



Transportation & Works Department

Environment Division

WATER TREATMENT PLANTS

&

DISTRIBUTION SYSTEMS

2003

Annual Report

REPECTFULLY SUBMITTED BY:

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INTRODUCTION

This report will be prepared on an annual basis to satisfy the requirements of the Ontario Ministry of the Environment and the Certificates of Approval for both plants. As well, this report is intended to inform City elected representatives, the general public and to serve as a source of information on water quality and water supply operations.

The Corporation of the City of Thunder Bay operated two water treatment plants in 2003. The water distribution network of the City is divided into a number of pressure zones. Most of the time, the northern part of the City receives its water supply from the Bare Point Water Treatment Plant and the southern portion of the City receives its water from the Loch Lomond Treatment Plant.

During peak demand periods, due to its limited capacity, the Loch Lomond Plant cannot meet the total demand from the southern portion of the City. At these times, additional water is pumped into the south system from the Bare Point supply through the James Street Pump Station.

The Bare Point Water Treatment Plant, located near the City limits, off Lakeshore Drive, has an operational capacity of 68 million litres per day (15 million gallons per day) and utilizes a chemically assisted direct filtration system. The plant draws water from Lake Superior, the world's largest body of fresh water. Treatment processes at the Bare Point Water Treatment Plant include raw water screening, pre-chlorination, chemically assisted coagulation-flocculation using alum and polymer, sand-anthracite filtration and post chlorine disinfection. The northern part of the City's distribution system consists of four pressure zones, four pumping stations, and three reservoirs.

The Loch Lomond Water Treatment Plant is located south of the City on Mount McKay. This plant draws water from Loch Lomond, partially situated within the Fort William First Nation's Reserve. The temporary microfiltration system, which was built in 1998, has an operational capacity of 38.68 million litres per day (8.5 million gallons per day) in the summer when the temperature is 10 degrees Celsius (or above). The capacity is 27.28 million litres per day (6 million gallons per day) in winter when the water temperature is 3 degrees Celsius (or above). Treatment processes include ultra-filtration membrane technology, the addition of sodium silicate for corrosion control and chlorine for disinfection. The south part of the City's distribution system consists of two pressure zones, one reservoir and one pumping station.

PER CAPITA WATER CONSUMPTION

In Canadian cities the per capita water consumption is a measure of the amount of treated water produced daily to serve each consumer in the water system. This takes into account all water used for residential, commercial, and industrial use including water used for street cleaning, fire protection and water lost through leakage or water main breaks.

The normal per person daily water consumption, is about 450 litres (100 gallons). Per capita usage greater than 450 litres per day indicates high water practices in industrial or commercial use.

In 2003, based on a service population of 102,500 for both Water Treatment Plants the per capita water usage equates to 587 litres, (129 gallons) per person per day.

The City's goal is to reduce this figure to approximately 450 litres (100 gallons) per capita, per day through successful water conservation plans and system improvements.

MAJOR PROJECTS

SCADA UPGRADES

As part of the City's commitment to comply with all requirements of the Certificates of Approval for both plants, phase 2 of the SCADA (Supervisory Control and Data Acquisition) upgrade project has been completed. The completion of this project allows for all in line analyzer data to be monitored in all stations/reservoirs and recorded and viewed at the Bare Point Plant. In 2004 additional upgrades will include the use of paperless recorders in each remote location for onsite trending.

SECURITY UPGRADES

The Water Treatment Plants' security systems have been enhanced using new technology for communicating any intrusion or breach of security back to the plants. Secondary barriers have been installed on all hatches at reservoir and pumping station sites. A complete site risk assessment has been completed at all sites and improvements to ensure a high standard of security will be implemented.

REPAIR AND REPLACEMENT OF MEMBRANE FILTERS (LOCH LOMOND)

As part of the yearly maintenance schedule at the Loch Lomond Water Treatment Plant, all individual membrane modules are pressure decay tested to establish their integrity. All modules not passing this test are either repaired or replaced dependent upon the number of severed fibres. The replacement of filter modules in 2003 significantly increased the direct operational costs for the Loch Lomond Plant.

KAM TUNNEL

On the South side of the City a water main travels under the Kam River and is housed in a concrete structure. The shafts on both sides of the river require safety equipment to enable entrance for inspections and maintenance by City staff. The project of updating all the safety equipment and ladders has had preliminary work done by our Engineering staff in 2003 and the work will be completed in 2004.

WATER CONSERVATION/BYLAW PROGRAM

A water conservation program was implemented as a result of the limited treated water storage capacity of the temporary membrane filtration plant at Loch Lomond. The program is in compliance with the City of Thunder Bay's Municipal code which states: "The use of or curtailment of water used for purposes of lawn and garden

sprinkling shall be subject to such regulations as may be enacted from time to time by Council.” The program “Odd and Even Watering Restrictions” effectively reduces the opportunity to water lawns and gardens by 50 per cent.

In addition to lawn and garden watering restrictions, City of Thunder Bay, in partnership with EcoSuperior Environmental Programs provides four different water efficiency programs for the community including:

- ❖ Ultra Low Flow Toilet Rebate Program
- ❖ Water Conservation Public Outreach Program
- ❖ Subsidized Rain Barrel Sales Program
- ❖ Downspout Disconnection Program

In order to encourage residents to participate in water conservation rain barrels have been provided to residents at a subsidized price. A water bylaw enforcement officer patrols the City from May to October, monitoring compliance with the Odd and Even Watering Restrictions. This staff member responds to enquiries from the public and responds to reports of by-law violations. The season with the high demand peak periods for treated water is usually May to October. It is estimated that this program has significantly reduced seasonal water use.

In May 2003 the City of Thunder Bay was presented with *The Award of Excellence in Water Efficiency* presented by the Ontario Water Works Association. This award recognizes community efforts to reduce water consumption with a integrated and comprehensive water efficiency program for residents and businesses.

Where demand meets or exceeds maximum possible output, it would be necessary to implement a total ban on outside watering. Failure to reduce the total demand to a figure less than the total output capacity of the plants would necessitate a bypassing of the temporary Loch Lomond Water Treatment Plant. The bypass option would allow unfiltered water to enter the distribution system and would immediately result in a declaration of a boil water advisory by the Medical Officer of Health.

COMPLIANCE SUMMARY

COMPLIANCE WITH TERMS AND CONDITIONS OF THE CERTIFICATE OF APPROVAL

BARE POINT

The Bare Point Water Treatment Plant operates under MOE Certificate of Approval #1151-5F2J5B, dated October 22, 2002. This replaced C. of A. #9385-575KF8, issued Feb. 20, 2002 which in turn replaced C. of A. #7-0748-90-006 issued July 19, 1990. The two C's of A issued in 2002 were part of a consolidation of WTP Certificates of Approval done by the Ontario MOE. The Ministry added specific disinfection/inactivation performance criteria and specific plant upgrade requirements based on the recommendations of the Bare Point First Engineers Report of May, 2001. The current (Oct. 22/02) C. of A. amended the date for completion of upgrade requirements from Dec. 31/02 to June 30/03 and added the specifications for the new Hazelwood Storage Tank on the Bare Point Distribution system.

The Permit to take Water for the Bare Point WTP, #91-P-6017 was renewed July 25, 2002, allowing a maximum withdrawal of 20 Million Imperial Gallons (MIG) per day (90,920 m3) from Lake Superior. The current C. of A. specifies a maximum treated water flow of 68,000 m3 from the Bare Point plant.

Compliance with all other provisions of Sections 1, 2 and 3 of the C. of A. have been met except for those specified in the “Non-Compliance .” Section of this Report. The issuance of this report meets the requirements of Section 4 of the C. of A. Section 5.1 of the C. of A. listed a number of performance and upgrade requirements. Their status is summarized below:

C. of A. Section	Performance/Upgrade Requirement	Status as of June 30/03
5.1 (a) (i), (ii), (iii)	Log removal/inactivation of giardia and virus requirements under most demanding operating conditions.	Bare Point WTP is in compliance with requirements
5.1 (a) (iv)	Upgrade facilities to maintain a free chlorine residual of 0.2 mg/L at all points in the Distribution System	Distribution System meets this requirement with some routine flushing. Additional rechlorination capability installed at Hazelwood Storage tank
5.1 (a) (v)	Install on-line free chlorine analysers at each reservoir, pump station and integrate into alarm system	This was completed in 2002
5.1 (a) (vi)	Have the capacity to chlorinate at a level of 2.0 mg/L free chlorine under maximum demand situations	Unused chlorinator dosage capacity at Bare Point is available to meet this requirement
5.1 (b) (i)	Provide for an alarm system if treated water turbidity or chlorine levels are out of target range	All turbidity and chlorine monitors at Bare Point are alarmed and integrated with the SCADA system
5.1 (b) (ii)	Provide automatic switchover of chlorine cylinders	Alternatives were identified to the Ministry as required by C. of A. Section 5.2. Alternative disinfection methods are identified in the WTP expansion plans
5.1 (b) (iii)	Provide a stand-by chlorine feed pump	A standby unit is on-line
5.1 (b) (iv)	Provide for filter-to-waste operation	Provision for this was identified to the Ministry under alternatives, Section 5.2 as part of WTP expansion. See also the additional comments under “Bare Point – Filter to Waste”

LOCH LOMOND

The Loch Lomond WTP operates under MOE Certificate of Approval #7206-575KCX, issued February 20, 2002 and amended Dec. 19, 2002. The new 2002 consolidated Certificate of Approval supercedes C. of A. #7-0706-98-006 issued August 24, 1998. The current C. of A. added specific disinfection/inactivation performance criteria and specific upgrade requirements based on the Loch Lomond First Engineers Report of May, 2001. The Dec. 19th amendment extended the date for upgrade requirements (Section 5.1) from Dec. 31/02 to June 30/03.

The Loch Lomond Permit to Take Water, #91-P-6015 was renewed on July 25, 2002 for five years, at a maximum withdrawal capacity of 17 MIG per day (77, 282 m3/d) from Loch Lomond. The current C. of A. specifies a

maximum treated water flow from the plant of 38,680 m³ per day in the summer when water temperature is 10 C or higher and 27,270 m³ per day in winter with water temperatures as low as 3 C.

Compliance with all other provisions of Sections 1, 2 and 3 of the C. of A. have been met. The issuance of this report meets the requirements of Section 4 of the C. of A. Section 5.1 of the Loch Lomond C. of A. listed a number of performance and upgrade requirements. Their status is summarized below:

C. of A. Section	Performance/Upgrade Requirement	Status as of June 30/03
5.1 (a) (i) (ii)	Log removal/inactivation of giardia and virus requirements under most demanding operating conditions	Loch Lomond WTP is in compliance with these requirements
5.1 (a) (iii)	Upgrade facilities to maintain a free chlorine residual of 0.2 mg/L at all points in the Distribution System	Distribution System meets this requirement with some routine flushing. Additional rechlorination capability is installed at the Zone 2 South pumping station, currently being commissioned
5.1 (a) (iv)	Install on-line chlorine residual analyzer on the unmonitored line leaving the reservoir	A chlorine analyzer was installed on this line in 2002 and integrated into the alarm system
5.1 (a) (v)	Have the capacity to chlorinate to at level of 2.0 mg/L free chlorine under maximum demand situations	Unused chlorinator dosage capacity is available at Loch Lomond to meet this requirement
5.1 (b) (i)	Provide for an alarm system if treated water turbidity or chlorine levels are out of target range	All turbidity and chlorine monitors at Loch Lomond are alarmed and integrated with the SCADA system
5.1 (b) (ii)	Provide improvements to the reservoir entrance to prevent debris entering the reservoir	Completed in 2002
5.1 (b) (iii)	Provide automatic switchover of chlorine cylinders	Alternatives were identified to the Ministry as required by Section 5.2. Alternative disinfection methods are identified in the WTP expansion plans
5.1 (b) (iv)	Install a particle counter at each membrane filtration train	In compliance – there is an active particle counter on each filter train
5.1 (b) (v)	Provide a stand-by chlorine feed pump	Three chlorinator units are available at Loch Lomond. At any time two of the units can handle the total plant chlorination requirements.

NON COMPLIANCE WITH TERMS AND CONDITIONS OF THE CERTIFICATE OF APPROVAL

BARE POINT– FILTER TO WASTE

After each of the sand-anthracite filter units at Bare Point is backwashed and put back into service, there is an initial small increase in turbidity as the filter settles into its normal filtering state. It is recommended that this initial filter water be routed to waste to avoid having any higher turbidity water enter the distribution system. The proposed Bare Point expansion will incorporate a piping and valve design that will allow this 'filter to waste' to happen or, alternatively, the Bare Point plant will be converted completely to membrane filtration technology.

The current plant configuration does not allow for this process, however at no time has the current plant operation produced treated water turbidity levels above the operational guidelines. Average treated water turbidity values at Bare Point are 0.08 N.T.U. and the highest value recorded was 0.55 N.T.U. in 2003.

