protection Advisory Committee approved the SWPP in October 2018. Appendix B identifies the boundaries of the source water protection area and delineates the four travel time zones around the production wells. The Water Protection Zone Mapping in GIS format is to be provided separately as a deliverable along with the SAR.

The main objective of the SWPP is to help ensure the continuing safety of the drinking water supply. Following the delineation of the protected water area, the Source Water Protection Advisory Committee (SWPAC) identified potential contaminants and completed a risk ranking for the various point and nonpoint sources for each zone. The main risks that have been established within the protection area boundary are:

- ▶ Road salt.
- ▶ Dust.
- ▶ Potential spills.
- ▶ Wastewater lagoon.
- ▶ Metals.
- ▶ Abandoned well (OW1).
- ▶ Chlorine/fuel storage.
- ▶ Mineral oil/potential Polychlorinated Biphenyls (PCBs).
- ▶ Pesticides/herbicides.
- ▶ Sediment.
- ▶ Illegal dumping.
- ▶ Fire suppression chemicals.

After the risk ranking was completed, a management plan was established to reduce the risk of a contamination event in the groundwater supply. Management strategies were developed for each potential risk. The management strategies adopted in the SWPP are as follows:

- ▶ Acquisition of land.
- ▶ Best management practices.
- ▶ Land use by-laws.

- ▶ Contingency planning
- ▶ Designation as a source water protection area.
- ▶ Education and stewardship initiatives.

A monitoring program has been established within the SWPP to regularly monitor for contaminants and identify changes in source water quality. The 2022 Annual Monitoring Plan states that the SWPP has not identified additional water quality parameters of concern that require monitoring. The last meetings of the SWPAC were held in 2018 and as such the meeting minutes are not attached as an appendix.

As part of the *Approval to Operate*, MCA must review and update the SWPP on an annual basis.

2.7 Conclusion & Recommendations

The objective of this section was to provide a detailed characterization of the source water through a review of available information. Specifically, the focus was on assessing the approach and ability to protect against pathogenic organisms, effectiveness of DBP monitoring, lead and corrosion control/monitoring, assessment of *GCDWQ* and *GMPDWS* parameters, source quantity, and SWPP.

2.7.1 Treatment Requirements to Protect Against Pathogenic Organisms

Raw water is drawn from non-GUDI wells. As per the *Nova Scotia Treatment Standards for Municipal Drinking Systems*, groundwater sources require 3.0-log reduction for protozoa and 4.0-log reduction for viruses.

2.7.2 GUDI Classification

All production and back-up wells are classified as non-GUDI. The site visit confirmed there were no changes in the surrounding area that would warrant re-classification of the wells.

2.7.3 Disinfection By-Products

MCA monitors THMs and HAAs quarterly at three different locations throughout the distribution system. THM and HAAs levels observed in the distribution system comply with the respective LRAA maximum of 100 µg/L and 80 µg/L, respectively.

MCA could request a reduction in sampling frequency from quarterly to annually and the number of sample locations as all 2022 sample results were less than 0.01 mg/L.

2.7.4 Lead & Corrosion Control

MCA adequately monitors lead and copper concentrations in the distribution system. In 2022, five residential dwellings were sampled, and none of the locations exceeded the MAC limits.

Currently no comprehensive document outlining the Corrosion Control Plan has been developed. This should include a sampling plan, action limits for corrosion monitoring parameters, and description of follow-up actions. If water is deemed non-corrosive from sampling results, a request to NSECC for a reduction in sampling frequency can be made.

2.7.5 Guidelines for Canadian Drinking Water Quality

MCA samples for *GCDWQ* parameters every five years. The last round of sampling results indicate that all treated samples are in compliance with the NSECC and *GCDWQ* sampling requirements. The next round of sampling is scheduled to be completed in June 2027 to meet the requirement of one sampling event every five years.

2.7.6 Guidelines for Monitoring Public Drinking Water Supplies

As per the *Approval to Operate*, the *GMPDWS* samples are collected and tested annually at AGAT Laboratories. The last round of sampling, completed in September 2021, is in compliance with the NSECC sampling requirements of the *GMPDWS*. The next round of compliance testing is scheduled to occur in 2023.

In 2019, Health Canada added a health-based maximum for total manganese of 120 µg/L. NSECC updated the *GMPDWS* to reflect this change and requires monitoring of total manganese in raw, treated, and distribution system samples.

Raw water samples for manganese testing should be taken twice per year in the spring and fall, and distribution system samples should be taken quarterly to comply with the Approval to Operate.

2.7.7 Source Water Protection Plan Monitoring

The current SWPP includes a monitoring program. The sampling protocols for the wells provides sufficient data and information needed to constantly evaluate the effectiveness of the SWPP. The monitoring plan provides MCA with a strong warning system for potential contamination or changes in source water quality.

The monitoring program has not fully been implemented within the communities annual sampling plan. All parameters listed should be tested at each individual well head following the outlined schedule.

2.7.8 Filter Backwash Water Discharge

This facility does not operate any filtration units in the drinking water system. Due to this, there is no filter backwash water to discharge.

2.7.9 Source Quantity

In 2022, the combined average daily rate of withdrawal of the system was 462 m³/day, with a maximum combined rate of withdrawal of 518 m³/day occurring in August. In 2022, the system used 44% of its allotted average yearly withdrawal rate, and 55% of the maximum rate of withdrawal.

MCA should add a raw water flowmeter and arrange for flow monitoring data collection programming to allow totalized flow to be recorded from each individual well, to ensure both wells are in compliance with the current *Approval to Operate* and *Water Withdrawal Approval*.

2.7.10 Source Water Protection Plan

Appendix B identifies the boundaries of the Granville Ferry protected water area including boundary descriptions. The Water Protection Zone Mapping in GIS format is to be provided to NSECC separately.

3 Treatment Processes, Facilities, & Equipment

3.1 Treatment Process

MCA owns and operates the system and associated works located on Rifle Range DND Road, Granville Ferry, Annapolis County, Nova Scotia. The *Approval to Operate* classifies the system as a Class I Water Distribution Facility. The *Approval to Operate* is attached in Appendix G, and the details are as follows:

- ▶ Approval Holder: Municipality of the County of Annapolis.
- ▶ Approval No: 2009-065809-04.
- ▶ Expiry Date: June 1, 2029.

3.1.1 Treatment Process Schematic

The water system is a non-GUDI chlorination system consisting of the following:

- ▶ Non-GUDI wells.
- ▶ Chlorination.

A schematic of the treatment process is presented in Figure 3.1 and in Appendix J. The following section describes the individual treatment process.

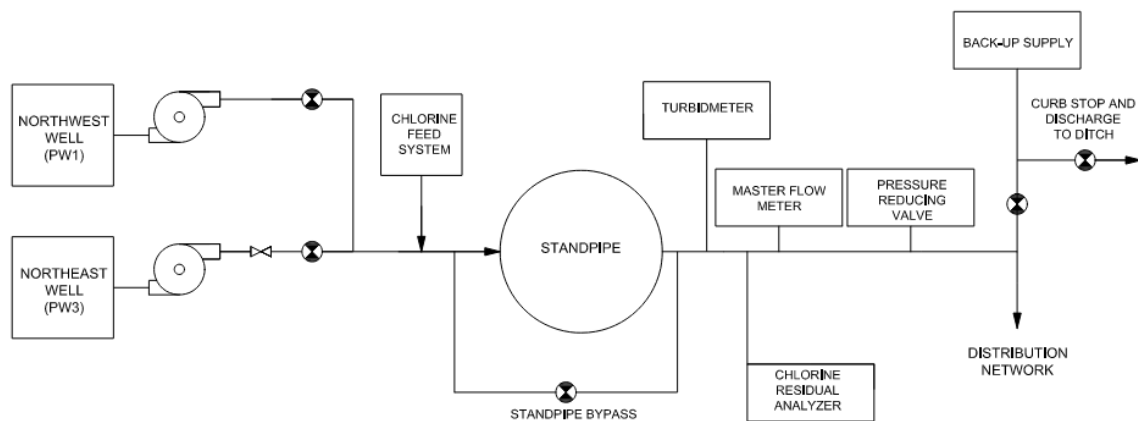


Figure 3.1: Treatment Process Schematic

3.1.1.1 Chlorination

Raw water is dosed with sodium hypochlorite as it enters the water storage tower. The disinfection equipment consists of a sodium hypochlorite dosing system with redundant peristaltic metering pump and complete with continuous chlorine residual measurement on the outlet of the tower.

Chlorine residual of water entering the distribution is sampled downstream of the injection point. The pumps operate in duty/standby such that if the duty pump is not able to operate, the standby pump would turn on. An alarm system has been installed that alerts staff when the chlorine residual is lower than the minimum set limit when entering the system. For locations leaving the storage tank, the action limit is set to 0.8 mg/L. Within the distribution system the action limit is set to 0.4 mg/L. At these levels, a notification is sent to the operator via SCADA for investigation. Operations personnel maintain a daily log and verify the chlorine residual by grab sample.

Secondary disinfection is considered to be the maintenance of a free chlorine residual throughout the distribution system. Water leaving the storage tank and entering the distribution system is continuously monitored for chlorine residual and trended via SCADA. The chlorine dosage is reported to be relatively constant and the secondary residual leaving the reservoir is consistently above 0.7 mg/L.

3.1.2 Turbidity Levels & Associated Criteria

3.1.2.1 Surface Water

This section is not applicable for this system.

3.1.2.2 GUDI Wells

This section is not applicable for this system.

3.1.2.3 Non-GUDI Wells

The *Nova Scotia Treatment Standards for Municipal Drinking Water Systems* outlines the prescribed turbidity levels for non-GUDI systems. The requirements for combined flow turbidity or individual well turbidity limits for non-GUDI systems, such as the Granville Ferry water system, are as follows:

- ▶ Turbidity shall be less than or equal to 1.0 NTU in at least 95% of the measurements taken by grab sample for each calendar month; or
- ▶ Turbidity shall be less than or equal to 1.0 NTU at least 95% of the time each calendar month if continuous monitoring is the method of turbidity measurement.

Verification of the ability for the system to continuously achieve the 3.0-log removal credit was not able to be evaluated using either option as continuous turbidity data was as not

available. Turbidity is not monitored continuously on the individual or combined raw water flow, it is monitored on water leaving the storage tower. Maximum turbidity values in water leaving the tower have been summarized by operations staff and included in the 2022 Annual Report, these values are included below in Table 3.1.

Table 3.1: 2022 Maximum Turbidity Readings

Monthly Maximum Raw Water Turbidity		
2022	Well 1	Well 2
January	0.032	0.032
February	0.028	0.028
March	0.024	0.024
April	0.025	0.025
May	0.016	0.016
June	0.096	0.096
July	0.110	0.110
August	0.092	0.092
September	0.065	0.065
October	0.054	0.054
November	0.033	0.033
December	0.035	0.035

Based on the data presented in Table 3.1, the turbidity from both sources is likely low, but monitoring is not currently done until water leaving the tower. A spike in raw water turbidity from either source cannot be detected by the online turbidimeter immediately.

It is recommended that the turbidimeter be relocated to the combined well water flow and programming be provided to allow separate data tracking of individual well turbidity, based on active pumping. Alternatively, a new turbidimeter on the combined flow could be added, leaving the tower turbidimeter in place.

3.1.2.4 Inspection of Turbidity Meters

Online monitoring of turbidity is conducted using a HACH 1720e low range process turbidimeter. These meters meet and exceed the *USEPA Method 180.1* rules for measuring turbidity for drinking water compliance. The analysis method is based upon the comparison of light scattering by the sample under defined conditions with the intensity of light scattered by a standard reference suspension. These units are capable of measuring turbidity levels with an accuracy of $\pm 2\%$ of the reading or ± 0.02 NTU (whichever is greater) from 0 to 40 NTU.

3.1.3 Membrane Filtration

This section is not applicable for this system.

3.1.4 Primary Disinfection

Under the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*, treatment processes using non-GUDI groundwater as their source water are required to have the ability to achieve a 4.0-log reduction for viruses.

The system is able to achieve a 3.0-log removal credit for protozoa removal (*Cryptosporidium* oocysts and *Giardia* cysts), based on natural filtration log removal credits assigned to non-GUDI water supplies as described in the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*. The system is required to provide a 4.0-log inactivation of viruses using disinfection. Chlorine is used to achieve primary chemical disinfection from the Contact Time (CT) control point at the water system. A schematic of the primary disinfection system is provided in Appendix J.

3.1.4.1 Chemical Disinfection (CT Concept)

CT calculations are based on various operational, treatment, and system design parameters. Operational parameters including maximum flowrate, chlorine dosing rate, and contact volume will affect the time that primary disinfection occurs and efficiency of disinfection. Furthermore, environmental conditions such as pH and temperature affect the efficiency of disinfection and are included in CT calculations. Calculations reflect the worst-case scenario to ensure that the system will always have adequate disinfection.

Primary disinfection occurs in the storage tank. Sodium hypochlorite is added to the raw water as it passes through the chlorination building before entering the 910 m³ standpipe storage tank. The storage tank is considered to have the minimum baffling condition as it includes a single unbaffled inlet and outlet, giving the baffling factor of 0.1. The water level during peak hours is held around 85%; for the purposes of providing a conservative calculation, a minimum volume of 15% is carried in the calculations below. All the design parameters are listed in Table 3.2 and Table 3.3.

Table 3.2: CT Design Parameters

CT Design Parameters	Values
Maximum Flow (m ³ /day)	798
Maximum pH	8.64
Minimum Temperature (°C)	5
Minimum Free Chlorine Residual (mg/L)	0.65

Table 3.3: Distribution Main Design Parameters for CT Calculations (Ridge Road Reservoir)

Distribution Main Design Parameters	Values
Tank Volume (m ³)	910
Minimum % Full	15
Baffling Factor	0.1

$$\text{Storage Tank Volume (m}^3\text{)} = V * \% \text{ full} = (910\text{m}^3) * 15\% = 136 \text{ m}^3$$

$$\text{Contact time (min)} = \frac{\text{Volume (m}^3\text{)}}{\text{Max Flow (}\frac{\text{m}^3}{\text{min}}\text{)}} = \frac{136 \text{ m}^3}{0.55 \frac{\text{m}^3}{\text{min}}} = 248 \text{ min}$$

$$CT_{\text{actual}} (\text{mg} * \text{min/L}) = \text{Chlorine Residual (}\frac{\text{mg}}{\text{L}}\text{)} * \text{Contact Time (min)} * \text{Baffling Factor}$$

$$CT_{\text{actual}} (\text{mg} * \text{min/L}) = 0.65 \frac{\text{mg}}{\text{L}} * 248 \text{ min} * 0.1 = 16 \text{ mg} * \text{min/L}$$

$$CT_{\text{req}} = 12 \text{ mg} * \text{min/L}$$

$$\frac{CT_{\text{actual}}}{CT_{\text{req}}} = \frac{16 * \text{min/L}}{12 \text{ mg} * \text{min/L}} = 1.3$$

The CT calculation above for the log inactivation of viruses confirm that minimum CT required for the 4.0-log inactivation of viruses in drinking water from both the primary and back-up sources is being met. This is the case as the ratios of $CT_{\text{actual}}/CT_{\text{required}}$ are greater than one and confirms proper disinfection. In 2022, there were no instances where operational conditions for adequate CT were not met.

3.1.4.2 UV Disinfection (IT Concept)

This section is not applicable for this system.

3.1.4.3 Redundancy, Monitoring, & Alerting

Online monitoring of chlorine residual is accomplished using an online HACH CL17 chlorine analyser that continuously takes primary disinfection residual readings and transmits this data to the SCADA system for monitoring and alarming as required. Control limits within the SCADA system are set to alarm and notify operators when the primary disinfection

system is operating incorrectly. The SCADA system is set to alarm if chlorine residual falls below the level of 0.5 mg/L at any of the chlorine residual monitors in the system. The pocket chlorine residual analyzer (HACH DR2000 Spectrophotometer) is used to confirm chlorine residual. This unit can measure free chlorine residual from a range of 0.1–8.0 mg/L (± 0.2 mg/L). The device is in good working order and is maintained by operations staff. The device is calibrated when required to ensure accuracy and functionality.

3.1.4.4 Standard Operating Procedures

There is no formal SOP for the disinfection process. A general SOP describes how the CT concept of disinfection may be applied.

MCA should update the current disinfection SOP to formally outline operational setpoints, worst case scenario CT values, response procedures, and operation/maintenance of the disinfection equipment.

3.1.5 Secondary Disinfection

Secondary disinfection is achieved by maintaining a minimum free chlorine residual of 0.2 mg/L at all points within the distribution system. Grab samples are collected weekly at two points in the system. All samples collected in 2022 met the required chlorine residual, therefore, meeting the requirements of the *Approval to Operate*.

Online chlorine monitoring systems continuously monitor free chlorine residual levels leaving the storage tank/water system as the water enters the distribution system. The monitoring equipment is inspected weekly by operations staff and maintained and calibrated as required. The requirement to maintain an adequate secondary disinfectant residual throughout the distribution system drives the dose applied at the primary chlorination point.

3.1.6 Other Critical Processes

There are no critical processes outside those described above.

3.1.7 Waste Streams

3.1.7.1 Filter-to-Waste

This section is not applicable for this system.

3.1.7.2 Filter Backwash Water - Discharging into a Freshwater Watercourse

This section is not applicable for this system.

3.1.7.3 Filter Backwash Water - Discharge to Land or Soil

This section is not applicable for this system.

3.1.7.4 Filter Backwash Water – Discharge to a Marine or Brackish Environment

This section is not applicable for this system.

3.1.7.5 Other Waste Streams

This section is not applicable for this system.

3.2 Distribution Water Quality

Distribution system water quality samples are collected from the locations listed below. The Distribution Map is provided in Appendix C.

Site A	5123 Granville Road
Site B	4663 Highway #1, Granville Ferry
Site C	Public Works Shop, 5483 Granville Road

3.2.1 Chlorine Residual Levels

Samples from the distribution system for residual chlorine levels are collected weekly at sites A and B as per the *Approval to Operate* conditions. In 2022, the chlorine residuals did not fall below 0.2 mg/L. Operators utilize a pocket colorimeter to conduct free chlorine analysis on grab samples.

Residual chlorine monitoring for water entering the distribution system is measured at the outlet of the storage tank by an online free chlorine analyzer. Values are reported continuously to a SCADA software package which sets alarms if the levels drop below 0.5 mg/L in the distribution system.

3.2.2 Microbial Water Quality

Schedule A in the existing *Approval to Operate* requires the collection of grab samples on a weekly basis to monitor for total coliforms and *E. coli*. Samples are collected from sites A and B as identified on the Water Distribution Map located in Appendix C.

Two samples are collected in the water distribution on a weekly basis. All test results showed absent for *E. coli* and total coliforms in 2022. The number of samples exceeds the minimum number of samples required for a population of 800 residents. The sampling locations represent the center and the distal end of the distribution system. As a result, the distribution system microbial water quality for the WTP is within compliance.

3.2.3 Turbidity

The distribution system is monitored for turbidity continuously at the outlet of the tower. Schedule A in the *Approval to Operate* requires turbidity samples from the distribution system to be taken on a weekly basis to ensure values are maintained below 5.0 NTU. Samples were collected at Sites A, B, and C, and all turbidity samples collected in 2022 were within compliance.

3.2.4 Cross Connection Control Program

MCA has developed a Cross Connection Control Program to partially comply with NSECC requirements. The Cross Connection Control Program requires all multi residential units (greater than four units), industrial, commercial, and institutional buildings to install a Backflow Prevention Device (BFD) on their water service lateral. The devices are installed to provide premises isolation at the entrance to the building for new sprinkler services, and on the customer's side of the water meter for domestic services.

Currently the plan does not meet the minimum requirements outlined in *A Guide to Assist Nova Scotia Municipal Water Works Develop a Cross Connection Control Program*. **MCA should update the cross-connection control program to include a detailed project scope, budget, authority, and timelines.**

3.2.5 Other Distribution System Monitoring Programs

MCA conducts the following distribution system monitoring:

- ▶ Annual flushing program with inspection of hydrants and system gate valves.
- ▶ Ongoing leak detection program in development, includes both flow monitoring and correlation and acoustic leak detection equipment.

3.3 On-Site Inspection

An on-site inspection was conducted on June 7, 2023, by Ben Bickerton, M.A.Sc., P.Eng., and Meghan Lea, M.A.Sc., EIT.

3.4 Conclusion & Recommendations

3.4.1 Turbidity Levels

Water is provided to the distribution system without passing through any filtration unit. Schedule A of the *Approval to Operate* states that turbidity from individual wellheads or combined wellhead flow shall be less than or equal to 1.0 NTU at least 95% of the time each calendar month for continuous monitoring; no continuous monitoring is provided on the combined raw water flow, only on water leaving the storage tank. **The turbidimeter should be relocated to the combined raw water flow or a second online turbidimeter**

added; alternatively, MCA could collect daily turbidity grab samples on the combined inlet flow. Turbidity leaving the tower was less than 1.0 NTU at all times in 2022.

3.4.2 Primary Disinfection

The system uses sodium hypochlorite for primary disinfection. The disinfection equipment consists of a duplex sodium hypochlorite peristaltic metering pump system complete with continuous chlorine residual measurement. Calculations for CT confirm that primary disinfection adequately attains a 4.0-log reduction of viruses at the CT control point (water tower outlet) prior to reaching the first customer in the distribution system.

MCA should update the current disinfection SOP to formally outlines operational setpoints, worst case scenario CT values, response procedures, and operation/maintenance of the disinfection equipment.

3.4.3 Secondary Disinfection

Secondary disinfection is achieved by maintaining a minimum free chlorine residual of 0.2 mg/L at all points within the distribution system. Grab samples were collected weekly at two designated sample locations. Free chlorine residual is also continuously monitored leaving the reservoir.

3.4.4 Other Critical Processes

There are no other critical processes in the system.

3.4.5 Waste Streams

This municipal drinking water system is lacking any filtration processes. As a result, no filter-to-waste streams are present.

3.4.6 Distribution Water Quality

3.4.6.1 Chlorine Residual Levels

Operators utilize a handheld colorimeter to grab free chlorine samples from two sample locations in the distribution system. Data for all sample sites in 2022 showed levels greater than 0.2 mg/L and, therefore, met regulatory requirements.

3.4.6.2 Microbial Water Quality

All *E. coli* and total coliform test results in 2022 showed absent for total coliforms and *E. coli*. As a result, the distribution system microbial water quality is within compliance.

3.4.6.3 Turbidity

The distribution system was monitored for turbidity on a weekly basis at Sites A, B, and C. All turbidity samples collected from these three locations in 2022 are within compliance and below 5.0 NTU.

3.4.6.4 Cross Connection Control Program

MCA has developed a Cross Connection Control Program to partially comply with NSECC requirements. The Cross Connection Control Program requires all multi residential units (greater than four units), industrial, commercial, and institutional buildings to install a backflow prevention device on their water service.

Currently the plan does not meet the minimum requirements outlined in *A Guide to Assist Nova Scotia Municipal Water Works Develop a Cross Connection Control Program*. **MCA should update the cross-connection control program to include a detailed project scope, budget, authority, and timelines.**

3.4.6.5 Other Distribution System Monitoring Programs

MCA conducts the following distribution system monitoring:

- ▶ Annual flushing program with inspection of hydrants and system gate valves.
- ▶ Ongoing leak detection program in development, includes both flow monitoring and correlation and acoustic leak detection equipment.

3.4.7 On-Site Inspection

An on-site inspection was conducted on June 7, 2023. There were no major concerns identified at this time.

4 Operations, Monitoring, & Management

4.1 Operations & Maintenance

As required by the *Approval to Operate*, MCA has a limited Operations and Maintenance Manual which outlines the characteristics of the system and includes emergency actions and a SOP for normal operations. Copies of the Operations and Maintenance Manual are available digitally, and operations staff have access to these documents and are aware of their contents. The manual contains various procedures and plans for tasks such as power outage procedures, equipment lockout procedures, engaging the backup water supply, issuing boil water advisories, and various distribution system maintenance and installation procedures. The maintenance program is also thoroughly documented in the operations manual which includes a list of tasks to be completed on daily, weekly, monthly, and annual schedules. Maintenance procedures include inspection of the site, equipment, and testing for the chlorine gas cylinder safety procedures.

