2010 Annual Water Report

City of Revelstoke

Engineering and Public Works Department

Contents

Introduction:

Under the terms of the City of Revelstoke's Operating Permit the City is required to provide an annual report to users of the system that provides an overview of the water system, and a summery of water test results, maintenance and improvements made to the system. All water suppliers are required to provide a similar annual report to their users.

This report has been submitted to Interior Health and is posted on the City of Revelstoke website. http://city.revelstoke.ca

Revelstoke Water Distribution System:

The City of Revelstoke has approximately 2996 residential and 310 commercial water connections serving the citizens of Revelstoke. These users primarily get their drinking water from Greeley Creek. The City also utilizes a secondary source from the Golf Course well groundwater field.

Water from the Greeley Creek source is treated through a membrane treatment facility. However, under the City's "Permit to Operate" additional treatment with chlorine is required to insure the integrity of the water is maintained while it travels through the distribution system. Water from the Golf Course well is treated with chlorine before it enters into the distribution system.

As part of the water distribution system the City maintains 98 km of water main, 2 reservoirs and 2 pump stations. Figure 1 shows the layout of the City's water distribution system.

Greeley Creek Water Treatment Plant

Located approximately 8km from the City of Revelstoke, the Greeley Water Treatment Plant is the primary water treatment facility for the City. The plant was constructed in 2000 and uses a micro filtration membrane system to remove water born parasites and particles. The plant also adds chlorine to the treated water to insure the integrity of the water up to the user's tap. The plant is capable of supplying up to

At the time of its construction the plant was one of the most advanced facilities in North America and the first of its kind in British Columbia.

The plant is capable of supplying 198 l/s.

Golf Course Well

The City of Revelstoke operates a groundwater well and disinfection station located adjacent to the Columbia River on the City of Revelstoke's municipally owned golf