BARE POINT– ADVERSES AND EXCEEDANCES IN 2003

In 2003 analysis was done for 62 Volatile Organics, 112 Pesticides/PCB's, 170 General Chemistry and Metals parameters as well as more than 4500 bacterial tests at the plant and in the distribution system. There were no chemical exceedances of the Drinking Water Quality Standards. The five adverse bacterial tests in 2003 were all isolated cases and all were quickly cleared up by flushing and resampling. There were four operational adverse reported in 2003. These are normally the result of instrumentation failures, power loss to instruments or low chlorine residuals recorded in the system. The Bare Point Adverse Tables on page 62 indicate the specific adverse incidents and the corrective actions taken.

LOCH LOMOND – ADVERSES AND EXCEEDANCES IN 2003

For the Loch Lomond Plant and Distribution System, a total of 62 Volatile Organic tests, 112 Pesticide/PCB tests, 171 General Chemistry and metals tests and over 4000 bacterial tests were done in 2003. There were no chemical exceedances of water quality standards. There were six bacterial adverses detected in 2003 and all were quickly cleared up by flushing and resampling. There were eight operational adverse reported in 2003. These are normally the result of instrumentation failures, power loss to instruments or low chlorine residuals recorded in the system. At no time was the distribution system considered at risk. The Loch Lomond Adverse Tables on page 63 indicate the specific adverse incidents and the corrective actions taken.

SUMMARY OF WATER SUPPLIED

BARE POINT

The total treated water produced for 2003 was 14595.70 million litres or 3210.66 million gallons. The maximum day output occurred on May 26th when the plant produced 63.43 million litres or 13.95 million gallons. In 2003, the capacity of 68ML/day (15Mg/day) as listed in the present Certificate of Approval was not exceeded. Data for treated water flows can be viewed on page 15 of this report.

LOCH LOMOND

The Loch Lomond Plant total treated water produced for 2003 was 7385.86 million litres or 1624.69 million gallons. The maximum day output occurred April 22nd, when the plant produced 25.93 million litres or 5.70 million gallons. In 2003, the capacity of 38.68 ML/day (8.5 Mg/day), as listed in the present Certificate of Approval, was not exceeded. Data for treated water flows can be viewed on page 36 of this report.

ANALYTICAL RESULTS AND REPORTING

The analytical results tables for Bare Point and Loch Lomond, referenced below show some of the metal and organic parameters as being done twice during the year while others were only done once and a few were done four times. This is due to the change in the Ontario drinking water regulations from Regulation 459/00 to Regulation 170/03 in June 2003. Under the new Regulation, most metal and organic parameters are to be tested annually instead of quarterly. This change was made by the government in response to the concerns of many municipalities over the high cost and redundancy of the quarterly testing requirements of Reg. 459/00. By June 2003 the City had already done two sets of quarterly tests and those are summarized in the tables. Reg. 170/03 kept a number of parameters, specifically nitrates, nitrites and distribution system trihalomethanes as quarterly test requirements and these show as being done four times in the tables. Benzo(a)pyrene and antimony were added as annual test requirements and these are also in the tables, along with other annual tests being done only once in 2003.

Regulation 170/03 also changed the reporting requirements to the public from quarterly to annually. This annual report will be available to the public in printed form and on the City's website, www.thunderbay.ca/water, in March of each year. Additional information on the new Ontario Drinking Water Systems Regulation is available on the MOE website at: www.ene.gov.on.ca/envision/water/sdwa/dwsr.htm (or go to www.ene.gov.on.ca and follow the drinking water links).

BARE POINT

The analytical results for the Bare Point Plant and system are listed on pages 27 to 31. In general, the raw water supply is very stable in chemical composition, relatively soft and low in volatile organics, which results in very low THM values. All pesticide and PCB tests in 2003 were negative. Dissolved metals are consistently low. Because alum (aluminum sulphate) is used as a treatment chemical, the aluminum residual is monitored daily by in-house analysis. The average value in 2003 was 0.024 mg/L, well below the operational guideline of 0.1 mg/L. Radionuclide tests, done in February were below detection limits.

LOCH LOMOND

The analytical results for the Loch Lomond Plant and system are listed on pages 48 to 52. The raw water supply from Loch Lomond is generally softer than that of Bare Point with lower hardness, lower alkalinity and lower conductivity. The higher organic content, is reflected in the Dissolved Organic Carbon (DOC) values of 5-6 mg/L versus 2-3 mg/L at Bare Point. This leads to higher THM formation in this water on chlorination and gives higher colour readings in the treated water. In 2003 the average treated water colour reading was 5.98 TCU, slightly above the Operational Guideline of 5 TCU. The membrane technology treatment at Loch Lomond does not remove any of the dissolved colour. Because of the softness of this water, it is more aggressive toward metal piping and is treated with low dosages of sodium silicate as an anti-corrosion agent and silicate levels are monitored monthly. As with the Bare Point supply, all pesticide and PCB tests in 2003 were negative. Radionuclide tests in February were below detection limits.

LOCH LOMOND– TRIHALOMETHANE AVERAGE

In February, 2002 a post-chlorination procedure was implemented at the Loch Lomond plant, with the objective of lowering the chlorine consumption on the raw water side of the membrane units. Trials during the year showed promising results with progressive lowering of the THM values in the distribution system. In 2003 this trend continued, with lower quarterly THM values leading to a running four-quarter average of 87.1 ug/L by the end of the year. The running THM averages are based on results from the current quarter averaged with those of the previous three quarters. The running average for each quarter is shown below:

Loch Lomond Distribution System THM Averages, 2003 (units are ug/L or ppb)				
Date	Feb. 13/03	May 02/03	Aug. 15/03	Nov. 21/03
THM Running Avg.	99.1	96.2	89.3	87.1

TREATMENT CHEMICAL USAGE

BARE POINT

The Bare Point WTP uses three chemicals for water treatment: alum (aluminum sulphate), polymer (Magnafloc LT35) and chlorine gas. Chlorine gas is added in two stages, prior to floc formation/filtration to disinfect the water and prevent fouling of the filtering material and post-filtration to provide a good residual in the distribution system. The average dosage for 2003 was 1.55 mg/L and the average free residual for water leaving the plant was 1.23 mg/L. A total of 24,312.60 kg of chlorine was used in 2003.

The alum and polymer combine with the raw water to form a sticky, insoluble floc which removes colour and fine particulate matter from the raw water. This floc settles at the top portion of the filter beds and is periodically back washed as a waste stream. This waste stream is currently discharged into Lake Superior, but the expansion plans will direct this stream to the sewage treatment plant. A total of 55,658 kg of alum (48.5% liquid concentrate) and 2391 kg of liquid polymer concentrate were used in 2003 with average doses of 3.55 mg/L and 0.15 mg/L respectively.

LOCH LOMOND

At the Loch Lomond WTP, chlorine gas and sodium silicate are used as the main processing chemicals with small quantities of sodium metabisulphite, sodium hydroxide and citric acid used for cleaning and waste neutralization. Chlorine is used for disinfection, again, in two stages: pre-filtration and post-filtration. The post-filtration stage was added in February 2002 with a corresponding drop in pre-filtration dosage in order to reduce THM formation. A lower chlorine dose in the raw water (pre-filtration) results in a slower rate of THM formation with suspended organics. Once these are removed by the membrane filters, there is less organic content for the post chlorine addition to react with. The total chlorine usage at Loch Lomond in 2003 was 22,014 kg, down significantly from the 30,144 kg used in 2001. The average dosage was 2.88 mg/L in 2003. The dosage at Loch Lomond is higher than that at Bare Point because the reaction with some organic matter occurs before a free chlorine residual is formed. The average free chlorine residual at the Loch Lomond reservoir was 1.89 mg/L.

Sodium silicate is added to the treated water for corrosion control. In 2003 a total of 58,916 kg of sodium silicate was added for an average dosage of 8.06 mg/L. Sodium silicate is a food grade material often used as a food additive. In the membrane ultra-filtration process, approximately 7.2 % of the raw water is wasted during the backpulse cleaning cycle of the membrane tank. This water is de-chlorinated by adding sodium metabisulphite prior to discharge into a ditch/marsh area at the base of the mountain.

A citric acid bath is used for a Clean-in-Place (CIP) membrane cleaning process. This citric acid bath is neutralized with sodium hydroxide (caustic soda) prior to discharge into the ditch/marsh area.

WATER QUALITY ASSURANCE

In Thunder Bay, residents receive a very good quality surface water supply consistently delivered to us from two water treatment plant sources – Bare Point on Lake Superior and Loch Lomond on Mount McKay. Ontario Ministry of Environment Regulation 170/03 sets out mandatory treatment requirements for facilities using surface water as a source. These requirements include chemically assisted filtration and disinfection, or other treatment capable of providing water of equal or better quality. No water can be allowed to enter the distribution system unless it has been chlorinated or undergone an equivalent disinfection. Samples shall be taken and evaluated, at a frequency set by the Ministry, for a number of parameters as outlined in the Regulations. Water quality is monitored at both plants 24 hours a day, seven days a week. Water treatment plants must meet strict provincial standards and regulations. Each plant operates under an Ontario Ministry of the Environment Certificate of Approval. We are committed to quality and continuous improvement in accordance with Ontario's water quality standards.

We are very serious about monitoring the water quality. Each year, independent labs test more than 2,400 samples for potential contaminants. Our testing program meets, and in many areas, exceeds, regulatory requirements.

RESPONSIBILITY FOR TREATMENT

The City of Thunder Bay's Environment Division oversees the treatment and distribution of water to consumers. The Environment Division is made up of several sections. The Water Treatment Plants are responsible for the treatment, sampling and distribution of water. The Sewer and Water Section is responsible for the operation and maintenance of the water distribution system.

We have a highly qualified team, certified by the Ontario Environmental Training Consortium. Staff is continually trained in accordance with provincial regulations. In addition, the new drinking water regulations, require all water treatment staff performing water testing to complete an additional 40 hours of specialized training annually.

The City of Thunder Bay has a preventative maintenance system designed to ensure annual, semi annual and monthly inspections and maintenance functions are performed on all equipment associated with the water treatment facilities. Records are kept on scheduled, non- scheduled and emergency breakdowns of facility equipment and are readily available for Ministry Inspections.

CUSTOMER SERVICE

Our qualified staff is available 24 hours per day, seven days per week to respond to consumer water quality concerns or issues. If needed, times are arranged for a water sample to be taken by one of our field staff. Samples are taken by a qualified staff member, in test specific bottles, and delivered to the laboratory for analysis. Homeowners are informed promptly of test results and if necessary, further investigation is undertaken.

The City of Thunder Bay publishes an Annual Report and communicates its availability to the public. This process was undertaken to satisfy the requirements of Regulation 170/03.

Bare Point
WATER TREATMENT PLANT

R.R.#13, 171 BARE POINT ROAD

THUNDER BAY, ONTARIO

P7B 5E4

Raw Water Flow Results*

Month	Total For Month	Avg. Peak Flow Daily Flow	Avg. Minimum Daily Flow	Average Daily Flow
January	1280.40	44.70	36.11	41.30
February	1206.10	47.66	37.77	43.08
March	1389.60	52.21	37.56	44.83
April	1263.50	50.23	33.73	42.12
May	1316.50	50.50	33.66	42.47
June	1416.40	55.90	49.88	47.21
July	1339.30	50.60	34.66	43.21
August	1318.40	55.91	35.16	47.09
September	1356.50	46.30	34.52	45.22
October	1340.90	48.21	35.68	43.26
November	1230.80	47.79	33.73	41.03
December	1278.00	49.74	34.44	41.23
Total	15736.40			522.05
Avg/Mth				43.50

* Flow Results in 1,000,000's of Litres

Treated Water Flow Results*

Month	Total For Month	Avg. Peak Rate Daily Flow	Avg. Min. Daily Flow	Average Daily Flow	Max/Min Flows (Hourly)
January	1210.90	40.53	26.10	39.06	Max. Jan 26 (47.00) Min. Jan 03 (39.06)
February	1190.90	44.92	29.54	42.53	Max. Feb 14 (49.00) Min. Feb 01 (42.53)
March	1319.90	46.79	28.34	42.58	Max. Mar 07 (57.00) Min. Mar 19 (42.58)
April	1124.10	42.67	27.48	37.47	Max. Apr 08 (60.00) Min. Apr 19 (37.47)
May	1249.30	44.45	25.52	40.30	Max. May 26 (73.50) Min. May 31 (40.30)
June	1317.40	50.30	28.67	43.92	Max. Jun 15 (75.50) Min. Jun 27 (43.92)
July	1238.60	44.69	27.03	39.96	Max. Jul 09 (60.00) Min. Jul 02 (39.96)
August	1243.80	53.14	28.30	44.42	Max. Aug 18 (73.00) Min. Aug 03 (44.42)
September	1248.80	44.52	26.87	41.63	Max. Sep 19 (50.00) Min. Sep 02 (41.63)
October	1235.10	41.82	26.45	39.84	Max. Oct 13 (49.00) Min. Oct 24 (39.84)
November	1091.30	40.62	25.48	36.38	Max. Nov 18 (48.00) Min. Nov 05 (36.38)
December	1125.60	40.32	25.90	36.31	Max. Dec 02 (46.00) Min. Dec 27 (36.31)
Total	14595.70			484.40	Max Flow For Year: 75.50
Avg/Mth				40.37	

