# North Bay Water Treatment Plant and Distribution System Report for the Period of October 1 to December 31, 2002 (Tenth Issue)

Prepared by
City of North Bay Engineering and Environmental Services Department with data supplied by the Ontario Clean Water Agency

*This report is prepared in compliance with Section 12, Ontario Regulation 459/00 (as amended) - Drinking Water Protection, as approved under the Ontario Water Resource Act (R.S.O. 2000).*

**North Bay's Water System:**

The City of North Bay obtains its municipal water supply from Trout Lake, a high quality surface water source. The North Bay Water Treatment Plant, rated as a level 2 facility, is located at 248 Lakeside Drive, North Bay. Water is drawn from Delaney Bay at a depth of 21.5 m through a 1,200 mm polyethylene intake structure approximately 300 meters from shore. The intake is situated 4 meters above the lake bottom. Water treatment at the North Bay Water Treatment Plant consists of coarse screening, disinfection through UV and the continuous feed of sodium hypochlorite (chlorine), fluoridation and pH adjustments using soda ash prior to distribution. The plant is owned by the City of North Bay and is operated by the Ontario Clean Water Agency (OCWA) under a long-term contract. OCWA's operating staff certification exceeds the certification required for the North Bay facility.

The North Bay Water Treatment Plant has been automated and can be run remotely through a Supervisory Control and Data Acquisition (SCADA) system operated by the Ontario Clean Water Agency. All key processes are fully alarmed. Raw and treated water turbidity, as well as the treated water free chlorine residual, pH, fluoride and flow are continuously monitored and recorded. Post chlorination occurs within the distribution system at the Ellendale Highlift Reservoir, the Judge Avenue Valve Chamber, CFB Reservoir and the Birches Road Standpipe. Continuous alarmed chlorine residual monitoring is carried out at these remote locations as well as at the Canadore Pumping Station. Treatment and pumping stations are operated by OCWA, with the distribution system being maintained by City forces (North Bay Public Works).

The City of North Bay water distribution system has 5 pressure zones. Zone 1, below the North Bay escarpment, is pressurized from the Ellendale Highlift Reservoir (4.0 Million Imperial Gallon (MIG) capacity) located at the top of Ellendale Drive, North Bay. Pressure in Zone 1A, south of the Judge Avenue Valve Chamber is pressurized from the Birches Road Standpipe (1.5 MIG capacity) located on Birches Road. Zone 2 (Canadore College area) and Zone 3 (Airport Hill) are pressurized by pumping stations located on Gormanville Road and at the Ellendale Highlift Reservoir. Zone 4 is pressurized by a small reservoir at CFB North Bay (0.4 MIG capacity) and by residual pressure from Zone 3. The system is fully monitored and controlled by OCWA through the SCADA system. The City of North Bay's distribution system is rated as a level 4 system.

North Bay's water system serves a population of approximately 54,000 and the treatment plant has a total capacity of 115,900 $m^3$/day with a rated head of 83.8 m. The firm capacity of the Trout Lake pumping system is 79,500 $m^3$/day with pump 3 out of service. In a power failure this pumping rate is reduced to 17,500 $m^3$/day through emergency pump 5. The City's water taking permit allows a maximum withdrawal of 79,500 $m^3$/day from Trout Lake.

# Table 1: Summary of Chemical and Physical Characteristics[1, 2] of Treated Water entering the North Bay Distribution System and data for Maximum Residency Time Parameters, 2002 (Oct 1 to Dec 31, 2002 highlighted)

