

## **DRINKING WATER QUALITY**

### **QUARTERLY REPORT**

**October 1 – December 31, 2000**

### **TRANSPORTATION & WORKS**

### **ENVIRONMENT DIVISION**

**RESPECTFULLY SUBMITTED BY:**

Veikko Long  
Acting Manager  
Environment Division

Don Kmill  
Supervisor  
Water Treatment Plants



# **City of Thunder Bay: *Quarterly Water Quality Report***

**For the period October 1 to December 31, 2000**

## ***What is the Quarterly Water Quality Report?***

The City of Thunder Bay is pleased to present its *Water Quality Report*, issued at the end of each quarter, to provide consumers with information about our water supply operations and drinking water quality.

In compliance with provincial regulation 459/00, this quarterly report includes:

- description of Thunder Bay's water supply system;
- treatment processes and quality assurance methods;
- process flow diagrams for each plant;
- compliance provisions;
- glossary of terms; and
- summary of water analysis results for this quarter.

## ***What are the new provisions in Regulation 459/00?***

Regulation 459/00, also known as Ontario's new Drinking Water Protection Regulation, came into effect on August 26, 2000 to provide an enforceable standard focusing on the treatment and testing of drinking water supplies in Ontario. The regulation includes provisions for public access to information and notification of adverse test results.

## ***How is the safety of our drinking water assured?***

In Thunder Bay, we have a supply of surface water of very good quality... consistently delivered to us from two

water treatment plant sources – Bare Point on Lake Superior and Loch Lomond on Mount McKay. Treatment processes and quality assurance methods at both plants make our water safe for residents.

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 Environment Certificate of Approval. We are committed to quality and continuous improvement in accordance with Ontario's new water quality standards.

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

Today, City of Thunder Bay residents enjoy safe drinking water of excellent quality. We are committed to making sure we have a water system that will continue to meet our needs tomorrow and beyond.

## ***Who is responsible for water treatment in Thunder Bay?***

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 & Water Section is responsible for the upkeep and maintenance of the water distribution system.

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Our highly qualified staff at the Water Treatment Plants consists of:

- Supervisor (1)
- Chief Operators (2)
- Certified Operators (6)
- Certified Maintenance Relief Operators (2)
- Electrician (1)
- Controls Technician (1)
- Water Quality Technician (1)

We have a highly qualified staff, certified by the Ontario Environmental Training Consortium. Staff are continually trained in accordance with provincial regulations. In addition, the new drinking water regulations require that all water treatment staff performing water testing complete an additional 36 hours of specialized training over the next three years.

### *Where does our water come from?*

Residents of Thunder Bay have two surface water supply sources. The Bare Point Water Treatment Plant supplies most of Thunder Bay north of the Neebing River with water from Lake Superior. The Loch Lomond Microfiltration Plant supplies most residents south of the river with water from Loch Lomond.

Water from Bare Point and Loch Lomond is distributed to consumers through a network of 672 km of water mains.

The total population of Thunder Bay is 116,152. The City's water treatment system serves 106,983 people; representing 92% of the population.

**Bare Point Water Treatment Plant** is located at the north limit of the City, having a current operational capacity of 14 million imperial gallons per day (64 million litres per day). The plant draws water from the world's largest body of fresh water - Lake Superior.

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.

Bare Point's distribution system consists of four pressure zones, three pumping stations and three reservoirs. The attached flow diagram illustrates plant operations.

**Loch Lomond Water Treatment Plant** is located south of the city on Mount McKay. Loch Lomond supplies water to the south portion of Thunder Bay. This plant draws water from Loch Lomond, partially situated within the Fort William First Nation Reserve.

The new Loch Lomond temporary filtration system, built in 1998 has an operational capacity of 6.25 million imperial gallons per day (28 million litres per day). Treatment processes include ultrafiltration membrane technology, the addition of sodium silicate for corrosion control and chlorine for disinfection.

The Loch Lomond distribution system consists of two pressure zones, one reservoir and two pumping stations. The pumping stations are available to pump Bare Point water into the Loch Lomond distribution system during seasonal or high demand periods. A process flow

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diagram of Loch Lomond operations is attached.

### ***What is found in our source water?***

Water taken directly from a surface water source is not suitable for human consumption as it contains impurities.

Parameters affecting the quality of water can be characterized as:

- microbiological – bacterial, algae and other living organisms;
- chemical – substances dissolved in water from manufactured or natural sources; or
- physical – materials that make the water appear cloudy.

Detailed descriptions of raw water characteristics can be found in the Ontario Drinking Water Standards. These are available on the Ministry of Environment web site at [www.ene.gov.on.ca](http://www.ene.gov.on.ca) under “New Drinking Water Protection Regulation”.

### ***Are we in compliance with Regulation 459/00?***

*Enviro-Test Laboratories*, an accredited, independent lab, provides for our drinking water testing requirements. The Enviro-Test Lab is accredited to analyze all microbiological parameters, metals and general water quality parameters, while partner labs in Winnipeg and Edmonton are accredited for testing the volatile organics, pesticides and PCBs. All operational staff at both Thunder Bay Water Treatment Plants have all required Water Treatment Plant Certification.

The City’s drinking water testing/analysis program was carefully reviewed following enactment of the new water protection legislation in August 2000. We are required to take 112 samples per month from the distribution system for bacterial testing. We have exceeded this requirement for many years, averaging 180 samples per month, and will continue to do so. Quarterly testing for volatile organics (15 parameters), pesticides and PCBs (48 parameters), as well as testing for heavy metals was implemented to meet legislated requirements. Previously, the majority of these parameters had been tested twice a year through the MOE Drinking Water Surveillance Program (DWSP). Our reports from the MOE’s DWSP can be viewed on their website at <http://www.ene.gov.on.ca/envision/dwsp9899/dwsp.htm>.