* Flow Results in 1,000,000's of Litres

Process Chemicals

Month	Pri. Coagulant Used (kg/month)	Pri. Coagulant Dosage (mg/L)	Sec. Coagulant Used (kg/month)	Sec. Coagulant Dosage (mg/L)
January	3802.40	2.97	167.13	0.13
February	3841.20	3.18	153.00	0.13
March	4423.20	3.23	172.89	0.13
April	4869.40	3.84	165.87	0.13
May	6208.00	4.80	217.26	0.17
June	5470.80	3.86	219.33	0.16
July	5199.20	3.89	252.63	0.19
August	4694.80	3.58	226.98	0.17
September	4268.00	3.17	215.10	0.16
October	4675.40	3.49	195.93	0.15
November	3783.00	3.10	197.10	0.16
December	4423.20	3.47	208.71	0.16
Total	55658.60		2391.93	
Average Per Month	4638.22	3.55	199.33	0.15

Disinfection

Month	Chlorine Used (kg)	Chlorine Dosage (mg/L)	Free Residual (mg/L)
January	1841.40	1.44	1.23
February	1789.60	1.49	1.22
March	1986.70	1.47	1.22
April	1802.30	1.43	1.22
May	2127.40	1.62	1.22
June	2356.70	1.67	1.25
July	2362.60	1.77	1.23
August	2213.70	1.68	1.23
September	2073.80	1.54	1.23
October	2116.50	1.58	1.28
November	1858.60	1.51	1.24
December	1783.30	1.40	1.22
Total	24312.60		14.79
Average Per Month	2026.05	1.55	1.23

Operational Report - Raw Water

Month	p.H. (-log10)	Hard. (mg/l)	Alk. (mg/l)	Turb. (N.T.U.)	Color (T.C.)	Alum. (mg/l)	Temp. (deg. C)	Iron (mg/L)	Lead (ug/L)
January	7.26	44.00	42.00	1.07	14.14		4.95	0.000	< 0.00
February	7.30	46.00	43.40	0.55	10.00		4.76	0.000	< 0.00
March	7.35	47.50	41.00	0.31	8.11		4.97	0.000	< 0.00
April	7.29	38.00	34.00	0.41	14.20		5.44	0.000	< 0.00
May	7.36	44.00	39.00	0.89	6.78		8.09	0.000	< 0.00
June	7.65	46.00	40.00	0.61	9.57		11.38	0.000	< 0.00
July	7.52	45.00	39.50	0.69	13.00		13.61	0.000	< 0.00
August	7.53	43.00	40.00	0.79	9.33		14.50	0.000	< 0.00
September	7.60	44.00	41.00	1.11	7.00		14.83	0.000	< 0.00
October	7.47	45.00	40.00	0.77	10.89		10.64	0.000	< 0.00
November	7.57	42.00	40.00	0.73	11.50		8.11	0.000	< 0.00
December	7.52	40.00	38.00	1.13	9.50		6.03	0.000	< 0.00
Average	7.45	43.71	39.82	0.76	10.34		8.94	0.000	< 0.00

Hard. - Hardness

Alk. - Alkalinity

Turb. Turbidity

**Alum. - Aluminum
Residual**

Temp. - Temperature

Operational Report - Treated Water

Month	p.H. (-log10)	Hard. (mg/l)	Alk. (mg/l)	Turb. (N.T.U.)	Color (T.C.)	Alum. (mg/l)	Temp. (deg. C)	Iron (mg/L)	Lead (ug/L)	Conductivity (Umho/Cm)
January	6.96	45.00	43.50	0.08	2.35	0.019	4.95	0.000	< 0.00	99.83
February	7.03	48.00	44.00	0.07	1.63	0.023	4.76	0.000	< 0.00	99.25
March	7.09	48.50	45.00	0.07	1.83	0.024	4.97	0.000	< 0.00	
April	7.04	40.40	36.00	0.08	1.56	0.020	5.44	0.000	< 0.00	99.89
May	6.97	45.50	40.00	0.11	1.28	0.030	8.09	0.000	< 0.00	102.11
June	7.07	47.00	42.00	0.08	1.36	0.028	11.38	0.000	< 0.00	99.00
July	7.07	45.40	41.20	0.07	2.13	0.032	13.61	0.000	< 0.00	99.63
August	7.16	44.00	42.00	0.08	1.22	0.034	14.50	0.000	< 0.00	100.33
September	7.11	46.00	42.40	0.08	1.50	0.036	14.83	0.000	< 0.00	99.67
October	7.09	45.40	42.00	0.07	2.22	0.020	10.64	0.000	< 0.00	101.00
November	7.12	44.00	42.00	0.07	1.63	0.015	8.11	0.000	< 0.00	100.50
December	7.11	41.00	41.00	0.07	2.25	0.012	6.03	0.000	< 0.00	99.00
Average	7.07	45.02	41.76	0.08	1.75	0.024	8.94	0.000	< 0.00	100.02

Hard. - Hardness

Alk. - Alkalinity

Turb. Turbidity

Alum. - Aluminum

Temp. - Temperature

**Chemical Analysis 1 - Raw Water
 Drinking Water Surveillance Program**

Month	Chlor. (mg/l)	Sulp. (mg/l)	Sil. (mg/l)	Turb. N.T.U.*	Colour H.U.**	Nitrates (mg/l)
January						
February						
March						
April						
May	1.50	3.90	1.12	0.58	2.40	0.346
June						
July						
August						
September						
October	1.90	3.70	1.00	1.02	0.70	0.333
November						
December						
Average	1.70	3.80	1.06	0.80	1.55	0.340

Chlor.- Chloride
 (*) - N.T.U. - Nephelometric Turbidity Units

Sulp.- Sulphate

Sil. - Silicates
 (**) - H.U. - Hazen Units

Turb. - Turbidity

**Chemical Analysis 2 - Raw Water
 Drinking Water Surveillance Program**

Month	Cond. (Umho/Cm)	Hard. (mg/l)	Calcium (mg/l)	Sodium (mg/l)	Alk. (mg/l)	pH (-log10)
January						
February						
March						
April						
May	99.00	46.50	13.80	1.80	44.50	7.83
June						
July						
August						
September						
October	100.00	46.50	14.00	1.60	44.90	8.03
November						
December						
Average	99.50	46.50	13.90	1.70	44.70	7.93

Cond. - Conductivity

Hard. - Hardness

Alk. - Alkalinity

**Chemical Analysis 1 - Treated Water
 Drinking Water Surveillance Program**

Month	Chlor. (mg/l)	Sulp. (mg/l)	Sil. (mg/l)	Turb. N.T.U.*	Colour H.U.**	Nitrates (mg/l)
January						
February						
March						
April						
May	2.70	6.10	1.08		0.20	0.342
June						
July						
August						
September						
October	3.00	5.20	0.96		0.20	0.330
November						
December						
Average	2.85	5.65	1.02		0.20	0.336

Chlor.- Chloride
 (*) - N.T.U. - Nephelometric Turbidity Units

Sulp.- Sulphate
 (*) - N.T.U. - Nephelometric Turbidity Units

Sil. - Silicates
 (**) - H.U. - Hazen Units

Turb. - Turbidity
 (**) - H.U. - Hazen Units

**Chemical Analysis 2 - Treated Water
 Drinking Water Surveillance Program**

Month	Cond. (Umho/Cm)	Hard. (mg/l)	Calcium (mg/l)	Sodium (mg/l)	Alk. (mg/l)	pH (-log10)
January						
February						
March						
April						
May	102.00	46.00	13.60	1.80	43.40	7.62
June						
July						
August						
September						
October	102.00	46.50	14.00	1.60	41.70	8.01
November						
December						
Average	102.00	46.25	13.80	1.70	42.55	7.81

Cond. - Conductivity

Hard. - Hardness

Alk. - Alkalinity

Metal Analysis - Treated Water (Drinking Water Surveillance Program)

Month	Alum. (ug/l)	Barium (ug/l)	Boron (ug/l)	Chrom. (ug/l)	Copper (ug/l)	Iron (ug/l)	Lead (ug/l)	Mang. (ug/l)	MolyB. (ug/l)	Nickel (ug/l)	Uran. (ug/l)	Zinc (ug/l)
January						0.00	0.00					
February						0.00	0.00					
March						0.00	0.00					
April						0.00	0.00					
May	37.90	9.71	3.00	0.30	2.70	3.00	0.02	0.25	0.13	0.10	0.04	1.90
June						0.00	0.00					
July						0.00	0.00					
August						0.00	0.00					
September						0.00	0.00					
October	54.90	11.00	6.00	0.70	0.70	5.00	0.00	0.12	0.13	0.30	0.04	0.50
November						0.00	0.00					
December						0.00	0.00					
Average	46.40	10.36	4.50	0.50	1.70	0.67	0.002	0.19	0.13	0.20	0.04	1.20

Alum. - Aluminum

Chrom. - Chromium

Mang.- Manganese

MolyB. - Molybdenum

Uran. - Uranium

Great Lakes Project #10 - Raw Water

Month	Chl. (mg/l)	Sil. (mg/l)	Total Phos. (mg/l)	Reactive Phos. (mg/l)	Total Ammon. (mg/l)	Total Nitrate (mg/l)	Total Nitrite (mg/l)	Chloro- phyll A (mg/l)	Total Nitro (mg/l)
January	1.67	1.09	0.0060	0.0007	0.007	0.387	0.002	0.83	0.120
February	1.53	1.07	0.0040	0.0007	0.007	0.356	0.002	1.22	0.110
March	1.55	1.11	0.0040	0.0007	0.014	0.356	0.002	1.45	0.120
April	1.75	1.07	0.0060	0.0005	0.015	0.341	0.004	1.00	0.140
May	1.60	1.10	0.0050	0.0007	0.010	0.346	0.003	1.20	0.110
June	1.50	1.08	0.0040	0.0009	0.008	0.324	0.004	1.48	0.180
July	1.80	1.06	0.0050	0.0010	0.009	0.328	0.004	1.13	0.160
August	1.78	0.99	0.0040	0.0009	0.017	0.309	0.003	1.23	0.120
September	2.08	0.99	0.0040	0.0005	0.009	0.319	0.004	0.55	0.130
October	1.75	0.99	0.0060	0.0017	0.006	0.326	0.005	1.27	0.110
November	1.63	1.01	0.0050	0.0005	0.003	0.344	0.002	1.33	0.120
December	1.85	1.08	0.0060	0.0007	0.003	0.351	0.002	0.98	0.100
Average	1.71	1.05	0.005	0.001	0.009	0.341	0.003	1.14	0.127

Chl. - Chloride

Sil. - Silicate

Phos. - Phosphorus

Ammon. - Ammonium

Nitro - Nitrogen

**Priority Organics - Treated Water
 Drinking Water Surveillance Program**

Month	Chloro- form	Chlordi- bromo- methane	Bromodi- chloro- methane	Bromo- form	Total trihalo- methane
January					
February					
March					
April					
May	8.70	0.20	1.20	0.50	10.60
June					
July					
August					
September					
October	10.70	0.20	1.60	0.50	13.00
November					
December					
Total	19.40	0.40	2.80	1.00	23.60
Avg/Mth	9.70	0.20	1.40	0.50	11.80

(All Analysis in ug/L)

Bare Point Water Treatment Plant - Volatile Organics Tests, 2003

Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yy	Range (ug/L)	Exceedance	SOURCE OF PARAMETER
Bare Point Treated	Vinyl Chloride	2	2	0	05/02/03-02/05/03	<0.2	NO	
	1,1-Dichloroethylene	14	2	0	"	<1	NO	
	Dichloromethane	50	2	0	"	<1	NO	
	Chloroform	Note 1	2	2	"	5.5 – 16.5	NO	Type of trihalomethane (THM)
	Carbon Tetrachloride	5	2	0	"	<0.5	NO	
	Benzene	5	2	0	"	<0.5	NO	
	1,2-Dichloroethane	5	2	0	"	<0.5	NO	
	Bromodichloromethane	Note 1	2	2	"	1.0 – 1.0	NO	Type of trihalomethane (THM)
	Toluene	24 **	2	0	"	<1		
	Trichloroethylene	50	2	0	"	<1	NO	
	Tetrachloroethylene	30	2	0	"	<1	NO	
	Dibromochloromethane	Note 1	2	0	"	<1	NO	Type of trihalomethane (THM)
	Monochlorobenzene	80	2	0	"	<1	NO	
	Ethylbenzene	2.4**	2	0	"	<1		
	m,p-Xylene	300*	2	0	"	<1		
	o-Xylene	300*	2	0	"	<1		
	Bromoform	Note 1	2	0	"	<1	NO	Type of trihalomethane (THM)
1,4-Dichlorobenzene	5	2	0	"	<0.5	NO		
1,2-Dichlorobenzene	200	2	0	"	<1	NO		
Bare Point Distr. System	Total THM's – System Extremity (2)	100	4	4	05/02/03-21/11/03	20.1 (2)	NO	Disinfection by-products (total)