All certified operators make process adjustments such as chemical dosing changes, perform equipment and instrument maintenance as required based on experience, and continuous evaluation of the system performance. The Operator in Direct Responsible Charge (ODRC) is ultimately responsible for changes, and significant changes beyond routine adjustments are discussed with the ODRC prior to implementing the change. The Operations and Maintenance Manual lacks detailed SOPs for the operations staff to follow. The maintenance plan was reviewed and is not adequate to ensure the long-term viability of the Municipal Public Drinking Water Supply, including distribution system components.

MCA should update the Operation and Maintenance Manual to include detailed SOPs in accordance with the NSECC document *A Guide to Assist Nova Scotia Municipal Water Works Develop a Comprehensive Operations Manual*.

4.2 Monitoring & Reporting

The approved monitoring program was submitted to NSECC in 2022. The program includes quality assurance programs and training, water quality compliance limits, sampling sites, and monitoring plans. Compliance monitoring is required to ensure that the water adheres to the quality standards outlined in the *GCWDQ/GMPDWS*. A summary of the raw, treated,

and SWPP sampling programs are provided in Table 4.1, Table 4.2, and Table 4.3, respectively.

Table 4.1: Raw Water Sampling Program

Summary of Raw Water Requirements			
Parameter	Approval to Operate Sampling Requirements		Granville Ferry 2022 Sampling Plan
	Location	Frequency	Frequency
Turbidity	Combined Well	Continuous	Continuous
Water Volume	Every Individual Well	Continuous	Continuous
All <i>GMPDWS</i>	Every Individual Well	Every 2 years	Every 2 years
All <i>GCDWQ</i>	Raw Water	Every 5 years	Every 5 years
Viruses	Every Individual Well	As Requested	As Requested
Manganese	Every Individual Well	Twice per year	Twice per year

Table 4.2: Distribution Water Sampling Program

Summary of Treated Water and Distribution Monitoring Requirements			
Parameter	Approval to Operate Sampling Requirements		Wolffville 2022 Sampling Plan
	Location	Frequency	Frequency
Turbidity	Distribution System Sample Points	Weekly Grab	Weekly Grab
	Entering Distribution System	-	Continuous
Free Chlorine	Entering Distribution System	Continuous	Continuous
	CT Control Point	Continuous	Continuous
	Distribution System Sample Points	Weekly Grab	Weekly Grab
All <i>GMPDWS</i>	Treated Water	Every 2 years	Quarterly
All <i>GCDWQ</i>	Treated Water	Every 5 years	Every 5 years
Temperature	CT Control Point	Continuous	Continuous
pH	CT Control Point	Continuous	Continuous
Total Coliforms and <i>E. coli</i>	Distribution System Sample Points	Weekly Grab	Weekly Grab
Viruses	Distribution System	As Requested	As Requested
Corrosion Monitoring Program	Distribution Sample Points	Quarterly Grab	Annual
Lead	Dwelling Sample Points	Annual	Annual
THMs	Representative Distribution Sample Points	Quarterly	Quarterly
HAAs	Representative Distribution Sample Points	Quarterly	Quarterly
Manganese	Entering Distribution System	Quarterly	Quarterly

Summary of Treated Water and Distribution Monitoring Requirements			
Parameter	Approval to Operate Sampling Requirements		Wolfville 2022 Sampling Plan
	Location	Frequency	Frequency
	Distribution System Sample Point	Quarterly	Quarterly

Table 4.3: Source Water Protection Plan Sampling Program

Parameter	Locations	
	Water Supply Well 1	Water Supply Well 3
Turbidity	Weekly	Weekly
Chlorine Residual	Weekly or Continuous	Weekly or Continuous
pH (Field)	Daily grab or Continuous	Daily grab or Continuous
Total Coliforms and <i>E. coli</i>	Weekly	Weekly
Total THMs	Quarterly	Quarterly
Bromodichloromethane	Quarterly	Quarterly
HAAs	Quarterly	Quarterly
Parameters outlined in <i>GMPDWS</i> (NSECC), including fluoride, arsenic, antimony, and lead	Every two years	Every two years
Parameters with MAC in <i>GCDWQ</i> (Health Canada), including Volatile Organic Compounds	Every five years	Every five years

All samples collected for the various monitoring programs are sent to AGAT Laboratories in Dartmouth, NS for analysis. AGAT Laboratories is an accredited laboratory as per the *Policy on Acceptable Certification of Laboratories*.

4.2.1 Review of Recent Submitted Annual Report

The 2022 Annual Report was reviewed. Not all sections were completed; most notably, distribution system corrosion control parameters and manganese, lead and copper sampling results were not included. **MCA should ensure that each section of the Annual Report where applicable to the Granville Ferry system is completed in its entirety each year. The document can be modified from the basic template provided by NSECC.**

4.3 Management

The facility has been classified as a Class I Water Distribution Facility. James Jenner is the ODRC of the distribution system. A summary of staffing information at the facility is provided below:

- ▶ James Jenner (ODRC) - Level I Water Distribution.
- ▶ John Webber - Level II Water Distribution.
- ▶ Andrew Cranton – Level II Water Distribution.
- ▶ Charles Grant – Level I Water Distribution.
- ▶ Amy Brown – Level I Water Distribution.
- ▶ Matt Leonard – Level I Water Distribution.

The ODRC protocol information is provided in Appendix A.

4.4 Conclusion & Recommendations

4.4.1 Operation & Maintenance

The system has a limited Operations and Maintenance Manual. It is recommended that a comprehensive manual be created that elaborates on protocols and procedures.

MCA should update the Operations and Maintenance Manual to include detailed SOPs on daily operations.

4.4.2 Monitoring & Reporting

MCA has submitted their 2022-2023 Annual Monitoring Program to NSECC. The program was adequate in meeting sampling requirements from the *Approval to Operate* as well as *GCDWQ* and *GMPDWS* requirements. The lab samples are completed by an accredited laboratory.

Results from all sampling listed in the approved Annual Sampling Plan was not available for review. The 2022 Annual Report did not include reporting on all parameters (e.g. corrosion control parameters). **MCA should ensure that each section of the Annual Report where applicable to the Granville Ferry system is completed in its entirety each year. The document can be modified from the basic template provided by NSECC.**

4.4.3 Management

The system has been classified as a Class I Water Distribution Facility. The ODRC is James Jenner. All operators are adequately certified and there are a sufficient number of operators as well as back-up personnel available. The procedure for when the ODRC is absent is outlined in Appendix A.

5 Ability to Comply

This section will provide a summary of conclusions as referenced from the NSECC Terms of Reference.

5.1 Summary

5.1.1 Treatment Processes, Facilities, & Equipment

5.1.1.1 Treatment Process

Water is supplied from non-GUDI wells and undergoes chlorine disinfection prior to entering the distribution system. The *Approval to Operate* is valid until June 1, 2029.

5.1.1.2 Turbidity Levels & Associated Criteria

Raw water supplied from the non-GUDI wells must be less than 1.0 NTU 95% of the time in each calendar month based on continuous monitoring. Continuous turbidity measurements are taken on water leaving the tower after chlorination and storage, not on individual or combined flow from the raw water sources. The turbidimeter should be relocated to sample this parameter in accordance with the *Approval to Operate*.

5.1.1.3 Primary Disinfection

All municipal drinking water systems in Nova Scotia are required to meet treatment standards to achieve:

- ▶ 3.0-log removal for *Giardia* and *Cryptosporidium*.
- ▶ 4.0-log removal credits for viruses.

The system is a groundwater chlorination process and consists of natural filtration and disinfection. Combined raw water turbidity was reviewed and meets the limit of 1.0 NTU 95% of the time. As such, the system received a natural filtration 3.0-log reduction credit for *Giardia* and *Cryptosporidium*.

The remaining removal credits were achieved with chlorine disinfection. The CT for chlorine disinfection is adequate to achieve a 4.0-log inactivation of viruses, therefore, the combination of natural filtration and inactivation can remove and inactivate protozoa

(*Giardia* and *Cryptosporidium*) and viruses to the requirements of the *Nova Scotia Treatment Standards for Municipal Drinking Water Systems*.

5.1.1.4 Secondary Disinfection

Secondary disinfection is achieved by maintaining a free chlorine residual of 0.2 mg/L. Weekly grab samples and continuous monitoring within the distribution system are used to ensure that the minimum chlorine residual is met.

5.1.1.5 Other Critical Processes

No other critical processes

5.1.1.6 Process Waste Streams

There are no process waste streams utilized in the system.

5.1.2 Distribution System Water Quality

5.1.2.1 Chlorine Residuals

Chlorine residuals in the distribution system are acceptable and met a minimum concentration of 0.2 mg/L. Weekly grab samples were taken and analyzed at two locations throughout the distribution system. Chlorine residual levels were also continuously monitored leaving the chlorination building and at various sites in the system.

5.1.2.2 Microbial Water Quality

Microbiological samples for *E. coli* and total coliforms were collected at two locations weekly. In 2022, all results for each location tested absent for both *E. coli* and total coliforms. As a result, the distribution system microbial water quality is within compliance.

5.1.2.3 Turbidity

Grab samples were collected on a weekly basis from the three distribution sampling locations. All samples tested were below the maximum turbidity of 5.0 NTU and within regulatory compliance.

5.1.2.4 Cross Connection Control Programs

MCA has implemented an approved Cross Connection Control Program to partially comply with NSECC requirements.

MCA should update the cross-connection control program to include a detailed project scope, budget, authority, and timelines.

5.1.2.5 Other Distribution System Monitoring Programs

No other distribution monitoring is required.

5.1.3 Operations, Monitoring, & Management

5.1.3.1 Operations & Maintenance

The system has a limited Operations and Maintenance Manual. It is recommended that a comprehensive manual be created that outlines the characteristics of the system and includes emergency actions and SOPs for normal facility operation.

5.1.3.2 Monitoring & Reporting

The 2022-2023 monitoring program and 2022 Annual Report appear to address all requirements, with minor exceptions including lead & copper, manganese, and corrosion control sampling results.

5.1.3.3 Management

The system has been classified as a Class I Water Distribution Facility. The ODRC is James Jenner. All operators are adequately certified and there are a sufficient number of operators as well as back-up personnel available. The procedure for when the ODRC is absent is outlined in Appendix A.

5.1.4 Recommendations

Table 5.1 summarizes the recommendations to address problems identified throughout this report, including an opinion of cost to comply and timeline based on urgency of the identified issue.

Table 5.1: Recommendations for Granville Ferry

Category	Problem/Challenge Area	Recommended Action	Time Frame to Complete	Opinion of Cost
Water Quality	Corrosion Control Monitoring	Formalize a comprehensive Corrosion Control Plan with action limits/responses, aiming to reduce lead and copper, to correspond to existing sampling plan.	6 months	No cost if done in-house
Water Quality	SWPP and Manganese Monitoring	Complete monitoring proposed in the SWPP, including water quality sampling, review of DND results, and watershed inspections.	1 year	No cost if done in-house
Water Quality	DBP Monitoring	Propose reduced monitoring of THMs and HAAs based on low historical readings.	1 year	Sampling cost savings
Water Quality	Raw Water Turbidity	Relocate tower outlet turbidity to tower inlet prior to chlorination.	3 months	\$1,000
Source Quantity	Flow Monitoring	Add a combined flowmeter on the well inlet to tower.	6 months	\$25,000
Sampling	Copper and Lead Sampling	Copper and Lead sampling methodology set by Health Canada includes four 1-L RDT samples, which should be implemented for all future sampling.	3 months	No cost
Management	O&M Manual and SOPs limited	Develop a comprehensive O&M manual with SOPs in accordance with the NSECC guidance manual.	1 year	No cost if done in-house

Category	Problem/Challenge Area	Recommended Action	Time Frame to Complete	Opinion of Cost
Management	Limited Cross Connection Control Plan	Update Cross Connection Control Plan to comply with minimum requirements set by NSECC.	3 months	No cost if done in-house

5.2 Report Preparation

I, the undersigned, hereby declare that to the best of my knowledge, the information contained herein and the information in support of this submission, as completed by me, is complete and accurate in accordance with my obligations under the Engineering Profession Act and its regulations. I further declare that this submission has been prepared in accordance with the published standard for this submission.



Ben Bickerton, M.A.Sc., P.Eng.
Process Engineer

APPENDIX A

Tables Required by the Terms of References

Table A.1: Groundwater Under the Direct Influence of Surface Water: Microscopic Particulate Analysis (MPA) Test Results
 Section not applicable.

Table A.2: Annual Trihalomethanes Concentrations (THMs) by Sample Location

Sampling Period/Month		Site A	Site B	Site C
		THM total (mg/L)	THM total (mg /L)	THM total (mg /L)
Q1	January	-	-	-
	February	<0.001	<0.001	<0.001
	March	-	-	-
Q2	April	-	-	-
	May	0.001	<0.001	<0.001
	June	-	-	-
Q3	July	0.001	<0.001	0.002
	August	-	-	-
	September	-	-	-
Q4	October	0.003	<0.001	0.001
	November	-	-	-
	December	-	-	-
LRAA (mg/L)		0.002	<0.001	0.001
Meets MAC of 0.1 mg/L (100 µg/L)		Yes	Yes	Yes

Table A.3: Annual Haloacetic Acid Concentrations (HAA5) by Sample Location

Sampling Period/Month		Site A	Site B	Site C
		HAA (5) mg/L	HAA (5) mg/L	HAA (5) mg/L
Q1	January	-	-	-
	February	<0.004	<0.004	<0.004
	March	-	-	-
Q2	April	-	-	-
	May	<0.004	<0.004	<0.004
	June	-	-	-
Q3	July	<0.004	<0.004	<0.004
	August	-	-	-
	September	-	-	-
Q4	October	<0.004	<0.004	<0.004
	November	-	-	-
	December	-	-	-
LRAA (µg/L)		<0.004	<0.004	<0.004
Meets MAC of 0.08 mg/L (80 µg/L)		Yes	Yes	Yes

Table A.4: Health-Related Parameters in the *Guidelines for Canadian Drinking Water Quality*

Parameter	MAC (mg/L)	Raw Water			Treated Water		
		Sampling Period			Sampling Period		
		2016	2021	2026	2016	2021	2026
Bacteria							
Total Coliforms	None per 100 mL	-	-	-	-	-	-
<i>E. coli</i>	None per 100 mL	-	-	-	-	-	-
Aluminum	2.9	0.38	<0.01	-	0.015	<0.01	-
Antimony	0.006	<0.002	<0.002	-	<0.002	<0.002	-
Arsenic	0.01	<0.002	<0.002	-	<0.002	<0.002	-
Atrazine	0.005	-	<0.001	-	-	<0.001	-
Barium	2	0.112	0.103	-	0.101	0.100	-
Benzene	0.005	<0.001	<0.001	-	<0.001	<0.001	-
Benzo[<i>a</i>]pyrene	0.00004	-	<0.00001	-	-	<0.00001	-
Boron	5	0.06	0.007	-	0.01	0.007	-
Bromate	0.01	-	<0.01	-	-	<0.01	-
Bromoxynil	0.03	-	<0.0005	-	-	<0.0005	-
Cadmium	0.007	0.000019	<0.00003	-	<0.000017	<0.00003	-
Carbon tetrachloride	0.002	0.00056	0.00056	-	-	0.00056	-
Chlorate	1	-	<0.02	-	-	<0.02	-
Chlorite	1	-	<0.02	-	-	<0.02	-
Chlorpyrifos	0.09	-	<0.001	-	-	<0.001	-
Chromium	0.05	0.003	0.003	-	0.002	0.003	-
Copper	2	0.002	<0.002	-	0.013	0.008	-
Cyanide	0.2	-	<0.002	-	-	<0.002	-
Cyanobacterial toxins	0.0015	-	<0.0015	-	-	<0.0015	-
Dicamba	0.11	-	<0.00005	-	-	<0.00005	-
1,4-Dichlorobenzene	0.005	<0.001	<0.001	-	-	<0.001	-
1,2-Dichloroethane	0.005	<0.002	<0.002	-	-	<0.002	-
1,1-Dichloroethylene	0.014	<0.00006	<0.002	-	-	<0.002	-
Dichloromethane	0.05	<0.002	<0.002	-	-	<0.002	-
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	-	<0.0005	-	-	<0.0005	-
Dimethoate	0.02	-	<0.0015	-	-	<0.0015	-
1,4-Dioxane	0.05	-	-	-	-	-	-
Diquat	0.05	-	<0.005	-	-	<0.005	-
Ethylbenzene	0.14	<0.001	<0.002	-	-	<0.002	-
Fluoride	1.5	<0.12	<0.12	-	3.42	0.39	-
Glyphosate	0.28	-	<0.015	-	-	<0.015	-
Haloacetic acids - Total (HAAs)	0.08	-	<0.004	-	-	<0.004	-
Lead	0.005	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Malathion	0.19	-	<0.001	-	-	<0.001	-

Parameter	MAC (mg/L)	Raw Water			Treated Water		
		Sampling Period			Sampling Period		
		2016	2021	2026	2016	2021	2026
Manganese	0.12	0.002	<0.002	-	0.003	<0.002	-
Mercury	0.001	-	<0.00005	-	-	<0.00005	-
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	0.35	-	<0.005	-	-	<0.005	-
Metribuzin	0.08	-	<0.00025	-	-	<0.00025	-
Nitrate-Nitrogen	10	-	1.98	-	2.48	1.97	-
Nitritotriacetic acid (NTA)	0.4	-	<0.03	-	-	<0.03	-
Nitrite-Nitrogen	1	-	<0.05	-	-	<0.05	-
N-Nitroso dimethylamine (NDMA)	0.00004	-	0.000002	-	-	0.000002	-
Pentachlorophenol	0.06	-	<0.0001	-	-	<0.0001	-
Perfluorooctane Sulfonate (PFOS)	0.0006	-	<0.000001	-	-	<0.000001	-
Perfluorooctanoic Acid (PFOA)	0.0002	-	<0.000001	-	-	<0.000001	-
Selenium	0.05	<0.001	<0.002	-	<0.001	<0.002	-
Strontium	7	-	0.212	-	-	0.190	-
Tetrachloroethylene	0.01	<0.0016	<0.001	-	-	<0.001	-
Toluene	0.06	<0.001	<0.001	-	-	<0.001	-
Trichloroethylene	0.005	<0.001	<0.001	-	-	<0.001	-
2,4,6-Trichlorophenol	0.005	-	<0.0005	-	-	<0.0005	-
Trihalomethanes (THM)	0.1	-	<0.001	-	<0.001	<0.001	-
Turbidity		0.9	<0.5	-	0.7	<0.5	-
Uranium	0.02	0.0014	0.0045	-	0.0039	0.0039	-
Vinyl chloride	0.002	0.0005	<0.00006	-	-	<0.00006	-
Xylenes (total)	0.09	<0.002	<0.004	-	<0.002	<0.004	-

Table A.5: Guidelines for Monitoring Public Drinking Water Supplies

Parameter	MAC	Aesthetic Guideline	2021	
	(mg/L)	(mg/L)	Raw (µg/L)	Treated (µg/L)
Alkalinity				-
Aluminium	0.1/0.2		<5	6
Ammonia			-	-
Antimony	0.006		<2	<2
Arsenic	0.01		<2	<2
Barium	1		104	102
Boron	5		9	8
Cadmium	0.005		<0.09	<0.09
Calcium			-	-
Chloride		≤250	-	-
Chromium	0.05		3	3
Colour		≤ 15 TCU	-	-
Conductivity			-	-
Copper		≤1.0	130	2
Fluoride	1.5		-	-
Hardness			-	-
Iron		≤0.3	<50	<50
Lead	0.01		<0.5	<0.5
Magnesium			-	-
Manganese	0.12	≤0.02	<2	<2
Nitrate-nitrogen	10		-	-
pH		6.5-8.5	-	-
Potassium			-	-
Selenium	0.01		<1	<1
Sodium		≤200	-	-
Sulphate		≤500	-	-
Total Dissolved Solids		≤500	-	-
Total Organic Carbon			-	-
Turbidity			-	-
Uranium	0.02		3.5	3.4
Zinc		≤5	<5	<5

Table C.1: Operator in Overall Direct Responsible Charge

Table C.1: Operator in Direct Responsible Charge

The operator in overall direct responsible charge (ODRC) is:
James Jenner

Signature of Operator: _____

Date: June 30, 2023

Protocols in place during the absence of the operator in ODRC include:

When on vacation:

There will be no changes made to any treatment process in the water treatment plants. Relief operators will maintain and monitor the treatment process and record all information.

When ill:

There will be no changes made to any treatment process in the water treatment plants. Relief operators will maintain and monitor the treatment process and record all information.

Other (specify):

There will be no changes made to any treatment process in the water treatment plants. Relief operators will maintain and monitor the treatment process and record all information.

Table A.6.a: Water Withdrawal Data (Approval No. 2007-058630)

Month	Monthly Maximum Daily Rate (m ³ /day)	Monthly Average Daily Rate (m ³ /day)	Monthly Withdrawal Volume (m ³)	Annual Withdrawal Volume (m ³)
2022	1,440	1,060	31,800	386,900
January	547	422	13,084	
February	590	441	12,342	
March	576	443	13,739	
April	485	406	12,179	
May	544	477	14,786	
June	555	469	14,067	
July	620	516	15,983	
August	668	518	16,054	
September	579	474	14,232	
October	798	485	15,025	
November	529	439	13,177	
December	521	450	13,948	
				168,616

*The Granville Ferry's Annual Reports provide a total raw water flow summary. There was no individual flow monitoring from each well in 2022, addition of individual well flow monitoring is being implemented.

Table A.6.b: Water Withdrawal Data Comparison to Approved Limits

PW1			PW3		Combined Sources		
Specify Approved Withdrawal Limits		Exceeds (Yes/No)	Specify Approved Withdrawal Limits	Exceeds (Yes/No)	Specify Approved Withdrawal Limits		Exceeds (Yes/No)
Maximum Daily Rate L/day	753,120	N/A*	1,059,840	No	Maximum Daily Rate L/day	1,440,000	No
Average Daily Rate - L/day	753,120	N/A*	686,880	No	Average Daily Rate - L/day	1,060,000	No
Volume (30 days) - Litres	22,593,600	N/A*	20,606,400	No	Volume (30 days) - Litres	31,800,000	No
Volume (Annual) - Litres	274,888,800	N/A*	250,711,200	No	Volume (Annual) - Litres	386,900,000	No

Table B.1: Membrane Filtration Direct Integrity Testing Using Pressure Decay
Section not applicable.