The City of Thunder Bay’s in-house lead monitoring program also exceeded provincial requirements, but is being maintained to monitor homes in older sections of the distribution system that have lead service connections.

In total, the City monitors over 100 parameters in its drinking water on a regular basis.

### ***Definitions of water industry terms:***

The following is a list of terms that will help you decipher this report.

**WTP:** *Water Treatment Plant.*

**MOE:** The *Ontario Ministry of Environment* is the principal body regulating the quality of drinking water in Ontario.

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**MOH:** The *Ontario Ministry of Health* immediately becomes involved when any health related water quality parameters are exceeded.

**MAC:** The *Maximum Acceptable Concentration*. This is a health-related drinking water standard established for contaminants that have known or suspected adverse health effects when above a certain concentration. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter.

**IMAC:** The *Interim Maximum Acceptable Concentration*. This is a health-related Ontario Drinking Water Standard established for contaminants when there are insufficient toxicological data to establish a MAC with reasonable certainty, or when it is not practical to establish a MAC at the desired level.

**AO:** *Aesthetic objective*. This is a parameter limit set for aesthetic appeal of water, such as colour and taste.

**OG:** *Operational Guidelines*. These are plant guidelines setting parameters that need to be controlled to ensure optimum water treatment.

**Parameter:** *Parameters* are substances that water is tested for.

**mg/L:** *Milligrams per liter*. This is the standard measure of concentration of a parameter in water, sometimes also called parts per million (ppm).

**ug/L:** *Micrograms per litre*, also called parts per billion (ppb). This concentration is 1000 times more sensitive than mg/L (1000 ug = 1mg)

**pg/L:** *Pico grams per litre*. This is equivalent to  $10^{-12}$  grams.

**THM:** *Trihalomethanes*. Trihalomethanes are the most widely occurring synthetic organics found in chlorinated drinking water. The four most common detected trihalomethanes in drinking water are chloroform,

bromodichloromethane, chlorodibromomethane and bromoform. The main source of trihalomethanes in drinking water is the result of the action of chlorine reacting with naturally occurring organic compounds present in the water.

**ND:** *Non Detectable Limits*. This means that the results are below the laboratory detection limits. This is the bacteriological standard for water free of total coliform, fecal coliform or e-coli.

**PLC:** *Programmable Logic Controller*. A PLC is used to control plant system operations by computer.

### *What do test results indicate for this Quarter?*

The City of Thunder Bay's Environment Division has taken all necessary measures to comply with the new Drinking Water Protection Regulations and the Ontario Drinking Water Standards.

The attached tables summarize tests completed, test results, ranges and actions taken to resolve any exceedances from October 1 to December 31, 2000. In this quarter, three total coliform adverse test results were resolved in accordance with the *Corrective Actions Requirements, Regulation 459/00*. The water mains were flushed and laboratory re-samples showed no further exceedances.

Minor exceedances of THMs were detected in the Loch Lomond distribution system. This problem is the result of high natural organic compounds in the Loch Lomond water supply. Natural organics in water, when combined with the chlorine (added for disinfection), result in a synthetic

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compound called THMs or Trihalomethanes. A long-term solution has been identified and corrective measures will be included in the Loch Lomond Plant expansion.

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### ***Where can I get further information?***

#### **TRANSPORTATION & WORKS**

Phone: 684-2195 (daytime)  
684-3117 (after hours)\*  
\* 4:30 pm to 8 am & holidays.

#### **Bare Point Water Treatment Plant**

R.R.#13  
171 Bare Point Road,  
Thunder Bay, ON, P7B 5E4  
Phone: 683-8141 (24 hours)  
Supervisor: Don W. Kmill  
MOE Waterworks No. 220000273  
MOE Certificate of Approval  
No. 7-0748-90-006

#### **Loch Lomond Water Treatment Plant**

R.R.#4  
151 Reservoir Road, Thunder Bay, ON,  
P7C 4Z2  
Phone: 622-0944 or  
683-8141 (24 hours)  
Supervisor: Don W. Kmill  
MOE Waterworks No. 220000282  
MOE Certificate of Approval  
No. 7-0706-98-006