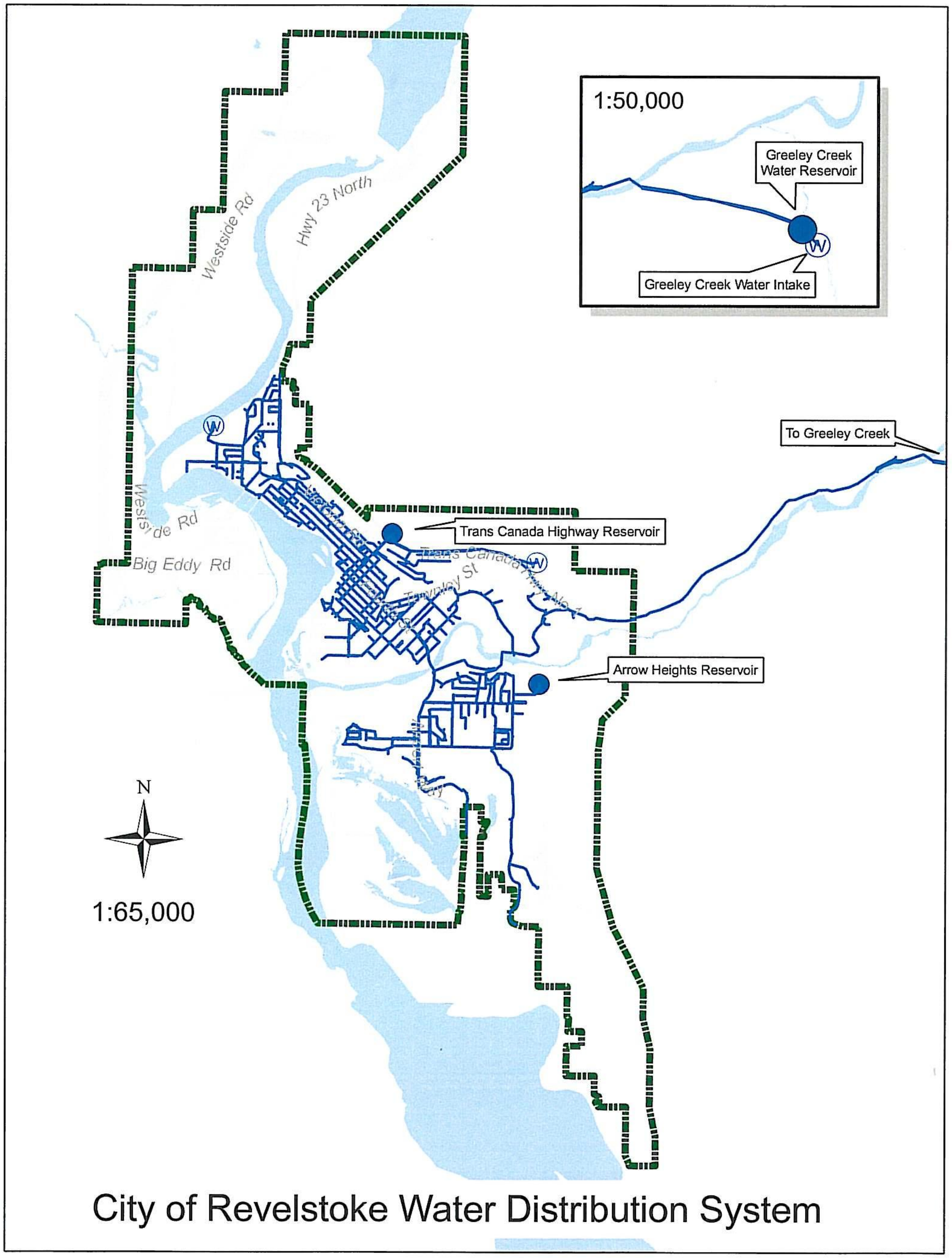

1:50,000
Greeley Creek Water Reservoir
Greeley Creek Water Intake
Westside Rd
Hwy 23 North
To Greeley Creek
Trans Canada Highway Reservoir
Big Eddy Rd
Arrow Heights Reservoir
N
1:65,000
City of Revelstoke Water Distribution System

Figure 1

course. The well is used as a back-up water supply to the Greeley Creek water source as well as providing additional water to the system during periods of peak demand. Additionally the well provides raw water to the golf course for irrigation purposes.

The well is capable of supplying 75 l/s. Disinfection at the site is provided through a hypochlorite system.

Reservoirs:

The Trans Canada Highway Reservoir is located off the Trans Canada Highway and the Arrow Heights Reservoir is located above upper Arrow Heights.

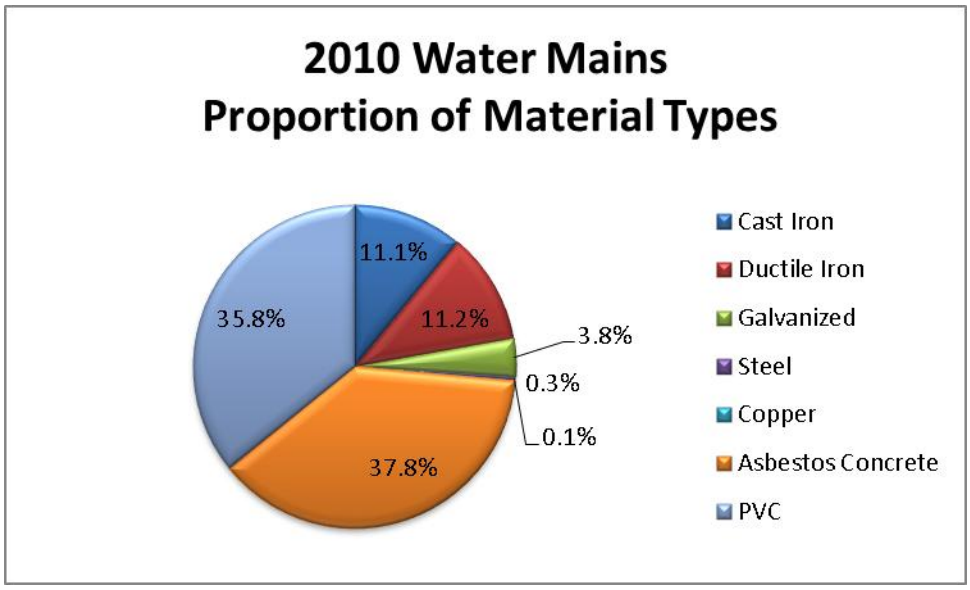
The Trans Canada Highway Reservoir is a steel tank which holds 4.55 million liters of water. The tank was constructed in 1927. The reservoir is the primary reservoir for the City of Revelstoke

