



Drinking-Water System Number:	220000406
Drinking-Water System Name:	North Bay Water Drinking Water System
Drinking-Water System Owner:	The Corporation of the City of North Bay
Drinking-Water System Category:	Large Municipal Residential
Period being reported:	January 1, 2016 to December 31, 2016

<p><u>Complete if your Category is Large Municipal Residential or Small Municipal Residential</u></p> <p>Does your Drinking-Water System serve more than 10,000 people? Yes [X] No []</p> <p>Is your annual report available to the public at no charge on a web site on the Internet? Yes [X] No []</p> <p>Location where Summary Report required under O. Reg. 170/03 Schedule 22 will be available for inspection.</p> <div style="border: 1px solid black; padding: 5px;"> <p>The Corporation of the City of North Bay P.O. Box 360 200 McIntyre Street East North Bay, ON P1B 8H8</p> </div>	<p><u>Complete for all other Categories.</u></p> <p>Number of Designated Facilities served: <div style="border: 1px solid black; width: 100px; height: 20px; margin: 5px 0;"></div> </p> <p>Did you provide a copy of your annual report to all Designated Facilities you serve? Yes [] No []</p> <p>Number of Interested Authorities you report to: <div style="border: 1px solid black; width: 100px; height: 20px; margin: 5px 0;"></div></p> <p>Did you provide a copy of your annual report to all Interested Authorities you report to for each Designated Facility? Yes [] No []</p>
---	---

Note: For the following tables below, additional rows or columns may be added or an appendix may be attached to the report

List all Drinking-Water Systems (if any), which receive all of their drinking water from your system:

Drinking Water System Name	Drinking Water System Number
N/A	

Did you provide a copy of your annual report to all Drinking-Water System owners that are connected to you and to whom you provide all of its drinking water? Yes [] No []

Indicate how you notified system users that your annual report is available, and is free of charge.

- Public access/notice via the web
- Public access/notice via a newspaper



Describe your Drinking-Water System

The City of North Bay water treatment plant (WTP), water distribution facilities and water distribution piping system are owned and operated by the Corporation of the City of North Bay.

The City of North Bay Water Treatment System is classified as a "Large Municipal Residential" Drinking-Water System, Class 3 Water Treatment Plant and Class 4 Water Distribution System with Drinking-Water System Number: 220000460. The WTP, located at 248 Lakeside Drive in North Bay, treats water from Trout Lake which is part of the Mattawa River watershed. The WTP services a population of approximately 54,000, the permit to take water permits consumption up to 79,500 cubic meters per day.

The water distribution facilities consist of the following:

Ellendale Reservoir, High lift Pump Station & Re-chlorination Facility;

CFB Reservoir;

Canadore Pumping Station;

Cedar Heights Booster pumping station (not in service);

Judge Avenue Valve Chamber;

Birches Road Standpipe and Re-chlorination Station; and

Airport Road Standpipe, Booster Pumping Station and Re-chlorination Facility.

The membrane filtration water treatment plant has the design capacity of 79,500 cubic meters per day. The plant is a SCADA controlled membrane filtration system with ultraviolet and chlorine disinfection. The plant also includes fluoride addition along with caustic pH adjustment prior to delivery to the distribution system.

The membrane filtration plant meets the Ontario Drinking Water Standards requirements for the removal/disinfection of 3-log Giardia Lambia, 2-log Cryptosporidium and 4-log Viruses. The membrane filtration Primary Barrier provides for a 3-log Giardia removal, 2-log Cryptosporidium removal. The chlorine/UV disinfection Secondary Barrier provides for a 0.5 UV Giardia removal, 0.5-log UV Cryptosporidium removal and a 4 log chlorine virus removal.

In general the North Bay WTP can be described as follows:

Intake

A 1200mm diameter series 45 polyethylene intake pipe, with a capacity of 80,000 cubic meters per day. The pipe, constructed in 1973, extends approximately 300 meters into Delaney Bay of Trout Lake and includes an intake structure consisting of a steel inlet bell mouth with fiber reinforced plastic (FRP) cage and is in approximately 21.5 meters of water at low water level.

Membrane Feed Pump Well/Prescreening

Two (2) parallel sub-surface well chambers with level monitoring containing, two (2) 6mm mesh manual prescreen in series, five (5) vertical turbine pumps (4 duty and one standby) rated at 20 m³/d feeding the primary membrane system.