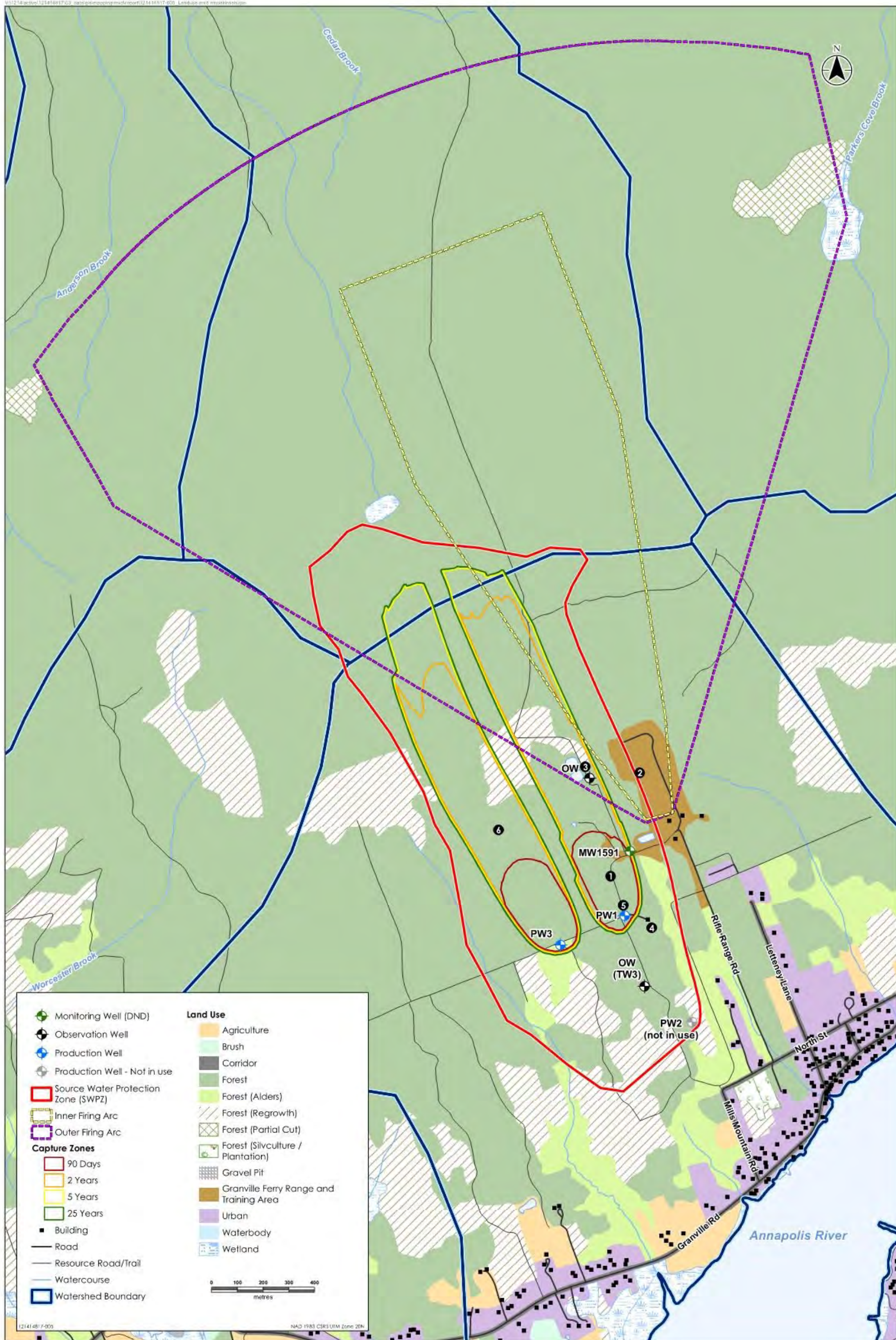
Table B.2: Filter Backwash Water – Discharges to A Freshwater Watercourse
Section not applicable.

Table B.3: Filter Backwash Water – Discharge to Land or Soil
Section not applicable.

Table B.4: Filter Backwash Water – Discharge to A Marine or Brackish Environment
Section not applicable.

APPENDIX B

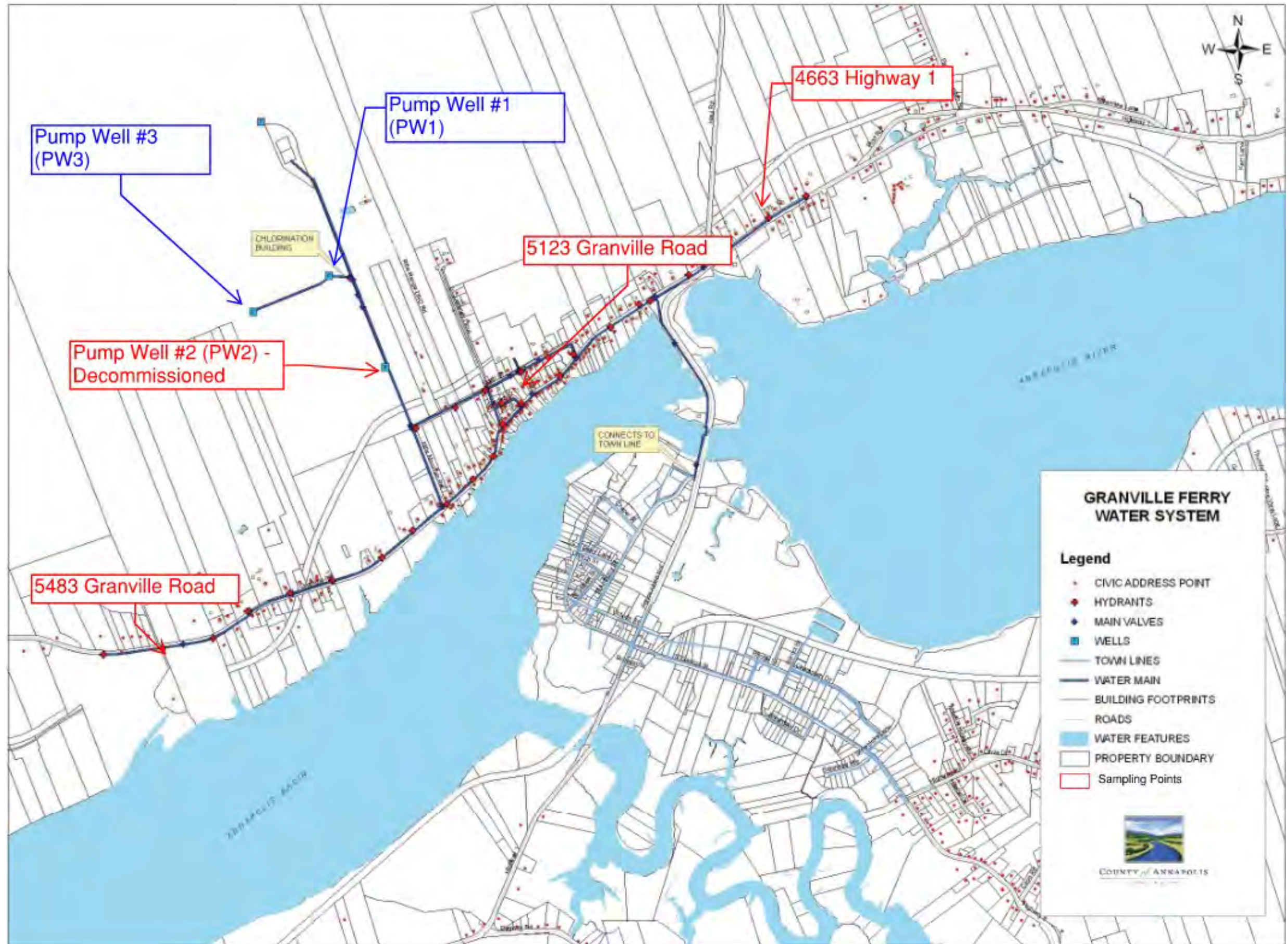
Watershed Boundary Plan



	Monitoring Well (DND)	Land Use
	Observation Well	
	Production Well	
	Production Well - Not in use	
	Source Water Protection Zone (SWPZ)	
	Inner Firing Arc	
	Outer Firing Arc	
Capture Zones		
	90 Days	
	2 Years	
	5 Years	
	25 Years	
	Building	
	Road	
	Resource Road/Trail	
	Watercourse	
	Watershed Boundary	

APPENDIX C

Distribution Map



APPENDIX D

Corrosion Control Program Results

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 PO Box 100
 Annapolis Royal, NS B0S1A0
 (902) 532-3141

ATTENTION TO: James Jenner
 PROJECT: Granville Lead & Copper

AGAT WORK ORDER: 22X909290

WATER ANALYSIS REVIEWED BY: Sara Knox, Data Reviewer

DATE REPORTED: Jun 22, 2022

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
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- The test results reported herewith relate only to the samples as received by the laboratory.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 22X909290
 PROJECT: Granville Lead & Copper

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8716
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Health Canada Lead & Copper Sampling - Drinking Water

DATE RECEIVED: 2022-06-17

DATE REPORTED: 2022-06-22

Parameter	Unit	SAMPLE DESCRIPTION:		5534 Granville	5352 Granville	35 North St	5375 Granville	67 North St
		Rd		Rd	Rd	Rd	Rd	Rd
		Water		Water	Water	Water	Water	Water
		DATE SAMPLED: 2022-06-13		2022-06-13	2022-06-13	2022-06-13	2022-06-13	2022-06-13
		G / S	RDL	3990397	3990399	3990400	3990401	3990402
Total Copper	ug/L	2000, 1000	2	4	14	5	16	13
Total Lead - Health Canada	ug/L	5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Sara Knox

Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 22X909290

PROJECT: Granville Lead & Copper

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 22, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Health Canada Lead & Copper Sampling - Drinking Water															
Total Copper	3984157		420	433	3.2%	< 2	108%	80%	120%	108%	80%	120%	NA	70%	130%
Total Lead - Health Canada	3984157		2.2	2.3	NA	< 0.5	101%	80%	120%	107%	80%	120%	92%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: _____



Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 22X909290

PROJECT: Granville Lead & Copper

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Copper	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Lead - Health Canada	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Study Record

P: 902.468.8718 • F: 902.468.8924

Client Name: **JENNER**
Address: **JTH BROADWAY**
City: **Annapolis, NS**
Phone: **-0566** Fax: _____
Service: **Drainville Lead and Copper**

Report Information (Please print):

1. Name: **JAMES JENNER**
Email: **jjenner@annapoliscounty.ca**
2. Name: _____
Email: _____

Report Format

Single Sample per page
 Multiple Samples per page
 Excel Format included

Laboratory Use Only

Arrival Condition: Good Poor (see notes)
Arrival Temperature: **12.6, 15.1, 15.6**

Hold Time: _____

AGAT Job Number: **228909290**

Notes: **Cooler, ice pack over temp**
LL

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days
Rush TAT Same day 1 day
 2 days 3 days

Date Required: _____

Drinking Water Sample: Yes No

Reg. No.: _____

Number is not provided client will be billed full price for analysis.
Same Yes / No

City: **Annapolis**
Address: **Annapoliscounty.ca**
Zip: **100**
Phone: **2-1445** Fax: _____

Regulatory Requirements (Check):

List Guidelines on Report Do not list Guidelines on Report

PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube

CCME

Industrial NSEQ-Cont. Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL
 Sediment Other

Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtrated/Preserved	Standard Water Analysis	Metals to Total	Mercury	pH	TSS	TDS	MS	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PRR)	Tier 2: TPH/BTEX (Fracturation)	CCME/CMS (PH/BTEX)	VOC	THM	HAA	PAH	PCB	TC + EC	DP/A	MPN	MF	HPC	Pseudomonas	Fecal Coliform	MPN	MF	Other: Health Canada Lead	Other: Copper	Hazardous (Y/N)	
June 13	TAP	1																																
June 13	TAP	1																																
June 13	TAP	1																																
June 13	TAP	1																																
June 13	TAP	1																																

Client: **NER** Date/Time: **June 15** Sample Received By (Print Name): _____ Date/Time: _____
 Signature: *[Signature]* Sample Received By (Sign): _____ Date/Time: _____
 Pink Copy - Client
 Yellow Copy - AGAT
 White Copy - AGAT
 Page of
 No: _____

122 JUN 17 8:59 AM

APPENDIX E

Last Round of Sampling Data for *GCDWQ*

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
PO Box 100
Annapolis Royal, NS B0S1A0
(902) 532-3141

ATTENTION TO: James Jenner

PROJECT:

AGAT WORK ORDER: 21X780719

FOOD CHEMISTRY REVIEWED BY: Félix Brasseur, chimiste

MISCELLANEOUS ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Sep 01, 2021

PAGES (INCLUDING COVER): 27

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

VERSION 2: Partial

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AGAT Laboratories (V2)

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8716
FAX (902)468-8924
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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Glyphosate (Montreal) (ug/L)

DATE RECEIVED: 2021-07-28		DATE REPORTED: 2021-09-01			
SAMPLE DESCRIPTION: Granville Raw		Granville Treated			
SAMPLE TYPE: Water		Water			
DATE SAMPLED: 2021-07-27		2021-07-27			
Parameter	Unit	G / S	RDL	2790940	2791022
Glyphosate	ug/L	15	<15	<15	<15

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Montréal (unless marked by *)

Certified By:





Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

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TEL: (902)468-8716
FAX: (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Canadian Drinking Water MAC Package (Radiochemistry)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		G / S	RDL	2790940	2791022
Radionuclides - Gross Alpha*	Bq/L	0.5	0.1	Y	Y
Radionuclides - Gross Beta*	Bq/L	1.0	0.1	Y	Y

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
2790940-2791022 *Analysis performed at subcontracted laboratory.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



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AGAT WORK ORDER: 21X780719
PROJECT:

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
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TEL: (902)468-8716
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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Canadian Drinking Water MAC Package (Subcontracted)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		G / S	RDL	G / S	RDL
Nitroacetic Acid (NTA)	mg/L	0.4	0.03	Y	Y

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
2790940-2791022 *Analysis performed at subcontracted laboratory.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



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AGAT WORK ORDER: 21X780719

PROJECT:

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 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Canadian Drinking Water MAC Package (HAAs, VOCs)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville	
		SAMPLE TYPE: Water		Treated	
		DATE SAMPLED: 2021-07-27		2021-07-27	
		G / S	RDL	2790940	2791022
Chloroacetic Acid	ug/L		0.5	<0.5	<0.5
Bromoacetic Acid	ug/L		0.5	<0.5	<0.5
Dichloroacetic Acid	ug/L		0.5	<0.5	0.6
Trichloroacetic Acid	ug/L		0.5	<0.5	<0.5
Bromochloroacetic Acid	ug/L		0.5	<0.5	<0.5
Dibromoacetic Acid	ug/L		0.5	<0.5	0.6
Haloacetic Acids	ug/L	80	4.0	<4.0	<4.0
Vinyl Chloride	ug/L	2	0.6	<0.6	<0.6
Chloroethane	ug/L		5	<5	<5
1,1-Dichloroethylene	ug/L	14	2	<2	<2
Methylene Chloride (Dichloromethane)	ug/L	50	2	<2	<2
Methyl-t-Butyl-Ether (MTBE)	ug/L	15 AO	2	<2	<2
Chloroform	ug/L		1	<1	<1
1,2-Dichloroethane	ug/L	5	2	<2	<2
Carbon Tetrachloride	ug/L	2	0.56	<0.56	<0.56
Benzene	ug/L	5	1	<1	<1
Trichloroethylene	ug/L	5	1	<1	<1
Bromodichloromethane	ug/L		1	<1	<1
Toluene	ug/L	60, 24 AO	2	<2	<2
Dibromochloromethane	ug/L		1	<1	<1
Tetrachloroethylene	ug/L		1	<1	<1
Chlorobenzene	ug/L	80, 30 AO	1	<1	<1
Ethylbenzene	ug/L	140, 1.6 AO	2	<2	<2
Bromoform	ug/L		1	<1	<1
Xylenes (Total)	ug/L	300 AO	4	<4	<4
1,4-Dichlorobenzene	ug/L	5, 1 AO	1	<1	<1
1,2-Dichlorobenzene	ug/L	200, 3 AO	1	<1	<1
Total Trinalomathanes	ug/L	100	1	<1	<1

Certified By: 



Certificate of Analysis

AGAT WORK ORDER: 21X780719
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FAX: (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Canadian Drinking Water MAC Package (HAAs, VOCs)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Surrogate	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville
		Acceptable Limits	2790940	Treated
			2021-07-27	2021-07-27
2-Bromobutanoic acid	%	50-130	124	125
Toluene-d8	%	60-130	97	97
4-Bromofluorobenzene	%	60-130	101	100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X780719
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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Carbamate Pesticides (Water)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		G / S	RDL	2790940	2791022
Aldicarb	µg/L	2.0	<2.0	<2.0	<2.0
Bendiocarb	µg/L	2	<2	<2	<2
Carbofuran	µg/L	5	<5	<5	<5
Carbaryl	µg/L	5	<5	<5	<5
Diuron	µg/L	10	<10	<10	<10
Triallate	µg/L	1	<1	<1	<1
Temephos	µg/L	10	<10	<10	<10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2790940-2791022 Results relate only to the items tested.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

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TEL: (902)468-8716
FAX: (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Diquat, Paraquat (Water)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		G / S	RDL	Water	Water
				2021-07-27	2021-07-27
				2790940	2791022
Diuron	µg/L		10	<10	<10
Paraquat	µg/L		1	<1	<1

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: _____



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AGAT WORK ORDER: 21X780719
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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

OC Pesticides (Water) (for Halifax)					
DATE RECEIVED: 2021-07-28			DATE REPORTED: 2021-09-01		
Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		DATE SAMPLED: 2021-07-27		2021-07-27	
		G / S	RDL	2790940	2791022
alpha-BHC	µg/L		0.01	<0.01	<0.01
Hexachlorobenzene	µg/L		0.01	<0.01	<0.01
beta-BHC	µg/L		0.05	<0.05	<0.05
Gamma-Hexachlorocyclohexane	µg/L		0.01	<0.01	<0.01
delta-BHC	µg/L		0.01	<0.01	<0.01
Heptachlor	µg/L		0.01	<0.01	<0.01
Aldrin	µg/L		0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L		0.01	<0.01	<0.01
Oxychlorane	µg/L		0.05	<0.05	<0.05
gamma-Chlordane	µg/L		0.1	<0.1	<0.1
op'-DDE	µg/L		0.01	<0.01	<0.01
Endosulfan I	µg/L		0.002	<0.002	<0.002
alpha - chlordane	µg/L		0.05	<0.05	<0.05
pp'-DDE	µg/L		0.05	<0.05	<0.05
Dieldrin	µg/L		0.02	<0.02	<0.02
op'-DDD	µg/L		0.05	<0.05	<0.05
Endrin	µg/L		0.05	<0.05	<0.05
Endosulfan II	µg/L		0.002	<0.002	<0.002
pp'-DDD	µg/L		0.05	<0.05	<0.05
op'-DDT	µg/L		0.04	<0.04	<0.04
Endrin Aldehyde	µg/L		0.05	<0.05	<0.05
Endosulfan Sulfate	µg/L		0.05	<0.05	<0.05
pp'-DDT	µg/L		0.05	<0.05	<0.05
Endrin Ketone	µg/L		0.05	<0.05	<0.05
Methoxychlor	µg/L		0.04	<0.04	<0.04
Mirex	µg/L		0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits			
TCMX	%		50-140	80	98
Decachlorobiphenyl	%		50-140	90	93

Certified By: _____



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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

OC Pesticides (Water) (for Halifax)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
2790940-2791022 DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

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Dartmouth, Nova Scotia
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http://www.agatlab.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

OP Pesticides (Water)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		G / S	RDL	2790940	2791022
Phorate	µg/L	0.5	<0.5	<0.5	<0.5
Dimethoate	µg/L	2.5	<2.5	<2.5	<2.5
Terbufos	µg/L	0.5	<0.5	<0.5	<0.5
Diazinon	µg/L	1	<1	<1	<1
Malathion	µg/L	5	<5	<5	<5
Chlorpyrifos	µg/L	1	<1	<1	<1
Parathion	µg/L	1	<1	<1	<1
Azinphos-methyl	µg/L	2	<2	<2	<2
Surrogate	Unit	Acceptable Limits			
Triphenyl phosphate (surr)	%	50-140	78	90	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to ODWS - Table D
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
2790940-2791022 Results relate only to the items tested.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

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TEL: (902)468-8718
FAX: (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Phenoxy Acid Herbicides (Water)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		G / S	RDL	2790940	2791022
2,4-D	µg/L	0.5	<0.5	<0.5	<0.5
2,4,5-T	µg/L	0.5	<0.5	<0.5	<0.5
2,4,5-TP	µg/L	0.5	<0.5	<0.5	<0.5
Dicamba	µg/L	0.5	<0.5	<0.5	<0.5
Dichlorprop	µg/L	0.5	<0.5	<0.5	<0.5
Dinoseb	µg/L	0.5	<0.5	<0.5	<0.5
Picloram	µg/L	0.5	<0.5	<0.5	<0.5
Diclofop-methyl	µg/L	0.5	<0.5	<0.5	<0.5
2,3,4,6-Tetrachlorophenol	µg/L	0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	µg/L	0.2	<0.2	<0.2	<0.2
2,4,5-Trichlorophenol	µg/L	0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	µg/L	0.5	<0.5	<0.5	<0.5
Bromoxynil	µg/L	0.3	<0.3	<0.3	<0.3
MCPA	µg/L	5.0	<5.0	<5.0	<5.0
MCPPP	µg/L	5.0	<5.0	<5.0	<5.0
Pentachlorophenol	µg/L	0.1	<0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits			
DCAA	%	50-140	86	74	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Toronto (unless marked by *)

Certified By: _____



Certificate of Analysis

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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Triazine Pesticides [water]

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw				Granville
		SAMPLE TYPE: Water		Water		Treated
		G / S	RDL	2790940	2791022	
Trifluralin	µg/L	1.0	<1.0	<1.0	<1.0	
Simazine	µg/L	1.0	<1.0	<1.0	<1.0	
Altrazine	µg/L	0.5	<0.5	<0.5	<0.5	
Metribuzin	µg/L	0.25	<0.25	<0.25	<0.25	
Prometryne	µg/L	0.25	<0.25	<0.25	<0.25	
Metolachlor	µg/L	0.11	<0.11	<0.11	<0.11	
Atachlor	µg/L	0.5	<0.5	<0.5	<0.5	
Cyanazine	µg/L	1.0	<1.0	<1.0	<1.0	
Surrogate	Unit	Acceptable Limits				
Triphenyl phosphate (surr)	%	30-130	87	98		

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to ODWS - Table D
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
2790940-2791022 Results relate only to the items tested.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL: (902)468-8718
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http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Canadian Drinking Water MAC Package (Metals, Hg & Inorganics)

DATE RECEIVED: 2021-07-28

DATE REPORTED: 2021-09-01

Parameter	Unit	SAMPLE DESCRIPTION: Granville Raw		Granville Treated	
		SAMPLE TYPE: Water		Water	
		G / S	RDL	2790940	2791022
Total Aluminum	ug/L	2900, 100	10	<10	<10
Total Antimony	ug/L	6	2	<2	<2
Total Arsenic	ug/L	10	2	3	2
Total Barium	ug/L	2000	5	103	100
Total Boron	ug/L	5000	5	7	7
Total Cadmium	ug/L	7	0.3	<0.3	<0.3
Total Chromium	ug/L	50	2	3	3
Total Copper	ug/L	2000, 1000	2	13	<2
Total Iron	ug/L	300 AO	50	<50	<50
Total Lead	ug/L	5	0.5	1.0	<0.5
Total Manganese	ug/L	120, 20 AO	2	<2	<2
Total Selenium	ug/L	50	2	<2	<2
Total Strontium	ug/L	7000	5	212	190
Total Uranium	ug/L	20	0.2	4.5	3.1
Total Zinc	ug/L	5000 AO	5	<5	<5
Total Sodium	mg/L	200 AO	0.1	7.8	8.2
Mercury	ug/L	1	0.05	<0.05	<0.05
pH		7.0-10.5		7.48	7.72
Turbidity	NTU	1.0	0.5	<0.5	<0.5
True Color	TCU	15 AO	5.00	<5.00	<5.00
Chloride	mg/L	250 AO	1		
Fluoride	mg/L	1.5	0.12		
Nitrate as N	mg/L	10	0.05		
Sulphate	mg/L	500 AO	2		
Total Dissolved Solids	mg/L	500 AO	5	162	162
Bromate	mg/L	0.01	0.01		
Chlorate	mg/L	1	0.02		
Chlorite	mg/L	1	0.02		
Chloramines - Total	mg/L		0.1	<0.1	<0.1

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X780719
PROJECT:

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http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
SAMPLING SITE:

ATTENTION TO: James Jenner
SAMPLED BY:

Canadian Drinking Water MAC Package (Metals, Hg & Inorganics)	
DATE RECEIVED: 2021-07-28	DATE REPORTED: 2021-09-01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 2790940-2791022 Chloramines is a calculated parameter. The calculated parameter is non-accredited. The component parameters of the calculation are accredited.
 Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Food Chemistry Analysis

RPT Date: Sep 01, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Glyphosate (Montreal) (ug/L)															
Glyphosate	812	NA	< 15	< 15	0.0%	< 15	108%	70%	130%	107%	70%	130%	96%	70%	130%