An evaluation of the tank in 2008 revealed that areas of the steel floor have deteriorated to unacceptable thicknesses. In order to limit further deterioration of the steel floor plates and to provide the City with enough time to plan for a replacement reservoir a high density polyethylene liner was installed over the floor in 2009 which would give the City up to additional 5 years of use. In the fall of 2009 the City was successful in securing $644,000 funding from the Building Canada Fund – Communities Component to cover a portion of cost to construct a new reservoir. Construction of the replacement reservoir is scheduled to take place in 2011.

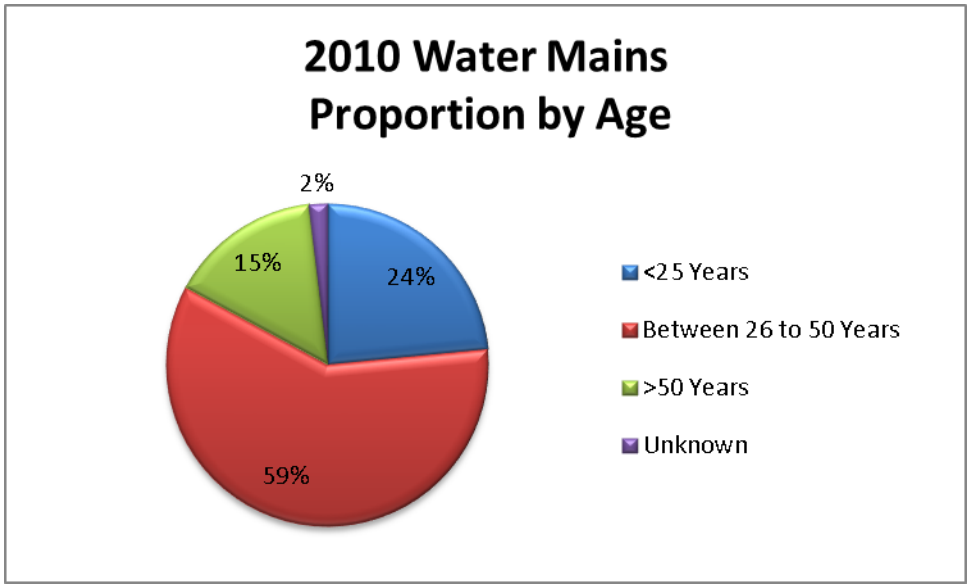
The Arrow Heights Reservoir is a 2.27 million liter concrete tank. The reservoir was constructed in 2004.

Distribution System:

The City's water 98 km distribution system is made up of 10.8 km cast iron pipe, 11 km of ductile iron pipe, 3.7 km of galvanized pipe, 0.3 km of steel pipe, 37.1 km of asbestos concrete pipe and 35.2 km PVC pipe,0.01km of copper. Pipe sizes range from 37mm to 300mm in diameter.



The age of the water mains range from new to approximately 81 years old. The age of the pipe does not necessarily reflect the need to replace it as the various material types have different average life expectancies. For example cast iron pipe can last up to 100 years where as galvanized pipe will only last up to 40 years.



The City has an active program to replace pipes which are either inadequately sized, in poor condition or have reached the end of their functional life.

Pump Stations:

The Arrow Heights Pump Station is used to fill the Arrow Heights Reservoir and regulate the line pressure in Pressure Zone 3. The station was constructed in 2005 at the same

time as the Arrow Heights Reservoir. In August of 2010, a pipe coupling failed which resulted in significant damage to the station. Repairs were completed and the station was brought back on line in November 2010.

The Revelstoke Mountain Resort Booster Station was completed in 2010 by Revelstoke Mountain Resort for the City. The station regulates the line pressure to Mackenzie Landing and Monashee Estates at present. In the future the station will also be used to fill additional storage reservoirs which will need to be constructed as the resort grows.