** NOTE 1 – Total of all trihalomethanes (chloroform & bromochloromethanes) should not exceed THM standard of 100 ug/L

(2) - THMs in the distribution system are based on a running annual average of four quarterly samples at point of max. residence (extremity)

** - Aesthetic Objective(AO). Exceedance column does not apply to these.

* - 300 ug/L is AO for total Xylenes < - Means less than the specified method detection limit

Bare Point Water Treatment Plant – Pesticides & PCB Tests

Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yy	Range (ug/L)	Exceedance	Source of Parameter
Bare Point Treated Water	Atrazine + N-dealkylated metabolites	5	2	0	05/02/03-02/05/03	<0.2	NO	Insecticide, herbicide and fungicide residues
	Alachlor	5	2	0	"	<0.1	NO	
	Azinphos-methyl	20	2	0	"	<0.1	NO	
	Chlorpyrifos	90	2	0	"	<0.1	NO	
	Cyanazine	10	2	0	"	<0.1	NO	
	Diazinon	20	2	0	"	<0.1	NO	
	Diclofop-methyl	9	2	0	"	<0.1	NO	
	Dimethoate	20	2	0	"	<0.1	NO	
	Dinoseb	10	2	0	"	<0.2	NO	
	Malathion	190	2	0	"	<0.1	NO	
Metribuzin	80	2	0	"	<0.1	NO		

Bare Point – Pesticides & PCB Tests (cont.)								
Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yyyy	Range (ug/L)	Exceedance	Source of Parameter
Bare Point Treated Water (cont.)	Parathion	50	2	0	05/02/03- 02/05/03	<0.1	NO	Insecticide, herbicide and fungicide residues
	Phorate	2	2	0	“	<0.1	NO	
	Prometryne	1	2	0	“	<0.1	NO	
	Simazine	10	2	0	“	<0.1	NO	
	Terbufos	1	2	0	“	<0.1	NO	
	Triallate	230	2	0	“	<0.1	NO	
	Trifluralin	45	2	0	“	<0.1	NO	
	P,p'-DDD	30**	2	0	“	<0.1	NO	
	P,p'-DDE	30**	2	0	“	<0.1	NO	
	P,p'-DDT	30**	2	0	“	<0.1	NO	
	Aldrin	0.7*	2	0	“	<0.02	NO	
	Dieldrin	0.7*	2	0	“	<0.02	NO	
	Heptachlor	3 ⁺	2	0	“	<0.1	NO	
	Heptachlor Epoxide	3 ⁺	2	0	“	<0.1	NO	
	Lindane (Total)	4	2	0	“	<0.1	NO	
	Methoxychlor	900	2	0	“	<0.1	NO	
	Metolachlor	50	2	0	“	<0.1	NO	
	Chlordane	7	2	0	“	<0.1	NO	
	Bromoxynil	5	2	0	“	<0.2	NO	
	Dicamba	120	2	0	“	<0.2	NO	
	2,4-Dichlorophenol	900	2	0	“	<0.5	NO	
	2,4-D	100	2	0	“	<0.2	NO	
	Pentachlorophenol	60	2	0	“	<0.5	NO	
	Picloram	190	2	0	“	<0.2	NO	
	2,3,4,6-Tetrachlorophenol	100	2	0	“	<0.5	NO	
	2,4,6-Trichlorophenol	5	2	0	“	<0.5	NO	
	2,4,5-T	280	2	0	“	<0.2	NO	
	Glyphosate	280	2	0	“	<28	NO	
	Diquat	70	2	0	“	<7	NO	
	Paraquat	10	2	0	“	<1	NO	
	Aldicarb	9	2	0	“	<0.9	NO	
	Bendiocarb	40	2	0	“	<0.1	NO	
Carbaryl	90	2	0	“	<0.1	NO		
Carbofuran	90	2	0	“	<0.1	NO		
Diuron	150	2	0	“	<15	NO		
Temephos	280	2	0	“	<0.1	NO		
PCB's	3	2	0	“	<0.06	NO	Electrical insulating oil	
Dioxins and Furans	15 pg/L Total TEQ	1	1	05/02/03	3.6 pg/L TEQ	NO	Insecticide and bleaching by-products, garbage burning by-products	

< - Means less than the specified method detection limit TEQ – Total Equivalent Concentration

BARE POINT WATER TREATMENT PLANT - INORGANIC & GENERAL CHEMISTRY PARAMETERS

Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	<u>DATES</u> dd/mm/yy	Range (mg/L)	Exceed- ance	Source of Parameter
Bare Point Raw Water	Alkalinity	500**	2	2	05/02/03- 02/05/03	42 - 45		Natural sources, mostly dissolved carbonate
	Calcium		2	2	“	14.2 - 14.7		Common mineral constituent
	Sodium	200**	2	2	“	1.63 – 2.05		Natural mineral constituent
	Total Phenolics		2	0	“	<0.002		Decomposition of wood
	Chloride	250**	2	2	“	1.8 – 2.0		Natural sources at low levels
	Conductivity (us/cm)		2	2	“	100 - 107		Natural dissolved material in water
	Dissolved Organic Carbon	5**	2	2	“	2 – 3		Organic matter leached into surface water from vegetation
	Hardness	100**	2	2	“	48 - 49		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	4	4	05/02/03 – 21/11/03	0.30 – 0.36	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 ⁺	4	0	“	<0.02	NO	Natural sources in oxygen-poor water
Cyanide	0.2	1	0	05/02/03	<0.002	NO	Industrial processes	
Bare Point Treated Water	Aluminum	0.1**	1	1	05/02/03	0.03		Natural sources at low levels
	Arsenic	0.025	2	0	05/02/03- 02/05/03	<0.001	NO	Natural source at low levels
	Antimony	0.006	1	0	21/11/03	<0.005	NO	
	Calcium		2	2	05/02/03- 02/05/03	14.7 – 15.0		Common mineral constituent
	Copper	1.0**	2	0	“	<0.001		Corrosion of plumbing systems
	Iron	0.3**	2	0	“	<0.05		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	2	1	“	<0.001 - .003		Erosion of natural mineral deposits
	Lead	0.01	2	0	“	<0.001	NO	Leaching from plumbing and service connections
Alkalinity	500**	2	2	“	37 - 42		Natural sources, carbonate minerals	

Bare Point – Inorganic & General Chemistry Parameters (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	DATES dd/mm/yy	Range (mg/L)	Exce- dence	Source of Parameter
Bare Point Treated Water (cont.)	Dissolved Organic Carbon (DOC)	5**	2	2	05/02/03 – 02/05/03	1 - 3		Organic matter leached into surface water from vegetation
	Chloride	250**	2	2	“	2.1 – 3.8		Natural sources at low levels
	Conductivity		2	2	“	105 - 109		Natural dissolved material in water
	Benzo(a)pyrene	.00001	1	0	05/02/03	<0.00001	NO	Incomplete combustion, diesel exhaust
	Barium	1.0	2	0	05/02/03- 02/05/03	<0.01	NO	Common constituent of sedimentary rock
	Boron	5.0	2	0	“	<0.05	NO	Borates, borax detergents
	Cadmium	0.005	2	0	“	<0.0001	NO	Electroplating, NiCad batteries
	Chromium	0.05	2	0	“	<0.001	NO	Electroplating, old yellow paints
	Mercury	0.001	2	0	“	<0.0001	NO	Metal refining, coal combustion, natural deposits
	Selenium	0.01	2	0	“	<0.005	NO	Natural deposits
	Uranium	0.10	2	0	“	<0.005	NO	Natural deposits, nuclear processing
	Cyanide	0.2	1	0	05/02/03	<0.002	NO	Industrial processes
	Fluoride	1.5	1	1	05/02/03	0.31	NO	Natural deposits, water fluoridation
	Magnesium		2	2	05/02/03- 02/05/03	3.04 – 3.06		Dissolved minerals in water
	Hardness	100**	2	2	“	49 - 50		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	4	4	05/02/03 – 21/11/03	0.44 - 0.30	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 ⁺	4	0	“	<0.02	NO	Natural sources in oxygen-poor water
	Silica, reactive		4	4	“	0.87 – 2.6		Natural mineral leaching in oxygen-poor conditions, usually low in surface water
	Orthophosphate		4	0	“	<.04		Bacterial action in ground water
	Gross Alpha (radioactivity)	0.1 Bq/L	1	0	13/02/03	<0.1	NO	Natural Background radiation, discharge of radioactive materials
Gross Beta (radioactivity)	0.5 Bq/L	1	0	13/02/03	<0.1	NO		
Tritium (radioactivity)	7000 Bq/L	1	0	13/02/03	<1000	NO		

Bare Point – Inorganic & General Chemistry Parameters (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	<u>DATES</u> <u>dd/mm/yyyy</u>	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Distribution System Water	pH		4	4	05/02/03 – 21/11/03	7.4 – 7.6		Measure of acidity (7.0 = neutral)
	Arsenic	0.025	1	0	05/02/03	<0.001	NO	Natural source at low levels
	Barium	1.0	1	0	05/02/03	<0.01	NO	Common constituent of sedimentary rock
	Boron	5.0	1	0	05/02/03	<0.05	NO	Borates, borax detergents
	Cadmium	0.005	1	0	05/02/03	<0.0001	NO	Electroplating, NiCad batteries
	Calcium		1	1	05/02/03	14.9		Erosion of natural mineral deposits
	Chloramines, total		1	1	31/12/03	0.05		Chlorination byproduct
	Chromium	0.05	1	0	05/02/03	<0.001	NO	Electroplating, old yellow paints
	Copper	1.0**	1	0	05/02/03	<0.001		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	0	05/02/03	<0.05		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	0	05/02/03	<0.001		Erosion of natural mineral deposits
	Mercury	0.0001	1	0	05/02/03	<0.0001	NO	Metal refining, coal combustion, natural deposits
	Lead	0.01	1	0	05/02/03	<0.001	NO	Leaching from plumbing and service connections
	Sodium	200**	2	2	05/02/03 – 02/05/03	1.66 – 1.92		Natural deposits
	Zinc	5**	1	0	05/02/03	<0.002		Natural sources, corrosion of plumbing
	Selenium	0.01	1	0	05/02/03	<0.005	NO	Natural deposits
	Uranium	0.10	1	0	05/02/03	<0.005	NO	Natural deposits, nuclear processing
	Alkalinity	500**	2	2	05/02/03 – 02/05/03	40 - 42		Natural dissolved carbonate minerals
	Conductivity (uS/cm)		2	2	“	100 - 110		Natural dissolved material in water
	Dissolved Organic Carbon	5**	2	2	“	2 - 2		Organic matter leached into surface water from vegetation
Hardness	100**	2	2	“	49 - 50		Natural dissolved minerals (Ca, Mg)	
Nitrate	10	4	4	05/02/03 – 21/11/03	0.31 - 0.43	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels	
Nitrite	10 ⁺	4	0	“	<0.02	NO	Natural sources in oxygen-poor water	
Chloride	250**	2	2	05/02/03 – 02/05/03	2.6 – 3.0		Natural sources at low levels	

** -Aesthetic Objectives (AO). Exceedance column does not apply to these.

+ -Nitrite plus Nitrate MAC is 10 mg/L < - Means less than the specified method detection limit

BARE POINT WATER TREATMENT PLANT

2003 DIRECT OPERATING EXPENDITURES

Hourly Wages & Fringe Benefits	\$ 454,972.15
Building Maintenance	\$ 5,132.01
Electricity	\$ 399,362.28
Chemicals	\$ 62,143.38
Equipment Maintenance and Operations	\$ 47,434.34
General Expenditures	\$ 28,819.74

Total Operating Expenditure	\$ 997,863.90
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No. of Million Litres Treated in 2003	14595.70
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Cost Per Million Litres Treated	\$ 68.37
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BARE POINT WATER TREATMENT PLANT