| Month/ 2001 | Total Flow ($m^3$) | Ave/Day Flow ($m^3$) | Max/Day Flow ($m^3$) | Max Turbidity (NTU) (Treated) | Ave Free Turbidity[3] (NTU) (Treated) | Ave Total Chlorine Residual (mg/L) | Ave Chlorine Residual (mg/L) | Max Fluoride (mg/L) | pH Ave Fluoride (mg/L) | Ave Temp °C | UVT (ug/l) | Distribution System THM[4] (ug/l) | Distribution System Lead | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 827,331 | 26,688 | 28,560 | 0.35 | 0.74 | 1.27 | 1.47 | 0.51 | 0.58 | 7.33 | 3.14 | 83.85 | - | - |
| FEB | 720,722 | 25,740 | 32,810 | 0.32 | 0.33 | 1.28 | 1.48 | 0.51 | 0.58 | 7.31 | 3.12 | 83.78 | 77.0 | <2.0 |
| MAR | 782,149 | 25,231 | 29,460 | 0.42 | 0.88 | 1.29 | 1.47 | 0.52 | 0.62 | 7.34 | 3.10 | 83.69 | - | - |
| APR | 785,570 | 26,186 | 36,800 | 0.66 | 1.26 | 1.40 | 1.61 | 0.55 | 0.82 | 7.31 | 3.27 | 81.73 | - | - |
| MAY | 828,053 | 26,711 | 35,822 | 0.62 | 0.69 | 1.21 | 1.40 | 0.51 | 0.60 | 7.33 | 5.81 | 83.31 | 110.0 | <2.0 |
| JUN | 949,750 | 31,658 | 37,300 | 0.52 | 0.60 | 1.18 | 1.36 | 0.52 | 0.56 | 7.30 | 6.78 | 84.92 | - | - |
| JUL | 1,321,370 | 42,625 | 53,820 | 0.54 | 0.63 | 1.28 | 1.49 | 0.55 | 0.61 | 7.22 | 7.24 | 85.23 | 90.0 | <2.0 |
| AUG | 1,300,261 | 41,944 | 53,440 | 0.46 | 0.54 | 1.26 | 1.44 | 0.50 | 0.58 | 7.18 | 7.39 | 85.16 | - | - |
| SEP | 1,049,350 | 34,978 | 48,960 | 0.38 | 0.55 | 1.25 | 1.43 | 0.55 | 0.66 | 7.21 | 7.50 | 83.90 | - | - |
| **OCT** | **873,074** | **28,164** | **35,000** | **0.35** | **0.66** | **1.33** | **1.55** | **0.56** | **0.67** | **7.33** | **8.24** | **82.72** | **110.0** | **<2.0** |
| **NOV** | **816,898** | **27,230** | **30,838** | **0.46** | **0.50** | **1.39** | **1.63** | **0.62** | **0.70** | **7.44** | **6.06** | **83.07** | **-** | **-** |
| **DEC** | **890,956** | **28,741** | **31,515** | **0.43** | **0.57** | **1.27** | **1.47** | **0.58** | **0.58** | **7.34** | **3.64** | **83.66** | **-** | **-** |
| Tot. | 11,145,484 | | | | | | | | | | | | | |
| AVG | | 30,491 | | 0.46 | | 1.28 | 1.48 | 0.54 | | 7.30 | | 83.75 | | |
| MAX: | | 53,820 | | 1.26 | 1.40 | 1.63 | | 0.82 | | | | | 96.75 | <2.0 |
| PDWS[5]: | | | | 1.00 | | | 0.8[6] | | | | Δ100.0 | 10.0 | | |

1) All data is for water entering the distribution system as measured at the North Bay Water Treatment Plant while trihalomethanes and lead are from distant points within the distribution system. Flow, Turbidity, Chlorine Residuals, Fluoride and pH are continuously monitored. Water temperature and Ultraviolet Transmittance (UVT) are averaged from daily grab samples. Trihalomethanes and Lead are measured from grab samples taken quarterly.

2) Data for other Inorganics, Nitrate/Nitrites as well as Pesticide and PCB is collected quarterly. Data has not been provided to conserve space. The City has never experienced an exceedance in any of these parameters. Data for these unreported parameters are available from the 3rd Floor North Bay City Hall upon request.

3) Turbidity: A measure of water clarity. "The maximum acceptable concentration is 1.0 Nephelometric Turbidity Unit (NTU) for water entering the distribution system." "An appearance related aesthetic objective of 5.0 NTU has been set for water taken at consumers' taps." (Quoted directly from the PWQS definition of Turbidity)

4) Trihalomethanes: Chlorine can react with natural organics in water to create byproducts generally known as trihalomethanes. The maximum acceptable concentration is 100.0 ug/L based on four quarterly moving annual average test results.