SCADA (Supervisory Control and Data Acquisition):

A SCADA computerize control system is used by the City to monitor and control the functions of the water treatment plant, pump stations and reservoirs. This system allows the Engineering and Public Works Department to monitor reservoir levels, the on/off status and flows of pumps, and chlorine residuals within the system. The operator can change set points and monitor the systems remotely 24 hours per day, seven days per week. Alarms are set to alert operators to potential problems within the systems.

Pressure Zones:

The City is divided into 5 pressure zones. The system pressure in each Zone ranges from 40 psi to 130 psi. As part of it's Water Regulations Bylaw, the City requires all service connections to the City's water system to have a pressure reducing valve where the service line enters into the premises.

Routine Maintenance Program:

Distribution:

Fire hydrants are inspected and flushed annually. Starting in 2011 the City will initiate a program to exercise water main valves to make sure that they are operating properly.

Golf Course Well

The City carries out a regular preventative maintenance program at the golf course well and disinfection station. The program includes a daily site visit, running the well pump daily to insure that it is at the ready if required as well as insuring the disinfection stations is operating within normal parameters..

Greeley Creek Water Treatment Plant:

As part of the preventative maintenance program for the plant, the site is visited daily and the chlorine disinfection unit is inspected.

As part of the routine maintenance of the membrane filtration system, individual filtration units are taken off line after a set volume of water has passed through them. The isolated unit is put through a chemical back wash to clean the filter and then put back on line. Each filter unit must be replaced at least one every 10 years.

Reservoirs:

The City's reservoirs are inspected daily to make sure the site and structure are secure. In the case of t he Arrow Heights Reservoir the flow through the reservoir is monitored to insure that there is adequate turnover of water within the tank.

Pump Stations:

The Arrow Heights and Revelstoke Mountain Resort pump stations are inspected daily. All pumps and motors are inspected and serviced annually as per the operations and maintenance protocols for each facility.

2010 Improvements:

- Upgraded the SCADA system communication network to improve transmission of data to and from sites
- Installed SCADA Corporate Historian to secure integrity of historic data collected from sites
- Increased water main size on Pearkes Street between La Forme Boulevard and Smyth Road
- Replaced water main on 4th Street between Campbell Avenue and Boyle Avenue
- Replaced water main on 9th Street from the CPR Right of Way to Victoria Road

2011 Capital Projects and Improvements:

In 2011 the City of Revelstoke is planning to undertake the following projects:

- Replacement of the Trans Canada Highway Reservoir
- Replacement of the water main on King Street
- Replacement of the water main 2nd street
- Installation of a pressure reducing valve on the Cedar Street main to improve line pressure for fire flows in the area.

Water Consumption:

In 2010 the City treated 2 million cubic meters of water. As shown in Figure 3 the amount of water treated in 2010 is consistent with other years since the Greeley water treatment plant was put into production. In 2010 the operational cost to produce treated water was $0.18 per cubic metre. This unit rate is constant with the average of the last 3 years.