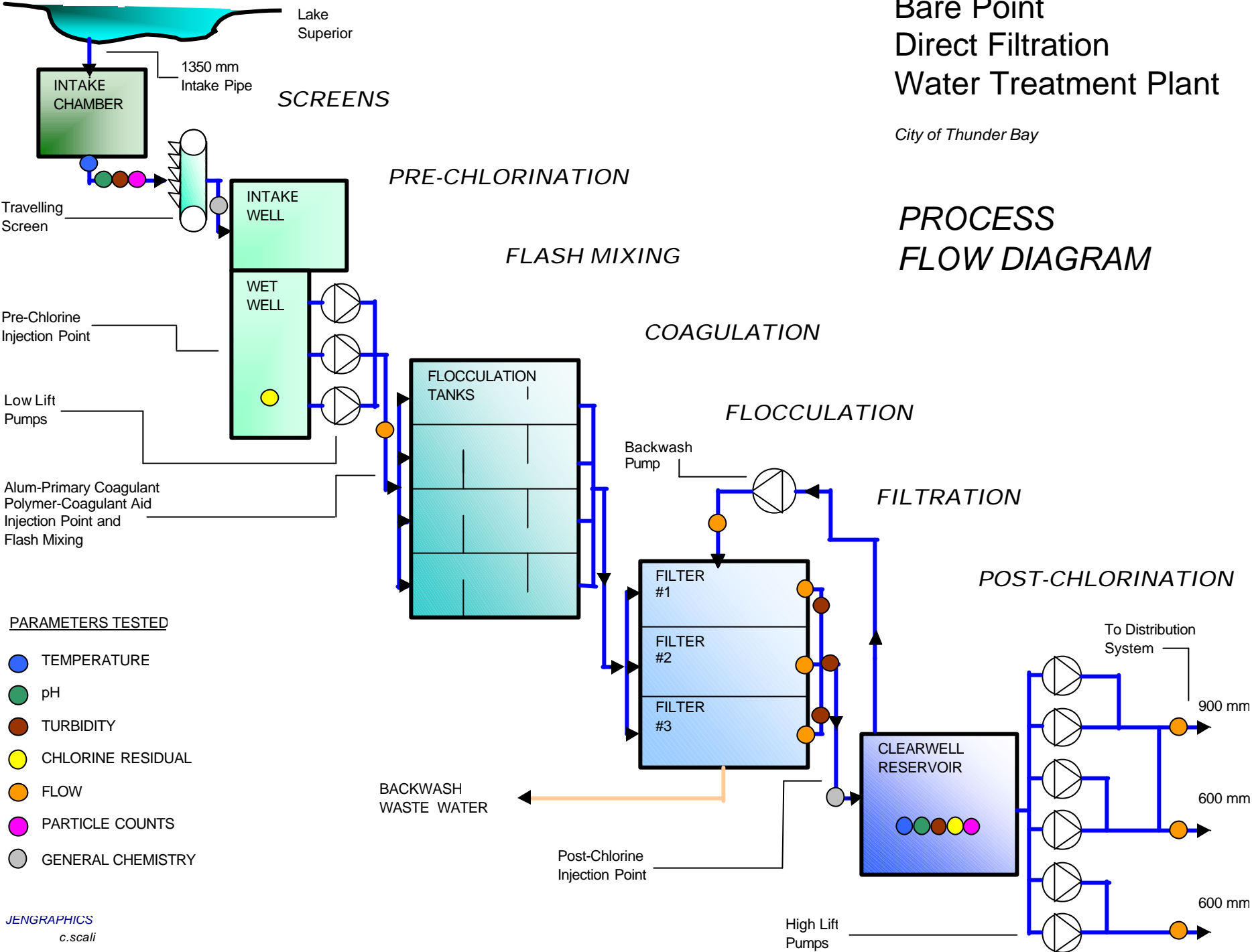
#### **Additional Contacts:**

Veikko Long, Acting Manager  
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E-mail: vlong@city.thunder-bay.on.ca