Membrane Feed Strainers

Five (5) 300 micron automatic membranes feed strainers (four duties and one standby).

Treatment Plant Process Areas

A building housing the following process components:

- **primary and secondary membrane filtration system;**
- **primary and secondary UV disinfection system;**
- **split chlorine contact tank;**
- **split high lift pump well**
- **three (3) chemical storage and delivery rooms housing membrane cleaning and neutralization chemical systems, pre-chlorination system, primary disinfection chemical system, residual chlorination chemical system, alkalinity adjustment system, and fluoride addition system. Also includes;**
- **high lift pumping;**
- **Generator room;**
- **Electrical room.**
- **compressor/blower room**

Administration Area

Two floor administrative area including laboratory/control room, server room, multipurpose training room, offices, washrooms, women's and men's locker rooms, janitor room, building mechanical room and storage room.

Membrane Filtration

Eleven (11) pressurized primary membrane racks treating water from the membrane feed strainers, two(2) pressurized secondary membrane racks treating non-chemical backwash water from the primary membrane racks. The primary racks have a maximum production flow rate of 78.7 MLD based on raw water flow rate of 79.5 MLD, Ancillary systems including backwash pumps, instrument air for operating valves and integrity testing membranes, process blowers, and chemical cleaning and neutralization systems.

UV Disinfection Systems

Three (3) 600mm primary UV reactors (two duty and one standby) treating water from the eleven (11) pressurized primary membrane racks and two (2) secondary membrane racks. Each reactor contains medium pressure high intensity lamps housed in quartz sleeve and equipped with self cleaning mechanism and intensity sensor.

Chemical systems for:

Primary disinfection

Secondary (residual) disinfection

Fluoride Dosing

pH Adjustment

Membrane cleaning

Membrane cleaning solutions neutralization



Chlorine Contact Tank #1 and #2

Two (2) baffled chlorine contact tanks in series with storage volumes of 688 cubic meters (tank #1) and 502 cubic meters (tank #2).

Corrosion Control

High Lift Pump Well #1 and #2

High lift pump well #1 has a capacity of approximately 240 cubic meters and is equipped with one (1) variable speed and two (2) constant speed vertical turbine high lift pumps each rated at 20 MLD. High lift pump well #2 has a capacity of approximately 240 cubic meters and is equipped with one (1) variable speed and one (1) constant speed vertical turbine high lift pump each rated at 20 MLD.

Generator Room

One (1) dual fuel generator set (NG/Diesel) with a rating of 2050KW, to provide power during peak hours and emergency situations.

Wastewater Disposal System

Primary Membrane Backwash Tank

Tank with a volume of approximately 310 cubic meters,
Two (2) membranes feed pumps supplying water to the Secondary Membrane System.

Secondary Waste Tank

Tank with a volume of approximately 130 cubic meters,
Two (2) pumps, one duty and one standby, to deliver water to the sanitary sewer.

Neutralization Tank #1 and #2

Two (2) tanks each with a volume of 150 cubic meters, pH and Chlorine Residual analyzers.

Sanitary Sewage Disposal

One sump with two (2) submersible pumps in the Administration Area and two (2) sumps and two (2) submersible pumps in the Process Area discharging to the sanitary sewer along Lakeside Drive

The treated water is pumped to the distribution system.

The water distribution facilities can be described as follows:

Ellendale Reservoir, High lift Pumping Station and Re-chlorination Facility

The facility is a reinforced concrete at-grade, double cell, un-baffled, treated water reservoir, located at the east end of Ellendale Drive. The reservoir has an approximate capacity of 18,200 cubic meters, with dimensions of 71 meters by 38 meters by 7 meters. The facility is equipped with a sodium hypochlorite re-chlorination system, on-line continuous water quality analyzers for free chlorine and turbidity and a standby generator to operate the facility during power outages.



Birch's Road Standpipe and Re-chlorination Station

The facility consists of one (1) 39 meter high, 19 meter diameter, 11,775 cubic meter capacity, steel, mixer pax system, treated water standpipe located near the southwest corner of Birch's Road and Booth Road. The facility is equipped with sodium hypochlorite re-chlorination system, on-line continuous water quality analyzers for free chlorine and turbidity and fixed 7.5kW, 120/240 Volt single phase, diesel powered generator to power the re-chlorination and SCADA communications during prolonged power outages.