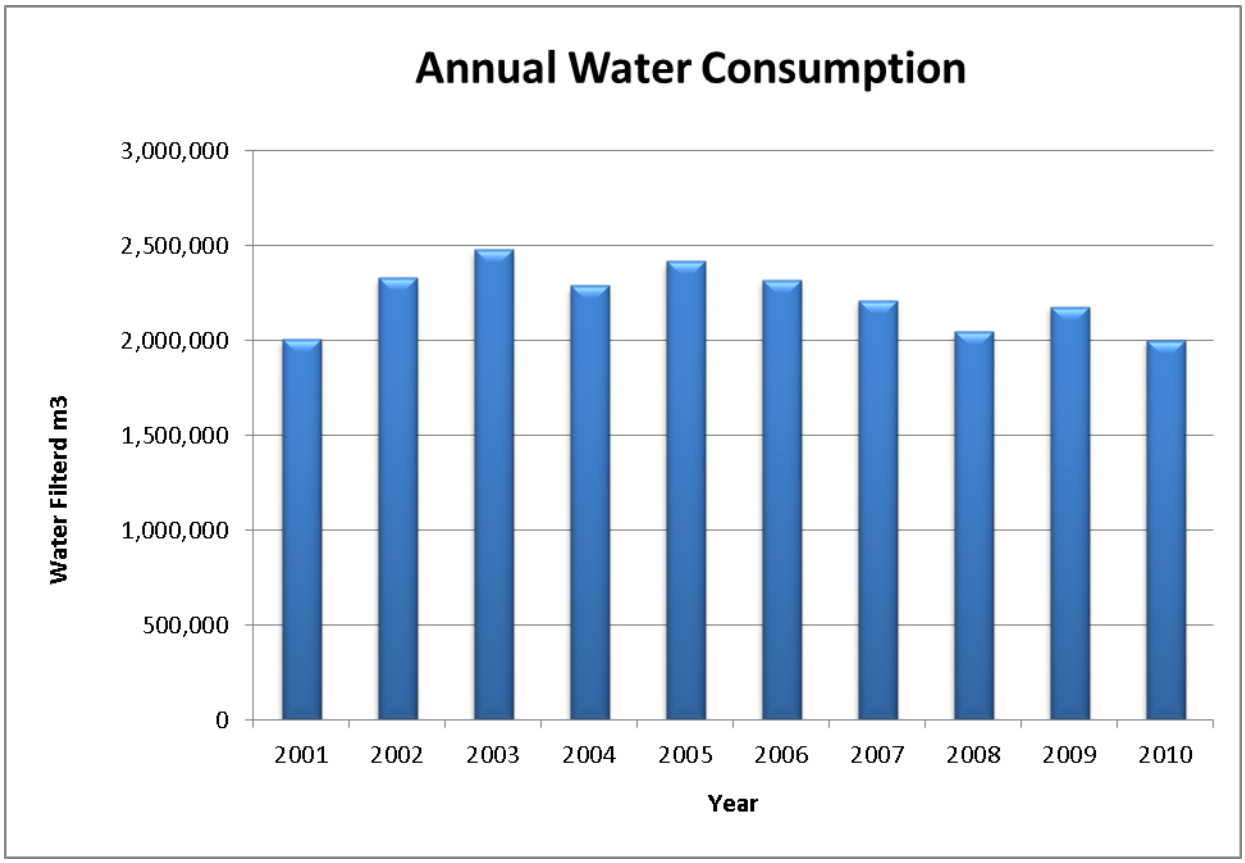


Figure 3.

As shown in Figure 4. Monthly water consumption in 2010 was below the 10 year average.