HISTORICAL OPERATING COSTS

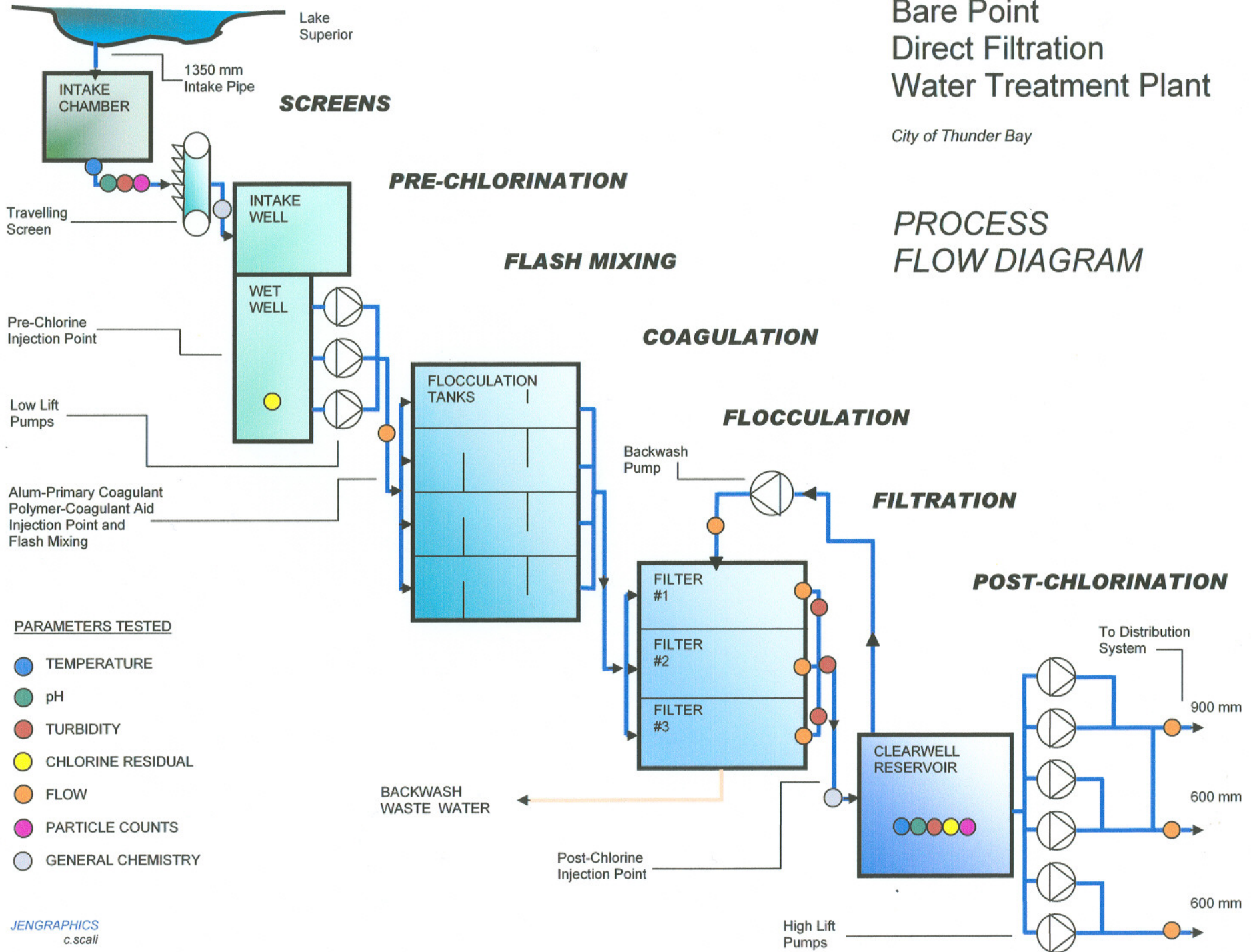
Year	Total Annual Flow(*)	Total Cost	Cost Per Million Litres
1983	11917.89	\$ 544321.07	\$ 45.67
1984	12590.29	\$ 584133.23	\$ 46.40
1985	13217.80	\$ 597494.63	\$ 45.20
1986	13777.55	\$ 650378.04	\$ 47.21
1987	13551.66	\$ 705033.91	\$ 52.03
1988	13221.18	\$ 612531.00	\$ 46.33
1989	12194.12	\$ 703281.00	\$ 57.67
1990	13673.08	\$ 688995.00	\$ 50.39
1991	12760.22	\$ 735409.00	\$ 57.63
1992	12270.34	\$ 724104.00	\$ 59.01
1993	12470.60	\$ 690107.28	\$ 55.34
1994	13169.20	\$ 758123.44	\$ 57.57
1995	12927.96	\$ 778917.96	\$ 60.25
1996	13464.00	\$ 782121.53	\$ 58.09
1997	11744.60	\$ 829325.31	\$ 70.61
1998	12276.90	\$ 740585.45	\$ 60.32
1999	11110.47	\$ 846144.20	\$ 76.16
2000	12229.58	\$ 882070.60	\$ 72.13
2001	13013.14	\$ 927899.39	\$ 71.30
2002	13314.86	\$ 1020587.61	\$ 76.65
2003	14595.70	\$ 997863.90	\$ 68.37

*Millions of Litres

Bare Point Direct Filtration Water Treatment Plant

City of Thunder Bay

PROCESS FLOW DIAGRAM



Loch Lomond
WATER TREATMENT PLANT

MISSION ROAD
THUNDER BAY, ONTARIO
P7C 4Z2

Raw Water Flow Results*

Month	Total For Month	Avg. Peak Rate Daily Flow	Avg. Minimum Daily Flow	Average Daily Flow
January	849.67	22.91	17.06	20.42
February	730.37	24.64	16.94	21.48
March	833.11	25.24	17.61	21.91
April	809.37	29.16	17.96	24.73
May	831.88	30.30	18.06	24.96
June	867.35	30.55	16.14	24.37
July	975.71	29.57	15.06	23.92
August	924.58	27.92	14.48	22.86
September	882.34	24.11	10.20	19.58
October	849.03	23.38	10.60	19.46
November	869.64	27.00	10.13	21.17
December	895.77	26.10	7.03	19.82
Total	10318.82			264.68
Average Per Month				22.06

* Flow Results in 1,000,000's of Litres

Treated Water Flow Results*

Month	Total For Month	Avg. Peak Rate Daily Flow	Avg. Min. Daily Flow	Average Daily Flow	Max/Min Flows (Hourly)
January	764.75	22.91	17.06	18.73	Max. Jan 09(25.90) Min. Jan 21(15.00)
February	657.32	24.65	16.94	19.95	Max. Feb 25(25.70) Min. Feb 28(9.50)
March	752.12	25.18	17.61	20.30	Max. Mar 03(26.60) Min. Mar 01(15.00)
April	728.46	29.28	17.96	22.93	Max. Apr 24(32.90) Min. Apr 17(13.50)
May	746.49	30.30	18.03	22.82	Max. May 02(42.10) Min. May 28(12.20)
June	780.64	30.55	16.14	22.44	Max. Jun 07(32.30) Min. Jun 03(12.40)
July	878.15	29.40	15.08	21.94	Max. Jul 25(32.20) Min. Jul 29(12.10)
August	834.27	27.98	14.62	20.83	Max. Aug 17(29.70) Min. Aug 17(9.10)
September	805.54	24.12	10.23	17.58	Max. Sep 03(28.40) Min. Sep 14(4.30)
October	797.23	23.38	10.60	17.87	Max. Oct 31(29.50) Min. Oct 11(5.60)
November	808.03	27.00	10.05	19.42	Max. Nov 03(29.90) Min. Nov 09(5.80)
December	833.85	26.10	7.03	18.03	Max. Dec 23(28.70) Min. Dec 14(4.10)
Total	9386.85			242.84	Max Flow For Year:
Avg/Mth.				20.24	42.10

* Flow Results in 1,000,000's of Litres

Note: Max hourly flow of 42.10 for May due to temporary malfunction of raw water inlet valve.

Sodium Silicate Treatment

Month	Sodium Silicate Used (kg/month)	Sodium Silicate Dosage (mg/L)	Treated Water pH (-log10)
January	3852.80	6.64	7.94
February	3484.60	6.25	7.91
March	4198.30	6.68	7.93
April	4733.20	6.87	7.83
May	5288.00	7.49	7.86
June	4980.00	7.40	7.85
July	5385.80	7.93	7.83
August	5469.40	8.49	7.81
September	5650.40	10.84	7.83
October	5920.60	10.70	7.94
November	5478.40	9.39	7.93
December	4475.40	8.01	7.88
Total	58916.90		
Avg/Mth.	4909.74	8.06	7.88

Disinfection

Month	Chlorine Used (kg)	Chlorine Dosage (mg/L)	Free Residual (mg/L)
January	2892.30	2.51	1.83
February	2407.50	2.38	1.91
March	2655.80	2.30	1.90
April	2696.20	2.39	1.96
May	2827.40	2.55	1.84
June	3081.90	2.99	1.87
July	3373.70	3.04	2.16
August	3185.60	3.28	1.84
September	3055.10	3.76	1.85
October	2851.60	3.38	1.82
November	2759.70	3.05	1.89
December	2395.00	2.91	1.85
Total	34181.80		
Avg/Mth.	2848.48	2.88	1.89

Operational Report - Raw Water

Month	p.H. (-log10)	Hard. (mg/l)	Alk. (mg/l)	Turb. (N.T.U.)	Color (T.C.)	Temp. (deg. C)	Iron (mg/L)	Lead (ug/L)
January	7.04	21.00	19.00	0.41	14.50	2.40	0.00	0.00
February	7.03	20.00	18.00	0.30	12.13	2.46	0.00	0.00
March	7.04	23.00	20.00	0.30	14.00	3.02	0.00	0.00
April	7.03	25.00	19.00	0.40	23.33	3.73	0.00	0.00
May	7.02	22.00	18.50	0.45	19.00	5.97	0.00	0.00
June	7.06	21.00	19.00	0.61	19.13	8.70	0.00	0.00
July	7.05	22.00	18.00	0.76	18.22	10.32	0.00	0.00
August	6.98	24.00	19.50	0.79	14.25	11.45	0.00	0.00
September	6.99	23.00	20.00	0.63	12.89	14.60	0.00	0.00
October	7.03	25.00	21.00	0.50	15.22	11.13	0.00	0.00
November	7.09	22.00	18.00	0.47	12.33	6.60	0.00	0.00
December	7.09	20.00	19.00	0.39	15.89	3.81	0.00	0.00
Average	7.04	22.33	19.08	0.50	15.91	7.02	0.00	0.00

Hard. - Hardness

Alk. - Alkalinity

Turb. Turbidity

Temp. - Temperature

Operational Report - Treated Water

Month	p.H. (-log10)	Hard. (mg/l)	Alk. (mg/l)	Turb. (N.T.U.)	Color (T.C.)	Temp. (deg. C)	Iron (mg/L)	Lead (ug/L)	Conductivity (Umho/Cm)
January	7.94	21.00	20.00	0.01	6.50	2.40	0.000	0.000	64.20
February	7.91	21.00	18.50	0.01	5.13	2.46	0.000	0.000	66.38
March	7.93	24.00	21.00	0.01	5.89	3.02	0.000	0.000	67.11
April	7.83	25.50	20.00	0.01	8.22	3.73	0.000	0.000	62.70
May	7.86	24.00	20.00	0.01	6.44	5.97	0.000	0.000	64.22
June	7.85	22.00	21.00	0.01	7.88	8.70	0.000	0.000	55.22
July	7.83	23.00	18.50	0.01	5.89	10.32	0.000	0.000	62.00
August	7.81	24.80	20.20	0.01	4.88	11.45	0.000	0.000	63.50
September	7.83	24.20	22.00	0.02	4.89	14.60	0.000	0.000	64.67
October	7.94	26.00	22.00	0.03	5.44	11.13	0.000	0.000	64.00
November	7.93	23.00	20.00	0.03	5.33	6.60	0.000	0.000	62.44
December	7.88	22.00	21.00	0.05	5.22	3.81	0.000	0.000	63.33
Average	7.88	23.38	20.35	0.02	5.98	7.02	0.000	0.000	63.31

Hard. - Hardness

Alk. - Alkalinity

Turb. Turbidity

Temp. - Temperature

Control Point Residual

Month	Sil. N.W. Hotel (mg/l)	Sil. St.P. School (mg/l)	Sil. L.L. Plant (mg/l)	CL2 Residual (Beaver) (mg/l)
January	7.50	7.40	7.80	
February	8.10	7.60	8.80	
March	8.80	8.50	9.20	
April	6.60	6.90	7.20	
May	9.90	10.30	10.10	
June	8.80	8.70	9.20	
July				
August	9.00	8.80	8.70	
September	8.60	9.00	8.80	
October	7.70	8.10	8.30	
November	7.60	7.90	8.00	
December				
Total	82.60	83.20	86.10	
Average Per Month	8.26	8.32	8.61	
Sil.- Silicate	CL2 - Chlorine	St.P.- St Patrick School	L.L.- Loch Lomond	Beaver - Beaver Gas Bar

**Chemical Analysis 1 - Raw Water
 (Drinking Water Surveillance Program)**

Month	Chlor. (mg/l)	Sulp. (mg/l)	Sil. (mg/l)	Turb. N.T.U.*	Colour H.U.**	Nitrates (mg/l)
January						
February						
March	0.60	5.40	1.78	0.13	12.50	0.063
April						
May						
June	0.50	5.10	1.68	0.30	12.90	0.060
July						
August						
September	0.60	5.10	1.54	0.31	10.90	0.031
October						
November						
December						
Average	0.57	5.20	1.67	0.25	12.10	0.051