Certified By: _____



AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis															
RPT Date: Sep 01, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
							Lower	Upper		Lower	Upper		Lower	Upper	
Canadian Drinking Water MAC Package (HAAs, VOCs)															
Chloroacetic Acid	1	2774693	0.8	0.9	NA	< 0.5	107%	70%	130%	70%	60%	130%	64%	60%	130%
Bromoacetic Acid	1	2774693	< 0.5	< 0.5	NA	< 0.5	103%	70%	130%	80%	60%	130%	74%	60%	130%
Dichloroacetic Acid	1	2774693	30.9	29.4	5.0%	< 0.5	99%	70%	130%	101%	60%	130%	102%	60%	130%
Trichloroacetic Acid	1	2774693	33.5	30.4	9.7%	< 0.5	91%	70%	130%	78%	60%	130%	81%	60%	130%
Bromochloroacetic Acid	1	2774693	6.3	6.1	3.2%	< 0.5	87%	70%	130%	100%	60%	130%	97%	60%	130%
Dibromoacetic Acid	1	2774693	0.9	1.0	NA	< 0.5	89%	70%	130%	106%	60%	130%	105%	60%	130%
Vinyl Chloride	1	2788131	< 0.6	< 0.6	NA	< 0.6	97%	50%	140%	90%	60%	130%	96%	50%	140%
Chloroethane	1	2788131	< 5	< 5	NA	< 5	96%	50%	140%	88%	60%	130%	86%	50%	140%
1,1-Dichloroethylene	1	2788131	< 2	< 2	NA	< 2	102%	50%	140%	94%	60%	130%	103%	50%	140%
Methylene Chloride (Dichloromethane)	1	2788131	< 2	< 2	NA	< 2	100%	50%	140%	94%	60%	130%	106%	50%	140%
Methyl-t-Butyl-Ether (MTBE)	1	2788131	< 2	< 2	NA	< 2	80%	60%	140%	79%	60%	140%	91%	60%	140%
Chloroform	1	2788131	81	88	8.3%	< 1	101%	50%	140%	96%	60%	130%	NA	50%	140%
1,2-Dichloroethane	1	2788131	< 2	< 2	NA	< 2	93%	50%	140%	89%	60%	130%	101%	50%	140%
Carbon Tetrachloride	1	2788131	< 0.56	< 0.56	NA	< 0.56	95%	50%	140%	89%	60%	130%	99%	50%	140%
Benzene	1	2788131	< 1	< 1	NA	< 1	95%	70%	130%	86%	70%	130%	98%	70%	130%
Trichloroethylene	1	2788131	< 1	< 1	NA	< 1	96%	50%	140%	90%	60%	130%	101%	50%	140%
Bromodichloromethane	1	2788131	17	18	5.7%	< 1	91%	50%	140%	86%	60%	130%	73%	50%	140%
Toluene	1	2788131	< 2	< 2	NA	< 2	96%	70%	130%	86%	60%	140%	95%	60%	140%
Dibromochloromethane	1	2788131	2	2	NA	< 1	93%	50%	140%	85%	60%	130%	96%	50%	140%
Tetrachloroethylene	1	2788131	< 1	< 1	NA	< 1	98%	70%	130%	88%	60%	140%	98%	60%	140%
Chlorobenzene	1	2788131	< 1	< 1	NA	< 1	94%	50%	140%	86%	60%	130%	93%	50%	140%
Ethylbenzene	1	2788131	< 2	< 2	NA	< 2	94%	70%	130%	84%	60%	140%	94%	60%	140%
Bromoform	1	2788131	< 1	< 1	NA	< 1	83%	50%	140%	75%	60%	130%	88%	50%	140%
1,4-Dichlorobenzene	1	2788131	< 1	< 1	NA	< 1	89%	50%	140%	80%	60%	130%	84%	50%	140%
1,2-Dichlorobenzene	1	2788131	< 1	< 1	NA	< 1	90%	50%	140%	84%	60%	130%	91%	50%	140%
Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution. If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.															
Diquat, Paraquat (Water)															
Diuron		TW	< 10	< 10	NA	< 10	96%	50%	140%	96%	50%	140%	97%	50%	140%
Paraquat		TW	< 1	< 1	NA	< 1	86%	50%	140%	95%	50%	140%	97%	50%	140%
Carbamate Pesticides (Water)															
Aldicarb		2767079	< 2.0	< 2.0	NA	< 2.0	98%	50%	140%	98%	50%	140%	106%	50%	140%
Bendiocarb		2767079	< 2	< 2	NA	< 2	102%	50%	140%	99%	50%	140%	101%	50%	140%
Carbofuran		2767079	< 5	< 5	NA	< 5	102%	50%	140%	99%	50%	140%	101%	50%	140%
Carbaryl		2767079	< 5	< 5	NA	< 5	108%	50%	140%	114%	50%	140%	115%	50%	140%
Diuron		2767079	< 10	< 10	NA	< 10	107%	50%	140%	103%	50%	140%	100%	50%	140%
Triallate		2767079	< 1	< 1	NA	< 1	101%	50%	140%	99%	50%	140%	99%	50%	140%
Temephos		2767079	< 10	< 10	NA	< 10	104%	60%	130%	104%	60%	130%	105%	60%	130%

AGAT QUALITY ASSURANCE REPORT (V2)

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Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Sep 01, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Phenoxy Acid Herbicides (Water)															
2,4-D	2767079		< 0.5	< 0.5	NA	< 0.5	101%	50%	140%	115%	50%	140%	95%	50%	140%
2,4,5-T	2767079		< 0.5	< 0.5	NA	< 0.5	92%	50%	140%	120%	50%	140%	102%	50%	140%
2,4,5-TP	2767079		< 0.5	< 0.5	NA	< 0.5	90%	50%	140%	116%	50%	140%	100%	50%	140%
Dicamba	2767079		< 0.5	< 0.5	NA	< 0.5	89%	50%	140%	108%	50%	140%	96%	50%	140%
Dichlorprop	2767079		< 0.5	< 0.5	NA	< 0.5	90%	50%	140%	103%	50%	140%	90%	50%	140%
Dinoseb	2767079		< 0.5	< 0.5	NA	< 0.5	80%	50%	140%	106%	50%	140%	95%	50%	140%
Picloram	2767079		< 0.5	< 0.5	NA	< 0.5	95%	50%	140%	93%	50%	140%	83%	50%	140%
Diclofop-methyl	2767079		< 0.5	< 0.5	NA	< 0.5	92%	50%	140%	79%	50%	140%	114%	50%	140%
2,3,4,6-Tetrachlorophenol	2767079		< 0.5	< 0.5	NA	< 0.5	76%	50%	140%	82%	50%	140%	73%	50%	140%
2,4-Dichlorophenol	2767079		< 0.2	< 0.2	NA	< 0.2	76%	50%	140%	94%	50%	140%	91%	50%	140%
2,4,5-Trichlorophenol	2767079		< 0.5	< 0.5	NA	< 0.5	90%	50%	140%	84%	50%	140%	84%	50%	140%
2,4,6-Trichlorophenol	2767079		< 0.5	< 0.5	NA	< 0.5	75%	50%	140%	86%	50%	140%	76%	50%	140%
Bromoxynil	2767079		< 0.3	< 0.3	NA	< 0.3	98%	50%	140%	94%	50%	140%	93%	50%	140%
MCPA	2767079		< 5.0	< 5.0	NA	< 5.0	96%	50%	140%	108%	50%	140%	86%	50%	140%
MCPP	2767079		< 5.0	< 5.0	NA	< 5.0	98%	50%	140%	108%	50%	140%	92%	50%	140%
Pentachlorophenol	2767079		< 0.1	< 0.1	NA	< 0.1	106%	50%	140%	91%	50%	140%	79%	50%	140%
Triazine Pesticides (water)															
Trifluralin		TW	< 1.0	< 1.0	NA	< 1.0	87%	50%	140%	96%	50%	140%	76%	50%	140%
Simazine		TW	< 1.0	< 1.0	NA	< 1.0	88%	50%	140%	82%	50%	140%	99%	50%	140%
Atrazine		TW	< 0.5	< 0.5	NA	< 0.5	79%	50%	140%	70%	50%	140%	92%	50%	140%
Metribuzin		TW	< 0.25	< 0.25	NA	< 0.25	98%	50%	140%	77%	50%	140%	98%	50%	140%
Prometryne		TW	< 0.25	< 0.25	NA	< 0.25	99%	50%	140%	94%	50%	140%	76%	50%	140%
Metolachlor		TW	< 0.11	< 0.11	NA	< 0.11	88%	50%	140%	76%	50%	140%	83%	50%	140%
Alachlor		TW	< 0.5	< 0.5	NA	< 0.5	80%	50%	140%	88%	50%	140%	94%	50%	140%
Cyanazine		TW	< 1.0	< 1.0	NA	< 1.0	78%	50%	140%	90%	50%	140%	99%	50%	140%
OC Pesticides (Water) (for Halifax)															
alpha-BHC	2797080		< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	86%	50%	140%	92%	50%	140%
Hexachlorobenzene	2797080		< 0.01	< 0.01	NA	< 0.01	109%	50%	140%	96%	50%	140%	96%	50%	140%
beta-BHC	2797080		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	85%	50%	140%	93%	50%	140%
Gamma-Hexachlorocyclohexane	2797080		< 0.01	< 0.01	NA	< 0.01	98%	50%	140%	91%	50%	140%	105%	50%	140%
delta-BHC	2797080		< 0.01	< 0.01	NA	< 0.01	106%	50%	140%	86%	50%	140%	102%	50%	140%
Heptachlor	2797080		< 0.01	< 0.01	NA	< 0.01	93%	50%	140%	84%	50%	140%	105%	50%	140%
Aldrin	2797080		< 0.01	< 0.01	NA	< 0.01	106%	50%	140%	96%	50%	140%	107%	50%	140%
Heptachlor Epoxide	2797080		< 0.01	< 0.01	NA	< 0.01	113%	50%	140%	97%	50%	140%	102%	50%	140%
Oxychlorane	2797080		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	89%	50%	140%	104%	50%	140%
gamma-Chlordane	2797080		< 0.1	< 0.1	NA	< 0.1	114%	50%	140%	98%	50%	140%	104%	50%	140%
op'-DDE	2797080		< 0.01	< 0.01	NA	< 0.01	94%	50%	140%	89%	50%	140%	98%	50%	140%

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Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Sep 01, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Endosulfan I	2797080		< 0.002	< 0.002	NA	< 0.002	114%	50%	140%	100%	50%	140%	106%	50%	140%
alpha - chlordane	2797080		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	98%	50%	140%	104%	50%	140%
pp'-DDE	2797080		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	100%	50%	140%	103%	50%	140%
Dieldrin	2797080		< 0.02	< 0.02	NA	< 0.02	118%	50%	140%	99%	50%	140%	101%	50%	140%
op'-DDD	2797080		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	107%	50%	140%	104%	50%	140%
Endrin	2797080		< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	103%	50%	140%	100%	50%	140%
Endosulfan II	2797080		< 0.002	< 0.002	NA	< 0.002	118%	50%	140%	94%	50%	140%	107%	50%	140%
pp'-DDD	2797080		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	105%	50%	140%	102%	50%	140%
op'-DDT	2797080		< 0.04	< 0.04	NA	< 0.04	102%	50%	140%	94%	50%	140%	102%	50%	140%
Endrin Aldehyde	2797080		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	89%	50%	140%	106%	50%	140%
Endosulfan Sulfate	2797080		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	95%	50%	140%	108%	50%	140%
pp'-DDT	2797080		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	96%	50%	140%	105%	50%	140%
Endrin Ketone	2797080		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	96%	50%	140%	109%	50%	140%
Methoxychlor	2797080		< 0.04	< 0.04	NA	< 0.04	85%	50%	140%	101%	50%	140%	102%	50%	140%
Mirex	2797080		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	92%	50%	140%	108%	50%	140%
OP Pesticides (Water)															
Phorate		TW	< 0.5	< 0.5	NA	< 0.5	90%	50%	140%	71%	50%	140%	89%	50%	140%
Dimethoate		TW	< 2.5	< 2.5	NA	< 2.5	76%	50%	140%	92%	50%	140%	74%	50%	140%
Terbufos		TW	< 0.5	< 0.5	NA	< 0.5	82%	50%	140%	84%	50%	140%	77%	50%	140%
Diazinon		TW	< 1	< 1	NA	< 1	94%	50%	140%	96%	50%	140%	80%	50%	140%
Malathion		TW	< 5	< 5	NA	< 5	77%	50%	140%	88%	50%	140%	92%	50%	140%
Chlorpyrifos		TW	< 1	< 1	NA	< 1	83%	50%	140%	90%	50%	140%	99%	50%	140%
Parathion		TW	< 1	< 1	NA	< 1	88%	50%	140%	93%	50%	140%	98%	50%	140%
Azinphos-methyl		TW	< 2	< 2	NA	< 2	90%	50%	140%	79%	50%	140%	85%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Sep 01, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Canadian Drinking Water MAC Package (Metals, Hg & Inorganics)															
Total Aluminum	2791500		<10	<10	NA	< 10	99%	80%	120%	100%	80%	120%	104%	70%	130%
Total Antimony	2791500		<2	<2	NA	< 2	98%	80%	120%	103%	80%	120%	105%	70%	130%
Total Arsenic	2791500		<2	<2	NA	< 2	100%	80%	120%	100%	80%	120%	105%	70%	130%
Total Barium	2791500		155	152	2.1%	< 5	90%	80%	120%	89%	80%	120%	NA	70%	130%
Total Boron	2791500		32	31	3.8%	< 5	97%	80%	120%	101%	80%	120%	103%	70%	130%
Total Cadmium	2791500		<0.3	<0.3	NA	< 0.3	105%	80%	120%	102%	80%	120%	96%	70%	130%
Total Chromium	2791500		<2	<2	NA	< 2	100%	80%	120%	100%	80%	120%	110%	70%	130%
Total Copper	2791500		36	35	2.0%	< 2	101%	80%	120%	99%	80%	120%	NA	70%	130%
Total Iron	2791500		<50	<50	NA	< 50	100%	80%	120%	99%	80%	120%	114%	70%	130%
Total Lead	2791500		0.6	0.5	NA	< 0.5	105%	80%	120%	102%	80%	120%	98%	70%	130%
Total Manganese	2791500		<2	<2	NA	< 2	100%	80%	120%	101%	80%	120%	106%	70%	130%
Total Selenium	2791500		<2	<2	NA	< 2	103%	80%	120%	102%	80%	120%	93%	70%	130%
Total Strontium	2791500		426	408	4.1%	< 5	100%	80%	120%	100%	80%	120%	NA	70%	130%
Total Uranium	2791500		0.8	0.8	NA	< 0.2	101%	80%	120%	95%	80%	120%	105%	70%	130%
Total Zinc	2791500		29	28	4.2%	< 5	101%	80%	120%	101%	80%	120%	102%	70%	130%
Total Sodium	2791500		63.4	61.8	2.6%	< 0.1	110%	80%	120%	111%	80%	120%	NA	70%	130%
Mercury	2792437		<0.026	<0.026	NA	< 0.05	104%	80%	120%		80%	120%	113%	70%	130%
pH	2867350		6.01	6.11	1.7%	<	NA	80%	120%	NA	80%	120%	NA	80%	120%
Turbidity	2859711		25.7	24.4	5.2%	< 0.5	92%	80%	120%	NA	NA	NA	NA	NA	NA
True Color	2792970		21.7	<5.00	NA	17.5	NA	80%	120%	NA	80%	120%	NA	NA	NA
Total Dissolved Solids	2789079		204	208	1.9%	< 5	88%	80%	120%	NA	NA	NA	NA	NA	NA

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:

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Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Food Chemistry Analysis			
Glyphosate	ORG-100-5115F	MA.403-GLYAMP 1.0 Modifiée	HPLC
Miscellaneous Analysis			
Radionuclides - Gross Alpha*			
Radionuclides - Gross Beta*			
Nitroacetic Acid (NTA)			

Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

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SAMPLING SITE:

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Chloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Bromoacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Dichloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Trichloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Bromochloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Dibromoacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Haloacetic Acids	ORG-120-5110	EPA 552.3	GC/ECD
2-Bromobutanoic acid	ORG-120-5110	EPA 552.3	GC/ECD
Vinyl Chloride	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Chloroethane	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
1,1-Dichloroethylene	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
Methylene Chloride (Dichloromethane)	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
Methyl-t-Butyl-Ether (MTBE)	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Chloroform	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
1,2-Dichloroethane	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Carbon Tetrachloride	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Benzene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Trichloroethylene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Bromodichloromethane	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Toluene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Dibromochloromethane	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Tetrachloroethylene	VOL-120-5001	EPA SW-846 5230B/8260	GC/MS
Chlorobenzene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Ethylbenzene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Bromoform	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Xylenes (Total)	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
1,4-Dichlorobenzene	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
1,2-Dichlorobenzene	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
Total Trihalomethanes	VOL-120-5001	EPA SW846 5230/8260	GC/MS
Toluene-d8	VOL-120-5001	EPA SW846 5030B/8260B	GC/MS
4-Bromofluorobenzene	VOL-120-5001	EPA SW846 5030B/8260B	GC/MS
Aldicarb	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Bendiocarb	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Carbofuran	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Carbaryl	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Diuron	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Triallate	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Temephos	ORG-91-5101	EPA 632 531.1 & MOE E3158	HPLC
Diuron	ORG 5501	EPA SW-632 531.1 & MOE E3389	HPLC
Paraquat	ORG-91-5102	EPA 549.1	HPLC
alpha-BHC	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Hexachlorobenzene	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
beta-BHC	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
delta-BHC	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD

Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Heptachlor	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Aldrin	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Heptachlor Epoxide	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Oxychlordan	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
gamma-Chlordane	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
op'-DDE	ORG-91-5112	modified from EPA SW846 3510C & 8081B	GC/ECD
Endosulfan I	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
alpha - chlordan	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
pp'-DDE	ORG-91-5112	modified from EPA SW846 3510C & 8081B	GC/ECD
Dieldrin	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
op'-DDD	ORG-91-5112	modified from EPA SW846 3510C & 8081B	GC/ECD
Endrin	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Endosulfan II	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
pp'-DDD	ORG-91-5112	modified from EPA SW846 3510C & 8081B	GC/ECD
op'-DDT	ORG-91-5112	modified from EPA SW846 3510C & 8081B	GC/ECD
Endrin Aldehyde	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Endosulfan Sulfate	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
pp'-DDT	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Endrin Ketone	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Methoxychlor	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Mirex	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
TCMX	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Decachlorobiphenyl	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Phorate	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Dimethoate	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Terbufos	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Diazinon	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Malathion	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS

Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Chlorpyrifos	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Parathion	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Azinphos-methyl	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
Triphenyl phosphate (surr)	ORG-91-5103	modified from EPA SW-846 3510C, 8141B & 8270E	GC/MS
2,4-D	ORG-91-5110	EPA SW-846 8151A	GC/ECD
2,4,5-T	ORG-91-5510	EPA SW846 8151A	GC/ECD
2,4,5-TP	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Dicamba	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Dichlorprop	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Dinoseb	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Picloram	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Diclofop-methyl	ORG-91-5110	EPA SW-846 8151A	GC/ECD
2,3,4,6-Tetrachlorophenol	ORG-91-5110	EPA SW-846 8151A	GC/ECD
2,4-Dichlorophenol	ORG-91-5110	EPA SW-846 8151A	GC/ECD
2,4,5-Trichlorophenol	ORG-91-5100	EPA SW-846 8151A	GC/ECD
2,4,6-Trichlorophenol	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Bromoxynil	ORG-91-5110	EPA SW-846 8151A	GC/ECD
MCPA	ORG-91-5110	EPA SW-846 8151A	GC/ECD
MCPP	ORG-91-5110	EPA SW-846 8151A	GC/ECD
Pentachlorophenol	ORG-91-5110	EPA SW-846 3510 & 8151	GC/ECD
DCAA	ORG-91-5110	EPA SW-846 8151	GC/ECD
Trifluralin	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Simazine	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Atrazine	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Metribuzin	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Prometryne	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Metolachlor	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Alachlor	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Cyanazine	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS
Triphenyl phosphate (surr)	ORG-91-5104	EPA SW-846 3510C, 8270D & MOE E3121	GC/MS

Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X780719

PROJECT:

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Aluminum	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP-MS
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Barium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Boron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Cadmium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Chromium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Copper	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Iron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Lead	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Selenium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Strontium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Uranium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Zinc	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Sodium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Mercury	INOR-121-6100 & INOR-121-6107	SM 3112 B	CV/AA
pH	INOR-121-6001	SM 4500 H+B	PC TITRATE
Turbidity	INOR-121-6022	SM 2130 B	NEPHELOMETER
True Color	INOR-121-6008	SM 2120 B	LACHAT FIA
Chloride	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INOR-121-6005	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Total Dissolved Solids	INOR-121-6024, 6025	SM 2540C, D	GRAVIMETRIC
Bromate	INOR-121-6005	SM 4110 B	ION CHROMATOGRAPH
Chlorate	INOR-121-6005	SM 4110 B	ION CHROMATOGRAPH
Chlorite	INOR-121-6005	SM 4110 B	ION CHROMATOGRAPH
Chloramines - Total			CALCULATION



AGAT Laboratories

Unit 122 • 11 Morris Drive
Dartmouth, NS
B3B 1M2
webearth.agatlabs.com • www.agatlabs.com

Laboratory Use Only

Arrival Condition: Good Poor (see notes)
Arrival Temperature: 14.9, 15.6, 16.0
Hold Time: _____
AGAT Job Number: 21x780719

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information

Company: County of Annapolis
Contact: James Jenner
Address: 490 South Broadway
Cornwallis
Phone: 902 526 0566 Fax: _____
Client Project #: Granville WTP
AGAT Quotation: _____
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):

1. Name: James Jenner
Email: jjenner@annapoliscounty.ca
2. Name: _____
Email: _____

Report Format

Single Sample per page
 Multiple Samples per page
 Excel Format included
 Export

Notes:

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days
Rush TAT Same day 1 day
 2 days 3 days

Date Required: _____

Invoice To

Same Yes / No

Company: County of Annapolis
Contact: Amanda Lewis
Address: _____
Phone: 902 955 0853 Fax: _____
PO/Credit Card#: _____

Regulatory Requirements (Check):

List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube
 CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Sediment Other

Drinking Water Sample: Yes No Salt Water Sample Yes No
Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info, Sample Containment	Pesticides - Misc	VOC	OP Pesticides - Misc	Diquat/Paraquat - Misc	Carbamate/Urea Pesticides - Misc	Various Inorganics	Cyanide - MFI	HAA	Total Metals	Mercury	NTA - SGS	Triazine Herbicides - Misc	TRM	Organophosphate - SRC	Lead 210 - SRC	OC Pesticides - Methoxychlor - Misc
Granville Raw	July 27	TAP			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Granville Filtered					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Sampled By (Print Name): <u>James Jenner</u>	Date/Time: <u>July 27</u>	Sampled By (Print Name): <u>James Jenner</u>	Date/Time:	Page <input type="text"/> of <input type="text"/>
Sampled By (Print Name):	Date/Time:	Sampled By (Print Name):	Date/Time:	White Copy - AGAT

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information
Company: County of Annapolis
Contact: James Jenner
Address: 490 South Broadway
Cornwallis
Phone: 902.526.0566 Fax: _____
Client Project #: Granville WTP
AGAT Quotation: _____
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
1. Name: James Jenner
Email: jjenner@annapoliscounty.ca
2. Name: _____
Email: _____

Report Format
 Single Sample per page
 Multiple Samples per page
 Excel Format Included
 Export

Regulatory Requirements (Check):
 List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube

Notes: _____
Turnaround Time Required (TAT)
Regular TAT 5 to 7 working days
Rush TAT Same day 1 day
 2 days 3 days
Date Required: _____

Invoice To Same Yes / No
Company: County of Annapolis
Contact: Amanda Lewis
Address: _____
Phone: 902.955.0853 Fax: _____
PO/Credit Card#: _____

CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Other: _____
 Sediment

Drinking Water Sample: Yes No Salt Water Sample Yes No
Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info, Sample Containment	Herbicides - Miss	VOG	OP Pesticides - Miss	Diquat/Paraquat - Miss	Carbanates/Urea Pesticides - Miss	Various Inorganics	Glyphosate - Mtl	BHA	Total Metals	Mercury	NTA - SGS	Triamine Herbicides - Miss	TFHM	Gross Alpha/Beta - SRC	Lead 210 - SRC	OC Pesticides - Methoxychlor - Miss	
Granville Treated					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Granville Treated	July 27	TAP			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Service Relinquished By (Print Name): James Jenner Date/Time: July 27 Sample Relinquished By (Sign): _____
 Sample Received By (Print Name): _____ Date/Time: _____ Samples Received By (Sign): _____
 Copy/Time: _____ Pink Copy - Client Page of
 Yellow Copy - AGAT _____
 White Copy - AGAT _____ No: _____

APPENDIX F

Last Round of Sampling Data for *GMPDWS*

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 PO Box 100
 Annapolis Royal, NS B0S1A0
 (902) 532-3141
 ATTENTION TO: James Jenner
 PROJECT: Granville THM's and SWA
 AGAT WORK ORDER: 21X796377
 TRACE ORGANICS REVIEWED BY: Amy Hunter, Trace Organics Supervisor, B.Sc.
 DATE REPORTED: Sep 15, 2021
 PAGES (INCLUDING COVER): 13
 VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This report shall not be reproduced or distributed, in whole or in part, without the prior written consent of AGAT Laboratories.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the information contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X796377
 PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8716
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Haloacetic Acids (water)

DATE RECEIVED: 2021-09-02

DATE REPORTED: 2021-09-15

Parameter	Unit	SAMPLE DESCRIPTION:		West	East	PWSHOP
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2021-08-31	2021-08-31	2021-08-31
		G / S	RDL	2920665	2920666	2920667
Chloroacetic Acid	ug/L		0.5	<0.5	<0.5	<0.5
Bromoacetic Acid	ug/L		0.5	<0.5	<0.5	<0.5
Dichloroacetic Acid	ug/L		0.5	<0.5	0.7	0.6
Trichloroacetic Acid	ug/L		0.5	<0.5	<0.5	<0.5
Bromochloroacetic Acid	ug/L		0.5	0.5	0.6	<0.5
Dibromoacetic Acid	ug/L		0.5	0.8	0.5	<0.5
Total Haloacetic Acids	ug/L	80	4.0	<4.0	<4.0	<4.0
HAA5	ug/L	80	4.0	<4.0	<4.0	<4.0
Surrogate	Unit	Acceptable Limits				
2-Bromobutanoic acid	%		70-130	113	84	110

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2023-01
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 2920665-2920667 HAA5 is a calculated parameter. The calculated parameter is non-accredited. The component parameters of the calculation are accredited.
 Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X796377
 PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8716
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Trihalomethanes in Water

DATE RECEIVED: 2021-09-02

DATE REPORTED: 2021-09-15

Parameter	Unit	SAMPLE DESCRIPTION:		West	East	PWSHOP
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2021-08-31	2021-08-31	2021-08-31
		G / S	RDL	2920665	2920666	2920667
Chloroform	ug/L		1	1	<1	3
Bromodichloromethane	ug/L		1	2	1	3
Dibromochloromethane	ug/L		1	2	<1	2
Bromoform	ug/L		1	<1	<1	<1
Total Trihalomethanes	ug/L	100	1	5	1	8
Surrogate	Unit	Acceptable Limits				
Toluene-d8	%	60-140		81	80	78
4-Bromofluorobenzene	%	60-140		92	91	91

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2023-01
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X796377
 PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8716
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Health Canada Lead Sampling - Drinking Water

DATE RECEIVED: 2021-09-02		DATE REPORTED: 2021-09-15				
SAMPLE DESCRIPTION: 5287 Granville PW Shop 5276 Granville						
		SAMPLE TYPE: Water		Water		Water
		DATE SAMPLED: 2021-08-27		2021-08-27		2021-08-31
		G / S		RDL		
		2920663		2920664		2920668
Parameter	Unit	G / S	RDL			
Total Lead - Health Canada	ug/L	5	0.5	<0.5	3.6	3.9

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2023-01
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 Analysis performed at AGAT Halifax (unless marked by *)

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X796377
 PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8718
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2021-09-02

DATE REPORTED: 2021-09-15

Parameter	Unit	SAMPLE DESCRIPTION:		Granville	
		SAMPLE TYPE:		Treated	Granville Raw
		G / S	RDL	Water	Water
				2920669	2920670
pH		7.0-10.5		7.87	7.90
Reactive Silica as SiO ₂	mg/L		0.5	24.2	23.2
Chloride	mg/L	250 AO	1	9	10
Fluoride	mg/L	1.5	0.12	<0.12	<0.12
Sulphate	mg/L	500 AO	2	35	39
Alkalinity	mg/L		5	76	77
True Color	TCU	15 AO	5.00	<5.00	<5.00
Turbidity	NTU	1.0	0.5	0.7	0.5
Electrical Conductivity	umho/cm		1	261	272
Nitrate + Nitrite as N	mg/L		0.05	0.18	0.17
Nitrate as N	mg/L	10	0.05	0.18	0.17
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05
Ammonia as N	mg/L		0.03	<0.03	<0.03
Total Organic Carbon	mg/L		0.5	1.3	0.9
Ortho-Phosphate as P	mg/L		0.01	0.03	0.03
Total Sodium	mg/L	200 AO	0.1	8.7	9.1
Total Potassium	mg/L		0.1	0.7	0.8
Total Calcium	mg/L		0.1	37.5	38.4
Total Magnesium	mg/L		0.1	3.4	3.7
Bicarb. Alkalinity (as CaCO ₃)	mg/L		5	76	77
Carb. Alkalinity (as CaCO ₃)	mg/L		10	<10	<10
Hydroxide	mg/L		5	<5	<5
Calculated TDS	mg/L	500 AO	1	141	148
Hardness	mg/L			108	111
Langelier Index (@20C)	NA			-0.28	-0.23
Langelier Index (@ 4C)	NA			-0.60	-0.55
Saturation pH (@ 20C)	NA			8.15	8.13
Saturation pH (@ 4C)	NA			8.47	8.45
Anion Sum	me/L			2.52	2.65

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X796377
 PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL: (902)468-8718
 FAX: (902)468-8924
 http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
 SAMPLING SITE:

ATTENTION TO: James Jenner
 SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2021-09-02

DATE REPORTED: 2021-09-15

Parameter	Unit	SAMPLE DESCRIPTION:		Granville	
		SAMPLE TYPE:		Treated	Granville Raw
		G / S	RDL	Water	Water
DATE SAMPLED:				2920669	2920670
Cation sum	me/L			2.55	2.64
% Difference/ Ion Balance	%			0.7	0
Total Aluminum	ug/L	2900, 100	5	6	<5
Total Antimony	ug/L	6	2	<2	<2
Total Arsenic	ug/L	10	2	3	2
Total Barium	ug/L	2000	5	102	104
Total Beryllium	ug/L	2	2	<2	<2
Total Bismuth	ug/L	2	2	<2	<2
Total Boron	ug/L	5000	5	8	9
Total Cadmium	ug/L	7	0.09	<0.09	<0.09
Total Chromium	ug/L	50	1	3	3
Total Cobalt	ug/L		1	<1	<1
Total Copper	ug/L	2000, 1000	1	2	130
Total Iron	ug/L	300 AO	50	<50	<50
Total Lead	ug/L	5	0.5	<0.5	2.6
Total Manganese	ug/L	120, 20 AO	2	<2	<2
Total Molybdenum	ug/L		2	<2	<2
Total Nickel	ug/L		2	<2	<2
Total Phosphorous	mg/L		0.02	0.05	0.05
Total Selenium	ug/L	50	1	<1	<1
Total Silver	ug/L		0.1	<0.1	<0.1
Total Strontium	ug/L	7000	5	165	162
Total Thallium	ug/L		0.1	<0.1	<0.1
Total Tin	ug/L		2	<2	<2
Total Titanium	ug/L		2	<2	<2
Total Uranium	ug/L	20	0.2	3.4	3.5
Total Vanadium	ug/L		2	6	5
Total Zinc	ug/L	5000 AO	5	<5	<5

Certified By: _____



Certificate of Analysis

AGAT WORK ORDER: 21X796377

PROJECT: Granville THM's and SWA

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8716
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CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2021-09-02

DATE REPORTED: 2021-09-15

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2023-01
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
2920669-2920670 % Difference / Ion Balance, Hardness, Langelier Index, Nitrate + Nitrite, Hydroxide and Saturation pH are calculated parameters. The calculated parameters are non-accredited. The component parameters of the calculations are accredited.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By: _____



Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY
PROJECT: Granville THM's and SWA
SAMPLING SITE:

AGAT WORK ORDER: 21X796377
ATTENTION TO: James Jenner
SAMPLED BY:

Trace Organics Analysis

RPT Date: Sep 15, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Trihalomethanes in Water															
Chloroform	1	2920665	1	2	NA	< 1	101%	50%	140%	128%	60%	130%	NA	50%	140%
Bromodichloromethane	1	2920665	2	2	NA	< 1	108%	50%	140%	120%	60%	130%	108%	50%	140%
Dibromochloromethane	1	2920665	2	3	NA	< 1	82%	50%	140%	89%	60%	130%	90%	50%	140%
Bromoform	1	2920665	< 1	< 1	NA	< 1	71%	50%	140%	77%	60%	130%	69%	50%	140%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution. Matrix spike performed on a different sample than the duplicate.
If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Haloacetic Acids (water)

Chloroacetic Acid	1	2920652	< 0.5	< 0.5	NA	< 0.5	95%	70%	130%	65%	60%	130%	94%	60%	130%
Bromoacetic Acid	1	2920652	< 0.5	< 0.5	NA	< 0.5	100%	70%	130%	74%	60%	130%	77%	60%	130%
Dichloroacetic Acid	1	2920652	35.5	37.8	6.3%	< 0.5	91%	70%	130%	94%	60%	130%	112%	60%	130%
Trichloroacetic Acid	1	2920652	82.9	80.4	3.1%	< 0.5	92%	70%	130%	75%	60%	130%	114%	60%	130%
Bromochloroacetic Acid	1	2920652	3.1	3.1	0.0%	< 0.5	87%	70%	130%	108%	60%	130%	115%	60%	130%
Dibromoacetic Acid	1	2920652	< 0.5	< 0.5	NA	< 0.5	90%	70%	130%	109%	60%	130%	115%	60%	130%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: 

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Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X796377

PROJECT: Granville THM's and SWA

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Sep 15, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
						Lower		Upper	Lower		Upper	Lower		Upper	

Health Canada Lead Sampling - Drinking Water

Total Lead - Health Canada	2922369	<0.5	<0.5	NA	< 0.5	100%	80%	120%	98%	80%	120%	94%	70%	130%
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Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Standard Water Analysis + Total Metals

pH	2948577	7.17	7.29	1.7%	<	101%	80%	120%	NA			NA		
Reactive Silica as SiO2	2920877	3.3	3.4	3.2%	< 0.5	102%	80%	120%	108%	80%	120%	115%	80%	120%
Chloride	2935177	2	2	NA	< 1	93%	80%	120%	NA	80%	120%	90%	70%	130%
Fluoride	2935177	<0.12	<0.12	NA	< 0.12	97%	80%	120%	NA	80%	120%	89%	70%	130%
Sulphate	2935177	3	3	NA	< 2	108%	80%	120%	NA	80%	120%	94%	70%	130%
Alkalinity	2948577	97	97	0.5%	< 5	85%	80%	120%	NA			NA		
True Color	2920877	8.56	11.1	NA	< 5	100%	80%	120%	93%	80%	120%	NA		
Turbidity	2914182	5.6	6.0	6.2%	< 0.5	94%	80%	120%	NA			NA		
Electrical Conductivity	2948577	317	322	1.6%	< 1	102%	90%	110%	NA			NA		
Nitrate as N	2935177	0.32	0.33	1.5%	< 0.05	89%	80%	120%	NA	80%	120%	84%	70%	130%
Nitrite as N	2935177	<0.05	<0.05	NA	< 0.05	94%	80%	120%	NA	80%	120%	90%	70%	130%
Ammonia as N	2914732	0.22	0.22	0.5%	< 0.03	98%	80%	120%	93%	80%	120%	106%	70%	130%
Total Organic Carbon	2920880	3.6	3.6	0.6%	< 5	98%	80%	120%	NA	80%	120%	91%	80%	120%
Ortho-Phosphate as P	2920877	0.06	<0.01	NA	< 0.01	92%	80%	120%	94%	80%	120%	90%	80%	120%
Total Sodium	2917229	22.0	22.3	1.4%	< 0.1	110%	80%	120%	115%	80%	120%	NA	70%	130%
Total Potassium	2917229	0.3	0.3	NA	< 0.1	108%	80%	120%	110%	80%	120%	107%	70%	130%
Total Calcium	2917229	2.6	2.6	0.8%	< 0.1	99%	80%	120%	104%	80%	120%	NA	70%	130%
Total Magnesium	2917229	0.5	0.5	NA	< 0.1	106%	80%	120%	108%	80%	120%	115%	70%	130%
Bicarb. Alkalinity (as CaCO3)	2948577	97	97	0.5%	< 5	NA	80%	120%	NA			NA		
Carb. Alkalinity (as CaCO3)	2948577	<10	<10	NA	< 10	NA	80%	120%	NA			NA		
Hydroxide	2948577	<5	<5	NA	< 5	NA	80%	120%	NA			NA		
Total Aluminum	2917229	30	26	15.1%	< 5	104%	80%	120%	108%	80%	120%	115%	70%	130%
Total Antimony	2917229	<2	<2	NA	< 2	91%	80%	120%	102%	80%	120%	90%	70%	130%
Total Arsenic	2917229	<2	<2	NA	< 2	99%	80%	120%	102%	80%	120%	85%	70%	130%
Total Barium	2917229	<5	<5	NA	< 5	88%	80%	120%	90%	80%	120%	86%	70%	130%
Total Beryllium	2917229	<2	<2	NA	< 2	105%	80%	120%	109%	80%	120%	104%	70%	130%
Total Bismuth	2917229	<2	<2	NA	< 2	100%	80%	120%	106%	80%	120%	92%	70%	130%
Total Boron	2917229	6	6	NA	< 5	104%	80%	120%	110%	80%	120%	113%	70%	130%
Total Cadmium	2917229	<0.09	<0.09	NA	< 0.09	99%	80%	120%	100%	80%	120%	87%	70%	130%
Total Chromium	2917229	<1	<1	NA	< 1	96%	80%	120%	101%	80%	120%	105%	70%	130%
Total Cobalt	2917229	<1	<1	NA	< 1	98%	80%	120%	103%	80%	120%	104%	70%	130%
Total Copper	2917229	16	16	1.9%	< 1	99%	80%	120%	104%	80%	120%	NA	70%	130%
Total Iron	2917229	161	163	NA	< 50	102%	80%	120%	102%	80%	120%	108%	70%	130%
Total Lead	2917229	<0.5	<0.5	NA	< 0.5	95%	80%	120%	99%	80%	120%	93%	70%	130%
Total Manganese	2917229	5	5	NA	< 2	96%	80%	120%	99%	80%	120%	105%	70%	130%

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Quality Assurance

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X796377

PROJECT: Granville THM's and SWA

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Sep 15, 2021			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Molybdenum	2917229		<2	<2	NA	< 2	94%	80%	120%	98%	80%	120%	101%	70%	130%
Total Nickel	2917229		<2	.11	NA	< 2	99%	80%	120%	104%	80%	120%	106%	70%	130%
Total Phosphorous	2917229		0.37	0.36	0.9%	< 0.02	116%	80%	120%	107%	80%	120%	NA	70%	130%
Total Selenium	2917229		<1	<1	NA	< 1	98%	80%	120%	99%	80%	120%	74%	70%	130%
Total Silver	2917229		<0.1	<0.1	NA	< 0.1	98%	80%	120%	102%	80%	120%	90%	70%	130%
Total Strontium	2917229		7	7	NA	< 5	91%	80%	120%	93%	80%	120%	102%	70%	130%
Total Thallium	2917229		<0.1	<0.1	NA	< 0.1	98%	80%	120%	101%	80%	120%	95%	70%	130%
Total Tin	2917229		<2	<2	NA	< 2	95%	80%	120%	101%	80%	120%	97%	70%	130%
Total Titanium	2917229		<2	<2	NA	< 2	105%	80%	120%	110%	80%	120%	123%	70%	130%
Total Uranium	2917229		<0.2	<0.2	NA	< 0.2	96%	80%	120%	99%	80%	120%	96%	70%	130%
Total Vanadium	2917229		<2	<2	NA	< 2	96%	80%	120%	100%	80%	120%	105%	70%	130%
Total Zinc	2917229		171	170	0.4%	< 5	99%	80%	120%	102%	80%	120%	NA	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: _____

AGAT QUALITY ASSURANCE REPORT (V1)

Page 10 of 13

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Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

AGAT WORK ORDER: 21X796377

PROJECT: Granville THM's and SWA

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Chloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Bromoacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Dichloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Trichloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Bromochloroacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
Dibromoacetic Acid	ORG-120-5110	EPA 552.3	GC/ECD
2-Bromobutanoic acid	ORG-120-5110	EPA 552.3	GC/ECD
Total Haloacetic Acids	ORG-120-5110	EPA 552.3	GC/ECD
HAA5	ORG-120-5110	EPA 552.3	GC/ECD
Chloroform	VOL-120-5001	EPA SW-846 5030B/8260B	GC/MS
Bromodichloromethane	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Dibromochloromethane	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Bromoform	VOL-120-5001	EPA SW846 5230B/8260	GC/MS
Total Trihalomethanes	VOL-120-5001	EPA SW846 5230/8260	GC/MS
Toluene-d8	VOL-120-5001	EPA SW846 5030B/8260B	GC/MS
4-Bromofluorobenzene	VOL-120-5001	EPA SW846 5030B/8260B	GC/MS

Method Summary

CLIENT NAME: MUNICIPALITY OF ANNAPOLIS COUNTY

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PROJECT: Granville THM's and SWA

ATTENTION TO: James Jenner

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Lead - Health Canada	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
pH	INOR-121-6001	SM 4500 H+B	PC TITRATE
Reactive Silica as SiO2	INOR-121-6027	SM 4500-SiO2 F	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Alkalinity	INOR-121-6001	SM 2320 B	
True Color	INOR-121-6008	SM 2120 B	LACHAT FIA
Turbidity	INOR-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-121-6047	SM 4500-NH3 H	COLORIMETER
Total Organic Carbon	INOR-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INOR-121-6012	SM 4500-P G	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Potassium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Calcium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Magnesium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Bicarb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC TITRATE
Carb. Alkalinity (as CaCO3)	INORG-121-6001	SM 2320 B	PC TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP-MS
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Barium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Beryllium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Bismuth	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Boron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS



Method Summary

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SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Cadmium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Chromium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Cobalt	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Copper	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Iron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Lead	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Molybdenum	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Nickel	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Phosphorous	MET-121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Selenium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Silver	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Strontium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Thallium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Tin	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Titanium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Uranium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Vanadium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Zinc	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

APPENDIX G

Approval to Operate



55 Starrs Rd. Unit 9
Yarmouth NS
Canada B5A 2T2

902-742-8985 P
902-742-7796 F
www.novascotia.ca

APPROVAL

Province of Nova Scotia
Environment Act, S.N.S. 1994-95, c.1 s.1

APPROVAL HOLDER: MUNICIPALITY OF THE COUNTY OF ANNAPOLIS

SITE PID: 05097019

APPROVAL NO: 2009-065809-04

EXPIRY DATE: June 1, 2029

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 s.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Municipal - Water Works - Water Treatment Facility

Administrator: Paddy-joe MacMillan

Effective Date: June 1, 2019

The Minister's powers and responsibilities under the Act with respect to this Approval have been delegated to the Administrator named above. Therefore, any information or notifications required to be provided to the Minister under this Approval can be provided to the Administrator unless otherwise advised in writing.

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TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Environment

Approval Holder: MUNICIPALITY OF THE COUNTY OF ANNAPOLIS

Project: Granville Ferry Water Treatment Plant

Site:

<u>PID</u>	<u>Civic #</u>	<u>Street Name</u>	<u>Street Type</u>	<u>Community</u>	<u>County</u>
05097019	195	RIFLE RANGE	RD.	GRANVILLE FERRY	ANNAPOLIS COUNTY

Approval No: 2009-065809-04

File No: 94600-30-YAR-2009-065809

Reference Documents

- Application submitted March 8, 2018 and attachments.

1. Definitions

- a. Act means Environment Act, 1994-95, c.1, s.1, and includes, unless the context otherwise requires, the regulations made pursuant to the Act, as amended from time to time.
- b. Administrator means a person appointed by the Minister for the purpose of the Act, and includes an acting administrator.
- c. CT means disinfectant residual in mg/L multiplied by the contact time in minutes.
- d. Contact Time, denoted as T10, is an effective contact time for disinfection in minutes and represents the time when 10% of the water passes the contact unit; that is 90% of the water remains in the unit and will be exposed to longer disinfection within the unit. T10 can be established by tracer studies or calculated using theoretical hydraulic detention times multiplied by an appropriate baffling factor listed in the "Nova Scotia Treatment Standards for Municipal Drinking Water Systems", as amended from time to time.
- e. Continuous monitoring is sampling of flow through analysis equipment that creates an output signal a minimum of once every five minutes.

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- f. Department means the Department of Environment, and the contact for the Department for this approval is:

Nova Scotia Environment
Western Region, Yarmouth Office
55 Starrs Road, Unit 9
Yarmouth , NS , B5A 2T2

Phone: (902) 742-8985
Fax: (902) 742-7796

- g. Grab sample means an individual sample collected in less than 30 minutes and which is representative of the substance sampled.
- h. Inadequate Primary Disinfection means water that does not meet the required CT/IT.
- i. Inadequate Secondary Disinfection means water that does not meet the required disinfectant residual in the distribution system.
- j. Log reduction means a negative of the base 10 logarithm of the fraction of pathogens remaining after the treatment process.

log reduction = log removal by physical treatment + log inactivation by disinfection

where log removal by physical treatment is equal to the credit assigned to the filtration technology indicated in the Department's "Nova Scotia Treatment Standards for Municipal Drinking Water Systems", as amended from time to time; and

log inactivation by disinfection is equal to the inactivation which shall be calculated as defined by the Department's "Nova Scotia Treatment Standards for Municipal Drinking Water Systems", as amended from time to time.

- k. Minister means the Minister of Environment and includes any person delegated the authority of the Minister.
- l. QA/QC means quality assurance and quality control.
- m. Quarterly sampling means samples taken once per quarter with no less than a 45 day interval between sampling events.
- n. Site means a place where a designated activity and/or undertaking is occurring or may occur.

2. Scope

- a. This Approval (the "Approval") relates to the Approval Holder(s) and their application and all documentation submitted to the Department prior to the issuance of this approval for the Water Treatment Facility situated at or near Granville Ferry, NS (the "Site").
- b. This Approval supersedes previous Approval number 2009-065809-A02 which is now null and void.

3. General

- a. The Approval Holder(s) shall conduct the Designated Activity in accordance with the following provisions:
 - i. The Act, as amended from time to time;
 - ii. Any standard adopted by the Department, as amended from time to time, which includes, but is not limited to the following:
 - (a) The Atlantic Canada Guidelines for the Supply, Treatment, Storage, Distribution and Operation of Drinking Water Supply Systems (2004), as amended from time to time;
 - (b) By January 1, 2020, the Nova Scotia Treatment Standards for Municipal Drinking Water Systems (2012), as amended from time to time;
 - (c) The Guidelines for Monitoring Public Drinking Water Supplies, as amended from time to time;
 - (d) Health Canada's Guidelines for Canadian Drinking Water Quality, as amended from time to time; and
 - (e) Facility Classification Standards (2009), as amended from time to time.
- b. Nothing in this Approval relieves the Approval Holder(s) of the responsibility for obtaining and paying for all licenses, permits, approvals or authorizations necessary for carrying out the work authorized to be performed by this Approval which may be required by municipal by-laws or provincial or federal legislation. The Minister does not warrant that such licenses, permits, approvals or other authorizations will be issued.
- c. If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- d. Any request for renewal or extension of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.
- e. If the Minister cancels or suspends this Approval, the Approval Holder(s) remains

subject to the penalty provisions of the Act.