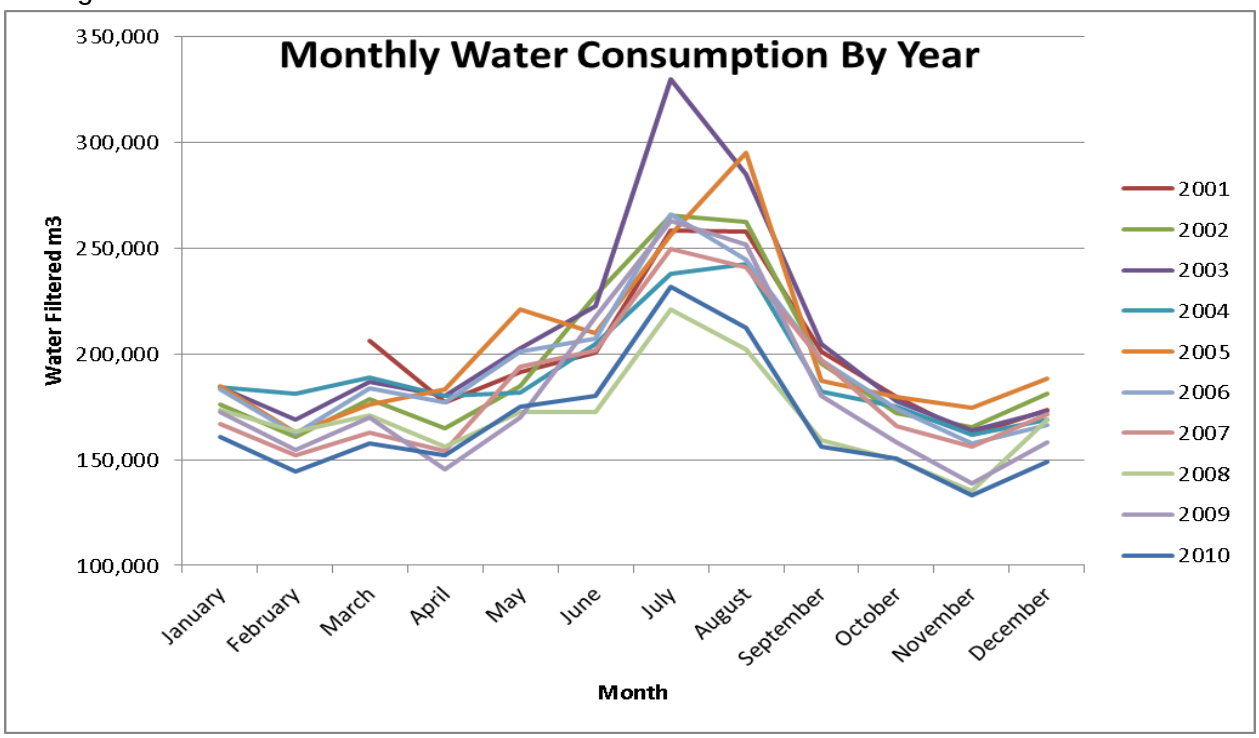


Figure 4.

As the population in the City grows, the cost of supplying and treating our water grows as well. These increases push the City to review infrastructure and plan improvements to offset these costs.

Water Sampling and Testing:

Bacteriological:

As required by the Interior Health Authority (IHA), City staff takes weekly samples of the water for bacteriological testing for Total Coliforms and e-Coli Bacteria. There are nine different sampling sites used throughout Revelstoke. In addition, water samples are taken from within project areas after any work on infrastructure.

See Appendix A for 2010 test results.

Full Spectrum Analysis:

Once per year, City staff also sends samples from the source water for a full spectrum analysis. Parameters such as alkalinity, metals, pH, turbidity, hardness and disinfection byproducts are tested.

See Appendix B for 2010 test results.

Water Quality Complaints:

The Engineering and Public Works Department had very few complaints in 2010 about water quality. A few people complained about a stronger than normal chlorine smell. These complaints were from several different areas in town and testing showed no increased chlorine levels present. A few complaints about dirty water in the Columbia Park area of town were attributed to the repair of a fire hydrant and flushing of water lines. Whenever there was a water main break there would be questions about the turbidity of the water in the area and residents were advised that this was normal and to run their water to flush out their water lines within their residence.

Cross Connection Program:

The City is developing a Cross Connection Control Program to address the potential for the water system to be compromised by high risk service connections which could introduce contaminated water into the City's water system.

Emergency Response Plan:

The City has an Emergency Response Plan pertaining to the water system. The Emergency Response Plan identifies a number of potential emergency situations which could occur and provides a systematic approach on how the City will deal with the emergency. The plan is available for public viewing at the Engineering and Public Works office at City Hall.

Appendix A:

Chevron	Date Collected	Total Coliform	E. Coli
	Feb. 3, 2010	<1	<1
	May 4, 2010	<1	<1
	June 1, 2010	<1	<1
	July 6, 2010	<1	<1
	Sept. 7, 2010	<1	<1
	Oct. 5, 2010	<1	<1
	Nov. 2, 2010	<1	<1
	Dec. 2, 2010	<1	<1

City Hall	Date Collected	Total Coliform	E. Coli
	Jan. 19, 2010	<1	<1
	May 18, 2010	<1	<1
	June 22, 2010	<1	<1
	July 20, 2010	<1	<1
	Aug. 17, 2010	<1	<1
	Sept. 21, 2010	<1	<1
	Oct. 20, 2010	<1	<1
	Nov. 16, 2010	<1	<1
	Dec. 15, 2010	<1	<1

Courthouse	Date Collected	Total Coliform	E. Coli
	Feb. 9, 2010	<1	<1
	Apr. 13, 2010	<1	<1
	May 11, 2010	<1	<1
	June 8, 2010	<1	<1
	July 13, 2010	<1	<1
	Sept. 14, 2010	<1	<1
	Oct. 13, 2010	<1	<1