# Bare Point Direct Filtration Water Treatment Plant

City of Thunder Bay

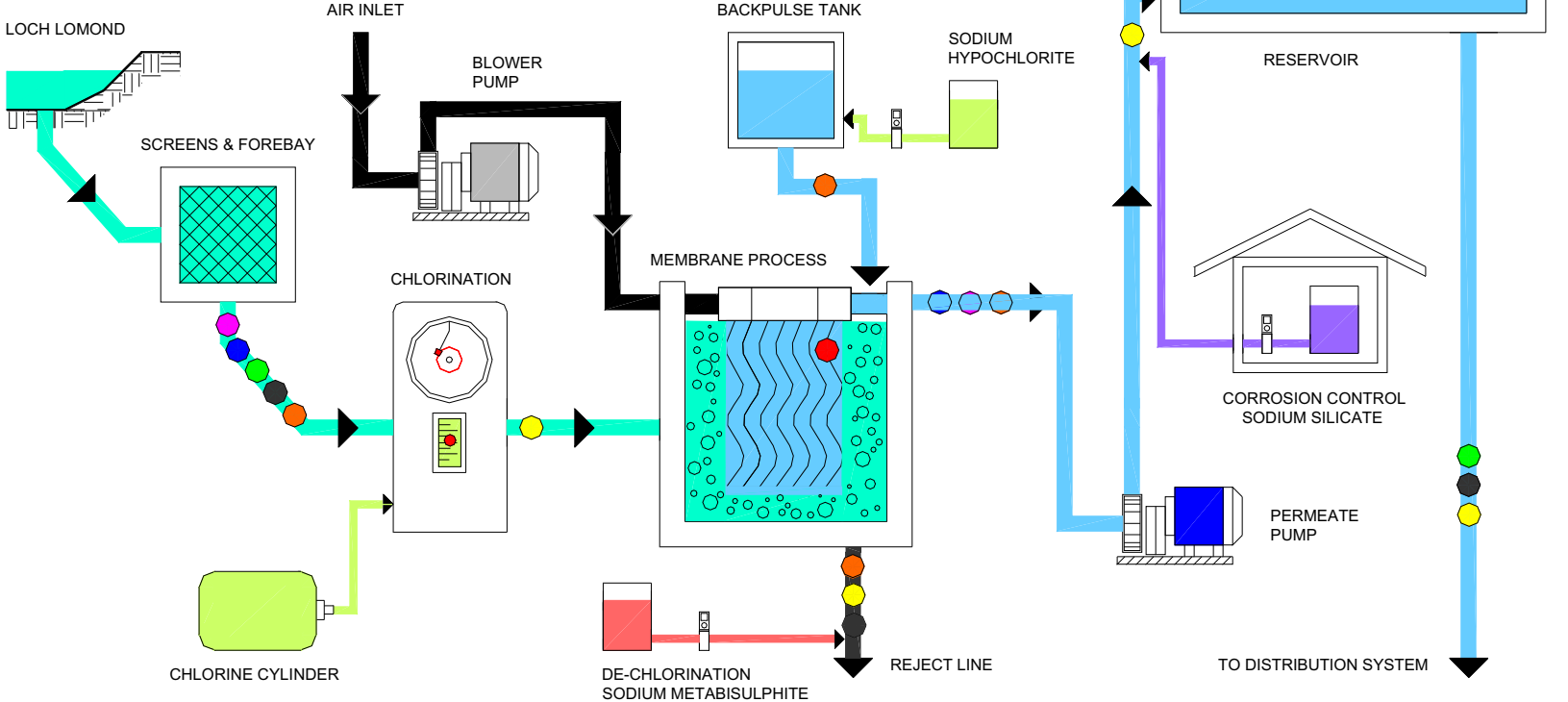
## PROCESS FLOW DIAGRAM



# Loch Lomond Temporary Membrane Water Treatment Plant

City of Thunder Bay

## PROCESS FLOW DIAGRAM



- |   |   |  |   |
|---|---|--|---|
| <span style="color: blue;">●</span> TEMPERATURE | <span style="color: black;">●</span> TURBIDITY          | <span style="color: orange;">●</span> FLOW             | <span style="color: red;">●</span> TRANSMEMBRANE PRESSURE |
| <span style="color: green;">●</span> pH         | <span style="color: yellow;">●</span> CHLORINE RESIDUAL | <span style="color: magenta;">●</span> PARTICLE COUNTS |   |





### BARE POINT DISTRIBUTION SYSTEM: ROUTINE BACTERIOLOGICAL SAMPLES

Microbiological Parameters	MAC/IMAC	# of Samples	# Detect Results	Sampling Date	Range	Exceedance	Typical Source of Parameter
Total Coliform	ND	292	0	10/01/ - 12/31	ND	NO	Naturally present in environment
Fecal Coliform	ND	292	0	10/01/ - 12/31	ND	NO	Animal / human fecal waste
E. Coli	ND	292	0	10/01/ - 12/31	ND	NO	Animal / human fecal waste
Deterioration Indicators	--	292	0	10/01/ - 12/31	ND	NO	
Heterotrophic Plate Count	500	67	26	10/01/ - 12/31	0 – 120	NO	General bacterial population

### BARE POINT DISTRIBUTION SYSTEM: OPERATIONAL PARAMETERS

Parameters related to Microbiological Quality	Units	AO/OG	# of Samples	# Detectable Results	Sampling Date	Range	Typical Source of Parameter
Turbidity	NTU	1	Continuous	Continuous	10/01 – 12/31	0.05 – 0.17	Suspended material in water
Free Chlorine at Plant	mg/L	0.8 – 4.0	Continuous	Continuous	10/01 – 12/31	0.74 – 1.41	Disinfectant added
Free Chlorine in System	mg/L	0.2 – 4.0	319	319	10/01 – 12/31	0.13 – 1.08	Disinfectant added
pH	No units	6.5-8.5	Continuous	Continuous	10/01 – 12/31	6.96 – 7.29	Measure of water acidity (7.00 = neutral)
Copper	mg/L	1.0	4	4	10/01 – 12/31	0.7 – 0.7	Erosion of natural deposits
Methane	L/m <sup>3</sup>	3	1	1	10/01 – 12/31	0.014	Bacterial action in some ground waters
Iron	mg/L	0.30	4	4	10/01 – 12/31	0.001 – 0.001	Erosion of natural deposits
Manganese	mg/L	0.05	1	1	10/01 – 12/31	0.0005	Erosion of natural deposits
Alkalinity	mg/L	30-500	5	5	10/01 – 12/31	43.2 – 48.8	Dissolved carbonate minerals
Conductivity	uS/cm		5	5	10/01 – 12/31	100 – 101	Dissolved and ionized minerals
Hardness	mg/L	80-100	5	5	10/01 – 12/31	46.4 – 50.8	Dissolved mineral salts, mainly of calcium, magnesium in water
Sulphate	mg/L	500	1	1	10/01 – 12/31	5.69	Erosion of natural deposits
Sodium	mg/L	200	1	1	10/01 – 12/31	1.76	Natural mineral constituent
Aluminum	mg/L	0.10	7	7	10/01 – 12/31	0.022 – 0.038	Erosion of natural deposits, Residues from coagulant use
Colour	TCU	5	73	73	10/01- 12/31	0.50 – 4.00	Tannins and lignins from natural decay

AO – Aesthetic Objective  
OG – Operational Guideline

## Bare Point Water Treatment Plant - Volatile Organics Tests

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Treated	Vinyl Chloride	.002	1	0	12/01/00	<0.001	NO	
	1,1-Dichloroethylene	.014	1	0	12/01/00	<0.001	NO	
	Dichloromethane	.05	1	0	12/01/00	<0.001	NO	
	Chloroform	Note 1	1	0	12/01/00	<0.001	NO	Type of trihalomethane (THM)
	Carbon Tetrachloride	.005	1	0	12/01/00	<0.001	NO	
	Benzene	.005	1	0	12/01/00	<0.001	NO	
	1,2-Dichloroethane	.005	1	0	12/01/00	<0.001	NO	
	Bromodichloromethane	Note 1	1	0	12/01/00	<0.001	NO	Type of trihalomethane (THM)
	Toluene	.024 **	1	0	12/01/00	<0.001		
	Trichloroethylene	.05	1	0	12/01/00	<0.001	NO	
	Tetrachloroethylene	.03	1	0	12/01/00	<0.001	NO	
	Dibromochloromethane	Note 1	1	0	12/01/00	<0.001	NO	Type of trihalomethane (THM)
	Monochlorobenzene	.08	1	0	12/01/00	<0.001	NO	
	Ethylbenzene	.0024**	1	0	12/01/00	<0.001		
	m,p-Xylene	0.3*	1	0	12/01/00	<0.001		
	o-Xylene	0.3*	1	0	12/01/00	<0.001		
	Bromoform	Note 1	1	0	12/01/00	<0.001	NO	Type of trihalomethane (THM)
	1,4-Dichlorobenzene	.005	1	0	12/01/00	<0.001	NO	
1,2-Dichlorobenzene	0.2	1	0	12/01/00	<0.001	NO		
Bare Point Distr. System								
	Total THM's – System Extremity (2)	0.100	4	4	12/01/00	0.029 (2)	NO	Disinfection by-products (total)

\*\* NOTE 1 – Total of all trihalomethanes (chloroform & bromochloromethanes) should not exceed THM standard of 0.100 mg/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.