Judge Avenue Valve Chamber

The facility consists of a valve and is located near the northeast corner of Judge Avenue and Lakeshore Drive. The facility is equipped with a fixed 7.5kW 120.240 Volt single phase, diesel powered generator to power the valve and SCADA communications during prolonged power outages. Valve control that is integrated with Birches Standpipe. The equipment for a re-chlorination station is located at the facility however not currently in use.

CFB North Bay Reservoir and Re-chlorination Facility

The facility consists of a double cell 1820 cubic meter capacity, un-baffled reservoir and a re-chlorination facility located at the north end of Manston Crescent. The facility is equipped with on line continuous water quality analyzer for free chlorine and standby power.

Canadore Pumping Station

The facility is equipped with high lift pumps and pressurized cushion tanks to maintain pressure in the pressurized zone of the distribution system servicing Canadore College and Nipissing University. There is an on-line continuous water quality analyzer to monitor free chlorine residual and a 200kW, 347/600 Volt, 3 phase diesel generator to provide power and SCADA communications during prolonged power outages.

Airport Standpipe, Booster Pumping Station

This 4,000 cubic meter water storage standpipe, booster pumping station and re-chlorination facility was constructed in 2009. With the standpipe, high lift pumps and pressurized cushion tanks and a 500kW back-up diesel generator, this facility maintains pressure in the pressurized zone of the distribution system servicing the Airport and Carmichael Drive areas. The overall system consists of pressure zones 4 and 5 which accommodate a total of nine pumps, including three booster pumps (2 duty and 1 standby) for Zone 4, four booster pumps (3 duty and 1 standby) and two fire pumps for Zone 5. The water standpipe is connected to the zone 4 distribution header to provide zone 4 fire flow and peak hour demand. It is also connect to the zone 5 fire pumps suction header to provide zone 5 fire demands. Zone 5 is equipped with four (4) pneumatic tanks connected to the Zone 5 discharge header to mitigate minor pressure fluctuations within the distribution system, and to provide some volume of available storage during power interruptions before the standby power system engages. This will mitigate the potential for negative pressure in the distribution system.



List all water treatment chemicals used over this reporting period

**Sodium Hydroxide
Sodium Hypochlorite
Hydrofluosilicic Acid
Control Max**

Were any significant expenses incurred to?

- Install required equipment
- Repair required equipment
- Replace required equipment

Please provide a brief description and a breakdown of monetary expenses incurred treatment and distribution of water to Major repair and replacement to ensure reliable the water system.

The major capital repairs and replacements include:

- **Replaced 86m of 200mm water main on Metcalfe St.**
- **Relined 150m of 150mm water main on Chippewa St.**
- **Water mains installed for new subdivision between Tower Dr. and Carmichael Dr.**
 - **110M of 300mm water main on Tower Dr.**
 - **270m of 200mm water main on Welkin Grove**
 - **110m of of 200mm water main in easement between Welkin Grove and Carmichael Dr.**
- **60m of 200mm water main on Carmichael Dr.**
- **Completion of 400mm water main extension on Memorial Dr.**
- **Cedar Heights pumping Station construction complete**
- **Valves and actuators replaced on membrane filtration system**
- **Third party flow meter calibration at all water system sites**
- **Annual hoist and crane inspections for all equipment at all water systems facilities**
- **Annual maintenance of generators at all water facilities**
- **Primary UV reactor 11100 rebuild**

Provide details on the notices submitted in accordance with subsection 18(1) of the Safe Drinking-Water Act or section 16-4 of Schedule 16 of O.Reg.170/03 and reported to Spills Action Centre

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
April 05, 2016	Lead Adverse	>0.10	ug/L	Reported to MOE as required. Flushed than resampled. Results met Ontario Drinking Water Quality Standards. AWQI# 122560	April 06, 2016
June 13, 2016	Cl2 Residual	0.00	mg/L	Failed to meet secondary disinfection. Free chlorine residual of 0.00mg/L at 621 Mcphail St. Flushed and resampled. Results met Ontario Drinking Water Quality Standards. AWQI # 12764	June 13, 2016
June 22, 2016	UV dosage	< 10	mJ/cm2	UV dosage below required 10mJ/cm2 off and on between 19:30 and 23:30. Log giardia removal in contact tanks dipped below 0.5 four times during this period. Reported to MOE and MOH immediately. UV dose was above 6mJ/cm2 in all instances of low giardia through the contact tanks, therefore the plant continued to meet 0.5 log giardia removal over (UV + Chlorine). UV units re-set and set low dose alarm to page to on-call operator AWQI # 12879	June 23,2016

Microbiological testing done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period.