	Nov. 9, 2010	<1	<1
	Dec. 15, 2010	<1	<1

Golf Course Well	Date Collected	Total Coliform	E. Coli
	Jan. 19, 2010	<1	<1
	Feb. 3, 2010	<1	<1
	May 4, 2010	<1	<1
	May 18, 2010	<1	<1
	June 1, 2010	<1	<1
	July 6, 2010	<1	<1
	July 20, 2010	<1	<1
	Aug. 17, 2010	<1	<1
	Sept. 7, 2010	<1	<1
	Sept. 21, 2010	<1	<1
	Oct. 5, 2010	<1	<1
	Nov. 16, 2010	<1	<1
	Dec. 2, 2010	<1	<1
	Dec. 21, 2010	<1	<1

Jacobson Ford	Date Collected	Total Coliform	E. Coli
	Feb. 9, 2010	<1	<1
	Apr. 13, 2010	<1	<1
	May 11, 2010	<1	<1
	June 8, 2010	<1	<1
	July 13, 2010	<1	<1
	Sept. 14, 2010	<1	<1
	Oct. 13, 2010	<1	<1
	Nov. 9, 2010	<1	<1
	Dec. 2, 2010	<1	<1

NAPA Auto	Date Collected	Total Coliform	E. Coli
	Feb. 3, 2010	<1	<1
	May 4, 2010	<1	<1
	June 1, 2010	<1	<1
	July 6, 2010	<1	<1
	Sept. 7, 2010	<1	<1
	Oct. 5, 2010	<1	<1
	Nov. 2, 2010	<1	<1
	Dec. 2, 2010	<1	<1

Public Works Yard	Date Collected	Total Coliform	E. Coli
	Jan. 19, 2010	<1	<1
	May 18, 2010	<1	<1
	June 22, 2010	<1	<1
	July 20, 2010	<1	<1
	Aug. 17, 2010	<1	<1
	Sept. 21, 2010	<1	<1
	Oct. 20, 2010	<1	<1
	Dec. 15, 2010	<1	<1

Queen Victoria Hospital	Date Collected	Total Coliform	E. Coli
	Jan. 26, 2010	<1	<1
	Mar. 23, 2010	<1	<1
	Apr. 27, 2010	<1	<1
	May 25, 2010	<1	<1
	June 29, 2010	<1	<1
	July 27, 2010	<1	<1
	Aug. 24, 2010	<1	<1
	Oct. 5, 2010	<1	<1
	Oct. 26, 2010	<1	<1

	Dec. 21, 2010	<1	<1

Sewage Treatment Plant	Date Collected	Total Coliform	E. Coli
	Jan. 26, 2010	<1	<1
	Mar. 23, 2010	<1	<1
	Apr. 27, 2010	<1	<1
	May 25, 2010	<1	<1
	June 29, 2010	<1	<1
	July 27, 2010	<1	<1
	Aug. 24, 2010	<1	<1
	Oct. 5, 2010	<1	<1
	Oct. 26, 2010	<1	<1
	Dec. 21, 2010	<1	<1

Appendix B:

SAMPLE DATA

CARO ANALYTICAL SERVICES

CLIENT	Revelstoke, City of	**WORK ORDER #**	K0L0803
PROJECT	Greeley Intake	**REPORTED**	Dec-30-10