Chlor.- Chloride
 (*) - N.T.U. - Nephelometric Turbidity Units

Sulp.- Sulphate
 Sulp. - Sulphate

Sil. - Silicates
 (**) - H.U. - Hazen Units

Turb. - Turbidity

**Chemical Analysis 2 - Raw Water
 (Drinking Water Surveillance Program)**

Month	Cond. (Umho/Cm)	Hard. (mg/l)	Calcium (mg/l)	Sodium (mg/l)	Alk. (mg/l)	pH (-log10)
January						
February						
March	59.00	26.50	6.20	1.20	23.50	7.50
April						
May						
June	56.00	24.50	5.80	1.20	22.40	7.57
July						
August						
September	58.00	24.50	5.80	1.20	23.40	7.46
October						
November						
December						
Average	57.67	25.17	5.93	1.20	23.10	7.51

Cond. - Conductivity

Hard. - Hardness

Alk. - Alkalinity

**Chemical Analysis 1 - Treated Water
 (Drinking Water Surveillance Program)**

Month	Chlor. (mg/l)	Sulp. (mg/l)	Sil. (mg/l)	Turb. N.T.U.*	Colour H.U.**	Nitrates (mg/l)
January						
February						
March	2.80	5.20	5.28		4.20	0.066
April						
May						
June	3.20	5.00	4.86		3.70	0.059
July						
August						
September						
October						
November						
December						
Average	3.00	5.10	5.07		3.95	0.063

Chlor.- Chloride
 (*) - N.T.U. - Nephelometric Turbidity Units

Sulp.- Sulphate

Sil. - Silicates

(**) - H.U. - Hazen Units

Turb. - Turbidity

**Chemical Analysis 2 - Treated Water
 (Drinking Water Surveillance Program)**

Month	Cond. (Umho/Cm)	Hard. (mg/l)	Calcium (mg/l)	Sodium (mg/l)	Alk. (mg/l)	pH (-log10)
January						
February						
March	67.00	26.00	6.00	3.20	22.90	7.83
April						
May						
June	65.00	23.50	5.40	3.00	21.80	7.58
July						
August						
September						
October						
November						
December						
Average	66.00	24.75	5.70	3.10	22.35	7.71
	Cond. - Conductivity		Hard. - Hardness		Alk. - Alkalinity	

Metal Analysis - Treated Water (Drinking Water Surveillance Program)

Month	Alum. (ug/l)	Barium (ug/l)	Boron (ug/l)	Chrom. (ug/l)	Copper (ug/l)	Iron (ug/l)	Lead (ug/l)	Mang. (ug/l)	MolyB. (ug/l)	Nickel (ug/l)	Uran. (ug/l)	Zinc (ug/l)
January											0.00	
February											0.00	
March	3.80	4.88	7.00	0.30	1.60	9.00	0.03	0.21	0.15	0.40	0.02	1.70
April											0.00	
May											0.00	
June	5.40	4.70	6.00	0.40	1.70	10.00	0.04	0.18	0.12	0.01	0.01	2.50
July											0.00	
August											0.00	
September											0.00	
October											0.00	
November											0.00	
December											0.00	
Average	4.60	4.79	6.50	0.35	1.65	9.50	0.04	0.20	0.14	0.21	0.00	2.10

Alum. - Aluminum

Chrom. - Chromium

Mang.- Manganese

MolyB. - Molybdenum

Uran. - Uranium

**Priority Organics - Treated Water
 (Drinking Water Surveillance Program)**

Month	Chloro- form *	Chlordi- bromo- methane *	Bromodi- chloro- methane *	Bromo- form *	Total trihalo- methane *
January					
February					
March	54.00	0.20	1.60	0.50	56.30
April					
May					
June	57.40	0.20	1.40	0.50	59.50
July					
August					
September					68.00
October					
November	61.40	0.20	1.80	0.50	63.90
December	50.80	0.20	1.40	0.50	52.90
Avg/Mth.	55.90	0.20	1.55	0.50	60.12

*(All Analysis in ug/L)

Loch Lomond Water Treatment Plant - Volatile Organics Tests, 2003

Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yyy	Range (ug/L)	Exceedance	SOURCE OF PARAMETER
Loch Lomond Treated	Vinyl Chloride	2	2	0	13/02/03 – 02/05/03	<0.2	NO	
	1,1-Dichloroethylene	14	2	0	“	<1	NO	
	Dichloromethane	50	2	0	“	<1	NO	
	Chloroform	Note 1	2	2	“	47.6 – 51	NO	Type of trihalomethane (THM)
	Carbon Tetrachloride	5	2	0	“	<0.5	NO	
	Benzene	5	2	0	“	<0.5	NO	
	1,2-Dichloroethane	5	2	0	“	<0.5	NO	
	Bromodichloromethane	Note 1	2	2	“	1.2 - 1.3	NO	Type of trihalomethane (THM)
	Toluene	24 **	2	0	“	<1		
	Trichloroethylene	50	2	0	“	<1	NO	
	Tetrachloroethylene	30	2	0	“	<1	NO	
	Dibromochloromethane	Note 1	2	0	“	<1	NO	Type of trihalomethane (THM)
	Monochlorobenzene	80	2	0	“	<1	NO	
	Ethylbenzene	2.4**	2	0	“	<1		
	m,p-Xylene	300*	2	0	“	<1		
	o-Xylene	300*	2	0	“	<1		
	Bromoform	Note 1	2	0	“	<1	NO	Type of trihalomethane (THM)
1,4-Dichlorobenzene	5	2	0	“	<0.5	NO		
1,2-Dichlorobenzene	200	2	0	“	<1	NO		
Loch Lomond Distr. System	Total THM's – System Extremity (2)	100	4	4	13/03/03- 21/11/03	87.1	NO	Disinfection by-products (total)

** NOTE 1 – Total of all trihalomethanes (chloroform & bromochloromethanes) should not exceed THM standard of 100 ug/L

(3) - THMs in the distribution system are based on a running annual average of four quarterly samples at point of max. residence (extremity)

** - Aesthetic Objective(AO). Exceedance column does not apply to these.

* - 300 ug/L is AO for total Xylenes < - Means less than the lab method detection limit

Loch Lomond Water Treatment Plant – Pesticides & PCB Tests

Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yy	Range (ug/L)	Exceedance	Source of Parameter
	Atrazine + N-dealkylated metabolites	5	2	0	13/02/03 – 02/05/03	<0.2	NO	Insecticide, herbicide and fungicide residues
	Alachlor	5	2	0	“	<0.1	NO	
	Azinphos-methyl	20	2	0	“	<0.1	NO	
	Chlorpyrifos	90	2	0	“	<0.1	NO	
	Cyanazine	10	2	0	“	<0.1	NO	
	Diazinon	20	2	0	“	<0.1	NO	
	Diclofop-methyl	9	2	0	“	<0.1	NO	
	Dimethoate	20	2	0	“	<0.1	NO	
	Dinoseb	10	2	0	“	<0.2	NO	
	Malathion	190	2	0	“	<0.1	NO	
	Metribuzin	80	2	0	“	<0.1	NO	

Loch Lomond – Pesticides & PCB Tests (cont.)								
Source Water	Parameter	MAC/ IMAC (ug/L)	# of Samples	# of Detectable Results	DATE(S) dd/mm/yy	Range (ug/L)	Exceedance	Source of Parameter
Loch Lomond Treated Water (cont.)	Parathion	50	2	0	13/02/03 – 02/05/03	<0.1	NO	Insecticide, herbicide and fungicide residues
	Phorate	2	2	0	“	<0.1	NO	
	Prometryne	1	2	0	“	<0.1	NO	
	Simazine	10	2	0	“	<0.1	NO	
	Terbufos	1	2	0	“	<0.1	NO	
	Triallate	230	2	0	“	<0.1	NO	
	Trifluralin	45	2	0	“	<0.1	NO	
	P,p'-DDD	30**	2	0	“	<0.1	NO	
	P,p'-DDE	30**	2	0	“	<0.1	NO	
	P,p'-DDT	30**	2	0	“	<0.1	NO	
	Aldrin	0.7*	2	0	“	<0.02	NO	
	Dieldrin	0.7*	2	0	“	<0.02	NO	
	Heptachlor	3 ⁺	2	0	“	<0.1	NO	
	Heptachlor Epoxide	3 ⁺	2	0	“	<0.1	NO	
	Lindane (Total)	4	2	0	“	<0.1	NO	
	Methoxychlor	900	2	0	“	<0.1	NO	
	Metolachlor	50	2	0	“	<0.1	NO	
	Chlordane	7	2	0	“	<0.1	NO	
	Bromoxynil	5	2	0	“	<0.2	NO	
	Dicamba	120	2	0	“	<0.2	NO	
	2,4-Dichlorophenol	900	2	0	“	<0.5	NO	
	2,4-D	100	2	0	“	<0.2	NO	
	Pentachlorophenol	60	2	0	“	<0.5	NO	
	Picloram	190	2	0	“	<0.2	NO	
	2,3,4,6-Tetrachlorophenol	100	2	0	“	<0.5	NO	
	2,4,6-Trichlorophenol	5	2	0	“	<0.5	NO	
	2,4,5-T	280	2	0	“	<0.2	NO	
	Glyphosate	280	2	0	“	<28	NO	
	Diquat	70	2	0	“	<7	NO	
	Paraquat	10	2	0	“	<1	NO	
Aldicarb	9	2	0	“	<0.9	NO		
Bendiocarb	40	2	0	“	<0.1	NO		
Carbaryl	90	2	0	“	<0.1	NO		
Carbofuran	90	2	0	“	<0.1	NO		
Diuron	150	2	0	“	<15	NO		
Temephos	280	2	0	“	<0.1	NO		
PCB's	3	2	0	“	<0.06	NO	Electrical insulating oil	
Dioxins and Furans	15 pg/L Total TEQ		1	1	13/02/2003	1.3 pg/L TEQ	NO	Insecticide and bleaching by-products, garbage burning by-products

< - Means less than the specified method detection limit

Loch Lomond Water Treatment Plant - Inorganic & General Chemistry Parameters

Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	<u>DATES</u> dd/mm/yy	Range (mg/L)	Exceedance	Source of Parameter	
Loch Lomond Raw Water	Calcium		2	2	13/02/03 – 02/05/03	6.7 - 6.8		Common mineral constituent	
	Sodium	200**	2	2	“	1.32-1.33		Natural mineral constituent	
	Alkalinity	500**	2	2	“	22 - 24		Natural sources, mostly dissolved carbonate	
	Chloride	250**	2	2	“	0.6 - 0.7		Natural sources at low levels	
	Conductivity (us/cm)		2	2	“	59 - 72		Natural dissolved material in water	
	Dissolved Organic Carbon	5**	2	2	“	4 – 6		Organic matter leached into surface water from vegetation	
	Hardness	100**	2	2	“	28 -28		Natural dissolved minerals (Ca, Mg)	
	Nitrate	10	4	4	13/02/03 – 21/11/03	0.04 - 0.09	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels	
	Nitrite	10 ⁺	4	0	“	<0.02	NO	Natural sources in oxygen-poor water	
	Cyanide	0.2	1	0	13/02/03	<0.002	NO	Industrial processes	
	Total Phenolics		1	0	“	<0.002		Decomposition of wood	
	Antimony	0.006	1	0	21/11/03	<.0005	NO		
	Arsenic	0.025	2	0	13/02/03 – 02/05/03	<0.001	NO	Natural source at low levels	
	Calcium			2	2	“	6.5 - 6.6		Common mineral constituent
	Copper	1.0**	2	2	2	“	.001-.002		Corrosion of plumbing systems
	Iron	0.3**	2	2	0	“	<0.05		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	2	2	0	“	<0.001		Erosion of natural mineral deposits
	Lead	0.01	2	2	0	“	<0.001	NO	Leaching from plumbing and service connections
	Sodium	200**	2	2	2	“	3.22 -3.57		Natural mineral constituent
	Alkalinity	500**	2	2	2	“	23 - 23		Natural sources, mostly dissolved carbonate