\* - 0.3 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	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Treated Water	Alachlor	.005	1	0	12/01/00	<0.005	NO	Insecticide, herbicide and fungicide Residues
	Atrazine	.005	1	0	12/01/00	<0.005	NO	
	Azinphos-methyl	.02	1	0	12/01/00	<0.02	NO	
	Chlorpyrifos	.09	1	0	12/01/00	<0.09	NO	
	Cyanazine	.01	1	0	12/01/00	<0.01	NO	
	Diazinon	.02	1	0	12/01/00	<0.02	NO	
	Diclofop-methyl	.009	1	0	12/01/00	<0.009	NO	
	Dimethoate	.02	1	0	12/01/00	<0.02	NO	
	Dinoseb	.01	1	0	12/01/00	<0.01	NO	
	Malathion	.19	1	0	12/01/00	<0.19	NO	
	Metribuzin	.08	1	0	12/01/00	<0.08	NO	

Bare Point - Pesticides & PCB Tests (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Treated Water (cont.)	Parathion	.05	1	0	12/01/00	<0.05	NO	Insecticide, hebicide and fungicide Residues
	Phorate	.002	1	0	12/01/00	<0.002	NO	
	Prometryne	.001	1	0	12/01/00	<0.001	NO	
	Simazine	.01	1	0	12/01/00	<0.01	NO	
	Terbufos	.001	1	0	12/01/00	<0.001	NO	
	Triallate	.23	1	0	12/01/00	<0.23	NO	
	Trifluralin	.045	1	0	12/01/00	<0.045	NO	
	P,p'-DDD	.03**	1	0	12/01/00	<0.03	NO	
	P,p'-DDE	.03**	1	0	12/01/00	<0.03	NO	
	P,p'-DDT	.03**	1	0	12/01/00	<0.03	NO	
	Aldrin	.0007*	1	0	12/01/00	<0.0007	NO	
	Dieldrin	.0007*	1	0	12/01/00	<0.0007	NO	
	Heptachlor	.003 <sup>+</sup>	1	0	12/01/00	<0.003	NO	
	Heptachlor Epoxide	.003 <sup>+</sup>	1	0	12/01/00	<0.003	NO	
	Lindane (Total)	.004	1	0	12/01/00	<0.004	NO	
	Methoxychlor	0.9	1	0	12/01/00	<0.9	NO	
	Metolachlor	.05	1	0	12/01/00	<0.05	NO	
	Chlordane	.007	1	0	12/01/00	<0.007	NO	
	Bromoxynil	.005	1	0	12/01/00	<0.005	NO	
	Dicamba	.12	1	0	12/01/00	<0.12	NO	
	2,4-Dichlorophenol	0.9	1	0	12/01/00	<0.9	NO	
	2,4-D	0.1	1	0	12/01/00	<0.1	NO	
	Pentachlorophenol	.06	1	0	12/01/00	<0.06	NO	
	Picloram	.19	1	0	12/01/00	<0.19	NO	
	2,3,4,6-Tetrachlorophenol	0.1	1	0	12/01/00	<0.1	NO	
	2,4,6-Trichlorophenol	.005	1	0	12/01/00	<0.005	NO	
	2,4,5-T	.28	1	0	12/01/00	<0.28	NO	
	Glyphosate	.28	1	0	12/01/00	<0.28	NO	
	Diquat	.07	1	0	12/01/00	<0.07	NO	
	Paraquat	.01	1	0	12/01/00	<0.01	NO	
	Aldicarb	.009	1	0	12/01/00	<0.0009	NO	
	Bendiocarb	.04	1	0	12/01/00	<0.04	NO	
	Carbaryl	.09	1	0	12/01/00	<0.09	NO	
Carbofuran	.09	1	0	12/01/00	<0.09	NO		
Diuron	.15	1	0	12/01/00	<0.15	NO		
Temephos	.28	1	0	12/01/00	<0.28	NO		
PCB's	.003	1	0	12/01/00	<0.00005	NO	Electrical insulating oil	
Dioxins & Furans	15 pg/L	2	20	09/15/00	0.22-0.25 (pg/L)	NO	Insecticide & bleaching by- product, combustion by-product	

< - Means less than the specified method detection limit

## BARE POINT WATER TREATMENT PLANT - INORGANIC & GENERAL CHEMISTRY PARAMETERS

Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	Dates	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Raw Water	Aluminum	0.1**	1	1	12/01/00	0.03		Natural sources at low levels
	Arsenic	0.025	1	1	12/01/00	0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	14.5		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	0.0009		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	12/01/00	0.01		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0035		Erosion of natural mineral deposits
	Lead	0.01	1	0	12/01/00	<0.0001	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	1.73		Natural mineral constituent
	Zinc	5**	1	0	12/01/00	<0.002		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	44		Natural sources, mostly dissolved carbonate
	Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels
	Chloride	250**	1	1	12/01/00	1.85		Natural sources at low levels
	Conductivity (uS/cm)		1	1	12/01/00	100		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	2		Organic matter leached into surface water from vegetation
	Hardness	100**	1	1	12/01/00	48.7		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	1	1	12/01/00	0.40	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03	NO	
	Sulphate	500**	1	1	12/01/00	4.71		Natural mineral sources
	Total Kjeldahl Nitrogen (TKN)		1	1	12/01/00	0.14		Organic matter leached into surface water from vegetation
	Total Phenolics		1	0	12/01/00	<0.001		Decomposition of wood
Bare Point Treated Water	Aluminum	0.1**	1	1	12/01/00	0.04		Natural sources at low levels
	Arsenic	0.025	1	0	12/01/00	<0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	14.5		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	0.0007		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	0	12/01/00	<0.01		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0005		Erosion of natural mineral deposits
	Lead	0.01	1	0	12/01/00	<0.0001	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	1.76		Natural mineral constituent
	Zinc	5**	1	1	12/01/00	0.003		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	41		Natural sources, mostly dissolved carbonate
	Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels

Bare Point - Inorganic & General Chemistry Parameters (cont.)								
Source Water	Parameter	MAC/ IMAC	# of Samples	# Detectable Results	Dates	Range (mg/L)	Exceedance	Source of Parameter
Bare Point Treated Water (cont.)	Chloride	250**	1	1	12/01/00	2.8		Natural sources at low levels
	Conductivity		1	1	12/01/00	102		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	2		Organic matter leached into surface water from vegetation
	Fluoride	1.5	1	1	12/01/00	0.04	NO	Natural mineral deposits
	Hardness	100**	1	1	12/01/00	48.9		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	1	1	12/01/00	0.35	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03	NO	
	Sulphide	0.05**	1	0	12/01/00	<0.003		Natural mineral leaching in oxygen-poor conditions, usually low in surface water
	Sulphate	500**	1	1	12/01/00	5.69		Natural mineral sources
	Total Kjeldahl Nitrogen (TKN)		1	0	12/01/00	<0.10		Organic matter leached into surface water from vegetation
Bare Point Distribution System Water	Total Dissolved Solids (TDS)	500**	1	1	12/01/00	92		Indicator of dissolved mineral content in water
	Aluminum	0.1**	1	1	12/01/00	0.03		Natural sources at low levels
	Arsenic	0.025	1	1	12/01/00	<0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	14.4		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	0.0036		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	12/01/00	<.01		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0007		Erosion of natural mineral deposits
	Lead	0.01	1	0	12/01/00	0.0007	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	1.76		Natural mineral constituent
	Zinc	5**	1	0	12/01/00	<0.002		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	44		Natural dissolved carbonate minerals
	Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels
	Chloride	250**	1	1	12/01/00	2.91		Natural sources at low levels
	Conductivity (uS/cm)		1	1	12/01/00	101		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	2		Organic matter leached into surface water from vegetation
	Hardness	100**	1	1	12/01/00	48.5		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	1	1	12/01/00	0.35	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03	NO		
Sulphate	500**	1	1	12/01/00	5.64		Natural mineral sources	
Total Kjeldahl Nitrogen (TKN)		1	1	12/01/00	<0.10		Organic matter leached into surface water from vegetation	

\*\* -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 Distribution System: Routine Bacteriological Samples

Microbiological Parameters	MAC/IMAC	# of Samples	# Detect Results	Sampling Date	Range	Exceedance (#)	Typical Source of Parameter
Total Coliform	ND	299	3	10/01/ - 12/31	Present	YES (3)	Naturally present in environment
Fecal Coliform	ND	299	0	10/01/ - 12/31	0	NO	Animal / human fecal waste
E. Coli	ND	299	0	10/01/ - 12/31	0	NO	Animal / human fecal waste
Deterioration Indicators	--	299	0	10/01/ - 12/31	0	NO	
Heterotrophic Plate Count	500	23	6	10/01/ - 12/31	0-11	NO	Indicator of deteriorating water quality if over 500

### Loch Lomond Distribution System - Adverse Water Samples

Submission No.	Date of Sample	Problem	Action Required	Date Action Taken	Results	Follow-up Action
AO-13	October 5/00	Total Coliform	Resample	October 7/00	Returned OK – October 11/00	No further action required
AO-14	October 13/00	Total Coliform	Flush & Resample	October 17 & 18/00	Failed– resampled as AO-16	Flush, resample- no consumption in bldg. ‘til clear
AO-15	October 26/00	Total Coliform	Flush & Resample	October 27/00	Returned OK – November 6/00	No further action required
AO-16	October 28/00	Total Coliform	Resample	October 30/00	Returned OK – November 6/00	No further action required



## LOCH LOMOND SYSTEM: OPERATIONAL PARAMETERS

Parameters related to Microbiological Quality	Units	AO/OG	# of Samples	# Detectable Results	Sampling Date	Range	Typical Source of Parameter
Turbidity	NTU	1	Continuous	Continuous	10/01 – 12/31	0.02 – 0.08	Suspended material in water
Free Chlorine at Plant	mg/L	1.1 – 4.0	Continuous	Continuous	10/01 – 12/31	1.39 – 2.86	Disinfectant added
Free Chlorine in System	mg/L	0.2 – 4.0	333	333	10/01 – 12/31	0.14 – 1.86	Disinfectant added
pH	No units	6.5-8.5	Continuous	Continuous	10/01 – 12/31	7.8 – 8.4	Measure of water acidity (7.00 = neutral)
Copper	mg/L	1.0	4	4	10/01 – 12/31	0.7 – 0.7	Erosion of natural deposits
Methane	L/m <sup>3</sup>	3	1	1	10/01 – 12/31	0.013	Bacterial action in some ground waters
Iron	mg/L	0.30	4	4	10/01 – 12/31	0.001 – 0.001	Erosion of natural deposits
Manganese	mg/L	0.05	1	1	10/01 – 12/31	0.0002	Erosion of natural deposits
Alkalinity	mg/L	30-500	4	4	10/01 – 12/31	18.10 – 19.90	Dissolved carbonate minerals
Conductivity	uS/cm		4	4	10/01 – 12/31	64 – 70	Dissolved and ionized minerals
Hardness	mg/L	80-100	4	4	10/01 – 12/31	22.40 – 25.30	Dissolved mineral salts, mainly calcium, magnesium in water
Sulphate	mg/L	500	1	1	10/01 – 12/31	5.72	Erosion of natural deposits
Sodium	mg/L	200	1	1	10/01 – 12/31	3.36	Natural mineral constituent
Colour	TCU	5	8	8	10/01 – 12/31	1 – 6	Tannins and lignins from natural decay