Analyte	Result	RDL	Units	Analyzed	Method (mod. from)	Lab	Notes
General Parameters							
Greeley Intake (K0L0803-01) Matrix: Water Sampled: Dec-21-10 09:00							
Alkalinity, Total as CaCO3	**40.9**	1.0	mg/L	Dec-22-10	APHA 2320 B	KEL	
Chloride	<0.10	0.10	mg/L	Dec-23-10	APHA 4110 B	KEL	
Colour, True	<5	5	Color Unit	Dec-23-10	APHA 2120 B	KEL	
Conductivity (EC)	**112**	2	uS/cm	Dec-22-10	APHA 2510 B	KEL	
Cyanide (total)	<0.01	0.01	mg/L	Dec-23-10	APHA 4500-CN	KEL	
Fluoride	<0.10	0.10	mg/L	Dec-23-10	APHA 4110 B	KEL	
Hardness, Total (Total as CaCO3)	**46.3**	2.91	mg/L	Dec-24-10	APHA 2340 B	RMD	
Nitrogen, Nitrate as N	**0.08**	0.01	mg/L	Dec-23-10	APHA 4110 B	KEL	
Nitrogen, Nitrite as N	<0.01	0.01	mg/L	Dec-23-10	APHA 4110 B	KEL	
pH	**7.49**	0.01	pH Units	Dec-22-10	APHA 4500-H+ B	KEL	
Solids, Total Dissolved	**52**	5	mg/L	Dec-24-10	APHA 2540 C	KEL	
Sulfate	**14.5**	1.0	mg/L	Dec-23-10	APHA 4110 B	KEL	
Turbidity	**0.2**	0.1	NTU	Dec-23-10	APHA 2130 B	KEL	
UV Transmittance @ 254nm	**97.3**	0.1	%	Dec-22-10	APHA 5910B	KEL	
Total Recoverable Metals by ICPMS							
Greeley Intake (K0L0803-01) Matrix: Water Sampled: Dec-21-10 09:00							
Aluminum	<0.040	0.040	mg/L	Dec-24-10	EPA 6020A	RMD	
Antimony	<0.0010	0.0010	mg/L	Dec-24-10	EPA 6020A	RMD	
Arsenic	<0.0050	0.0050	mg/L	Dec-24-10	EPA 6020A	RMD	
Barium	<0.0500	0.0500	mg/L	Dec-24-10	EPA 6020A	RMD	
Beryllium	<0.0010	0.0010	mg/L	Dec-24-10	EPA 6020A	RMD	
Boron	<0.040	0.040	mg/L	Dec-24-10	EPA 6020A	RMD	
Cadmium	<0.00010	0.00010	mg/L	Dec-24-10	EPA 6020A	RMD	
Calcium	**15.6**	1.0	mg/L	Dec-24-10	EPA 6020A	RMD	
Chromium	<0.0050	0.0050	mg/L	Dec-24-10	EPA 6020A	RMD	
Cobalt	<0.00050	0.00050	mg/L	Dec-24-10	EPA 6020A	RMD	
Copper	<0.0020	0.0020	mg/L	Dec-24-10	EPA 6020A	RMD	
Iron	<0.10	0.10	mg/L	Dec-24-10	EPA 6020A	RMD	
Lead	<0.0010	0.0010	mg/L	Dec-24-10	EPA 6020A	RMD	
Magnesium	**1.78**	0.10	mg/L	Dec-24-10	EPA 6020A	RMD	
Manganese	<0.0020	0.0020	mg/L	Dec-24-10	EPA 6020A	RMD	
Mercury	<0.00050	0.00050	mg/L	Dec-24-10	EPA 6020A	RMD	
Molybdenum	<0.0010	0.0010	mg/L	Dec-24-10	EPA 6020A	RMD	
Nickel	**0.0028**	0.0020	mg/L	Dec-24-10	EPA 6020A	RMD	
Phosphorus	<0.20	0.20	mg/L	Dec-24-10	EPA 6020A	RMD	
Potassium	**1.12**	0.20	mg/L	Dec-24-10	EPA 6020A	RMD	
Selenium	<0.0050	0.0050	mg/L	Dec-24-10	EPA 6020A	RMD	
Silicon	<5.0	5.0	mg/L	Dec-24-10	EPA 6020A	RMD	
Silver	<0.00050	0.00050	mg/L	Dec-24-10	EPA 6020A	RMD	
Sodium	**1.21**	0.20	mg/L	Dec-24-10	EPA 6020A	RMD	
Uranium	**0.00032**	0.00020	mg/L	Dec-24-10	EPA 6020A	RMD	
Vanadium	<0.010	0.010	mg/L	Dec-24-10	EPA 6020A	RMD	
Zinc	<0.040	0.040	mg/L	Dec-24-10	EPA 6020A	RMD	

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