- f. The Approval Holder(s) shall immediately notify the Department of any incidents of non-compliance with this Approval.
- g. The Approval Holder(s) shall advise the Department, in writing, prior to any proposed extensions or modifications to the Site. An amendment to this Approval may be required before implementing any extension or modification.
- h. The Approval Holder(s) shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- i. All sampling and analysis must be performed in accordance with the following as amended from time to time: Standard Methods for the Examination of Water and Wastewater, or the analytical methods section of Health Canada's guideline technical document for the parameter of concern. All samples shall be collected by persons trained in appropriate sample collection procedures.
- j. Unless written authorization is received otherwise from the Minister, all samples required by this Approval shall be analyzed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories", as amended from time to time.
- k. Notwithstanding the above item, the following parameters may be analyzed at the Site or a laboratory that is not certified:

Alkalinity*, Aluminum Residual*, Chloramines, Chloride Dioxide Residual, Chlorine Residual, Colour, Conductivity*, Fluoride Residual*, Hardness*, Iron*, Manganese*, Methane*, Free Ammonia (as N)*, Ozone Residual, pH, Temperature, Total Organic Carbon, Turbidity and UV Absorbance.

*These parameters must have a Quality Assurance/Quality Control component that includes quarterly confirmation by an accredited laboratory.
- l. The Approval Holder(s) shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the designated activity are made fully aware of the terms and conditions which pertain to this Approval.
- m. Upon any changes to the Registry of Joint Stock Companies information, the Approval Holder(s) shall provide a copy to the Department within five business days.

4. Releases

- a. Releases shall be reported in accordance with the Act.
- b. Releases shall be cleaned up in accordance with the Act.

5. Operation

- a. The Municipal Public Drinking Water Supply has been classified as a Class I water distribution facility.
- b. When it is necessary to use a by-pass to divert water around one or more unit processes, the Approval Holder(s) shall immediately notify the Department and identify the anticipated period of time that the by-pass will be in service.
- c. When it is necessary to use a by-pass to divert water around one or more unit processes, the Approval Holder(s) shall immediately initiate a Boil Water Advisory. The Approval Holder(s) shall maintain the boil advisory until otherwise advised by the Department.
- d. The Approval Holder(s) shall ensure the development and implementation of a cross-connection control program to protect the Municipal Public Drinking Water Supply from contamination due to cross-connections from commercial, institutional, industrial, multi-unit residential, and agricultural facilities, at a minimum, and avoid any cross-connections within the drinking water treatment facility. The program shall be submitted to the Department for review on or before June 1, 2020. Upon review, the Department may require changes to the cross-connection control program.
- e. The Approval Holder(s) shall demonstrate that any Municipal Public Drinking Water Supply component in contact with treated water has been disinfected after construction, repair or maintenance in accordance with ANSI (American National Standards Institute)/AWWA (American Water Works Association) C651 - Disinfection of Water Mains, ANSI/AWWA C653 - Disinfection of Water Treatment Plant, and ANSI/AWWA C652 - Disinfection of Water Storage Facilities, or the latest revisions.
- f. The Approval Holder(s) shall ensure that all chemicals used in the treatment process and all materials contacting the water are of "food grade" quality and meet both the AWWA quality criteria as set out in AWWA standards and the ANSI safety criteria as set out in ANSI standard NSF/60 (for chemical additives) or NSF/61 (for materials). A copy of the appropriate NSF certification is to be kept on Site and is to be available for review immediately upon request by the Department.
- g. The Approval Holder(s) shall discontinue use of any chemical found to have adverse effects on finished water quality limits as prescribed in the Act and/or this Approval.
- h. Emergency Notification Procedures:
 - i. The Approval Holder(s) shall ensure that the emergency notification procedures are reviewed and updated on a yearly basis. The Approval

Holder(s) shall document in the annual report what modifications were made to the emergency notification procedures and how the procedures were communicated to staff.

- ii. A copy of the emergency notification procedures are to be maintained on Site at all times and are to be available for review immediately upon request by the Department.
 - iii. The Approval Holder(s) shall ensure that all employees are trained in accordance with the emergency notification procedures and shall keep a record of training at the facility for a minimum period of five (5) years.
- i. Operations Manual:
- i. A copy of the operations manual is to be kept on Site at all times and is to be available for review immediately upon request by the Department.
 - ii. The Approval Holder(s) shall ensure that all employees are trained in accordance with the operations manual and shall keep a record of training at the facility for a minimum period of five (5) years.
- j. A set of drawings, incorporating any amendments made from time to time, shall be retained on Site by the Approval Holder(s) for as long as the Municipal Public Drinking Water Supply is kept in operation and are to be available for inspection or review by departmental staff immediately upon request.
- k. The Approval Holder(s) shall establish procedures for receiving and responding to complaints including a reporting system that records and documents what steps were taken to determine the cause of complaint and the corrective measures taken to alleviate the cause and prevent its recurrence.
- l. The Approval Holder(s) shall establish security measures to assure the safety of the Municipal Public Drinking Water Supply.
- m. The Approval Holder(s) shall maintain a written list of the name of each laboratory utilized, and the parameters analyzed by each laboratory, and shall submit this list to the Department immediately upon request.

6. System Assessment Report

- a. The Approval Holder(s) shall submit a System Assessment Report to the Department by April 1, 2023, to verify that the Municipal Public Drinking Water Supply complies with the Act and standards.
- b. The System Assessment Report shall be in accordance with the Department's "Terms of Reference for System Assessment Reports for Water Works", as amended from time to time.
- c. The Approval Holder(s) shall provide the Department with their corrective action

plan to address deficiencies identified by the System Assessment Report by October 1, 2023. Any changes to the corrective action plan shall be submitted to and deemed acceptable by the Department.

7. Source Water Protection

- a. The Approval Holder(s) shall implement the accepted Source Water Protection Plan in accordance with the accepted schedule.
- b. The Approval Holder(s) shall ensure that the Source Water Protection Plan is reviewed and updated on a yearly basis. The Approval Holder(s) shall ensure that any changes are documented in the annual report.
- c. The Approval Holder(s) shall modify the Source Water Protection Plan, including updates, if so directed by the Department.

8. Water Quality Requirements - Performance and Limits

General Requirements

- a. Treatment shall be sufficient to ensure 99.99% reduction of viruses (4-Log Reduction) for each well or, if water from individual wells is combined, for the combined flow.
- b. The treated water shall minimize corrosion of the water distribution and/or plumbing systems.

Primary Disinfection Requirements

- c. Primary disinfection through the use of chlorine, ultraviolet light (UV) and/or a Department approved alternate disinfection method, shall contribute a minimum of 4-log inactivation for viruses for each well or, if water from individual wells is combined, for the combined flow. The disinfection log inactivation shall be based on CT/IT values which shall be calculated as defined by the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, as amended from time to time.
- d. Flow from each well or the combined flow, if water from individual wells is combined, shall have a minimum of two primary disinfection units configured to apply disinfection treatment at all times to ensure that inadequately disinfected water does not enter the water distribution system unless the Approval Holder(s) makes an application for system wide redundancy and the application is deemed acceptable by the Department.
- e. Each disinfection unit shall be capable of meeting the maximum day demand flow. Where more than two disinfection units are provided, the maximum day demand flow shall be met when the largest unit is out of service.
- f. Continuous on-line monitoring of the primary disinfection process is required at

each treatment facility with measurements taken at a minimum of once every five minutes to ensure that inadequately disinfected water does not enter the distribution system. Water systems shall be equipped with alarm capabilities to notify operations staff if the disinfection process fails to operate properly to prevent inadequately disinfected water from being distributed.

- g. In the event of an emergency situation where water enters the water distribution system that does not meet the water quality limits as prescribed in the Act and/or this Approval, the Approval Holder(s) shall issue a boil water advisory, do-not-consume, or do-not-use advisory as described in the Guidelines for Monitoring Public Drinking Water Supplies and notify the Department as soon as the Approval Holder(s) becomes aware.
- h. Standard operational procedures (SOPs) for the disinfection process shall be developed, implemented and communicated to all operations staff and documented in the operations manual required herein. The procedures and a log indicating the date and method of communication to staff shall be made available to the Department immediately upon request.
 - i. The standard operational procedures shall indicate the design ranges for achieving CT (e.g. minimum temperature and chlorine residual, maximum flow and pH) and/or IT (e.g. minimum UV intensity, minimum UV transmittance, and maximum water flow).
 - ii. When operational conditions are outside the design ranges for achieving CT/IT, the Approval Holder(s) shall notify the Department as soon as the Approval Holder(s) becomes aware, investigate the cause and take necessary corrective action. CT/IT shall be calculated during every such event.

Secondary Disinfection and Residual Monitoring Requirements

- i. Secondary disinfection through the use of chlorine shall be used to maintain a chlorine residual in the water distribution system.
- j. The disinfection process shall be operated in such a manner as to ensure that the following minimum chlorine residual value is achieved throughout the water distribution system at all times:
 - i. 0.20 mg/L free chlorine residual.
- k. The disinfection process shall be operated in such a manner as to ensure that the maximum chlorine residual delivered to consumers does not exceed the following value:
 - i. 4.0 mg/L free chlorine residual.
- l. Monitoring of the water distribution system for chlorine residual is required.

Unless specified otherwise in this Approval, sampling and testing frequency is the same as for bacteriological sampling requirements as stated in the "Guidelines for Monitoring Public Drinking Water Supplies".

- m. Continuous monitoring of chlorine residual is required for the water leaving any water storage structure within the water distribution system, with measurements taken at no more than five minute intervals.
- n. Continuous monitoring of chlorine residual is required for finished water at each location where water enters the distribution system from an individual well or combined wells, with measurements taken at no more than five minute intervals.

Turbidity Requirements

- o. The turbidity levels entering the water distribution system from each well or combination of wells shall not exceed 1.0 NTU:
 - i. In at least 95% of the measurements taken by grab sample for each calendar month; or
 - ii. In at least 95% of the time each calendar month if continuous monitoring is the method of turbidity measurement.
- p. If the Approval Holder(s) cannot meet the 1.0 NTU turbidity requirements described herein, the Approval Holder(s) may request that a less stringent value apply provided the Approval Holder(s) can demonstrate to the Department that the turbidity is not health-related and that the disinfection process is not compromised by the use of a less stringent value.
- q. A turbidity value of 5.0 NTU or less shall be achieved on water distribution system sampling.
- r. Unless specified otherwise in this Approval, sampling and testing frequency is the same as for bacteriological sampling requirements as stated in the "Guidelines for Monitoring Public Drinking Water Supplies".
- s. Where turbidity values of greater than 5.0 NTU are observed in the water distribution system, the Approval Holder(s) shall investigate the cause and take corrective action as necessary and notify the Department immediately.

Turbidity Monitoring Requirements

- t. Daily grab or continuous monitoring, with measurements taken at no more than five minute intervals, is required for each wellhead or combined flow.
- u. Continuous or grab sample monitoring of the water distribution system is required. Unless specified otherwise in this Approval, sampling and testing frequency is the same as for bacteriological sampling requirements as stated in the "Guidelines for Monitoring Public Drinking Water Supplies".

9. Backup Water Systems

- a. Prior to the use of a backup water system, the Approval Holder(s) shall immediately notify the Department and identify the anticipated period of time that the backup system will be in service.
- b. For backup systems that do not meet the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, the Approval Holder(s) shall immediately initiate a Boil Water Advisory as stated in the "Guidelines for Monitoring Public Drinking Water Supplies" prior to the use of a backup system. The Approval Holder(s) shall maintain the boil advisory until otherwise advised by the Department.
- c. For backup systems that meet the Nova Scotia Treatment Standards for Municipal Drinking Water Supplies, the backup water system may continue to operate until the main water system is put back into service or as otherwise directed by the Department.

10. Laboratory Reports and Water Quality Results

- a. The Approval Holder(s) shall submit copies of the laboratory certificate of analysis to the Department immediately upon request.
- b. The Approval Holder(s) will authorize and work with laboratories to electronically report water quality results to the Department upon implementation of an on-line drinking water quality surveillance program.
- c. Electronic reporting shall not replace the Approval Holder(s)'s responsibility to notify the Department immediately, by telephone, of the presence of bacteria or an exceedance of a maximum acceptable concentration for a health-related parameter listed in the "Guidelines for Canadian Drinking Water Quality".

11. Monitoring and Recording

- a. The Approval Holder(s) shall monitor and sample the Municipal Public Drinking Water Supply in accordance with a monitoring program deemed acceptable by the Department and which meets the minimum requirements of Schedule A, attached. In the case of a discrepancy between Schedule A and the accepted monitoring program, the accepted monitoring program shall apply.
- b. All required monitoring data must be collected and submitted in the units of measure indicated in the standard(s)
- c. Sampling shall be representative of the water distribution system.
- d. On or before October 1 of each year, the Approval Holder(s) shall recommend to the Department the monitoring program for the Municipal Public Drinking Water Supply for the following calendar year, highlighting any proposed changes and

the reason for the changes. Any existing monitoring program shall remain in place until the recommended monitoring program is deemed acceptable by the Department.

- e. The monitoring program shall meet the minimum requirements of the Department's "A Guide to Assist Nova Scotia Municipal Water Works Prepare Annual Sampling Plans", as amended from time to time.
- f. The monitoring program shall be acceptable to the Department.
- g. The Approval Holder(s) is responsible for implementing, on an annual basis, the monitoring program and subsequent revisions as deemed acceptable by the Department.
- h. The Approval Holder(s) shall not move, relocate or otherwise alter the location of the sampling locations indicated in the approved monitoring program without written permission from the Department.
- i. Following a review of any of the analytical results required by this Approval, the Department may alter the frequencies, location, and parameters for analyses required for this Approval or require other remedial action.
- j. Any flow measuring devices and continuous water quality analyzers and indicators with alarm systems shall be installed, maintained and calibrated as specified by the instrument manufacturer's instructions. Calibration logs for each instrument shall be maintained at the site and be available for inspection immediately upon request by the Department.
- k. The Approval Holder(s) shall establish a QA/QC program to validate the measurements obtained from continuous monitoring equipment and for all analysis conducted at the Site or a non-certified laboratory.
- l. The Approval Holder(s) shall establish and conduct process control testing and sampling and record the results. Results are to be made available for inspection or review by departmental staff immediately upon request.
- m. The Approval Holder(s) shall establish and conduct source water protection testing and sampling and record the results. Results are to be made available for inspection or review by departmental staff immediately upon request.

12. Reporting

Reporting Upon Request

- a. The Approval Holder(s) shall keep records continually updated in such a way, that weekly and/or monthly reporting of monitoring and sampling results can be immediately sent to the Department upon request.

Annual Reporting

- b. The Approval Holder(s) shall prepare and submit to the Department, an annual report for the Municipal Public Drinking Water Supply.
- c. The annual report shall be submitted on or before April 1 following the completion of the calendar year being reported upon.
- d. The annual report shall contain, but not be limited to, the following information:
 - i. a summary and discussion of the quantity of water supplied during the reporting period on a per month basis showing design values, maximum daily flow and average daily flow for each month and any other parameters or conditions specified in the Water Withdrawal Approval;
 - ii. a summary and interpretation of analytical results obtained in accordance with the "Monitoring and Recording" section of this Approval, including an explanation for any exceedance of the maximum acceptable concentration (MAC) of health-related parameters listed in the "Guidelines for Canadian Drinking Water Quality", latest edition and the actions taken to address the exceedance;
 - iii. annual trend graphs for parameters that are continuously monitored;
 - iv. date and description of any emergency or upset conditions which occurred during the period being reported upon and action taken to correct them;
 - v. any modifications to the contingency plan or emergency notification procedures including a description of how the information was communicated to staff;
 - vi. a list of the names of each laboratory utilized by the Approval Holder(s) and the parameters analyzed by each laboratory;
 - vii. an update on the status of the source water protection plan, including any modifications to the plan or implementation schedule, and a summary of activities taken to achieve the goals and objectives of the plan;
 - viii. all incidents of free chlorine residual below 0.20 mg/L in the water distribution system shall be detailed with a description of any actions taken
 - ix. verification that the operational conditions remained within the design range for achieving CT/IT; if operational conditions went outside the design ranges, provide CT/IT calculations and a summary of corrective actions taken;
 - x. a summary and interpretation of results obtained in accordance with the corrosion assessment/control program including, but not limited to, residential lead sampling results;

- xi. mathematical verification that turbidity levels entering the water distribution system from each well or combination of wells shall not exceed 1.0 NTU 95% of the time each calendar month;
- xii. incidents of non-compliance with this Approval, the date it was reported to the Department, and corrective actions taken by the Approval Holder(s);
- xiii. any complaints received, the steps taken to determine the cause of the complaint and the corrective measures taken to alleviate the cause and prevent its recurrence;
- xiv. a review of the QA/QC program to validate the measurements obtained from continuous monitoring equipment and for all analysis conducted at the facility or a non-certified laboratory; and
- xv. a list of each certified operator and their level of certification.

Emergency Reporting on Operation

- e. The Approval Holder(s) shall notify the Department immediately of an incident that may adversely affect the quality of the water within the Municipal Public Drinking Water Supply. Notification shall be made to a live person by phone or in person and followed by fax or email. These incidents shall include, but not be limited to: the presence of bacteria; inadequately disinfected water being directed to the water distribution system; sewage or other releases in the source Municipal Public Drinking Water Supply area; line breakage that may result in cross contamination; exceedance of turbidity values required by this Approval; if using membrane filtration, failure of direct integrity test, etc.
- f. The Approval Holder(s) shall notify the Department immediately of any analytical results that exceed the maximum acceptable concentration (MAC) of health-related parameters listed in the "Guidelines for Canadian Drinking Water Quality", latest edition. Notification shall be made to a live person by phone or in person and followed by fax or email.
- g. When bacteria are detected in the water distribution system, the Approval Holder(s) shall notify the Department immediately and undertake corrective action as outlined in the latest edition of the "Guidelines for Monitoring Public Drinking Water Supplies", as amended from time to time. Notification shall be made to a live person by phone or in person and followed by fax or email.
- h. If the chlorine residual in the water distribution system is less than 0.20 mg/L free chlorine, the Approval Holder(s) shall notify the Department immediately of the low chlorine residual and take corrective actions to obtain the required residual. Notification shall be made to a live person by phone or in person and followed by fax or email.

13. Contingency Plan

- a. The contingency plan is to meet the minimum requirements of the Department's "A Guide to Assist Nova Scotia Municipal Water Works Develop a Comprehensive Operations Manual" and "Contingency Planning Guidelines", as amended from time to time.
- b. The Approval Holder(s) shall ensure that the contingency plan for the Municipal Public Drinking Water Supply is reviewed and updated on a yearly basis. The Approval Holder(s) shall document in the annual report what modifications were made to the plan and how the plan was communicated to their staff.
- c. The Approval Holder(s) shall ensure that all employees are trained in accordance with the contingency plan and shall keep a record of training at the facility for a minimum period of five (5) years.
- d. A copy of the contingency plan is to be maintained on Site at all times and is to be available for review immediately upon request by the Department.

14. Records

- a. The Approval Holder(s) shall keep the following records and water quality analyses:
 - i. All incidents of suspected and/or confirmed disease outbreaks attributed to the water system shall be documented and kept for a minimum of ten (10) years;
 - ii. Bacteriological, chlorine residual and turbidity analyses shall be kept for two (2) years;
 - iii. Chemical analysis shall be kept for ten (10) years;
 - iv. Annual water withdrawal records shall be kept for ten (10) years.
- b. The Approval Holder(s) shall retain the following information for a period of five (5) years:
 - i. Calibration and maintenance records;
 - ii. Continuous monitoring data.
- c. A copy of project reports, construction documents and drawings, and inspection records shall be kept for the life of the Municipal Drinking Water Supply.

Schedule A Non-GUDI		
Water Quality Parameters	Sample Location	Minimum Frequency
Turbidity		
Turbidity	At individual wellheads or the combined flow	Continuous at no more than 5 minute intervals or daily grab sample.
	Distribution system sample points	Weekly grab sample
Primary Disinfection (Parameters to be monitored depend on the disinfection method used)		
Free Chlorine		
Free Chlorine Residual	CT control point (water entering the distribution system)	Continuous at no more than 5 minute intervals – must meet CT design criteria
Temperature	CT control point	Continuous at no more than 5 minute intervals or daily grab – must meet CT design criteria
pH	CT control point	Continuous at no more than 5 minute intervals – must meet CT design criteria
Secondary Disinfection (Parameters to be monitored depend on the disinfection method used)		
Free Chlorine		
Free Chlorine Residual	Storage structure outlet	Continuous at no more than 5 minute intervals
	Distribution system sample points	Weekly grab sample
Microbial Quality		
Total coliforms and <i>E. coli</i> (present/absent)	Distribution system sample points	Weekly grab sample
Viruses	Raw water	As requested by the Department
	Water distribution system	As requested by the Department
Corrosion Monitoring Program		
<ul style="list-style-type: none"> • pH • Alkalinity 	Point of entry and representative locations	Quarterly grab sample for two consecutive years*

Schedule A Non-GUDI																
Water Quality Parameters	Sample Location	Minimum Frequency														
<ul style="list-style-type: none"> • Conductivity • Temperature • Dissolved oxygen • Chlorine or chloramine residual • Corrosion inhibitor residual (if used) <p>These parameters will assist the utility determine the corrosivity of the water and type of corrosion control the system should install, if needed.</p>	<p>within the distribution system based on population served:</p> <table border="1"> <thead> <tr> <th>Population</th> <th># of distribution samples</th> </tr> </thead> <tbody> <tr> <td><100</td> <td>1</td> </tr> <tr> <td>101-500</td> <td>2</td> </tr> <tr> <td>501-3,300</td> <td>3</td> </tr> <tr> <td>3,301-10,000</td> <td>4</td> </tr> <tr> <td>10,001-100,000</td> <td>6</td> </tr> <tr> <td>>100,000</td> <td>10</td> </tr> </tbody> </table>	Population	# of distribution samples	<100	1	101-500	2	501-3,300	3	3,301-10,000	4	10,001-100,000	6	>100,000	10	<p>* An owner may submit a request to NSE for a reduction in the frequency of point-of-entry and distribution monitoring requirements from quarterly to annually between May and October if the water is not corrosive as evidenced by point-of-entry and distribution sample results for key parameters in conjunction with residential lead levels (e.g. the 90th percentile lead concentrations are below the lead action level for a period of two consecutive years).</p> <p>*If the water is corrosive as evidenced by point-of-entry and distribution sample results for key parameters in conjunction with residential lead levels (e.g. the 90th percentile lead concentrations are above the lead action level in any given year), the utility shall implement a corrosion control program or optimize their existing program. The utility shall submit a corrosion control program to NSE for review and acceptance. Once accepted by NSE, the utility shall follow the corrosion control monitoring parameters, location(s) and frequency included in their program.</p>
	Population	# of distribution samples														
	<100	1														
	101-500	2														
	501-3,300	3														
	3,301-10,000	4														
	10,001-100,000	6														
	>100,000	10														

Schedule A Non-GUDI														
Water Quality Parameters	Sample Location	Minimum Frequency												
Lead – flushed sample(s)	Representative locations within the distribution system based on population served – see table above.	Annually – during the warmest month* *An owner may submit a request to NSE to stop collecting flushed samples for lead from the distribution system, if samples collected from the distribution system during the warmest month for a period of two consecutive years show the utility does not have lead present in fittings or other components in the distribution system.												
Lead – Stagnated Sampling (as per Health Canada's Guidance for Controlling Corrosion in Drinking Water Distribution Systems, as amended from time to time) Tier 1 Sampling <ul style="list-style-type: none"> • Minimum 6-hour stagnation period • Collect first draw 1 litre sample. May collect 4 1-litre samples in case Tier 2 sampling is required. 	Where possible, sites shall be selected to include: 1/ at least 50% of sites with lead service lines (where present); 2/ locations that contain copper pipes with lead solders or lead pipes; and 3/ locations with lead containing brass fittings	Annually between May to October to assess corrosivity of water to lead release. If < 10% (defined as 90 th percentile) of initial sample results are above the lead action limit for a period of two consecutive years, submit request to NSE to sample once per year (reduced annual). If > 10% (defined as 90 th percentile) of initial sample results are above the lead action limit, proceed to Tier 2 sampling.												
Number of monitoring sites is based on the population served as shown in the following table:														
<table border="1"> <thead> <tr> <th>Population</th> <th># of sites (Routine annual)</th> <th># of sites (Reduced annual)</th> </tr> </thead> <tbody> <tr> <td><100</td> <td>5</td> <td>5</td> </tr> <tr> <td>101-500</td> <td>10</td> <td>5</td> </tr> <tr> <td>501-3,300</td> <td>20</td> <td>10</td> </tr> </tbody> </table>			Population	# of sites (Routine annual)	# of sites (Reduced annual)	<100	5	5	101-500	10	5	501-3,300	20	10
Population	# of sites (Routine annual)	# of sites (Reduced annual)												
<100	5	5												
101-500	10	5												
501-3,300	20	10												

Schedule A Non-GUDI		
Water Quality Parameters	Sample Location	Minimum Frequency
	3,301-10,000	40
	10,001-100,000	60
	>100,000	100
	<p>*An owner may submit a request to NSE for a reduction in the number of residential samples if the 90th percentile lead concentrations are below the lead action level for a period of two consecutive years.</p>	
<p>Tier 2 Sampling</p> <ul style="list-style-type: none"> Minimum 6-hour stagnation period Collect first draw 4* x 1 litre samples (or additional 3 x 1 litre samples from Tier 1) <p>* More than 4 samples may be required to identify the source of lead, depending on several factors including the length and diameter of piping, etc.</p>	<p>Sample at 10% of sites sampled in Tier 1 (sites with the highest lead concentration). For systems serving 500 or fewer people a minimum of two sites are required.</p> <p>Each 1 liter sample is analyzed to obtain a profile of lead contribution from the:</p> <ul style="list-style-type: none"> -Faucet -Plumbing (leaded solder, brass and bronze fittings, brass water meter, etc.) -Lead service line 	<p>Only required when >10% of Tier 1 samples exceed the lead action limit.</p>
Process Control		
Water Volume	Each individual well	Continuous at no more than 5 minute intervals
Fluoride – for facilities that add fluoride	Water entering the distribution system	Daily
Disinfection By-products		
Total Trihalomethanes (THMs)	Select distribution system sample point(s) – representative of highest level. Areas in the distribution system with the	Quarterly*- locational running annual average (lraa) based on a minimum of 4 quarterly samples.