5) Provincial Drinking Water Standards: Updated standards came into effect on August 8, 2000

6) A new provincial standard of 0.50 to 0.80 mg/ L was introduced in the first quarter of 2001.

## Microbiological Characteristics of North Bay's Treated Water:

Monitoring for bacterial life in the water distribution system has been an ongoing program of the City of North Bay for decades. Microbiological monitoring consists of testing for Total Coliform bacteria, *Escherichia Coli (E. Coli)* bacteria and bacterial General Background Populations. Data presented in Table 2 is reported as pass or fail. A water sample fails to meet Provincial Water Quality Standards, and constitutes an adverse reportable event, if greater than zero Colony Forming Units (CFU)/100 ml of either Total Coliform or *E. Coli* bacteria are encountered or if General Background Populations exceed 200 CFU/100 ml in treated water. The City is required to sample weekly and must take a minimum of 62 samples per month within the distribution system. Chlorine residuals are measured in advance of microbiological sampling to ensure that chlorination levels meet provincial standards. If a microbiological sample detects adverse water quality conditions, additional confirmatory testing including sites around the test failure site are immediately undertaken. If unacceptable growth in the City's system is confirmed, chlorination rates are boosted and water mains in the affected area are flushed until chlorine residuals are restored and microbiological growth is controlled.

### Table 2: Microbiological Test Results for City of North Bay Water Distribution System, 2002*

| | Total Coliforms | | | *E. Coli* | | | General Background | | |
|---|---|---|---|---|---|---|---|---|---|
| Month | No. Taken | Pass | Fail | No. Taken | Pass | Fail | No. Taken | Pass | Fail |
| JAN | 85 | 85 | 0 | 85 | 85 | 0 | 85 | 85 | 0 |
| FEB | 68 | 68 | 0 | 68 | 68 | 0 | 68 | 68 | 0 |
| MAR | 68 | 68 | 0 | 68 | 68 | 0 | 68 | 68 | 0 |
| APR | 147 | 147 | 0 | 147 | 147 | 0 | 147 | 147 | 0 |
| MAY | 89 | 89 | 0 | 89 | 89 | 0 | 89 | 89 | 0 |
| JUN | 71 | 70 | 1 | 71 | 71 | 0 | 71 | 71 | 0 |
| JUL | 85 | 85 | 0 | 85 | 85 | 0 | 85 | 85 | 0 |
| AUG | 68 | 68 | 0 | 68 | 68 | 0 | 68 | 68 | 0 |
| SEP | 72 | 71 | 1 | 72 | 72 | 0 | 72 | 71 | 1 |
| **OCT** | **85** | **85** | **0** | **85** | **85** | **0** | **85** | **85** | **0** |
| **NOV** | **70** | **70** | **0** | **70** | **70** | **0** | **70** | **70** | **0** |
| DEC | **85** | **85** | **0** | **85** | **85** | **0** | **85** | **85** | **0** |
| TOTAL | 993 | 991 | 2 | 993 | 993 | 0 | 993 | 992 | 1 |
| Ave/mth | 82.75 | 82.58 | 0.17 | 82.75 | 82.75 | 0 | 82.75 | 82.66 | 0.08 |

*Reg 459/00 requires the City to take a minimum of 62 samples per month in the distribution system. Data includes results from treated water as it enters the distribution system and is in addition to the required 62 (usually 4/month).

## Notices Given within the Fourth Quarter of 2002

Nine adverse water quality events were reported in the fourth quarter of 2002. Seven adverse events were reported for distribution system chlorine residuals that were lower than the 0.05 mg/L. Readings below this level are considered inadequate for maintenance of distribution system disinfection. In all instances water mains at the location of the low chlorine residuals are immediately flushed until residuals are restored to above 0.2 mg/L. All but one of these reportable chlorine residuals were located in Zone 1 on the west side of the City, which does not receive post chlorination after leaving the Treatment Plant at Trout Lake. One site was located at a dead end in the West Ferris portion of the City. One notice of adverse water quality was given by the lab that undertakes water analysis for OCWA due to an exceedence of the 4-quarter running average for trihalomethanes at the end of the system measured at the Clarion Resort on Pinewood Parkway Drive. The final reportable event occurred in December 2002 when a short duration turbidity spike briefly exceeded 1.0 NTU.