**AO – Aesthetic Objective**

**OG – Operational Guideline**

## Loch Lomond Water Treatment Plant - Volatile Organics Tests

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Treated	Vinyl Chloride	.002	1	0	12/01/00	<0.001	NO	
	1,1-Dichloroethylene	.014	1	0	12/01/00	<0.001	NO	
	Dichloromethane	.05	1	0	12/01/00	<0.001	NO	
	Chloroform	Note 1	1	1	12/01/00	.062	NO	Type of trihalomethane (THM)
	Carbon Tetrachloride	.005	1	0	12/01/00	<0.001	NO	
	Benzene	.005	1	0	12/01/00	<0.001	NO	
	1,2-Dichloroethane	.005	1	0	12/01/00	<0.001	NO	
	Bromodichloromethane	Note 1	1	1	12/01/00	.002	NO	Type of trihalomethane (THM)
	Toluene	.024 **	1	0	12/01/00	<0.001		
	Trichloroethylene	.05	1	0	12/01/00	<0.001	NO	
	Tetrachloroethylene	.03	1	0	12/01/00	<0.001	NO	
	Dibromochloromethane	Note 1	1	0	12/01/00	<0.001	NO	
	Monochlorobenzene	.08	1	0	12/01/00	<0.001	NO	
	Ethylbenzene	.0024**	1	0	12/01/00	<0.001		
	m,p-Xylene	0.3*	1	0	12/01/00	<0.001		
	o-Xylene	0.3*	1	0	12/01/00	<0.001		
	Bromoform	Note 1	1	0	12/01/00	<0.001	NO	
	1,4-Dichlorobenzene	.005	1	0	12/01/00	<0.002	NO	
1,2-Dichlorobenzene	0.2	1	0	12/01/00	<0.002	NO		
Loch Lomond Distribution System	Total THM's – System Extremity (2)	0.100	4	4	12/01/00	0.115 (2)	YES	Disinfection by-products

NOTE 1 – Total of all trihalomethanes (chloroform & bromochloromethanes) should not exceed THM standard of 0.100 mg/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

\* - 0.3 is AO for total Xylenes

< -Means less than the specified method detection limit

## Loch Lomond Water Treatment Plant – Pesticides & PCB Tests

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Treated Water	Alachlor	.005	1	0	12/01/00	<0.005	NO	Insecticide, hebicide and fungicide Residues
	Atrazine	.005	1	0	12/01/00	<0.005	NO	
	Azinphos-methyl	.02	1	0	12/01/00	<0.02	NO	
	Chlorpyrifos	.09	1	0	12/01/00	<0.09	NO	
	Cyanazine	.01	1	0	12/01/00	<0.01	NO	
	Diazinon	.02	1	0	12/01/00	<0.02	NO	
	Diclofop-methyl	.009	1	0	12/01/00	<0.009	NO	
	Dimethoate	.02	1	0	12/01/00	<0.02	NO	
	Dinoseb	.01	1	0	12/01/00	<0.01	NO	
	Malathion	.19	1	0	12/01/00	<0.19	NO	
	Metribuzin	.08	1	0	12/01/00	<0.08	NO	



**Loch Lomond - Pesticides & PCB Tests (cont.)**

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Date(s)	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Treated Water (cont.)	Parathion	.05	1	0	12/01/00	<0.05	NO	Insecticide, hebicide and fungicide Residues
	Phorate	.002	1	0	12/01/00	<0.002	NO	
	Prometryne	.001	1	0	12/01/00	<0.001	NO	
	Simazine	.01	1	0	12/01/00	<0.01	NO	
	Terbufos	.001	1	0	12/01/00	<0.001	NO	
	Triallate	.23	1	0	12/01/00	<0.23	NO	
	Trifluralin	.045	1	0	12/01/00	<0.045	NO	
	P,p'-DDD	.03**	1	0	12/01/00	<0.03	NO	
	P,p'-DDE	.03**	1	0	12/01/00	<0.03	NO	
	P,p'-DDT	.03**	1	0	12/01/00	<0.03	NO	
	Aldrin	.0007*	1	0	12/01/00	<0.0007	NO	
	Dieldrin	.0007*	1	0	12/01/00	<0.0007	NO	
	Heptachlor	.003 <sup>+</sup>	1	0	12/01/00	<0.003	NO	
	Heptachlor Epoxide	.003 <sup>+</sup>	1	0	12/01/00	<0.003	NO	
	Lindane (Total)	.004	1	0	12/01/00	<0.004	NO	
	Methoxychlor	0.9	1	0	12/01/00	<0.9	NO	
	Metolachlor	.05	1	0	12/01/00	<0.05	NO	
	Chlordane	.007	1	0	12/01/00	<0.007	NO	
	Bromoxynil	.005	1	0	12/01/00	<0.005	NO	
	Dicamba	.12	1	0	12/01/00	<0.12	NO	
	2,4-Dichlorophenol	0.9	1	0	12/01/00	<0.9	NO	
	2,4-D	0.1	1	0	12/01/00	<0.1	NO	
	Pentachlorophenol	.06	1	0	12/01/00	<0.06	NO	
	Picloram	.19	1	0	12/01/00	<0.19	NO	
	2,3,4,6-Tetrachlorophenol	0.1	1	0	12/01/00	<0.1	NO	
	2,4,6-Trichlorophenol	.005	1	0	12/01/00	<0.005	NO	
	2,4,5-T	.28	1	0	12/01/00	<0.28	NO	
	Glyphosate	.28	1	0	12/01/00	<0.28	NO	
	Diquat	.07	1	0	12/01/00	<0.07	NO	
	Paraquat	.01	1	0	12/01/00	<0.01	NO	
	Aldicarb	.009	1	0	12/01/00	<0.0009	NO	
	Bendiocarb	.04	1	0	12/01/00	<0.04	NO	
Carbaryl	.09	1	0	12/01/00	<0.09	NO		
Carbofuran	.09	1	0	12/01/00	<0.09	NO		
Diuron	.15	1	0	12/01/00	<0.15	NO		
Temephos	.28	1	0	12/01/00	<0.28	NO		
PCB's	.003	1	0	12/01/00	<0.00005	NO	Electrical insulating oil	
Dioxins & Furans	15 pg/L	2	2	09/15/00	0.37-0.40 (pg/L)	NO	Insecticide & bleaching by- product, combustion by-product	