Schedule A Non-GUDI		
Water Quality Parameters	Sample Location	Minimum Frequency
	longest disinfectant retention time.	* The Approval Holder may request a reduction in sample frequency to annual, if the Iraa based on a minimum of four quarterly samples collected from each location is < 0.010mg/L
Haloacetic Acids (HAAs)	Select distribution system sample point(s) – where historical data show the highest concentration. Where historical data is not available concentrations shall be monitored in the middle and extremities of the distribution system.	Quarterly* - locational running annual average (Iraa) based on a minimum of 4 quarterly samples. * The Approval Holder may request a reduction in sample frequency to annual, if the Iraa based on a minimum of four quarterly samples collected from each location is < 0.010mg/L
Chlorate – if storing sodium hypochlorite more than 3 months	Water entering distribution system	Quarterly
Bromate – if storing sodium hypochlorite more than 3 months	Water entering distribution system	Quarterly
Treatment Process Backwash Wastewater		
If required, treatment process backwash wastewater- parameter(s), location(s), and frequency in accordance with this approval and the accepted annual monitoring program.		
General Chemical and Physical Quality		
General chemical and physical parameters listed in the Guidelines for Monitoring Public Drinking Water Supplies	Raw and treated water	Minimum every two-years
Manganese	<ul style="list-style-type: none"> • Raw water (prior to treatment) • Entering the distribution system • Distribution system. 	<ul style="list-style-type: none"> • Twice per year (spring and fall) • Quarterly • Quarterly <p>* The Approval Holder may request a reduction in sample frequency, if it is</p>

Schedule A Non-GUDI		
Water Quality Parameters	Sample Location	Minimum Frequency
		determined that manganese is not a parameter of concern for the water supply.
Guidelines for Canadian Drinking Water Quality		
All health-related parameters in the Guidelines for Canadian Drinking Water Quality	Raw and treated water	Every 5 years unless system assessment report or source water protection plan requires more frequent monitoring.
Source Water Protection		
Parameters as per the source water protection monitoring program	Locations and frequencies in accordance with the source water protection monitoring program.	

APPENDIX H

Water Withdrawal Approval



55 Starrs Rd. Unit 9
Yarmouth NS
Canada B5A 2T2

902-742-8985 P
902-742-7796 F
www.novascotia.ca

APPROVAL

**Province of Nova Scotia
Environment Act, S.N.S. 1994-95, c.1 s.1**

APPROVAL HOLDER: MUNICIPALITY OF THE COUNTY OF ANNAPOLIS

SITE PID: 05097019

APPROVAL NO: 2022-2978962-00

EXPIRY DATE: September 21, 2032

Pursuant to Part V of the Environment Act, S.N.S. 1994-95, c.1 s.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Water Approval - Water Withdrawal

Administrator: Robert Cuthbert

Effective Date: September 21, 2022

The Minister's powers and responsibilities under the Act with respect to this Approval have been delegated to the Administrator named above. Therefore, any information or notifications required to be provided to the Minister under this Approval can be provided to the Administrator unless otherwise advised in writing.

Page 1 of 9

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Department of Environment and Climate Change

Approval Holder: MUNICIPALITY OF THE COUNTY OF ANNAPOLIS

Project: Granville Ferry Wells PW1 & PW3

Site:

PID	Civic #	Street Name	Street Type	Community	County
05097019	195	RIFLE RANGE	RD.	GRANVILLE FERRY	ANNAPOLIS COUNTY

Approval No: 2022-2978962-00

File No: 95100-30-KEN-2022-2978962

Grid Reference: Easting - 299565, Northing - 4959010

Reference Documents

- Application submitted June 8, 2022 and attachments.

1. Definitions

- a. Act means Environment Act, 1994-95, c.1, s.1, and includes, unless the context otherwise requires, the regulations made pursuant to the Act, as amended from time to time.
- b. Department means the Nova Scotia Department of Environment and Climate Change, and the contact for the Department for this approval is:
Nova Scotia Department of Environment and Climate Change
Western Region, Kentville Office
136 Exhibition Street
Kentville, Nova Scotia B4N 4E5

Phone: (902) 679-6086
Fax: (902) 679-6186
- c. Minister means the Minister of Environment and Climate Change and includes any person delegated the authority of the Minister.
- d. Site means a place where a designated activity and/or undertaking is occurring or may occur.

2. Scope

Page 2 of 9

- a. This Approval (the "Approval") relates to the Approval Holder(s) and their application and all documentation submitted to the Department prior to the issuance of this approval for the Water Withdrawal situated at or near Rifle Range Road, Granville Ferry, Annapolis County.
- b. The Approval Holder(s) shall ensure the designated activity is carried out in accordance with this Approval and reference documents, including the application and supporting documentation.
- c. This approval authorizes only the activities outlined in the Scope section. All other watercourse alterations require additional Approvals or Notifications.

3. General

- a. The Approval Holder(s) shall conduct the Designated Activity in accordance with the following provisions:
 - i. The Act, as amended from time to time;
 - ii. Any standard adopted by the Department, as amended from time to time.
- b. Nothing in this Approval relieves the Approval Holder(s) of the responsibility for obtaining and paying for all licenses, permits, approvals or authorizations necessary for carrying out the work authorized to be performed by this Approval which may be required by municipal by-laws, provincial or federal legislation, or other organizations. The Minister does not warrant that such licenses, permits, approvals or other authorizations will be issued.
- c. No authority is granted by this Approval to enable the Approval Holder(s) to commence or continue the designated activity on lands which are not in the control or ownership of the Approval Holder(s). It is the responsibility of the Approval Holder(s) to ensure that such a contravention does not occur. The Approval Holder(s) shall provide, to the Department, proof of such control or ownership upon expiry of any relevant lease or agreement. Failure to retain said authorization may result in this Approval being cancelled or suspended.
- d. If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- e. Any request for renewal or amendment of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.
- f. The Approval Holder(s) shall advise the Department in writing prior to any proposed extensions or modifications to the Activity and/or the Site. An amendment to this Approval may be required before implementing any extension or modification.
- g. The Approval Holder(s) shall immediately notify the Department of any incidents of non-compliance with this Approval.

- h. The Approval Holder(s) shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- i. Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures that are all deemed acceptable to the Department.
- j. Unless written authorization is received otherwise from the Minister, all samples required by this Approval shall be analyzed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- k. Any well that is required to be decommissioned by the Minister or that is not being used or maintained for present or future use shall be decommissioned in accordance with the Well Construction Regulations.
- l. The Approval Holder(s) shall ensure that this Approval, or a copy, is present on Site while personnel are on Site.
- m. The Approval Holder(s) shall ensure that personnel directly involved in the designated activity are made fully aware of the terms and conditions of this Approval.
- n. Upon any changes to the Registry of Joint Stock Companies information, the Approval Holder(s) shall provide a copy to the Department within five business days.

4. Covenant Conditions

- a. By granting this Approval, the Department is not responsible for any damages as a result of the approved activities, including any water quality or quantity problems that may be encountered by the Approval Holder(s) or other parties.
- b. By issuing this approval, the department is not providing any assurance(s) as to sufficient water quantity and/or quality to meet any requirements of the Approval Holder(s).

5. Fees

- a. The Approval Holder(s) shall, upon receipt of an invoice from the Department stating the amount owing in accordance with the Fees Regulations, as amended from time to time, pay to the Minister of Finance the amount stipulated.

6. Operation

- a. This Approval applies to the following production wells: PW1 and PW3. Available location and construction details for the production wells are identified in the Well Construction Information Table found in this Approval.

- b. The Maximum Pumping Rate (litres/day), Average (30-day) Pumping Rate, 30-day Withdrawal Volume (litres) and Annual Withdrawal Volume shall adhere to the limits shown in the Approved Groundwater Withdrawal Table found in this Approval.
- c. If the water withdrawal authorized by this approval causes interference problems with any existing well supplies, the withdrawal rates shall be reduced and/or the problem rectified by the Approval Holder(s) in accordance with an action plan deemed acceptable to the Department.
- d. The Approval Holder shall submit a request to the Department, prior to implementation, for any proposed changes, including well deepening and well casing alterations. Such work may require an amendment to this Approval, depending upon the nature of the work and at the discretion of the Department.

7. Monitoring

- a. A flow meter shall be maintained, and monitored for the wellfield (combined for PW1 and PW3).
- b. A well production flow meter shall be installed, maintained, and monitored separately for: PW1 and PW3 at the request of the Department.
- c. The Approval Holder(s) shall keep daily well production flow records for the total of PW1 and PW3. Data shall be tabulated within a spreadsheet and compared to approved limits shown in the Approved Groundwater Withdrawal Table found in this Approval.
- d. The Approval Holder(s) shall record and keep daily well production flow records for each well at the request of the Department.
- e. The Approval Holder(s) shall measure well water levels in production well(s): PW1 and PW3 at the request of the Department.
- f. The Approval Holder(s) shall measure well water levels in observation well(s): TW3 via a level logger and validate the water level logger readings through manual measurements obtained at the time when the logger is installed and on at least an annual basis.
- g. In addition to the depth of the water level table, water level elevation (geodetic elevation) shall be also recorded and tabulated in a spreadsheet.
- h. The Approval Holder shall collect raw water samples at each individual production well: PW1 and PW3, for analyzing general chemistry and metals at the request of the Department.

8. Reporting

- a. The Approval Holder(s) shall prepare an Annual Report in a format acceptable to the Department summarizing the following information, as required by the terms and conditions of this Approval, for each calendar year. The completed Annual Report is to be submitted to the Department upon request.

- i. a comparison of monitoring results to Approval limits and an evaluation of whether all results demonstrate compliance with Approval conditions. The evaluation of compliance shall also be presented in a statement at the beginning of the report;
- ii. results shall be provided in graphical format along with historical trends. Any instances of non-compliance shall be clearly noted on the graph;
- iii. any instances of non-compliance and mitigation measures taken.
- iv. any complaints received and the steps taken to determine the cause of the complaint and the corrective measures taken to alleviate the cause and prevent its recurrence;
- v. observations of effects of the activity on other surface and groundwater users and/or the environment;
- vi. the following records for the term of the annual report for each production well and the total wellfield:
 - (a) daily pumping rate (litres/day)
 - (b) average (30-day) pumping rate
 - (c) 30-day withdrawal volume (litres)
 - (d) annual withdrawal volume
- vii. Available current and historical water levels for production wells and observation well.
- viii. Available current and historical raw water quality for production wells and observation well.

9. Records

- a. The Approval Holder(s) shall collect and maintain the following monitoring records for the duration of the authorized activity:
 - i. observations of effects of the activity on other surface and groundwater users and/or the environment
 - ii. complaints received and the steps taken to determine the cause of the complaint, the corrective measures taken to alleviate the cause and prevent its recurrence;
 - iii. based on flow meter readings for the total wellfield, and for each production well if applicable:
 - Daily pumping rate (L/day)
 - Average (30-day) pumping rate (L/day)
 - 30-day withdrawal volume (L)
 - Annual withdrawal volume (L)

- iv. available current and historical raw water quality for: production wells and observation well;
- v. available current and historical water levels for: production wells and observation well; and
- b. The monitoring records shall be submitted to the Department upon request and in a format and timeframe acceptable to the Department.
- c. The Approval Holder(s) shall ensure that all records required by this Approval are maintained for a period of five (5) years and are to be made available to the Department upon request.

10. Site Specific Conditions

- a. The Approval Holder shall collect raw water samples at each individual production well: PW1 and PW3, in the year of 2023 for analyzing general chemistry and metals. Analytical results shall be tabulated in a spreadsheet and submitted to the department by April 1, 2024.
- b. Laboratory reports for the raw water sampling shall be submitted along with the spreadsheet of analytical results by April 1, 2024.
- c. The Approval Holder shall submit the annual report which shall include the contents specified above (9.a), for the year of 2023 to the Department by April 1, 2024.

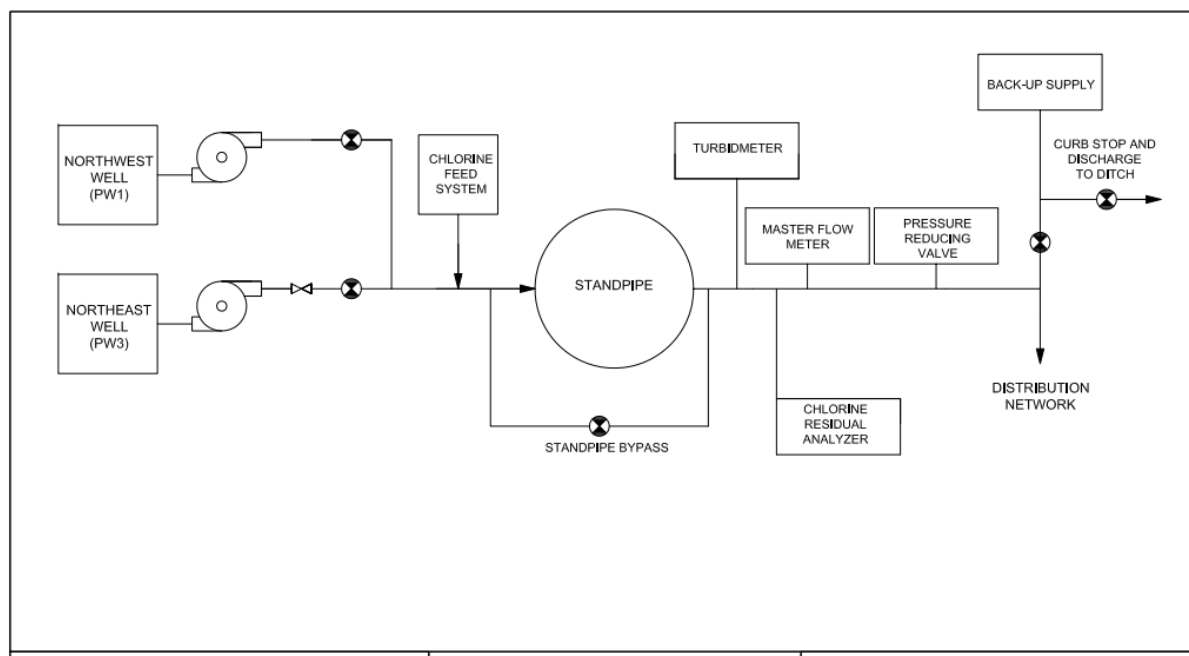
Approved Groundwater Withdrawal Limits Table				
Production Well Name	Maximum Pumping Rate (L/day)	Average Pumping Rate Over 30 Days (L/day)	30 Day Withdrawal Volume (L)	Annual Withdrawal Volume (L)
PW1	753,120	753,120	22,593,600	274,888,800
PW3	1,059,840	686,880	20,606,400	250,711,200
Total Wellfield	1,440,000	1,060,000	31,800,000	386,900,000

Well Construction Information Table			
Production Well Name	NSE Well Log Number	Parameter	Value
PW1	N/A	UTM (Easting)	299482
		UTM (Northing)	4959045
		UTM (Zone)	20
		Well Total Depth (m)	76.2
		Casing Depth(m)	24.4
		Diameter (mm)	203
		Screen Description	bedrock: 9.1m; open hole
PW3	N/A	UTM (Easting)	299233
		UTM (Northing)	4958909
		UTM (Zone)	20
		Well Total Depth (m)	118.3
		Casing Depth(m)	29.9
		Diameter (mm)	406/254/155
		Screen Description	bedrock: 4m; screen:@203 45.7-48.8m; 51.9-58.1m; 63.1-66.3m; 79.5-82.6m
TW3(Observation Well)	N/A	UTM (Easting)	299525
		UTM (Northing)	4958781
		UTM (Zone)	20
		Well Total Depth (m)	100
		Casing Depth(m)	15.2
		Diameter (mm)	155
		Screen Description	bedrock:7.8m; GPS based on the map dated October 4, 2004
PW2 (decommissioned)	N/A	UTM (Easting)	299732
		UTM (Northing)	4958607
		UTM (Zone)	20
		Well Total Depth (m)	70.1
		Casing Depth(m)	N/A
		Diameter (mm)	155
		Screen Description	open hole; well information based on the October 2004 report



APPENDIX I

Schematic of the Treatment & Disinfection Process



APPENDIX J

Water Protection Zone Mapping in GIS Format for NSECC

To be provided separately

APPENDIX K

Terms of Reference Checklist

Nova Scotia Environment & Climate Change
System Assessment Report
Terms of Reference Checklist



PART I

Introduction

This checklist was prepared as a companion document to the Terms of Reference for System Assessment Reports for Municipal Drinking Water Systems, 2022. For detailed information on each of the submission requirements below, please consult the source document. For ease of reference, reports should follow the format and sequence of the checklist below. Where possible, section references should follow section and subsection numbering conventions used in the checklist.

Where data is required to be submitted for “the most recent calendar year”, Approval Holders may submit 12 consecutive months of data within a 2-year period from the date the system assessment report is due.

PART II Characterization of the Water Source

2.0 Source Water Characterization

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.1 Source Description and Schematic*				
i. Describe the water source(s) used to meet water consumption demand.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.1	4
ii. Describe any sources that are used as back-up supplies.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Identify sources on a map.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. C	
iv. Document what precautions are required for back-up supplies.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. If a back-up supply is intended to be used without precautions, verify that it meets the Nova Scotia Treatment Standards for Municipal Drinking Water Systems or if the back-up supply is connected to an adjoining municipality, document the name of the Municipal Public Drinking Water Supply to which it is connected.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. For Municipal Public Drinking Water Supplies that purchase water from an adjoining system, identify system connections on a map.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Document the name of the municipal public drinking water supply(s) that water is purchased from and proceed to section 2.3.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.2 Microbial Risks				
2.2.1 Surface Water Sources				
i. Summarize microbial risks and water quality variability of the surface water source(s).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.2.1	9
ii. Submit raw water quality data for total coliforms and E. coli, as well as Cryptosporidium and Giardia if available, for the most recent calendar year as an Appendix.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.2.2 Groundwater Sources				
i. Verify that all individual wells have been classified in accordance with the Protocol for Determining Groundwater Under the Direct Influence of Surface Water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Summarize the GUDI status by individual well and identify at which step in the GUDI Protocol the well was categorized as GUDI or non-GUDI.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. For wells that are no longer in use, identify if the well has been properly decommissioned or is being maintained as a back-up well or monitoring well.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. For GUDI wells, complete Table A.1 and verify that the GUDI classification has not changed based on the results of microscopic particulate analysis (MPA) testing required every two years.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Verify that MPA samples were taken following a rainfall event in accordance with Step 3 of the GUDI Protocol (e.g., if there is a 15-day time-of-travel, then the well shall be sampled 15 days after a surface water event).	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Inspect the site(s) to verify that there are no changes to the surrounding area to warrant re-classification of the well(s).	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
vii. Recommend corrective action for wells: <ul style="list-style-type: none"> • For which MPA test results indicate a change in GUDI classification. • Where changes to the surrounding area have occurred to warrant re-classification of the well per the GUDI Protocol. • Where any other concerns are identified. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
viii. Submit raw water quality data for total coliforms and E. coli bacteria for the most recent calendar year as an Appendix.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ix. For GUDI wells, submit any raw water quality data for Cryptosporidium or Giardia (if available) for the most recent calendar year as an Appendix.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.3 Chemical Risks				
2.3.1 Disinfection By-Products				
a) Trihalomethanes (THMs)				
i. Complete Table A.2 to summarize quarterly THM concentrations by sampling location.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App.A	
ii. For non-GUDI systems that have had quarterly sampling reduced to annual sampling: <ul style="list-style-type: none"> Note the acceptance date for this reduction in sampling frequency. Modify Table A.2 to summarize annual results, including sampling date. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. If the locational running annual average for any sampling location exceeds the maximum acceptable concentration, recommend corrective actions.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Verify that sampling locations are appropriate as follows: <ul style="list-style-type: none"> Are samples collected at the point(s) in the distribution system with the highest potential THM concentrations? Are an adequate number of sites sampled to represent exposure levels system-wide? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App.A	
v. Identify THM sampling locations on a map of the distribution system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. C	
vi. Recommend sampling location/frequency changes if necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
b) Haloacetic Acids (HAA5)				

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
i. Complete Table A.3 to summarize HAA5 concentrations by sampling location.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. A	
ii. For non-GUDI systems that have had quarterly sampling reduced to annual sampling: <ul style="list-style-type: none"> Note the acceptance date for this reduction in sampling frequency. Modify Table A.3 to summarize annual results, including sampling date. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. If the locational running annual average for any sampling location exceeds the maximum acceptable concentration, recommend corrective actions.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Verify that sampling locations are appropriate as follows: <ul style="list-style-type: none"> Are samples collected at the location(s) where historical data show the highest HAA5 concentrations? If historical data are not available, are HAA5 concentrations monitored in the middle and extremities of the distribution system to determine the highest concentrations? Are samples collected in areas where disinfectant residuals are significantly lower than the system average because of long residence time? In systems with booster chlorination stations and water tanks/reservoirs, are HAA5 concentrations monitored downstream of these components? Are an adequate number of sites sampled to represent system-wide exposure levels? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App A	
v. Identify HAA5 sampling locations on a map of the distribution system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App C	
vi. Recommend sampling location/frequency changes if necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
c) Other Disinfection By-Products (DBPs)				
i. Identify which other DBPs are required to be monitored and compare this to existing monitoring (see Table 1 in the Terms of Reference).	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Verify that sampling locations are appropriate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Identify sampling locations on a map of the distribution system.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Recommend sampling location/frequency changes if necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Summarize concentrations for the most recent calendar year as an Appendix.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Recommend corrective actions if any maximum acceptable concentration is exceeded.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.3.2 Lead and Corrosion Control				
a) Lead and Copper				