Loch Lomond – Inorganic & General Chemistry Parameters (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	<u>DATES</u> <u>dd/mm/y</u> y	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Treated Water (cont.)	Chloride	250**	2	2	13/02/03 – 02/05/03	2.3 - 2.9		Natural sources at low levels
	Conductivity		2	2	“	67 - 70		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	2	2	“	4 - 5		Organic matter leached into surface water from vegetation
	Barium	1.0	2	0	“	<0.01	NO	Common constituent of sedimentary rock
	Boron	5.0	2	1	“	0.12	NO	Borates, borax detergents
	Cadmium	0.005	2	0	“	<0.0001	NO	Electroplating, NiCad batteries
	Chromium	0.05	2	0	“	<0.001	NO	Electroplating, old yellow paints
	Hardness	100**	2	2	“	27 - 28		Natural dissolved minerals (Ca, Mg)
	Mercury	0.001	2	0	“	<0.0001	NO	Metal refining, coal combustion, natural deposits
	Selenium	0.01	2	0	“	<0.005	NO	Natural deposits
	Uranium	0.10	2	0	“	<0.005	NO	Natural deposits, nuclear processing
	Benzo(a)pyrene	.00001	1	0	13/02/03	<0.00001	NO	Incomplete combustion, diesel exhaust
	Cyanide	0.2	1	0	“	<0.002	NO	Industrial processes
	Fluoride	1.5	1	1	“	0.35	NO	Natural deposits, water fluoridation
	Nitrate	10	4	4	13/02/03 – 21/11/03	0.05 - .18	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 ⁺	4	0	“	<0.02	NO	Natural sources in oxygen-poor water
	Orthophosphate		4	4	“	<.04 -0.09		Bacterial action in ground water
	Gross Alpha(radioactivity)	0.1 Bq/L	1	0	13/02/03	<0.1	NO	Natural background radiation, discharge of radioactive materials
	Gross Beta (radioactivity)	0.5 Bq/L	1	0	13/02/03	<0.1	NO	
Tritium (radioactivity)	7000 Bq/L	1	0	13/02/03	<1000	NO		

Loch Lomond – Inorganic & General Chemistry Parameters (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	DATES dd/mm/yy	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Distribution System Water	pH		4	4	13/02/03 – 21/11/03	7.2		Measure of acidity (7.0 = neutral)
	Arsenic	0.025	1	0	13/02/03	<0.001	NO	Natural source at low levels
	Barium	1.0	1	0	13/02/03	<0.01	NO	Common constituent of sedimentary rock
	Boron	5.0	1	1	13/02/03	0.07	NO	Natural borates, borax detergent
	Cadmium	0.005	1	0	13/02/03	<0.0001	NO	Electroplating, NiCad Batteries
	Calcium		1	1	13/02/03	7.1		Common mineral constituent
	Chloramines, total		1	1	30/12/03	0.12		Chlorination byproduct
	Chromium	0.05	1	0	13/02/03	<0.001	NO	Electroplating, old yellow paints
	Copper	1.0**	1	1	13/02/03	0.042		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	13/02/03	0.14		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	13/02/03	0.001		Erosion of natural mineral deposits
	Mercury	0.001	1	0	13/02/03	<0.0001	NO	Metal refining, coal combustion, natural deposits
	Lead	0.01	1	0	13/02/03	<0.001	NO	Leaching from plumbing and service connections
	Selenium		1	0	13/02/03	<0.005	NO	Natural deposits
	Uranium	0.10	1	0	13/02/03	<0.005	NO	Natural deposits, nuclear processing
	Sodium	200**	2	2	13/02/03 – 02/05/03	3.30 – 3.46		Natural deposits
	Alkalinity	500**	2	2	“	23 - 23		Natural dissolved carbonate minerals
	Chloride	250**	2	2	“	2.4 - 2.7		Natural sources at low levels
	Conductivity (uS/cm)		2	2	“	62 – 68		Natural dissolved material in water
Dissolved Organic Carbon	5**	2	2	“	4 – 5		Organic matter leached into surface water from vegetation	
Hardness	100**	2	2	“	28 – 28		Natural dissolved minerals (Ca, Mg)	
Nitrate	10	4	4	13/02/03 – 21/11/03	0.04 -0.10	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels	
Nitrite	10 ⁺	4	1	“	<0.02 -0.02	NO	Natural sources in oxygen-poor water	

** -Aesthetic Objectives (AO). Exceedance column does not apply to these.

+ -Nitrite plus Nitrate MAC is 10 mg/L < - Means less than the specified method detection limit

LOCH LOMOND WATER TREATMENT PLANT

2003 DIRECT OPERATING EXPENDITURES

Hourly Wages & Fringe Benefits	\$ 340,017.17
Building Maintenance	\$ 1,270.25
Electricity	\$ 166,635.75
Chemicals	\$ 124,099.42
Equipment Maintenance and Operations	\$ 267,989.01
General Expenditures	\$ 35,843.88
<hr/>	
Total Operating Expenditure	\$ 935,855.48
<hr/>	
No. of Million Litres Treated in 2003	7385.86
Cost Per Million Litres Treated	\$ 126.71

LOCH LOMOND WATER TREATMENT PLANT

HISTORICAL OPERATING COSTS

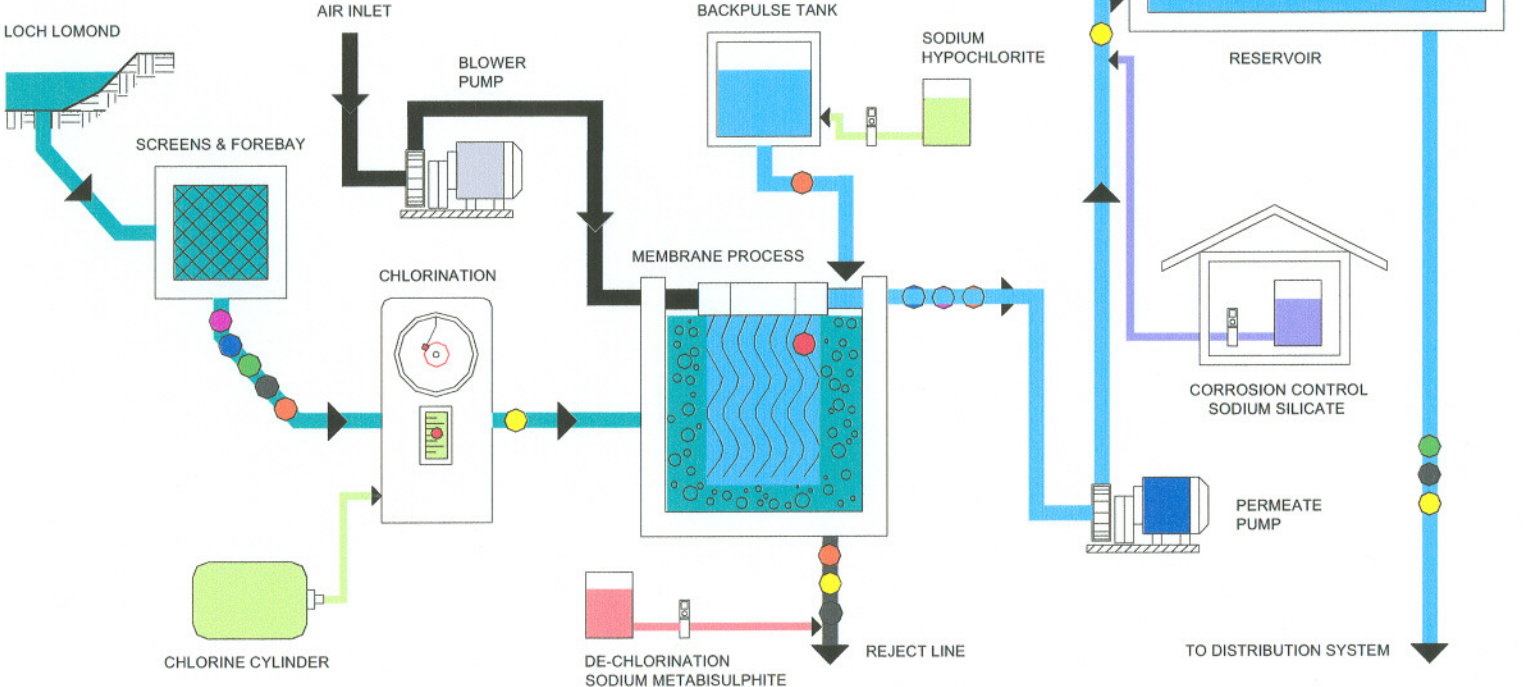
Year	Total Annual Flow(*)	Total Cost	Cost Per Million Litres
1983	13454.40	\$ 228431.94	\$ 16.98
1984	13090.56	\$ 191232.90	\$ 14.61
1985	12825.45	\$ 227958.11	\$ 17.78
1986	12268.26	\$ 290036.07	\$ 23.64
1987	12497.24	\$ 346792.58	\$ 27.75
1988	12431.00	\$ 389382.00	\$ 31.32
1989	10958.00	\$ 332113.00	\$ 30.31
1990	11749.00	\$ 301610.00	\$ 25.67
1991	11631.00	\$ 309233.00	\$ 26.59
1992	11173.70	\$ 342037.00	\$ 30.61
1993	10183.70	\$ 304573.22	\$ 29.91
1994	9670.50	\$ 296776.40	\$ 30.69
1995	9899.50	\$ 329433.49	\$ 33.28
1996	10054.80	\$ 365922.20	\$ 36.39
1997	8970.50	\$ 344535.91	\$ 38.41
1998	9151.50	\$ 507953.91	\$ 55.50
1999	9386.85	\$ 776628.32	\$ 82.71
2000	9832.39	\$ 712039.62	\$ 72.42
2001	10178.71	\$ 787739.76	\$ 77.39
2002	9427.16	\$ 858695.28	\$ 91.09
2003	7385.86	\$ 935855.48	\$ 126.71

* Millions of litres

Loch Lomond Temporary Membrane Water Treatment Plant

City of Thunder Bay

PROCESS FLOW DIAGRAM



- TEMPERATURE
- TURBIDITY
- FLOW
- TRANSMEMBRANE PRESSURE
- pH
- CHLORINE RESIDUAL
- PARTICLE COUNTS

**Thunder Bay
North Distribution
System**

BACTERIOLOGICAL RESULTS

Routine Sampling Program

Month	Number of Samples	Number of HPC	Number of Coliform	Number of Fec. Col.	Number of Fec. Strep.
January	95	0	0	0	0
February	95	0	0	0	0
March	102	0	0	0	0
April	106	0	0	0	0
May	101	0	0	0	0
June	103	0	0	0	0
July	111	0	1	0	0
August	92	0	0	0	0
September	104	0	1	1	0
October	105	0	0	0	0
November	93	0	1	0	0
December	96	0	1	1	0

HPC – Heterotrophic Plate Count Total Col. – Total Coliform Bacteria
Fec. – Fecal Coliform Fec. Strep. – Fecal Streptococcus Bacteria

Metal Analysis - Treated Water (Drinking Water Surveillance Program)

Month	Alum. (ug/l)	Barium (ug/l)	Boron (ug/l)	Chrom. (ug/l)	Copper (ug/l)	Iron (ug/l)	Lead (ug/l)	Mang. (ug/l)	MolyB. (ug/l)	Nickel (ug/l)	Uran. (ug/l)	Zinc (ug/l)
January												
February												
March												
April												
May												
June												
July												
August												
September												
October	54.30	10.40	6.00	0.60	3.40	5.00	0.56	0.86	0.14	0.40	0.04	1.00
November												
December												
Average	54.30	10.40	6.00	0.60	3.40	5.00	0.56	0.86	0.14	0.40	0.04	1.00

Alum. - Aluminum Chrom. - Chromium Mang.- Manganese MolyB. - Molybdenum Uran. - Uranium

**Priority Organics - Treated Water
 (Drinking Water Surveillance Program)**

Month	Chloro- form	Chloro- bromo- methane	Bromo- chloro- methane	Bromo- form	Total trihalo- methane
January					
February					
March					
April					
May					
June					
July					
August					
September					
October	12.70	0.20	2.20	0.50	15.60
November					
December					
Total	12.70	0.20	2.20	0.50	15.60
Avg/Mth.	12.70	0.20	2.20	0.50	15.60

(All Analysis in ug/L)

**Thunder Bay
South Distribution
System**

**Bacteriological Results
 Routine Sampling Program**

Month	Number of Samples	Number of HPC	Number of Coliform	Number of Fec. Col.	Number of Fec. Strep.
January	83	0	0	0	0
February	83	0	0	0	0
March	88	0	0	0	0
April	94	0	0	0	0
May	87	0	1	1	0
June	88	0	0	0	0
July	94	0	0	0	0
August	80	0	2	0	0
September	90	0	1	1	0
October	92	0	0	0	0
November	82	0	0	0	0
December	82	0	0	0	0

HPC – Heterotrophic Plate Count Total Col. – Total Coliform Bacteria

Metal Analysis - Treated Water (Drinking Water Surveillance Program)

Month	Alum. (ug/l)	Barium (ug/l)	Boron (ug/l)	Chrom. (ug/l)	Copper (ug/l)	Iron (ug/l)	Lead (ug/l)	Mang. (ug/l)	MolyB. (ug/l)	Nickel (ug/l)	Uran. (ug/l)	Zinc (ug/l)
January												
February												
March												
April												
May												
June												
July												
August												
September	4.10	4.16	6.00	0.40	32.60	8.00	0.08	0.59	0.09	0.40	0.01	2.30
October												
November												
December												
Average	4.10	4.16	6.00	0.40	32.60	8.00	0.08	0.59	0.09	0.40	0.01	2.30

Alum. - Aluminum

Chrom. - Chromium

Mang.- Manganese

MolyB. - Molybdenum

Uran. - Uranium

**Priority Organics - Treated Water
 (Drinking Water Surveillance Program)**

Month	Chloro- form	Chlordi- bromo- methane	Bromodi- chloro- methane	Bromo- form	Total trihalo- methane
January					
February					
March					
April					
May					
June					
July					
August					
September	72.80	0.20	2.00	0.50	75.50
October					
November	51.60	0.20	1.40	0.50	53.70
December	54.90	0.20	1.60	0.50	57.20
Total	179.30	0.60	5.00	1.50	186.40
Avg/Mth.	59.77	0.20	1.67	0.50	62.13

(All Analysis in ug/L)

**Water Quality
Monitoring Program Results:
Distribution Systems**

North Distribution System

ADVERSE 2003

Log #	Location	Date	Type	Submission	Action	Resample
A3-1	DSN	July 27 2003	Total Coliform	L121606-1	Flush Area and take 3 samples on 2 consecutive days.	Samples taken July 28 & 29. Results okay.
A3-3	DSN	August 6 2003	Total Coliform	L123185-1	Flush Area and take 3 samples on 2 consecutive days.	Samples taken August 6 & 7. Results okay.
A3-9	DSN	September 21 2003	Total Coliform & Fecal Coliform	L131221-2	Flush Area and take 3 samples on 2 consecutive days. Flush as per MOE's recommendations.	Samples taken September 25 & 26. Results okay.
A3-10	DSN	November 21 2003	Total Coliform	L142073-3	Flush Area and take 3 samples on 2 consecutive days.	Samples taken November 21 & 22. Results okay.
A311	DSN	December 18 2003	Total Coliform & Fecal Coliform	L146044-1	Flush Area and take 3 samples on 2 consecutive days.	Samples taken December 18 & 19. Results okay.