< - Means less than the specified method detection limit

## Loch Lomond Water Treatment Plant - Inorganic & General Chemistry Parameters

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Dates	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Raw	Aluminum	0.1**	1	0	12/01/00	<0.01		Natural sources at low levels
	Arsenic	0.025	1	1	12/01/00	<0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	6.39		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	0.0026		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	12/01/00	0.04		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0037		Erosion of natural mineral deposits
	Lead	0.01	1	1	12/01/00	0.0001	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	1.31		Natural mineral constituent
	Zinc	5**	1	0	12/01/00	<0.002		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	22		Natural sources, mostly dissolved carbonate
	Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels
	Chloride	250**	1	1	12/01/00	0.9		Natural sources at low levels
	Conductivity (uS/cm)		1	1	12/01/00	57		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	5		Organic matter leached into surface water from vegetation
	Hardness	100**	1	1	12/01/00	26.7		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	1	1	12/01/00	0.08	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03	NO	
	Sulphate	500**	1	1	12/01/00	6.05		Natural mineral sources
	Total Kjeldahl Nitrogen (TKN)		1	1	12/01/00	0.26		Organic matter leached into surface water from vegetation
Total Phenolics		1	0	12/01/00	<0.001	NO	Decomposition of wood	
Loch Lomond Treated	Aluminum	0.1**	1	0	12/01/00	<0.01		Natural sources at low levels
	Arsenic	0.025	1	0	12/01/00	<0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	6.34		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	0.0018		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	12/01/00	0.02		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0002		Erosion of natural mineral deposits
	Lead	0.01	1	0	12/01/00	<0.0001	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	3.36		Natural mineral constituent plus sodium silicate anticorrosion additive at Loch
	Zinc	5**	1	0	12/01/00	<0.002		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	21		Natural sources, mostly dissolved carbonate
Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels	

### Loch Lomond - Inorganic & General Parameters (cont.)

Source Water	Parameter	MAC/ IMAC	# of Samples	# of Detectable Results	Dates	Range (mg/L)	Exceedance	Source of Parameter
Loch Lomond Treated Water (cont.)	Chloride	250**	1	1	12/01/00	2.96		Natural sources at low levels
	Conductivity (uS/cm)		1	1	12/01/00	65		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	4		Organic matter leached into surface water from vegetation
	Fluoride	1.5	1	1	12/01/00	0.04	NO	Natural mineral deposits
	Hardness	100**	1	1	12/01/00	26.4		Natural dissolved minerals (Ca,Mg)
	Nitrate	10	1	1	12/01/00	0.08	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03	NO	
	Sulphide	0.05**	1	0	12/01/00	<0.003		Natural leaching in oxygen-poor conditions, low levels in surface water
	Sulphate	500**	1	1	12/01/00	5.72		Natural mineral sources
	Total Kjeldahl Nitrogen (TKN)		1	1	12/01/00	0.19		Organic matter leached into surface water from vegetation
Loch Lomond Distribution System	Total Dissolved Solids	500**	1	1	12/01/00	90		Indicator of dissolved minerals in water
	Aluminum	0.1**	1	0	12/01/00	<0.01		Natural sources at low levels
	Arsenic	0.025	1	0	12/01/00	<0.0004	NO	Natural source at low levels
	Calcium		1	1	12/01/00	6.37		Common mineral constituent
	Copper	1.0**	1	1	12/01/00	.0234		Corrosion of plumbing system, erosion of natural deposits
	Iron	0.3**	1	1	12/01/00	0.07		Erosion of natural deposits, corrosion of cast iron mains
	Manganese	0.05**	1	1	12/01/00	0.0013		Erosion of natural mineral deposits
	Lead	0.01	1	1	12/01/00	0.0001	NO	Leaching from plumbing and service connections
	Sodium	200**	1	1	12/01/00	3.42		Natural mineral constituent plus sodium silicate anticorrosion additive at Loch
	Zinc	5**	1	0	12/01/00	<0.002		Natural sources, corrosion of plumbing
	Alkalinity	500**	1	1	12/01/00	22		Natural sources - dissolved carbonates
	Ammonia		1	0	12/01/00	<0.05		Natural sources at low levels
	Chloride	250**	1	1	12/01/00	2.89		Natural sources at low levels
	Conductivity (uS/cm)		1	1	12/01/00	65		Natural dissolved material in water
	Dissolved Organic Carbon (DOC)	5**	1	1	12/01/00	4		Organic matter leached into surface water from vegetation
	Hardness	100**	1	1	12/01/00	26.4		Natural dissolved minerals (Ca, Mg)
	Nitrate	10	1	1	12/01/00	0.08	NO	Natural sources at low levels, Fertilizer, septic runoff at high levels
	Nitrite	10 <sup>+</sup>	1	0	12/01/00	<0.03		
	Sulphate	500**	1	1	12/01/00	5.73		Natural mineral sources
	Total Kjeldahl Nitrogen (TKN)		1	1	12/01/00	0.20		Organic matter leached into surface water from vegetation

\*\* -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