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
i. Verify that sampling locations and frequencies for lead are appropriate as follows: <ul style="list-style-type: none"> Does the residential sampling program meet the minimum requirements as outlined in the Lead and Copper Management Requirements – Municipal Public Drinking Water Supplies or as otherwise accepted by the Department? Are residences suspected to be at the highest risk for lead targeted in the residential sampling program? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2	10
ii. Recommend sampling location/frequency changes if necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2	11
iii. Summarize and append lead and copper concentrations by sampling location and sample protocol used for the most recent calendar year.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2	11
iv. Summarize corrective actions taken when residential sample results exceeded the maximum acceptable concentration, as outlined in the Lead and Copper Management Requirements – Municipal Public Drinking Water Supplies. <ul style="list-style-type: none"> Are the corrective actions taken in line with the minimum requirements outlined in the Lead and Copper Management Requirements – Municipal Public Drinking Water Supplies or as otherwise accepted by the Department? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2	12
v. Recommend program improvements, where applicable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2	13
b) Corrosion Control				
i. Review the corrosion control program: <ul style="list-style-type: none"> Does one exist? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2.2	13
<ul style="list-style-type: none"> Does it include the minimum monitoring requirements as outlined in the Guidelines for Monitoring Public Drinking Water Supplies – Part 1? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2.2	13

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
<ul style="list-style-type: none"> Does it include action limits for the corrosion monitoring parameters that trigger follow-up? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2.2	14
ii. Summarize the water quality results of the corrosion control program for the most recent calendar year as an Appendix.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Recommend corrective actions if concerns are identified from the review of the corrosion control program.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2.2	14
iv. If a corrosion control program does not exist, document why, including water quality results that demonstrate non-corrosivity of the water, or recommend the need for a more comprehensive corrosion control program. Note: The Langelier Index is no longer considered an adequate measure of corrosivity. The submission of water quality results based solely on a positive Langelier Index will not be accepted as justification for not having a corrosion control program. Note: The Engineer is not required to develop a corrosion control program as part of the System Assessment Report.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.2.2	14
2.3.3 Guidelines for Canadian Drinking Water Quality* *Municipalities that only distribute water purchased from another Municipal Public Drinking Water Supply may obtain water quality results from the Approval Holder of the Municipal Public Drinking Water Supply that treats the water.				
i. Verify that the full suite of health-related parameters (see Table A.4 in the Terms of Reference) has been analyzed a minimum of once every five years for all raw water sources and treated water and document sampling dates.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.3	14
ii. Review the data to: <ul style="list-style-type: none"> Verify that sampling locations and frequencies are appropriate for cyanobacterial toxins and pesticides. Identify if any maximum acceptable concentrations (MACs) have been exceeded. Identify parameters with detectable concentrations. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.3	14

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
iii. Discuss any trends for parameters with detectable concentrations.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Include laboratory results from the last round of sampling as an Appendix.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. E	
v. Identify when the next round of sampling is scheduled to occur.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.3	14
vi. Recommend corrective actions if any MACs are exceeded.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Recommend any changes to the monitoring program (frequency/location) if sampling is inappropriate for cyanobacterial toxins, pesticides or other parameters with enhanced monitoring that was recommended for parameters with detectable concentrations.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.3.4 Guidelines for Monitoring Public Drinking Water Supplies				
i. Verify that the parameters in the Guidelines for Monitoring Public Drinking Water Supplies (see Table A.5) have been analyzed as required in all raw water sources and treated water and document the sampling dates.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.4	15
ii. Review the data to: <ul style="list-style-type: none"> • Verify that sampling locations and frequencies are appropriate. • Identify if any maximum acceptable concentrations (MACs) have been exceeded. • Identify any aesthetic parameters that may compromise disinfection or other critical processes. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.4	15
iii. Discuss any water quality trends.	<input type="checkbox"/>	<input type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
iv. Include laboratory results from the last round of sampling as an Appendix.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.4	15
v. Identify when the next round of sampling is scheduled to occur.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.4	15
vi. If any MACs are exceeded, recommend corrective actions.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Recommend any changes to the monitoring program, sampling location/ frequencies if necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.3.5 Source Water Protection Plan Monitoring*				
*This section is not applicable for municipalities that only distribute water purchased from another Municipal Public Drinking Water Supply.				
i. For Approval Holders monitoring any other chemical parameters for source water protection purposes, summarize the parameters, their sampling frequency, and their measured concentrations.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.5	15
ii. Recommend corrective actions if concentrations are detectable or increasing.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.5	15
iii. Review the source water protection plan monitoring program: <ul style="list-style-type: none"> • Does one exist? • Does it include monitoring of parameters that provide the information that is needed to evaluate the effectiveness of the source water protection plan? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.5	15

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.3.6 Cyanobacteria*				
*This section is only applicable to surface water sources.				
i. Identify whether the source of supply has been impacted by cyanobacterial blooms.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Summarize and append any results for cyanobacterial blooms through visual observation and/or confirmation from laboratory results including dates.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Discuss any corrective actions taken when cyanobacteria have been detected in the source water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Discuss the treatment capability of the facility to remove microcystin toxins and identify any vulnerabilities.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Provide recommendations if necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.3.6	15

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.4 Filter Backwash Water*				
*Not applicable for municipalities that only distribute water purchased from another Municipal Public Drinking Water Supply				
i. Document the impact on the raw water source if water from the filter backwash treatment system is discharged upstream of the raw water intake.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Provide recommendations if this discharge impacts the source.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.5 Source Quantity*				
*Not applicable for municipalities that only distribute water purchased from another Municipal Public Drinking Water Supply				
i. Compile existing Water Withdrawal Approvals and include copies of these as an Appendix.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.5	
ii. Complete Table A.6.a and A.6.b to compare water withdrawals to approved limits.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. A	
iii. Recommend corrective actions, including water conservation measures, if water withdrawals are greater than approved limits.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.5	
iv. Recommend corrective actions if water withdrawals are approaching approved limits and growth is forecast to increase withdrawals beyond approved limits.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.5	

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
2.6 Source Water Protection Plan*				
*Not applicable for municipalities that only distribute water purchased from another Municipal Public Drinking Water Supply.				
i. Identify the source water protection zone(s) on a map.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.6	20
ii. Submit the source water protection zone(s) in GIS format to the Department. If zones are not available in GIS format, contact the Watershed Planner for your supply.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Summarize the status of the source water protection plan and implementation schedule.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.6	20
iv. Document the dates of the last two SWPP meetings.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Note the status of meeting actions and/or SWPP deliverables.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.6	20
vi. Make recommendations to address any concerns identified by the advisory committee or the source water protection planning process.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.6	20
2.7 Conclusions and Recommendations				
i. Refer to the Terms of Reference.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2.7	

PART III Treatment Processes, Facilities and Equipment

3.0 Evaluation of Treatment Processes, Facilities and Equipment

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.1 Treatment Processes				
i. Compile existing Approval(s) to Operate and include copies of these as an Appendix. For Approval Holders that only distribute water purchased from another Municipal Public Drinking Water Supply, document the name of the treatment facility, and proceed to section 3.2.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. G	
3.1.1 Treatment Process Schematic				
i. Provide a schematic of the treatment process from the source to treated water entering the distribution system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1	24
3.1.2 Turbidity Levels and Associated Criteria				
a) Surface Water				
i. Verify that filtration technologies are meeting specified turbidity limits to receive the assigned log removal credits outlined in Table C2 of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems by either Option 1 or Option 2.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2	25
ii. Submit individual filter effluent turbidity values for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2	26
iii. Recommend corrective actions if the supply does not meet stipulated turbidity limits.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
iv. For Municipal Public Drinking Water Supplies with cartridge filters assigned log reduction credits for protozoa, provide the highest recorded individual filter differential pressure reading for each month of the most recent calendar year.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Review the standard operating procedures (SOPs) for the filtration process: <ul style="list-style-type: none"> • Have control limits been set to alarm and notify operators of issues related to the filtration process? • Have procedures been developed to remove a filter or membrane unit from service before turbidity or differential pressure (i.e., for cartridge filters assigned log reduction credits) exceeds stipulated values? • Have procedures been implemented and communicated to all operations staff? • Have procedures been documented in the operations manual? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Inspect the filtration process to verify that continuous on-line turbidity measurements are taken and recorded for each individual filter at a minimum of once every five minutes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2	27

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.		Yes	N/A	Section	Page #
vii.	Inspect the on-line turbidimeters: <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? • Are they in good working order? • Do they have a maintenance and quality assurance/calibration program? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2	27
viii.	Inspect the filtration process to verify that there are a minimum of two filters.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2.5	28
ix.	Document if the maximum day flow can be met with the largest filter out of service. Note: If the facility is unable to meet maximum day flows with the largest filter out of service, improvements to meet the Treatment Standards may be deferred to a future expansion provided SOPs are in place to minimize filter rate changes and spikes in turbidity which can result in filter breakthrough.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
x.	Make recommendations to address any concerns identified by the review of the filtration SOPs, inspection of on-line turbidimeters, and filter redundancy.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.2.4	27

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
b) GUDI Wells				
i. Verify that natural filtration is achieving specified turbidity limits to receive the assigned log removal credits outlined in Table C2 of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems by either Option 1 or Option 2.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Submit individual GUDI well turbidity values for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2).	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. For GUDI wells that do not meet stipulated turbidity limits, contact the Department to determine what requirements shall apply.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Inspect the site(s) to verify that continuous on-line turbidity measurements are taken for each individual GUDI wellhead at a minimum of once every five minutes.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Inspect the on-line turbidimeters: <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? • Are they in good working order? • Do they have a maintenance and quality assurance/calibration program? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Make recommendations to address any concerns identified by the inspection of the on-line turbidimeters.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
c) Non-GUDI Wells				
i. Summarize turbidity levels in non-GUDI wells by either Option 1 or Option 2.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Note if measurements are by daily grab samples or continuous on-line turbidimeters.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Submit non-GUDI system turbidity for individual wells or combined flow for the most recent calendar year by month (Option 1) or by the time interval graphed (Option 2).	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. For non-GUDI wells that do not meet stipulated turbidity limits, contact the Department to determine what requirements shall apply.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Where continuous measurements are taken, inspect the on-line turbidimeters: <ul style="list-style-type: none"> • Do they have the required range and accuracy to measure turbidity levels? • Are they in good working order? • Do they have a maintenance and quality assurance/calibration program? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Where grab samples are taken, inspect the monitoring equipment, SOPs, maintenance, and quality assurance/calibration program to ensure equipment is in good working order and measurements are appropriate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Make recommendations to address any concerns identified by the inspection of on-line turbidimeters or grab sample protocols.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.1.3 Membrane Filtration – Additional Requirements				
i. Complete Table B.1 to verify that each individual membrane treatment unit that is used for pathogen reduction credits is free of any integrity breaches and determine its log removal value using pressure-based testing.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Make recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. For Municipal Public Drinking Water Supplies with integrated membrane systems, summarize the process used to verify the rejection rate remains adequate for organics removal.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Make recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.1.4 Primary Disinfection				
i. Document how many inactivation log credits are required by the disinfection process for each target microorganism (e.g., protozoa and/or viruses).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4	29
ii. Discuss how disinfection is achieved (e.g., chemical disinfectants, UV or both).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.1	29

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
a) Chemical Disinfection (CT Concept)				
i. Where chemical disinfectants are used, provide a schematic of the primary disinfection process including, but not limited to: <ul style="list-style-type: none"> Tank(s) dimensions. Baffling configuration and assumed baffling factor. Water level operating range, highlighting the low level. Disinfection type (e.g., free chlorine, chlorine dioxide, ozone). Minimum disinfectant concentration at the CT control point. Minimum water temperature. Maximum pH of the water for free chlorine or optimum pH for chlorine dioxide or ozone. Maximum flow and minimum retention time - if the tank used to achieve CT is subject to water level fluctuations, verify if the inflow/outflow represents the maximum flow condition. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.1	29
ii. Calculate the design CT.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.1	29
iii. Verify that operational conditions remained within the design range for achieving CT at all times during the most recent calendar year.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.1	29
iv. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that CT was calculated during every such event.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Make recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
b) UV Disinfection (IT Concept)				

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
i. Where UV disinfection is used, provide a schematic of the primary disinfection process including, but not limited to: <ul style="list-style-type: none"> • Unit manufacturer and model. • Validation standard. • Maximum flow. • Minimum intensity at the end of lamp life. • Minimum transmittance at the end of lamp life. • Correction for water temperature. • Maximum concentrations for water quality parameters that promote fouling (e.g., iron, manganese, hardness). • Sleeve cleaning method. 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Verify that the unit has been designed to deliver a UV dose of 40 mJ/cm ² or Department accepted alternate dose. Specify the alternate dose, if applicable.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
iii. Verify that the following conditions were met at all times during the most recent calendar year: <ul style="list-style-type: none"> Was the intensity above the minimum required? Was the flow below the maximum allowed? Was the transmittance above the minimum required? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that IT was calculated during every such event.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Provide recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
e) Redundancy, Continuous Monitoring and Alerting				
i. Inspect the primary disinfection process to verify the following: <ul style="list-style-type: none"> Are there a minimum of two primary disinfection units? Are the primary disinfection units sized to meet maximum day demand with one unit out of service? Is on-line monitoring of the primary disinfection process in place with measurements taken and recorded at least once every five minutes? Have control limits been set to alarm and notify operators that the primary disinfection process is not working properly? Are protocols in place to prevent inadequately disinfected water from entering the distribution system? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.3	31
ii. Inspect the on-line instrumentation: <ul style="list-style-type: none"> Do they have the required range and accuracy to measure chlorine concentrations? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.3	31

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
<ul style="list-style-type: none"> Are they in good working order? Do they have a maintenance and quality assurance/calibration program? 				
iii. Provide recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
d) Standard Operating Procedures				
i. Review the standard operating procedures for the disinfection process: <ul style="list-style-type: none"> Do they specify the design ranges for achieving CT (e.g., temperature, disinfectant residual, flow, pH) or IT (e.g., intensity, flow, transmittance)? Do they include notification and response procedures when operational conditions are outside CT or IT design ranges? Do they include procedures to ensure the disinfection process is working properly? Do they include response procedures when the disinfection process is not working properly? Have they been implemented and communicated to all operations staff? Have they been documented in the operations manual? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.4	32
ii. Provide recommendations to address any concerns identified.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.4.4	32
3.1.5 Secondary Disinfection				
i. Describe the secondary disinfection process.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.5	31
ii. Inspect the secondary disinfection process to verify the following:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.5	31

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
<ul style="list-style-type: none"> • Are on-line continuous chlorine residual monitors in place to measure chlorine residual entering the distribution system at least once every five minutes? • Are the on-line chlorine residual monitors in good working order? • Is there a maintenance and quality assurance/calibration program in place? 				
iii. Where free chlorine is used for both primary and secondary disinfection, refer to Section 3.1.4 and note if the chlorine dose is controlled by CT (primary disinfection) or distribution system residual maintenance (secondary disinfection).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.5	31
iv. Where UV light is used for primary disinfection to receive protozoa inactivation credits, calculate the design CT for virus inactivation credits.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Where UV light is used for primary disinfection to receive protozoa inactivation credits, verify that operational conditions remained within the design range for achieving CT for virus inactivation at all times during the most recent calendar year.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
vi. Where operational conditions went outside the design range, identify the cause, document the corrective actions taken and verify that CT was calculated during every such event.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Provide recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.1.6 Other Critical Processes				
i. Evaluate and inspect other critical processes against established standards and guidelines.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Recommend corrective actions where necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.1.7 Waste Streams				
a) Filter-to-Waste				
i. Describe the filter-to-waste process.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.1.7.1	32
ii. For chemically assisted filtration, verify that turbidity is less than or equal to 0.2 NTU before returning a filter to service.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Identify recommendations, if necessary, to meet the Nova Scotia Treatment Standards for Municipal Drinking Water Systems.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
b) Filter Backwash Water – Discharge Into A Freshwater Watercourse				
i. Summarize treatment of the filter backwash water, if applicable, and identify the watercourse it is discharging into.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Identify any discharge criteria specified in the Approval to Operate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
iii. Complete Table B.2. <ul style="list-style-type: none"> Does sampling meet the minimum requirements as outlined in the Nova Scotia Treatment Standards for Municipal Drinking Water Systems? Does effluent quality meet the discharge criteria stipulated in the Approval to Operate? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App A	
iv. If the water quality does not meet the discharge criteria stipulated in the Approval to Operate or if there are no discharge criteria stipulated in the Approval to Operate, identify recommendations to meet the requirements specified in Part V – Management of Waste Streams of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. Recommend corrective actions where necessary to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
c) Filter Backwash Water – Discharge To Land Or Soil				
i. Summarize treatment of the filter backwash water, if applicable, and identify the location of discharge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Identify whether the municipal public drinking water supply has a Discharge Management Plan in accordance with Part V – Management of Waste Streams of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, as amended from time to time.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Identify the effluent discharge criteria specified in the Approval to Operate, or the Department accepted Discharge Management Plan.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Complete Table B.3. <ul style="list-style-type: none"> Does effluent quality meet the discharge criteria stipulated in the Approval to Operate, or the Department accepted Discharge Management Plan? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
v. If the water quality does not meet the discharge criteria stipulated in the Approval to Operate, or the Department accepted Discharge Management Plan, identify recommendations to meet the minimum requirements for a plan specified in Part V – Management of Waste Streams of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, as amended from time to time.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vi. Identify operational, maintenance, and monitoring procedures in the Discharge Management Plan that do not meet the minimum requirements for a plan as specified in Part V – Management of Waste Streams of the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, as amended from time to time.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
vii. Recommend corrective actions where necessary to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
d) Filter Backwash Water – Discharge To A Marine Or Brackish Environment				
i. Summarize treatment of the filter backwash water, if applicable, and identify the watercourse it is discharging into.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Identify any discharge criteria specified in the Approval to Operate.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iii. Complete Table B.4. • Does effluent quality meet the discharge criteria stipulated in the Approval to Operate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
iv. Recommend corrective actions where necessary to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
e) Other Waste Streams				
i. Review other waste streams and verify that they are being managed appropriately.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Provide recommendations to address any concerns identified.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.		Yes	N/A	Section	Page #
3.2 Distribution Water Quality					
3.2.1 Chlorine Residual Levels					
i.	Review distribution system chlorine residuals for the most recent calendar year available.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.1	33
ii.	Recommend corrective actions where residuals are routinely less than 0.20 mg/L or 0.40 mg/L (depending on the concentration specified in the Municipal Public Drinking Water Supply's Approval to Operate) where free chlorine is used (or less than 1.0 mg/L combined chlorine for chloraminated systems).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.1	33
iii.	Inspect all distribution water storage tanks to verify that on-line continuous chlorine residual monitors are in place to measure chlorine residual at the storage tank outlet at least once every five minutes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.1	33
iv.	Inspect the on-line chlorine residual monitors to ensure that they are in good working order and that a maintenance and quality assurance/calibration program is in place.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.1	33
v.	Recommend corrective actions where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.1	33

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.2.2 Microbiological Water Quality				
i. Review total coliforms and E. coli results for the most recent calendar year available.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.2	33
ii. Discuss any presence of bacteria in the distribution system and identify recommendations where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.2	33
iii. Verify that sampling locations and frequencies meet the requirements of the Guidelines for Monitoring Public Drinking Water Supplies Part I, including any re-sampling required after the presence of bacteria is detected.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.2	33
iv. Identify sampling locations on a map of the distribution system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.2	33
v. Recommend sampling location/frequency changes if necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.2	33

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.2.3 Turbidity				
i. Review distribution system turbidity results for the most recent calendar year available.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.3	33
ii. Verify that a protocol exists for investigating the cause of turbidity values above 5 NTU.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.3	33
iii. Discuss any values above 5 NTU and identify recommendations identified where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.3	33

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.2.4 Cross Connection Control Program				
i. Review the cross connection control program. <ul style="list-style-type: none"> Does it meet the minimum requirements as outlined in A Guide to Assist Nova Scotia Municipal Water Works Develop a Cross Connection Control Program, as amended from time to time. Are implementation timelines being met in accordance with the accepted plan? Provide an update on the status of the Cross Connection Control Program, including any modifications to the plan or implementation schedule, and a summary of the activities taken to achieve the goals and objectives of the program. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2.4	34
ii. Provide recommend where necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.2.5 Other Distribution System Monitoring/Programs				
i. Review any other distribution system monitoring or programs that are in place to deal with threats to distribution system integrity, including but not limited to infrastructure age, watermain breaks, leak detection, pressure transients, etc.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
ii. Provide recommendations where necessary.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
3.3 Site Inspection				
i. Conduct a site inspection to evaluate treatment processes, as well as other facilities and equipment as per the requirements outlined in section 3.3 of the Terms of Reference.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.3	34
3.4 Conclusions and Recommendations				
i. Refer to section 3.4 of the Terms of Reference.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.4	

PART IV Operations, Monitoring and Management

4.0 Review of Operations, Maintenance, Monitoring and Management

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
4.1 Operations and Maintenance				
i. Review the comprehensive operations manual: <ul style="list-style-type: none"> • Does one exist? • Is it current and up to date? • Does it include SOPs, emergency notification procedures and contingency plans? • Is it available on site or an alternate location accepted by the Department? • Are operations staff aware of its contents? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.1	37
ii. Evaluate the procedures an operator follows to identify any problem(s) with the water treatment and distribution process, determine the changes needed to correct the problem(s) and how adjustments to the processes are approved and performed as needed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.1	38
iii. Verify that a maintenance program exists and is adequate to ensure the long-term viability of the Municipal Public Drinking Water Supply, including distribution system components.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.1	38
iv. Identify recommendations where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.1	38
4.2 Monitoring and Reporting				

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
i. Review the annual monitoring program to: <ul style="list-style-type: none"> • Does one exist? • Is it current and up to date? • Does it meet the minimum requirements as outlined in the Nova Scotia Treatment Standards for Municipal Drinking Water Systems and A Guide to Assist Nova Scotia Municipal Water Works Prepare Annual Sampling Plans? • Are operations staff aware of its contents? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38
ii. Identify the laboratories being used for water quality analyses.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38
iii. Verify that the Municipal Public Drinking Water Supply is operating in accordance with the Policy on Acceptable Certification of Laboratories.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38
iv. Review reporting requirements and verify that the Approval Holder has complied with the immediate, annual and ad hoc reporting requirements outlined in the Nova Scotia Treatment Standards for Municipal Drinking Water Systems.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38
v. Review the most recent annual report and identify any concerns in the System Assessment Report.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38
vi. Identify recommendations where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.2	38

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
4.3 Management				
i. Review the number of certified operators and back-up personnel to verify that the municipal public drinking water supply is operating in accordance with Part I of the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.3	41
ii. Complete Table C.1 to identify the operator(s) in overall direct responsible charge (ODRC) and summarize what protocols are in place during the absence of the operator(s) in ODRC. Note: The ODRC operator(s) must sign Table C.1.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	App. A	
iii. Review the water quality goals that the Municipal Public Drinking Water Supply has and evaluate their plan(s) to accomplish or maintain these goals.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.3	41
iv. Identify recommendations where necessary.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.3	41
4.4 Conclusions and Recommendations				
i. Refer to section 4.4. of the Terms of Reference.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4.4	


PART V REPORT SUBMISSION

5.0 Ability to Comply

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
5.1 Summary				
i. Summarize conclusions and identify all recommendations necessary to meet the Nova Scotia Treatment Standards for Municipal Drinking Water Systems.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5.1	43
ii. Include preliminary cost estimates and an implementation schedule to address the above requirements. Costs shall be presented and prioritized with respect to public health risks. Note: If the corrective action plan submitted to the Department varies from the risk-based approach documented in the System Assessment Report, written justification shall be included in the corrective action plan for varying the priority.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5.1.4	46
iii. Highlight any obvious problems associated with the Municipal Public Drinking Water Supply that jeopardize treated water quality to the point that it no longer meets the health protection standards adopted by the Department.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

Confirm all applicable information has been submitted to the Department. Indicate the section and page number where the information is documented.	Yes	N/A	Section	Page #
5.2 Report Preparation				
i. Submit three (3) copies of the System Assessment Report to the Department and include a copy of this completed checklist.	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
ii. Engineer's Declaration (refer to section 1.4 of the Terms of Reference)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5.2	48



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