## Steps Taken within the Quarter to comply with Provincial Water Quality Standards

The City of North Bay has continued to advance compliance work in the last quarter of 2002 to achieve full compliance with Ontario Regulation 459/00 by established dates. New drinking water legislation, including updated Provincial Water Quality Standards, came into effect on August 26th, 2000. An Amended Certificate of Approval (No. 4118-55JMHT) for the North Bay Water Treatment Plant was issued on December 19, 2001. This Certificate specifies that the City must add UV disinfection, move its point of chlorination to the intake and make other repairs to the existing plant as specified in the Engineers Report by the end of 2002. The City has been given until October 31, 2005 to add filtration or equivalent to its treatment process. Certificate of Approval conditions reflect recommendations made in the Engineers Report prepared for the North Bay Water Works that was filed with the Ministry of the Environment on March 31, 2001. The Engineers Report included a thorough evaluation of raw source water as well as treated and distributed water in the North Bay system and made recommendations on compliance issues. The Certificate of Approval provides the City with clarification as to what it must do to comply with the new Drinking Water Protection Regulations. The City of North Bay is currently studying the impact of the Safe Drinking Water Act and consolidated regulations that have been issued in draft at the time of writing.

All works to be completed by the end of 2002 have now been implemented including the installation of Ultraviolet disinfection, the relocation of the initial point of chlorination to the entrance to the intake pipe, changes to instrumentation and raw water sampling, repairs to chemical storage tanks and improvements to chemical room ventilation. The City is now working on the installation of backup power to ensure that the system can continue to operate in a power outage (the current backup pump does not have UV disinfection). The flow meter at the Trout Lake Water Treatment Plant was properly calibrated in 2002 in compliance with the Water Plant Certificate of Approval. Improvements have been completed to update the SCADA control systems and to improve electronic communications and alarms.

The City of North Bay continues to make progress to add filtration to its system by October 31, 2005. A Municipal Class C Environmental Assessment, completed by R. V. Anderson in mid October, included two public open houses. In the 30-day review period the City also became aware of neighbourhood issues based on public review of ESR documentation. The ESR has recommended that the top two preferred treatment options; conventional filtration and membrane filtration, be referred to a Value Engineering process to determine which is most appropriate for North Bay. This VE session is currently scheduled for the first week in February 2003 and will involve stakeholders. Once the type of filtration is selected, the City of North Bay will quickly move to tender the design, approval and construction of this facility to meet the 2005 deadline. The plant will be built at the existing Trout Lake treatment plant site at 248 Lakeside Drive, North Bay.

The City has also completed erosion control work on a Margaret Street drainage course, which was the main source of silt that impacted the City's water supply during heavy runoff events. The City is studying options for improving chlorination in the western part of Zone 1 of the water distribution system and it is also studying ways to limit trihalomethanes until a new filtration plant is constructed, which should solve the current problem. The City has completed two looping projects in 2002: Ralph Place and Regina at Memorial Drive. The new draft regulation released in January 2003 combined with new regulations will result in the City developing financial plans to sustain the management of its water infrastructure and will significantly affect the way in which the City operates and maintains its water system resulting in a fairly significant change in the costs associated with meeting these needs. The City is planning to undertake computer analysis of distribution system operational and maintenance needs, and will improve line cleaning, swabbing, directional flushing, end of line flushing and general preventative maintenance. The City also plans to continue to complete water line looping projects in 2003 to eliminate dead ends.

Quarterly Reports are available from City Hall or at North Bay's Web Site at www.city.north-bay.on.ca.

The City of North Bay's 2002 Compliance Report will be available from the 3rd Floor of City Hall by March 31/ 2003.