OPERATIONAL ADVERSE 2003

Log #	Location	Date	Type	AWQI #	Summary of Action Taken
OA3-2	DSN	July 28 2003	Low chlorine residual	13132	Problem with Scada between Hodder Standpipe and Bare Point. No low chlorine residuals entered the system.
OA3-5	DSN	August 14 2003	High turbidity	14392	High Turbidity occurred while working on the finish water turbidity monitor. Cleaned unit.
OA3-6	DSN	September 9 2003	Low chlorine residual	16099	Area flushed and free residual restored to .2ppm. Flushed for 1 hour to achieve residual of .52ppm.
OA3-9	DSN	October 17 2003	Low chlorine residual	18416	Chlorine and Turbidity analyzers taken out of service until pump station is fully commissioned.

South Distribution System

ADVERSE 2003

Log #	Location	Date	Type	Submission	Action	Resample
A3-1	DSS	May 14 2003	Total Coliform	L109974-4	Flush Area and take 3 samples on 2 consecutive days.	Samples taken May 14 & 15. Results okay.
A3-4	DSS	August 13 2003	Total Coliform	L124329-2	Flush Area and take 3 samples on 2 consecutive days.	Samples taken August 13 & 14. Results okay.
A3-5	DSS	August 21 2003	Total Coliform	L125551-4	Flush Area and take 3 samples on 2 consecutive days.	Samples taken August 21 & 22. Results okay.
A3-6	DSS	September 3 2003	Total Coliform & Fecal Coliform	L128766-5	Flush Area and take 3 samples on 2 consecutive days.	Samples taken September 7 & 8. Results okay.
A3-7	DSS	September 9 2003	Total Coliform & Fecal Coliform	L128929-1	Flush Area and take 3 samples on 2 consecutive days.	Samples taken September 10 & 11. Results okay.
A3-8	DSS	September 10 2003	Total Coliform & Fecal Coliform	L129216-1	Flush Area and take 3 samples on 2 consecutive days.	Samples taken September 10 & 11. Results okay.

OPERATIONAL ADVERSE 2003

Log #	Location	Date	Type	AWQI #	Summary of Action Taken
OA3-1	DSS	July 24 2003	Low chlorine residual	12894	Line flushed to achieve free chlorine residuals of 0.32 (5 hour flush of main).
OA3-3	DSS	July 31 2003	Low chlorine residual	13335	Power failure at Loch Lomond plant. At no time did unchlorinated water enter the system. Momentary loss of power to analyzer.
OA3-4	DSS	August 12 2003	Low chlorine residual	14167	Analyzer pump lost prime. Pump re-primed and returned to service. No untreated water entered distribution system.
OA3-7	DSS	September 29 2003	Low chlorine residual	17316	Area flushed for four hours . Chlorine residual increased from .03ppm to .65ppm.
OA3-8	DSS	October 2 3003	Low chlorine residual	17620	Flushed area for five hours. Residual increased to .3ppm.
OA3-10	DSS	November 18 2003	High turbidity	20162	Turbidity spiked above 1 NTU during maintenance of online instrument.
OA3-11	DSS	November 19 2003	Low chlorine residual	20195	Hydrant flushed. Free chlorine residual before flushing (.17ppm). Free chlorine residual after flushing (.24ppm).
OA3-12	DSS	December 9 2003	Low chlorine residual	21272	Line flushed for seven hours. Chlorine increased to 0.23ppm.



NEW MAINS 2003

Location	Construction Completion Date	Pressure Test Date	Disinfection Date	Flushing Date	Sampling Date	In-Service Date
820 110th Ave (Island Drive)	Jan 7/03	Jan 8/03	March 25/03	March 26/03	March 27/03	April 1/03
Chippewa Park	April 28/03	April 28/03	April 30/03	May 1/03	May 2/03	May 6/03
Trowbridge Campground	N/A	N/A	May 21/03	May 22/03	May 23/03	May 25/03
2465 City Road	May 12/03	May 12/03	May 13/03	May 14/03	May 15/03	May 20/03
Airport Authority	May 13/03	May 15/03	May 22/03	May 26/03	May 27/03	June 2/03
100 Princess Boulevard	May 21/03	June 19/03	June 19/03	June 23/03	June 24/03	June 30/03
2465 City Road	May 30/03	June 3/03	June 3/03	June 5/03	June 6/03	June 9/03
Simpson and Ogden	June 4/03	June 9/03	June 9/03	June 12/03	June 13/03	June 16/03
Madeline (Van Norman to Carrie)	June 3/03	N/A	June 19/03	June 20/03	June 20/03	June 24/03
Prospect Ave (Red River to Hebert)	June 18/03	N/A	June 19/03	June 20/03	June 20/03	June 24/03
359 Main Street (Home Depot)	June 20/03	July 8/03	July 10/03	July 11/03	July 12/03	July 17/03
Prospect Ave (Dawson to Tupper)	July 11/03	N/A	July 11/03	July 12/03	July 12/03	July 17/03
955 Oliver Road	July 7/03	July 22/03	July 22/03	July 23/03	July 25/03	July 29/03
Prospect Ave (Red River to Hebert)	July 18/03	N/A	July 18/03	July 20/03	July 22/03	July 29/03
Green Park Crescent	July 18/03	N/A	July 18/03	July 21/03	July 23/03	July 29/03
Francis Street (James to Brown)	July 21/03	N/A	N/A	July 22/03	July 23/03	July 29/03
Francis Street (Edward to Ford)	July 22/03	N/A	July 23/03	July 24/03	July 24/03	July 29/03
Arundel Street (Dewe to Current)	July 28/03	N/A	July 26/03	July 28/03	July 28/03	August 5/03
Francis Street (Syndicate to Sprague)	July/03	N/A	July 25/03	July 28/03	July 28/03	August 5/03
Francis Street (Tarbutt to Sprague)	July/03	N/A	July 25/03	July 28/03	July 28/03	August 5/03
Francis Street (Tarbutt to Ford)	July/03	N/A	July 26/03	July 28/03	July 28/03	August 5/03
Boulton/Sillsdale/Parkway	July/03	N/A	July 29/03	July 29/03	July 30/03	August 5/03
Ogden School (McMurry to McKenzie)	July/03	N/A	July 31/03	August 1/03	August 1/03	August 5/03
955 Oliver Road	July 28/03	N/A	August 6/03	August 7/03	August 8/03	August 11/03
955 Oliver Road	July 28/03	N/A	August 6/03	August 7/03	August 11/03	August 14/03
Mary Street (Ford to Tarbutt)	August 8/03	N/A	August 7/03	August 7/03	August 8/03	August 11/03
Francis Street (Brown to James)	August/03	N/A	August 13/03	August 14/03	August 16/03	August 19/03
Prospect Ave (Dawson to Tupper)	August/03	N/A	August 14/03	August 15/03	August 18/03	August 22/03
Ogden Street (McKenzie to Simpson)	August 18/03	N/A	August 20/03	August 21/03	August 21/03	August 25/03
Francis Street (Edward to Tarbutt)	August/03	N/A	August 16/03	August 28/03	August 29/03	September 3/03
Francis Street (Tarbutt to Syndicate)	October/03	N/A	August 19/03	August 20/03	August 21/03	August 25/03
Marlborough Street (John to Whitney)	August/03	N/A	October 7/03	October 8/03	October 8/03	October 14/03



NEW MAINS 2003 CONTINUED

Location	Construction Completion Date	Pressure Test Date	Disinfection Date	Flushing Date	Sampling Date	In-Service Date
Mary Street (Edward to Ford)	August/03	N/A	August 20/03	August 21/03	August 23/03	August 25/03
Mary Street (Tarbutt to Sprague)	August/03	N/A	August 22/03	August 23/03	August 25/03	August/03
College Street (Tupper to Van Norman)	August/03	N/A	August 25/03	August 27/03	August 28/03	September 4/03
McBain Street (McNaughton to Pacific)	September 5/03	N/A	September 8/03	September 9/03	September 10/03	September 15/03
Prospect Ave (Van Norman to Tupper)	September/03	N/A	N/A	September 11/03	September 12/03	September 16/03
Christina (Syndicate to Sprague)	September/03	N/A	September 3/03	September 5/03	September 5/03	September 8/03
Mary Street (Sprague to Ford)	September/03	N/A	September 6/03	September 7/03	September 8/03	September 12/03
Confederation College (Off Sibley Drive)	September 8/03	N/A	September 8/03	September 14/03	September 16/03	September 19/03
Christina Street (Ford to Tarbutt)	September 8/03	N/A	September 8/03	September 9/03	September 15/03	September 15/03
Ogden Street (Simpson to Hardisty)	September 8/03	N/A	September 8/03	September 17/03	September 18/03	September 24/03
Sillsdale Crescent	September 11/03	N/A	September 11/03	September 14/03	September 16/03	September 24/03
Christina Street (Syndicate to Sprague)	September/03	N/A	September 18/03	September 19/03	September 23/03	September 26/03
Ogden Street (McMurray to McKenzie)	September/03	N/A	September 22/03	September 23/03	September 25/03	September 29/03
Christina Street (Sprague to Tarbutt)	September/03	N/A	September 20/03	September 22/03	September 23/03	September 26/03
Christina Street (Tarbutt to Ford)	September/03	N/A	September 20/03	September 22/03	September 23/03	September 26/03
Arundel Street (Dewe to Current)	September/03	N/A	September 22/03	September 23/03	September 25/03	September 29/03
Ogden Street (McKenzie to Simpson)	September/03	N/A	September 29/03	September 30/03	October 3/03	October 7/03
Private Road (E of Feaver on Mountain)	N/A	N/A	N/A	N/A	N/A	N/A
Dewe Avenue (Richard to dead end)	September/03	N/A	September 30/03	October 1/03	October 1/03	October 6/03
McBain Street (Pacific to Mcnaughton)	October 8/03	N/A	October 8/03	October 9/03	October 11/03	October 15/03
College Street (Tupper to Van Norman)	October 8/03	N/A	October 8/03	October 9/03	October 11/03	October 15/03
Dewe Avenue	October 18/03	N/A	October 23/03	October 26/03	October 27/03	October 31/03
Marlborough St (John to Gron Morgan)	October 21/03	N/A	October 23/03	October 26/03	October 28/03	October 31/03
Madeline Street (Van Norman to Carrie)	N/A	N/A	November 12/03	November 13/03	November 15/03	November 18/03
Marborough St (Gron Morgan to Corpus)	November 03/03	N/A	November 10/03	November 11/03	November 13/03	November 17/03
Marborough St (Corpus to Laneway)	November 7/03	N/A	November 10/03	November 11/03	November 12/03	November 17/03
Burwood Road (North of Central)	November 10/03	N/A	November 13/03	November 14/03	November 16/03	November 19/03
Hazelwood Dr (Dawson to Hazelwood)	November/03	N/A	November 14/03	November 16/03	November 18/03	November 24/03
Hazelwood Tank (Hazelwood to tank)	November/03	N/A	November 14/03	November 16/03	November 18/03	November 24/03
McNaughton St (McLeod to McPherson)	November/03	N/A	November 12/03	November 13/03	November 15/03	November 18/03
20 Pine Street	November 13/03	November 19/03	November 19/03	November 20/03	November 22/03	November 26/03