	Number of Samples	Range of E.Coli (#)-(#)	Range of Total Coliform Results (#)-(#)	Number of samples Background Colony Counts	Range of Back-ground Colony Counts	Number of HPC Samples	Range of HPC Results (#)-(#)
Raw	52	0-4	3->65	52	0->200	N/A	N/A
Treated	52	0-0	0-0	52	0-0	52	0-10
Distribution Fixed Sites	364	0-0	0-0	364	0-2	104	0-7
Distribution Random Sites	513	0-0	0-0	513	0-33	153	0-145



Operational testing done under Schedule 7, 8 or 9 of Regulation 170/03 during the period covered by this Annual Report.

POE Grab Samples	Number of Grab Samples	Range of Results (min #)-(max #)	ODWQS/Operational Requirement
Turbidity	171	0.065 – 0.87 NTU	1.0 NTU max
Chlorine	216	0.99 – 1.40 mg/L	0.5 mg/L min
Fluoride (If the DWS provides fluoridation)	49	0.33 – 0.66 mg/L	1.5 mg/L max

Distribution Free Chlorine Grab Samples	Number of Grab Samples	Range of Results (min #)-(max #)	ODWQS Requirement
Chlorine Fixed Sites	3701	0.15 – 3.86 mg/L	0.05mg/L min
Chlorine Random Sites	513	0.10-1.51 mg/L	0.05 mg/L min

POE on-line Continuous Analyzers	Number of Grab Samples	Range of Results (min #)-(max #)	ODWQS/Operational Requirement
Turbidity	8760	0.007 – 0.565 NTU	5.0 NTU max
Chlorine	8760	0.65 – 2.71 mg/L	0.05 mg/L min
Fluoride (If the DWS provides fluoridation)	8760	0.292 - 0.775 mg/L	1.5 mg/L max

NOTE: For continuous monitors use 8760 as the number of samples.

Summary of Inorganic parameters tested during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	13 Jul 16	<0.5	ug/L	no
Arsenic	13 Jul 16	<1	ug/L	no
Barium	13 Jul 16	12.0	ug/L	no
Boron	13 Jul 16	<40	ug/L	no
Cadmium	13 Jul 16	<0.1	ug/L	no
Chromium	13 Jul 16	<1	ug/L	no
Mercury	13 Jul 16	<0.1	ug/L	no
Selenium	13 Jul 16	<1	ug/L	no
Sodium	13 Apr 16	42	mg/L	no
Fluoride	13 Jul 16	0.422	mg/L	no
Uranium	13 Jul 16	<0.1	ug/L	no
Nitrite	23 Feb 16	<0.05	mg/L	no
	13 Apr 16	<0.05	mg/L	
	13 Jul 16	<MDL	mg/L	
	13 Oct 16	<MDL	mg/L	
Nitrate	23 Feb 16	0.1	mg/L	no
	13 Apr 16	0.2	mg/L	
	13 Jul 16	0.313	mg/L	
	13 Oct 16	0.246	mg/L	

*only for drinking water systems testing under Schedule 15.2; this includes large municipal non-residential systems, small municipal non-residential systems, non-municipal seasonal residential systems, large non-municipal non-residential systems, and small non-municipal non-residential systems

Summary of lead testing under Schedule 15.1 during this reporting period

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

	Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Unit of Measure	Number of Exceedances
Round 1 Dec 15 2015 to Apr 15 2016	Plumbing	44	<0.001 – 0.0081	mg/L	0
	Distribution	8	0.0001 – 0.0118	mg/L	1
Round 2 June 15 2013 to Oct 15 2013	Plumbing	44	<0.001 – 0.0013	mg/L	0
	Distribution	8	0.0002 – 0.0014	mg/L	0



Summary of Organic parameters sampled during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	13 Jul 16	<0.5	ug/L	no
Atrazine + N-dealkylated metabolites	13 Jul 16	<.9	ug/L	no
Azinphos-methyl	13 Jul 16	<.4	ug/L	no
Benzene	13 Jul 16	<0.2	ug/L	no
Benzo(a)pyrene	13 Jul 16	<0.005	ug/L	no
Bromoxynil	13 Jul 16	<0.1	ug/L	no
Carbaryl	13 Jul 16	<1	ug/L	no
Carbofuran	13 Jul 16	<1	ug/L	no
Carbon Tetrachloride	13 Jul 16	<0.2	ug/L	no
Chlorpyrifos	13 Jul 16	<0.4	ug/L	no
Diazinon	13 Jul 16	<0.4	ug/L	no
Dicamba	13 Jul 16	<0.08	ug/L	no
1,2-Dichlorobenzene	13 Jul 16	<0.2	ug/L	no
1,4-Dichlorobenzene	13 Jul 16	<0.3	ug/L	no
1,2-Dichloroethane	13 Jul 16	<0.2	ug/L	no
1,1-Dichloroethylene (vinylidene chloride)	13 Jul 16	<0.3	ug/L	no
Dichloromethane	13 Jul 16	<1	ug/L	no
2-4 Dichlorophenol	13 Jul 16	<0.2	ug/L	no
2,4-Dichlorophenoxy acetic acid (2,4-D)	13 Jul 16	<0.08	ug/L	no
Diclofop-methyl	13 Jul 16	<0.08	ug/L	no
Dimethoate	13 Jul 16	<0.4	ug/L	no
Diquat	13 Jul 16	<7	ug/L	no
Diuron	13 Jul 16	<5	ug/L	no
Glyphosate	13 Jul 16	<0.02	mg/L	no
Malathion	13 Jul 16	<0.4	ug/L	no
Metolachlor	13 Jul 16	<0.2	ug/L	no
Metribuzin	13 Jul 16	<0.2	ug/L	no
Monochlorobenzene	13 Jul 16	<0.5	ug/L	no
Paraquat	13 Jul 16	<1	ug/L	no
Pentachlorophenol	13 Jul 16	<0.6	ug/L	no
Phorate	13 Jul 16	<0.2	ug/L	no
Picloram	13 Jul 16	<.08	ug/L	no
Polychlorinated Biphenyls(PCB)	13 Jul 16	<0.05	ug/L	no
Prometryne	13 Jul 16	<0.1	ug/L	no
Simazine	13 Jul 16	<0.4	ug/L	no
THM (NOTE: show latest annual average)	13 Jul 16	93.43	ug/L	no
Terbufos	13 Jul 16	<0.1	ug/L	no
Tetrachloroethylene	13 Jul 16	<0.3	ug/L	no
2,3,4,6-Tetrachlorophenol	13 Jul 16	<0.6	ug/L	no

Triallate	13 Jul 16	<0.2	ug/L	no
Trichloroethylene	13 Jul 16	<0.2	ug/L	no
2,4,6-Trichlorophenol	13 Jul 16	<0.6	ug/L	no
Trifluralin	13 Jul 16	<0.2	ug/L	no
Vinyl Chloride	13 Jul 16	<0.2	ug/L	no
2 Methyl-4-Chlorophenoxyacetic acid (MCPA)	13 Jul 16	<10	ug/L	no

THM Dist Sample Location 55 Aviation Ave & 201 Pinewood Park	1 st Quarter Result Value	2 nd Quarter Result Value	3 rd Quarter Result Value	4 th Quarter Result Value	Unit of Measure	Exceed- dance
Date Sampled	06 Jan 16	13 Apr 16	13 Jul 16	13 Oct 16	ug/L	No
Bromodichloromethane	3.1 3.1	2.8 2.0	1.6 2.5	72.5 80.4	ug/L	No
Bromoform	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	ug/L	No
Chloroform	66.9 67.0	64.9 60.8	57.2 120.0	67.2 74.6	ug/L	No
Dibromochloromethane	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	ug/L	No
Total Trihalomethanes	70.1 70.1	67.7 62.8	58.8 123.0	140 155	ug/L	No
Total Trihalomethanes 4 Quarter Average				93.43	ug/L	No

List any Inorganic or Organic parameter(s) that exceeded half the standard prescribed in Schedule 2 of Ontario Drinking Water Quality Standards.

Parameter	Result Value	Unit of Measure	½ MAC VALUE	MAC VALUE	Date of Sample
THM	93.43	ug/L	50	100	Oct.13, 2016

*In all the cases marked with * the analysis result value was less than the lab detection limit. However the lab detection limit